Santa Margarita Groundwater Agency

Document: DRAFT - Santa Margarita Basin Water Year 2022 Annual Report

Version: February 14, 2023

Prepared by: Montgomery & Associates

Posted: https://www.smgwa.org/AgencyDocuments

Comments and Revisions on Draft

(ordered alphabetically)

1. Board Director, Jack Dilles, City of Scotts Valley
2. Board Alternate Director, Doug Engfer, City of Santa Cruz
3. Board Director, Gail Mahood, San Lorenzo Valley Water District
4. Board Director, Ruth Stiles, Scotts Valley Water District

Comments on Draft GSP Annual Report for Water Year 2022

Jack Dilles
Fri 3/3/2023 12:40 PM
To: Santa Margarita Groundwater Agency Admin <admin@smgwa.org>

Greetings: I have one comment/question about the Santa Margarita Draft GSP Annual Report. The following section in the draft report describes LID Projects, including past and current activities and the evaluation of future opportunities. I do not see any mention of the $1.6 million grant just awarded to the Scotts Valley Water District to complete its LID project at the Metro station in Scotts Valley. As I understand this project, it will direct 8 million gallons of water a year into the groundwater system. Should this be included in the report?

Thank you.

Jack Dilles, Board Member
City of Scotts Valley

4.5.1.2 SVWD Low Impact Development (LID) Projects

SVWD monitors 3 LID facilities, which were developed prior to SGMA. As Table 2 shows, 16 AF of stormwater capture is reported in WY2022 at the three LID facilities. LID infiltrated stormwater recharges the Santa Margarita aquifer in a manner similar to natural processes. The stormwater infiltration helps augment groundwater levels and sustains groundwater contributions to creek baseflow that supports local fishery habitats. The three LID facilities

overlie and infiltrate stormwater into the Santa Margarita Sandstone in areas where the underlying Monterey Formation restricts recharge of that water into the Lompico aquifer beneath the Monterey Formation. Because of the geological sequence, there is limited potential of the existing LID facilities to recharge the Lompico aquifer that has the greatest need for recovery and is the source of most of SVWD's water supply. Another complicating factor in implementing LID projects in the Scotts Valley area is that there is no centralized stormwater collection system, which limits feasibility for large scale projects and direct recharge to the most beneficial areas.

SVWD continues to evaluate opportunities for additional LID expansion in the future. Costs of past projects have been in large part offset by grant funding. SVWD is pursuing 2022 Urban Community Drought Relief grant funding to expand the Transit Center LID project to contribute approximately 1 to 4 AF/yr of additional stormwater recharge to the Santa Margarita aquifer.

Re: Draft GSP Annual Report Water Year 2022 Available for Review

Doug Engfer
Thu 3/2/2023 2:04 PM
To: Santa Margarita Groundwater Agency Admin <admin@smgwa.org>
Cc: Rosemary Menard ;Justin Burks ;David Baskin

Thanks for the opportunity to "pre-review" this draft. Generally, very solid work (as always!) - please commend staff and the Montgomery team for the good work.

I do have a few suggestions / questions, as follows:

- [Page 3, 58]
  - The discussion of the additional SVWD production well needs further context in order to clarify how adding a production well can contribute to basin sustainability (as claimed in the document). I do recall some perspective that Piret has shared on this in the past, but can't access any detailed information as I write this (getting older is not for the faint of heart!).
- [Page 33]
  - Suggest considering adding some information about how frequently we will re-calibrate the basin model (that is, reference the model re-calibration schedule, and where we are in that schedule).
  - As regards the results-interpretation error regarding cumulative storage losses, suggest that staff consider including the original (erring) chart (perhaps among the various charts in the appendices) for reference.
- [Page 36]
  - Suggest consider adding note about our intent to deploy a new monitoring well in Butano (funding permitting), as we've done elsewhere in the document.

Also, a few copy-edit suggestions:

- [Page 30]
  - The sentence beginning "Nearly all Basin surface water…" needs to be re-written in order to make clear that the sentence refers not to all of the basin's surface water, but rather that portion of the basin's surface water that is used for SLVWD supplies.
- [Page 35]
  - "…is absent the…" should perhaps read "…is absent and the…."
- [Page 42]
  - "…recent years are drier…" should perhaps read "…recent years have been drier…"
- [Page 46]
  - "…not expected to be achieved…" should be expanded to clarify that we don't expect to achieve it without in-planning PMAs. As written, it sounds like we simply don't expect to ever achieve that MO.
  - "…absent of other…" should perhaps read "…absent other…"
- [Page 57]
  - "…involve 2 two …" - pick one

- [Page 58]
    - “Results….is expected…” should perhaps be “Results…are expected…”
- [Page 59]
    - “…a SGMI …” should perhaps be “…an SGMI…”
- [Page 60]
    - “…than other wells…” should perhaps be “…than the other wells…”

That’s it. Thanks again!

I stand with Ukraine,

Doug

Director Gail Mahood Revisions/Mark-Up

BOARD DRAFT

MONTGOMERY & ASSOCIATES
Water Resource Consultants

February 14, 2023

Santa Margarita Basin
Water Year 2022 Annual Report

Prepared for:

Santa Margarita Groundwater Agency

Prepared by:

Montgomery & Associates

1970 Broadway, Suite 225, Oakland, California

Contents

Tables

Figures

Appendices

ACRONYMS & ABBREVIATIONS

1,2-DCE	1,2-dichloroethene
AF	acre-feet
AF/yr	acre-feet per year
amsl	above mean sea level
Annual Report	GSP Annual Report
ASR	Aquifer Storage and Recovery
Basin	Santa Margarita Groundwater Basin
Basin Model	GSP Groundwater Basin Model
CEQA	California Environmental Quality Act
County	County of Santa Cruz
DAC	disadvantaged community
DLR	detection limit for reporting
DWR	California Department of Water Resources
EIR	Environmental Impact Report
ft bgs	feet below ground surface
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
JPA	Joint Powers Agreement
LID	low impact development
mg/L	milligrams per liter
MHA	Mount Hermon Association
MO	measurable objective
MT	minimum threshold
MTBE	methyl-tert-butyl ether
ND	not detected at laboratory detection limit
PCE	tetrachloroethene
RMPs	representative monitoring point(s)
SCWD	City of Santa Cruz Water Department
SLVWD	San Lorenzo Valley Water District
SGMA	Sustainable Groundwater Management Act
SGMI	Sustainable Groundwater Management Implementation
SMC	sustainable management criteria
SMGWA	Santa Margarita Groundwater Agency
SVWD	Scotts Valley Water District
TCE	trichloroethene
TDS	total dissolved solids
µg/L	micrograms per Liter
VOCs	volatile organic compounds

WY ....Water Year

EXECUTIVE SUMMARY

The Santa Margarita Groundwater Agency (SMGWA) prepared this second Groundwater Sustainability Plan (GSP) Annual Report (Annual Report) to summarize groundwater extractions, overall water use, groundwater conditions, and progress toward achieving sustainability for the Santa Margarita Basin (Basin) in Water Year (WY) 2022. Per the Sustainable Groundwater Management Act (SGMA), an Annual Report must be submitted to the California Department of Water Resources (DWR) by April 1 each year after completing a GSP. This Annual Report covers WY2022 from October 1, 2021, through September 30, 2022.

No undesirable results occurred in the Basin in WY2022. No minimum thresholds (MTs) were exceeded for any of the Sustainability Management Criteria (SMC) relevant to the Basin.

Groundwater in the Basin is generally of good quality and meets primary drinking water standards. Naturally occurring groundwater quality constituents that are present in some aquifers locally in the Basin are iron, manganese, arsenic, and salinity. Nitrate is the main anthropogenic groundwater contaminant that is detected occasionally in a minority of wells. In WY2022, groundwater quality concentrations are lower than MTs for all analyzed constituents except iron and manganese, which regularly exceed applicable secondary drinking water standards. These exceedances of MTs are naturally occurring; hence undesirable results are not being caused by groundwater use. All measured concentrations of iron and manganese were within their respective historical ranges. The concentrations of TDS, chloride, and nitrate were all well below MTs, but exceeded MOs in some but not all wells sampled. Arsenic was detected in 3 of 7 wells sampled. SVWD #11B is the only RMP well that regularly approaches the arsenic MCL and MT of 10 µg/L.

Like much of California, the Basin ~~has~~ experienced significantly below-~~-~~average rainfall from WY2020 through WY2022. Despite dryer-~~-~~than-~~-~~average conditions in WY2022, ~~reduced groundwater extraction helped~~ groundwater levels largely remained ~~generally~~ stable compared to WY2021 due to reduced groundwater extraction, ~~, resulting~~which resulted in a modest increase of groundwater in storage.

In WY2022, a total of ~~about~~ 2,485 acre-feet (AF) of groundwater was extracted from the Basin, ~~. Total extraction was~~ the lowest annual volume since at least WY1985. About 74% of groundwater extracted was used for public water supply by the 2 biggest water providers in the Basin: the San Lorenzo Valley Water District (SLVWD, 29%) and Scotts Valley Water District

(SVWD, 45%). The remaining 26% extracted is accounted for by Mount Hermon Association (MHA, 6%), other small water systems and private domestic wells (14%), and non-domestic uses (6%).~~Small water systems and private domestic wells accounted for an estimated 20% of groundwater extracted, while other non-domestic uses accounted for the remaining 6%.~~ Groundwater in the Basin is predominantly extracted from ~~the~~ 3 principal aquifers: the Lompico aquifer (51%), Santa Margarita aquifer (27%), and Butano aquifer (17%).

~~Surface water from the San Lorenzo River and its tributaries is an important water supply both in the Basin and downstream in the City of Santa Cruz. SLVWD diverts surface water from 9 intakes on San Lorenzo River tributaries immediately upstream of the Basin. However, 6 of SLVWD's 9 diversions were inoperable due to damage sustained by the CZU Complex wildfire in August 2020. Repairs to Foreman Creek in the North System and a raw water line from the Bennett diversion in the Felton System have been completed. SLVWD was able to maximize its Fall Creek diversion while maintaining bypass flows to help reduce its reliance on groundwater.~~ In WY2022, SLVWD reduced its groundwater extraction by about 47% compared to WY2021, a year in which groundwater usage was anomalously high due to the destruction of surface water infrastructure in the August 2020 CZU wildfire. The emergency condition created by the wildfire damage allowed SLVWD to use an emergency intertie to maximize its surface water diversions in the Felton System (while maintaining fish bypass flows) in conveying water to the North and South Systems to reduce reliance on groundwater. This District-wide conjunctive use made it possible for SLVWD to use surface water exclusively for approximately 30 days in WY2021 and 60 days in WY2022, and to reduce WY2022 total groundwater extraction to an annual volume that is one of the lowest on record, despite having only a single reconstructed surface water intake in the North system. ~~These repairs allowed SLVWD to exclusively use surface water for approximately 30 days in WY2021 and 60 days in WY2022. With limited surface water diversion capacity in WY2022, demand management through water conservation and public awareness after successive dry years has also allowed SLVWD to reduce WY2022 groundwater extractions to an annual volume that is one of the lowest on record.~~ SLVWD plans to rebuild the remaining damaged creek intakes and the raw water pipelines in the North System in order to restore its surface water supply and increase the amount of surface water available for *in lieu* recharge to further reduce groundwater extraction in the Basin.

SVWD reduced its groundwater extraction by about 2% in WY2022 compared to WY2021, with most reductions coming from its Lompico aquifer wells. Groundwater extraction by small water systems, including MHA, have remained stable according to data reported to the County. Un-metered groundwater extraction by private domestic wells and other minor non-domestic users are not expected to fluctuate significantly from year to year.

SLVWD plans to repair the remaining 5 damaged diversions in the North System to improve redundancy and increase overall surface water availability.

Reduced groundwater extractions in recent years have allowed groundwater levels to stabilize, thus meeting the Basin's sustainability goals and sustainable management criteria (SMC) established in the GSP. At all the representative monitoring points (RMPs) used to assess chronic lowering of groundwater levels and depletion of interconnected surface water, groundwater elevations are higher than minimum thresholds (MTs). Many RMP's Groundwater elevations in many RMPs are higher than the 2027 interim milestones and the long-term measurable objectives (MO) the SMGWA strives to achieve by 2042. TSimilarly, the volume of groundwater extracted, used to evaluate the groundwater in storage indicator, is less than the MT but does not quite achieve the MO. This is expected as thee MO for groundwater in storage is an aspirational level (as opposed to a historical average as used for the MOs for other SMCs) that is based on implementation of additional projects and management actions that are still in the planning phase.

Total water use by the two major water providers in the Basin, SLVWD and SVWD, has been decreasing consistently since the early 2000s, largely due to residents' strong conservation efforts and State regulations regarding water use efficiency in construction, as well as water-efficiency measures undertaken by the water districts. Over this same period, groundwater extraction by SVWD has declined despite continued population growth in the town of Scotts Valley. As a result, in WY2022 the volume of groundwater extracted south of Bean Creek, where the majority of the Basin's population resides, was similar to the volume extracted north of Bean Creek. The two-decade long reduction in groundwater use is consistent with the observation that groundwater elevations in SVWD wells in the South Scotts Valley area appear to be on a recovery trajectory since WY2015, despite recent dry years. These data suggest that current extraction rates in the area of most concern, the Lompico aquifer south of Bean Creek, may be sustainable under present conditions.

Although all indicators are that the Basin is now on a positive trajectory, the two decades of overdraft caused losses of groundwater in storage that otherwise would provide a buffer against extended drought. In order to assure sustainability of the Basin under predicted future climate patterns, the 2022 GSP ranked a number of potential projects and management actions that could be implemented in the Basin. The highest-priority projects were continuation and augmentation of conservation and water efficiency projects that began before the 2022 GSP and expansion of *in lieu* recharge in the Basin. In

Groundwater quality is good in public supply well RMPs, with concentrations below MTs for constituents of concern, except where naturally elevated iron and manganese are found in the

Santa Margarita and Lompico aquifers. In WY2022, iron and manganese in RMPs are close to long-term average concentrations used to define the MOs for these constituents. Iron and manganese concentrations are reduced in drinking water, either through treatment of raw water or by blending to meet appropriate water quality standards.

With changing climate patterns in the region, additional projects or management actions are needed to achieve sustainability and to improve water supply reliability, especially in the Santa Margarita and Lompico aquifers south of Bean Creek near Mount Hermon, Pasatiempo, and South Scotts Valley. Planned and potential projects and management actions focus on improving water use efficiency, increasing groundwater recharge, and increasing conjunctive use of surface water, recycled water, or other available water sources.

In WY2022, SMGWA member and partner agencies advanced planning efforts for expanded conjunctive use of surface water and groundwater.

For many years, SLVWD has successfully applied practiced conjunctive use in its North System to limit groundwater extraction in wet years, so that increased reliance on groundwater in dry years does not cause groundwater overdraft. SLVWD is currently pursuing a change in its water rights to expand conjunctive use within the District so that excess surface flows from the Felton System could be conveyed to the North and South Systems for *in lieu* recharge in order to to the South System, raise groundwater levels in the overdrafted Lompico aAquifer south of Bean Creek, and to support fisheries in the creeks within the Basin. SLVWD plans to complete an Environmental Impact Report (EIR) in WY2024 in support of conjunctive use within the District boundaries.

SLVWD is also planning to complete a study in WY2023 that assesses the feasibility of conveyance and improvements to water treatment necessary in order to utilize its 313 AF allocation of the surface water supply stored in Loch Lomond by SCWD. Environmental impact studies of the use of the Loch Lomond allocation and potentially sending excess surface water to SVWD would be undertaken at a later date, as would changes in District water rights to allow inter-district transfers.

that evaluates expanded conjunctive use within the district boundaries. SLVWD is also planning to complete a feasibility study in WY2023 that assesses improvements to water treatment and conveyance to utilize potentially available surface water supply stored in Loch Lomond.

SVWD SVWD is exploring various projects and management actions to utilize alternative water supplies to groundwater that will help the districtit become more resilient to climate change and will maximize *in lieu* recharge in order to help the Basin more sustainablereach its sustainability goals. ~~Currently, SVWD does not use surface water as a supply source.~~ A change in SLVWD water rights could allow SLVWD to provide surface water to SVWD through an existing emergency intertie for *in lieu* recharge~~when excess water is available~~. In WY2022, SVWD was awarded a 2021 Urban and Multibenefit Drought Relief Grant (Phase 2) to fund design and construction of a bi-directional~~n~~ intertie with ~~the City of Santa Cruz water system~~SCWD that could potentially provide excess wet-~~-~~season surface water or purified wastewater ~~from the city~~ to SVWD ~~and SLVWD~~. The grant also funds~~, and~~ construction of a new large production well ~~that~~ to replace aging wells and provide redundancy within the SVWD system, and to serve as a potential water supply~~could be used to supply water~~ to neighboring agencies during droughts.

During WY2022, progress was made toward filling data gaps in ~~the~~ groundwater water level monitoring as ~~data gap~~ identified in the GSP. During the past year, 8 new monitoring well sites were selected, well installation specifications were developed, and access negotiations with landowners were initiated. Well installations at 7 of the sites are planned for WY2023, with 1 significantly deeper well in the Butano aquifer needing additional funding to complete.

~~The~~ SMGWA prepared a Sustainable Groundwater Management Implementation ~~(SGMI)~~ Round 2 Grant application that was submitted in December, 2022, to fund some future GSP implementation efforts. The application requested funds to evaluate project and management actions, develop SMGWA funding mechanisms, perform additional monitoring of streams and groundwater dependent ecosystem~~ monitorings~~, install the deep Butano aquifer monitoring well ~~that could not be funded as part of the monitoring well installations mentioned in the paragraph above~~, provide private well owner assistance, and assist with GSP administration and reporting. The bulk of the requested funding would be used to evaluate the feasibility and compare the capital and operational costs of the planned high-priority projects and potential additional projects and management actions that are being considered in case the high-priority projects are insufficient to achieve the Basin's sustainability goals. These include import of SCWD surface water for use as *in lieu* recharge by SVWD, storage of excess surface water from SCWD in ASR wells in the Scotts Valley area to provide a drought reserve for SCWD while progressively raising groundwater levels in the Lompico aquifer, and injection of treated wastewater by SVWD to expand its water sources and prevent undesirable results in the Basin during periods of extended drought.

1 INTRODUCTION

This Groundwater Sustainability Plan (GSP) Annual Report (Annual Report) for the Santa Margarita Groundwater Basin (Basin) fulfills the requirements of Water Code §10733.6 and the Sustainable Groundwater Management Act (SGMA). The Santa Margarita Groundwater Agency (SMGWA), the sole Groundwater Sustainability Agency (GSA) for the Basin is required to submit an annual report to the California Department of Water Resources (DWR) by April 1 of each year following the adoption of its GSP. The SMGWA Board of Directors unanimously adopted the final GSP after a public hearing on November 17, 2021. The GSP was submitted to the SGMA Portal (https://sgma.water.ca.gov/portal/) on January 3, 2022. DWR is required under SGMA to complete its technical assessment of the GSP by January 31, 2024.

1.1 Purpose of Annual Report

The SMGWA has until the end of January 2042 to achieve sustainable groundwater conditions as described in the GSP. This Annual Report compiles groundwater data collected for the 2022 Water Year (WY) from October 1, 2021, through September 30, 2022. The purpose of the Annual Report is to evaluate groundwater conditions, summarize total water use, estimate change in groundwater storage, provide progress updates on projects and management actions implemented to achieve sustainability, and outline other GSP implementation tasks. Required Annual Report components are outlined in §356.2 of the GSP Regulations.

1.2 Santa Margarita Groundwater Agency

The SMGWA is the sole GSA for the Basin. ~~The SMGWA~~It was formed through a Joint Powers Agreement (JPA) in June 2017 among the Scotts Valley Water District (SVWD), San Lorenzo Valley Water District (SLVWD), and the County of Santa Cruz (County). Figure 1 shows the jurisdictional extent of the Basin and member agencies that comprise the SMGWA. The SGMA and JPA grant the SMGWA the legal authority to implement the GSP in the Basin.

The SMGWA is governed by an 11-member Board of Directors comprised of 2 representatives from each member agency, 1 from the City of Scotts Valley, 1 from the City of Santa Cruz, 1 from Mount Hermon Association (MHA), and 2 private well owners. Each of the member agencies and other entities also have an alternate B~~b~~oard member.

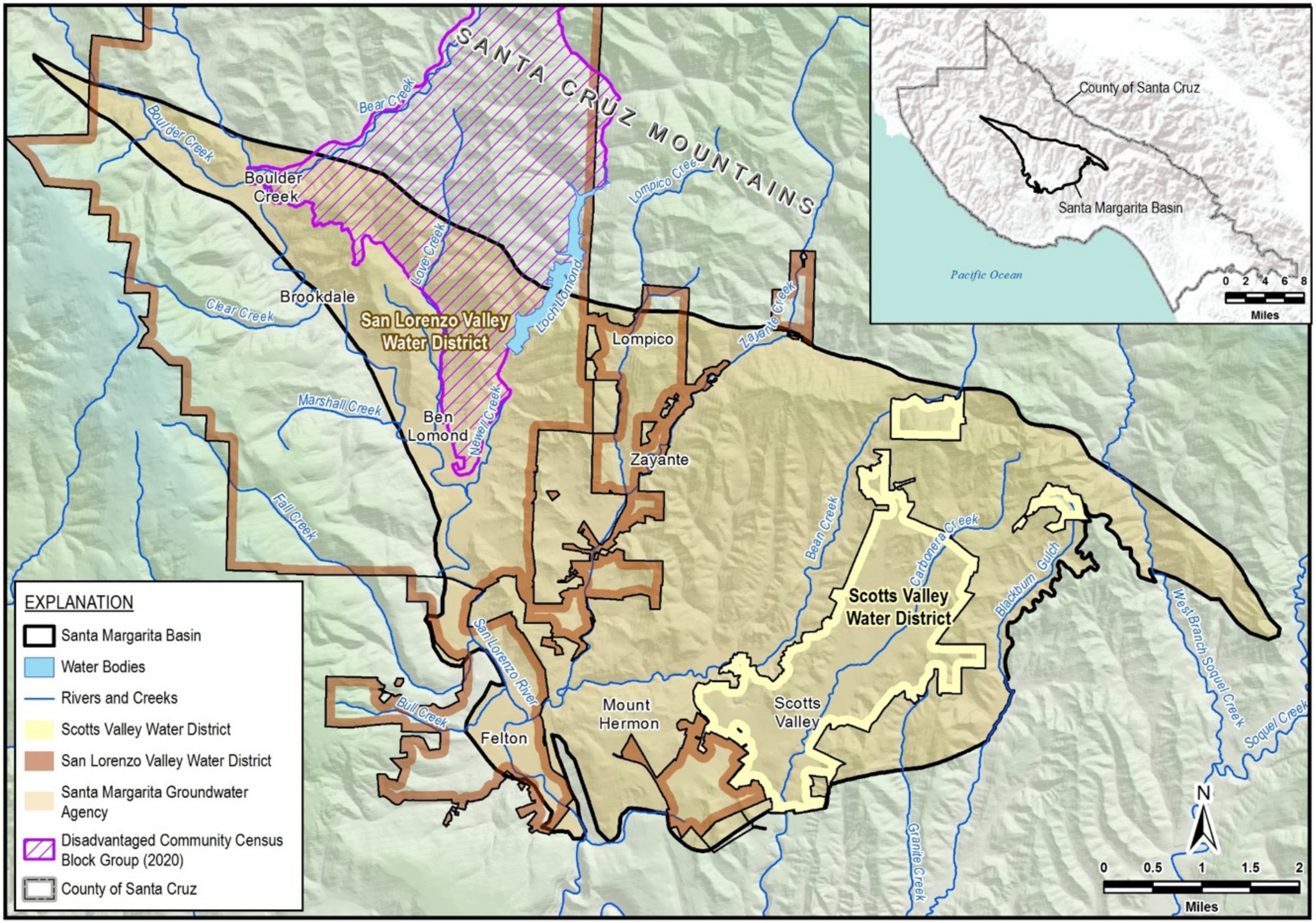

SANTA CRUZ MOUNTAINS
Boulder Creek
Bear Creek
Boulder Creek
Brookdale
Clear Creek
Love Creek
San Lorenzo Valley Water District
Loch Lomond
Lompico Creek
Lompico
Zayante Creek
Marshall Creek
Ben Lomond
Newell Creek
Zayante
Fall Creek
Bean Creek
Carbonera Creek
Blackburn Gulch
Scotts Valley Water District
West Branch Soquel Creek
San Lorenzo River
Bull Creek
Felton
Mount Hermon
Scotts Valley
Soquel Creek
Granite Creek
County of Santa Cruz
Santa Margarita Basin
Pacific Ocean
0 2 4 6 8
Miles
N
0 0.5 1 1.5 2
Miles
EXPLANATION
Santa Margarita Basin
Water Bodies
Rivers and Creeks
Scotts Valley Water District
San Lorenzo Valley Water District
Santa Margarita Groundwater Agency
Disadvantaged Community Census Block Group (2020)
County of Santa Cruz

Figure 1. Basin and Member Agency Jurisdictional Boundaries

2 BASIN SETTING

2.1 Basin Description

The Santa Margarita Basin (DWR Basin 3-027) is defined in DWR Bulletin 118 as a medium priority basin (DWR, 2016). The Basin is located at the northern end of the Central Coast hydrologic region. The area of the Basin is 34.8 square miles (22,249 acres). To the south and southeast of the Basin is the Santa Cruz Mid-County Basin, and to the south is the West Santa Cruz Terrace Basin.

The Santa Margarita Basin includes the City of Scotts Valley and the communities of Boulder Creek, Brookdale, Ben Lomond, Lompico, Zayante, Felton, and Mount Hermon. Based on 2020 census block data, the population of the Basin is approximately 33,000 (U.S. Census Bureau, 2021).

The Basin is a geologically complex area that was formed by the same tectonic forces along the San Andreas fault zone that created uplift of the Santa Cruz Mountains and the rest of the California Coast Range. The Basin is bounded on the north by the Zayante trace of the active, strike-slip Zayante-Vergeles fault zone, on the east by a buried granitic high that separates the Basin from Santa Cruz Mid-County Basin, and on the west by the Ben Lomond fault except where areas of alluvium lie west of the fault in an area previously designated as the Felton Basin. The southern boundary of the Basin with the West Santa Cruz Terrace Basin is located where sedimentary formations thin over a granitic high. A surface geology map of the Basin is shown on Figure 2.

The Basin is filled with Tertiary-age~~d~~ sedimentary rocks that form the principal aquifers. The Butano Sandstone, Lompico Sandstone, Monterey Formation, and Santa Margarita Sandstone are found in that order from deepest to shallowest in ~~most of~~ the Basin, except ~~for~~ where the shallower units are eroded or other less extensive formations outcrop. The sandstone formations form the Basin's principal aquifers. Although used for shallow private wells, the ~~The~~ Monterey Formation is not a principal aquifer because it only supports small groundwater extraction volumes. The Purisima Formation is used as a groundwater supply where it occurs on hilltops primarily east of Zayante Creek, but it is not considered a principal aquifer because of its limited extent in the Basin. An example geologic cross-section D-D' is shown on Figure 3. Three additional cross-sections are included in the GSP. This cross-section and the geologic basemap show the area in Mount Hermon and Scotts Valley where the Monterey Formation aquitard is absent between the Santa Margarita Sandstone and the underlying Lompico Sandstone~~Scotts Valley and Mount Hermon~~.

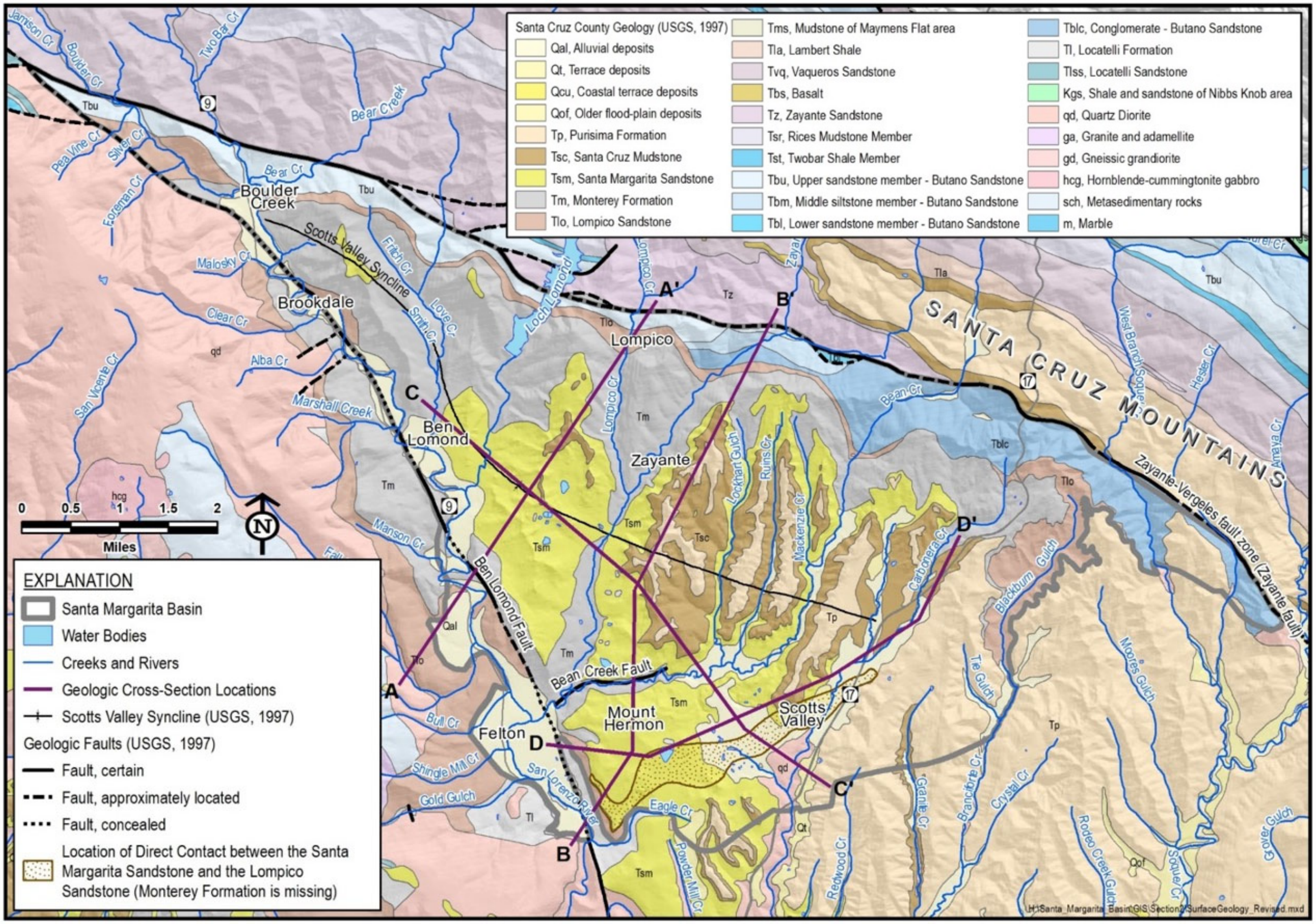


Figure 2. Surface Geology and Geologic Cross-Section Locations

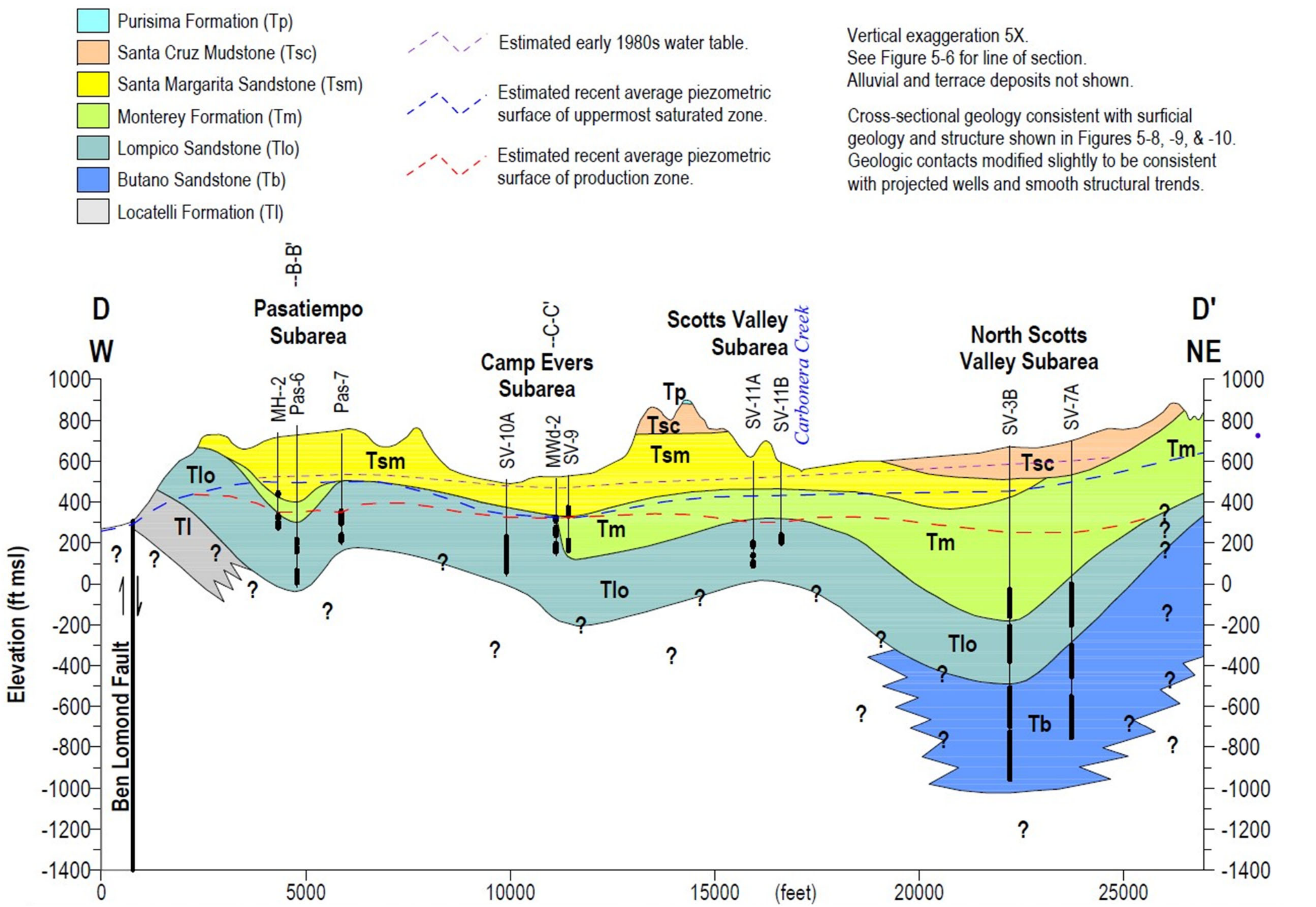

Purisima Formation (Tp)
Santa Cruz Mudstone (Tsc)
Santa Margarita Sandstone (Tsm)
Monterey Formation (Tm)
Lompico Sandstone (Tlo)
Butano Sandstone (Tb)
Locatelli Formation (Tl)
Estimated early 1980s water table.
Estimated recent average piezometric surface of uppermost saturated zone.
Estimated recent average piezometric surface of production zone.
Vertical exaggeration 5X.
See Figure 5-6 for line of section.
Alluvial and terrace deposits not shown.
Cross-sectional geology consistent with surficial geology and structure shown in Figures 5-8, -9, & -10.
Geologic contacts modified slightly to be consistent with projected wells and smooth structural trends.
D
W
D'
NE
--B-B'
--C-C'
Pasatiempo Subarea
Camp Evers Subarea
Scotts Valley Subarea
North Scotts Valley Subarea
Carbonera Creek
MH-2
Pas-6
Pas-7
SV-10A
MWd-2
SV-9
SV-11A
SV-11B
SV-3B
SV-7A
Tp
Tsc
Tsm
Tm
Tlo
Tl
Tb
Ben Lomond Fault
Elevation (ft msl)
(feet)
1000
800
600
400
200
0
-200
-400
-600
-800
-1000
-1200
-1400
0
5000
10000
15000
20000
25000

Figure 3. D-D' Geologic Cross-Section

2.2 2020 Census Disadvantaged Community Update

Based on the 2020 census, the census block overlapping the northwest corner of the Basin that was identified in the 2022 GSP~~The 2020 Census~~ as a ~~revised~~ disadvantaged community (DAC) ~~locations identified in the 2022 GSP. The GSP included a 334-acre low population density DAC census block in the northeast corner of the Basin,~~ no longer has that designation; instead, a nearby larger census block with a greater population is now ~~west of the San Lorenzo River and Boulder Creek. Based on the 2020 census, the DAC identified in the GSP no longer has this designation, but the Basin does have a new census block~~ classified as a DAC. ~~The new DAC covers a larger area and has a higher population than the previous DAC.~~ The new DAC covers an area of approximately 1,823 acres overlapping the northwestern margin of the Basin between Loch Lomond and Bear Creek ~~in the rural northeastern portion of the Basin and extends outside the Basin to the northeast~~ (Figure 1). The new DAC ~~between Loch Lomond and Bear Creek~~ is a rural area with 1 small water system and approximately 33 domestic wells, or 5% of the total domestic wells in the Basin~~, and 1 small water system~~.

2.3 Precipitation and Water Year Type

Precipitation is the primary source of recharge in the Basin by both direct rainfall percolation and streamflow infiltration through streambeds. Monitoring annual precipitation is a key component for understanding local water supply trends and groundwater conditions. Long-~~-~~term precipitation records are available for 2 weather stations in the Basin: (1) the El Pueblo weather station in Scotts Valley,~~;~~ and (2) the Boulder Creek weather station in Boulder Creek (shown on Figure 4Figure 4).

WY2022 precipitation was below average. Total precipitation was 27.3 inches or 68% of the long-term average in Scotts Valley, and 34.6 inches or 66% of the long-term average in Boulder Creek (Figure 4Figure 4). The year was mostly dry except for 2 large atmospheric river precipitation events in October and December 2021 that produced about 70% of the year's ~~annual~~ precipitation. WY2022 is classified as a normal water year, but, as shown on Figure 4Figure 4, is one of the drier normal water years on record .[1]

Lower-~~-~~than-~~-~~average rainfall totals in WY2022 are reflective of a long-term drier climate pattern since WY2006. The average annual rainfall during the past 16 years is about 5 ~~5-~~inches ~~below~~ less than the long-term average in Scotts Valley and 7 ~~-~~inches ~~below~~ less than the long-term

[1] The water year type presented in hydrographs in this report is determined using the ~~City of Santa Cruz~~SCWD water year classification system. This system is based on total annual runoff between October and September as measured at the United States Geological Survey (USGS) Big Trees gauge in the San Lorenzo River just downstream of the confluence with Bean Creek.

average in Boulder Creek. The climate pattern since WY2012 has ~~also~~ been more ~~erratic~~ variable than the historical record. Drought from WY2012 to WY2015 was followed by near--record precipitation in WY2017, ~~and~~ then another severely dry period from WY2020 to WY2022. ~~Reduced groundwater recharge from below average precipitation in WY2020 to WY2022 not only impacts groundwater levels, but also groundwater baseflow that supports streams in the summer and fall months.~~

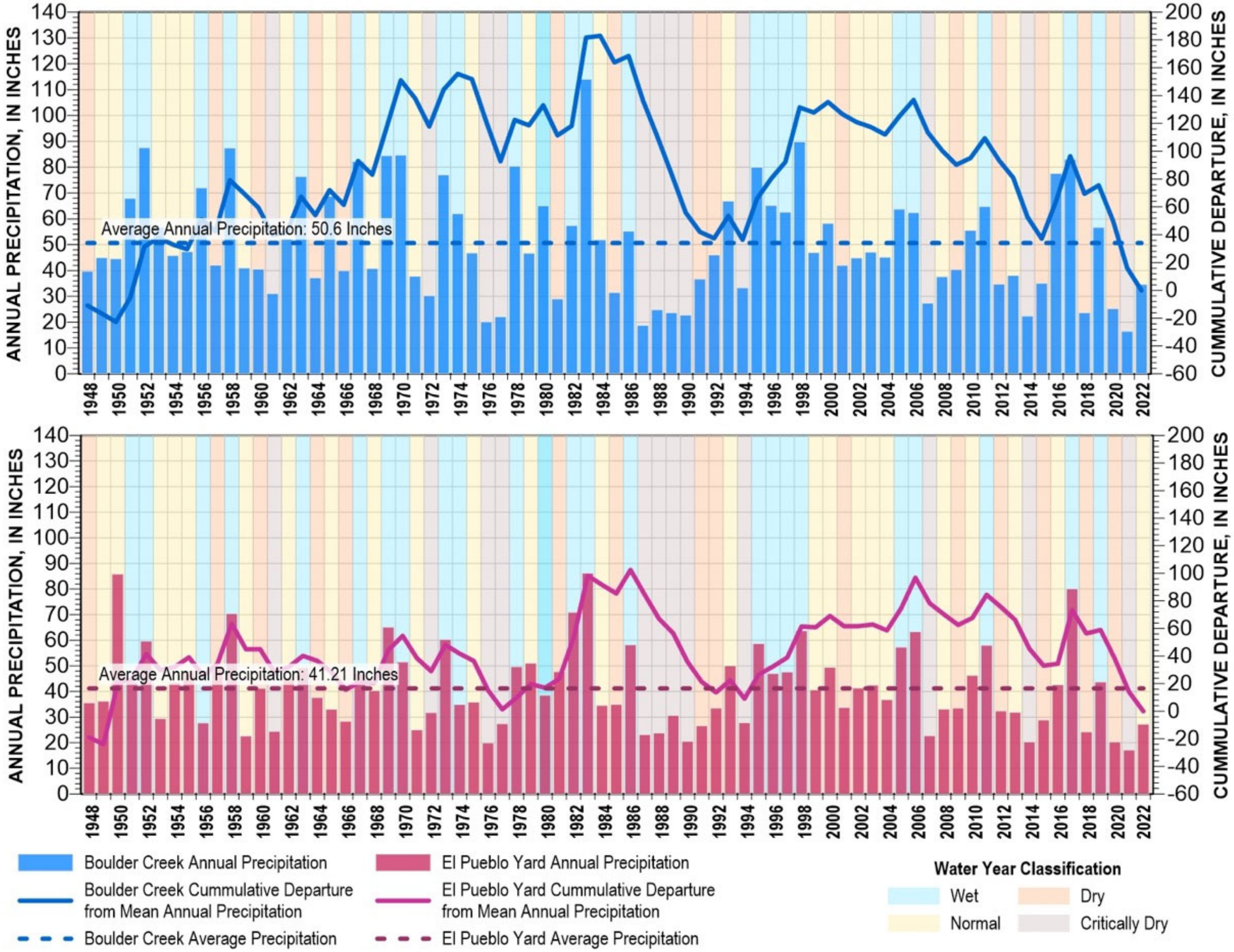


Figure 4. Annual Precipitation, Cumulative Departure from Mean Annual Precipitation, and Water Year Type, WY1948-2022

3 BASIN CONDITIONS

3.1 Groundwater Elevations

Groundwater elevations in the Basin are monitored using a network of 36 wells, 14 of which were selected as representative monitoring points (RMPs) for evaluating groundwater level sustainable management criteria (SMC). The monitoring network is comprised of either production wells or monitoring wells installed by SLVWD, SVWD, or MHA, many of which have been used for decades to evaluate short-term, seasonal, and long-term groundwater trends for groundwater management purposes. Nearly all wells are located in areas currently used for municipal groundwater extraction. To address data gaps in areas near interconnected streams and areas with concentrations of domestic wells, a~~A~~dditional monitoring wells will be installed in WY2023. ~~installations are planned in WY2023 to address regional groundwater level data gaps in areas with concentrated domestic use and near interconnected streams.~~ Clusters of monitoring wells completed in different aquifers at the same location are used by agencies to understand seasonal and temporal changes in vertical gradients between aquifers.

Groundwater levels are hand-~~-~~measured in monitoring wells using electric sounders at least semi-annually. SVWD wells also have pressure transducers that measure and record groundwater level data every 6 hours. Groundwater level measurements collected in or near active extraction wells are noted and later removed from the datasets used to generate hydrographs and groundwater elevation contour maps. Groundwater elevation is calculated from depth to groundwater using each well's unique reference point elevation. Groundwater level data are uploaded by the agencies collecting the data to the regional Water Information Systems by Kisters database.

Groundwater elevations are used to generate seasonal groundwater elevation contour maps for each principal aquifer (Figure 5Figure 5 through Figure 10Figure 10). Seasonal groundwater elevation contour maps show measured minimum groundwater elevations between April and May 2022 on the S~~s~~pring contour maps and minimum groundwater elevations in September 2022 on the F~~f~~all contour maps. Spring groundwater elevations typically represent seasonal high conditions, ~~while~~ whereas F~~f~~all groundwater elevations typically represent seasonal low conditions. For the GSP, groundwater elevation contours for portions of the Basin without measured groundwater elevation data ~~used contours simulated by~~were calculated using the calibrated GSP Groundwater Basin Model (Basin Model). For the Annual Report, groundwater elevation contours are ~~only~~ shown only for areas where groundwater elevation data are available. New monitoring wells ~~expected~~ planned for installation ~~to be installed~~ in WY~~WY~~2023 will ~~be used to~~allow expansion of~~d~~ the area with groundwater elevation contours in future annual reports.

Hydrographs are used to evaluate long-term trends in groundwater elevation~~ trends~~. ~~The hydrographs~~A~~ plot a~~ll available non-pumping groundwater elevation data collected in each well through WY2022 is plotted against a background that indicates ~~. The hydrographs include~~ water-year type ~~in the background~~ to demonstrate the relationship between ~~climate~~ precipitation and groundwater elevations. Minimum thresholds and measurable objectives are included on the hydrographs for groundwater level RMPs.

Hydrographs are compiled in the appendices, grouped by RMPs and non-RMPs as follows:

- Appendix A: Pages A-2 through A-18: Chronic Lowering of Groundwater Level RMP Well Hydrographs
- Appendix B: Pages B-1 and B-2: Depletion of Interconnected Surface Water RMP Well Hydrographs
- Appendix C: Pages C-1 through C-39: GSP Monitoring Network Well Hydrographs

Locations of g~~G~~roundwater elevation monitoring wells ~~locations~~ are ~~included~~ shown in Appendix A, Page A-1.

3.1.1 Santa Margarita Aquifer

The Santa Margarita Sandstone is the most permeable formation in the Basin, and it is exposed widely at the surface ~~more permeable than other formations in the Basin and has widespread surface exposure~~ in the southern and central portions of the Basin. As a result, t~~T~~he mostly unconfined Santa Margarita aquifer~~'s high hydraulic conductivity and extensive surface exposure allow it to~~ recharges quickly in response to rainfall, but ~~also cause~~ its groundwater levels ~~to~~ drop when rainfall is limited. The Santa Margarita aquifer supplies about 27% of the total groundwater extracted from the Basin ~~extraction~~ for municipal, domestic, landscape, and sand quarry uses. It ~~and~~ is the ~~primary~~ aquifer that is most important for supportings groundwater-~~-~~dependent ecosystems~~, ,~~ springs, and baseflow to creeks.

Se~~There are distinct se~~asonal patterns in groundwater levels in the Santa Margarita aquifer are ~~Santa Margarita aquifer groundwater elevation patterns in~~ different north and south of Bean Creek. ~~areas in the Basin. The discussion below focuses on WY2022 groundwater levels and trends~~ I~~i~~n areas north of Bean Creek (Quail Hollow and Olympia/Mission Springs areas), ~~and south of Bean Creek (Mount Hermon/South Scotts Valley and North Scotts Valley areas).~~

the Santa Margarita aquifer exhibits greater seasonal fluctuations in groundwater level than in other areas (or, for that matter, in other aquifers) in the Basin due to pumping at SLVWD wells in the Quail Hollow and Olympia/Mission Springs areas. ~~North of Bean Creek in the Quail Hollow and Olympia/Mission Springs areas served by the SLVWD North System, Santa~~

Margarita aquifer groundwater extraction and recharge result in greater seasonal groundwater level fluctuations than other areas and aquifers in the Basin. Groundwater -levels in this area increased slightly in WY2022 compared to WY2021 (Appendix C, pages C-5 through C-6 and C-8 through C-12), because in WY2022 there was more precipitation and less extraction of groundwater. had more precipitation and less extraction than WY2021. SLVWD conservation measures and community awareness after consecutive dry years successfully reduced groundwater extraction despite limited overall surface water availability due to wildfire-damaged surface water infrastructure. The wildfire damaged all 6 surface water diversion intakes and/or pipelines serving the SLVWD North System. SLVWD repaired the Foreman Creek diversion in December 2020 and repairs to the other 5 diversions are being planned.

South of Bean Creek (Mount Hermon/South Scotts Valley and North Scotts Valley areas)South of Bean Creek, in the Scotts Valley area, the Santa Margarita aquifer is partially dewatered. Where groundwater does occur in the Santa Margarita aquifer, groundwater elevations are relatively stable. Dewatering occurred in the Mount Hermon/South Scotts Valley area, due to overpumping in the 1990s. Groundwater elevations in this area have not recovered fully even though the Santa Margarita aquifer is no longer used for municipal supply, because the Santa Margarita aquifer is in direct contact with the over-drafted Lompico aquifer below. Where the Santa Margarita aquifer is not dewatered Innear the MHA and SLVWD Pasatiempo wellfields and in North Scotts Valley, the Santa Margarita aquifer was never used extensively as a water source, the aquifer is not used extensively as a water source; hence, it is not dewatered in these areas. , and long-term stable groundwater levels occur. The hydrographs for SLVWD's Pasatiempo MW-2 (Appendix C, page C-7) and SVWD TW-18 (Appendix C, page C-14) reflect illustrate the long-term stable groundwater levels in this area trends, with slight fluctuations depending on climateprecipitation.

Groundwater elevation contour maps for the Santa Margarita aquifer are shown on Figure 5Figure 5 and Figure 6Figure 6 for WY2022 Sspring and Ffall, respectively. During WY2022, groundwater elevations remained relatively consistent between spring and fallfell only 1 to 3 feet between Spring and Fall in most Santa Margarita aquifer wells, with typical fluctuations of 1 to 3 feet between seasons, except in wells installed close to active extraction wells. (Figure 5 and Figure 6). Groundwater flow in the aquifer generally mimics topography, flowing toward areas where groundwater discharges to springs and creeks, particularly along Bean and Zayante Creeks. Locally, groundwater in the aquifer also flows toward depressions around extraction wells in the Quail Hollow and Olympia/Mission Springs areas.

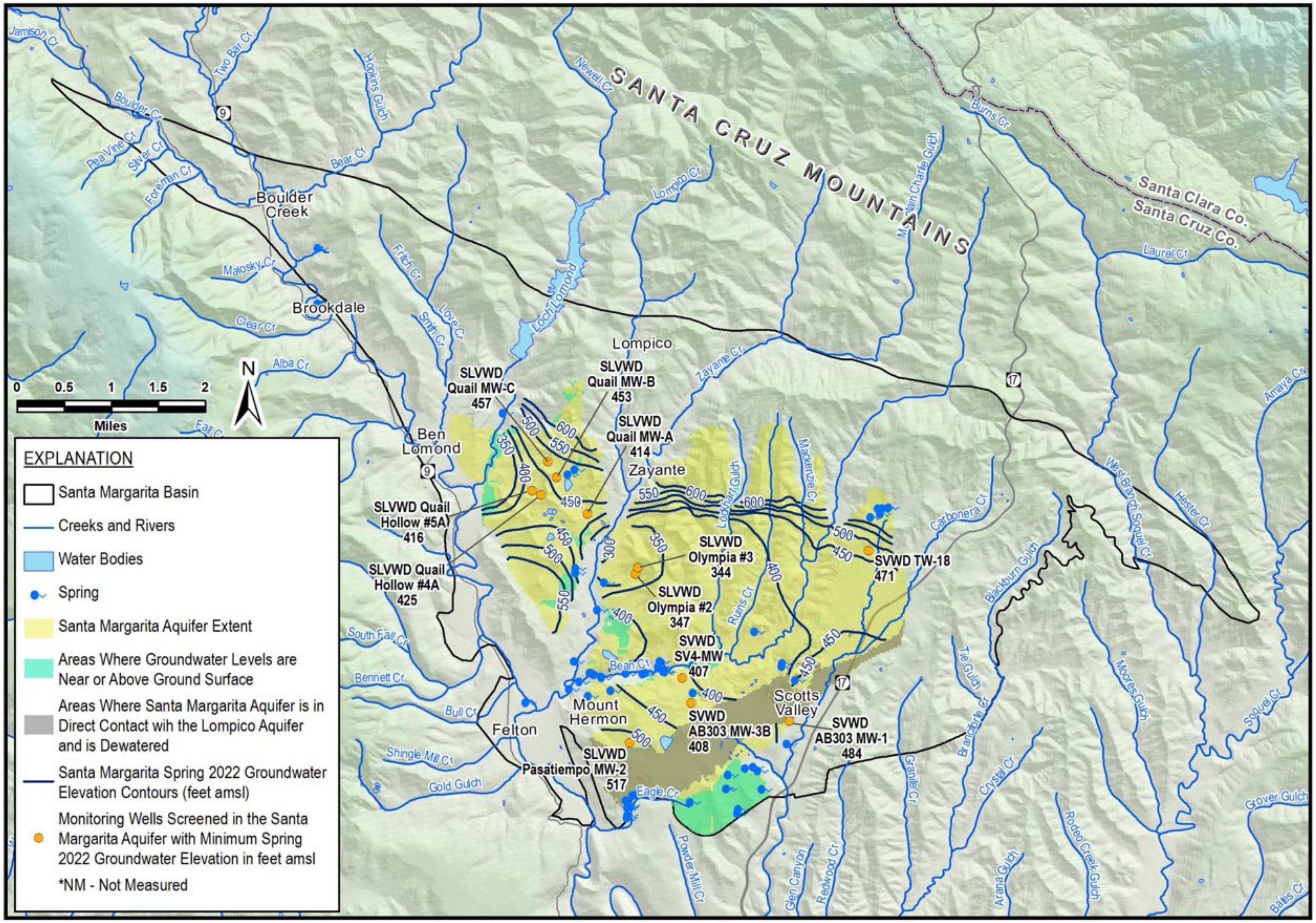


Figure 5. Santa Margarita Aquifer Groundwater Elevations and Contours, Spring 2022

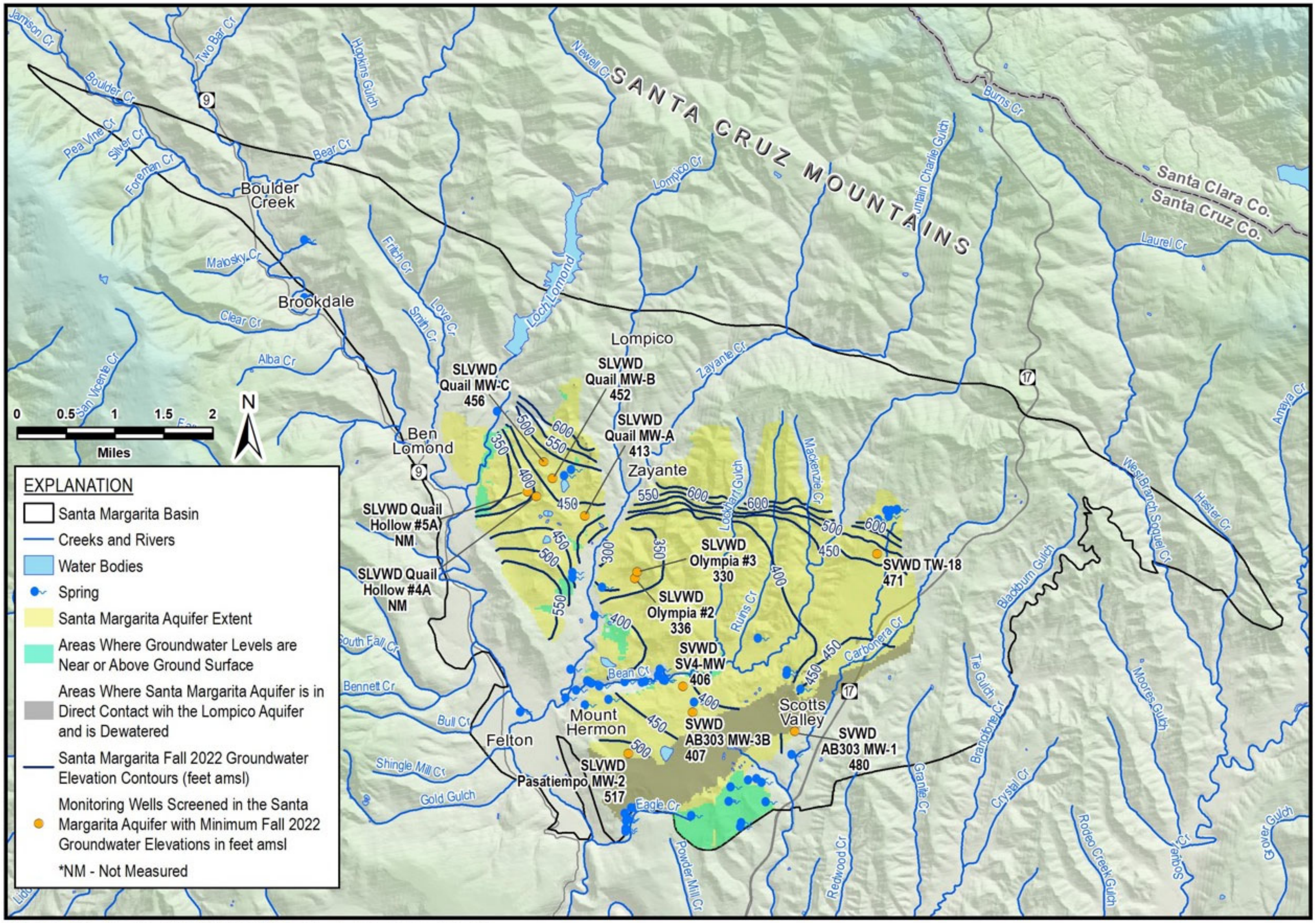


Figure 6. Santa Margarita Aquifer Groundwater Elevations and Contours, Fall 2022

3.1.2 Monterey Formation

The Monterey Formation is not considered a principal aquifer, even though it is used by some Basin residents who have low demands or no alternative water source. Only about 4% of groundwater extracted in the Basin is from the Monterey Formation. This fine-grained, relatively impermeable formation is present across much of the Basin and forms an important aquitard that separates the Santa Margarita and Lompico aquifers. Where the Monterey Formation is absent, the Santa Margarita aquifer may be dewatered due to percolation into overdrafted Lompico aquifer with lowered groundwater levels directly below (Figure 2 and Figure 3).

~~The Monterey Formation is a low yielding aquifer and not considered a principal aquifer, even though it is used by some Basin residents who have low demands or no alternative water source. The formation is present across much of the Basin and forms an important aquitard that separates the Santa Margarita and Lompico aquifers. Areas where the Monterey Formation is absent may have dewatering in the overlying Santa Margarita aquifer because lowered Lompico aquifer groundwater levels can cause recharge from rainfall percolation to pass through the Santa Margarita and into the Lompico aquifer (Figure 2 and Figure 3). As described in Section 3.2, 4% of groundwater extracted in the Basin is from the Monterey Formation.~~

SVWD Well #9, an inactive production well, is the only monitoring well in the Monterey Formation. By the early 1990s, the groundwater elevation in the well had fallen 200 feet from pre-1980 levels due to the combination of less-than-average precipitation and increased groundwater extraction in the overlying Santa Margarita aquifer and in the ~~underlying~~ Lompico aquifer below. ~~s and drier than average climate.~~ Groundwater extraction in the area decreased during the 1990s, and, as a result, ~~and~~ groundwater elevations in the Monterey Formation have ~~recovered~~ risen by about 50 feet since 1998. Nevertheless, the ~~since 1998.~~

~~Through WY2022,~~ groundwater elevation in SVWD Well #9 is still about 150 feet below the 1980 elevation (Appendix C, page C-16), because recharge is inhibited by the low permeability of the formation. ~~continues to increase slowly, but it is still about 150 feet below the 1980 elevation (Appendix C, page C-16).~~ In WY2022 groundwater elevation fluctuated by a few feet, similar to last year.

Given that SVWD Well #9 is the only monitoring network well, a groundwater elevation contour map is not presented for the Monterey Formation. In WY2023, SMGWA plans to install 2 additional monitoring wells in areas where the Monterey Formation is used heavily for residential supply.

~~Since SVWD Well #9 is the only monitoring network well, groundwater elevation contour maps are not produced for the Monterey Formation. An additional 2 Monterey Formation wells in areas where the aquifer is used for residential supply are expected to be added in WY2023 and contour maps may be produced in the future.~~

3.1.3 Lompico Aquifer

The Lompico Sandstone is found throughout most of the Basin, but ~~only~~ outcrops only along the Basin margins and in a few locations along the San Lorenzo River. The semi-confined Lompico aquifer is the primary ~~water producing~~ aquifer tapped by ~~in the area south of Bean Creek near~~ SVWD, SLVWD, and MHA supply wells in the area south of Bean Creek. The Lompico aquifer accounts for about 51% of total groundwater extracted in the Basin (see Section 3.2). The Lompico aquifer is also an important source of baseflow to the San Lorenzo River in the few areas where it outcrops in or near the river. There is little extraction from the Lompico aquifer north of Bean Creek because it is much deeper there than it is south of Bean Creek; for the same reason, there are no historical or current Lompico aquifer groundwater level monitoring wells north of Bean Creek.

Reliance on groundwater from the Lompico aquifer in the Mount Hermon/Pasatiempo/South Scotts Valley area has contributed to historical groundwater level declines of up to 200 feet since before the 1980s (see SVWD Well #10's hydrograph in Appendix C, page C-27). Starting in 2005, groundwater levels in the Lompico aquifer ~~have~~ stabilized, and since 2015 have risen~~a slightly increasing trend~~ in the S~~s~~outh Scotts Valley area (see SLVWD Pasatiempo #7's hydrograph in Appendix C, page C-23).

Groundwater elevation contour maps for the Lompico aquifer are shown on Figure 7Figure 7 and Figure 8Figure 8 for WY2022 S~~s~~pring and F~~f~~all, respectively. Groundwater elevations in the Lompico aquifer ~~do not~~ fluctuate little ~~substantially~~ seasonally, with most wells ~~having~~ exhibiting less than 5 feet of ~~annual~~ groundwater level ~~change~~ decline between S~~s~~pring and F~~f~~all, except ~~for some larger fluctuations~~ close to active production wells.

The highest groundwater elevations in the Lompico aquifer occur at the northern boundary of the Basin, where the Lompico Sandstone is exposed at the surface in a narrow strip parallel to the Zayante-Vergeles fault (Figure 2). This is the only area where the Lompico aquifer is recharged directly by percolation of precipitation or streamflow; elsewhere it is largely covered by younger geologic units that prevent direct recharge. The small areas of exposure of the Lompico Formation ~~or~~along the San Lorenzo River, near Felton and further upstream near the communities of Ben Lomond and Boulder Creek (Figure 2), are ~~is~~ located downgradient, ~~and~~ so ~~is~~ the Lompico aquifer is ~~thus a point~~a source of groundwater discharge that contributes to San Lorenzo River baseflow. ~~.~~

Groundwater flow in the southern portion of the Lompico aquifer is primarily controlled by municipal extraction in the Ssouthern Scotts Valley area by SVWD and in the Mount Hermon/Pasatiempo area by SLVWD and MHA. EGroundwater extraction in these areas has formed localized groundwater depressions in groundwater levelswith hydraulic gradients toward the extraction centers.

The Lompico aquifer is exposed at the ground surface and in the riverbed in areas west of the Ben Lomond fault near Felton and further upstream near the communities of Ben Lomond and Boulder Creek (Figure 2). These are locations where the aquifer contributes to San Lorenzo River baseflow.

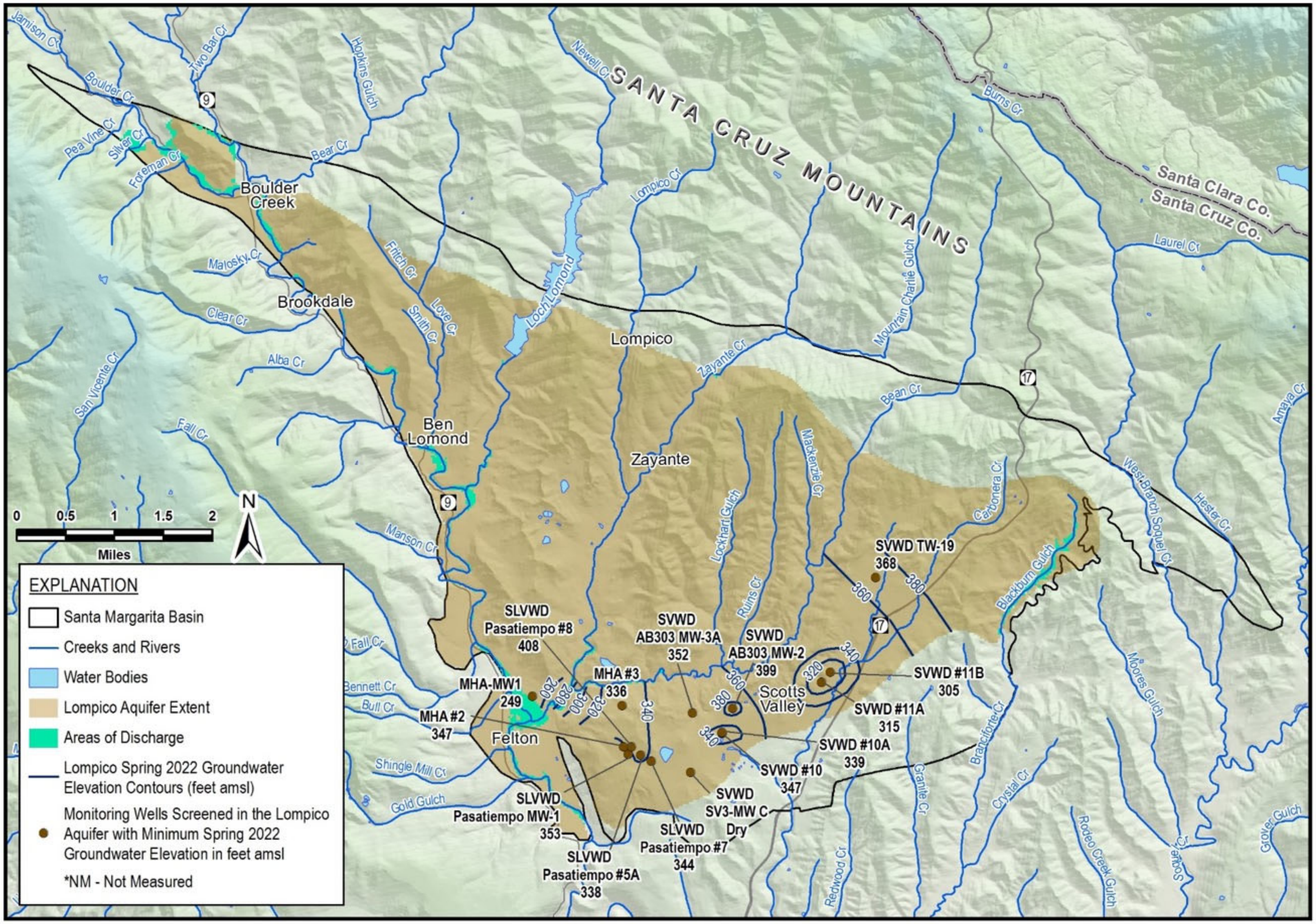


Figure 7. Lompico Aquifer Groundwater Elevations and Contours, Spring 2022

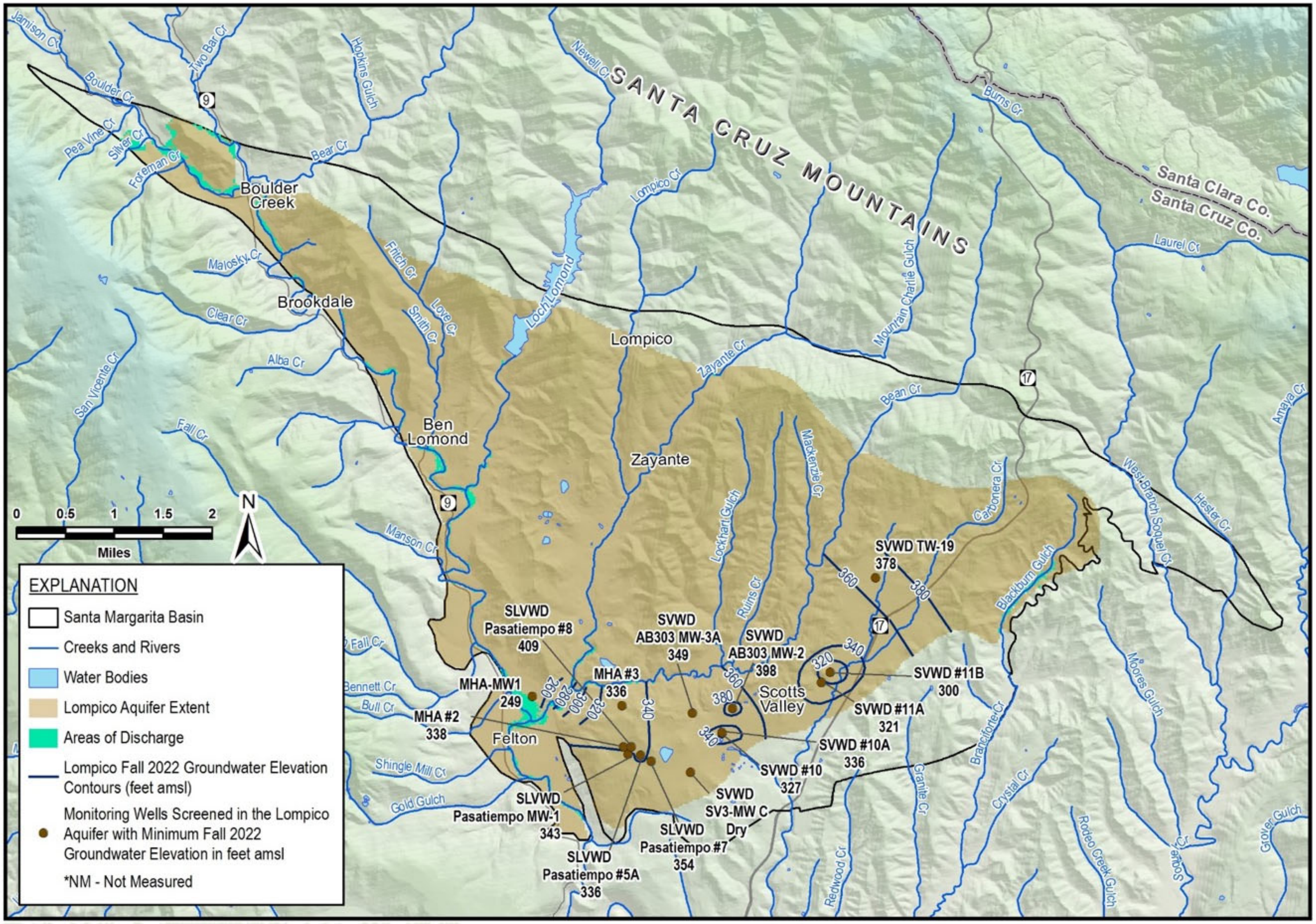


Figure 8. Lompico Aquifer Groundwater Elevations and Contours, Fall 2022

3.1.4 Butano Aquifer

The stratigraphically oldest of the three main aquifers, the Butano Sandstone, is the deepest, except where it outcrops in the northern limb of the Scotts Valley syncline, The Butano Sandstone is a relatively deep sedimentary sandstone except where it outcrops along the northern Basin boundary, roughly parallel to the Zayante-Vergeles Fault (Figure 2). SVWD has 2 deep supply wells in the northeastern portion of its service area that extract groundwater from both the Lompico and Butano aquifers. The Butano aquifer accounts for about 17% of groundwater extracted from the Basin (see Section 3.2).

Due to its great depth, there are currently only 2 dedicated monitoring wells solely in the Butano aquifer: SVWD Canham and Stonewood. Originally drilled as exploratory wells in search of additional water resources north of the SVWD service area, neither well encountered sizable groundwater resources; hence, they were converted to monitoring wells. The SVWD Stonewood well is located where the Butano aquifer outcrops near the Basin's northern boundary; the Canham well lies further south (Figure 9). Groundwater elevations over time in the dedicated Butano aquifer monitoring wells are stable (Appendix C, pages C-37 and C-38).

There are 3 SVWD wells in the northeastern portion of the SVWD service area that are screened in both the Lompico and Butano aquifers: the production wells SVWD Orchard and SVWD #3B and monitoring well SVWD #15. Due to extraction from the production wells, all show more seasonal fluctuations in groundwater level than the dedicated Butano wells located upgradient from the municipal supply wells (Appendix C, pages C-34 through C-36). Long-term groundwater elevations in the Lompico/Butano wells have been relatively stable since the late 1990s, as is the case for many of the wells screened exclusively in the Lompico aquifer.

Groundwater elevation contour maps for the Butano Aquifer for WY2022 Spring and Fall are shown on Figure 9 and Figure 10, respectively. Groundwater flow is mostly north to south, mimicking the topography from the aquifer's higher elevation recharge area at the Basin's northern boundary toward the lower elevations of Scotts Valley. Contingent on grant funding, a new deep monitoring well screened solely in the Butano aquifer will be drilled in the next two years near the northern SVWD wellfield in order to determine the effect of SVWD production wells on groundwater levels in the Butano aquifer and to provide an additional, more southerly, monitoring point to allow better delineation of groundwater elevation contours.

Due to its great depth, there are currently only 2 dedicated monitoring wells solely in the Butano aquifer. These 2 wells, SVWD Canham and Stonewood, were originally exploratory wells drilled by SVWD in search of additional water resources to the north of the SVWD service area. Neither well yielded enough groundwater and they were converted to monitoring wells. The SVWD Stonewood well is installed where the Butano aquifer outcrops near the Basin's northern boundary and Canham is further south (Figure 9). Groundwater elevations over time in the dedicated Butano aquifer monitoring wells are stable (Appendix C, pages C-37 and C-38).

There are 3 SVWD wells screened across both the Lompico and Butano aquifers in the northeastern portion of the SVWD service area that are influenced by both aquifers. The Lompico/Butano production wells SVWD Orchard and SVWD #3B and monitoring well SVWD #15 show more seasonal groundwater level fluctuations due to pumping cycles than dedicated Butano wells located upgradient from the municipal supply wells (Appendix C, pages C-34 through C-36). However, like many Lompico aquifer wells, long-term groundwater elevation trends have been relatively stable since the late 1990s.

Groundwater elevation contour maps for the Butano Aquifer are shown on Figure 9 and Figure 10 for WY2022 spring and fall, respectively. Groundwater flow is mostly north to south, from the Butano aquifer's recharge area at the Basin's northern boundary towards SVWD Orchard and #3B extraction wells. A new deep Butano aquifer monitoring well is planned to be drilled near the SVWD wellfield in the next 2 years depending on available funding. It will provide an additional monitoring point south of the southernmost monitoring point and will be used to delineate groundwater elevation contours.

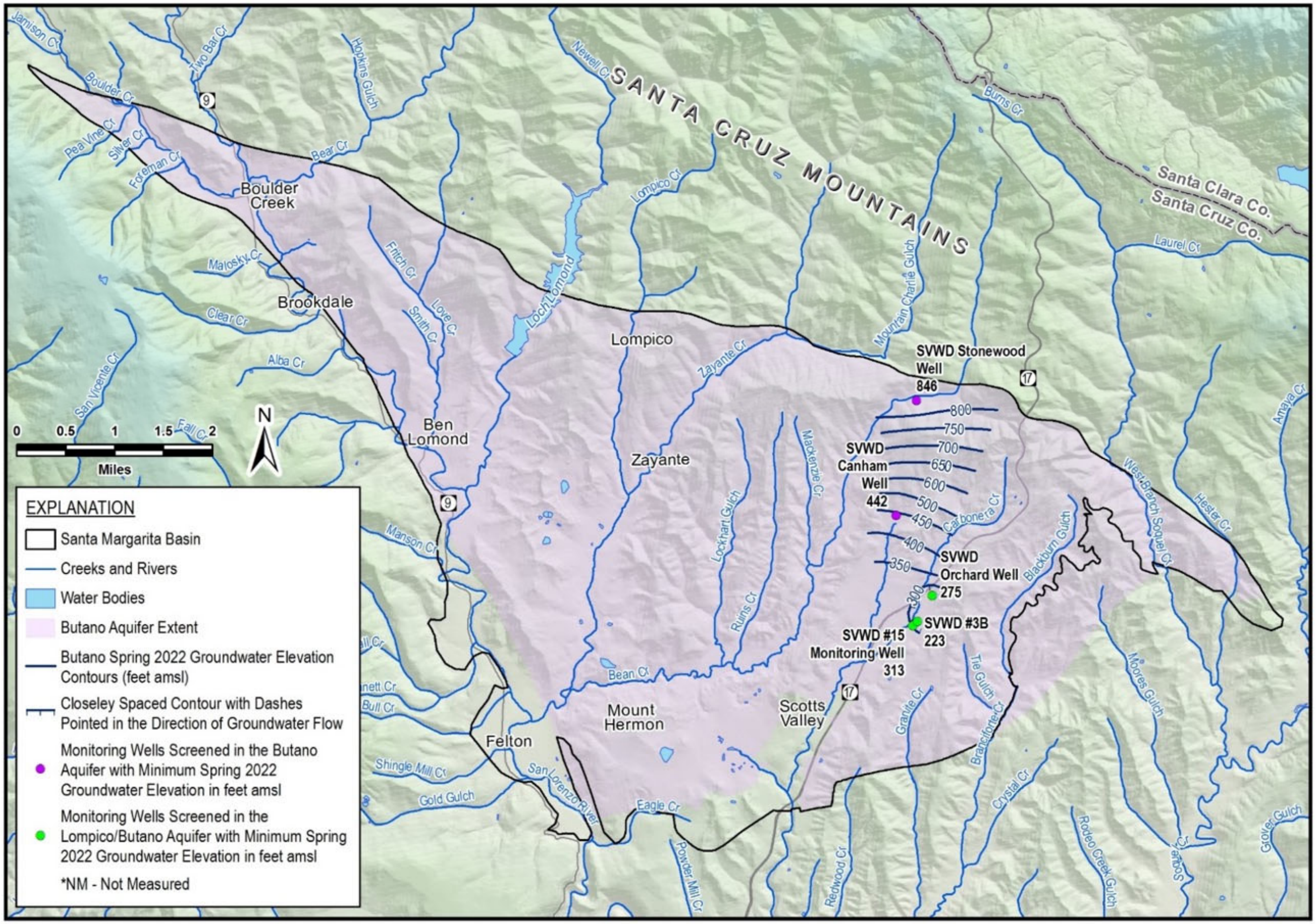


Figure 9. Butano Aquifer Groundwater Elevations and Contours, Spring 2022

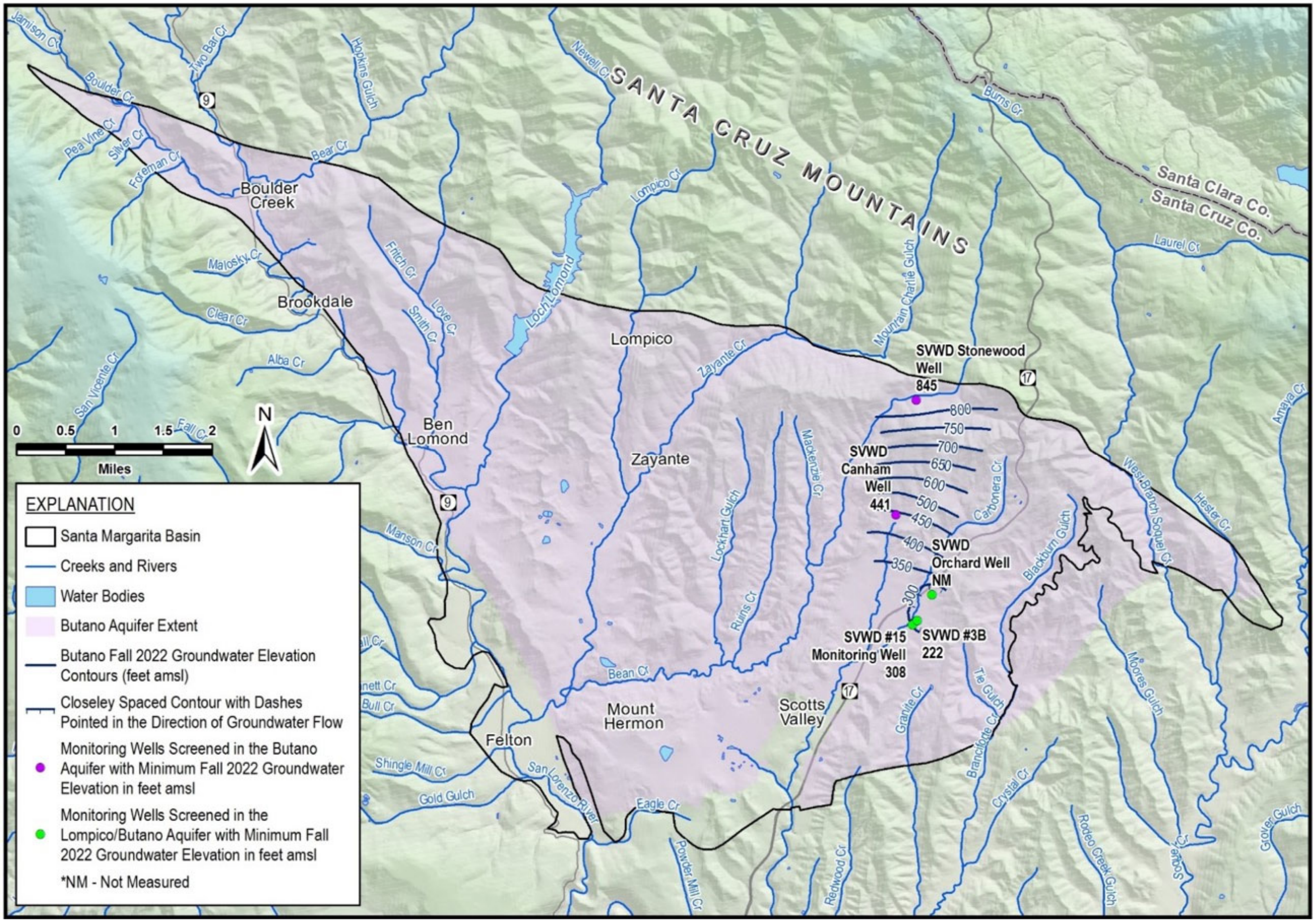


Figure 10. Butano Aquifer Groundwater Elevations and Contours, Fall 2022

3.2 Groundwater Extraction in WY2022

The total volume of groundwater extracted in WY2022 is 2,485 acre-feet (AF). This is the lowest volume extracted since WY1985 when reliable record keeping began and is about 21% less than the 3,151 AF extracted in WY2021. Table 1 summarizes groundwater extraction for WY2022 by water use sector and aquifer. The basis for these estimates and their accuracy is explained in footnotes to Table 1. Notes below the table identify measurement method and relative accuracy. Figure 11 shows water use in the Basin over time, and Figure 12Figure 12 Figure 11 shows the locations of groundwater extraction sites, the aquifers used, and the relative volumes of groundwater extracted in WY2022. and relative volume of WY2022 groundwater extraction by aquifer.

The total volume of groundwater extracted in WY2022 is 2,485 acre-feet (AF), about 21% less than extracted in WY2021. WY2022 had the lowest total volume extracted since WY1985 when reliable record keeping began.

Groundwater extraction in the Basin is mostly for public supply, but there are lesser volumes extracted from each aquifer for other uses. Most of the groundwater is extractedextraction from the Basin is from wells located from Basin aquifers south of Bean Creek. Only the The Santa Margarita aquifer is the only aquiferhas with significant extraction north of Bean Creek. TIn total, the Lompico aquifer supplies 51% of the the total groundwater extracted from the Basin, and the Santa Margarita aquifer supplies 27%, and of groundwater extractions. Approximately 17% of total Basin extractions are from SVWD supply wells screened across the Lompico and Butano aquifers yield 17%. About The remaining 5% of groundwater is extracted primarily for rural domestic use is extracted from non-principal aquifers such as the Monterey Formation and Purisima Formation, primarily for rural domestic use.

Most groundwater extraction in the Basin is used for municipal supplies. In WY2022, about 74% of all groundwater was extracted by SLVWD and SVWD. SLVWD extracted 732 AF (29%) and SVWD extracted 1,108 AF (45%). MHA extracts a smaller amount compared to the larger water districts, totaling aboutextracted 154 AF (6%) in WY2022, all from Lompico aquifer supply wells.

About 70% of SLVWD extraction wasis from the Santa Margarita aquifer north of Bean Creek and about 30% wasis from the Lompico aquifer south of Bean Creek. About 65% of SVWD extraction is from the Lompico aquifer and 35% from the Butano aquifer. MHA extracts a smaller amount compared to the larger water districts, totaling about 154 AF (6%) in WY2022, all from Lompico aquifer supply wells.

In WY2022, SLVWD ~~was able to~~ reduced its groundwater extraction by about 47% compared to WY2021, a year in which groundwater usage was anomalously high due to the destruction of surface water infrastructure in the August 2020 CZU wildfire~~1~~. ~~However, the WY2022 extractions are similar to extractions prior to the 2020 CZU Complex wildfire (discussed further in Section 3.4).~~ The volume extracted in WY2022 ~~extraction~~ was about 10% less than the average annual extraction for the 6-year period before the wildfire (~~volume decreased by about 10% compared to average extraction before the wildfire~~ from WY2014 to WY2019 in (Figure 11). The emergency condition created by the wildfire damage allowed SLVWD to engage in conjunctive use between all three of its systems, thereby maximizing ~~SLVWD maximized~~ its surface water use ~~even with limited surface water availability~~ to reduce WY2022 groundwater extraction, despite having only a single reconstructed surface water intake in the North system.~~.~~

SVWD ~~was also able to~~ reduced its groundwater extraction by about 2% in WY2022 compared to WY2021, with most reductions coming from the Lompico aquifer wells. SVWD pumping from the Butano aquifer nearly doubled from WY2021 to WY2022 because the SVWD Lompico/Butano supply wells were out of service for water treatment upgrades for much of 2021. ~~However, groundwater~~WY2022 extraction ~~extracted by SVWD~~ from the Butano/Lompico aquifer supply wells ~~in WY2022~~ was, however, slightly less than in the 7 years prior to WY2021.

Groundwater extractions by users other than SLVWD, SVWD and MHA ~~for other uses in the Basin~~ are not ~~as~~ well measured, but extraction ~~but these are relatively small volumes and assumed to be consistent over time. Extraction~~ for non-municipal use is estimated to make~~s~~ up about 20% of the total groundwater extraction in the Basin, including 9% for private domestic use, 5% for small water systems, 5% for landscaping, irrigation, and pond filling, and 1% for quarries. Small water system groundwater extractions do not fluctuate substantially from year to year, based on metered data reported to the County. Unmetered domestic, ~~,~~ landscape, ~~and~~ pond filling, and quarry extractions ~~in WY2022~~ are assumed to be the same in WY2022 as estimated for WY2018 in the GSP ~~in WY2018~~. It is not expected that year-to-year usage would vary significantly because there has been little change in the commercial and domestic use in these sparsely populated ~~much since quarry and landscape operations, population and numbers of domestic wells in the~~ rural areas of the Basin. ~~are not changing much annually. Similarly, small water system groundwater extractions do not fluctuate substantially as verified by metered data reported to the County.~~

Table 1. Groundwater Extraction, WY2022

Agency / Extraction Type	Principal Aquifer Extraction (AF)			Non-Principal Aquifer Extraction (AF)		Total (AF)	Percentage of Total Extraction
	Santa Margarita	Lompico	Butano	Monterey	Purisima		
San Lorenzo Valley Water District[1]	505	227	0	0	0	**732**	**29%**
Scotts Valley Water District[1, 2]	0	711	397	0	0	**1,108**	**45%**
Mount Hermon Association[1]	0	154	0	0	0	**154**	**6%**
Private Domestic Wells[2]	62	28	26	87	30	**232**	**9%**
Non-Domestic Private Groundwater Users[3]	38	84	0	0	0	**122**	**5%**
Small Water Systems[4]	53	55	0	4	0	**112**	**5%**
Quail Hollow Quarry[5]	25	0	0	0	0	**25**	**1%**
Total by Aquifer (AF)	**683**	**1,258**	**423**	**91**	**30**	**2,485**	**100%**
Aquifer Percentage of Total Extraction	**27%**	**51%**	**17%**	**4%**	**1%**	**100%**	

[1] Direct measurement by flow meter (most accurate).
[2] For SVWD extraction wells screened in both the Lompico and Butano aquifers, its assumed they extract 40% of their water from the Lompico aquifer and 60% from the Butano aquifer.
[2] Estimated based annual water use factor per connection determined from metered Small Water Systems and applied to each residence outside of municipal water service areas (less accurate). The water use factor for WY2022 was 0.3 AF per connection. Number of private wells is assumed to be 777.
[3] Other private non-domestic uses include landscape irrigation and water for landscape ponds. Extraction is not metered so the volume is estimated (less accurate).
[4] Metered data are reported to County but timing of reporting is too late for inclusion into the Annual Report. Therefore, only October through December 2021 are from WY2022, while January through September 2022 are from January through September 2021). While this reduces accuracy, the volumes from year to year generally do not vary significantly.
[5] Estimated based on historical usage (less accurate).

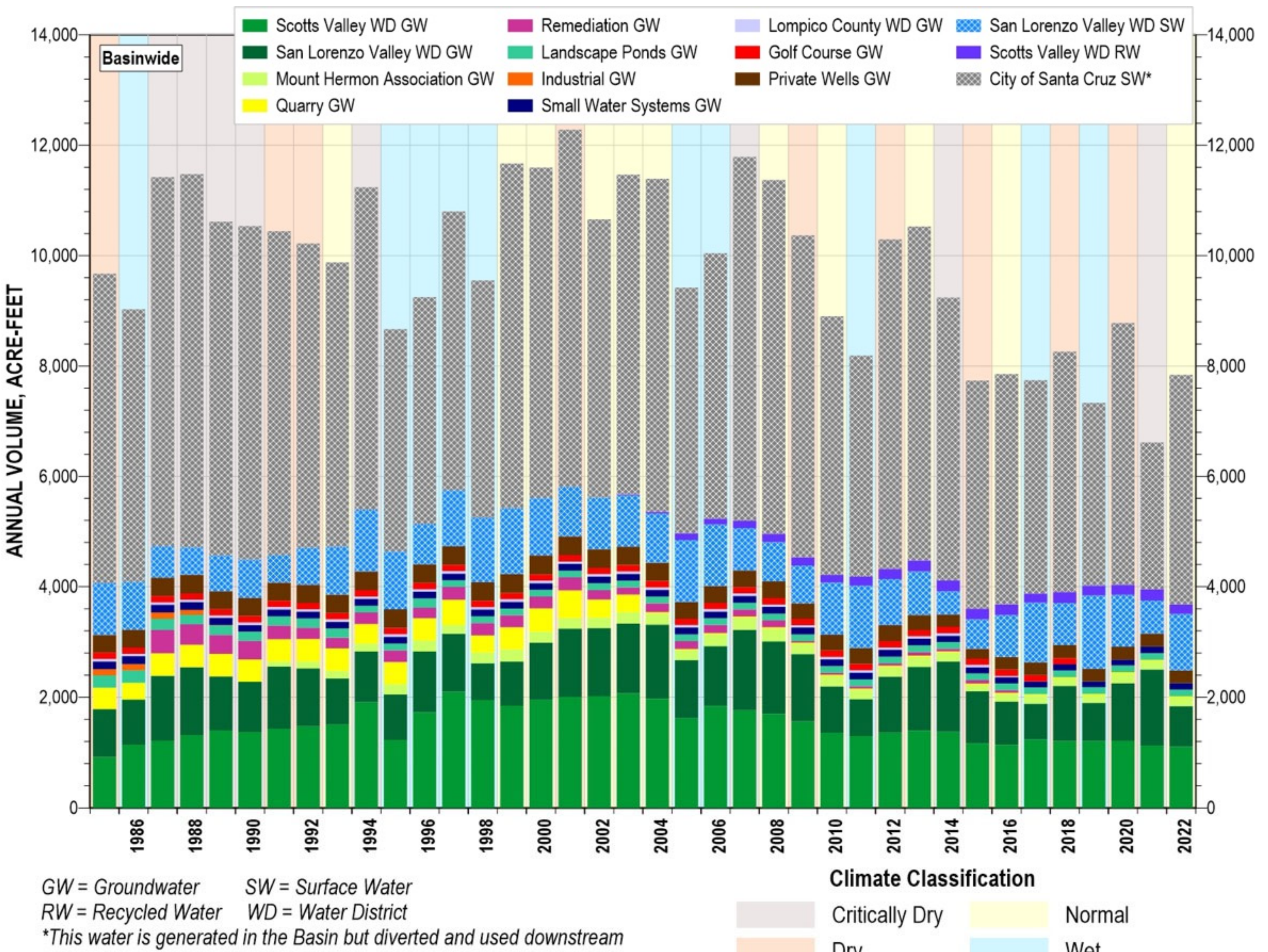


Figure 11. Total Basin Water Use, WY1985-2022

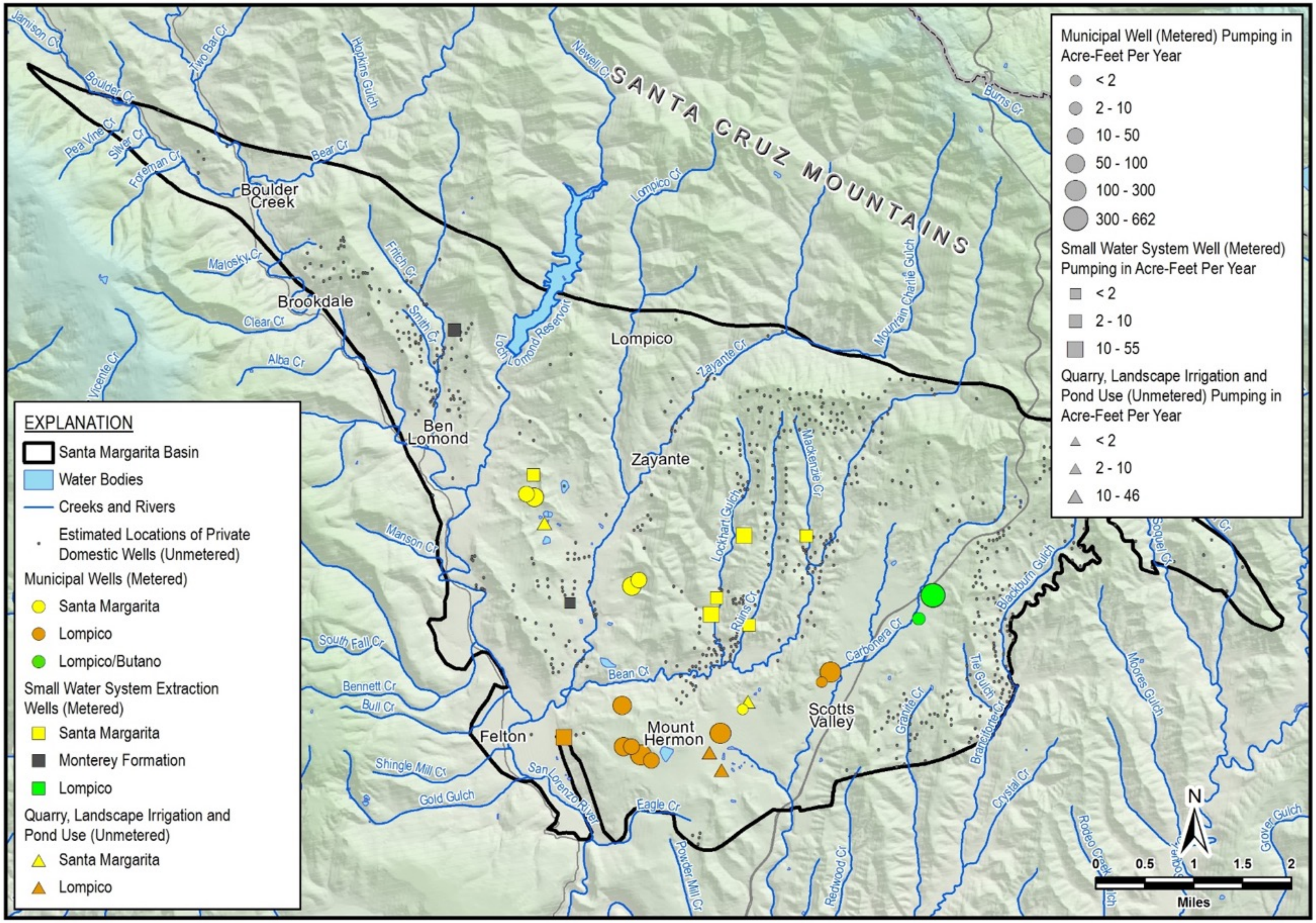


Figure 12. Groundwater Extraction, WY2022

3.3 Surface Water Supply Used for ~~Groundwater Recharge or~~ In-Lieu ~~Use~~Recharge and Direct Groundwater Recharge

~~There is currently no surface water used for managed aquifer recharge in the Basin.~~ Managed aquifer recharge in the Basin currently takes two forms: (1) use of excess surface flows for *in lieu* recharge by SLVWD, and (2) percolation of stormwater in Scotts Valley.

SLVWD has implemented conjunctive use in their North System for decades. In the North System, SLVWD optimizes the use of surface water and groundwater by utilizing stream flows while they are high and relying more on groundwater during the dry season. The benefits of conjunctive use in the North System are reduced groundwater pumping in the Santa Margarita aquifer at the Quail Hollow and Olympia wellfields. The conjunctive use of these sources has met annual water demands since 1984, without a substantial decline in groundwater levels.

Since the August 2020 CZU wildfire, SLVWD has used the emergency intertie to maximize its surface water diversions in the Felton System (while maintaining fish bypass flows) to convey water to the North and South Systems and reduce reliance on groundwater. This District-wide conjunctive use made it possible for SLVWD to use surface water exclusively for approximately 30 days in WY2021 and 60 days in WY2022, and to reduce WY2022 total groundwater extraction to an annual volume that is one of the lowest on record.

~~However,~~ SVWD and other private developments capture stormwater at low-~~-~~impact development (LID) sites in Scotts Valley. Table 2Table 2 shows the total volume of known managed aquifer recharge using LID. The stormwater infiltration volume is relatively small, with ~~the~~ a maximum ~~totaling less than~~of about 40~~1~~ AF in WY2019. In WY2022 about 16 AF of LID recharge was measured, though this total is ~~underestimated~~ an underestimate by a few AF because a transducer malfunctioned for most of the wet season at the Scotts Valley Library site. ~~Since 2018, the library site has recharged between 1.4 and 6.1 acre-feet per year (AF/yr) of stormwater.~~

Table 2. LID Infiltration, WY2018-2022

Water Year	Volume Infiltrated, AF			
	Transit Center	Woodside HOA	Scotts Valley Library	Total
2018	1.75	17.30	3.39	**22.44**
2019	3.08	31.17*	6.11*	**40.38***
2020	1.50*	14.97*	2.94*	**19.42***
2021	1.40	13.86	1.41	**16.67**
2022	1.75	13.87	0.55**	**16.18****

*Volumes estimated using available data

**Transducer malfunction resulted in no data collection at Library LID between October and February 2022. Since this is when nearly all annual precipitation occurred, the total WY2022 LID recharge volume is underestimated.

3.4 Total Water Use in WY2022

Figure 12 illustrates the total use of water from wells within the Santa Margarita Basin and from water diversion within the San Lorenzo River watershed in and surrounding Santa Margarita Basin by water source for all users for the period WY1985-WY2022. Table 3Table 3 summarizes WY2022 total water use by user, use, and water source type. Footnotes to Table 3 explain how the values were determined and provide estimates of their relative accuracy.

SCWD is the largest user of water resources in the Basin and surrounding watershed. In WY2022, SCWD diverted 4,159 AF of water from the San Lorenzo River for consumption in the City of Santa Cruz. Total water use by SCWD increased by about 1,500 AF compared to WY2021, an increase of 56%, made possible by surface water flows that were higher in WY2022 than in WY2021.

The total water use for WY2022 by all other providers that serve residents of the Basin and the surrounding watershed was ~~total water use in the Basin is~~ 3,719 AF. ~~. The total water use includes 2,485 AF of groundwater extraction, 1,022 AF of surface water diversion, 174 AF of recycled water, and 38 AF of imported water.~~ Total water use by these providers ~~in the Basin~~ decreased by about 300 AF from WY2021, a decrease of 7%. ~~Table 3 summarizes WY2022 total water use by user, use, and water source type. Notes below the table identify measurement method and relative accuracy.~~

Table 3. Total Water Use by Source, WY2022

Water Supplier	Groundwater Use (AF)	Surface Water Use (AF)	Recycled Water Use (AF)	Imported Water Use (AF)	Total WY2022 Water Use (AF)
Water Use Within the Santa Margarita Basin and Adjacent Areas of the San Lorenzo River Watershed					
San Lorenzo Valley Water District[1]	732	1,021	0	0	1,753
Scotts Valley Water District [1]	1,108	0	174	0	1,282
Mount Hermon Association[1]	154	0	0	0	154
Private Domestic Wells[2]	232	0	0	0	232
Other Non-Domestic Private Groundwater Users[3]	122	0	0	0	122
Small Water Systems[4]	112	1	0	38	151
Quail Hollow Quarry[5]	25	0	0	0	25
	2,485	**1,022**	**174**	**38**	**3,719**
Water ~~Use~~ Diverted from But Used Outside the Santa Margarita Basin and Adjacent Areas of the San Lorenzo River Watershed					

City of Santa Cruz[1]	0	0[6] 4,159[7]	0	0	4,159
Total	**2,485**	**5,181**	**174**	**38**	**7,878**

[1] Direct measurement by flow meter (most accurate).

[2] See note in Table 1. Volume is estimated using population and water use data.

[3] Other private non-domestic uses include landscape irrigation and water for landscape ponds. Extraction is not metered so the volume is estimated (less accurate).

[4] See note in Table 1. Volume is partially estimated using prior water year data.

[5] Estimated based on historical usage (less accurate).

[6] City of Santa Cruz's San Lorenzo River diversion from Felton to Loch Lomond - inactive in WY2022.

[7] City of Santa Cruz's San Lorenzo River diversion at Tait Street (5 miles downstream of the Basin) to the City treatment plant. Water is primarily sourced from within the Santa Margarita Basin but is used outside of the Santa Margarita Basin in the City of Santa Cruz.

3.4.1 Surface Water Use in WY2022

~~Surface water is the most commonly used water supply in the Basin other than groundwater. Nearly all Basin surface water is diverted by SLVWD for municipal supply in its North System and Felton System.~~ As is apparent from Figure 12, surface water is the most important water supply utilized in the Basin and surrounding watershed of the San Lorenzo River. Surface water diversions totaled 5,181 AF in WY2022 (Table 3Table 3). About 80% of this total (4,159 AF) was diverted by SCWD from the San Lorenzo River. Water diverted at Felton, at the southern end of the Basin. is pumped to Loch Lomond reservoir for use in dry seasons in the City of Santa Cruz. SCWD WY2022 diversions from the San Lorenzo River increased by about 1,500 AF compared to WY2021, an increase of 56%. Surface water flows in WY2022 were higher than in WY2021, allowing the SCWD to divert closer to their long-term average since 2015. SLVWD, the only other major surface water user in the Basin and adjacent watershed, diverted 1,021 AF in WY2022.

SLVWD ~~typically~~ has historically sourceds about half of its annual water supply from surface water diversions located on the eastern slope of Ben Lomond Mountain, outside the limits of the Santa Margarita Basin. The Felton System has 2 diversions on creeks tributary to the San Lorenzo River plus a source at Bennett Springs. The North system has 6 diversions on creeks tributary to Boulder Creek and the San Lorenzo River. ~~9 diversions in the San Lorenzo River watershed streams just upstream of the Basin. The North System has 6 diversions and Felton System has 3 diversions.~~ The August 2020 CZU Complex wildfire ~~damaged 7 SLVWD diversion intakes~~destroyed all 6 creek diversions in the North System and~~/or~~ miles of supply pipelines, including the one from Bennett Springs in the Felton System~~, including all 6 in the North System~~. T~~With repair of t~~he diversion on Foreman Creek ~~diversion~~ was reconstructed a few months after the wildfire, but replacement of the other ~~plans and designs for repair of the remaining~~ 5 diversions in the North System ~~are underwa~~will take years due to the necessary engineering and environmental studies, now underway.~~y. After a~~A raw water line for ~~one of the~~Bennett Springs was replaced shortly after the fire; hence the Felton System was fully operational for WY2022[2]. During WY2022, S~~Felton System diversions was repaired, the Felton System is now fully operational. S~~LVWD was able to able to make full use of excess surface flows on Fall Creek in the Felton System to convey water to the North and South Systems using the emergency intertie. As a result, total surface water diversions by SLVWD in WY2022 returned to values typical of the period before the fire (Figure 12), even though only 1 reconstructed water intake was operating in the North System.~~maximize its Fall Creek diversion while maintaining bypass flows to help reduce its reliance on groundwater. These~~

[2] The Bull Creek diversion in the Felton System was badly damaged in the January 2023 atmospheric river storms, and will be unavailable for much of WY2023.

repairs allowed SLVWD to exclusively use surface water for approximately 30 days in WY2021 and 60 days in WY2022.

An additional 4,159 AF of surface water is sourced partially in the Basin, but diverted downstream of the Basin for use in the City of Santa Cruz. City of Santa Cruz diversions from the San Lorenzo River increased by about 1,500 AF compared to WY2021, an increase of 56%. Surface water flows in WY2022 were higher than WY2021 allowing the City of Santa Cruz to divert closer to their long-term average surface water supply since 2015. Including City of Santa Cruz diversions, about 7,878 AF of water from the Basin was used in the region in WY2022 (Table 3).

Emergency interties are available to transfer water between SLVWD and SVWD but are rarely used. Table 4Table 4 summarizes emergency intertie usage between SLVWD and SVWD since spring WY2016. There were no intertie transfers between the districts in WY2022.

Table 4. Emergency Intertie Transfer Between SLVWD and SVWD, WY2016-2022

Water Year	Positive Flows from SLVWD to SVWD (AF)	Negative Flows from SVWD to SLVWD (AF)
2016	0	0.3
2017	5.4	0
2018	0	0
2019	0	0
2020	9.1	0
2021	10.1	0
2022	0	0

3.4.2 Trends in Total Water Use by Major Water Providers SLVWD and SVWD

Total water use has been decreasing consistently in the Basin since the early 2000s.
Total water use has been decreasing consistently in the Basin since the early 2000s.
Figure 11 shows water use between WY1985 and WY2022, including water used downstream by the City of Santa Cruz. Continuing water use efficiency will partially help SMGWA meet the GSP's sustainability goals.

Despite overall decreasing water use trends, there are still areas where more groundwater is extracted from specific aquifers than may be sustainable under anticipated future climate conditions. Charts on Figure 13 show volumes of water used north and south of Bean Creek

~~by user and source. The greatest water demand and usage is south of Bean Creek in the Mount Hermon and City of Scotts Valley areas where the majority of the Basin's population resides. The area south of Bean Creek has also seen the greatest reductions in water use since the early 2000s. Less water is also used north of Bean Creek, but water use is more consistent on an annual basis over time with noticeable reductions during drier periods. Historically, about half of water use north of Bean Creek is supplied by surface water.~~ Total water use by the two major water providers in the Basin, SLVWD and SVWD, has been decreasing consistently since the early 2000s (Figure 12), largely due to residents' strong conservation efforts and State regulations regarding water use efficiency in construction, as well as water-efficiency measures undertaken by the water districts.

The effect of these conservation and water efficiency efforts are well-illustrated by Figure 13, which shows the volumes of water used north and south of Bean Creek by user and source. Despite continued population growth, Scotts Valley, water use has declined significantly from the amounts used in the early 2000s. As a result, in WY2022 the volume of water used south of Bean Creek, where the majority of the Basin's population resides, was similar to water used north of Bean Creek. This is consistent with the observation that groundwater elevations in SVWD wells in the South Scotts Valley area appear to be on a recovery trajectory since WY2015, despite recent dry years.

These data suggest that current extraction rates in the area of most concern, the Lompico aquifer south of Bean Creek, may be sustainable under present conditions. Nevertheless, the two decades of overdraft resulted in reductions of groundwater in storage such that there is an insufficient buffer to be confident that we can adapt to future climate change without further conservation, *in lieu* recharge, and potentially other projects in the Basin.

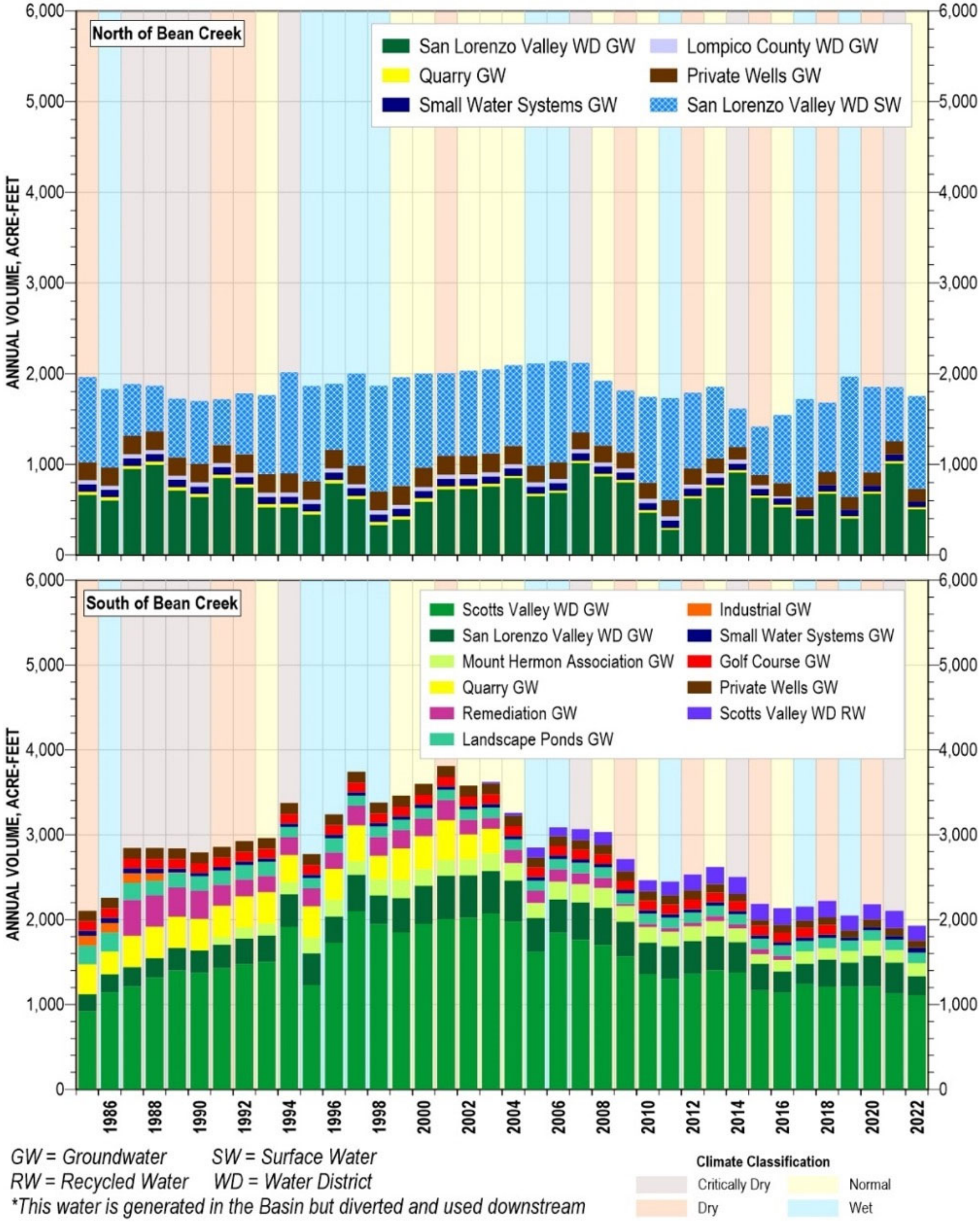


Figure 13. Total Water Use by Source, WY1985-2022

3.5 WY2022 Change ~~of~~ in Groundwater in Storage

~~Since the 1970s and even possibly starting in the 1960s, there has been a consistent reduction of groundwater stored in the Basin primarily due to over-pumping of the Lompico aquifer in the south Scotts Valley area but also to drier than average conditions. Figure 14 shows the annual and cumulative change of groundwater in storage and groundwater extraction for the Basin from WY1985 through WY2022.~~

~~Singular annual increases of groundwater stored in the Basin correlate with wet years and some normal years if they follow a dry year (Figure 14). Historically, normal or drier water year types generally result in decreased groundwater in storage. After WY2014, cumulative change in storage appears to be leveling out, though high annual variability related to climate persists (Figure 14).~~

The change of groundwater in storage is estimated annually using the Basin Model. The Basin Model was updated with WY2022 climate and groundwater extraction data, including the following:

- Monthly precipitation and temperature data from Parameter-elevation Regressions on Independent Slopes Model Climate Group were used to update precipitation, evapotranspiration, recharge, runoff, and streamflow
- Extraction volumes provided by SLVWD, SVWD, and MHA
- Small water system extraction volumes provided by the County

P~~Other p~~arameters assumed to have remained constant ~~with~~ at the 2018 baseline levels in the GSP are domestic, quarry, ~~and~~ landscape, and pond use groundwater extraction, and septic return flows. Parameters such as surface water and groundwater interactions, stream stage, and groundwater elevations are simulated by the Basin Model. The Basin Model was not recalibrated for this Annual Report.

During preparation of this Annual Report, a model results interpretation error was discovered that had resulted in overestimation of storage losses in WY2019 and smaller differences in storage change in WY2020 and WY2021. Overall, the processing error resulted in an overestimate of~~d~~ cumulative storage loss of about 3,800 AF, most of which occurred in WY2019. The error was corrected in this report.

3.5.1. WY2022 Change in Groundwater in Storage for the Entire Santa Margarita Basin

Figure 14Figure 14 shows the annual and cumulative change of groundwater in storage and groundwater extraction for the Basin from WY1985 through WY2022. Singular annual increases of groundwater stored in the Basin correlate with wet years and some normal years if they follow large storage losses in previous dry or critically dry years (Figure 14Figure 14). Historically, normal or drier water years generally result in decreased groundwater in storage.

The calculated gGroundwater in storage in the Basin increased modestly, in WY2022 by about 1,090 AF, in WY2022, which is classified as a normal rainfall water year. This annual increase is greater than 70% of prior normal water years since 1985, in part because . Change in storage tends to increase after large storage losses in previous dry or critically dry years and WY2022 followed 2 years of drought.

Starting in the 1970s, or perhaps earlier, there was a consistent reduction of groundwater stored in the Basin, mostly due to over-pumping of the Lompico aquifer in the South Scotts Valley area, but also due to drier than average conditions. These 2 decades of overpumping were succeeded, starting in the early 2000s, by 2 decades of progressively declining groundwater extraction by SVWD. THowever, a his reduction in decreasing groundwater extraction trend in the past decade has helped to at least slowed the storage loss and possibly stabilized groundwater in long-term declining storage in the Basin. Figure 14 shows the annual and cumulative change of groundwater in storage and groundwater extraction for the Basin from WY1985 through WY2022.

Since WY2015, cumulative change in storage appears to be leveling out, though annual variability related to precipitation persists (Figure 14Figure 14).

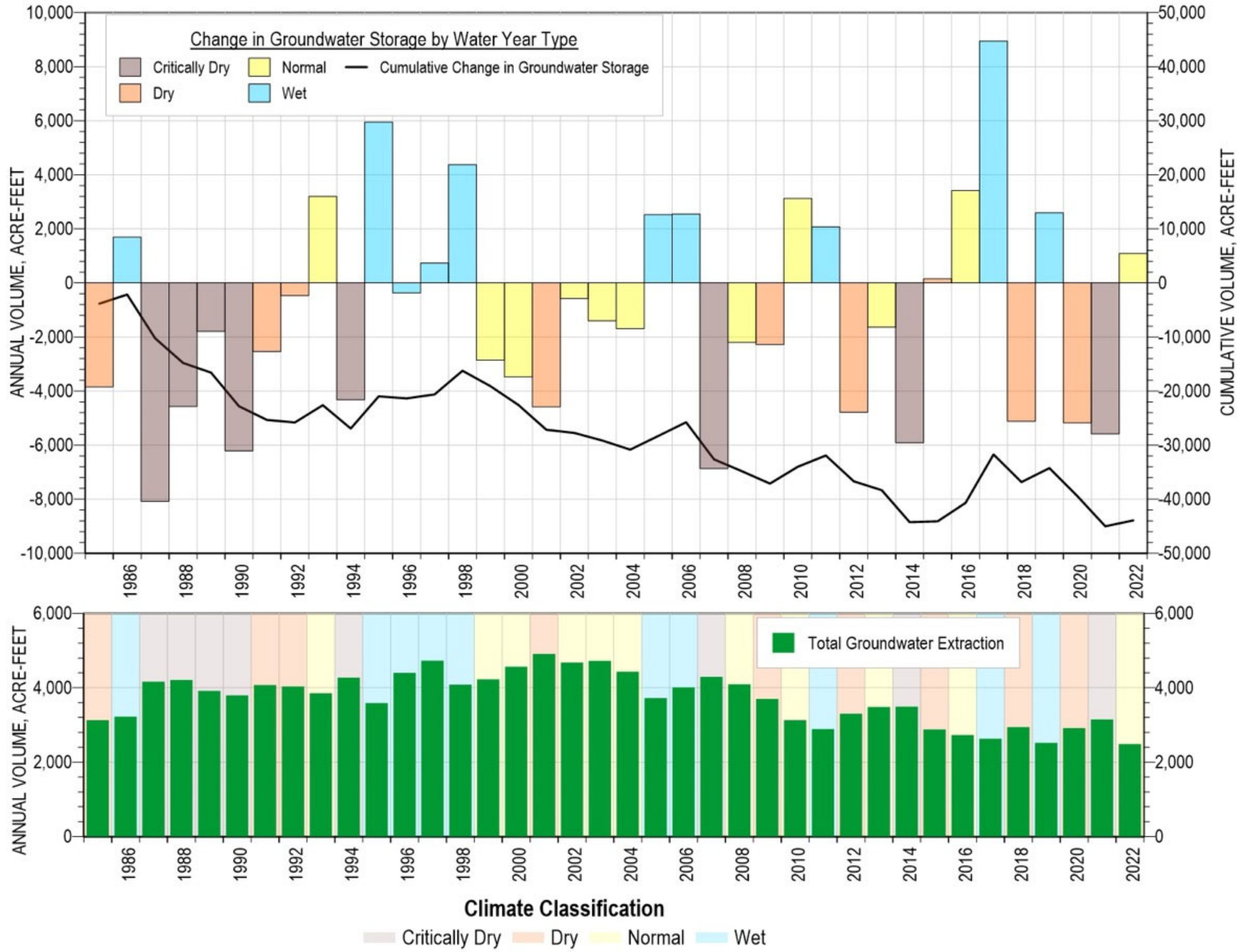


Figure 14. Annual Change in Groundwater in Storage, WY1985-2022

3.5.1. WY2022 Change in Groundwater in Storage for the 3 Principal Aquifers and the Monterey Formation

~~Since~~ Given that groundwater elevations in principal aquifers and the Monterey Formation did not change substantially from WY2021 to WY2022, one would expect that changes in groundwater in storage for particular aquifers would not change significantly, except potentially ~~the change in storage is also relatively similar between aquifers, with most of the differences noted~~ near active extraction wells. ~~and at the aquifer boundaries.~~ Figure 15Figure 15 through Figure 18Figure 18 show contour maps of calculated changes in groundwater in storage ~~Basin Model simulated change of groundwater in storage~~ from Fall WY2021 to Fall WY2022 for the Santa Margarita aquifer, Monterey Formation, Lompico aquifer, and Butano aquifer, respectively.

In viewing these contour maps it is important to keep in mind that they are products of calculations using the Basin Model, not measured values. The accuracy of the contour maps depends on the degree to which the Basin Model is well-calibrated for a particular aquifer. Given that there are few monitoring wells in the Monterey Formation and the Butano aquifer, the model is not well-calibrated for these aquifers, so care must be taken in interpreting results for these aquifers. In addition, the results for all aquifers are dependent on model inputs, such that small calculated differences should be regarded with some skepticism in the absence of sensitivity analyses that test how the results of model simulations change if small changes in input parameters (such as hydraulic conductivity) are implemented.

The amount of groundwater stored in the unconfined and highly conductive Santa Margarita aquifer is strongly correlated with precipitation. Groundwater levels and groundwater storage decrease when conditions are dry, but ~~also recharge~~rise quickly during wet years. The location and relative storage volume changes for WY2022 shown on Figure 15Figure 15 depicts large areas of the Santa Margarita aquifer having similar groundwater in storage to WY2021. Areas around the Olympia wellfield have the greatest reductions in storage, and storage increased the most in the northern upland parts of the aquifer.

The Monterey Formation is not a permeable formation and, therefore, changes in storage would be expected to be ~~are~~ much smaller on an annual basis than in the Santa Margarita aquifer. The greatest reduction in storage is in the northern upland areas where the Santa Margarita aquifer is absent, and the Monterey formation is used for domestic supply. The largest calculated storage increase is near Carbonera Creek in Scotts Valley; this is~~,~~ likely related to modeled storage increases in the underlying Lompico and Butano aquifers in the same area (Figure 16Figure 16).

~~The mostly confined Lompico aquifer is less conducive to storage changes from decreased precipitation than the shallower, unconfined Santa Margarita Sandstone. With decreased~~

groundwater extraction in WY2022, the Lompico aquifer which is the primary aquifer used for municipal extraction experienced groundwater in storage increases in WY2022. Areas of largest storage increase are in the Mount Hermon / Pasatiempo area where extraction for municipal supply decreased by about 150 AF since WY2021 and in northern Scotts Valley near the SVWD Orchard and #3B supply wells where although overall extraction increased groundwater levels at the end of WY2022 were higher than at the end of WY2021 (Figure 17; green and blue colors represent increased groundwater in storage).

The mostly confined Lompico and Butano aquifers are less subject to storage changes resulting from fluctuations in precipitation than the shallower, unconfined Santa Margarita aquifer. The recharge areas for these aquifers are limited to where they are exposed in narrow strips along the northern boundary of the Basin. This is where they are used as sources by private domestic wells (Figure 17 and 18).

Modest increases in groundwater in storage in the Lompico aquifer in WY2022 are calculated for the Mount Hermon / Pasatiempo area, where extraction for municipal supply decreased by about 150 AF over WY2021, and in North Scotts Valley near the SVWD Orchard and #3B supply wells, where groundwater levels increased despite an overall increase in extraction (Figure 17). A modest increase in storage is also calculated for the Butano aquifer around the SVWD supply wells in North Scotts Valley.

The Butano aquifer, like the Lompico aquifer, is mostly confined and less conducive to storage changes from decreased precipitation than the shallower, unconfined Santa Margarita aquifer. The Butano aquifer is only used for water supply in the area northeast of Scotts Valley as shown by thRelatively larger decreases in storage in the Butano aquifer are calculated for areas near the northern boundary of the Basin, but counter-intuitively not in the areas with private wells, where there is calculated relative stability e extraction wells on Figure 18. In general, the southern portion of the Basin had a slight increase in storage and the northern portion of the Basin had a larger decrease in storage. The greatest declines in Butano aquifer storage in WY2022 are near the Basin's northern boundary where it is exposed at the surface, but not in areas used for domestic water supply where changes in groundwater in storage are more stable (Figure 18Figure 18). Due to limited data, the Basin Model is not well calibrated for much of the Butano aquifer, so the calculated storage changes beyond the area northeast of Scotts Valley,north of where there are some monitoring wells screened in the Butano aquifer, may be artifacts of a poorly constrained model. are not well understood.

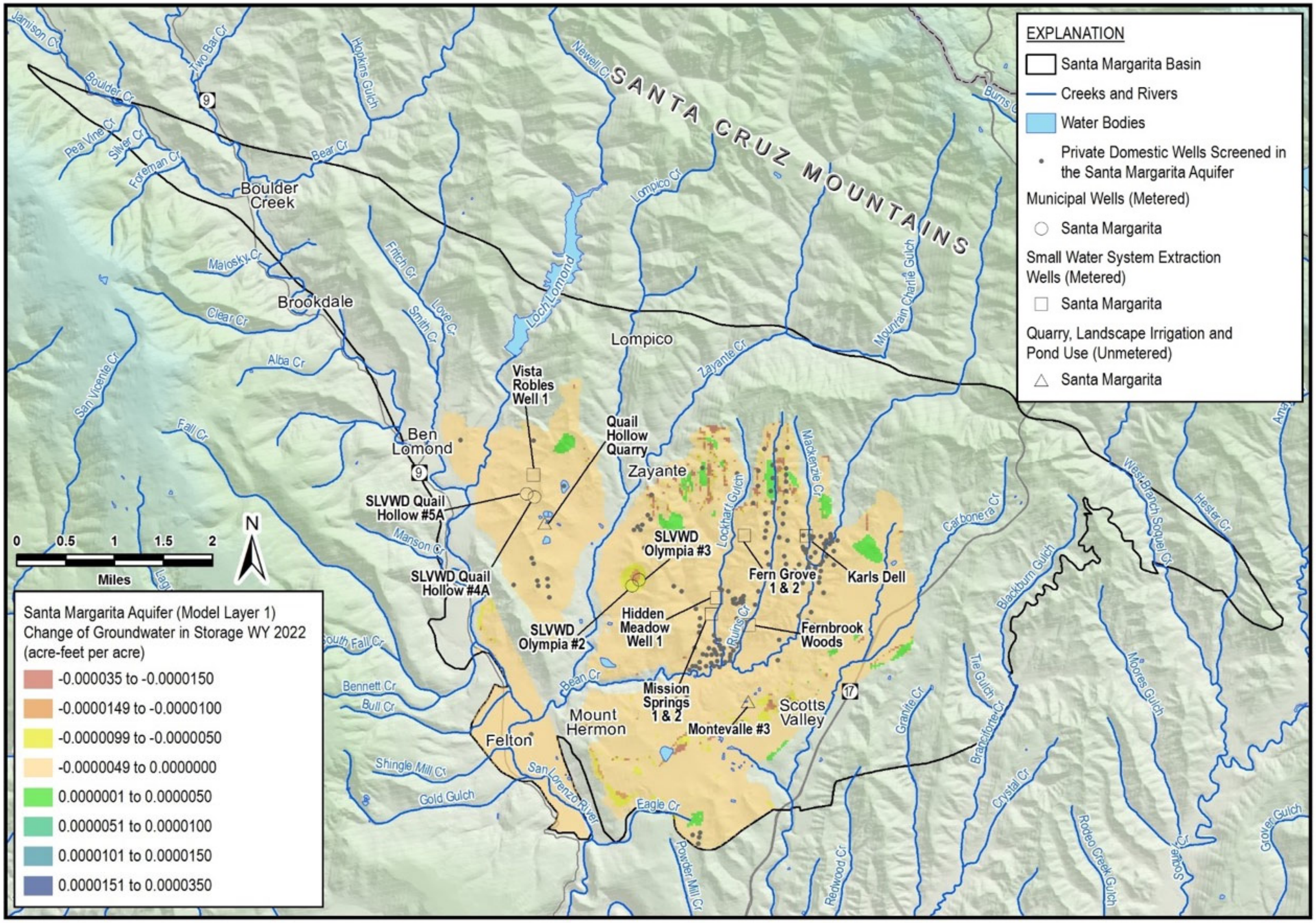


Figure 15. Change of Groundwater in Storage in Santa Margarita Aquifer, WY2022

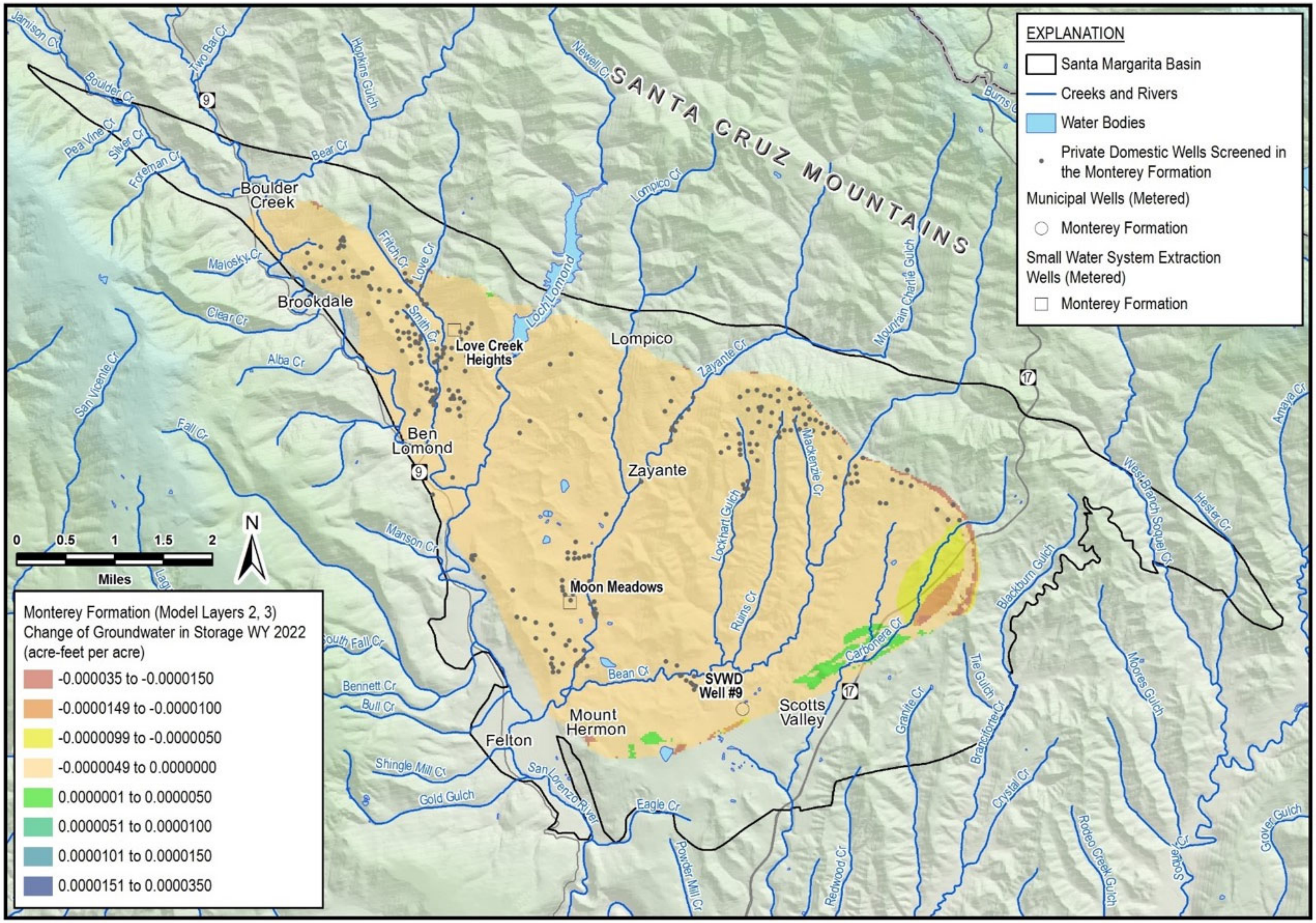


Figure 16. Change of Groundwater in Storage in Monterey Formation, WY2022

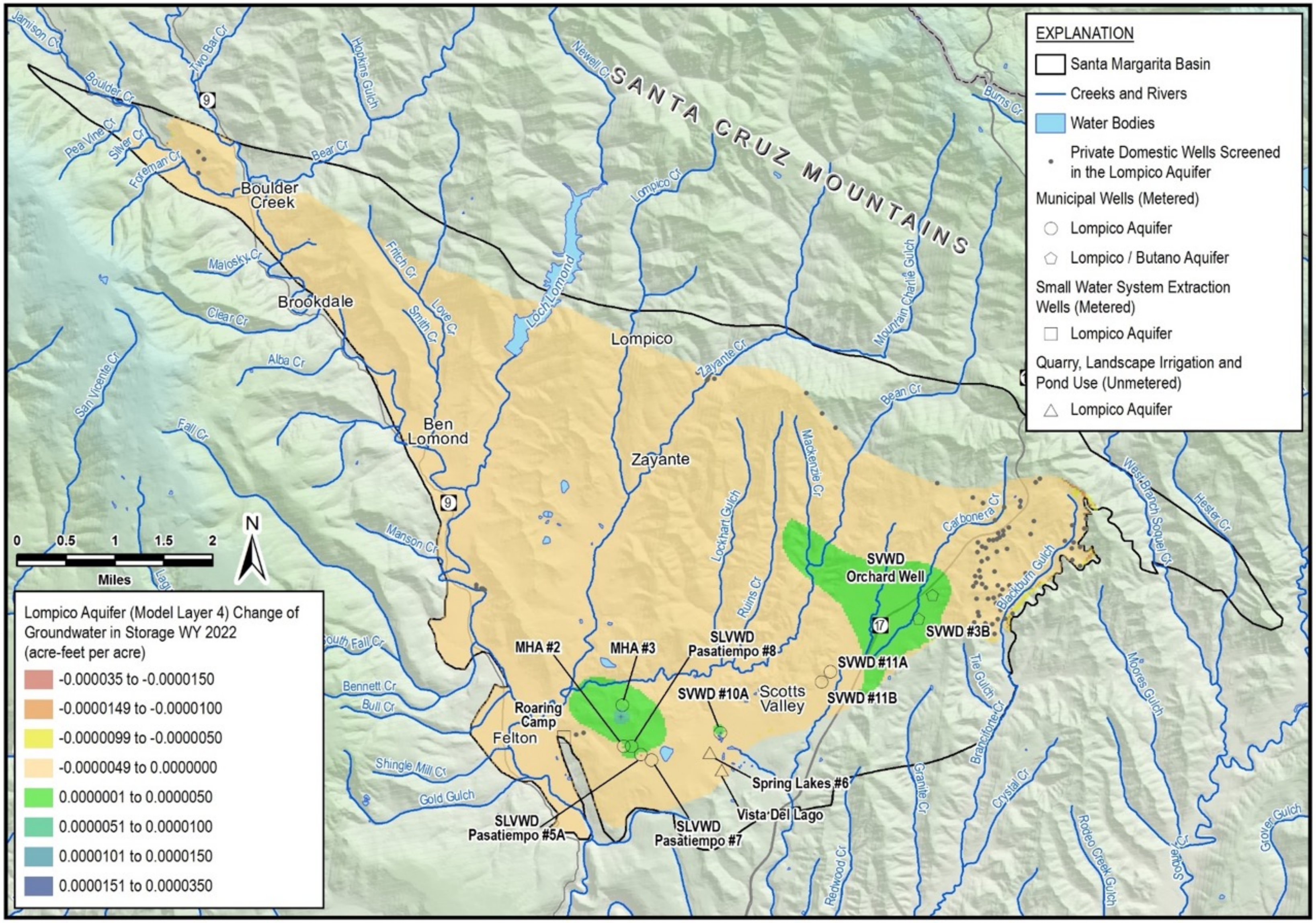


Figure 17. Change of Groundwater in Storage in Lompico Aquifer, WY2022

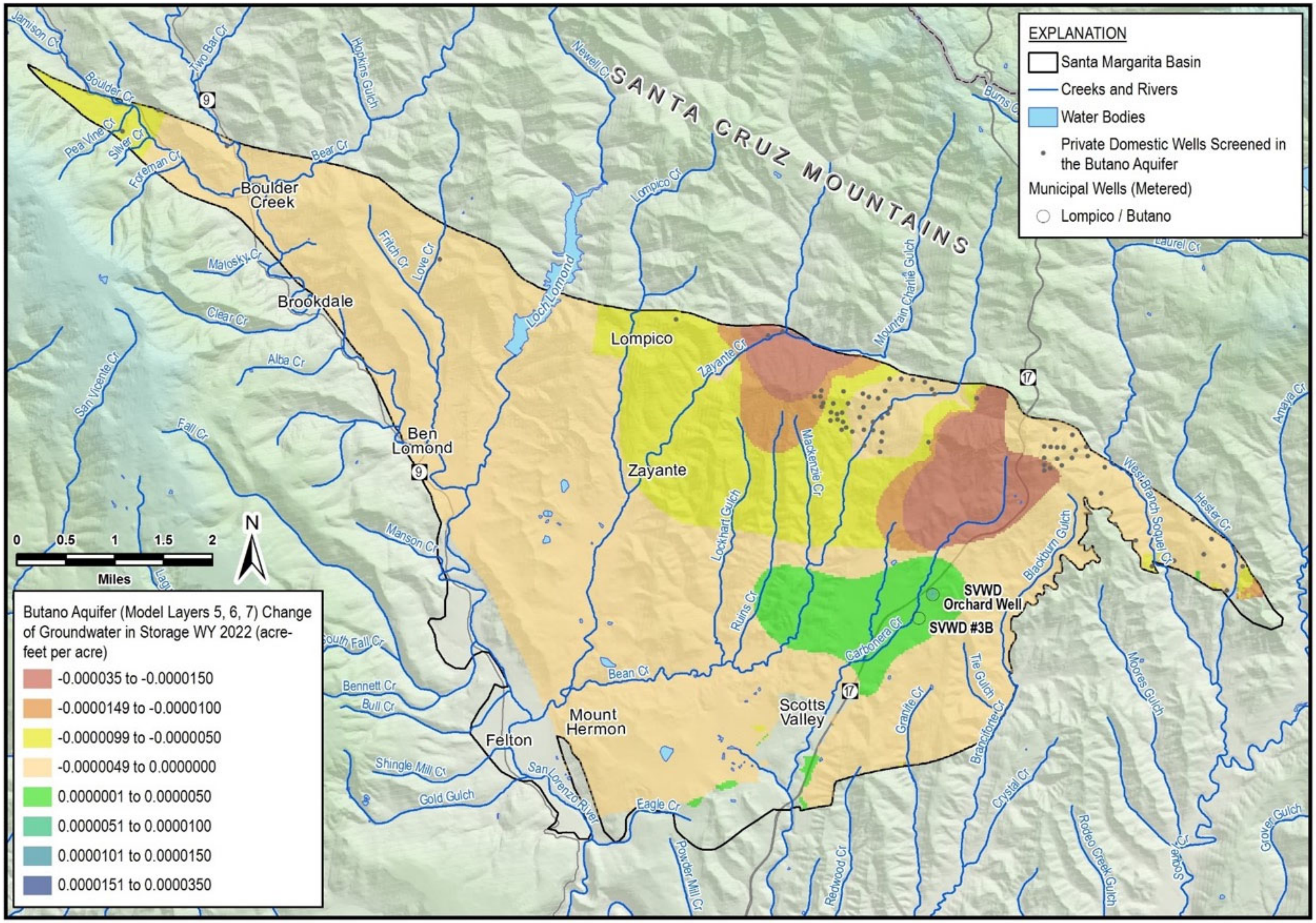


Figure 18. Change of Groundwater in Storage in Butano Aquifer, WY2022

4 PROGRESS TOWARD IMPLEMENTING THE PLAN

This section provides an update on WY2022 GSP implementation and progress toward sustainability. First, groundwater conditions are compared to the SMC defined in the GSP. Then the section outlines major near-term milestones, including project and management action implementation efforts and planned improvements to the GSP monitoring networks. Finally, the section summarizes SMGWA's upcoming implementation priorities addressed in the SGMA Implementation Round 2 Grant funding application submitted to DWR in December 2022.

Sustainability is defined by GSP Regulations as the absence of undesirable results for relevant groundwater conditions sustainability indicators. The minimum threshold (MT) is the point at which undesirable results may start to occur, and the measurable objective (MO) is the goal for each indicator designed to provide operational flexibility and ensure that future droughts and other unforeseen changes to water supplies do not cause unsustainable conditions. Interim milestones are 5-year goals to help SMGWA manage the Basin over the next 20 years to meet MOs by 2042. Land subsidence and seawater intrusion are not applicable sustainability indicators in the Basin and are not addressed in this report. Overall, groundwater conditions in the Basin are relatively stable and sustainable, -with annual changes primarily related to variation in precipitation and streamflow recharge of the shallow Santa Margarita aquifer.

4.1 Chronic Lowering of Groundwater Levels

There are 12 RMPs used to evaluate chronic lowering of groundwater levels relative to SMC. Annual groundwater elevations are reviewed in this section to assess whether they remain within the target operational range between the MT and MO, and if they are on track to meet the 2027 interim milestone. Undesirable results for the chronic lowering of groundwater levels indicator occur if the groundwater elevation in any RMP falls below the MT in 2 or more consecutive non-drought years. Temporary groundwater level declines caused by emergency operational issues or extended droughts are not considered an undesirable result. Table 5Table 5 shows the annual minimum groundwater elevation at each RMP since WY2018, relative to the MT, MO, and the 2027 interim milestone. Hydrographs in Appendix A (pages A-3 through A-18) show all historical data collected at RMPs relative to the MTs and MOs.

In WY2022 groundwater elevations at all 12 RMPs are above MTs; hence undesirable results did not occur for the groundwater level SMC. Groundwater elevations are ~~, with~~ stable or increasing ~~elevations~~ in most wells. The 2027 interim milestone is met for 8~~7~~ RMPs (green and yellow colors in Table 5Table 5), 5~~4~~ of which also meet MOs (green color in Table 5Table 5). ~~Since RMP groundwater levels did not fall below MTs in WY2022, undesirable results did not occur for the groundwater level sustainability indicator.~~

4.1.1 Santa Margarita Aquifer

There are 4 Santa Margarita aquifer RMPs, the first two representing the areas where the Santa Margarita aquifer is used most extensively for groundwater extraction in the Basin:

- SLVWD Quail Hollow wellfield: SLVWD Quail MW-B
- SLVWD Olympia and Mission Springs wellfields: SLVWD Olympia #3
- Mount Hermon/Pasatiempo/South Scotts Valley wellfields: SLVWD Pasatiempo MW-2
- North~~ern~~ Scotts Valley: SVWD TW-18

In WY2022, groundwater elevations remained relatively stable compared to the prior water year, and are within the target operational range (Table 5Table 5):

- ~~Two~~ One RMP~~s~~ ~~are~~ is below the 2027 interim milestone: S ~~SVWD TW-18 and S~~LVWD Quail MW-B
- One RMP is, within measurement error, at the 2027 interim milestone: SVWD TW-18
- ~~Two~~ Two RMPs are above MOs: SLVWD Olympia #3 and SLVWD Pasatiempo MW-2

~~Santa Margarita aquifer groundwater elevations in wells in the Olympia, Quail Hollow, and Mount Hermon/Pasatiempo/South Scotts Valley areas fluctuate more with climate than the Northern Scotts Valley portion of the aquifer and other deeper aquifers in the Basin. Groundwater levels decline in the climate-dependent portions of the aquifer during drier years and recover during wetter years. Since recent years are drier than average, G~~Groundwater elevations in SLVWD Olympia #3, Pasatiempo MW-2, and Quail MW-B ~~have~~ declined in WY2020 and WY2021 ~~overall since the last wet year in 2019~~ (Appendix A, pages A-3 through A-5) because, in addition to these being dry and critically dry water years, the District had to pump more from its wells during parts of these water years because of the loss of most of its surface water intakes in the August 2020 CZU Fire. In WY2022, groundwater elevations rose in Olympia #3 and Pasatiempo MW-2, and declined only slightly in Quail MW-B, in part because of implementation of emergency conjunctive use throughout the District.~~.~~

Groundwater elevations in the ~~northern~~ North Scotts Valley area, at SVWD TW-18, ~~are~~ have been stable and close to or above the MO ~~and 2027 interim milestone elevation~~ since 2000 (Appendix A, page A-6), because SVWD does not use this area for production from the Santa Margarita aquifer.

4.1.2 Monterey Formation

The only Monterey Formation RMP is SVWD Well #9 in the South Scotts Valley area. ~~SVWD~~ This well ~~Well #9~~ has a long-term trend of increasing groundwater elevation ~~trend~~ (Appendix A, page A-8). In WY2022 the groundwater elevation is within the target operational range, ~~Groundwater levels in SVWD Well #9 are~~ above the 2027 interim milestone and very close to the MO ~~in WY2022~~ (Table 5Table 5). ~~The WY2022 groundwater elevation is within the target operational range.~~

4.1.3 Lompico Aquifer

There are 4 Lompico aquifer RMPs representing ~~the~~ areas where the Lompico aquifer is used most extensively for groundwater extraction in the Basin:

- Mount Hermon / Pasatiempo wellfield: SLVWD Pasatiempo MW-1
- South Scotts Valley: SVWD Well #10
- Central Scotts Valley: SVWD Well #11A
- North~~ern~~ Scotts Valley: SVWD TW-19

Groundwater elevations remained relatively stable in Lompico aquifer RMPs in WY2022 compared to the prior water year, and are within the target operational range (Table 5Table 5):

- One RMP is above the MO (SVWD Well #10~~)~~
- Two RMPs are greatly above the 2027 interim milestone ~~but~~ and are very near or slightly above ~~below~~ the MO (SVWD Well #11A and SVWD TW-19)
- One RMP is below the 2027 interim milestone (SLVWD Pasatiempo MW-1)

The 3 SVWD Lompico aquifer RMPs have increasing groundwater elevation trends since about WY2015~~6~~; the~~, except for~~ SLVWD RMP in Pasatiempo MW-1 does not. ~~, which has been decreasing slightly since WY2019~~ (Appendix A, pages A-10 through A-13). The groundwater level in Pasatiempo MW-1 has decreased slightly since 2019, which reflects increased pumping during and in the aftermath of the August 2020 CZU wildfire affecting groundwater elevation levels in WY2019 and WY2020, with recovery of the aquifer being inhibited by the recent dry years and the limited direct recharge to the semi-confined Lompico aquifer.

4.1.4 Lompico/Butano Aquifer

SVWD #15 monitoring well in the Northern Scotts Valley area is the only RMP screened in both the Lompico and Butano aquifers. This well is located near the 2 Lompico/Butano SVWD

~~supply~~ production wells: SVWD #3B and SVWD Orchard. Groundwater elevations in SVWD #15 monitoring well fluctuate~~s~~ seasonally, with S~~s~~pring measurements frequently greater than the MO and F~~f~~all measurements below the 2027 interim milestone (Appendix A, page A-15). The minimum groundwater elevation in WY2022 is within the target operational range at a level slightly below the 2027 interim milestone.

4.1.5 Butano Aquifer

There are 2 Butano aquifer RMPs (SVWD Stonewood and Canham) located in the Northern Scotts Valley area upgradient of the SVWD #3B and Orchard Lompico/Butano wellfield. Both Butano aquifer RMP wells exhibit long-term stable groundwater elevation trends (Appendix A, pages A-17 and A-18). G~~and g~~roundwater elevations remain within the target operational range (Table 5Table 5):

- One RMP is above the MO (Stonewood well)
- One RMP is below the 2027 interim milestone (Canham well)

The Canham well MO and 2027 interim milestone ~~are~~ are aspirational goals, higher than any ~~higher than prior~~ groundwater ~~elevation measurements~~ elevations measured in the well since monitoring began in 2011. The MO~~s~~ and interim milestone~~s~~ were ~~developed~~ set at groundwater elevations predicted by the Basin Groundwater Model assuming the implementation of an additional ~~using groundwater model simulations of the~~ 540 AF/yr in conjunctive use ~~project,~~as one of the high-priority projects and management actions described in Section 4.5.2. Given that this project is still in the planning stage, it is expected that the 2027 interim milestone is not met.

Table 5. Groundwater Elevations Compared to Chronic Lowering of Groundwater Levels SMC, WY2018-2022

Aquifer	Well Name	Minimum Groundwater Elevation (feet amsl)							
		Minimum Threshold	Interim Milestone #1 (2027)	Measurable Objective	WY2018	WY2019	WY2020	WY2021	WY2022
Water Year Type					Dry	Wet	Dry	Critically Dry	Normal
Santa Margarita	SLVWD Quail MW-B	449	472	472	462.4	460.4	462.4	455.8	451.8
	SLVWD Olympia #3	302	307	307	344.0	332.0	351.4	335.9	330.1
	SLVWD Pasatiempo MW-2	498	514	514	523.7	517.7	519.6	512.7	516.3
	SVWD TW-18	462	471	471	469.9	469.9	471.8	471.8	470.9
Monterey	SVWD #9	301	340	358	338.6	342.1	346.7	351.0	354.0
Lompico	SLVWD Pasatiempo MW-1	334	339	372	346.7	357.4	346.6	340.4	335.4
	SVWD #10	286	302	322	297.4	308.8	317.9	330.3	338.1
	SVWD #11A	288	299	317	292.6	302.3	310.4	308.0	312.6
	SVWD TW-19	314	357	376	342.5	361.6	373.1	370.4	370.0
Lompico/Butano	SVWD #15 Monitoring Well	291	310	333	308.5	298.1	302.8	307.1	307.9
Butano	SVWD Stonewood Well	836	844	844	846.8	849.1	848.3	845.0	845.8
	SVWD Canham Well	427	447	467	443.2	443.0	442.0	441.7	441.2

amsl – above mean sea level

Minimum threshold not met

Minimum threshold met but 2027 interim milestone and measurable objective not met

Minimum threshold and 2027 interim milestone met, but measurable objective not met

Measurable objective met

4.2 Reduction of Groundwater in Storage

The reduction of groundwater in storage SMC are annual groundwater extraction volumes for the principal aquifers and Monterey Formation. Groundwater sustainable yield estimates are developed using groundwater model projections. The MTs are related to groundwater extraction volumes without implementation of additional projects or management actions, and the MOs are related to groundwater extraction volumes with assuming implementation of the a 540 AF/yr conjunctive use project. The 2027 interim milestones are equal to the MT through 2027, and thereafter are equal to the MO through 2042. Undesirable results occur if groundwater extraction volumes exceed the reduction in groundwater storage MTs in 1 or more principal aquifers.

In WY2022, groundwater extraction is within the operational range between the MT and MO. The total extraction from each aquifer and formation is less than the MT but exceeds the MO in the Santa Margarita, Lompico, and Butano aquifers. Since the MO is based on implementation of a projects that is are still in the planning stages, it is not expected to be achieved, absent of other efficiency improvements or wetter climatethe latter result is expected. Table 6Table 6 lists WY2022 groundwater extraction in each aquifer relative to MTs and MOs. Since Given that no MTs were exceeded, WY2022 extraction volumes did not result in undesirable results for this sustainability indicator.

Although total extraction is not a sustainability metric in the GSP, it is a useful value to assess sustainability progress. Total extraction in the principal aquifers and Monterey Formation is 2,455 AF in WY2022, which is midway between the extraction MO (2,125 AF) and extraction MT (2,820 AF). Implementation of planned projects and management actions described in Section 4.5 will help the SMGWA further reduce groundwater extractions to meet the sustainable yield and reduction in groundwater storage SMC.

Table 6. Groundwater Extractions Compared to Reduction in Groundwater in Storage SMC, WY2022

Aquifer	Groundwater Extraction, AF/yr		
	Minimum Threshold*	Measurable Objective	WY2022
Santa Margarita	850	615	683
Monterey	140	130	91
Lompico**	1,290	1,000	1,258
Butano**	540	380	423
TOTAL	**2,820**	**2,125**	**2,455**

* The first interim milestones in 2027 is equal to the minimum threshold.

** Assumes that the SVWD extraction wells screened in both the Lompico and Butano aquifers pump 40% of their water from the Lompico aquifer and 60% from the Butano aquifer.

Minimum threshold not met
Minimum threshold and 2027 interim milestone met, but measurable objective not met
Measurable objective met

4.3 Degraded Water Quality

Groundwater in the Basin is generally of good quality and meets primary drinking water standards. However, both naturally occurring and anthropogenic groundwater quality constituents of concern are present in some aquifers and areas. The main naturally occurring groundwater quality constituents in the Basin that occasionally approach or are greater than drinking water standards are iron, manganese, arsenic, and salinity~~y (measured as total dissolved solids and chloride)~~. A~~ The main a~~nthropogenic groundwater quality constituents that are occasionally detected, though at concentrations less than drinking water standards, are nitrate, organic point-~~-~~source contaminants from several industrial sites, and constituents of emerging concern from wastewater sources.

The MTs for degraded water quality are the drinking water standards for each constituent, except for nitrate, which is set to half the MCL ~~lower than the~~ drinking water standard. ~~.~~The MOs are the average concentrations at each well between January 2010 and December 2019. Interim milestones for groundwater quality are the same as MOs. The SMC for this sustainability indicator are met when concentrations are at or below the criteria. The MTs and WY2022 maximum concentrations for degraded groundwater RMPs are summarized in Table 7Table 7. Chemographs in Appendix D show groundwater quality in RMPs over time, relative to the MTs and MOs.

~~The only~~All SVWD RMP wells were ~~not~~ sampled in WY2022 ~~is~~ except SVWD Well #9, which is an inactive extraction well screened in the Monterey Formation. In WY2022 SLVWD ~~only~~ analyzed only for iron, manganese, arsenic, and nitrate in RMP wells (plus ~~in~~

WY2022. With the exception of volatile organic compounds (VOCs) in Quail Hollow #5A)., SLVWD did not analyze Although not measured in WY2022, levels of total dissolved solids (TDS), chloride, or and VOCs in their supply wells this year, but these constituents were all below MOs and/or detection limits in WY2021.

In WY2022, groundwater quality concentrations are lower than MTs and MOs for most analyzed constituentsmpounds, except iron and manganese. At least 1 mineral or metalconstituent is reported at a concentration greater than the MO in all RMP wells except SLVWD Olympia #3 (Appendix D). Since the MOs are based on recentlong-term -average concentrations, small exceedances of MOs are expected. The MO values are provided on individual chemographs in Appendix D

Iron and manganese are naturally elevated in the Lompico aquifer and in parts of the Santa Margarita aquifer, such as the Olympia wellfield. Iron and manganese concentrations in untreated groundwater regularly exceed applicable secondary drinking water standards, so SLVWD and SVWD treat or blend raw groundwater to meet state drinking water standards. Since these are naturally occurring exceedances of MTs, and the exceedances are not being caused by groundwater use, they do not constitute undesirable results.

s are not being caused.

Table 8 shows the WY2022 maximum concentrations for iron and manganese relative to MOs for RMPs that do not meet the MT. The MOs are based on long-term average concentrations for these wells and, therefore, have a higher concentrations than the MT. In WY2022, 4 wells have lower concentrations than the MO and 2 have higher concentrations than the MO. WY2022 iron and manganese concentrations in SLVWD Pasatiempo #7 and SVWD #3B are greater than the MO, but are within their respective historical ranges.

Besides iron and manganese, other constituents detected at concentrations above the MO include TDS, chloride, arsenic, and nitrate:

- TDS concentrations between 300 and 730 milligrams per Liter (mg/L) are below the MT of 1,000 mg/L but exceeded the MO in 3 of 5 sampled wells.

- Chloride concentrations between 12 and 54 mg/L are below the MT of 250 mg/L but exceeded the MO in 4 of 5 sampled wells.

- Arsenic concentrations of 3.7, 8.6 were between 3.7 and 9.7 micrograms per Liter (µg/L) in 3 wells where itwere measured in SVWD #11A, SVWD #11B and -was detected (SLVWD Pasatiempo #7, respectively. Levels were SVWD #11A, and SVWD #11B) and below detection limits in 44 other sampled wells. 2 of 3 detections were greater than the MO. The MCL and MT for arsenic is 10 µg/L so was nearly exceeded at SLVWD Pasatiempo #7. Examination of theThe chemograph for SLVWD Pasatiempo #7 (Appendix D, Page D-12) suggests that 9.7 µg/L is an anomalous result for the well. The levels measured in SVWD #11A and SVWD #11B were slightly above and slightly below the respective MOs for those wells. . SVWD #11B is , the only RMP well that regularly approaches the arsenic MCL and MT of 10 µg/L, was detected at 8.6 µg/L in WY2022 (Appendix D, Page D-16).

- Nitrate was only detected only at SLVWD Quail Hollow #5A (2.3 mg/L) and Pasatiempo #7 (0.29 mg/L). The detection at SLVWD Quail Hollow #5AThe only other detection greater than a MO in WY2022 is nitrate in SLVWD Quail Hollow #5A. The nitrate concentration of 2.3 milligrams per liter (mg/L) is slightly higher than the MO of 2.13 mg/L butand well below the MT of 5 mg/L.

Table 7. Groundwater Quality Compared to Minimum Thresholds, WY2022

Aquifer	Well Name	Concentration milligrams per Liter (mg/L)										
		Total Dissolved Solids (TDS)	Chloride	Iron	Manganese	Arsenic	Nitrate as Nitrogen	Methyl-tert-butyl-ether	Chlorobenzene	Trichloroethylene	Tetrachloroethylene	1,2-Dichloroethylene
Minimum Threshold		***1,000***	***250***	***0.3***	***0.05***	***0.01***	***5***	***0.013***	***0.07***	***0.005***	***0.005***	***0.07***
Santa Margarita	SLVWD Quail Hollow #5A	NS	NS	ND	NSND	NDNS	2.3	NS	ND	ND	ND	NS
	SLVWD Olympia #3	NS	NS	0.31	0.15	ND	ND	NS	NS	NS	NS	NS
Monterey	SVWD Well #9	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Lompico	SLVWD Pasatiempo #7	NS	NS	0.39	0.10	0.0010.0097	0.29	NS	NS	NS	NS	NS
	SVWD #10A	300	32	0.79	0.099	ND	ND	ND	ND	ND	ND	ND
	SVWD #11A	520	29	0.26	ND	ND0.0037	ND	ND	ND0.0005	ND	ND	ND
	SVWD #11B	340	22	ND0.68	0.076	ND0.0086	ND	ND	ND	ND	ND	ND
Lompico/ Butano	SVWD #3B	730	12	0.44	0.12	ND	ND	ND	ND	ND	ND	ND
	SVWD Orchard Well	490	54	0.010	0.003	ND	ND	ND	ND	ND	ND	ND

Minimum threshold not met
Minimum threshold met, but measurable objective not met (see Appendix D for MO)
Minimum threshold and measurable objective met or analyte not detected (ND)
NS – not sampled

Table 8. Groundwater Quality Compared to Iron and Manganese Measurable Objectives, WY2022

Aquifer	Well Name	Iron Concentration (mg/L)		Manganese Concentration (mg/L)	
		Measurable Objective	WY2022 Maximum	Measurable Objective	WY2022 Maximum
Santa Margarita	SLVWD Olympia #3	0.502	0.31	0.157	0.15
Lompico	SLVWD Pasatiempo #7	0.539	0.39	0.099	0.10
	SVWD #10A	1.51	0.79	0.099	0.099
	SVWD #11A	0.459	0.26	0.112	ND
	SVWD #11B	0.826	ND0.68	0.077	0.076
Lompico/ Butano	SVWD #3B	0.380	0.44	0.042	0.12

Measurable objective not met
Measurable objective met

4.4 Depletion of Interconnected Surface Water

Depletion of interconnected surface water is assessed at 2 RMPs using groundwater elevations as a proxy. The approach for evaluating sustainability is identical to the approach described for the chronic lowering of groundwater levels indicator in Section 4.1. Table 9Table 9 compares 5 years of annual minimum groundwater elevations for depletion of interconnected surface water RMPs with MTs and MOs. Hydrographs for depletion of interconnected surface water RMPs are shown in Appendix B, pages B-2 and B-3.

WY2022 groundwater elevations in both RMPs remained stable and higher than the MTs despite 3 consecutive years of below--average rainfall. The groundwater elevation in SVWD SV4-MW is 18.7 feet higher than the MO, while the groundwater elevation in SLVWD Quail MW-A is 2.9 feet lower than the MO. ~~Hydrographs for depletion of interconnected surface water RMPs are shown in Appendix B, pages B-2 and B-3.~~

Table 9. Groundwater Elevations Compared to Depletion of Interconnected Surface Water SMC, WY2018-2022

Aquifer	Well Name	Minimum Groundwater Elevation (feet amsl)						
		Minimum Threshold	Measurable Objective*	WY2018	WY2019	WY2020	WY2021	WY2022
Water Year Type				**Dry**	**Wet**	**Dry**	**Critically Dry**	**Normal**
Santa Margarita	SLVWD Quail MW-A	413	416	413.7	413.7	414.4	413.3	413.1
	SVWD SV4-MW	381	387	398.9	406.6	401.6	404.1	405.7

* 2027 interim milestones are equal to the measurable objective

Minimum threshold not met
Minimum threshold met, but measurable objective not met
Measurable objective met

4.5 Update on Implementation of Projects and Management Actions

SMGWA's member agencies have managed groundwater proactively in the Basin for the past several decades. There are ~~ongoing~~ management activities predating the SGMA that ~~continue~~ are ongoing during GSP implementation. Historical groundwater level declines have been mitigated over the past 2 decades by reduced consumption, water use efficiency programs, reduction in system leaks, ~~and SVWD~~ use of recycled water for non-potable uses by SVWD, and conjunctive use of surface water and groundwater by SLVWD. Groundwater elevations in wells and calculated groundwater in storage stabilized around 2015 and since then groundwater levels have risen in many wells, suggesting that current extraction levels may be sustainable under present conditions. However, to ensure that ~~additional projects are needed to achieve the~~ SMGWA's sustainability goals are met under future climate conditions and to improve ~~individual agency~~ water supply reliability for individual agencies and the region, SMGWA is proceeding with high-priority ~~given climate change. The need for future~~ projects and management actions that maximize *in lieu* recharge, and is investigating other types of projects to implement should these efforts prove insufficient. ~~is driven by lowered groundwater levels and ongoing reliance on groundwater extraction from the Lompico aquifer in the Mount Hermon/Pasatiempo/South Scotts Valley area.~~

This section summarizes progress during WY 2022 toward implementing projects and management actions for groundwater sustainability ~~during WY2022~~. The estimated costs, timing, and benefits of ongoing, planned, and potential projects and management actions are described in detail in the GSP. ~~Projects and management actions are summarized in the GSP~~They fall into ~~in~~ the following groups:

- Group 1 – projects and management actions that are already being implemented
- Group 2 – projects and management actions that have not been implemented yet, but are the most likely options to be pursued during GSP implementation
- Group 3 – potential additional ~~conceptual~~ projects and management action ~~options~~ that will be ~~pursued~~ considered if Group 1 and 2 projects are not feasible or do not achieve sustainability

Many of the projects and management actions under consideration focus on conjunctive use, which is the optimized, sustainable use of multiple water sources throughout repeated climatic cycles under physical, legal, and environmental constraints. SLVWD has demonstrated effective conjunctive management of surface water and groundwater in their North S~~Distribution s~~ystem since 1984, and has successfully employed it throughout the District since the August 2020 CZU wildfire to reduce groundwater use. SLVWD's experience ~~which~~ can serve as a model for expanded conjunctive use in the Basin during GSP implementation.

4.5.1 Existing Projects and Management Actions (Group 1)

~~Ongoing projects and management activities predating SGMA will continue during GSP implementation.~~ This section summarizes the existing projects and management actions already being implemented in the Basin.

4.5.1.1 Conservation and Water Use Efficiency

SLVWD, SVWD, SCWD, and the County~~, and the City of Santa Cruz~~ continue to implement ~~a number of water use efficiency and~~ conservation activities that ~~that~~ reduce water demand in the region by building awareness about indoor and outdoor water use efficiencies, promoting water-efficient behaviors, and reducing water waste. The agencies individually implement a variety of water conservation programs focused on education, outreach, rebates, and enforcement of water waste policies. They ~~. These agencies~~ are all members of the Water Conservation Coalition of Santa Cruz County, which serves as a regional information source for countywide water reduction measures, rebates, and ~~resources. The Water Conservation Coalition provides water saving tips, information on countywide rebate programs, and~~ educational materials. The organization's outreach efforts to improve water conservation include press releases, local advertisements, and informational booths at events.

~~Continuation and further expansion of water use efficiency activities is foreseen in the future by SLVWD, SVWD, the County, and the City of Santa Cruz. These agencies strive to continue building awareness about indoor and outdoor water use efficiencies, promoting water efficient behaviors, and reducing water waste. The agencies implement a variety of water conservation programs focused on education, outreach, rebates, and enforcement of water waste policies.~~

While education and outreach programs increase awareness and efficiency on the customer side, SLWVD, SVWD, and ~~the City of Santa Cruz Water Department (~~SCWD~~)~~ also focus on improving efficiency within their respective distribution systems through upgrades to the metering infrastructure, reduction of non-revenue water, and evaluation of system pressure. New metering infrastructure allows for increased accuracy, leak detection, and improved customer accountability. In 2016, SLVWD began deploying new meters in its Lompico service area, and a multi-year system-~~-~~wide meter change-~~-~~out program has upgraded 33% of meters through WY2022. The District recently received a grant to upgrade an additional one third of the meters. In 2016, SVWD began deploying advanced metering infrastructure and achieved 100% completion in WY2021. SVWD tested and calibrated all production meters in WY2022.

Systemically addressing non-revenue water losses increases overall efficiency and ~~reduces non-revenue loss thereby~~ decreas~~es~~ing ~~consumption and~~ groundwater extractions. SVWD conducted a leak detection audit in WY2022. SLVWD has increased the frequency of contracted system--wide leak detection from every 3 years to every 2 years. As part of regular capital improvements, SLVWD is in the process of replacing older storage tanks and pipelines. Several Old, redwood storage tanks within SLVWD are made of redwood and are known sources of water loss. SLVWD replaced 4 Four redwood tanks were replaced in WY2022, and. Other SLVWD has applied for grant funding to replace additional redwood tanks may be replaced in future years if funding can be secured.

4.5.1.2 SVWD Low Impact Development (LID) Projects

SVWD monitors 3 LID facilities, which were developed prior to SGMA. As Table 2Table 2 shows, a minimum of 16 AF of stormwater was captured is reported inin WY2022 at the three LID facilities. LID- infiltrated stormwater recharges the Santa Margarita aquifer in a manner similar to natural processes, augmenting . The stormwater infiltration helps augment groundwater levels and sustainingings groundwater contributions to creek baseflows that supports local fishery habitats. The three LID facilities overlie and infiltrate stormwater into the Santa Margarita Sandstone in areas where the presence of intervening underlying Monterey Formation restricts recharge of that water into the Lompico aquifer beneath the Monterey Formationbelow. The relatively small size of the area where the Monterey Formation is absent limits the Because of the geological sequence, there is limited potential of the existing LID facilities to recharge the Lompico aquifer, which that has the greatest need foris the aquifer most affected by past overdraft recovery and is the source of most of SVWD's water supply. Another complicating factor in implementing LID projects in the Scotts Valley area is that there is no centralized stormwater collection system, which limits the scale of projects and the ability to feasibility for large scale projects and direct recharge to the most beneficial areas.

SVWD continues to evaluate opportunities for additional LID expansion in the future. Costs of past projects have been in large part offset by grant funding. SVWD is pursuing 2022 Urban Community Drought Relief grant funding to expand the Transit Center LID project to contribute approximately 1 to 4 AF/yr of additional stormwater recharge to the Santa Margarita aquifer.

4.5.1.3 SVWD Recycled Water Program

The SVWD Recycled Water Program is a cooperative effort between SVWD and the City of Scotts Valley. Recycled water has been used *in lieu* of groundwater by SVWD for non-potable uses since 2002 to augment the water supply and help the SVWD meet water--use efficiency goals. Recycled water is produced at the City of Scotts Valley Tertiary Wastewater Treatment Plant, where it undergoes nitrate removal, ultra-violet disinfection, and chlorination. Recycled water is then distributed by SVWD to customers through a dedicated recycled water system. Recycled water is used mostly ~~used~~ for landscape irrigation and to a lesser extent ~~, but also~~ for dust control ~~to a lesser extent~~. SVWD continues to explore options to maximize the beneficial use of recycled water in the future. Costs of operating the recycled water system are built into SVWD and City of Scotts Valley budgets, and are not anticipated to be passed on to ~~the~~ SMGWA.

Use of recycled water ~~Recycled water use within the Basin represents an equivalent reduction in groundwater extraction. Groundwater not extracted from the basin is assumed to be available for future beneficial use. Therefore, recycled water use~~ results in a reduction in groundwater extraction and an increase in groundwater levels in the Basin. Figure 19 charts recycled water demand since it was made available to SVWD customers in 2012. SVWD distributed 174 AF of recycled water in WY2022.

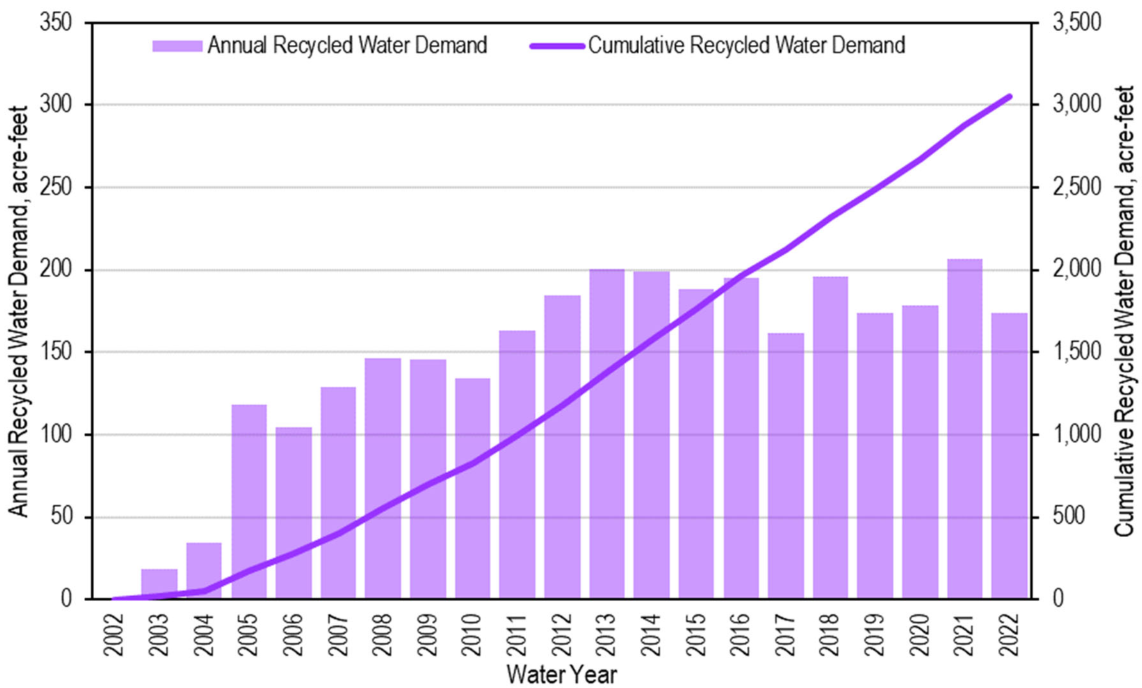


Figure 19. Recycled Water Demand by SVWD Customers, WY2002-2022

4.5.1.4 SLVWD ~~North System~~ Conjunctive Use

The SLVWD owns, operates, and maintains 2 ~~permitted~~ water systems that supply different water sources to distinct areas in the Basin. The San Lorenzo Valley System, made up of the connected North and South distribution systems, and the Felton System, which only serves the community of Felton and surrounding ~~unincorporated~~ areas in the southern portion of the Basin (Figure 20). The North System uses surface water and groundwater conjunctively, the South System uses groundwater and surface water conveyed from the North System, and the

Felton System only uses surface water. The Felton System is connected to the San Lorenzo Valley System by an intertie that is only for emergency use.

A successful conjunctive use program has been implemented by SLVWD in their North System for decades. In the North System, the SLVWD optimizes the use of surface water and groundwater by utilizing stream flows while they are high and groundwater when stream flows are low. The benefits of conjunctive use in the North System are reduced groundwater pumping of~~in~~ the Santa Margarita aquifer in the Quail Hollow and Olympia wellfields, increased groundwater levels around the wells that are resting, and, hypothetically, increased ~~creek~~ baseflow in Bean Creek, Zayante Creek and their tributaries near the wellfields. The conjunctive use of these sources has met annual water demands since 1984, without a substantial decline in groundwater levels. On average, the North System obtains 56% of its water supply from stream diversions and 44% from groundwater extraction (Figure 13). ~~SLVWD plans to continue implementing the North System conjunctive use strategy for the foreseeable future.~~

Since the August 2020 CZU wildfire, SLVWD has undertaken a "natural experiment" in District-wide conjunctive that has been a striking demonstration of the effectiveness of this approach for reducing groundwater use, and a powerful argument for expanding conjunctive use beyond SLVWD's North system to the entire Basin. The destruction of all the surface water intakes and raw water pipelines in the North System by the wildfire created the emergency situation that allowed the District to use the emergency intertie with the Felton System. As a result, SLVWD was able to maximize its surface water diversions in the Felton System (while maintaining fish bypass flows) in conveying water to the North and South Systems and reduce reliance on groundwater. This District-wide conjunctive use made it possible for SLVWD to use surface water exclusively (i.e., rest the wells in both the North and the South Systems) for approximately 30 days in WY2021 and 60 days in WY2022, and to reduce WY2022 groundwater extraction to an annual volume that is one of the lowest on record.

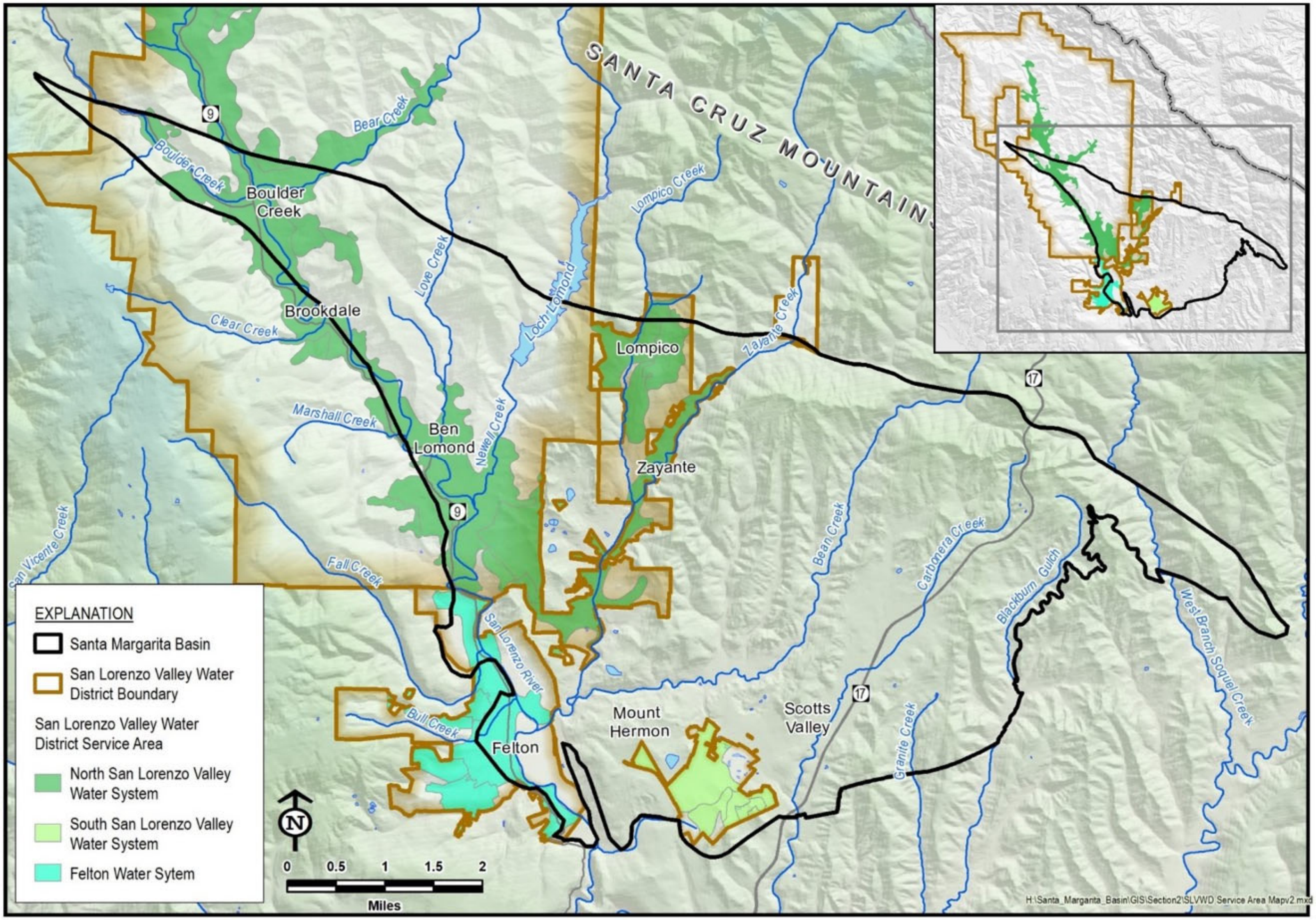


Figure 20. San Lorenzo Valley Water District Systems

4.5.2 Projects and Management Actions Using Existing Water Sources Within the Basin (Group 2, Tier 1)

Group 2, Tier 1 projects and management actions identified in the GSP focus~~es~~ on expansion of conjunctive use and *in lieu* recharge in the Basin using existing water sources within the Basin. The amount of excess surface water available for conjunctive use is ~~In general, availability of excess surface water is constrained~~a function of ~~by~~ factors such as annual precipitation, required minimum bypass flows for fish in the Felton System, the capacity of drinking ~~including drinking~~ water treatment ~~capacity~~facilities, and water rights restrictions on place-~~-~~of-~~-~~use ~~restrictions, required minimum fish flows, and availability of adequate surface water supplies~~. ~~Conjunctive use is currently implemented by SLVWD to effectively manage water use in their North System (described in Section 4.5.1.4). Expansion of conjunctive use is identified in the GSP as a priority project and management action to achieve sustainability.~~

Expanding conjunctive use will involve 2 ~~two~~ phases with different sources, conveyance infrastructure, and regulatory frameworks:

Phase 1 of Expanded Conjunctive Use: Excess surface water ~~available to the SLVWD~~ from ~~its~~ existing diversion points in SLVWD's Felton and North Systems is available for expanded conjunctive use in the South System and can ~~likely~~ be conveyed with minimal modifications to existing infrastructure to other areas of the Basin where surface water ~~it~~ is not currently used.

There is on average an estimated 227 AF/yr of excess surface water from SLVWD's North and Felton Systems available for expanded conjunctive use in the South System or other parts of the Basin. ~~The SLVWD is currently in the planning phase with an Environmental Impact Report (EIR) anticipated to be completed by the end of 2024.~~

~~Phase 1 of expanded conjunctive use will likely be implemented after completion of environmental permitting and necessary system improvements.~~

Phase 2 of Expanded Conjunctive Use: ~~An additional~~SLVWD's contractual allocation of 313 AF/yr of raw water from Loch Lomond reservoir is currently unused. This ~~of raw surface~~ water ~~from Loch Lomond~~ could be available for conjunctive use in the Basin with improvements to water treatment and conveyance infrastructure, subject to ~~agreements with the City of Santa Cruz, and~~ completion of environmental compliance permitting and agreements with SCWD. ~~The SLVWD plans to complete a feasibility study in 2023 for conjunctive use of Loch Lomond water in the district.~~

Expanded conjunctive use of water sources in the Basin requires modifications to SLVWD's water rights regarding place-of-use to allow the District to use surface water from the Felton

System throughout the District, and to convey water to SVWD on a non-emergency basis. The Initial Study with Negative Declaration submitted by SLVWD in support of its water rights petition as part of the California Environmental Quality Act review met with numerous formal objections by SCWD. As a result, the District is currently undertaking a full Environmental Impact Report of intra-District water transfers, which is anticipated to be completed by the end of 2024, in support of a scaled-back water rights petition. Once those are completed, SLVWD will proceed with environmental studies and water rights petitions that address inter-district water transfers. SLVWD plans to complete an updated engineering feasibility study and environmental impact report by the end of 2024 for conjunctive use of its contracted 313 AF/yr allocation of Loch Lomond water. In parallel the District will continue to pursue discussions with SCWD about purchasing an equivalent amount of treated water instead. SLVWD and SCWD entered a formal agreement in 2021 to work collaboratively on reaching agreement on SLVWD's utilization of its Loch Lomond allocation and resolving water rights issues in the San Lorenzo River watershed.

4.5.3 Projects and Management Actions Using Surface Water Sources Outside the Basin (Group 2, Tier 2)

If further planning for Group 2, Tier 1 projects shows they ~~the approaches~~ are not feasible or are not likely to result in Basin sustainability, ~~do not result in the desired benefits,~~ water sources from outside the Basin could be considered for conjunctive use ~~through an agreement with the City of Santa Cruz~~.

4.5.3.1 Water Transfer from Other Basins for Inter-District Conjunctive Use

Water transfer~~s~~ from sources outside of the Basin for inter-district conjunctive use is similar to the transfers described above, but they rely on import of~~ed~~ treated surface water during the wet season months to offset ~~SLVWD and SVWD~~ groundwater extraction demands ~~during the wet season months~~. Treated ~~source~~ surface water would be provided by ~~the City of Santa Cruz~~SCWD from its San Lorenzo River and N~~n~~orth C~~c~~oast sources when excess water is available.

SVWD was awarded a 2021 Urban and Multibenefit Drought Relief grant for a Regional Drought Resiliency Project. The project, anticipated to be completed by early 2026, includes the design and construction of 2 critical pieces of infrastructure to improve drought resiliency for SVWD and ~~the~~ SCWD:

1. A 12-inch~~-~~diameter, bi-directional, intertie pipeline and pump station between the SCWD and SVWD distribution systems to facilitate transfers of water ~~supply~~ in droughts or other emergencies

2. A new, large, production groundwater well in Scotts ValleySVWD to replace aging wells, that will increaseallow for increased extraction capacity, strengthen SVWD's ability to provide redundancy and meet potential increased demand, and to supply water to neighboring agencies in drought conditions

Together, the 2 new infrastructure elements create an opportunity to increase groundwater stored in the Basin, while providing an emergency supply to be used by SCWD during extended droughts. This could be done by importing wet season surface water, by *in lieu* conjunctive use (i.e., use SCWD excess surface water to rest SVWD wells, resulting in natural recovery of groundwater levels in the Basin) and/or by injection of surface water into the Lompico aquifer.

4.5.3.2. which could be made available as a regional groundwater supply during periods of drought. The project is anticipated to be completed by early 2026.

Aquifer Storage & Recovery Project in Scotts Valley Area of the Basin

Over the past few years, the City of Santa CruzSCWD has explored the possibility of an aquifer storage and recovery (ASR) project in the area of Scotts Valley where groundwater levels in the Lompico aquifer groundwater levels are have been lowered and there is the most storage capacity. The potential project would use treated surface water from the City of Santa Cruz'sSCWD's San Lorenzo River and North Coast sources to create an underground reservoir in the Basin for drought supply.

The City of Santa CruzSCWD has used the Basin groundwater model to simulate preliminary options for ASR configurations and operations. In 2022, SMGWA submitted an application for a Sustainable Groundwater Management Implementation (SGMI) Round 2 grant that includes evaluating several managed aquifer recharge strategies. Results on whether the grant application is successful is expected in late summer 2023.

4.5.4 Projects Using Purified Wastewater Sources (Group 2, Tier 3)

There are several potential project alternatives included in the GSP that would use purified wastewater to supplement water suppliesy in the Basin. The advantage of using purified wastewater is that it is available year-round and is a drought--resilient source, while whereas conjunctive use relies on excess surface water in wet years. With concerns that changing climate is altering the timing and intensity of rainfall events that impact surface water runoff, expanded conjunctive use may not solely be sufficient to provide the benefits needed to achieve sustainability. SVWD and City of Santa CruzSCWD have both completed initial feasibility studies of projects involving injection and storage of purified wastewater. .

~~SMGWA submitted an application for a SGMI Round 2 grant that includes evaluating several managed aquifer recharge strategies.~~

4.5.5 Other Projects and Management Actions Requiring Future Evaluation

In 2022, SMGWA submitted an application for a Sustainable Groundwater Management Implementation (SGMI) Round 2 grant that includes funding to evaluate the managed aquifer recharge strategies, including conjunctive use of Loch Lomond reservoir water and imported treated surface water, and ASR involving treated surface water or purified wastewater. Should ~~the ongoing, planned, and conceptual projects and management~~the actions described above in Sections 4.5.2, 4.5.3, and 4.5.4 prove to not be feasible or ~~not~~ insufficient to achieve sustainability goals, SMGWA may look into the feasibility of additional projects and management actions ~~. These potential projects,~~ identified in the GSP as Group 3. These ~~,~~ will be evaluated as necessary and discussed in future annual reports or the 5-year GSP update.

4.6 Update on Improvement of Monitoring Network

~~The GSP~~SMGWA identified data gaps in the monitoring network ~~data gaps~~ that should be filled as funding allows during implementation of the GSP. This section describes improvements to the GSP monitoring network~~s~~ made in WY2022 and planned for~~in~~ the near future.

4.6.1 Groundwater Level Monitoring Improvements

~~Progress was made in WY2022 towards adding new groundwater level monitoring wells to the GSP monitoring network. A unifying monitoring well elevation survey is a lower priority data gap that will be performed as funding becomes available.~~

4.6.1.1 Groundwater Level Monitoring Well Installations

During WY2022, SMGWA advanced plans to install up to 8 new groundwater level monitoring wells ~~to fill data gaps identified in the GSP. There are~~in areas of the Basin where groundwater is extracted, but no historical or current monitoring wells exist. Monitoring wells are planned in locations shown on Figure 21 for the purposes described in Table 10, as ~~and~~ summarized ~~briefly~~ below:

- Santa Margarita aquifer and Monterey Formation well installations are planned near communities with many private domestic wells but no groundwater level monitoring. Some of these well locations will also be used to assess interconnection between shallow groundwater and surface water and to evaluate whether groundwater extraction is causing depletion of surface water.

- One Butano aquifer monitoring well is planned where SVWD extraction wells are installed in both the Lompico and Butano aquifers but no dedicated Butano monitoring well exists.

Sites for 9 new monitoring wells were selected in WY2021, shortly after the GSP was submitted. In WY2022, SMGWA acquired site access, developed well installation technical specifications, prepared public bid documents, and coordinated well permits for 8 of the sites. A ~~Monterey Formation~~ monitoring well in the Monterey Formation in the northern portion of the Basin that was identified as Weston Road in the GSP cannot be installed at this time because an accessible location could not be identified.

SMGWA plans to install 7 ~~shallower~~ monitoring wells in the Santa Margarita aquifer and Monterey Formation ~~monitoring wells~~ in WY2023. The installation of these shallow ~~Shallow~~ monitoring wells ~~installations are~~is to be f~~f~~unded using remaining Proposition 68 funds and SMGWA contributions. The deeper Butano aquifer monitoring well ~~may~~ will be installed on a different timeline ~~than the other shallower wells~~. This well will be constructed at a school where installation can only occur in the summer when school is out of session. The Butano aquifer monitoring well is also much more expensive than other wells because it is substantially deeper. SMGWA requested additional funding to install the Butano monitoring well in the SGMI Round 2 grant application, as discussed in Section 4.7.

Table 10. Rationale for Proposed New Monitoring Well Locations

Well ID	Location Name	Location Description	Target Aquifer / Formation	Anticipated Well Depth (ft bgs)	Sustainability Indicator Monitoring	Rationale for Well
SMGWA-1	Vine Hill School	West side of Scotts Valley Drive just inside Vine Hill Elementary school's northern gate.	Butano	800	Groundwater levels	Establish a monitoring well screened only in the Butano aquifer near SVWD extraction wells.
SMGWA-2	Bean Creek Downstream of Mackenzie Creek	County right-of-way on the east side of Bean Creek Road near the 0.94 mile marker	Santa Margarita	80	Interconnected surface water	Collect groundwater data near a portion of Bean Creek that periodically runs dry in summer months near newly installed stream gage.
SMGWA-3	Ruins Creek	County right-of-way on the west side of Nelson Road, and approximately 500 feet north of 0.88 mile marker	Santa Margarita	300	Groundwater levels	Address a data gap in the aquifer where there is groundwater pumping but no historical groundwater level data.
SMGWA-4	Nelson Road / Lockhart Gulch	County right-of-way on the north side of Nelson Road approximately 350 feet north of the intersection between Nelson and Lockhart Gulch Roads	Santa Margarita	100	Interconnected surface water	Monitor an area that has a high concentration of private domestic pumping and is the location where Bean Creek flow resurfaces when the upgradient reach is dry.
SMGWA-5	Bahr Drive	North side of Bahr Dr opposite 310 Bahr Road, Scotts Valley.	Santa Margarita	200	Interconnected surface water	Monitor an area where groundwater seeps out of the valley side and into Zayante Creek.
SMGWA-6	Quail Hollow Road	SLVWD-owned parcel with an inactive extraction well (Well #8).150 feet past 0.31 mile marker.	Santa Margarita	300	Interconnected surface water	Monitor groundwater levels in the Quail Hollow subarea near upgraded Newell Creek stream gage
SMGWA-7	Love Creek	County right-of-way on the west east side of Love Creek Road opposite 10545 Love Creek Road, Ben Lomond	Monterey	300	Groundwater levels	Collect data from an area with a high concentration of private domestic pumping and no records of historical groundwater levels.
SMGWA-8	Randall Morgan Sandhills Preserve	Land Trust of Santa Cruz County property. Well will be drilled through an existing concrete pad.	Monterey	200	Interconnected surface water	Establish a correlation between groundwater levels and surface water stage in Bean Creek at Mount Hermon Camp in an area downgradient of a high concentration of private domestic users.

ft bgs – feet below ground surface

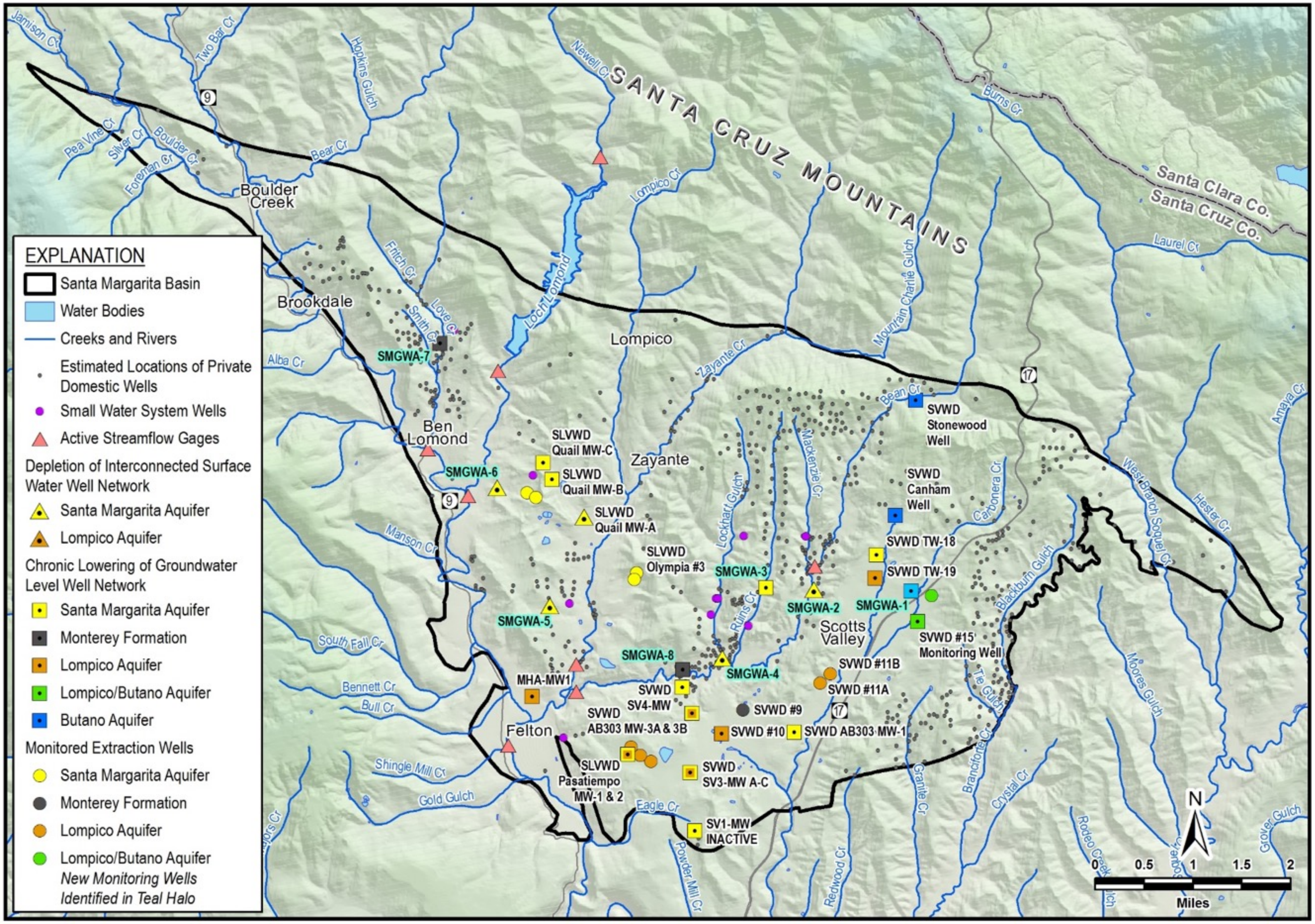


Figure 21. Proposed New Monitoring Wells, Existing Monitoring Locations, and Supply Wells

4.6.1.2 Survey of Reference Point Elevations in Groundwater Level Monitoring Wells Survey

Groundwater level monitoring well reference point elevations

Reference-point elevations in groundwater monitoring wells are used to convert depth--to-groundwater in wells to a groundwater elevations that can be compared to other wellsused to assess groundwater flow directions. RWell reference point elevations in wells were compiled during GSP preparation from several member agency datasets. The reference points were established over many years and measured using a variety of survey techniques or estimates. A comprehensive survey would improve understanding of groundwater flow in the Basin by standardizing the reference elevations at each monitoring location. Such a survey is a lower-priority A reference point elevation survey is a monitoring network improvement, and is being considered by the SMGWA as funding allows.

4.6.2 Groundwater Extraction Monitoring Improvements

As part of GSP implementation, the SMGWA will initiate a new well metering program requiring measurement and reporting of all non-*de minimis* groundwater extraction greater than 2 AF/yr. Currently active non-municipal extractors using more than 2 AF/yr include the Quail Hollow Quarry, those users that pump groundwater for large--scale irrigation or to fill landscape ponds, and small water systems with more than 5 connections. Small water systems with more than 5 connections have been metered since 2015. Development of a non-*de minimis* metering program will commence in WY2023, with implementation of the program anticipated in WY2024. The SMGWA requested funding to advance the non-*de minimis* metering program in the SGMA Implementation Round 2 Grant application, discussed in Section 4.7.

4.6.3 Groundwater Quality Monitoring Improvements

Groundwater quality sampling is conducted routinely in public extraction wells; therefore, there are no spatial data gaps in this network. However, the sampling frequency in some public extraction wells is insufficient suboptimal because some analytes are only sampled only once every 3 years per the requirements of the State Water Resources Control Board Division of Drinking Water requirements. Increasing the frequency of groundwater quality sampling will generate a better data set that can be used to detect promptly any degradation of groundwater quality from projects and management actions implemented to achieve the Basin's sustainability goals. SLVWD will increase the sampling frequency on their groundwater quality RMP wells (Olympia #3, Quail Hollow #4A, and Pasatiempo #7).

4.6.4 Streamflow Monitoring Improvements

~~There is 1~~One streamflow monitoring data gap ~~of lower priority identified~~ near Carbonera Creek was identified in the GSP. As this creek ~~which~~ is not as connected to groundwater as most other creeks in the Basin, this is a data gap with a low priority and will ~~. This is a lower priority data gap to~~ be addressed by SMGWA as funding becomes available.

4.7 SGMA Implementation Round 2 Grant Application

SMGWA submitted a DWR SGMI Round 2 grant application in December 2022 to help fund GSP implementation. The grant application requests funds for evaluating projects and management actions, developing long-term agency funding mechanisms, improving monitoring networks, and assisting p ~~disadvantaged p~~rivate well owners. The implementation plans described below are specific to the grant application and may not be prioritized by SMGWA if the request is not successful.

4.7.1 Project and Management Action Prioritization

The GSP identified the need to further evaluate, prioritize, and refine ~~high priority~~ projects and management actions described in this Annual Report in Sections 4.5.2 through 4.5.5. All of the projects being considered for implementation already have feasibility-level engineering studies and cost estimates, but, in order to compare projects, more analysis is required. The goal is to ~~SMGWA will~~ combine existing or more detailed engineering studies (30% design) and updated cost estimates with groundwater modeling and~~, engineering, and~~ qualitative analyses to ~~evaluate and~~ arrive at an optimized combination of projects and management actions that achieve sustainability as cost-effectively as possible.

~~Most of the projects being considered for GSP implementation already have feasibility level engineering estimates. However, the priority project expanding conjunctive use with water sourced from the San Lorenzo River watershed (Section 4.5.2) requires a focused EIR and engineering analysis, or 30% design, to compare to other projects. Feasibility assessment work will include a review of existing reports and information to outline and describe key project attributes, including the following:~~

- ~~Timing, location, and quantity of available water sources (e.g., potable surface water, stormwater, recycled water, purified wastewater)~~
- ~~Storage and recovery mechanisms (e.g., direct through injection or surface impoundment, in-lieu conjunctive use)~~

- ~~Frequencies (e.g., water availability at different times of years and in different water year types)~~

~~Need for and relative cost of new infrastructure, especially as compared to existing infrastructure~~In order to proceed with the high-priority Group 2, Tier 1 projects that expand conjunctive use with surface water sourced from the San Lorenzo River watershed, the grant application lists funding for focused EIRs in support of SLVWD's water rights petitions (as described in Section 4.5.2) to change point of use. It also requests funding for a 30% design engineering analysis and updated cost estimate for water treatment and conveyance infrastructure required for SLVWD to make use of its 313 AF/yr allotment of raw surface water from Loch Lomond reservoir.

Evaluation of the Group 2, Tier 2 and Tier 3 projects using surface water sources outside the Basin and purified wastewater sources (Sections 4.5.3 and 4.5.4 above) will include a review of existing reports and information to outline and describe key project attributes, including the following:

- Timing, location, and quantity of available water sources (e.g., potable surface water, stormwater, recycled water, purified wastewater)
- Storage and recovery mechanisms (e.g., direct through injection or surface impoundment, in-lieu conjunctive use)
- Frequencies (e.g., water availability at different times of years and in different water year types)
- Need for and relative cost of new infrastructure, especially as compared to existing infrastructure
-

After the project and management action options are defined consistently, their costs and benefits will be evaluated relative to SMGWA member and partner agency goals. Projects will be evaluated individually and in conceptual bundles of complementary projects that could be implemented together. The highest-ranking options will be evaluated for cost, infrastructure need, permitting requirements, schedule, local support, and other factors. The benefits and impacts of the most promising options will also be evaluated using the existing Basin Model and state-of-the-art machine learning modeling techniques.

4.7.2 GSP Implementation Activities

The SMGI Round 2 grant application also requests funds to carry out other GSP implementation activities that are not directly related to projects and management actions~~s described in sections below~~.

4.7.2.1 Agency Membership and Funding Structure Evaluation

The grant application requests funds to evaluate and establish long-term funding options for SMGWA. The evaluation will include research, planning and development of potential funding models based on the following:

- Assessment of parcel and groundwater use characteristics
- Understanding previous fee and rate discussions
- Consideration of SMGWA, stakeholder, and community preferences

Following the assessment, a technical memorandum on funding options will be prepared. ~~The~~ SMGWA will use the information gathered to advance long-term funding strategies.

4.7.2.2 Monitoring and Reporting

The grant application requests funds to cover monitoring and assessment of groundwater conditions~~ monitoring and assessment~~. Monitoring will include dry-~~-~~season stream gauge monitoring at 5 sites, and semi-annual monitoring of groundwater-dependent ecosystems ~~monitoring ~~at another 5 locations. Recorded data will include stream flow, specific conductance, temperature, and observations of general site conditions~~ observations~~. The grant application requests funds to comprehensively assess groundwater conditions and GSP implementation progress in future Annual Reports.

4.7.2.3 Non-De Minimis Metering Program

The grant application requests funds for a groundwater metering program for non-*de minimis* pumpers, as discussed in Section 4.6.2. The program will include:

- Research and verification of non-*de minimis* groundwater pumpers
- Preparation of guidance documents, reporting tools, and focused outreach
- Evaluation of options and consideration of mechanisms for ensuring compliance with program requirements

Program implementation will include participant tracking and coordination of annual reporting by participants.

4.7.2.4 Addressing Data Gaps

The grant application requests funds for installing a deep monitoring well, as discussed in Section 4.6.1.1. The plan is to install an 800-foot deep, 4-inch--diameter monitoring well to expand the monitoring network in the Butano aquifer near active Lompico/Butano SVWD extraction wells. Site access, preliminary design, and preparation of a California Environmental Quality Act (CEQA) Notice of Exemption have already been completed. Future activities will include:

- Procuring drilling contractor and professional services contractor to oversee construction
- Securing well permit and filing -California Environmental Quality ActCEQA Notice of Exemption
- Drilling borehole, performing geophysical logging of borehole, completing final well design, constructing and developing monitoring well
- Collecting and analyzing groundwater samples
- Purchasing and installing a pressure transducer for continuous groundwater level monitoring
- Preparing well completion report and as-built well design drawing

4.7.3 Private Well Owner Assistance

The grant application requests funding to assist private well owners with the following:

- Identifying which private wells may have a viable option to connect to existing water systems in the Basin
- Conducting additional outreach to private well owners on alternative water supply options in the event of loss of supply from their well
- Installing 2 bulk potable water stations provided with SLVWD water so residents in the Basin experiencing a well outage will have access to water 24 -hours per day

REFERENCES

[DWR] California Department of Water Resources, 2016. Bulletin 118 Interim Update 2016. December 22. Accessed June 5, 2020. https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Bulletin-118/Files/B118-Interim-Update-2016_ay_19.pdf

U.S. Census Bureau, 2021. Decennial Census Total Population, 2020 Census Redistricting Data (Public Law 94-171). https://data.census.gov/cedsci/table?q=scotts%20valley,%20ca%20population&y=2020&tid=DECENNIALPL2020.P1

EXECUTIVE SUMMARY

The Santa Margarita Groundwater Agency (SMGWA) prepared this second Groundwater Sustainability Plan (GSP) Annual Report (Annual Report) to summarize groundwater extractions, overall water use, groundwater conditions, and progress toward achieving sustainability for the Santa Margarita Basin (Basin) in Water Year (WY) 2022. Per the Sustainable Groundwater Management Act (SGMA), an Annual Report must be submitted to the California Department of Water Resources (DWR) by April 1 each year after completing a GSP. This Annual Report covers WY2022 from October 1, 2021, through September 30, 2022.

Like much of California, the Basin has experienced significantly below average rainfall from WY2020 through WY2022. Despite dryer than average conditions in WY2022, reduced groundwater extraction helped groundwater levels remain generally stable compared to WY2021, resulting in a modest increase of groundwater in storage.

In WY2022, about 2,485 acre-feet (AF) of groundwater was extracted from the Basin. Total extraction was the lowest annual volume since at least WY1985. About 74% of groundwater extracted was used for public water supply by the 2 biggest water providers in the Basin: the San Lorenzo Valley Water District (SLVWD) and Scotts Valley Water District (SVWD). Small water systems and private domestic wells accounted for an estimated 20% of groundwater extracted, while other non-domestic uses accounted for the remaining 6%. Groundwater in the Basin is predominantly extracted from the 3 principal aquifers: the Lompico aquifer (51%), Santa Margarita aquifer (27%), and Butano aquifer (17%).

Surface water from the San Lorenzo River and its tributaries is an important water supply both in the Basin and downstream in the City of Santa Cruz. SLVWD diverts surface water from 9 intakes on San Lorenzo River tributaries immediately upstream of the Basin. However, 6 of SLVWD's 9 diversions were inoperable due to damage sustained by the CZU Complex wildfire in August 2020. Repairs to Foreman Creek in the North System and a raw water line from the Bennett diversion in the Felton System have been completed. SLVWD was able to maximize its Fall Creek diversion while maintaining bypass flows to help reduce its reliance on groundwater. These repairs allowed SLVWD to exclusively use surface water for approximately 30 days in WY2021 and 60 days in WY2022. With limited surface water diversion capacity in WY2022, demand management through water conservation and public awareness after successive dry years has also allowed SLVWD to reduce WY2022 groundwater extractions to an annual volume that is one of the lowest on record. SLVWD plans to repair the remaining 5 damaged diversions in the North System to improve redundancy and increase overall surface water availability.

I'm impressed

1 INTRODUCTION

This Groundwater Sustainability Plan (GSP) Annual Report (Annual Report) for the Santa Margarita Groundwater Basin (Basin) fulfills the requirements of Water Code §10733.6 and the Sustainable Groundwater Management Act (SGMA). The Santa Margarita Groundwater Agency (SMGWA), the sole Groundwater Sustainability Agency (GSA) for the Basin is required to submit an annual report to the California Department of Water Resources (DWR) by April 1 of each year following the adoption of its GSP. The SMGWA Board of Directors unanimously adopted the final GSP after a public hearing on November 17, 2021. The GSP was submitted to the SGMA Portal (https://sgma.water.ca.gov/portal/) on January 3, 2022. DWR is required under SGMA to complete its technical assessment of the GSP by January 31, 2024.

1.1 Purpose of Annual Report

The SMGWA has until the end of January 2042 to achieve sustainable groundwater conditions as described in the GSP. This Annual Report compiles groundwater data collected for the 2022 Water Year (WY) from October 1, 2021, through September 30, 2022. The purpose of the Annual Report is to evaluate groundwater conditions, summarize total water use, estimate change in groundwater storage, provide progress updates on projects and management actions implemented to achieve sustainability, and outline other GSP implementation tasks. Required Annual Report components are outlined in §356.2 of the GSP Regulations.

1.2 Santa Margarita Groundwater Agency

The SMGWA is the sole GSA for the Basin. The SMGWA was formed through a Joint Powers Agreement (JPA) in June 2017 among the Scotts Valley Water District (SVWD), San Lorenzo Valley Water District (SLVWD), and the County of Santa Cruz (County). Figure 1 shows the jurisdictional extent of the Basin and member agencies that comprise the SMGWA. The SGMA and JPA grant the SMGWA the legal authority to implement the GSP in the Basin.

The SMGWA is governed by an 11-member Board of Directors comprised of 2 representatives from each member agency, 1 from the City of Scotts Valley, 1 from the City of Santa Cruz, 1 from Mount Hermon Association (MHA), and 2 private well owners. Each of the member agencies and other entities also have an alternate board member.

Formatting note: it bugs me to see the numeral one in a sentence. It breaks up the flow and goes against the rules of style that I was taught.

MONTGO & ASSOCIATES

In future years, it might be helpful to add the major roads if it can be done without being too distracting

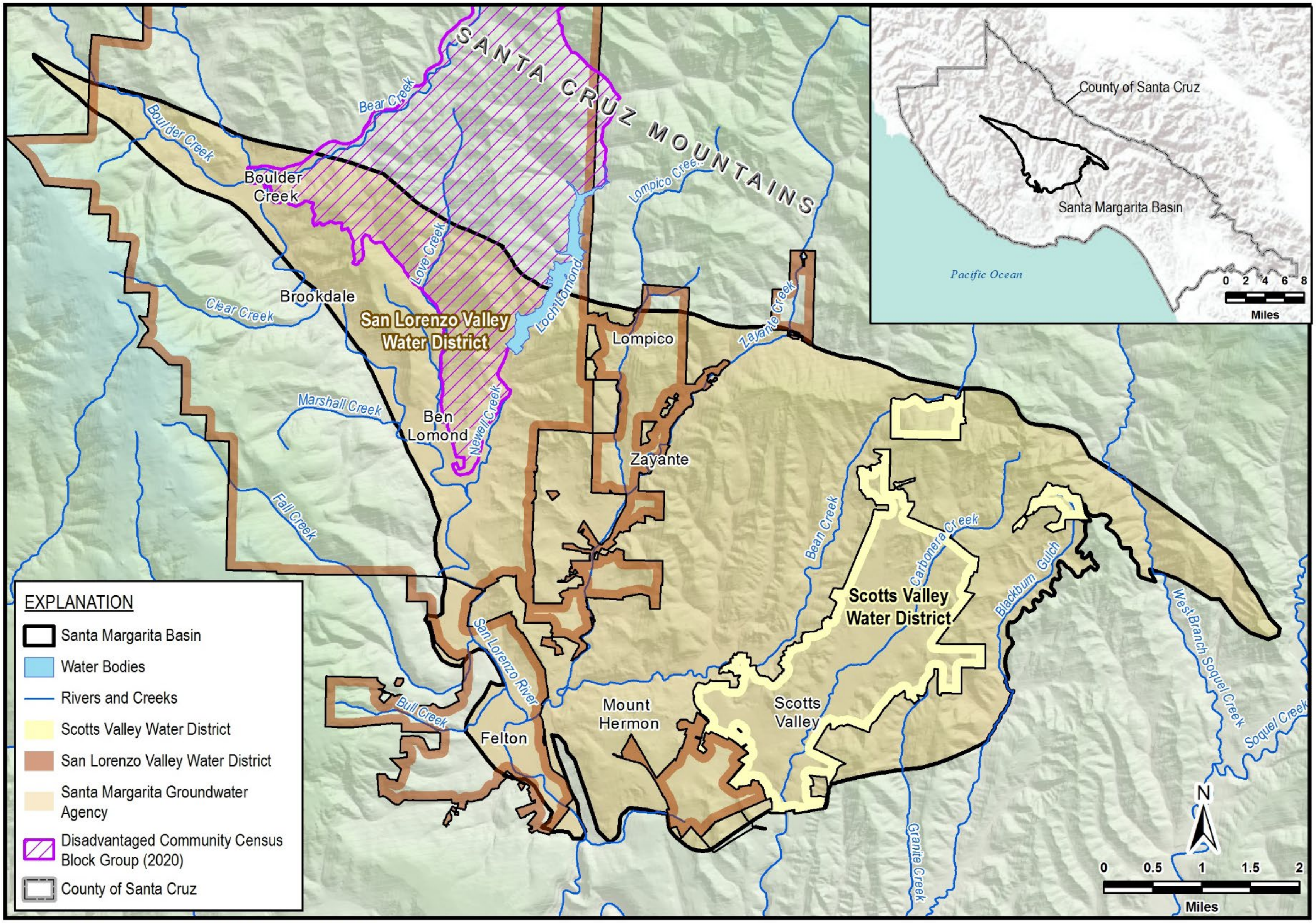
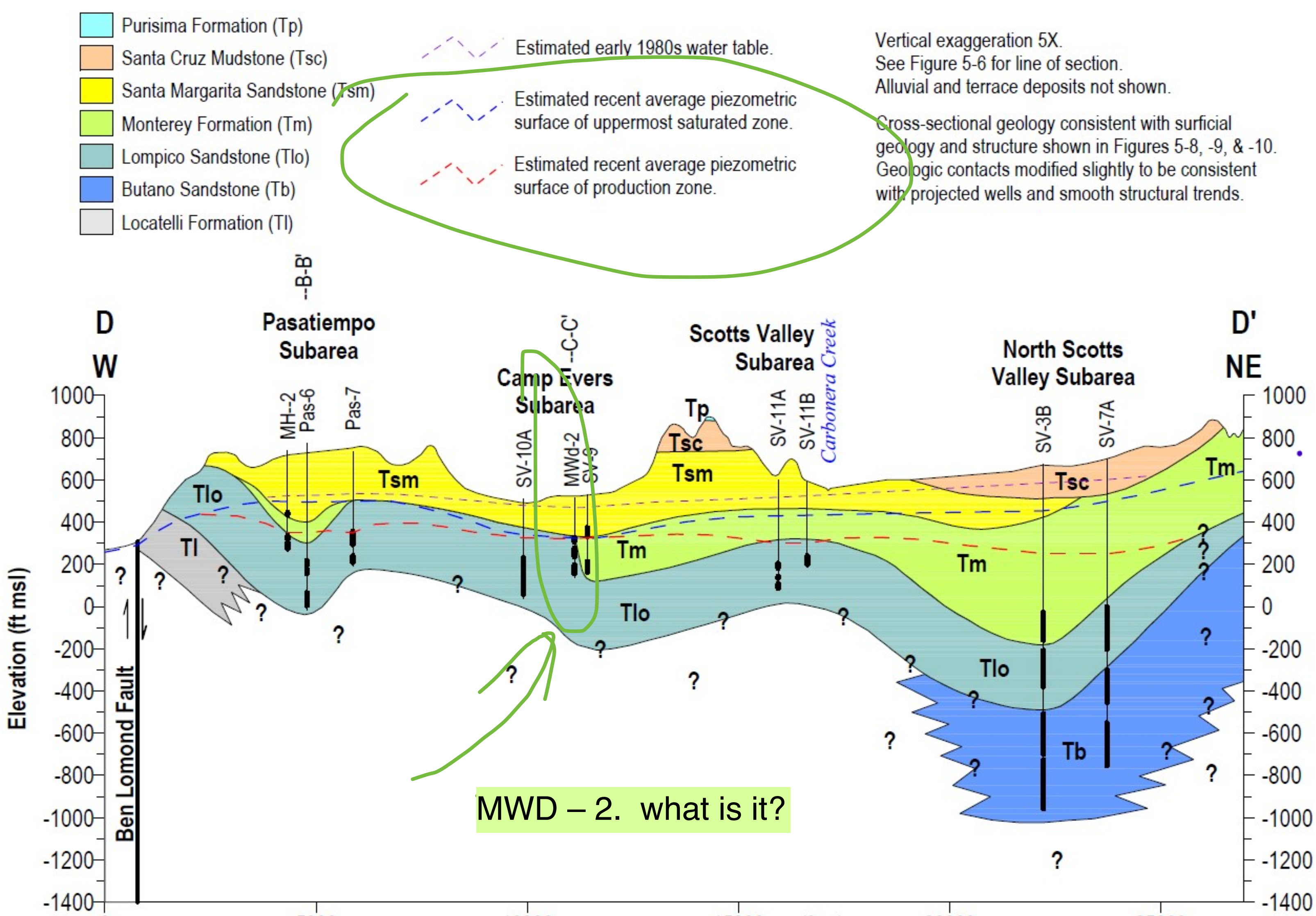


Figure 1. Basin and Member Agency Jurisdictional Boundaries

Director Ruth Stiles Comments/Mark-up

What's the difference between these two?



MWD – 2. what is it?

Figure 3. D-D' Geologic Cross-Section

3.2 Groundwater Extraction

The total volume of groundwater extracted in WY2022 is 2,485 acre-feet (AF). This is the lowest volume extracted since WY1985 when reliable record keeping began and is about 21% less than the 3,151 AF extracted in WY2021. Table 1 summarizes groundwater extraction by water use sector and aquifer. Notes below the table identify measurement method and relative accuracy. Figure 11 shows water use in the Basin over time and Figure 12 shows the location and relative volume of WY2022 groundwater extraction by aquifer.

Groundwater extraction in the Basin is mostly for public supply, but there are lesser volumes extracted from each aquifer for other uses. Most groundwater is extracted from Basin aquifers south of Bean Creek. The Santa Margarita is the only aquifer with significant extraction north of Bean Creek. In total, the Lompico aquifer supplies 51% of the groundwater, and the Santa Margarita aquifer supplies 27% of groundwater extractions. Approximately 17% of total Basin extractions are from SVWD supply wells screened across the Lompico and Butano aquifers. About 5% of groundwater extracted primarily for rural do… aquifers such as the Monterey Formation and Purisima Fo…

It's unclear if this is included in the Lompico total above

Most groundwater extraction in the Basin is used for municipal supplies. In WY2022, about 74% of all groundwater was extracted by SLVWD and SVWD. SLVWD extracted 732 AF (29%) and SVWD extracted 1,108 AF (45%). About 70% of SLVWD extraction is from the Santa Margarita aquifer north of Bean Creek and about 30% is from the Lompico aquifer south of Bean Creek. About 65% of SVWD extraction is from the Lompico aquifer and 35% from the Butano aquifer. MHA extracts a smaller amount compared to the larger water districts, totaling about 154 AF (6%) in WY2022, all from Lompico aquifer supply wells.

In WY2022, SLVWD was able to reduce its groundwater extraction by about 47% compared to WY2021. However, the WY2022 extractions are similar to extractions prior to the 2020 CZU Complex wildfire (discussed further in Section 3.4). The WY2022 extraction volume decreased by about 10% compared to average extraction before the wildfire from WY2014 to WY2019 (Figure 11). SLVWD maximized its surface water use even with limited surface water availability ~~to reduce WY2022 extraction~~.

SVWD was also able to reduce its groundwater extraction by about 2% in WY2022 compared to WY2021, with most reductions coming from the Lompico aquifer wells. SVWD pumping from the Butano aquifer nearly doubled from WY2021 to WY2022 because the SVWD Lompico/Butano supply wells were out of service for water treatment upgrades for much of 2021. However, groundwater extracted by SVWD from the Butano/Lompico aquifer supply wells in WY2022 was slightly less than in the 7 years prior to WY2021.

These paragraphs don't flow well, editing would help

MONTGOMERY & ASSOCIATES

This page is really hard for me to look at. On my device it goes in and out of focus. Maybe changing the crosshatched bars to solid pastels would help. Or perhaps grays. It's a really useful chart, I just wish it was easier to examine

Where did Mount Hermon get their water from prior to 1991?

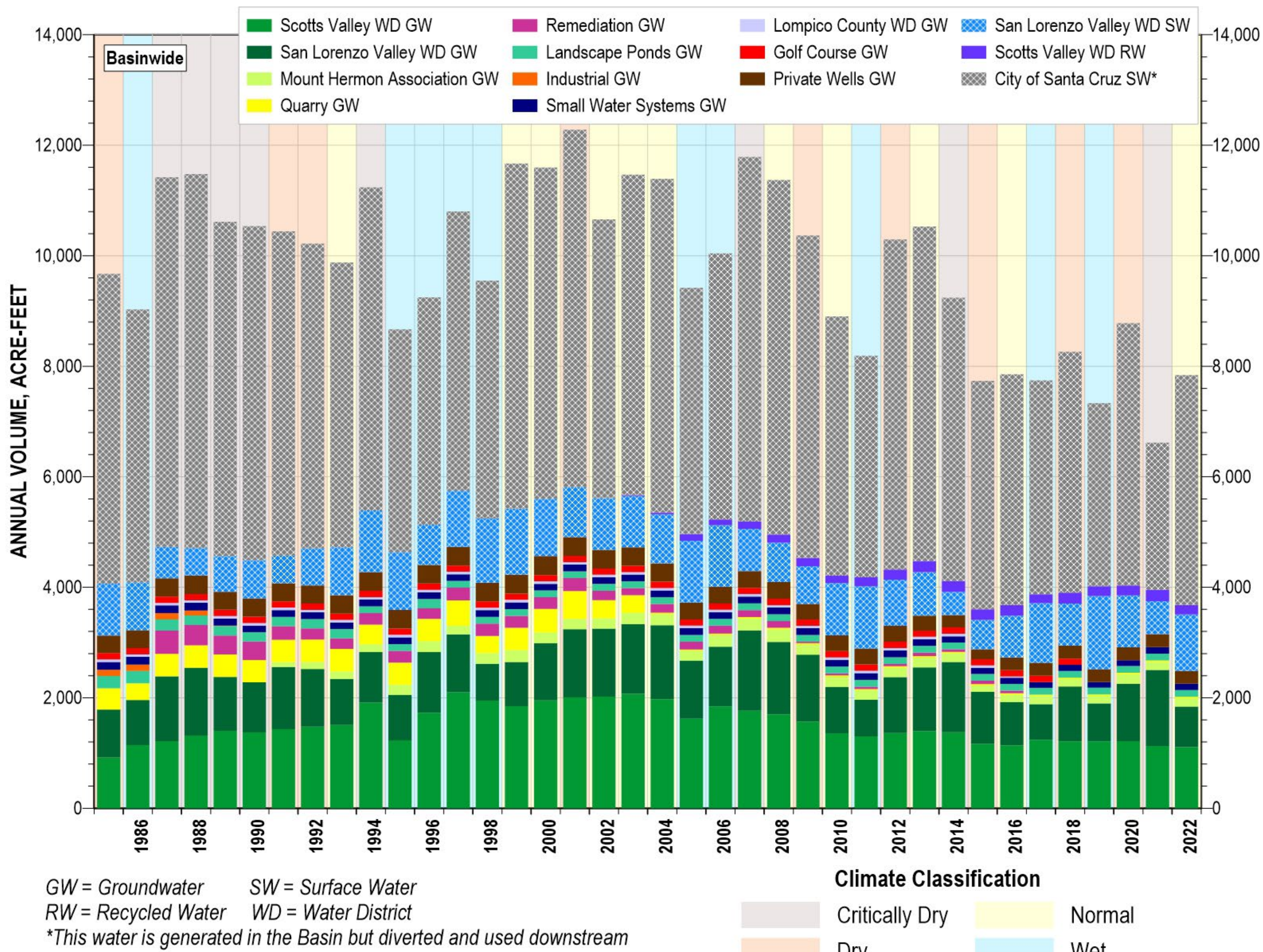


Figure 11. Total Basin Water Use, WY1985-2022

3.3 Surface Water Supply Used for Groundwater Recharge or In-Lieu Use

There is currently no surface water used for managed aquifer recharge in the Basin. However, SVWD and other private developments capture stormwater at low impact development (LID) sites in Scotts Valley. Table 2 shows the total volume of known managed aquifer recharge using LID. The stormwater infiltration volume is relatively small, with the maximum totaling less than 41 AF in WY2019. In WY2022 about 16 AF of LID recharge was measured, though this total is underestimated because a transducer malfunctioned for most of the wet season at the Scotts Valley Library site. Since 2018, the library site has recharged between 1.4 and 6.1 acre-feet per year (AF/yr) of stormwater.

Table 2. LID Infiltration, WY2018-2022

Water Year	Volume Infiltrated, AF			
	Transit Center	Woodside HOA	Scotts Valley Library	Total
2018	1.75	17.30	3.39	**22.44**
2019	3.08	31.17*	6.11*	**40.38***
2020	1.50*	14.97*	2.94*	**19.42***
2021	1.40	13.86	1.41	**16.67**
2022	1.75	13.87	0.55**	**16.18****

*Volumes estimated using available data
**Transducer malfunction resulted in no data collection at Library LID between October and February 2022. Since this is when nearly all annual precipitation occurred, the total WY2022 LID recharge volume is underestimated.

Are on-site systems like Chris's development included in this total

This could be read two ways, better to clarify that "surface water diverted by SLVWD for municipal supply is primarily used in its North and Felton systems.

Surface water is the most commonly used water supply in the Basin other than groundwater. Nearly all Basin surface water is diverted by SLVWD for municipal supply in its North System and Felton System. SLVWD typically sources about half of its annual water supply from 9 diversions in the San Lorenzo River watershed streams just upstream of the Basin. The North System has 6 diversions and Felton System has 3 diversions. The August 2020 CZU Complex wildfire damaged 7 SLVWD diversion intakes and/or supply pipelines, including all 6 in the North System. With repair of the Foreman Creek diversion a few months after the wildfire, plans and designs for repair of the remaining 5 diversions in the North System are underway. After a raw water line for one of the Felton System diversions was repaired, the Felton System is now fully operational. SLVWD was able to maximize its Fall Creek diversion while maintaining bypass flows to help reduce its reliance on groundwater. These repairs allowed SLVWD to exclusively u[illegible] WY2021 and 60 days in WY2022.

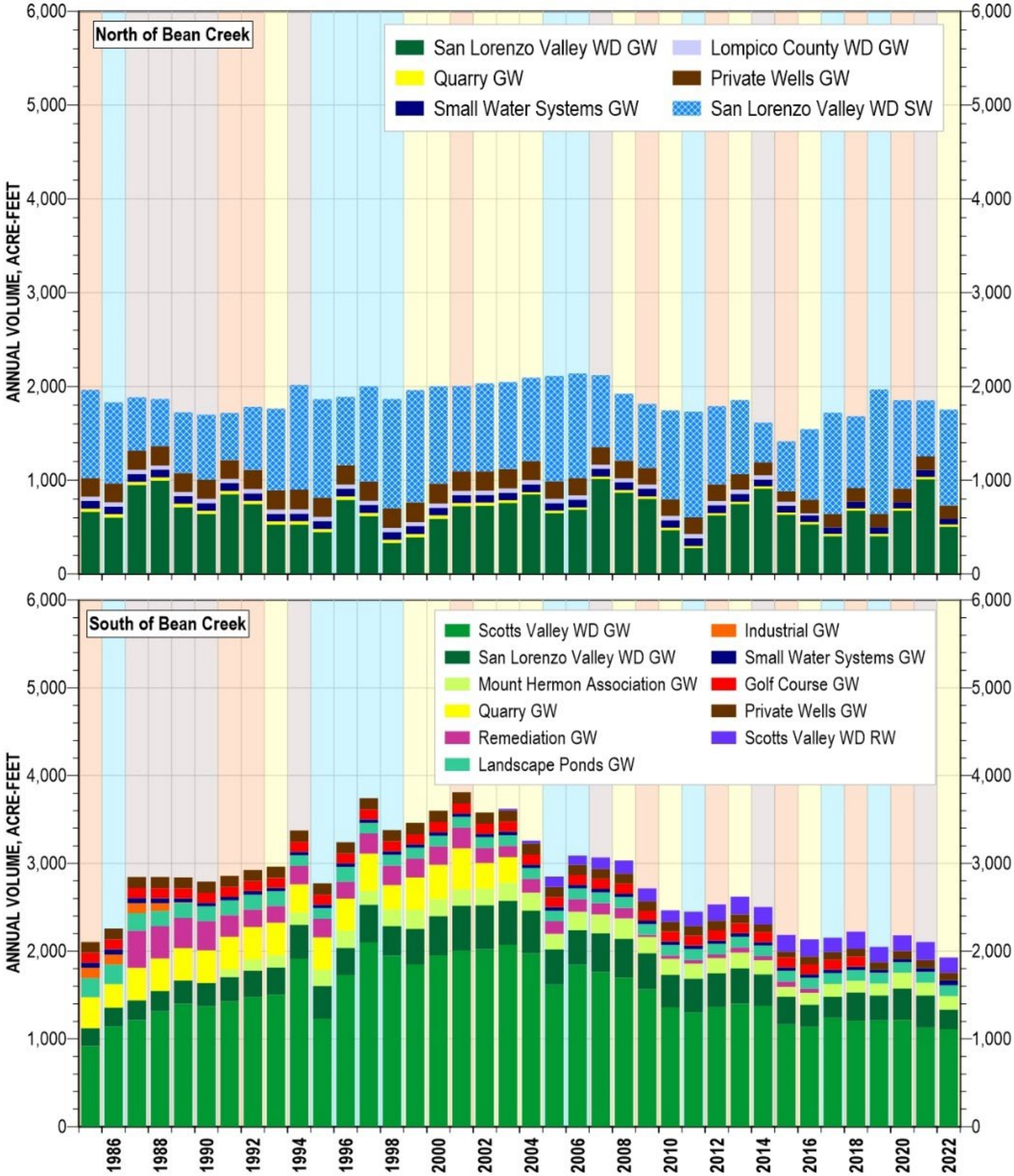
This could be clearer, I had to read it several times

An additional 4,159 AF of surface water is sourced partially in the Basin, but diverted downstream of the Basin for use in the City of Santa Cruz. City of Santa Cruz diversions from the San Lorenzo River increased by about 1,500 AF compared to WY2021, an increase of 56%. Surface water flows in WY2022 were higher than WY2021 allowing the City of Santa Cruz to divert closer to their long-term average surface water supply since 2015. Including City of Santa Cruz diversions, about 7,878 AF of water from the Basin was used in the region in WY2022 (Table 3).

Emergency interties are available to transfer water between SLVWD and SVWD but are rarely used. Table 4 summarizes emergency intertie usage between SLVWD and SVWD since spring WY2016. There were no intertie transfers between the districts in WY2022.

Table 4. Emergency Intertie Transfer Between SLVWD and SVWD, WY2016-2022

Water Year	Positive Flows from SLVWD to SVWD (AF)	Negative Flows from SVWD to SLVWD (AF)
2016	0	0.3
2017	5.4	0
2018	0	0
2019	0	0
2020	9.1	0
2021	10.1	0
2022	0	0



GW = Groundwater SW = Surface Water
RW = Recycled Water WD = Water District
**This water is generated in the Basin but diverted and used*

This graph makes it look like the small water systems used more water in 2022 than in the past. Maybe it's just resolution, but please check it

Figure 13. Total Water Us

Discussion of the Monterey formation should be in a different paragraph

Since groundwater elevations in principal aquifers and the Monterey Formation did not change substantially from WY2021, the change in storage is also relatively similar between aquifers, with most of the differences noted near active extraction wells and at the aquifer boundaries. Figure 15 through Figure 18 show Basin Model simulated change of groundwater in storage from Fall WY2021 to WY2022 for the Santa Margarita aquifer, Monterey Formation, Lompico aquifer, and Butano aquifer, respectively.

The amount of groundwater stored in the unconfined and highly conductive Santa Margarita aquifer is strongly correlated with precipitation. Groundwater levels and groundwater storage decrease when conditions are dry, but also recharge quickly during wet years. The location and relative storage volume changes for WY2022 shown on Figure 15 depicts large areas of the Santa Margarita aquifer having similar groundwater in storage to WY2021. Areas around the Olympia wellfield have the greatest reductions in storage and storage increased the most in the northern upland parts of the aquifer.

The Monterey formation has low permeability….

The Monterey Formation is not a permeable formation and, therefore, changes in storage are much smaller on an annual basis than in the Santa Margarita aquifer. The greatest reduction in storage is in the northern upland areas where the Santa Margarita aquifer is absent the Monterey formation is used for domestic supply. The largest storage increase is near Carbonera Creek in Scotts Valley, likely related to modeled storage increases in the underlying Lompico and Butano aquifers (Figure 16).

If these two concepts are not related, they should be in separate sentences

The mostly confined Lompico aquifer is less conducive to storage changes from decreased precipitation than the shallower, unconfined Santa Margarita Sandstone. With decreased groundwater extraction in WY2022, the Lompico aquifer which is the primary aquifer used for municipal extraction experienced groundwater in storage increases in WY2022. Areas of largest storage increase are in the Mount Hermon / Pasatiempo area where extraction for municipal supply decreased by about 150 AF since WY2021 and in northern Scotts Valley near the SVWD Orchard and #3B supply wells where although overall extraction increased groundwater levels at the end of WY2022 were higher than at the end of WY2021 (Figure 17; green and blue colors represent increased groundwater in storage).

Edit this paragraph to make it clearer. Fix the run-on sentence

The Butano aquifer, like the Lompico aquifer, is mostly confined and less conducive to storage changes from decreased precipitation than the shallower, unconfined Santa Margarita aquifer. The Butano aquifer is only used for water supply in the area northeast of Scotts Valley as shown by the extraction wells on Figure 18. In general, the southern portion of the Basin had a slight increase in storage and the northern portion of the Basin had a larger decrease in storage. The greatest declines in Butano aquifer storage in WY2022 are near the Basin's northern boundary where it is exposed at the surface, but not in areas used for domestic water supply where changes in groundwater in storage are more stable (Figure 18).

This paragraph needs editing too

The amount of groundwater in storage was more stable in the areas where it is used for domestic supply

Due to limited data, the Basin Model is not well calibrated for much of the Butano aquifer, so the storage changes beyond the area northeast of Scotts Valley, where there are some monitoring wells screened in the Butano aquifer, are not well understood.

Edit this paragraph too

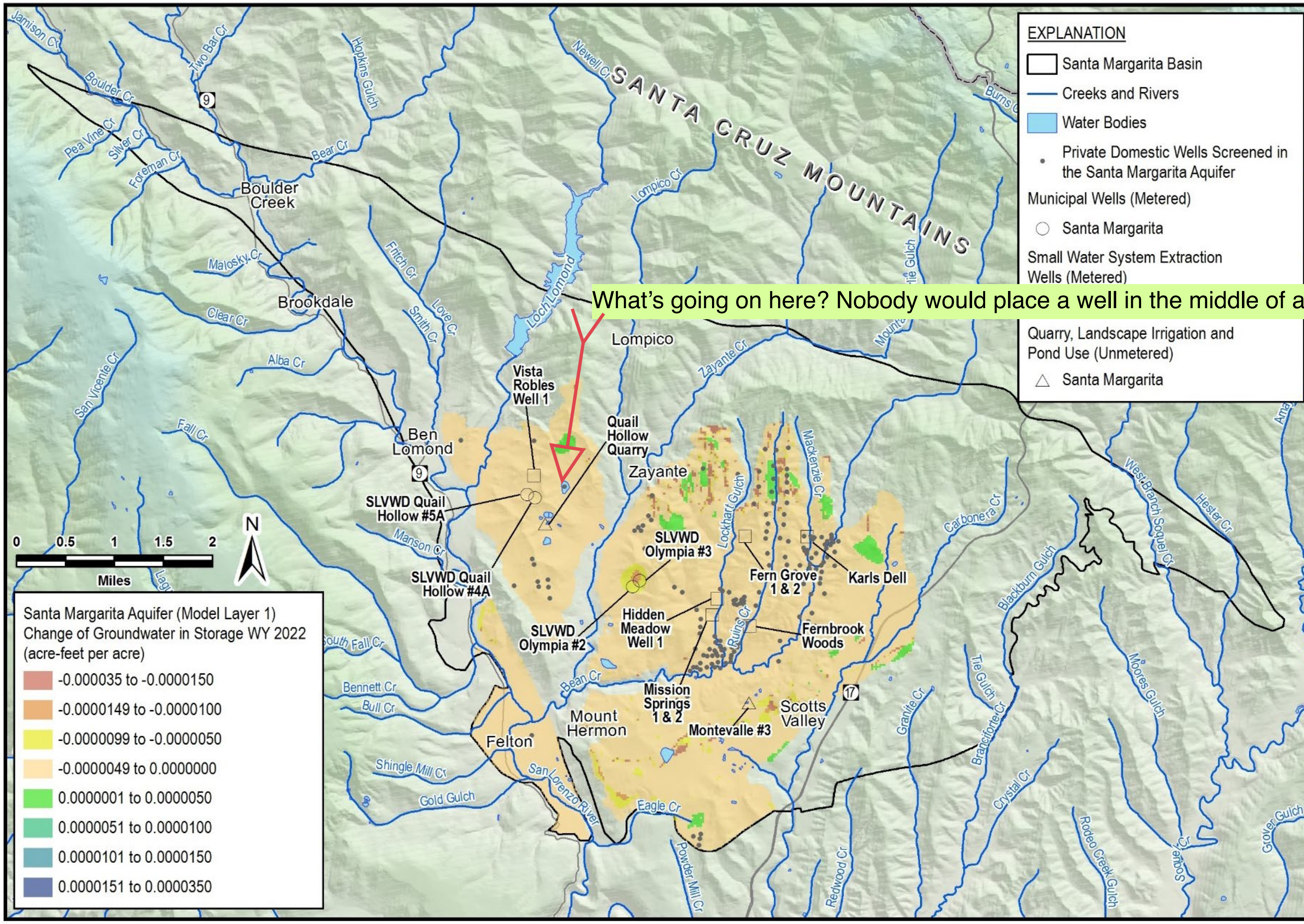
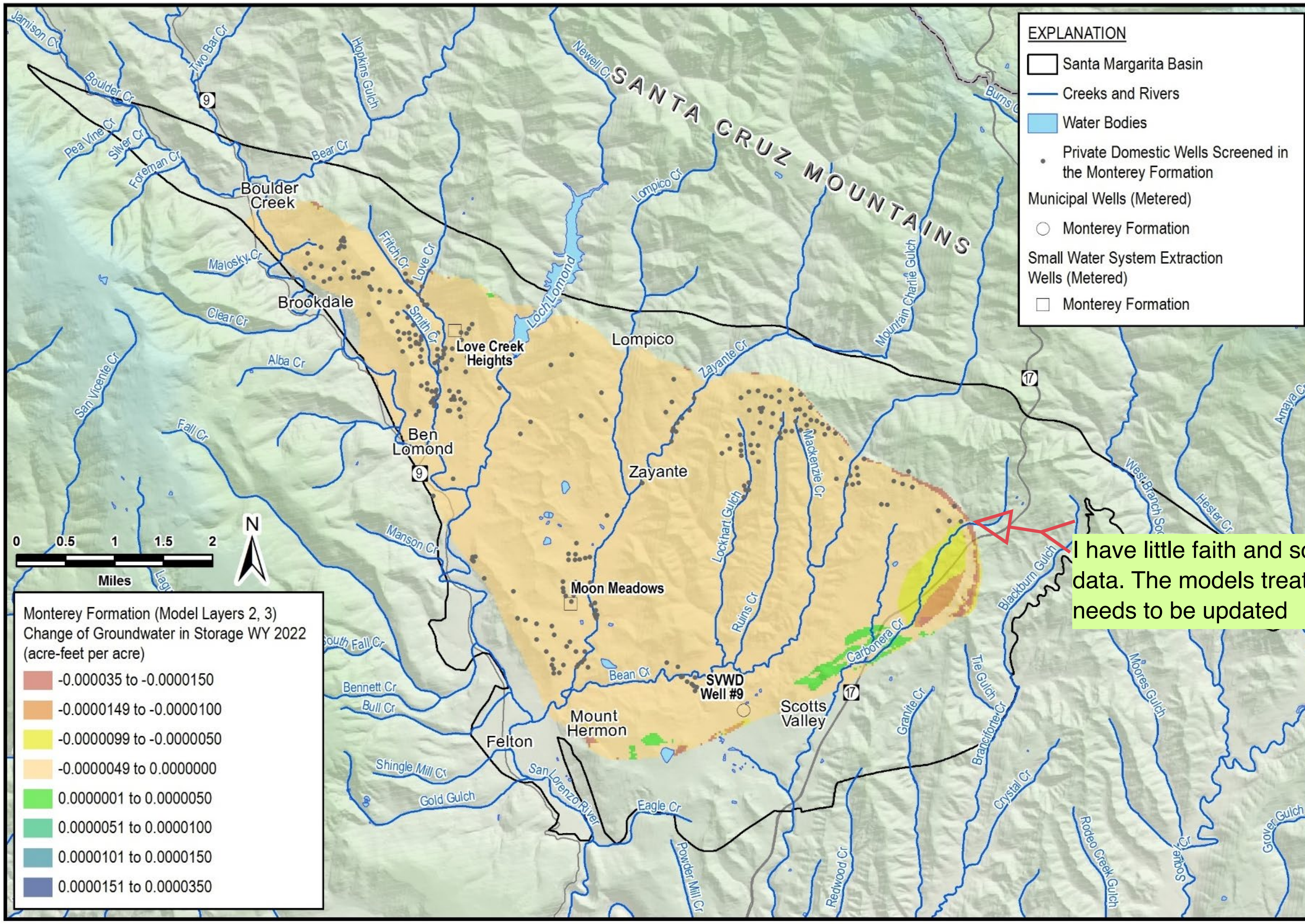


Figure 15. Change of Groundwater in Storage in Santa Margarita Aquifer, WY2022

Add a statement that this is from the model rather than field data. Include it on the following maps also.

The teeny little brown quadrants with decreases look like they could just be data aberrations, since they're not surrounded by yellow. In some areas, the brown is immediately adjacent to the green. There's a lot of noise in this data



I have little faith and some of this modeled data. The models treatment of this edge needs to be updated

Figure 16. Change of Groundwater in Storage in Monterey Formation, WY2022

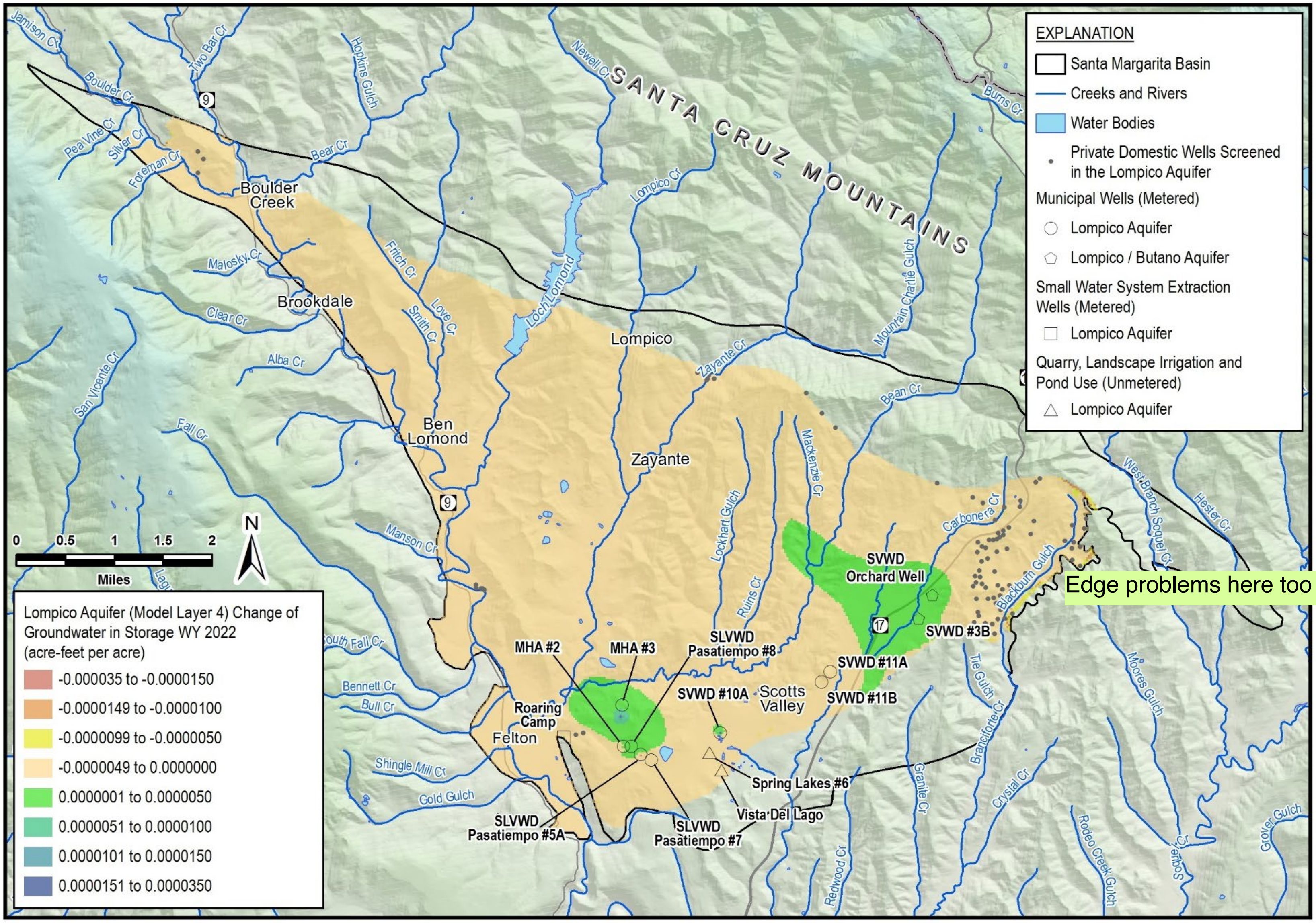
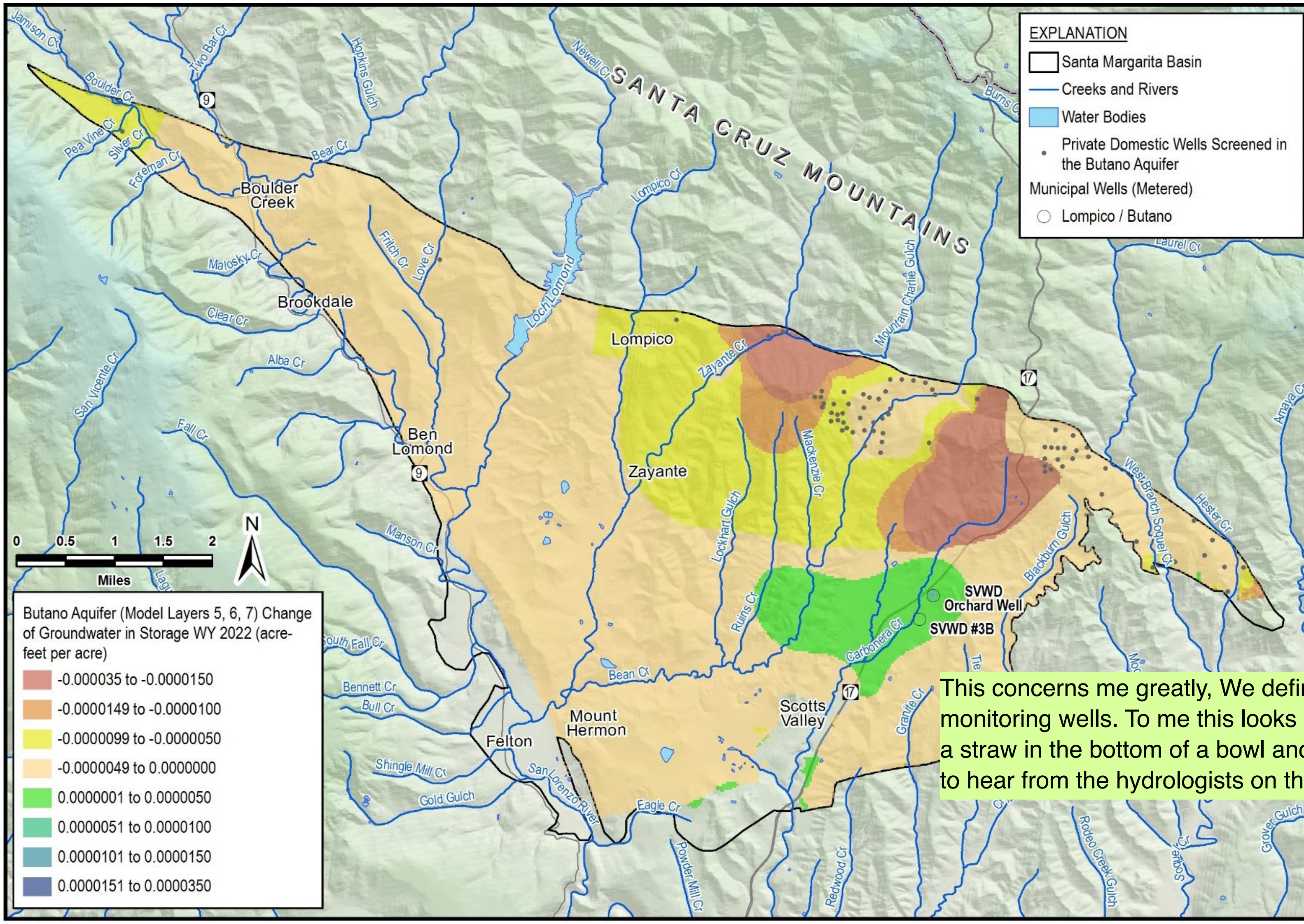


Figure 17. Change of Groundwater in Storage in Lompico Aquifer, WY2022



This concerns me greatly, We definitely need more monitoring wells. To me this looks like Scotts Valley has a straw in the bottom of a bowl and is draining it. I'd like to hear from the hydrologists on this one.

Figure 18. Change of Groundwater in Storage in Butano Aquifer, WY2022

4 PROGRESS TOWARD IMPLEMENTING THE PLAN

This section provides an update on WY2022 GSP implementation and progress toward sustainability. First, groundwater conditions are compared to the SMC defined in the GSP. Then the section outlines major near-term milestones, including project and management action implementation efforts and planned improvements to the GSP monitoring networks. Finally, the section summarizes SMGWA's upcoming implementation priorities addressed in the SGMA Implementation Round 2 Grant funding application submitted to DWR in December 2022.

Edit

From the

Sustainability is defined by GSP Regulations as the absence of undesirable results for relevant groundwater conditions sustainability indicators. The minimum threshold (MT) is the point at which undesirable results may start to occur and the measurable objective (MO) is the goal for each indicator designed to provide operational flexibility and ensure that future droughts and other unforeseen changes to water supplies do not cause unsustainable conditions. Interim milestones are 5-year goals to help SMGWA manage the Basin over the next 20 years to meet MOs by 2042. Land subsidence and seawater intrusion are not applicable sustainability indicators in the Basin and are not addressed in this report. Overall, groundwater conditions in the Basin are relatively stable and sustainable with annual changes primarily related to variation in precipitation and streamflow recharge of the shallow Santa Margarita aquifer.

New paragraph

4.1 Chronic Lowering of Groundwater Levels

You just defined MTs and MOs, should RMPs be defined here too?

There are 12 RMPs used to evaluate chronic lowering of groundwater levels relative to SMC. Annual groundwater elevations are reviewed in this section to assess whether they remain within the target operational range between the MT and MO and if they are on track to meet the 2027 interim milestone. Undesirable results for the chronic lowering of groundwater levels indicator occur if the groundwater elevation in any RMP falls below the MT in 2 or more consecutive non-drought years. Temporary groundwater level declines caused by emergency operational issues or extended droughts are not considered an undesirable result. Table 5 shows the annual minimum groundwater elevation at each RMP since WY2018, relative to the MT, MO, and the 2027 interim milestone. Hydrographs in Appendix A (pages A-3 through A-18) show all historical data collected at RMPs relative to the MT and MO.

In WY2022 groundwater elevations at all 12 RMPs are above MTs, with stable or increasing elevations in most wells. The 2027 interim milestone is met for 7 RMPs (green and yellow colors in Table 5), 4 of which also meet MOs (green color in Table 5). Since RMP groundwater levels did not fall below MTs in WY2022, undesirable results did not occur for the groundwater level sustainability indicator.

4.1.1 Santa Margarita Aquifer

There are 4 Santa Margarita aquifer RMPs representing the areas where the Santa Margarita aquifer is used most extensively for groundwater extraction in the Basin:

- SLVWD Quail Hollow wellfield: SLVWD Quail MW-B
- SLVWD Olympia and Mission Springs wellfields: SLVWD Olympia #3
- Mount Hermon/Pasatiempo/South Scotts Valley wellfields: SLVWD Pasatiempo MW-2
- Northern Scotts Valley: SVWD TW-18

In WY2022, groundwater elevations remained relati and are within the target operational range (Table 5):

It looks like I'm seeing about a one year lag in some of the Santa Margarita wells. It should be mentioned in the text. What time of year were the wells measured? Could that explain it?

- Two RMPs are below 2027 interim milestone: SVWD TW-18 and SLVWD Quail MW-B
- Two RMPs are above MOs: SLVWD Olympia #3 and SLVWD Pasatiempo MW-2

Santa Margarita aquifer groundwater elevations in wells in th Mount Hermon/Pasatiempo/South Scotts Valley areas fluctuate more with climate than the Northern Scotts Valley portion of the aquifer and other deeper aquifers in the Basin. Groundwater levels decline in the climate-dependent portions of the aquifer during drier years and recover during wetter years. Since recent years are drier than average, groundwater elevations in SLVWD Olympia #3, Pasatiempo MW-2, and Quail MW-B have declined overall since the last wet year in 2019 (Appendix A, pages A-3 through A-5). Groundwater elevations in the northern Scotts Valley area, at SVWD TW-18, are stable and close to the MO and 2027 interim milestone elevation since 2000 (Appendix A, page A-6).

Why doesn't the Northern Scotts Valley part of the Santa Margarita fluctuate as much with climate?

4.1.2 Monterey Formation

The only Monterey Formation RMP is SVWD Well #9 in the South Scotts Valley area. SVWD Well #9 has a long-term increasing groundwater elevation trend (Appendix A, page A-8). Groundwater levels in SVWD Well #9 are above the 2027 interim milestone and close to the MO in WY2022 (Table 5). The WY2022 groundwater elevation is within the target operational range.

4.1.3 Lompico Aquifer

There are 4 Lompico aquifer RMPs representing the areas where the Lompico aquifer is used most extensively for groundwater extraction in the Basin:

Table 5. Groundwater Elevations Compared to Chronic Lowering of Groundwater Levels SMC, WY2018-2022

Aquifer	Well Name	Minimum Groundwater Elevation (feet amsl)							
		Minimum Threshold	Interim Milestone #1 (2027)	Measurable Objective	WY2018	WY2019	WY2020	WY2021	WY2022
Water Year Type					Dry	Wet	Dry	Critically Dry	Normal
Santa Margarita	SLVWD Quail MW-B	449	472	472	462.4	460.4	462.4	455.8	451.8
	SLVWD Olympia #3	302	307	307	344.0	332.0	351.4	335.9	330.1
	SLVWD Pasatiempo MW-2	498	514	514	523.7	517.7	519.6	512.7	516.3
	SVWD TW-18	462	471	471	469.9	469.9	471.8	471.8	470.9
Monterey	SVWD #9	301	340	358	338.6	342.1	346.7	351.0	354.0
Lompico	SLVWD Pasatiempo MW-1	334	339	372	346.7	357.4	346.6	340.4	335.4
	SVWD #10	286	302	322	297.4	308.8	317.9	330.3	338.1
	SVWD #11A	288	299	317	292.6	302.3	310.4	308.0	312.6
	SVWD TW-19	314	357	376	342.5	361.6	373.1	370.4	370.0
Lompico/Butano	SVWD #15 Monitoring Well	291	310	333	308.5	298.1	302.8	307.1	307.9
Butano	SVWD Stonewood Well	836	844	844	846.8	849.1	848.3	845.0	845.8
	SVWD Canham Well	427	447	467	443.2	443.0	442.0	441.7	441.2

amsl – above mean sea level

Minimum threshold not met

Minimum threshold met but 2027 interim milestone and measurable objective not met

Minimum threshold and 2027 interim milestone met, but measurable objective not met

Measurable objective met

I stopped reviewing here