SANTA CRUZ MID-COUNTY GROUNDWATER AGENCY

DRAFT

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Santa Cruz Mid-County Groundwater Basin
GROUNDWATER SUSTAINABILITY PLAN

2025 PERIODIC EVALUATION




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Acronyms & Abbreviations

AEM ..... airborne electromagnetic
AF ..... acre feet
AFY ..... acre-feet per year
amsl ..... above mean sea level
ASR ..... Aquifer Storage and Recovery
Basin ..... Santa Cruz Mid-County Groundwater Basin
Board ..... MGA Board of Directors

Chromium VI ..... hexavalent chromium
COC ..... constituent(s) of concern
Commission ..... Santa Cruz County Water Advisory Commission
County ..... County of Santa Cruz
DDW ..... Division of Drinking Water
DROP ..... Drought Response and Outreach Plan
DSWMAR ..... Distributed Storm Water Managed Aquifer Recharge
DWR ..... California Department of Water Resources
EIR ..... Environmental Impact Report
Executive Team .... MGA member agency executive staff
GDE ..... Groundwater Dependent Ecosystem
gpm ..... gallons per minute
GRR ..... Groundwater Reuse and Replenishment
GRRP ..... Groundwater Reuse Replenishment Program
GSFLOW ..... coupled groundwater and surface water flow model
GSP ..... Groundwater Sustainability Plan
HCM ..... hydrogeological conceptual model
IM ..... interim milestone
IRWM ..... Integrated Regional Water Management
ISW ..... interconnected surface water
JPA ..... Joint Powers Agreement
JSSH ..... Juvenile Steelhead and Stream Habitat
MCL ..... maximum contaminant level
mg/L ..... milligrams per liter
MGA ..... Santa Cruz Mid-County Groundwater Agency
MNM ..... Monitoring Network Module
MO ..... measurable objective
MOA ..... Memorandum of Agreement
Model ..... Santa Cruz Mid-County Basin's integrated surface water/groundwater model
MT ..... minimum threshold
MTBE ..... methyl tert-butyl ether
NDVI ..... Normalized Derived Vegetation Index
OSWCR ..... Online System of Well Completion Reports
PFAS ..... Per- and polyfluoroalkyl substances
PMA ..... Project and Management Action
PWS ..... Pure Water Soquel
RCA ..... recommended corrective action
RCD ..... Resource Conservation District of Santa Cruz County
RMP ..... representative monitoring point
RSL ..... Rural Services Line
RWMF ..... Regional Water Management Foundation
RWQCB ..... Central Coast Regional Water Quality Control Board
SAFER ..... Safe and Affordable Funding for Equity and Resilience

SB.....Senate Bill
SCWD…… .....City of Santa Cruz Water Department
SCWSM.....Santa Cruz Water System Model
SGMA.....Sustainable Groundwater Management Act
SMC.....sustainable management criteria
SqCWD.....Soquel Creek Water District
SSWS.....State Small Water Systems
SWIP .....Seawater Intrusion Prevention
SWRCB .....State Water Resources Control Board
SWS .....small water systems
TAC .....Technical Advisory Committee
TDS .....total dissolved solids
µg/L.....micrograms per liter
UR .....undesirable result
USGS .....United States Geological Survey
USL.....Urban Services Line
WUF .....water use factor
WY.....Water Year (October 1 – September 30)

EXECUTIVE SUMMARY

Introduction

This report documents the Santa Cruz Mid-County Groundwater Agency's (MGA's) first Periodic Evaluation of the implementation of its approved Groundwater Sustainability Plan (GSP or Plan) for the Santa Cruz Mid-County Groundwater Basin (Basin). The Periodic Evaluation covers the evaluation cycle from February 1, 2020, through January 30, 2025. The Periodic Evaluation fulfills the requirements of the Sustainable Groundwater Management Act (SGMA). The evaluation shows that the Basin is being managed sustainably under the existing GSP and that no amendment to the Plan is necessary to achieve MGA's sustainability goals.

Significant New Information

Significant new information acquired by the MGA includes:

- Statewide Airborne Electromagnetic (AEM) geophysical data, including for the Santa Cruz Mid-County Basin, to help refine geologic structure and other aspects of hydrogeological conceptual model (HCM)
- Shallow monitoring wells and coupled stream gages installed to monitor interconnected surface water (ISW)
- Deep coastal monitoring wells installed to monitor seawater intrusion in the deepest aquifers where groundwater is extracted
- Three Seawater Intrusion Prevention (SWIP) recharge wells and 9 monitoring wells installed in the Purisima A and BC aquifers as part of Pure Water Soquel (PWS) project infrastructure and monitoring. Monitoring wells are equipped with water level and conductivity transducers and monitored for an extensive list of groundwater quality constituents
- Data collected from PWS pilot recharge demonstration testing with potable treated groundwater and the Santa Cruz Water Department's ASR pilot and demonstration testing has been used to refine the Basin's groundwater model.
- A 3-year study of streamflow conditions and land use patterns in the Soquel Creek watershed aimed at better understanding rural water demand, surface water availability, and implications for salmonid recovery provided recommendations for protecting salmonid habitat.

New information and data acquired by the MGA and member agencies during the evaluation cycle is consistent with the hydrogeological understanding of the Basin and does not change how the MGA manages groundwater as laid out in the 2020 GSP.

Recommended Corrective Action

The California Department of Water Resources (DWR), in a June 3, 2021, letter detailing its review and approval of the MGA's GSP, proposed a single recommended corrective action. The recommended corrective action is related to identifying and quantifying the potential impacts to non-municipal domestic wells that the GSP describes as potentially needing to be deepened if groundwater levels unexpectedly decline to minimum thresholds (MTs). Additionally, DWR recommended the MGA inventory and better define the location of all active wells in the Basin and document in subsequent annual reports and periodic evaluations any known impacts to drinking water users caused by groundwater management, should they occur.

The MGA's response to the recommended corrective action documented in Section 3 is explanatory and does not lead to any GSP revisions. The mountainous nature and stacked, dipping aquifer systems of the inland portions of the Basin where most domestic wells are found precludes using the typical methods of identifying and quantifying chronic lowering of groundwater MT impacts on domestic wells. Relatively balanced groundwater conditions and stable demand supported by regulated rural land use development, limits long-term groundwater level declines in areas of domestic well use. This means groundwater levels are unlikely to decline to MTs which are based on the depths of wells in proximity to representative monitoring points. The County of Santa Cruz (County) has developed a Drought Response and Outreach Plan to support domestic or small water system well owners should they experience impacts to their wells, particularly during drought periods, and when State funding is available. The MGA is continuing to refine well inventories and increase collaboration with the County to track future dry wells as well replacement permits are issued. These well data will be used to continue to evaluate the protectiveness of groundwater level MTs for beneficial uses and users.

Groundwater Conditions

The MGA tracks groundwater conditions relative to sustainable management criteria (SMC) for the 6 sustainability indicators identified by SGMA. The SMC include the MT, measurable objective (MO), interim milestones (IM), and undesirable results (UR). Historically, certain areas of the Basin experienced chronic lowering of groundwater levels, with historic lows in the 1980s. However, the introduction of conservation measures has successfully reversed these declining trends. Although groundwater users were not significantly affected when groundwater levels declined, the lowered groundwater levels caused localized seawater intrusion, which is why the Basin is classified by DWR as critically overdrafted.

Groundwater Levels

Over the evaluation cycle groundwater levels generally remained stable with local variability related to precipitation recharge and changes in groundwater extraction. Groundwater level trends in aquifers directly recharged by precipitation are variable during the evaluation cycle because of the extreme wet and dry years that occurred during the 5-year period. Groundwater levels in deeper confined aquifers near the coast do not vary as much with precipitation and continue to rise in response to decreasing municipal groundwater extraction. Implementation of

PWS and ASR projects will facilitate further coastal area groundwater level increases to prevent seawater intrusion and achieve sustainability by 2040.

Seawater Intrusion

Seawater intrusion has been detected at Soquel Point in the Purisima A unit aquifer and consistently detected in deep monitoring wells screened in both Purisima F unit and Aromas Red Sands aquifers. Seawater intrusion is monitored and evaluated directly through chloride concentrations and also using protective groundwater elevations as a proxy.

Coastal chloride concentrations are generally stable or decreasing over the evaluation cycle. The exception is in the southeastern portion of the Basin at Seascape where increasing chloride concentrations occurred at depths shallower than historically observed despite the protective groundwater elevation being met in the area's Purisima F unit representative monitoring well. This may be associated with an upward vertical gradients observed in deeper zones. It is uncertain what impact wells pumping from the overlying Aromas aquifer in the Seascape area have on observed chloride increases. Additional analysis is being conducted by the MGA to better understand pumping operations and dynamics, groundwater geochemistry, and to potentially delineate the onshore extent of seawater intrusion.

Coastal groundwater elevations meet the MT and MO in some of the monitoring wells. This means the Basin remains in overdraft and some areas are at risk of further seawater intrusion. Coastal areas that do not yet meet the MT should be able to meet the metrics through projects and management actions (PMAs) that decrease municipal groundwater demand and provide supplemental water supply.

Interconnected Surface Water

The MGA's current understanding of surface water and groundwater interactions are informed by streamflow and groundwater level monitoring, surface and groundwater flow simulations using the integrated groundwater and surface water model, and groundwater dependent ecosystem (GDE) surveys. Groundwater levels in shallow monitoring wells adjacent to streams are used as a proxy for monitoring and managing surface water depletion. Shallow groundwater levels near interconnected streams were stable during the evaluation cycle, fluctuating by no more than 4 feet. The monitoring network for interconnected surface water was improved with 7 new monitoring wells. Additional monitoring data and guidance from DWR on managing depletion of interconnected surface water will be incorporated into the next Periodic Evaluation.

Groundwater Quality

Groundwater produced in the Basin is generally of good quality and does not regularly exceed primary drinking water standards. Iron and manganese historically exceed drinking water standards in parts of the Basin as they are naturally occurring. Water with iron and manganese is treated or blended by municipal water providers to lower the concentration below taste and odor thresholds. Some parts of the Basin underlain by the Aromas Red Sands have naturally occurring hexavalent chromium (chromium VI) that exceeds the drinking water standard

established in 2024. Groundwater from municipal supply wells is blended or treated to meet chromium VI drinking water standards, as required by regulation, before being served to customers. A limited number of coastal monitoring wells have chloride and TDS at concentrations exceeding regulatory standards due to seawater intrusion.

Groundwater in Storage

The reduction of groundwater in storage sustainability indicator is measured as the total volume of groundwater that can be withdrawn from the Basin without causing conditions that lead to undesirable results. Although Basin-wide change in storage is relatively stable, undesirable results are occurring for the reduction in groundwater storage sustainability indicator because extraction volumes exceed MTs or the sustainable yields of the principal aquifers. Until planned PMAs are implemented, these temporary undesirable results are expected.

Land Subsidence

Land subsidence due to lowering of groundwater levels is not known to occur in the Basin and therefore no SMC are set for this sustainability indicator. The Basin is not susceptible to subsidence because the aquifers are primarily consolidated sandstones that are not prone to compaction from lowering of groundwater levels.

Status of Projects and Management Actions

The GSP identified PMAs to achieve SMC and avoid undesirable results. Some PMAs predate SGMA and were already being implemented. The primary focus of new PMAs is to prevent seawater intrusion, with ancillary benefits to interconnected surface water and GDEs. Because the City of Santa Cruz's water supply relies in part on surface water, an additional focus of several PMAs is to improve water reliability by creating supplemental water supply, particularly for dry years when surface water flows are limited.

The MGA member agencies continue to implement a full range of water conservation programs and have successfully implemented policies and programs promoting and incentivizing water conservation and efficient water use. These conservation programs reduce water demands demonstrated by decreasing groundwater extraction since 1985.

SqCWD and SCWD developed PMAs to promote groundwater sustainability by developing new supplies for use in their respective service areas. SqCWD's PWS project will recharge purified recycled water at 3 locations to replenish the groundwater system and protect against seawater intrusion by raising groundwater levels above seawater intrusion MTs. PWS is currently being constructed to produce and directly recharge the Purisima A and BC aquifer units with up to 1,500 acre-feet per year (AFY) of purified water. PWS project start up is expected in 2025. SCWD is evaluating an ASR project as part of its effort to develop additional water supplies for use during extended drought periods while contributing to improved conditions in the Basin. The project will divert available flows from the San Lorenzo River, beyond what is needed to meet system demands, and inject and store the treated water in the aquifer through conversion of

existing and installation of new municipal wells. Permitting of the initial well conversion is expected to be completed in 2026.

MGA member agencies continue to implement management actions to improve water use efficiency and well operations by moving groundwater production inland to reduce the threat of seawater intrusion related to pumping impacts.

MGA and member agencies identified other PMAs in the GSP that may be advanced if the ongoing and planned projects do not achieve anticipated benefits. Other projects include enhanced stormwater recharge, expanded recycled water use, groundwater pumping curtailments and/or restrictions, and desalination for water supply.

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

None of the new studies and data collected during the evaluation cycle and described in Section 2 significantly change understanding of the Basin's HCM.

Water use in general, and especially groundwater extraction, continues to decrease in response to effective water conservation programs. Water Year 2023 had the lowest total municipal water use since tracking began in 1984, despite increasing population over that period.

Monitoring Networks

An evaluation of monitoring networks for groundwater levels, groundwater quality, groundwater extraction, and streamflow confirm they are providing the quantity and quality of data necessary to monitor groundwater conditions in the Basin during GSP implementation.

Monitoring networks used to evaluate Basin conditions have been expanded to fill all GSP-identified data gaps. Additional new monitoring wells associated with the PWS and ASR projects supplement the existing networks and provide a means for monitoring project performance.

MGA Authorities and Enforcement Actions

Minor and substantive revisions were made to the original MGA Joint Powers Agreement (JPA). The more substantive revisions are summarized below:

- Update Recital D for consistency with the basin boundary modifications previously approved by the Department of Water Resources and Bulletin 118;
- Revise Section 8.2 which stated the Board would meet at least semi-annually as it implied the Board would meet twice per year and the Board intends to meet more frequently. The revised language allows the Board to establish the meeting schedule on an annual basis; and

- Removal of the term “capital” to the Section 9.3 requirement that Member Agency Directors unanimously approve any capital expenditure over $100,000 whereby the term is removed.

The First Amended JPA is effective from August 10, 2021.

No substantive change was made to the MGA By-Laws, however the document title was changed to the “First Amended Bylaws” due to a change the tense of a sentence in Section 1.1. The First Amended By-Laws are effective from September 9, 2021.

The MGA adopted the Groundwater Well Registration and Metering Policy for Non-De Minimis Users on June 20, 2024. The requirement was identified in the GSP and requires well registration, metering and reporting by groundwater users that extract more than 2 AFY in priority zones or users that extract more than 5 AFY anywhere in the basin. Well registration is required by applicable well owners by December 31, 2024. Meter installation is required by September 30, 2025 and the first annual report of extracted volumes is due by October 31, 2025.

MGA Administration, Stakeholder Engagement, and Inter-Agency Coordination

The MGA manages GSP implementation through a collaborative staffing model to accomplish its work. Professional and technical staff from the MGA member agencies provide staff leadership, management, work products, and administrative support for the MGA. The MGA contracts with the Regional Water Management Foundation (RWMF) for administrative and planning support. The MGA member agency executive staff is composed of the 4 member agency executive and senior staff and provides support for the MGA officers and Board of Directors (Board). The Board includes representatives from member agencies and other local stakeholders. Over the evaluation cycle, there were no changes to the MGA member agencies, composition of the MGA Board, governance structure, or administration.

The MGA has maintained active public outreach and engagement throughout GSP development and implementation. The Periodic Evaluation has been on the agenda at all MGA Board meetings since December 2023 (total of 4 meetings). Public comments — which were received at all 4 meetings — have been limited to a single individual who has commented on availability of AEM data, effects of increased water demands associated with state housing mandates, and issues and recommendations related to increasing chloride in the Seascape area. In addition to public Boards meetings, the MGA has committed to outreach and engagement through an active website, timely press releases, direct mailings, bi-monthly drop-in office hours, and routine electronic newsletters.

MGA maintains close communication with partner agencies in the adjacent basins to ensure groundwater sustainability is achieved throughout the region. The MGA and member agencies routinely collaborate with the Santa Margarita Basin and Pajaro Valley Subbasin. Coordination meetings are held at least annually between the Pajaro Valley Subbasin and the MGA to

provide a forum to discuss issues such as observed increases or evidence of seawater intrusion in an area close to the basins' boundary. Regular meetings between neighboring agencies facilitate data and information sharing to prepare GSP annual reports and other implementation activities.

Summary of Proposed or Completed Revisions to the Plan

Based on the information evaluated and presented in this Periodic Evaluation, the GSP is still a viable Plan for achieving sustainability. Since the GSP does not need to be changed, a Plan Amendment is not necessary. The MGA will continue to implement the GSP as adopted by the MGA with the understanding that there is potential for some elements of the Plan to require an update in the future based on additional analysis of increasing chloride in the Seascape area and results from the Optimization Study.

1 INTRODUCTION

This Periodic Evaluation documents the Santa Cruz Mid-County Groundwater Agency's (MGA's) first Periodic Evaluation of the implementation of its approved Groundwater Sustainability Plan (GSP or Plan) for the Santa Cruz Mid-County Groundwater Basin (Basin). The Periodic Evaluation covers the evaluation cycle from February 1, 2020 through January 30, 2025. The Periodic Evaluation fulfills the requirements of the Sustainable Groundwater Management Act (SGMA).

The purpose of the Periodic Evaluation is to evaluate whether GSP implementation is on track to achieve sustainability in the 20-year GSP implementation period from 2020 through 2040. If the evaluation identifies that changes to the Plan are needed, then a GSP Amendment must be prepared and submitted together with the evaluation. Based on the information evaluated and presented in this Periodic Evaluation, the Basin is likely to achieve sustainability with the implementation of planned projects and management actions (PMAs). Since the GSP still accurately reflects the MGA's plan to achieve sustainability, a Plan Amendment is not necessary.

2 NEW INFORMATION COLLECTED

New information and data were acquired by the MGA and member agencies during the evaluation cycle. This information supplements but does not change how the MGA manages the Basin as described in the 2020 GSP. New information collected is summarized in Table 2-1 and the subsections below.

Table 2-1. Summary of New Information Collected

Significant New Information	Description	Aspects of Plan Affected	Warrant Change to Any Aspects of the Plan (Yes/No) If yes, include section of the Plan
DWR AEM	DWR collected statewide aerial geophysical data, including for the Santa Cruz Mid-County Basin, to help refine geologic structure and other aspects of HCM.	Potentially basin setting / HCM	No
7 new ISW monitoring wells and 6 streamflow gages	Installation of shallow monitoring wells and coupled stream gages to monitor interconnected surface water. Filled GSP-identified data gap.	Basin setting, monitoring network	No, monitoring network changes do not warrant change to GSP
2 new deep coastal monitoring wells	Installation of deep coastal monitoring wells to monitor seawater intrusion in the deepest aquifers where groundwater is extracted. Filled GSP-identified data gap.	Monitoring network, SMC, HCM depth of aquifer contacts	No, monitoring network changes do not warrant change to GSP
PWS SWIP recharge and monitoring well installation	Installed 3 SWIP recharge wells and 9 monitoring wells in the Purisima A and BC aquifers. Monitoring wells are equipped with water level and conductivity transducers and monitored for an extensive list of groundwater quality constituents.	Potentially basin setting, HCM, aquifer properties, contact depths	No
PWS demonstration testing	Pilot recharge demonstration testing with potable treated groundwater performed in October 2024. Data used to refine aquifer properties in the groundwater model near the project wells.	Aquifer properties and basin setting	No
SCWD ASR Pilot and Demonstration testing	ASR pilot and demonstration testing to support permanent ASR wells and permitting	Aquifer properties and basin setting	No
Soquel Creek Streamflow Assessment Study.	Resource Conservation District of Santa Cruz County (December 2019) 3-year study of streamflow conditions and land use patterns in the Soquel Creek watershed aimed at better understanding rural water demand, surface water availability, and implications for salmonid recovery. The goal of this work is to inform and help prioritize future water conservation projects to enhance late season streamflow conditions in strategic locations throughout the watershed.	Helps the MGA design and plan PMAs that avoid habitat impairment.	No, findings were informational.

Notes:
HCM = hydrogeologic conceptual model, ISW = interconnected surface water, SMC = sustainable management criteria, SWIP = Seawater Intrusion Prevention,

2.1 DWR AEM Data

One of the technical assistance projects under the Basin Characterization Program is California's Department of Water Resources (DWR) Statewide Airborne Electromagnetic (AEM) Surveys. DWR conducted AEM surveys in California's high- and medium-priority groundwater basins where data collection was feasible. The collected AEM data is intended to assist local water managers in characterizing their aquifer systems and supports the implementation of SGMA to manage groundwater for long-term sustainability. The AEM surveys were funded by voter-approved Proposition 68, and all the data from the surveys are publicly available online.

The AEM survey technique involves a helicopter flying approximately 50 miles per hour with the geophysical equipment suspended below, mounted on a large hexagonal frame about 98 feet above the ground surface. The AEM equipment sends a pulsating weak electromagnetic signal into the ground and measures the response, which provides an electrical resistivity profile of the earth's geological layers and structures down to depths of as much as 1,000 feet. Aquifer systems consist of (1) aquifers typically composed of sands and gravels that have high resistivities, and (2) aquitards composed of silt and clays that have low resistivities, so the resistivity profiles help in mapping the overall aquifer systems dimensions and extent. The AEM survey data is analyzed in detail, correlated with data from nearby wells, and modeled to produce subsurface maps of the resistivity, lithology, and an initial hydrostratigraphic model.

For the November 2022 survey containing Monterey Bay area groundwater basins (Survey Area 8), 477.8 line-miles flight lines were flown, with 36 line-miles running through portions of the Basin (Figure 2-1). Initial flight lines were developed based on input from the MGA, but were modified to avoid or flying over the following:

- Urban areas
- Structures containing people or confined livestock
- Highways
- Transmission lines
- Railroads
- Pipelines
- Vineyards (most vines are supported by metal cables and posts)

The final flight lines were modified to be co-located with existing high-quality lithology or geophysical data gathered from public databases or provided by the MGA and member agencies.

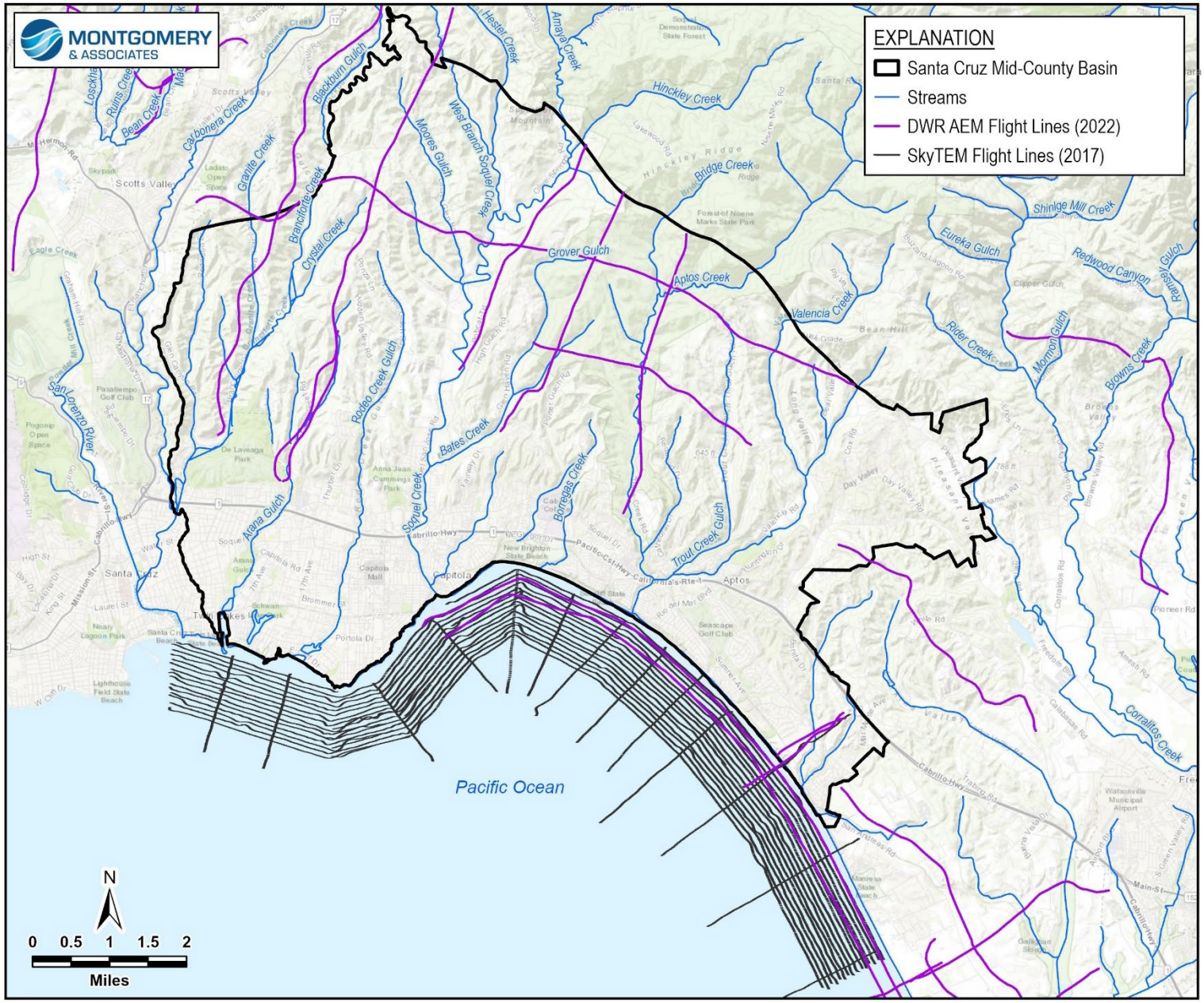

Figure 2-1. DWR AEM Flight Lines (2022) Compared to SkyTEM Flight Lines (2017)

The procedure undertaken to process the AEM data is summarized on Figure 2-2. The full report for Survey Area 8 can be found at: https://data.ca.gov/dataset/dwr-airborne-electromagnetic-aem-surveys-data/resource/0d6459e3-0480-43c5-afc7-d39b45ffb276. DWR's AEM report for Survey Area 8, Figures 4-7 to 4-10, show interpolated resistivity at various depths in the Basin and Figure 5-1 shows the typical relationship between resistivity, lithology, and salinity. Appendix 9 includes the resistivity, hydrostratigraphic interpretation, hydrostratigraphic uncertainty, and supporting well log data for each survey transect. Transects in the Basin are found on Appendix 9, pages 16 to 22 and 58 to 65.

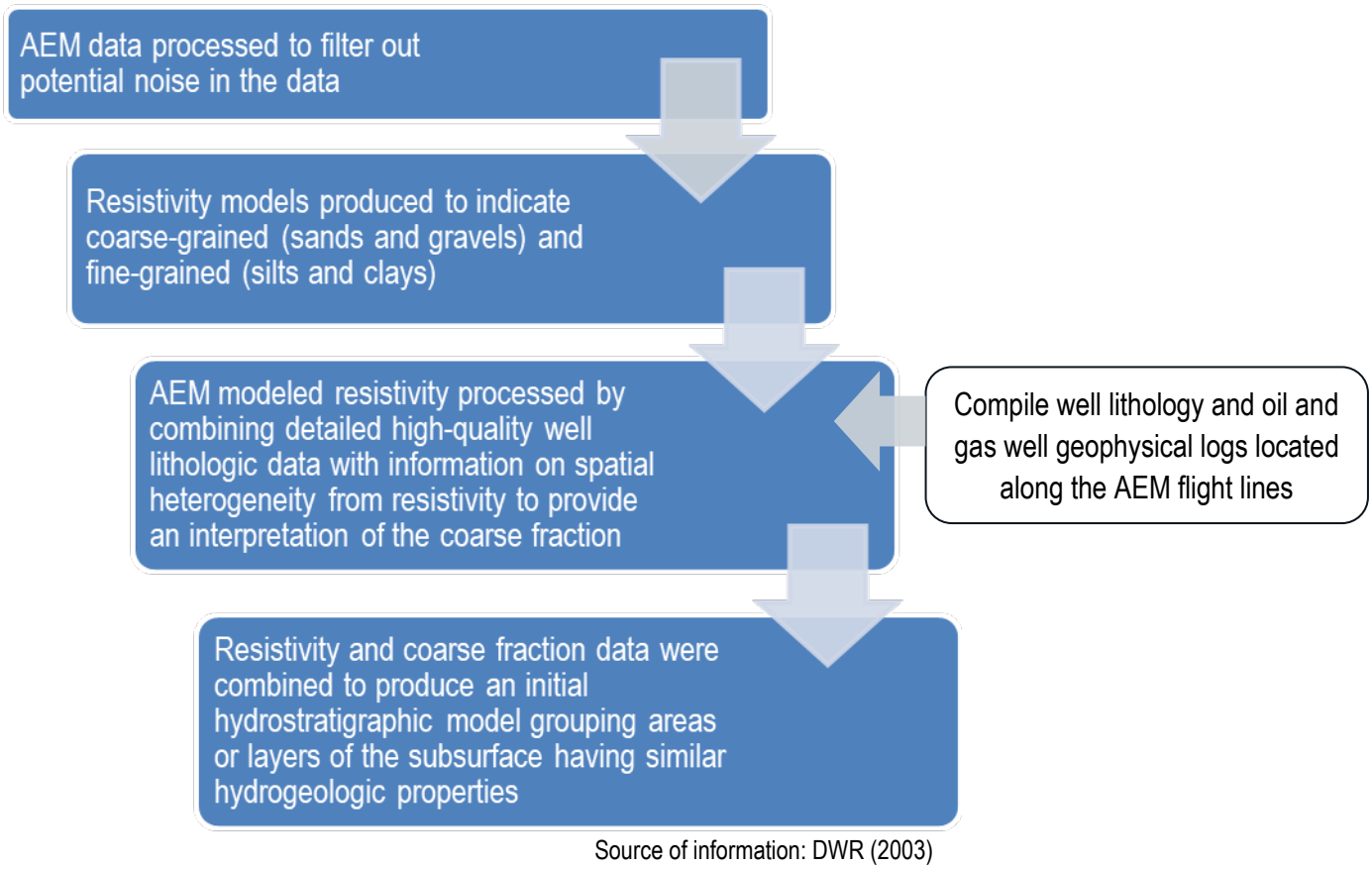

Figure 2-2. AEM Processing

The AEM data confirm assumptions for the hydrogeologic conceptual model and provides a snapshot of offshore seawater intrusion along the coastal boundary of the Basin. The coastal data supplements prior geophysical data collected in the Basin. As shown on Figure 2-1, the AEM survey flight lines were less extensive along the coast than the SkyTEM flight lines flown in 2017. Flight lines that are similar are 2 offshore lines and 1 line in the Seascape area (southeastern portion of the Basin) perpendicular to the coast. Because the 2017 and 2022 flight lines were not flown over the exact same locations, comparison of changes over time are difficult to interpret. Additionally, AEM information regarding depth and extent of seawater

intrusion is not as robust as the 2017 dataset that focused on mapping the offshore fresh water / seawater interface (Ramboll, 2018). However, the DWR AEM data were able to confirm geologic structure in inland areas where less hydrogeologic well data are available.

In general, the processed AEM data confirm the following aspects of the hydrogeologic conceptual model (HCM):

- The deeper portions of the Purisima Formation are semi-consolidated to consolidated.
- There is shallow bedrock around the Basin's boundary with the Santa Margarita Basin that provides a geologic barrier to flow between the Basins. This bedrock boundary was inferred in the GSPs for both Basins.
- Seawater intrusion persists in the offshore aquifers along the entire length of the Basin's coastline.

2.2 New Shallow Monitoring Wells and Streamflow Gages to Monitor Interconnected Surface Water

Seven shallow monitoring wells near creeks have been added to the ISW monitoring network. The wells are equipped with pressure transducers and, except for 1 shallow monitoring well (Lupin SW), are paired with streamflow gages. The wells are discussed in more detail in Section 7.1.1. Regular groundwater level measurements have been collected from the wells starting in December 2022. Streamflow gage rating curves were developed in early 2023 and regular flow measurements at the gages started in May 2023. A streamflow monitoring report documents the data collected in WY 2023 (Trout Unlimited, 2024). Since there is less than 18 months of groundwater level and streamflow data collected, there are not enough data over various water year types to fully evaluate interconnected surface water (ISW) at these locations yet.

2.3 New Deep Coastal Monitoring Wells

Two deep monitoring wells designated as SC-3AA and SP-5 were installed near the coastline to monitor seawater intrusion in the Purisima AA unit and Tu unit near existing supply wells. Monitoring well SC-3AA was installed by Soquel Creed Water District (SqCWD) and is completed in the Purisima AA unit. Monitoring well SP-5 was installed by SCWD and is completed in the Tu unit. Establishing sustainable management criteria (SMC) for these 2 new representative monitoring points (RMP[s]) will help monitor and protect supply wells from seawater intrusion. SC-3AA will be used to monitor the aquifer near the SqCWD Rosedale municipal supply well, also screened in the Purisima AA unit, and SP-5 will be used to monitor the Tu aquifer unit.

Deep well installation helped refine the depths of geologic contacts in the 2 locations. It was expected that granitic bedrock would be found below the Purisima AA unit at the SC-3AA site, however the Tu unit was encountered below the Purisima AA unit. This enhances understanding of lateral extent of the Tu unit. At the SP-5 site, granitic bedrock was encountered approximately 80 feet deeper than expected. This contact improves understanding

of the thickness of the Tu aquifer unit. Other contacts in the 2 locations were consistent with the integrated groundwater and surface water flow (GSFLOW) model layers.

The information gathered from installation of new deep monitoring wells is incorporated into the GSP monitoring and evaluation process and does not alter any aspect of the GSP. The new monitoring wells are now included in the groundwater level and seawater intrusion RMP network with SMC to protect groundwater quality in their respective aquifers. The geologic information obtained from borehole drilling is used to refine geologic contact depths in the most recent version of the GSFLOW model.

2.4 SWIP Recharge and Monitoring Wells

Seawater Intrusion Prevention (SWIP) recharge and monitoring wells have been installed as part of SqCWD's PWS project, described in more detail in Section 5.1.2.1. The PWS project will treat effluent from the Santa Cruz Wastewater Treatment Facility to tertiary level of treatment, then purify it at the Chanticleer Advanced Water Purification Facility and recharge it into the Basin's aquifers via 3 SWIP wells installed between 2019 and 2021 in the central coastal portion of the Basin. The Regional Water Quality Control Board (RWQCB) permit for PWS sets requirements for meeting Groundwater Replenishment Reuse Project (GRRP) Regulations to protect groundwater quality during project implementation.

The GRRP Regulations require PWS to establish and monitor monitoring wells situated between each SWIP recharge well and the nearest drinking water well. The monitoring wells are equipped with transducers to monitor groundwater levels and pumps to sample for water quality analysis prior to and during project implementation. A total of 9 PWS monitoring wells were installed from fall of 2021 through the summer of 2022. Five monitoring wells were installed near the Twin Lakes Church SWIP Well, 2 near the Monterey SWIP Well, and 2 near the Willowbrook SWIP Well.

Title 22 requires background monitoring of groundwater quality prior to the startup of the PWS project and during the operation of the SWIP recharge wells (operational monitoring). Four quarters of background water quality data have been collected at the PWS monitoring wells to characterize the groundwater quality in each aquifer receiving recycled water. Groundwater quality data collected so far is consistent with known groundwater quality in the Basin and does not exceed MTs, except for naturally occurring iron and manganese, which is expected.

The monitoring wells will be used for evaluating PWS performance during demonstration in October 2024 and full-scale operations scheduled to start in 2025. Monitoring wells will be used to collect tracer study data during recharge to demonstrate that adequate underground retention time exists to address water quality issues should they occur. Background and operational monitoring data will be submitted to the State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW) and made public via DDW's Drinking Water Watch Database and SWRCB's Geotracker Database. The SWIP and monitoring wells are added to the MGA's monitoring network.

The hydrostratigraphy encountered during the drilling and installation of the SWIP recharge and monitoring wells was consistent with the Basin's HCM and does not change how groundwater will be managed in the Basin.

2.5 Pure Water Soquel SWIP Recharge Well Testing

Pilot testing at 1 SWIP well took place in 2019. Start up and acceptance testing at all SWIP recharge wells with potable treated groundwater will be performed in October 2024. Recharge rate and groundwater level data collected during start up and acceptance testing suggests similar aquifer properties to those estimated by aquifer testing conducted after SWIP recharge and monitoring well installation. Chloride transducers installed in each monitoring well are used to evaluate arrival of chloride as an intrinsic tracer to estimate travel times between SWIP recharge and monitoring wells. Demonstration data are not yet available to include in this evaluation.

2.6 City of Santa Cruz Aquifer Storage and Recovery Project

Aquifer Storage and Recovery (ASR) is being evaluated by SCWD as a multi-benefit water supply reliability project. The project would use ASR wells to inject and store excess surface water in wet seasons and then used during dry seasons and droughts. The surface water would be treated to drinking water standards before injection into Basin aquifers.

SCWD is implementing a phased approach to the ASR Project. The overall purpose of the completed Phase 1 ASR investigation was to confirm the initial ASR feasibility findings developed from a Reconnaissance-Level Study of ASR and, as no fatal flaws were identified, develop the information necessary to plan Phase 2 ASR pilot and demonstration testing at selected existing wells. Phase 2 consisting of ASR pilot testing and demonstration is also complete for 2 wells and ongoing for a third well. Each phase's scope is summarized on Figure 2-3.

Phase 1 findings indicated there are several wells that could suitably serve as potential Phase 2 ASR pilot testing wells. Additionally, no fatal flaws in terms of theoretical injection capacity, geochemical interaction modeling, hydraulic losses or adverse impacts on the groundwater basin were identified. None of this information changes the HCM or other aspects of the GSP. Findings from Phase 1 supported continuing with Phase 2 which provides field-level information on ASR operations and impacts/benefits to the Basin.

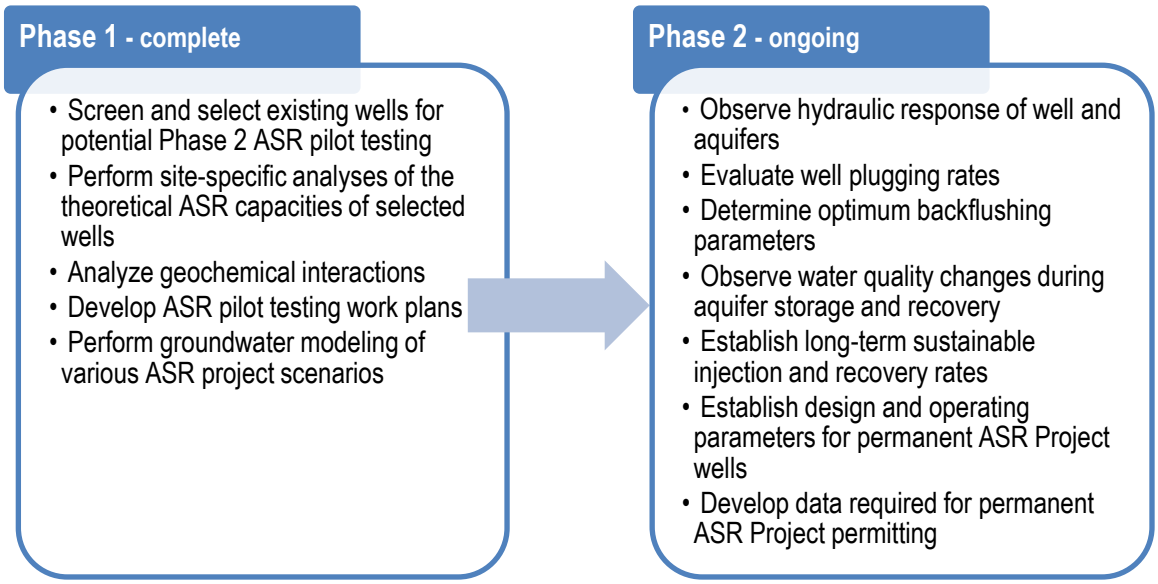

Figure 2-3. Santa Cruz ASR Project Phase 1 and 2

2.7 Soquel Creek Streamflow Assessment Study

The Resource Conservation District of Santa Cruz County (RCD, 2019) conducted a 3-year study (Water Year [WY] 2017 – WY 2019) of streamflow conditions and land use patterns in the Soquel Creek watershed which supports diverse habitat for a number of special status species, in particular steelhead and coho salmon (salmonids). The Soquel Creek watershed falls partially within the Basin, with the majority of it extending north of the Basin.

The study's purpose was aimed at better understanding rural water demand, surface water availability, and implications for salmonid recovery. The study's goal is to inform and help prioritize future water conservation projects to enhance late season streamflow conditions in strategic locations throughout the watershed.

The study approach included:

- Supplementing the only long-term streamflow record at the United States Geological Survey's (USGS) Soquel Creek gage with 4 gages in the upper portion of the watershed, an area where there is no municipal supply and domestic users pump groundwater for their needs. After the study ended, the MGA continued to monitor the gages through May 2022 (see Section 7.4.4).
- Evaluating trends in salmonid monitoring data from the County of Santa Cruz (County) Juvenile Steelhead and Stream Habitat (JSSH) Program[1] to better understand where improvements to in-stream flow would have the most benefit. Invasive plant species were mapped along certain portions of the riparian corridor to better understand their potential impact on water availability and habitat quality.

[1] https://scceh.com/NewHome/Programs/WaterResources/FisheriesWatershedManagement/SteelheadMonitoring.aspx

- Performing 2 analyses to estimate human water demand across the watershed. One coupled a combination of standardized water use estimates and known use rates with hand-digitized geospatial data that captured land use patterns (i.e. agricultural fields, irrigated lawns and turf, and different types of building structures). The other approach estimated water demand based on allotted water rights. In addition, a water availability analysis was completed in order to evaluate the viability of developing water storage projects to alleviate the effects of demand on late-season flow (a water right is required for such projects, requiring proof from the availability analysis that sufficient water exists to supply the storage tanks).

Based on streamflow data collected, it was concluded there are multiple stream diversions occurring throughout the watershed, causing streamflow conditions to drop by as much as 1 cubic foot per second. Groundwater pumping and diversions from springs also likely impact summer streamflow conditions in the watershed, though the impacts of these diversions are much more difficult to detect in the gage data.

Review of JSSH Program data show that in general, steelhead juvenile densities are highest in the East and West Branches and the Upper Mainstem Soquel Creek and densities show a negative trend from 1994 to 2018. However, higher densities were reported for 2019, a wet year, which is expected to change the earlier trend lines. There was a marked decline in juvenile densities due to extremely low streamflow and pool disconnection in the East Branch during drought years 2014 and 2015.

The study found that habitat quantity and quality is correlated with population density. Riffle and run average depth and juvenile densities is statistically significant for both Size Class 1 (smaller) and 2 (larger) salmonids. This shows that streamflow supports juvenile survival through a combination of increased habitat quantity (more depth and width) and quality (higher dry season flows increase food supply). Through development of a mathematical relationship between field-collected flow data and USGS Soquel Creek gage data, it was determined there is a significant negative relationship between Size Class 1 and the mean September flow variable. This relationship suggests that with higher flows, more juveniles grow into the larger Size Class 2. Although the data show a positive relationship between Size Class 2 and flow, the relationship was not significant.

Remote sensing analysis of the focus study area above the Bates Creek confluence mapped 52.6 acres of vineyard, 89 acres of orchard, 1.8 acres of irrigated turf, 27.8 acres of row crops, 9.5 acres of irrigated pasture, and over 7,600 marijuana plants. There are 1,663 commercial and residential structures within the focus area, as well as 1 school, 4 camps/conference centers, and 5 wineries. Accounting for well and reservoir use, the total annual human surface water demand based on remote sensing analysis was estimated at 267 acre-feet (AF). The estimate of surface water demand adjusted for the small portion of the watershed that falls within the Basin aligns with the assumption made in estimating domestic surface water use in the GSP and annual reports as being “unknown but minimal.”

Water availability analysis indicated that there is adequate water available during the winter season (December 15 – March 31) for future water storage projects. Along with the analysis on human water use, the data indicate that there is considerable opportunity to store water in the winter for summer use while maintaining the water needed for ecological processes. The study indicates there is sufficient water in the Soquel Creek Watershed to meet human needs on an annual basis. However, the streamflow data suggests that human water management activities have a negative impact on streamflow during the dry season and thus the potential to impact salmonid survival in drier years. The study recommends a primary goal for future streamflow enhancement work should be to complete projects that simultaneously ensure adequate water supply year-round for human consumption and ecosystem function.

The information and recommendations of the report do not change management of groundwater in the Basin or any aspect of the GSP.

3 RESPONSE TO DWR RECOMMENDED CORRECTIVE ACTION

In a letter dated June 3, 2021, detailing its review and approval of the MGA's GSP, the DWR provided 1 recommended corrective action (RCA) to enhance the GSP. The RCA is related to identifying and quantifying the potential impacts to non-municipal domestic wells (also referred to as *de minimis* groundwater users) that the GSP describes as potentially needing to be deepened if groundwater level MTs are reached. Additionally, DWR recommended the MGA inventory and better define the location of all active wells in the Basin, and document known impacts to drinking water users caused by groundwater management, should they occur, in subsequent annual reports and periodic evaluations.

To address the RCA, the domestic well distribution is described in relation to the Basin's physical and hydrogeologic setting. Where feasible, impacts to domestic wells are evaluated. The Basin's dry well history, future rural land use plans, and the County's domestic and small water system support and well inventory plans are described to provide context to the MGA's response to the RCA.

3.1 Physical and Hydrogeologic Basin Setting

Ground surface elevations in the Basin range from sea level at the coast to approximately 1,200 feet above mean sea level (amsl) in the Santa Cruz mountains. Ground surface elevation profiles on Figure 3-1 show how topography varies greatly across the Basin. Profile A-A' depicts the valleys formed by major creeks as they flow to the ocean. Soquel Creek valley slopes can have elevation changes of 600 feet over 0.3 miles (Figure 3-1). Profiles B-B' and C-C' show topography from the Santa Cruz Mountains to the coast where elevations can change over 700 feet.

The Basin's principal aquifers are the Purisima Formation and Aromas Red Sands. The Purisima Formation extends throughout the Basin and overlies granitic basement rock, which outcrops in the west of the Basin. Sediments of the Purisima Formation are semi-consolidated to consolidated marine deposits compressed into mudstone and sandstone and uplifted over time. The Purisima Formation dips to the southeast at approximately 4 degrees, which results in remnants of the lower-most Purisima strata occurring only along ridge tops in the western portion of the Basin (Figure 3-2 and Figure 3-3). To the southeast of the Basin, the Purisima Formation is overlain by unconfined, poorly consolidated Aromas Red Sands (Figure 3-3). Alluvium at relatively shallow depths only occurs in narrow bands alongside major creeks. Alluvium is not a principal aquifer, although well permit records indicate approximately 25 domestic wells may extract groundwater from it.

In the Basin's inland area, where domestic users are the primary groundwater pumpers, groundwater levels have remained relatively stable over the period of record. Typically, groundwater levels respond to climatic cycles and appear to be in balance. These characteristics are shown on hydrographs for inland RMPs on Figure 3-4 through Figure 3-7.

In the coastal area where most of the Basin's population resides, groundwater levels historically declined due to overdraft caused by municipal pumping which peaked in the mid-1980s and mid-1990s. Since 1995, extensive and effective water conservation efforts have reduced water demand and total basin groundwater pumping which has allowed groundwater levels to recover to close to mid-1980 levels (Figure 3-8).

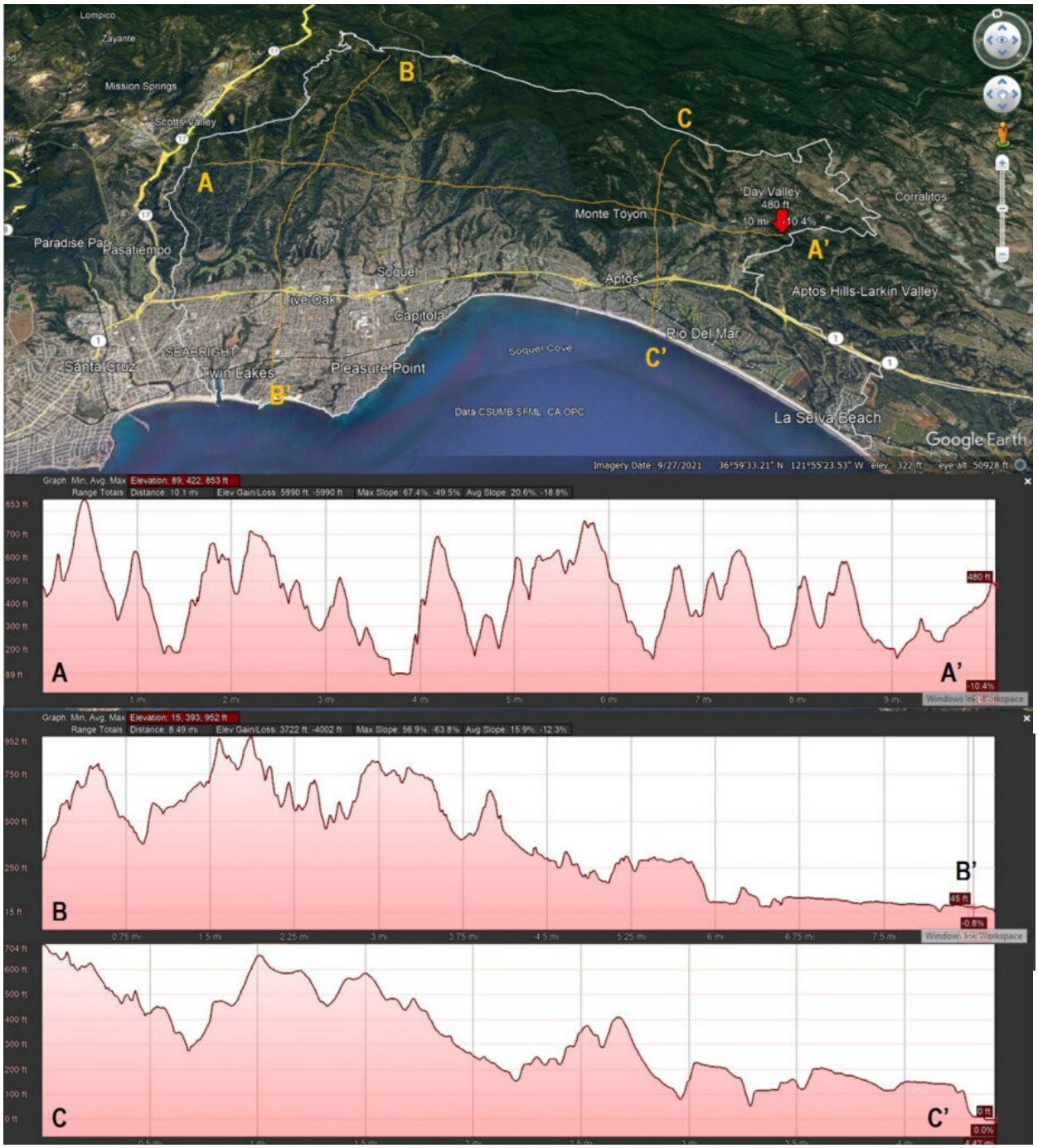

Figure 3-1. Basin Ground Surface Elevation Profiles (Source: Google Earth)

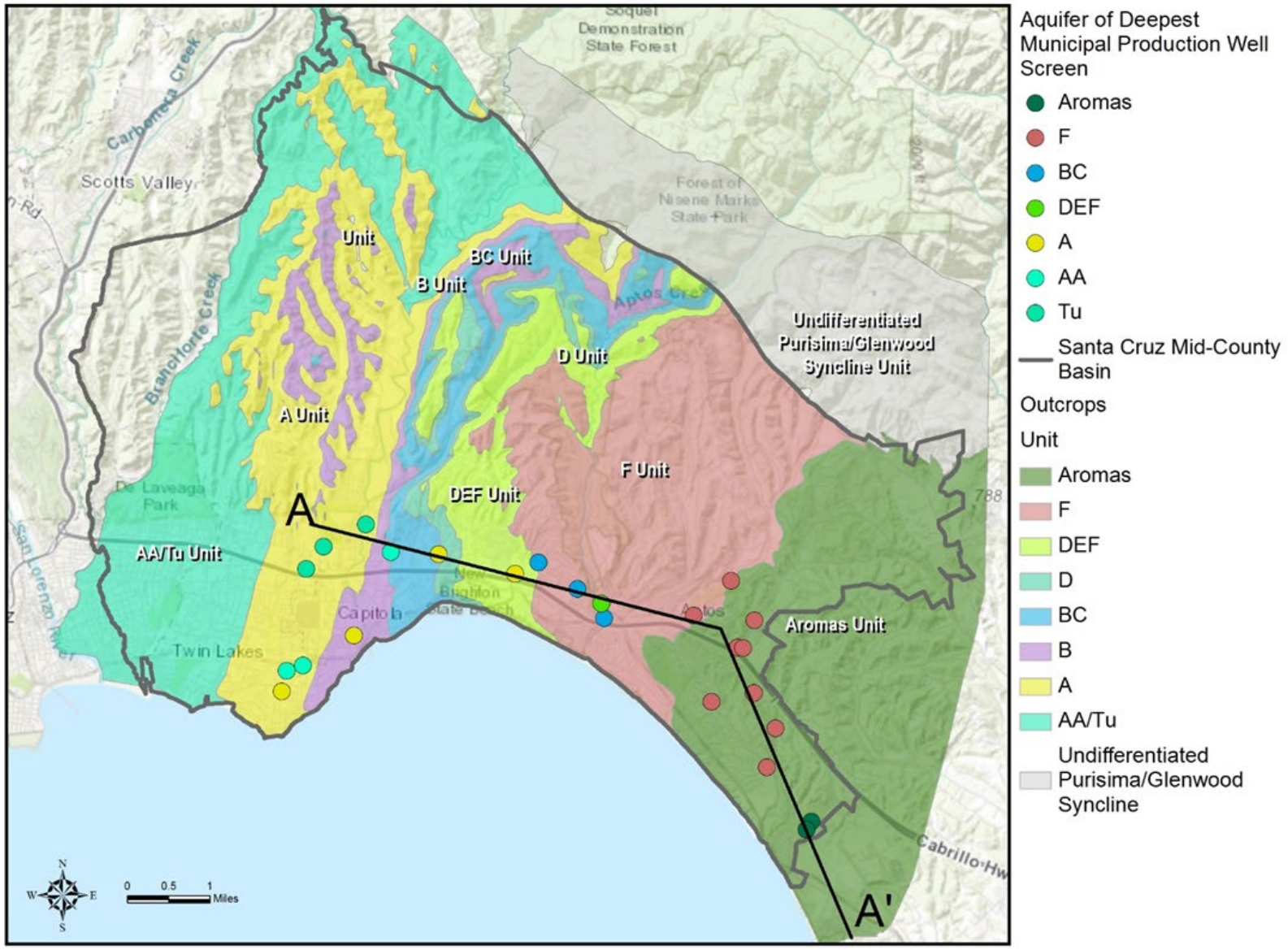

Figure 3-2. Aquifer and Aquitard Outcrops (from 2020 GSP)

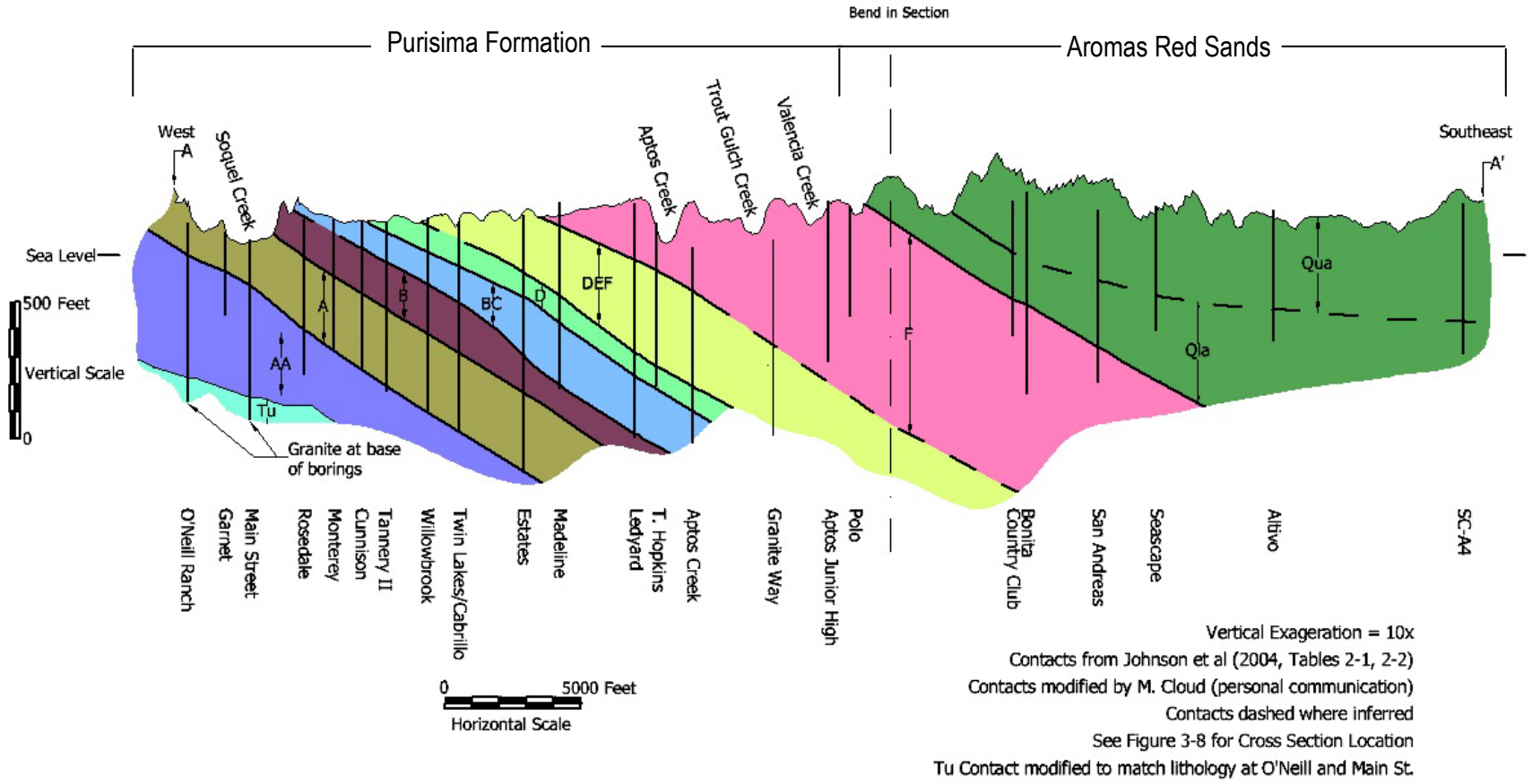

Figure 3-3. Hydrostratigraphic Cross-section, A-A' (from 2020 GSP)

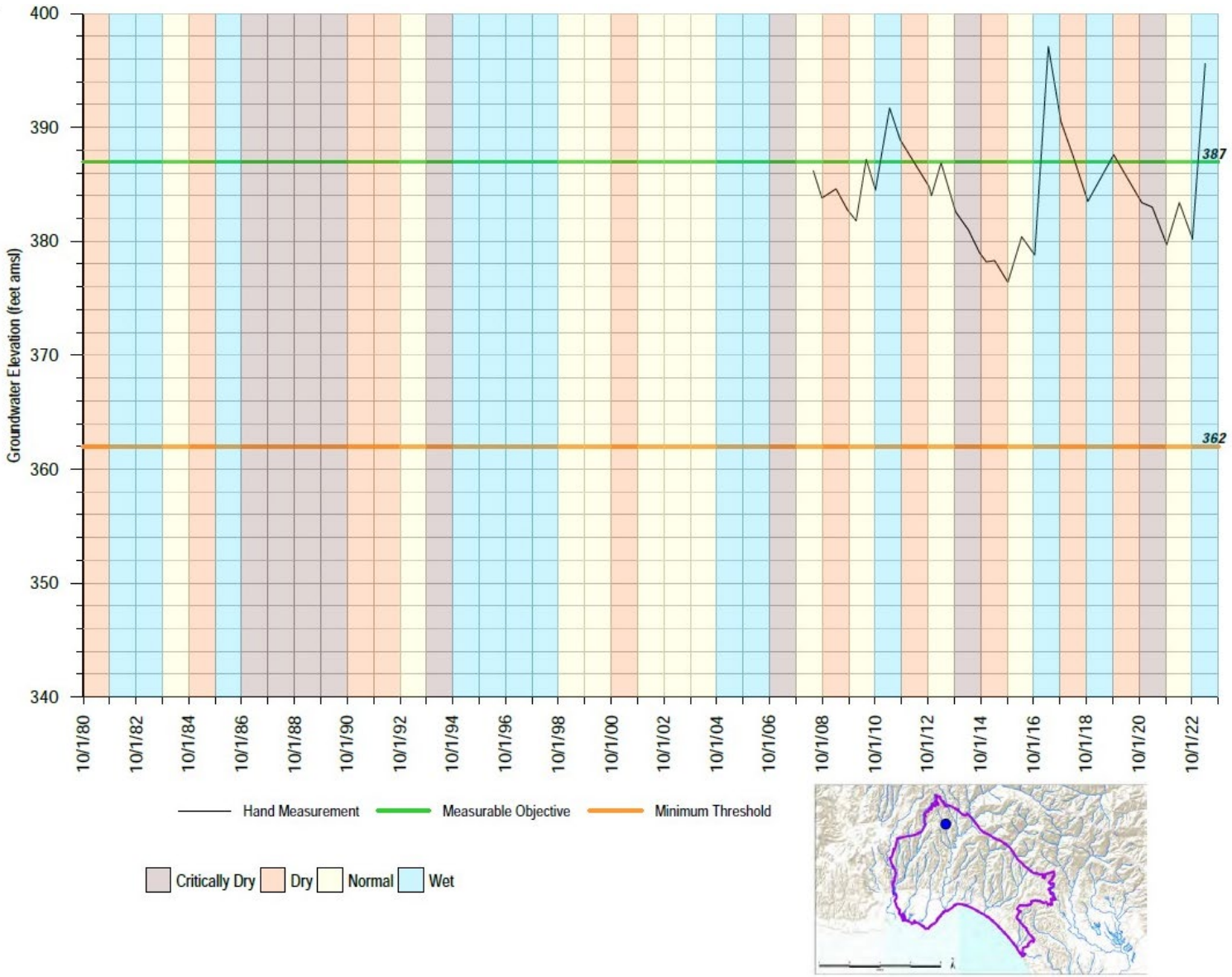

Figure 3-4. Hydrograph for Representative Monitoring Point Private Well #1

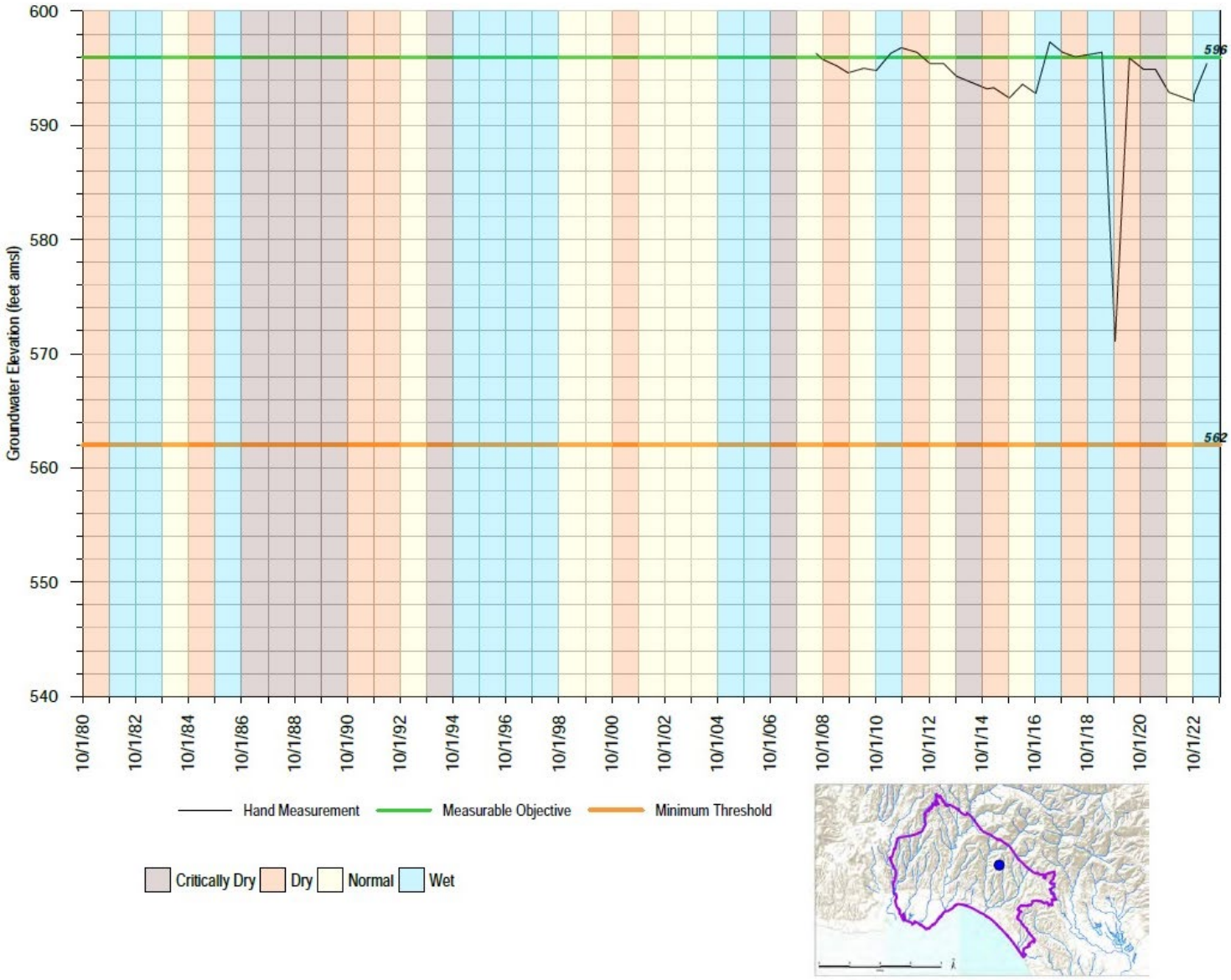

Figure 3-5. Hydrograph for Representative Monitoring Point Private Well #2

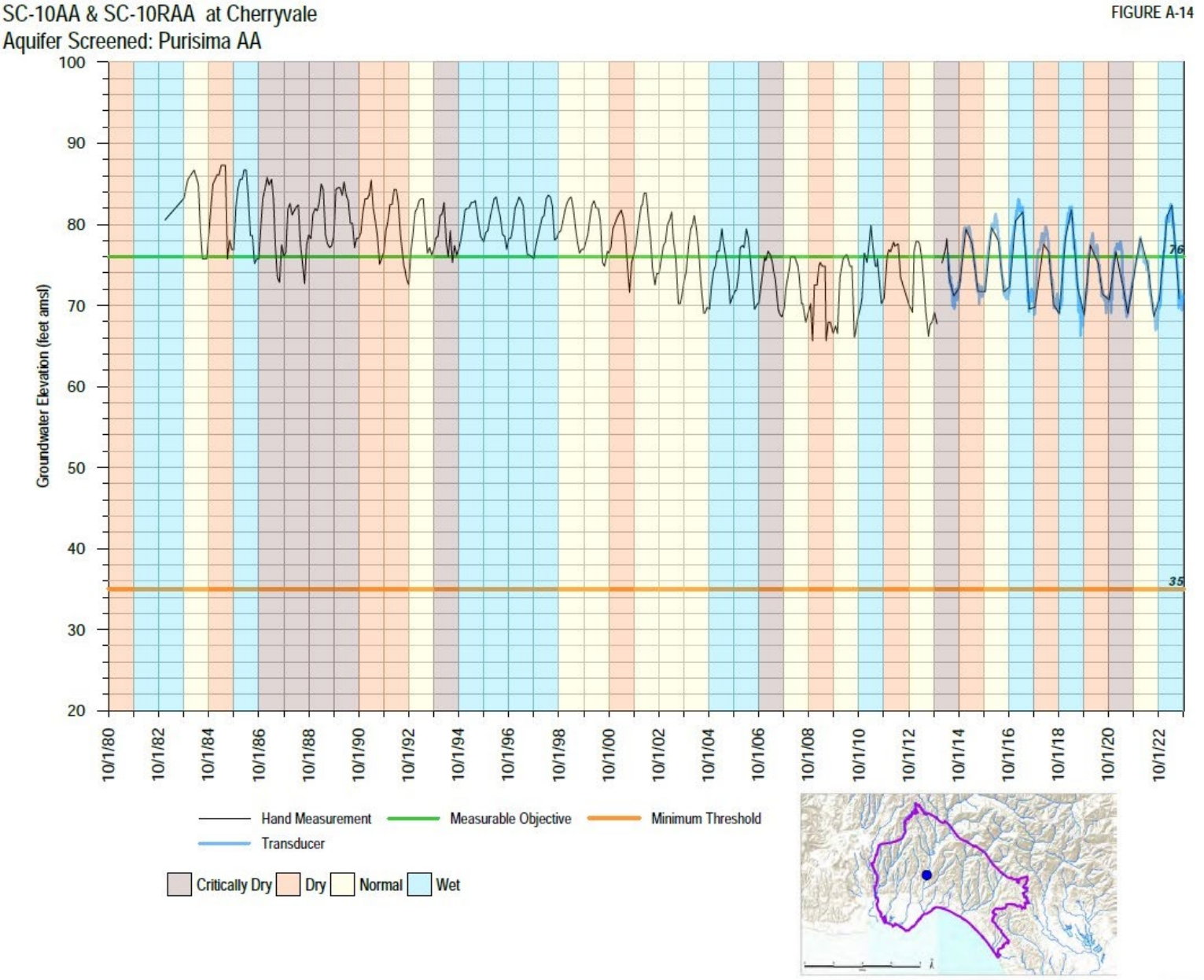

Figure 3-6. Hydrograph for Representative Monitoring Point SC-10RAA

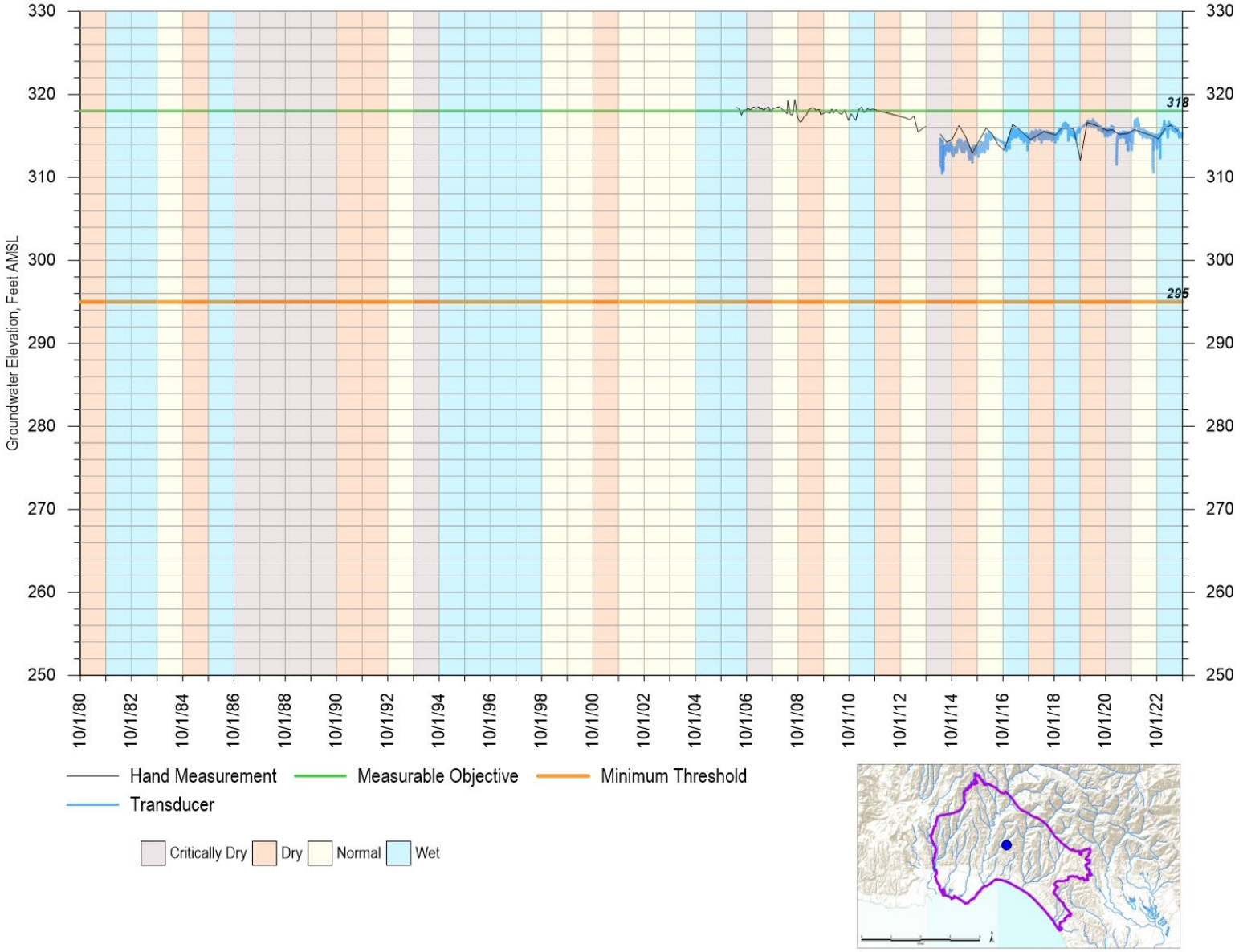

Figure 3-7. Hydrograph for Representative Monitoring Point SC-11RD

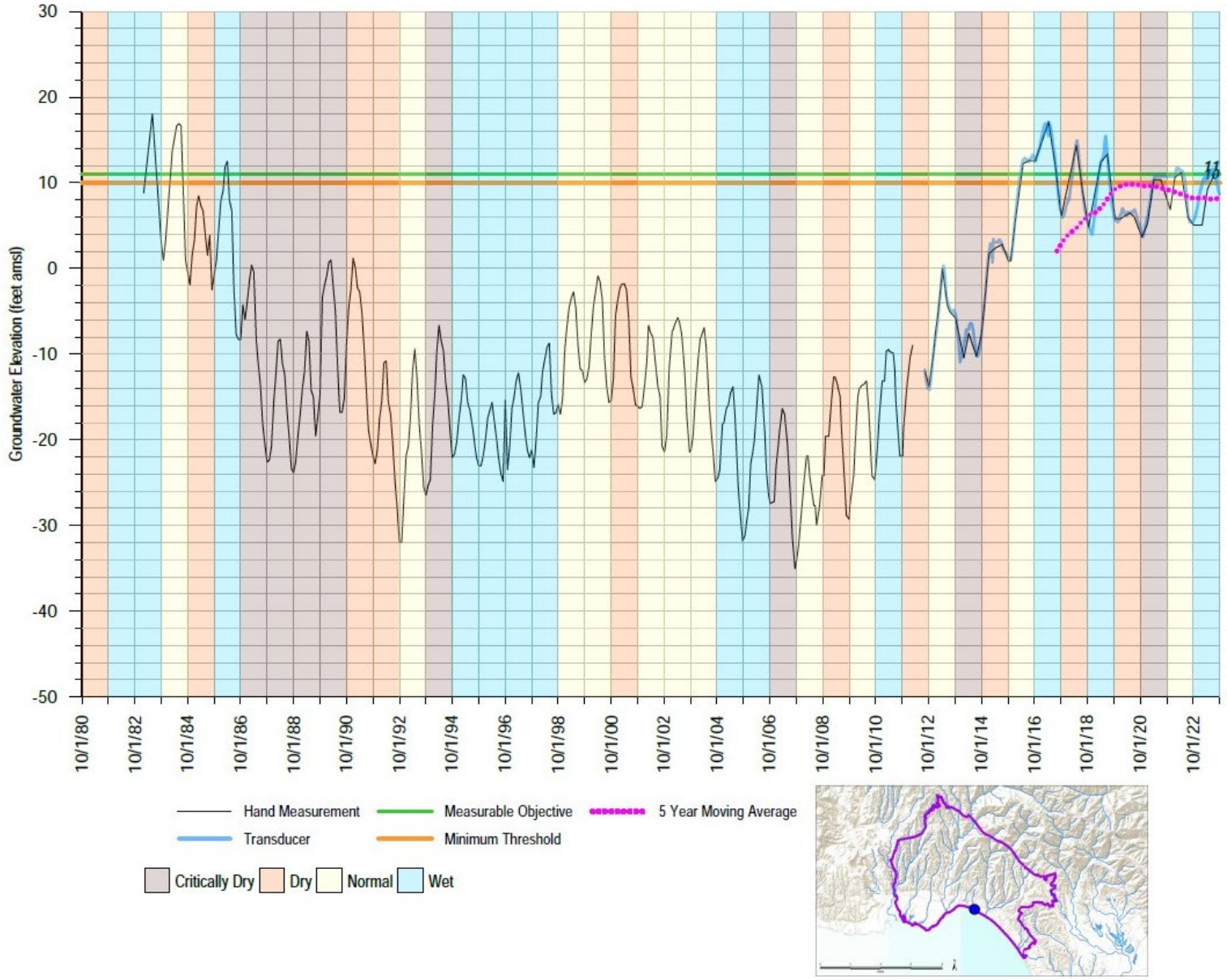

Figure 3-8. Hydrograph for Representative Monitoring Point SC-9C & SC-9RC (Purisima B unit)

3.1.1 Well Data Sources

During GSP development, the County's 2016 Well Geodatabase was used to identify domestic wells. The most current Well Geodatabase, used to support the MGA's response to the RCA, has well permits added through 2022.

3.1.2 Identification and Quantification of Domestic Well Impacts

The typical method of identifying and quantifying domestic well impacts from groundwater levels at MTs in a low topography alluvial basin does not work for the physical and hydrogeologic setting of the Basin as described above. Minimum thresholds at RMPs are set based on groundwater levels that allow nearby groundwater users to meet their typical water demand. Table 3-1 summarizes the number of nearby wells used to determine the well depth to protect when developing MTs. A half-mile radius around the RMP to determine minimum well depth is intentionally conservative to be protective of the shallowest wells.

According to the County's well permit database, domestic permits across the Basin are found in both non-principal and principal aquifers. The following bullets summarize the number of domestic wells in non-principal and principal aquifers in the Basin:

- 25 domestic wells less than 100 feet deep are completed in alluvial sediments associated with streams and creeks. Alluvium in the basin is not a principal aquifer, and therefore the limited groundwater extractions by these *de minimis* pumpers are not managed by the MGA.

- 48 domestic bedrock wells extract groundwater from underlying igneous and metamorphic rock formations in the eastern portion of the Basin. These are also not principal aquifers, so the limited groundwater extractions by these *de minimis* pumpers are not managed by the MGA.

- 1,131 domestic wells pump groundwater from principal aquifers. Of those, only 14 wells are located on the lowest emergent coastal terrace/coastal plain (13 have well depth data) and 1,117 wells are located in the inland mountainous parts of the Basin (785 have well depth data).

Table 3-1. Chronic Lowering of Groundwater Levels Representaive Monitoring Points

Representative Monitoring Point	Well Type	Aquifer	Number of Nearby Wells Used in Minimum Threshold Development	Well Depth Minimum Threshold is Based On in feet	Comments
SC-A7C	Monitoring	Aromas	14 domestic 7 ag	Not lower than sea level, shallower than shallowest well	On the coastal plain
Private Well #2	Production	Purisima F	15 domestic	320, depth of RMP which is shallower than nearby wells	Inland
Black	Monitoring		13 domestic 1 municipal 3 ag	420, 20th percentile	Inland
CWD-5	Monitoring		10 domestic 1 ag	200, 12th percentile	Inland
SC-23C	Monitoring		2 small water system 9 domestic 2 municipal	270, depth of RMP which is shallower than nearby wells	Inland
SC-11RD	Monitoring	Purisima DEF	10 domestic	262, shallowest	Inland
SC-23B	Monitoring		3 domestic	435, shallowest	Inland
SC-11RB	Monitoring	Purisima BC	5 domestic	470, shallowest	Inland
SC-19	Monitoring		9 domestic	400, shallowest	Inland
SC-23A	Monitoring		2 domestic 3 municipal	600, shallowest	Inland
Coffee Lane Shallow	Monitoring	Purisima A	10 domestic	110, shallowest well	On the coastal plain
SC-22A	Monitoring	Purisima A	9 domestic	Not lower than sea level, shallower than shallowest well	On the coastal plain, area served water by the City of Santa Cruz
SC-22AA	Monitoring	Purisima AA	2 municipal	Not lower than sea level, shallower than shallowest well	On the coastal plain, area served water by the City of Santa Cruz
SC-10RAA	Monitoring		7 domestic	420, shallowest	Inland
Private Well #1	Production	Purisima AA/Tu	29 domestic	120, shallowest	Inland
30th Ave Deep	Monitoring	Tu	2 municipal	650, shallowest	On the coastal plain, Tu is a deep aquifer that domestic wells typically do not pump from in this area served water by the City of Santa Cruz
Thurber Lane Deep	Monitoring		22 domestic	280, 10th percentile	Inland

3.1.2.1 Inland Domestic Well Impacts

Analyzing impacts to domestic wells in a mountainous area in relation to MTs in RMPs is infeasible. Groundwater levels in the inland areas vary according to the topography, so it is not appropriate to analyze wells at much different elevations to the RMPs. In these areas, ground surface and groundwater elevations change within a few hundred feet, which is also why there are no groundwater elevation contour maps for the inland areas.

Although it is not possible to quantify domestic well impacts, the subsection above on Basin hydrogeology and subsections below on dry well history and rural land use planning indicate relatively stable historical groundwater levels and future groundwater demand. Stable conditions in the rural inland areas are unlikely to cause groundwater levels to decline to MTs. Furthermore, MTs are generally based on the depths of the shallowest wells in close proximity to RMPs which will protect the majority of domestic wells in the unlikely event groundwater levels fall to MTs.

3.1.2.2 Coastal Domestic Well Impacts

On the coastal plain, the topography is flatter and it is feasible to evaluate domestic wells impacts. For this analysis, it is assumed that if groundwater levels fall below 30 feet above the bottom of the well, the well may not be able to produce groundwater and the well is impacted. A groundwater level 30 feet above the bottom of a well is referred to herein as a protective level. Since all MTs on the coastal plain are either at or above sea level, a protective level in a domestic well below sea level means the well will not be impacted if groundwater levels fall to the MTs because the MT is at higher elevation than the protective level. Of the 14 domestic wells on the coastal plain, 10 wells have protective levels below sea level, 3 wells have protective levels above sea level, and 1 well has no depth information available (Table 3-2).

Table 3-2. Summary of Domestic Well Impacts on the Coastal Plain

Protective Level Compared to Minimum Thresholds	Number of Domestic Wells
Wells with Protective Levels below sea level and where the Minimum Threshold is higher than 30 feet above bottom of well	10
Wells with Protective Level between 0 and 2 feet above sea level	2
Well with Protective Level between 5 and 6 feet above sea level	1
No well depth Information	1
Total	**14**

All 3 domestic wells with protective levels above sea level are 60 years or older, 150 feet in depth or shallower, and are on parcels supplied water by either the SqCWD or SCWD. Although not confirmed, it is highly likely these wells are no longer used for domestic purposes since they are older than the typical supply well life expectancy and are within the service area of a public water system. The closest RMP to the domestic well with the highest protective level of 6 feet

amsl is 1,200 feet away from the domestic well and has a MT of 8.6 feet for depletion of interconnected surface water. Since groundwater levels in the area should not fall below the MT of 8.6 feet amsl, it is likely the domestic well will not experience groundwater levels lower than 6 feet amsl.

There will be minimal impacts to the few domestic wells on the coastal plain from groundwater levels falling to MTs. All known domestic wells on the coastal plain have protective levels below or just above nearby RMP MTs. The 3 wells with protective levels above MTs are on parcels served water by either SqCWD or SCWD, which allows those well owners who still use their wells for domestic purposes to use public water supplies if their wells are impacted.

3.1.3 Dry Well History

The Basin has had no dry wells reported in the DWR Dry Well Reporting System[2]. Until recently, there has been no formal dry well reporting program in Santa Cruz County. As an indicator of potential dry wells, the County's permit records were examined. Permit records for domestic wells are summarized in Table 3-3. According to the number of domestic wells in the Basin compared to the County, the Basin has approximately 56% of the County's domestic well permits. Since Table 3-3 summarizes well permits issued for the whole County, it is a fair assumption that just over half the wells are in the Basin.

Table 3-3. History of Domestic Well Permts in Santa Cruz County

Period	Average Number of Well Permits per Year
2018 – 2022 current	7 new domestic well permits per year 21 supplemental/replacement domestic well permits
2012 – 2015 drought	Not a significant increase from current average number of permits (2018 – 2022)
1990 – 1992 drought	155 permits per year
1975 – 1977 drought	400 total permits in 1977

Source: Santa Cruz County (2023)

The most recent drought (2012 – 2015) did not result in an increase in well permit applications indicating domestic wells were not impacted by the drought (Table 3-3). Groundwater level data over the drought support the permit data since inland groundwater levels in the Basin over the 2012 – 2015 drought only declined by 4 to 16 feet (Figure 3-4 and Figure 3-5), while closer to the coast and in the area of municipal extraction, groundwater levels increased in response to reduced groundwater extraction (Figure 3-8).

3.1.4 Land Use

Domestic wells in the Basin are predominantly (75%) located in areas designated as rural residential in the County's General Plan. About 14% of domestic wells are in areas designated as open space, parks, agriculture, or institutional camps. The remaining 11% of domestic wells

[2] https://data.cnra.ca.gov/dataset/dry-well-reporting-system-data

are in areas designated as suburban or urban residential; these residential areas are generally served water by either the City of Santa Cruz, SqCWD, or Central Water District. Figure 3-9 shows the location of permitted domestic wells in relation to land use and public water services.

A basic land use policy of the County is to separate urban and rural areas. A distinct boundary between urban and rural areas serves to encourage new development to locate in urban areas and protect agricultural land and natural resources in the rural areas. The overall goals of the Land Use Element of the General Plan for Rural Residential Siting and Density are to achieve patterns of rural residential development that are compatible with the physical limitations of the land, the natural and cultural resources of the County, the availability of public services, and protection of the natural environment. The application of this system results in densities that are appropriate for the protection of resources in rural areas by assessing 9 criteria or factors which, when taken together, determine the development potential for a particular rural site. These factors include access, water supply, type of groundwater basin, timber resources, sensitive plant or animal habitats, erosion, potential seismic activity, landslide activity, and fire hazards.

In rural areas outside the Urban Services Line (USL) and Rural Services Line (RSL), the extensive presence of steep slopes, high fire hazard severity zones, landslide hazards, fault zones, and sensitive habitats make much of the rural area ill-suited to large-scale development and also make the provision of urban-level services such as sewer, public water, and urban fire protection very challenging.

As part of the Santa Cruz County's 2023 Housing Element[3], which is 1 of the 10 State-mandated "elements" or chapters of the County's General Plan, the County has been allocated 4,634 housing units at specific affordability levels to accommodate the County's projected housing needs by 2031. This allocation is the County's Regional Housing Needs Assessment. The Housing Element must identify "adequate sites" to accommodate this estimated growth. The 2023 Housing Element inventoried both urban and rural sites to fulfill the mandate, however, capacity for additional units is focused on USL where transportation and services can be easily accessed.

Factors influencing the County's Rural Residential Siting and Density and capacity for additional housing units being focused within the USL indicate that changes in land use in the rural, mostly mountainous, areas of the Basin are unlikely to cause density increases. Without increased rural density, rural demands on groundwater will remain similar to current demands and the balanced hydrogeologic conditions in the inland areas of the Basin will be maintained.

[3]https://www.sccoplanning.com/Portals/2/County/Planning/policy/2023HousingElement/SCCO%202023%20Housing%20Element%202-14-24%20COMPLETE.pdf?ver=H-zXR7sxGck4rCDxnezAow%3d%3d

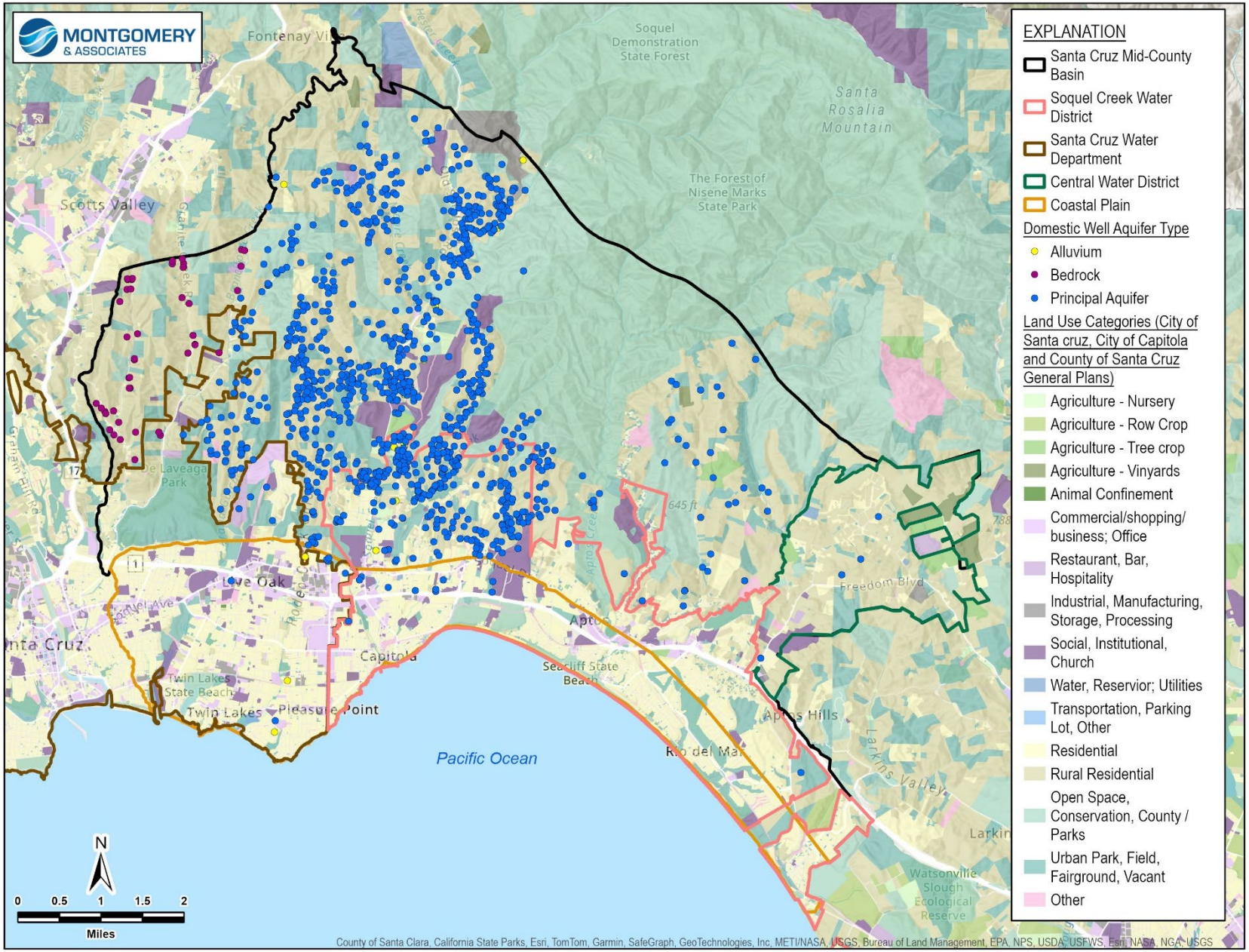

Figure 3-9. Land Use and Domestic Well Locations

3.1.5 Domestic Well Owner and Small Water System Support

If domestic-use well owners or small water systems experience adverse impacts to their ability to pump groundwater from their wells due to declining groundwater levels during times of drought, there are County-led plans to provide assistance. The County is a member agency of the MGA and has involved the MGA representatives in drafting the plans discussed below.

3.1.5.1 County Drought Response and Outreach Plan

California Governor Gavin Newsom signed Senate Bill (SB) 552 into law on September 21, 2021. Among other things, SB 552 places the drought and water shortage planning responsibility on counties for State Small Water Systems (SSWS) and domestic wells within the county's jurisdiction. In response to SB 552, the Santa Cruz County Board of Supervisors adopted the Drought Response and Outreach Plan (DROP) as part of the Climate Action and Adaptation Plan on December 13, 2022. The DROP is available on the County's website[4].

To meet Chapter 3 of SB 552 which states that "a county shall establish a standing county drought and water shortage task force to facilitate drought and water shortage preparedness for SSWSs and domestic wells within the county's jurisdiction…", Santa Cruz County opted to use its Water Advisory Commission (Commission) as the required task force. The Commission was established in 1975 and is responsible for advising the Santa Cruz County Board of Supervisors on water related issues. To achieve the goal of a comprehensive and inclusive plan, the Commission formed a Subcommittee to include outside agencies and interested parties. This Subcommittee, known as the Drought Response Working Group, comprises the following:

- 3 Water Advisory Commission representatives, including a small water system representative
- Pajaro Valley Water Management Agency
- Santa Cruz Mid-County Groundwater Agency
- Santa Margarita Groundwater Agency
- Disadvantaged Communities (Rural Community Assistance Corporation representative)
- At-Large Environmental
- At-Large Public

The DROP describes the County's plans to improve data collection and provide resources to domestic well owners and small water systems, with a focus on SSWSs. The DROP uses the term "small water systems (SWS)" as a catch-all for situations that apply to both SSWSs and Small Public Water Systems.

[4] https://scceh.com/Portals/6/Env_Health/water_resources/NEW%20WAC/Drought%20Working%20Group/DroughtResponseOutreachPlan_Final.pdf

In addition to many of the same vulnerabilities faced by domestic wells, small water systems are further stressed by deferred maintenance, existing and upcoming regulations, and minimal reserve funding. The DROP also focuses on the County's role assisting residents who rely on wells and small water systems during emergencies. Drought is the primary focus of the legislation, however other emergencies such as wildfire are also included.

A Domestic Well Drought Mitigation Plan included in the DROP intends to build resiliency and prepare for potential drought-related impacts to private domestic wells. Mitigation plan development included assessment of the County population that relies on domestic wells, planning for outreach and education, a preliminary vulnerability assessment, and identification of well mitigation strategies that can be implemented to provide water in the short-term (i.e., interim strategies) and long-term (i.e., permanent strategies).

The DROP includes a Small Water Systems Support Plan to promote drought resiliency in small community water systems. In Santa Cruz County, the average depth of SSWS wells is 291 feet, which is significantly shallower than large water systems. Shallower wells are more vulnerable to contamination and lowered levels during drought than larger public supply wells. The small populations served by these systems also make the relative cost for repairs and system upgrades higher for each individual customer. At the same time, these systems must meet increasingly strict regulatory requirements, adding further costs beyond those for domestic well owners. The SWS Support Plan is intended to help these systems navigate coming challenges by providing emergency support and also assistance with taking proactive steps to build resiliency and avoid emergency situations. The SWS Support Plan includes interim and permanent outreach, education, and water accessibility strategies for the County to mitigate drought impacts on SWS.

The County has secured funding that can provide help for private and SWS wells impacted by drought. Through this funding, the County can provide up to 50 gallons of bottled water per person per month or 3,800 gallons of hauled water per household every 6 weeks, at no cost, to private well owners whose well has gone dry due to drought (though income restrictions may apply). To receive this assistance, well owners need to report their dry well through the State's Dry Well Reporting System[5]. County staff will review the report to determine if the well is likely to have gone dry or if there is another issue causing the well to stop producing water. If the well is likely dry, County staff will coordinate with the well owner and the water hauler to fill onsite storage tanks while a long-term solution is pursued, for the duration of the grant period.

Historically, some wells in the mountainous areas of the Basin can temporarily dry up during severe drought but after good rains they usually start producing again. As described above, the County has funding to provide emergency supplies for private and small water system wells impacted by drought. If a long-term solution is needed, the first option is for the County to assist the well owner to connect to an existing public water system, if feasible. The second option is for

[5] https://mydrywatersupply.water.ca.gov/report/

the County to use SWRCB Safe and Affordable Funding for Equity and Resilience (SAFER) funds if available and eligible.

3.1.5.2 Online Resources for Domestic Well Owners and Small Water Systems

The MGA provides a link on its website for domestic well owners and small water systems to be able to directly access the County's online resources:

- Drought preparedness for Private Wells https://www.scceh.org/NewHome/Programs/WaterResources/DroughtResponse/HouseholdWellAssistance.aspx
- Drought preparedness for Small Water Systems https://www.scceh.org/NewHome/Programs/WaterResources/DroughtResponse/DroughtPreparednessSmallWaterSystems.aspx

3.1.5.3 Well Registration

The County does not have a well registration program but rather they have developed a Countywide Well Geodatabase from multiple sources such as County and city well permits and DWR's Online System of Well Completion Reports (OSWCR).

The County has a County Drought Resilience Planning 2023 Grant to improve its Well Geodatabase by adding OSWCR data, improving well location information including associated parcel, and adding other pertinent information such as well screen and seal depth if missing. Work on improving the Well Geodatabase will start in 2024 and continue for 2 years.

3.1.6 Conclusion Regarding Whether a Plan Amendment is Needed

The mountainous nature and stacked, dipping aquifer systems of the inland portions of the Basin, where most domestic wells are found, precludes using the typical method of identifying and quantifying groundwater level MT impacts on domestic wells. These inland areas are characterized by relatively balanced groundwater conditions and stable demand which is validated by no dry wells being reported during the recent droughts and regulated rural land use that will not increase groundwater demand. Domestic wells in the inland areas are unlikely to be impacted because, firstly, groundwater levels in these areas are well above MTs and are not expected to fall to MTs for the aforementioned reasons, and secondly, MTs are based on the depths of the shallowest wells in close proximity to RMPs. On the coastal plain, a domestic well impact analysis is feasible because the topography is flatter. Parcels on the coastal plain are supplied water by public water systems and accordingly there are only 14 domestic wells. Comparing domestic well protective levels 30 feet above the bottom of the wells to nearby RMP MTs shows there will be minimal well impacts because protective levels are below or a few feet above nearby RMP MTs.

Should domestic well owners experience drought impacts to their wells, the County has developed a Drought Response and Outreach Plan to support domestic or small water system

well owners. Additionally, to better track impacts to domestic wells, the County is continuing to update and refine well inventories and dry well replacements as new permits are issued.

No Plan amendment is needed since the response to the RCA is explanatory and does not lead to any GSP revisions.

4 GROUNDWATER CONDITIONS RELATIVE TO SUSTAINABLE MANAGEMENT CRITERIA

Groundwater conditions are evaluated routinely to ensure groundwater resources are being managed sustainability for all beneficial uses and users. This section describes the sustainability goals, sustainability approach, and metrics used to evaluate groundwater sustainability. Subsections for each sustainability indicator follow with an evaluation of groundwater conditions relative to SMC and whether the indicator is on track to achieve sustainability.

4.1 Sustainability Goal

As stated in the GSP, the MGA's sustainability goal is to manage the groundwater basin to ensure beneficial uses and users have access to a safe and reliable groundwater supply that meets current and future Basin demand without causing undesirable results to:

- Ensure groundwater is available for beneficial uses and a diverse population of beneficial users
- Protect groundwater supply against seawater intrusion
- Prevent groundwater overdraft within the Basin and resolves problems resulting from prior overdraft
- Maintain or enhance groundwater levels where groundwater dependent ecosystems exist
- Maintain or enhance groundwater contributions to streamflow
- Support reliable groundwater supply and quality to promote public health and welfare
- Ensure operational flexibility within the Basin by maintaining a drought reserve
- Account for changing groundwater conditions related to projected climate change and sea level rise in Basin planning and management
- Do no harm to neighboring groundwater basins in regional efforts to achieve groundwater sustainability

4.2 Sustainability Approach

The MGA is managing the Basin to achieve sustainability in an uncertain future climate. Aquifers used for water supply and other beneficial uses are susceptible to drought, impacts from sea level rise, and other unforeseen effects due to climate change. Climate change is expected to result in longer and more intense droughts, fewer but greater intensity rainfall events, and warmer temperatures. Consequently, the MGA must promote aquifer recharge during wet years so groundwater supply is available during drier years while ensuring beneficial uses and users are not affected. Sea level rise may cause seawater intrusion if groundwater

levels are allowed to decline relative to the seawater interface. Sea level is expected to rise globally, with about 2.3 feet of rise along the Basin's coastline between 2000 and 2070. The MGA established protective groundwater elevations near the coast that ensure groundwater levels remain above rising sea level.

The MGA adaptively manages the Basin by evaluating groundwater conditions relative to SMC and implementing PMAs that prevent undesirable results from occurring. PMAs are being implemented to help the Basin achieve groundwater sustainability by 2040, as discussed in more detail in Section 5. Group 1 management actions promote water conservation, sustainable land use, and water use efficiency, and optimization of groundwater extraction. Group 1 projects pre-exist SGMA in some cases and are already helping to stabilize groundwater conditions. Group 2 projects will accrue benefits by recharging the coastal aquifers and increasing coastal groundwater levels to achieve sustainability. Two Group 2 projects, ASR and PWS, are nearing the end of their planning and construction phases, respectively, so benefits have yet to accrue.

4.3 Sustainability Indicators

There are 6 sustainability indicators required by SGMA to have SMC. The SMC include the MT, measurable objective (MO), interim milestones (IMs), and undesirable results (UR). The MT is the point at which significant and unreasonable conditions, or undesirable results, may start to occur. The MO is a goal designed to provide operational flexibility and ensure that future droughts and unforeseen changes to water supplies do not cause unsustainable conditions. The MOs are set at conditions that generally improve groundwater conditions from their pre-SGMA condition, especially where potential vulnerability to chronic lowering of groundwater levels, seawater intrusion, and depletion of interconnected surface water exists. IMs are 5-year incremental goals to help the MGA manage the Basin to achieve sustainability by 2040.

In general, the MGA strives to reach sustainability by achieving the following conditions for the 6 sustainability indictors:

Chronic Lowering of Groundwater Levels: Do not allow groundwater levels to decline to a level that no longer supports beneficial uses such as agricultural, industrial, private, and municipal.

Seawater Intrusion: Prevent seawater from moving farther inland than was observed from 2013 to 2017. Seek to maintain groundwater levels in coastal monitoring wells at levels that prevent further seawater intrusion.

Depletion of Interconnected Surface Water: Ensure there is no more surface water depletion due to groundwater extraction than prior to 2015 in interconnected streams supporting priority species.

Degradation of Groundwater Quality: Maintain groundwater quality so that no state drinking water standard is exceeded in any representative monitoring well as a result of groundwater pumping or managed aquifer recharge.

Reduction of Groundwater in Storage: Achieve net groundwater extraction goals, accounting for water added to storage through managed aquifer recharge projects, so other sustainability indicators aren't negatively affected.

Land Subsidence: Prevent land subsidence from occurring. Consolidated sandstone aquifers are not susceptible to subsidence, so land subsidence is not an applicable sustainability indicator in the sedimentary bedrock aquifers that provide the Basin's groundwater supply.

4.4 Chronic Lowering of Groundwater Levels

Chronic lowering of groundwater levels occurred in parts of the Basin but was being addressed and reversed through management actions prior to SGMA. In the late 1980's, groundwater levels in parts of the Basin were up to 150 feet lower than they are currently. Even at these lower levels, extraction wells were still able to extract groundwater for beneficial uses. Although groundwater users did not lose significant capacity when groundwater levels declined, those lower groundwater levels induced seawater intrusion which is the primary reason the Basin is classified as critically overdrafted. The MGA member agencies started planning and implementing PMAs before passage of SGMA to prevent further chronic lowering of groundwater levels and seawater intrusion.

Per the GSP, chronic lowering of groundwater levels is considered significant and unreasonable when the following occurs:

> *A significant number of private, agricultural, industrial, and municipal production wells can no longer provide enough groundwater to supply beneficial uses.*

The SMC for chronic lowering of groundwater levels are designed to maintain groundwater levels at or above 2020 levels to provide operational flexibility and avoid significant and unreasonable conditions during future droughts or other operational challenges. The SMC are also designed to avoid impacts related to other sustainability indicators, such as seawater intrusion, depletion of interconnected surface water, and reduction of groundwater in storage. SMC for chronic lowering of groundwater levels are summarized in Table 4-1.

Table 4-1. Summary of Sustainable Management Criteria for Chronic Lowering of Groundwater Levels

Sustainable Management Criteria	Description
Minimum Threshold	The groundwater elevation required to meet the typical overlying water demand in the shallowest well in the vicinity of the RMP
2025 Interim Milestone	Same as measurable objectives
Measurable Objective	75th percentile of historical groundwater elevations for the period of record of each monitoring point
Undesirable Results	Any average monthly representative monitoring point's groundwater elevation falls below its minimum threshold

In the mountainous inland portion of the Basin, unconfined aquifer groundwater levels respond relative to annual precipitation. Coastal groundwater levels in the semi-confined to confined Purisima aquifers, which provide most of the supply for municipal use, do not typically show a clear response to precipitation because of their distance from recharge areas, depth, and confinement. Instead, groundwater levels in coastal aquifers respond more directly to changes in groundwater extraction. From WY 2005 to WY 2014, reduced extraction in coastal aquifers has increased groundwater levels. Since WY 2015 there has been historically low groundwater extraction, but groundwater levels have stabilized and not continued to increase. Stabilized groundwater levels indicate inflows and outflows are balanced. The WY 2023 Annual Report (M&A, 2024b) includes hydrographs showing historical groundwater elevations for all RMPs; hydrographs for an inland and coastal example RMP are provided in the following subsection.

4.4.1 Current Groundwater Level Conditions Relative to Sustainable Management Criteria

Groundwater levels respond to climate and extraction differently in each of the Basin's principal aquifers depending on depth, confinement, and distance from the coast. While precipitation readily recharges groundwater in inland unconfined aquifers, coastal groundwater levels in the semi-confined to confined Purisima aquifers do not typically show a clear response to annual changes in recharge from precipitation. In coastal confined aquifers, groundwater levels respond more directly to changes in groundwater extraction than precipitation. A representative groundwater level hydrograph for an inland RMP screened in the Purisima F unit is shown on Figure 4-1.

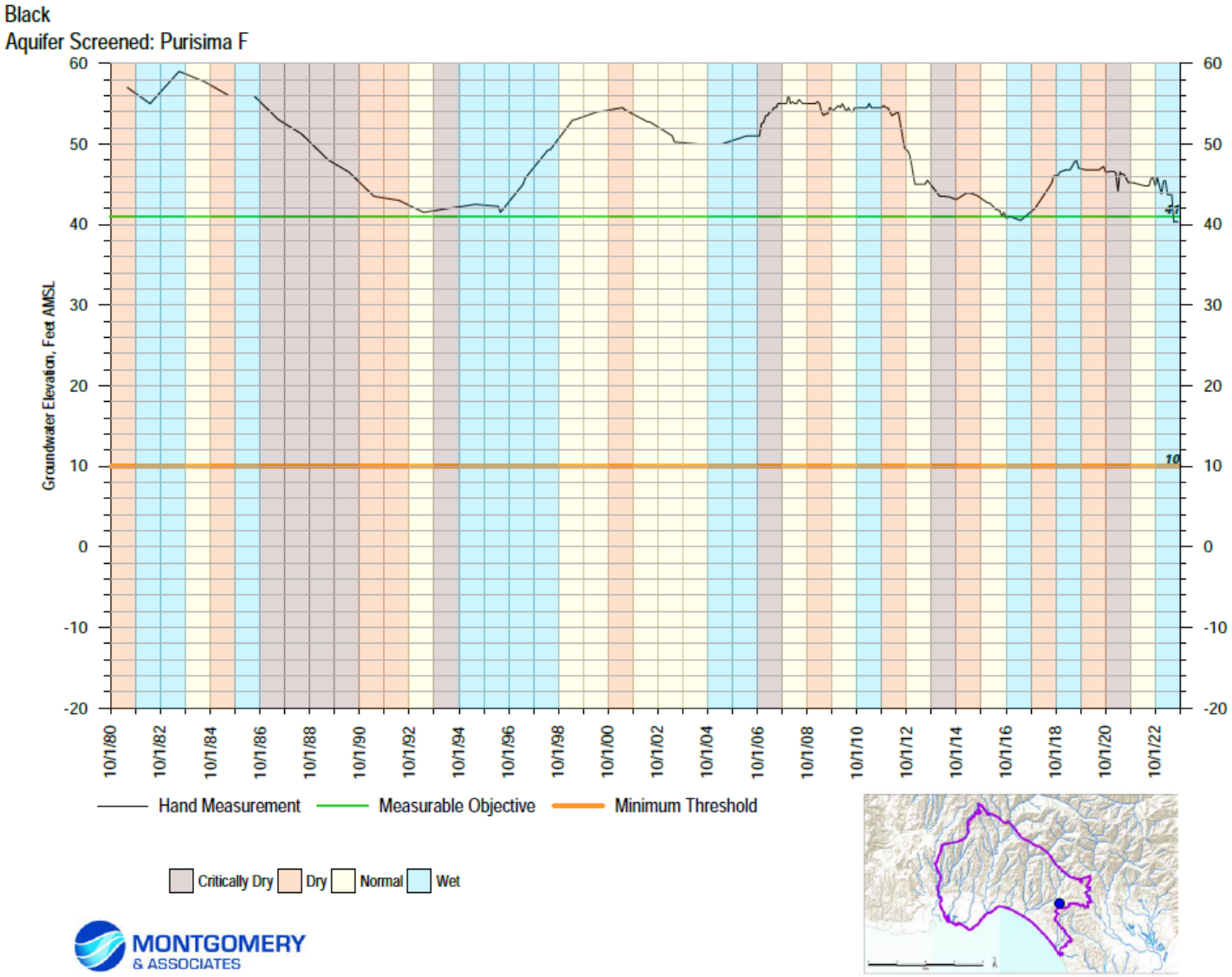

Figure 4-1. Example Inland Groundwater Level Hydrograph

Groundwater level trends in aquifers directly recharged by precipitation have been variable during the evaluation cycle because precipitation has been variable. The start of the evaluation cycle in WY 2019 was wetter than average, WY 2020 through WY 2022 was 1 of the drier 3-year periods on record, and WY 2023 was wetter than most years. Groundwater level declines during the WY 2020 to WY 2022 dry period were offset by some groundwater level recovery in wet WY 2023. However, groundwater levels remain slightly lower in most shallow wells that are directly influenced by precipitation in WY 2023 than the start of the evaluation cycle in WY 2019.

Groundwater levels in deeper confined aquifers near the coast continue to increase from historical lows in the 1980s as municipal groundwater extraction has decreased over time (see Section 6.3.1 for discussion of historical water use). Groundwater level trends are similar year to year based on water demands with higher groundwater levels in the winter and spring and lower levels in the summer and fall. During the evaluation cycle, extraction was relatively stable with slightly more extraction in dry years WY 2020 to WY 2022 than wet years WY 2019 and WY 2023. Similarly, coastal groundwater levels were relatively stable from year to year, with slightly lower levels in dry years than wet years, as shown in the representative coastal hydrograph on Figure 4-2.

The chronic lowering of groundwater level RMPs discussed in this section consist of both inland and coastal wells. Many coastal groundwater monitoring wells are also used as a proxy for evaluating seawater intrusion (see Section 4.5.1).

Groundwater levels in RMPs are generally in the operational range above MTs and below the 2025 IM and MOs, which are the same for this sustainability indicator. Since MT exceedances are not occurring, undesirable results are also not occurring. The MO was met at 4 of 16 RMPs in WY 2019 but has since declined slightly below the MO in these 4 RMPs. The RMP's minimum monthly average groundwater levels in WY 2023 relative to MTs, MO, and IMs are summarized in Table 4-2 for each aquifer.

Groundwater level changes and trends are assessed to evaluate if the Basin is on-track to achieve sustainability by 2040. Figure 4-3 shows RMP groundwater levels during the evaluation cycle relative to the MT. The graph shows how the range (blue bar), median (dark blue dot), and WY 2023 minimum monthly average groundwater levels (light blue dot) during the evaluation cycle compared to the SMC; MT (red line), range of operational flexibility between MT and MO (yellow bar), and MO (green line). Despite drier than average conditions and delayed implementation of PWS and ASR to benefit coastal aquifers, reduced groundwater extraction during the evaluation cycle helped keep groundwater levels above the MT in all wells. Between WY 2019 and WY 2023, each RMP was above or close to the MO at some point and about half the median monthly average groundwater levels were above or close to the MO.

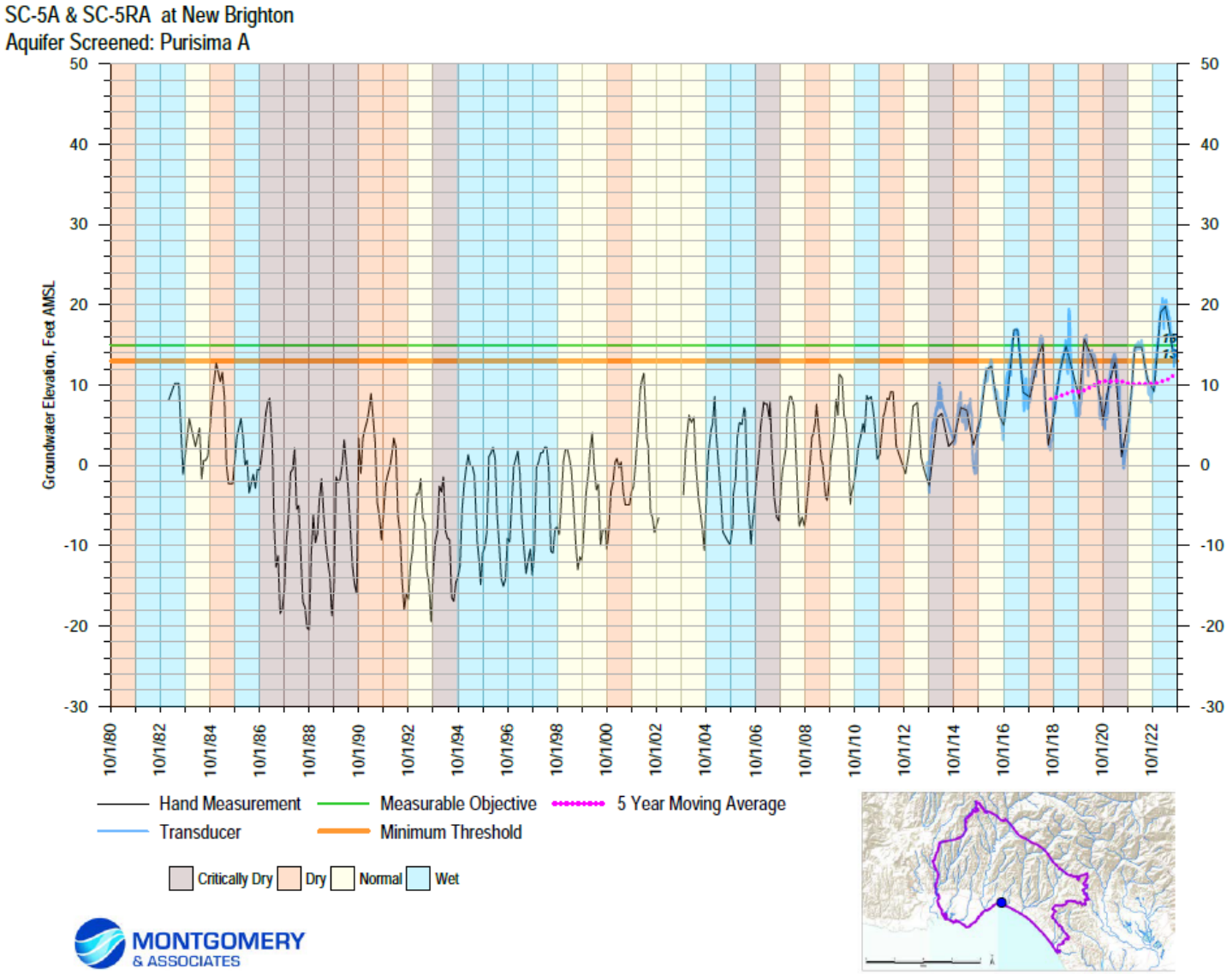

Figure 4-2. Example Coastal Groundwater Level Hydrograph

Table 4-2. Summary of Chronic Lowering of Groundwater Levels Sustainable Management Criteria Achievement as of Water Year 2023

Aquifer	Number of Representative Monitoring Points (RMP)	Number and Percentage of RMP Meeting Sustainable Management Criteria			Undesirable Results
		Minimum Threshold	Interim Milestone 2025	Measurable Objective	
Aromas	1	1 (100%)	0 (0%)	0 (0%)	0 (0%)
Purisima F	4	4 (100%)	0 (0%)	0 (0%)	0 (0%)
Purisima DEF	2	2 (100%)	0 (0%)	0 (0%)	0 (0%)
Purisima BC	3	3 (100%)	0 (0%)	0 (0%)	0 (0%)
Purisima A	2	2 (100%)	0 (0%)	0 (0%)	0 (0%)
Purisima AA	2	2 (100%)	0 (0%)	0 (0%)	0 (0%)
Tu	2	2 (100%)	0 (0%)	0 (0%)	0 (0%)
	Total	**16 of 16 (100%)**	**0 of 16 (0%)**	**0 of 16 (0%)**	**0 of 16 (0%)**

RMP groundwater level changes and trends are evaluated using the most recent data and hydrographs summarized in the WY 2023 Annual Report (M&A, 2024b). Figure 4-4 is a map showing groundwater level trends for each RMP location between WY 2019 and WY 2023, with the applicable aquifer noted below the well name. Green upward facing triangles are RMPs with increasing trends, yellow diamonds are RMPs with stable trends, and red downward facing triangles are RMPs with decreasing trends. The figure labels also show the total change (in feet) of annual minimum monthly average groundwater level between WY 2019 and WY 2023.

Groundwater level trends vary across the Basin due to influences of extraction and precipitation recharge on each well. Four wells had decreasing groundwater levels during the evaluation cycle: 2 wells in inland and 2 closer to the coast in SqCWD's service area near where PWS is being implemented. The 2 inland RMPs with decreasing trends, Private Well #2 and SC-11B, rebounded to WY 2019 levels after the wet winter in WY 2023. Groundwater levels in coastal wells SC-19 in the Purisima BC unit and SC-23B in the Purisima DEF unit remained relatively low in WY 2023. Both SC-19 and SC-23B are inland of SqCWD supply wells. SC-23B groundwater levels decreased when a nearby supply well, Granite Way Well, came online in WY 2021 but levels remain above MTs. Two wells in the Tu unit near the City of Santa Cruz had slightly increasing groundwater levels with more than 2-foot total increase between WY 2019 and WY 2023. However, groundwater levels in both wells fluctuate over a relatively wide range over time (Figure 4-3). The other 10 RMP wells had relatively stable groundwater levels between WY 2019 and WY 2023 with levels increasing or decreasing less than 2 feet overall.

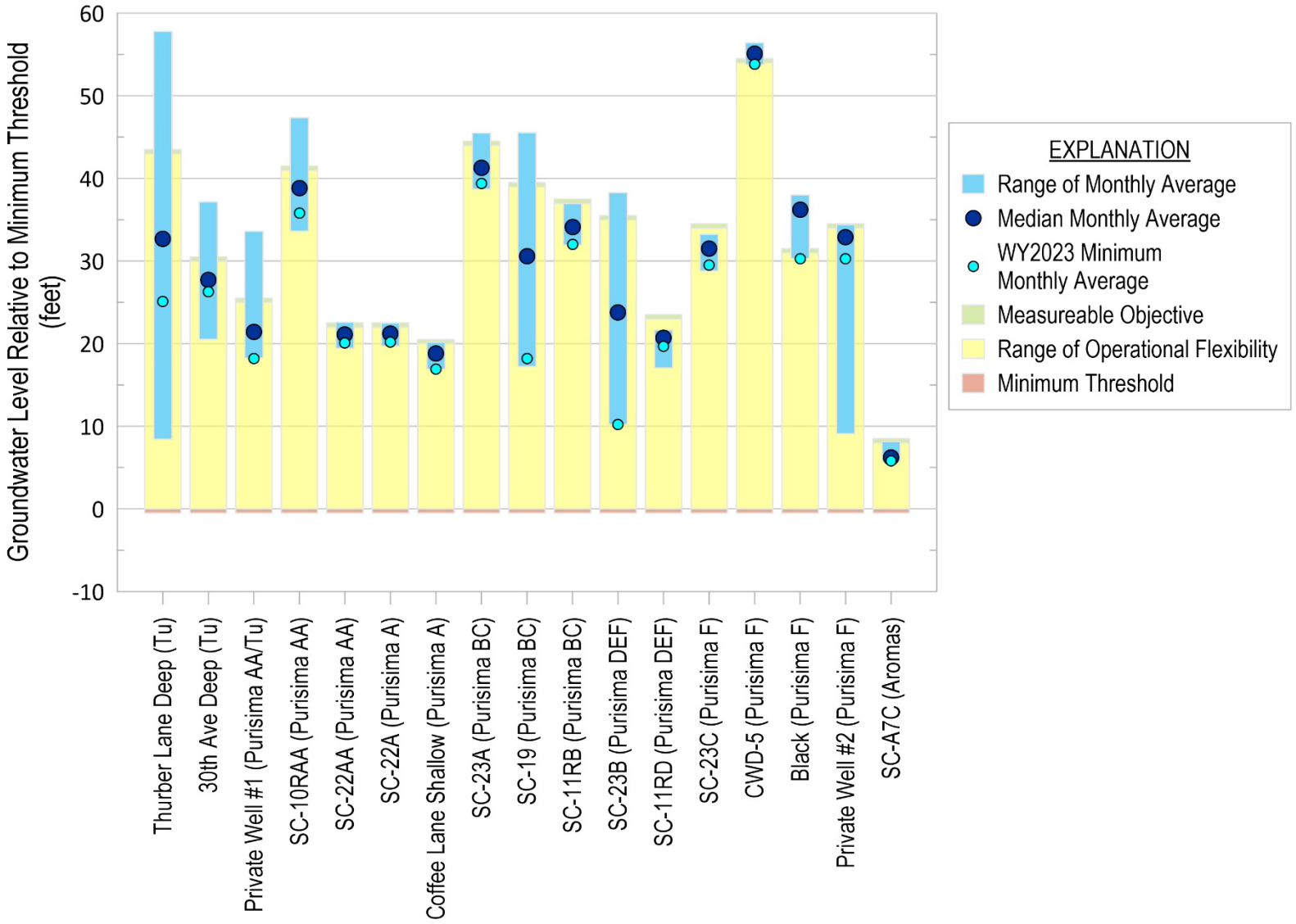

Figure 4-3. Groundwater Levels Relative to Minimum Thresholds and Measurable Objectives between Water Years 2019 and 2023

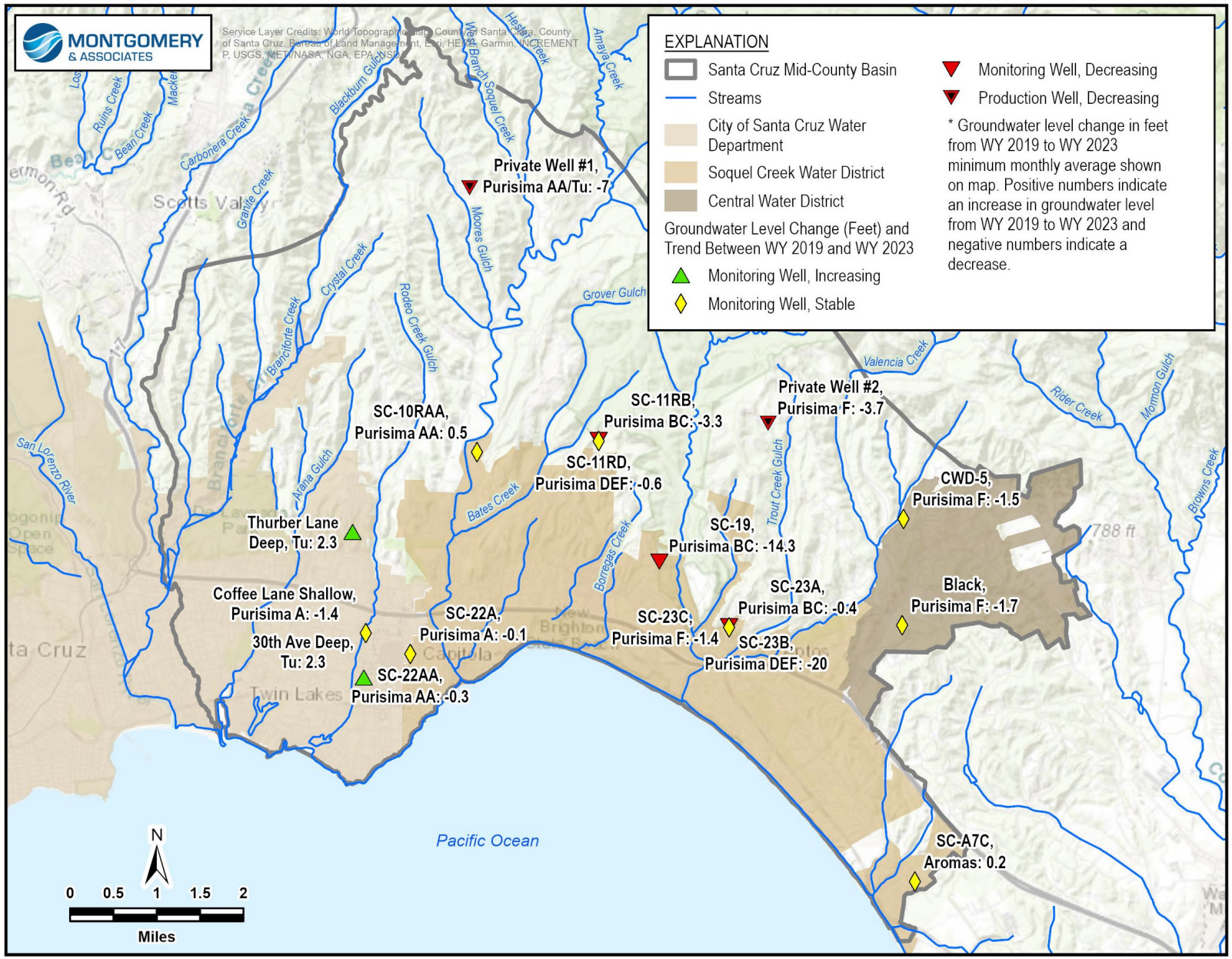

Figure 4-4. Groundwater Elevation Change and Trends between Water Years 2019 and 2023

RMP minimum monthly average groundwater levels in WY 2023 are compared to the MT and MO spatially to evaluate where SMC are being achieved or are close to being achieved and how much operational flexibility is currently available above the MT. Groundwater levels are shown relative to the MT spatially on Figure 4-5. Groundwater levels in all RMPs are currently above the MT. RMPs closer to their MT are shown in light yellow and further above the MT in dark yellow. Groundwater levels relative to the MO are shown on Figure 4-6, with groundwater levels closest to achieving the MO shown in light green and furthest from achieving the MO in dark green. Minimum monthly groundwater levels in WY 2023 are between 0.2 and 25 feet from achieving the MOs. Inland RMPs are generally far above the MT and close to the MO. Coastal RMPs are generally closer to MTs and further below MOs but will benefit from implementation of PWS and ASR.

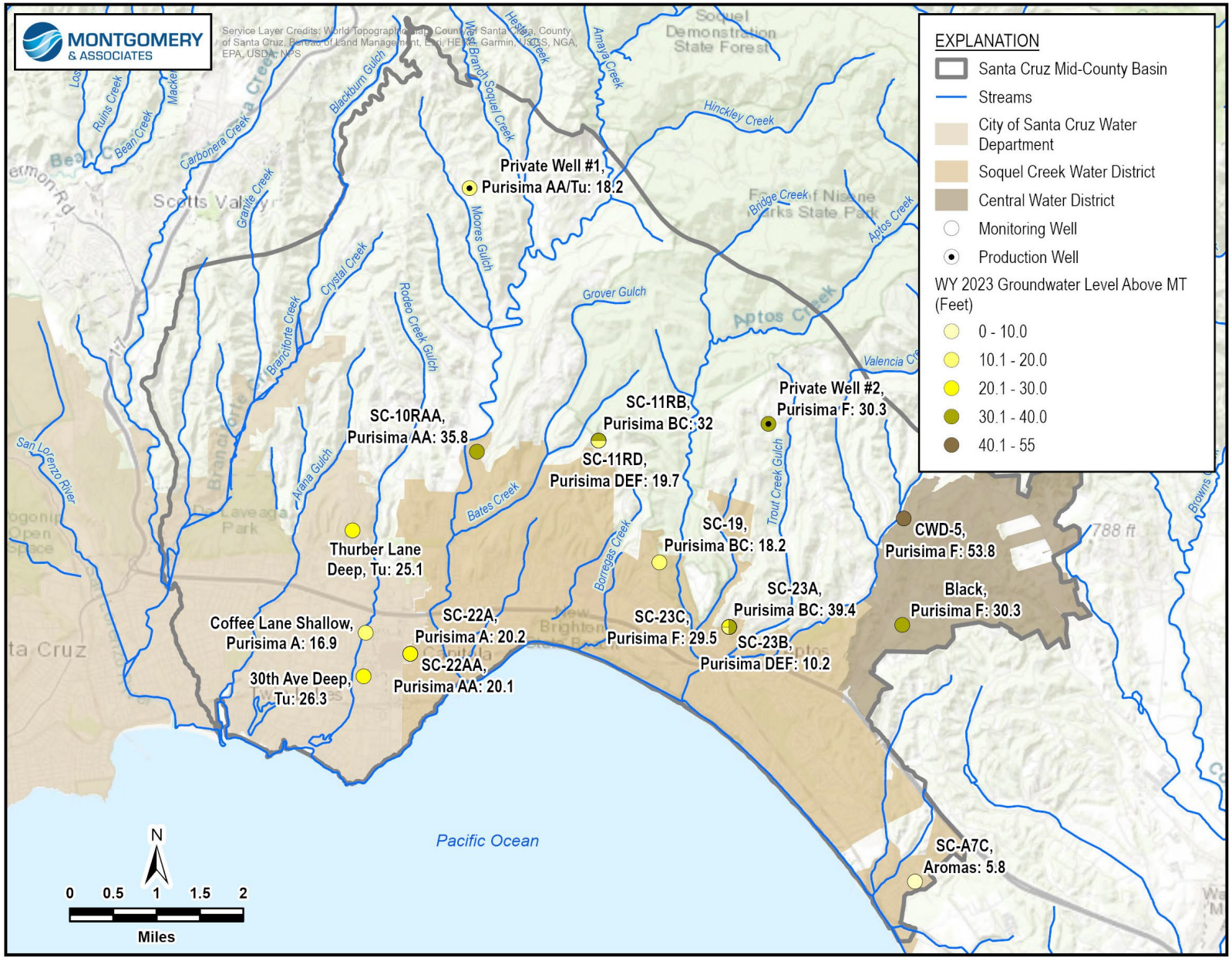

Figure 4-5. Water Year 2023 Minimum Average Monthly Groundwater Elevation Above Minimum Threshold

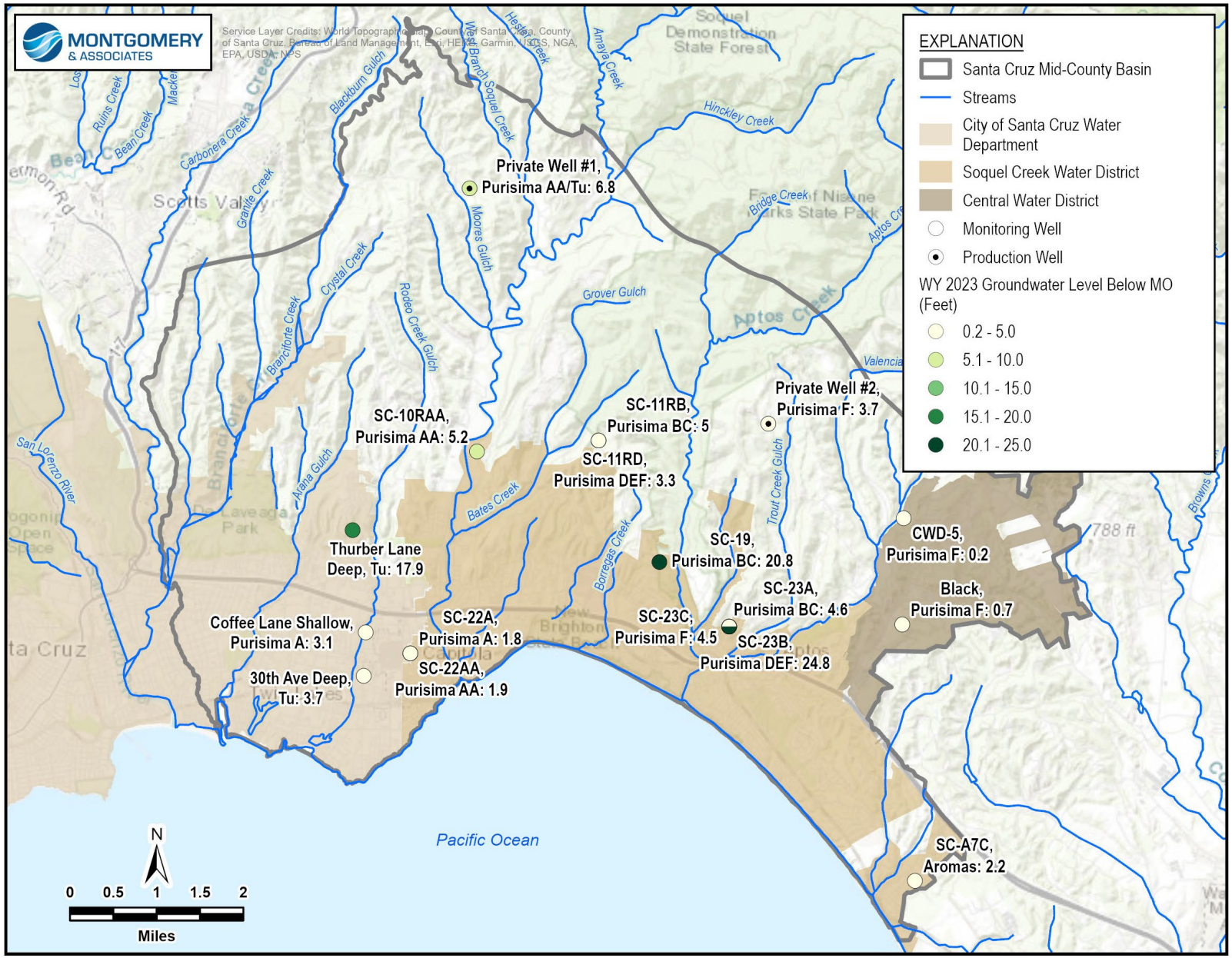

Figure 4-6. Water Year 2023 Minimum Average Monthly Groundwater Elevation Below Measureable Objectives

4.4.2 Evaluation of Chronic Lowering of Groundwater Levels Sustainable Management Criteria

The RCA addressed in Section 3 related to impacts to domestic wells if MTs are reached does not require any changes to MTs. Section 3 describes the mountainous nature and stacked, dipping aquifer systems of the inland portions of the Basin, where most domestic wells are found. The mountainous topography precludes use of the typical method of identifying and quantifying groundwater level MT impacts on domestic wells. Areas where most domestic wells are found have balanced groundwater conditions, stable demand, and no reported dry wells. Even if in the worst case scenario groundwater levels fall to MTs, impacts to domestic wells are unlikely to occur since MTs are based on the depths of the shallowest wells in close proximity to RMPs.

The MGA is currently on track to achieve chronic lowering of groundwater levels SMC and no SMC changes are needed. Implementation of PWS is projected to raise coastal groundwater levels to meet the MOs and achieve sustainability by 2040. Reaching MOs for the inland portions of the aquifer is dependent on climate. Historically, extraction in inland areas is relatively balanced with natural recharge; groundwater levels go down in dry periods but recover during wet periods. Since land use plans and topography limit development in inland areas, future groundwater levels are not expected to vary much from historical conditions. Unless future climate is substantially drier than conditions experienced historically, groundwater levels in inland areas should remain in the operational range above the MT during dry periods and recover to levels above the MO during wet periods. For these reasons there are currently no PMAs specifically planned to increase groundwater levels in inland areas.

4.5 Seawater Intrusion

Historically, seawater intrusion has been observed at Soquel Point in the Purisima A unit and has been consistently detected at deep monitoring wells in all coastal monitoring clusters in the Seascape area (in both Purisima F unit and Aromas Red Sands aquifers). Seawater intrusion is the primary reason the Basin is classified as critically overdrafted. Preventing seawater intrusion is the MGA's main sustainability focus. The MGA's member agencies began managing groundwater levels and implementing management actions to prevent further seawater intrusion prior to SGMA. Significant and unreasonable seawater intrusion defined in the GSP is as follows:

Seawater moving farther inland than has been observed from 2013 through 2017.

Seawater intrusion is monitored directly through chloride concentrations at wells and also using protective groundwater elevations as a proxy. The SMC for seawater intrusion are summarized in Table 4-3. Groundwater model simulations used in the GSP indicate that achieving protective groundwater elevations at the coast will prevent seawater intrusion. The simulations also indicate that achieving protective groundwater levels for seawater intrusion will also prevent undesirable results for other applicable sustainability indicators, with the exception of degraded

groundwater quality. Groundwater quality is not always related to groundwater levels and the model is also not constructed to simulate groundwater quality.

Table 4-3. Summary of Sustainable Management Criteria for Seawater Intrusion

Sustainable Management Criteria	Description
Minimum Threshold	Chloride concentrations: historical maximum concentration for intruded wells, 250 mg/L for unintruded coastal wells, 150 mg/L for unintruded inland wells
	Groundwater level as a proxy: 5-year average groundwater elevations below protective groundwater elevations for any coastal RMP: >70% of cross-sectional model simulations being protective against seawater intrusion for each monitoring well with available cross-sectional models; the Ghyzen-Herzberg method based on the elevation of the bottom of the RMP screen was used to estimate the protective elevation for wells that did not have a cross-sectional model available
2025 Interim Milestone	Chloride concentrations: Identical to MO.
	Groundwater level as a proxy: 5 year average of model simulated groundwater elevations in WY 2025
Measurable Objective	Chloride concentrations: 2013-2017 average chloride concentration for all intruded wells, 100 mg/L for unintruded inland wells
	Groundwater level as a proxy: 5-year average groundwater elevations below protective groundwater elevations for any coastal RMP; >99% of cross-sectional model simulations being protective against seawater intrusion for each monitoring well with available cross-sectional models; the Ghyzen-Herzberg method based on the elevation of the bottom of the specific aquifer was used to estimate the protective elevation for wells that did not have a cross-sectional model available
Undesirable Results	Chloride concentrations: 2 or more consecutive quarterly samples exceed MT
	Groundwater level as a proxy: 5-year moving average groundwater elevation below MT

4.5.1 Current Seawater Intrusion Conditions Relative to Sustainable Management Criteria

The WY 2023 chloride concentration meets the MT, 2025 IM, and MO in most seawater intrusion RMPs and concentration trends are generally stable or decreasing in most wells. The exception where increasing chloride trends and MT exceedances are being observed is the area near Seascape in the southeastern portion of the Basin. Consecutive MT exceedances at 4 RMPs in this area constitute an undesirable result. Seawater intrusion in the Seascape area is summarized below and in a technical memorandum prepared for the MGA (M&A, 2024a). Chloride concentrations relative to SMC are summarized by aquifer in Table 4-4.

Table 4-4. Summary of Seawater Intrusion Chloride Concentration Sustainable Management Criteria Achievement as of Water Year 2023

Aquifer	Number of Representative Monitoring Points (RMP)	Number and Percentage of RMP Meeting Sustainable Management Criteria			Number and Percentage of MT Exceedances but no Undesirable Results	Number and Percentage of RMP with Undesirable Results
		Minimum Threshold	Interim Milestone 2025	Measurable Objective		
Aromas	3	3 (100%)	1 (33%)	1 (33%)	0 (0%)	0 (0%)
Purisima F	8	3 (38%)	3 (38%)	3 (38%)	1 (12%)	4 (50%)
Purisima DEF	3	3 (100%)	3 (100%)	3 (100%)	0 (0%)	0 (0%)
Purisima BC	4	4 (100%)	4 (100%)	4 (100%)	0 (0%)	0 (0%)
Purisima A	9	9 (100%)	9 (100%)	9 (100%)	0 (0%)	0 (0%)
Purisima AA	7	7 (100%)	5 (71%)	5 (71%)	0 (0%)	0 (0%)
Tu	1	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Total	**28 of 33 (85%)**	**25 of 33 (76%)**	**25 of 33 (76%)**	**1 of 33 (3%)**	**4 of 33 (12%)**

Chloride concentrations and trends are assessed to evaluate if the Basin is on track to achieve seawater intrusion SMC by 2040. Chloride concentrations during the evaluation cycle relative to SMC are shown on Figure 4-7 for intruded coastal wells, Figure 4-8 for unintruded coastal wells, and Figure 4-9 for unintruded inland wells. The graph shows how the range (blue bar), median (dark blue dot), and WY 2023 maximum concentration (light blue dot) during the evaluation cycle compare to the SMC; MT (red line), range of operational flexibility between MT and MO (yellow bar), and MO (green line).

Chloride concentrations and trends are also evaluated using the data and chemographs presented in the WY 2023 Annual Report (M&A, 2024b). Figure 4-10 is a distribution map of chloride trends for each RMP location between WY 2019 and WY 2023, with the applicable aquifer noted below the well name. Red upward facing triangles are RMPs with increasing trends, yellow diamonds are RMPs with stable trends, and green downward facing triangles are RMPs with decreasing trends. The figure labels also show the total change in chloride concentration between WY 2019 and WY 2023.

Chloride concentrations in WY 2023 are compared to the MT and MO spatially to evaluate where SMC are being achieved or are close to being achieved and how much operational flexibility is currently available below the MT. Chloride concentration is shown relative to the MT spatially on Figure 4-11. RMPs that meet the MT are shown in yellow, with darker shades further below and lighter shades closer to the MT. RMPs at higher concentration than the MT are shown in orange if closer to the MT and red if further above the MT. Chloride concentration relative to the MO is shown on Figure 4-12, with concentrations below the MO in green, slightly above the MO in light yellow, and further above the MO in dark yellow.

Collectively these figures show that other than the Seascape area, chloride concentrations are generally meeting their SMC and trending toward sustainability. Increasing chloride concentrations above the MT are noted in 5 Purisima F unit RMPs (SC-A5A, SC-A5B, SC-A8A, SC-A2RA, and SC-A2RB) all in the Seascape area.

Increasing chloride trends in the Purisima F unit intermediate zones (SC-A5B and SC-A2RB) may be associated with an upward vertical gradient of high chloride groundwater observed in deeper zones (SC-A5A and SC-A2RA). It is uncertain what impact wells pumping from the overlying Aromas aquifer in the Seascape area have on observed chloride increases. Private pumping includes irrigation wells for large landscape by a homeowner association, private agriculture, and a camp; SqCWD pumps the Seascape well for municipal supply. Inland and north of the Seascape area, SqCWD operates the San Andreas and Bonita municipal supply wells, which extract primarily from the Aromas aquifer. Pumping at the Seascape well has been reduced to less than 50 acre-feet per year (AFY) with an average annual groundwater pumped of 31 AFY from 2016 to 2023. It is estimated the local private wells combined pumped an average of 108 AFY over the same period (M&A, 2024a). Increasing chloride is occurring in this already intruded area despite Purisima F unit coastal monitoring well SC-A2RA meeting the protective groundwater elevation MT. Additional analysis is being conducted by the MGA to better understand pumping operations and dynamics, groundwater geochemistry, and to potentially delineate the onshore extent of seawater intrusion using ground-based electromagnetic surveys. In the future, SqCWD plans to further reduce municipal pumping from the Aromas aquifer with operation of PWS to help mitigate advancement of seawater intrusion.

Other than the Seascape area, chloride is consistently less than MOs throughout the Basin and concentration trends are either stable or decreasing. The only other RMP with a recent increasing chloride trend is Purisima AA unit Soquel Point Deep, which is in an intruded portion of the Basin. Chloride concentration steadily increased in this well from 2004 to 2019 but has since stabilized around 150 mg/L, which is above the MO of 100 mg/L and below the MT of 250 mg/L. The chloride concentration in this well's intruded shallower counterpart in the Purisima A unit Soquel Point Medium, has steadily decreased in concentration over the same timeframe from about 1,300 mg/L to 1,000 mg/L and is below its MO. Neighboring wells Moran Lake Deep and Medium also have stable or decreasing chloride trends. Moran Lake Deep routinely has concentrations between 50 and 70 mg/L and Moran Lake Medium has a notable decreasing trend from 700 mg/L in 2004 to about 50 mg/L currently. ASR is designed to protect this area of the Basin from additional seawater intrusion.

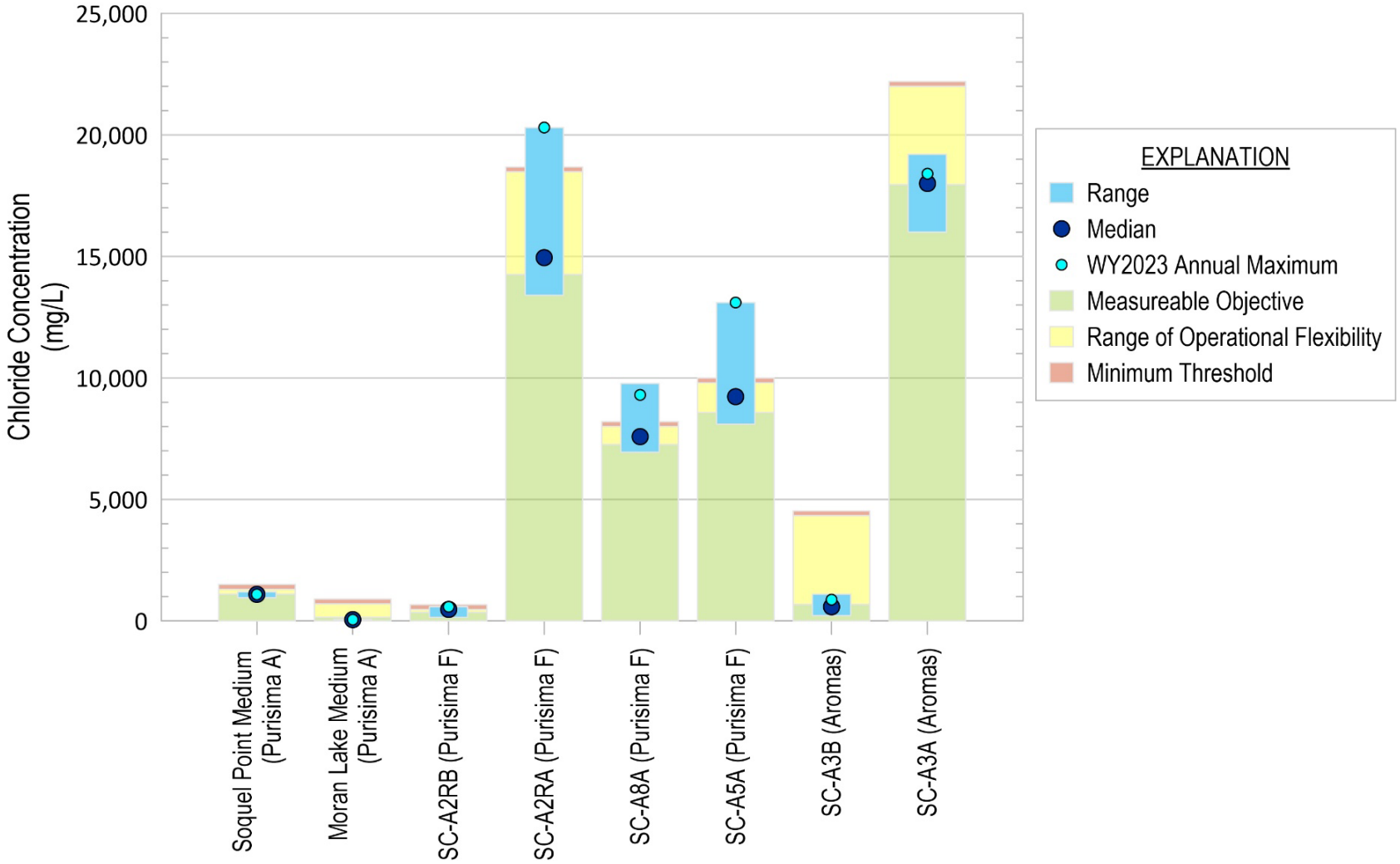

Figure 4-7. Chloride Concentration Relative to Minimum Thresholds and Measurable Objectives in Coastal Intruded Representative Monitoring Wells between Water Years 2019 and 2023

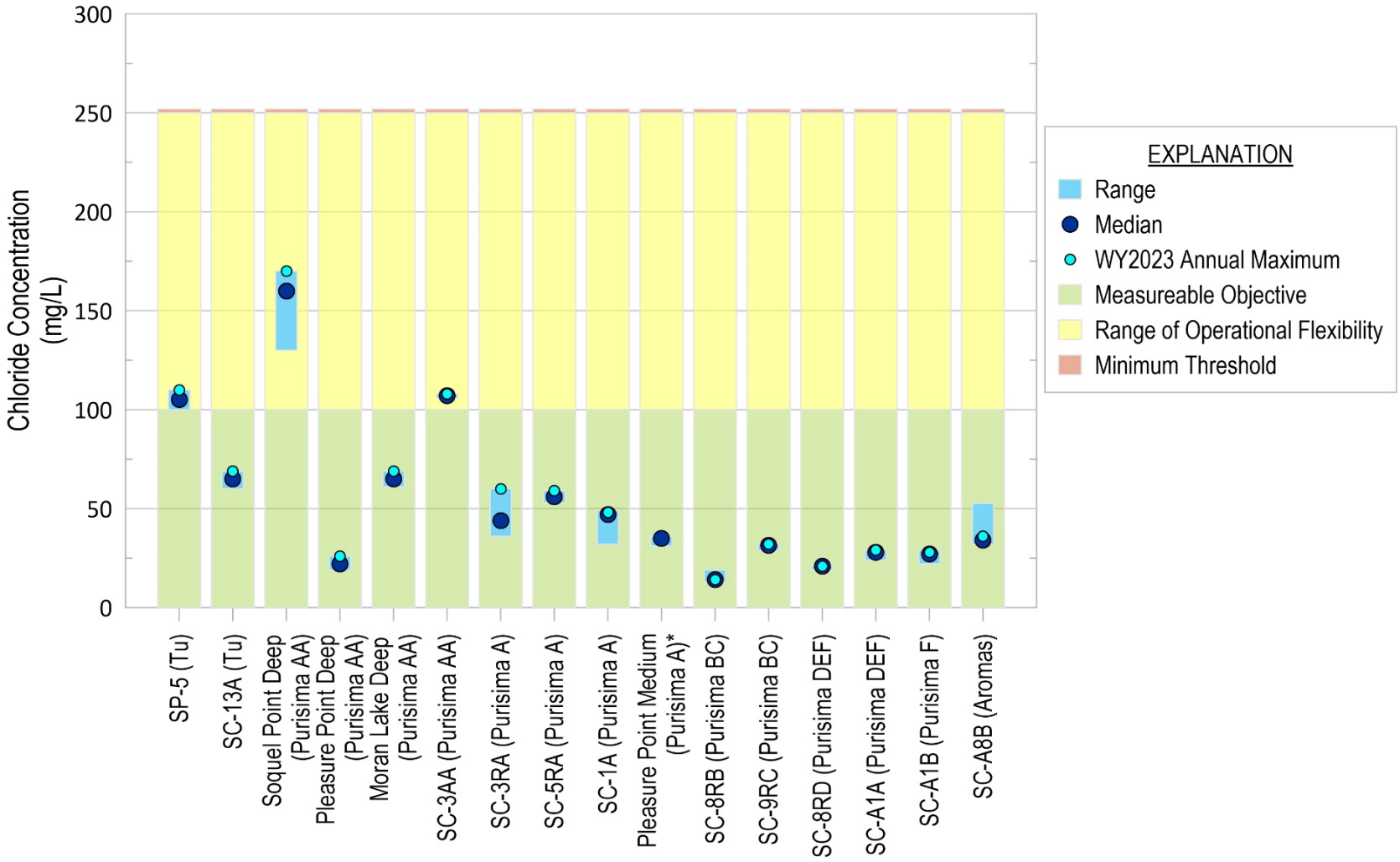

Figure 4-8. Chloride Relative to Minimum Thresholds and Measurable Objectives in Coastal Non-Intruded Representative Monitoring Wells between Water Years 2019 and 2023

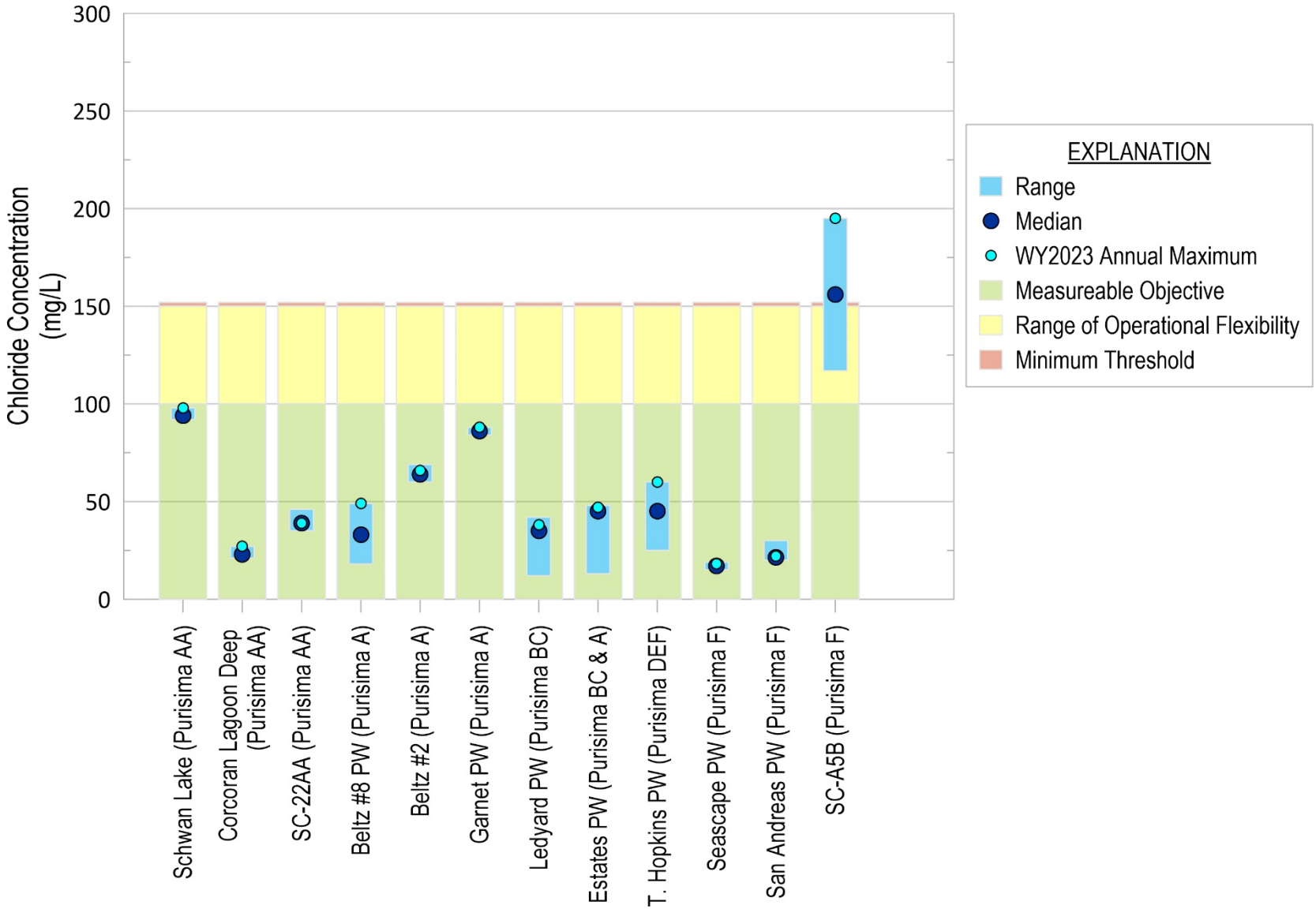

Figure 4-9. Chloride Concentrations Relative to Minimum Thresholds and Measurable Objectives in Inland Representative Monitoring Wells between Water Years 2019 and 2023

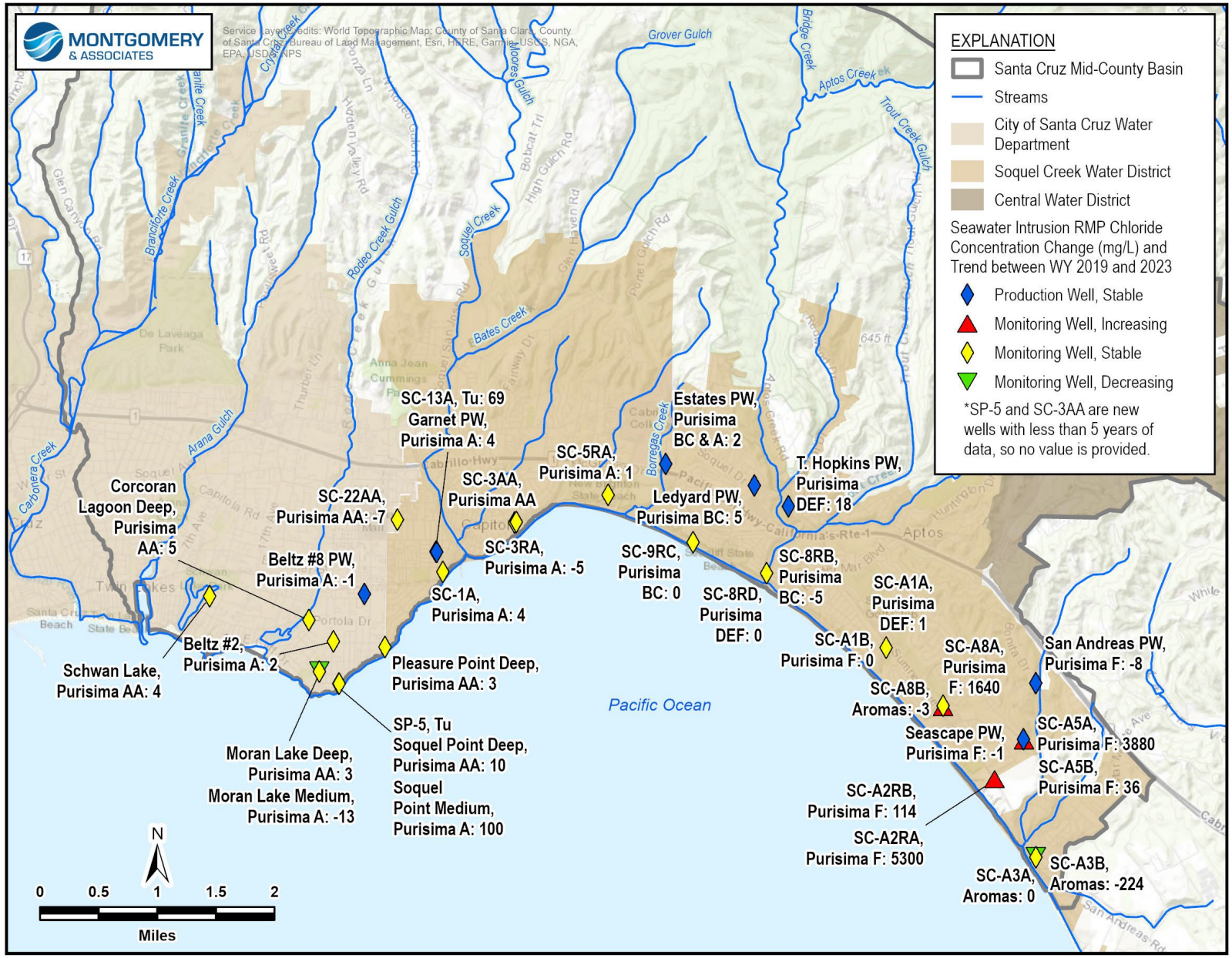

Figure 4-10. Chloride Concentration Change and Trends between Water Years 2019 and 2023

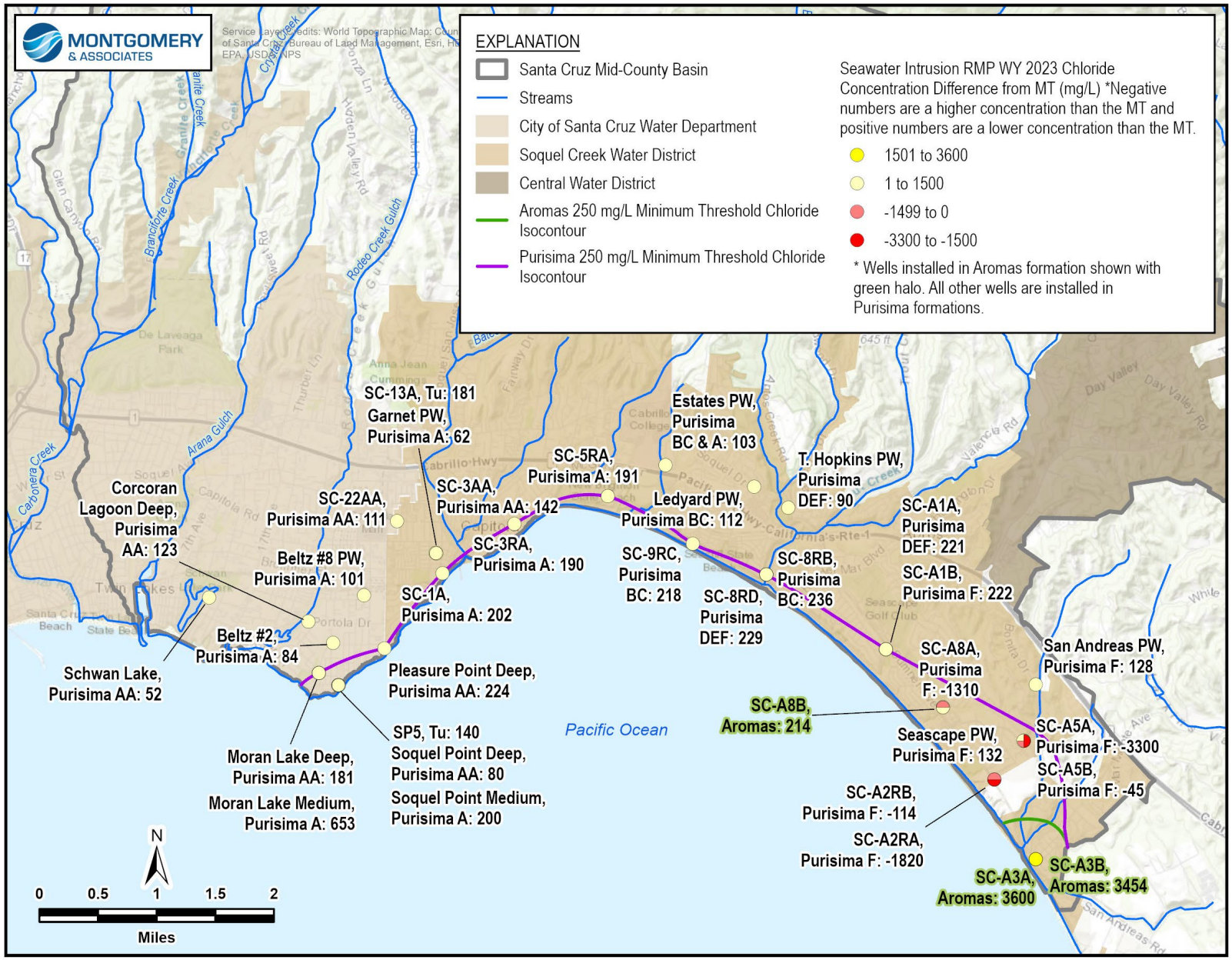

Figure 4-11. Water Year 2023 Chloride Concentrations Compared to Minimum Thresholds

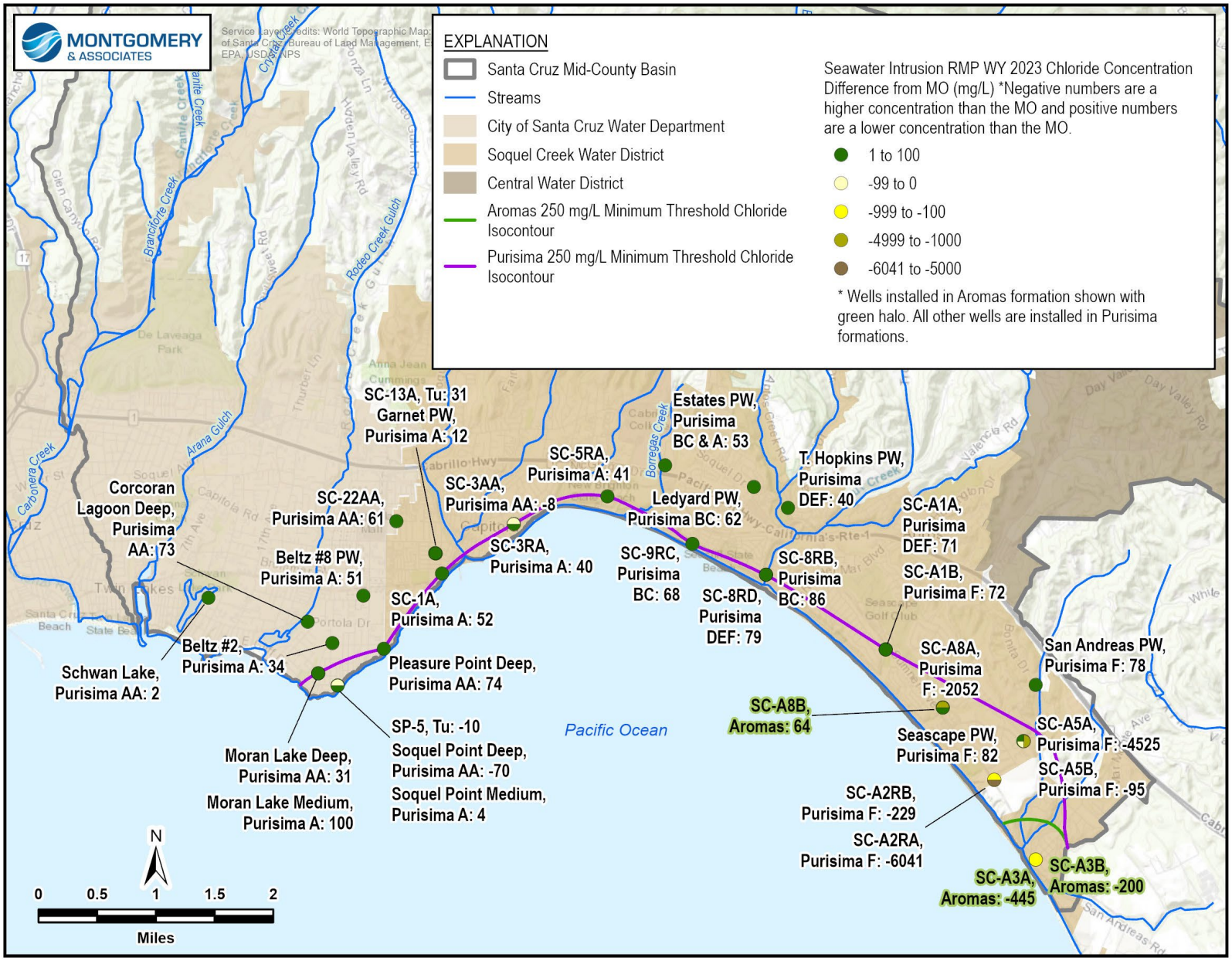

Figure 4-12. Water Year 2023 Chloride Concentrations Compared to Measureable Objectives

Maintaining groundwater elevations in coastal aquifers at elevations higher than sea level should prevent further seawater intrusion. The protective groundwater levels for each RMP are derived from groundwater model simulations or the Ghyben-Herzberg analytical method. In addition to chloride concentration, protective groundwater elevations are used as a proxy SMC for seawater intrusion. The annual minimum of 5-year moving average groundwater elevation is used to compare groundwater elevation data to SMC. This long-term averaging approach ensures that seasonal and operational changes are smoothed so that brief outlying measurements do not obscure the analysis, but still captures trends.

In WY 2023, groundwater levels achieve MT and MO in some RMPs but are lower than the protective groundwater elevation proxy MT and MO in some areas. The minimum 5-year moving average groundwater elevation in WY 2023 met the MT in 10 of 17 wells (Table 4-5). Seven wells with groundwater levels below the MT and 2025 IM are screened in the Purisima F, A, AA, and Tu units and are not confined to a single area of the Basin but are dispersed along the coast. Currently the same 10 of 17 wells also meet the 2025 IM and 5 of 17 meet the MO. New monitoring wells SP-5 and SC-3AA do not have enough data to evaluate if the 5-year moving average constitutes an MT exceedance or undesirable result. Five-year moving average groundwater levels relative to proxy SMC are summarized by aquifer in Table 4-5.

Table 4-5. Summary of Seawater Intrusion Groundwater Elevation Proxy Sustainable Management Criteria Achievement as of Water Year 2023

Aquifer	Number of Representative Monitoring Points (RMP)	Number and Percentage of RMP Meeting Sustainable Management Criteria			Undesirable Results
		Minimum Threshold	Interim Milestone 2025	Measurable Objective	
Aromas	1	1 (100%)	1 (100%)	0 (0%)	0 (0%)
Purisima F	3	2 (66%)	2 (66%)	2 (66%)	1 (33%)
Purisima DEF	1	1 (100%)	1 (100%)	1 (100%)	0 (0%)
Purisima BC	2	0 (0%)	0 (0%)	0 (0%)	2 (100%)
Purisima A	6	4 (66%)	4 (66%)	2 (33%)	2 (33%)
Purisima AA	3	2 (66%)	2 (66%)	0 (0%)	1 (33%)
Tu	1	0 (0%)	0 (0%)	0 (0%)	1 (100%)
	Total	**10 of 17 (59%)**	**10 of 17 (59%)**	**5 of 17 (29%)**	**7 of 17 (31%)**

Note. SP-5 and SC-3AA are not included because they have not been monitored long enough for 5-years moving averages to be calculated

Five-year moving average groundwater elevations as a proxy SMC for SWI are graphed and plotted on similar maps to the chronic lowering of groundwater levels SMC:

- Five-year moving average groundwater level range, median, and current conditions during the evaluation cycle are graphed relative to the MT and MO on Figure 4-13.

- Five-year moving average groundwater level change and trend during the evaluation cycle is mapped on Figure 4-14.
- WY 2023 five-year moving average groundwater levels are mapped compared to the MT on Figure 4-15.
- WY 2023 five-year moving average groundwater levels are mapped compared to the MO on Figure 4-16.

See Section 4.4.1 for symbol descriptions and other explanatory notes for these figures.

Overall, groundwater elevations are stable to slightly increasing during the evaluation cycle (Figure 4-14). The WY 2023 annual minimum 5-year moving average shown on Figure 4-13 for each RMP demonstrates 5-year moving average groundwater elevations are above the MT or only slightly below the MT in all but 1 RMP. One well SC-8RB in the Purisima BC unit remains about 15 feet below the MT. This RMP had a long-term increasing groundwater level trend from 2008 to 2015, coinciding with about 40 feet of groundwater elevation gain from about -30 to 10 feet amsl. However, the groundwater level rise has slowed since WY 2019, with elevations slightly increasing in a range between 0 and 10 feet amsl (Figure 4-14). Implementation of PWS should benefit the Purisima BC aquifer through direct recharge at the Twin Lakes Church SWIP well and in-lieu recharge at SqCWD production wells screened in the BC aquifer. If the groundwater elevation does not start to increase in this RMP again with PWS implementation, similar to the trend before GSP implementation started, the MGA will investigate whether PMAs or changes to the SMC need to be implemented for this location.

SC-13A in the Tu unit, has a range of groundwater levels during the evaluation cycle of about +/- 20 feet relative to the MT. The 5-year moving average groundwater elevation is only slightly below the MT (Figure 4-13). SC-13A has an overall increasing groundwater elevation trend (Figure 4-14), so should be able to meet the MT in the next few years.

Specific wells are identified in the GSP as locations that exceeded protective elevations at the time. These wells are SC-A3A in Aromas Red Sands, SC-5A and SC-A8A in Purisima F unit, and SC-9RC in Purisima BC unit. During the evaluation cycle these 4 RMPs have relatively stable groundwater level trends near the MT. WY 2023 groundwater elevations range from 4 feet below the MT at SC-5RA to just above the MT at SC-A3A. Stable to slightly increasing groundwater levels at these locations demonstrate areas identified in the GSP requiring groundwater level increases have been managed sustainably but implementation of PMAs for direct or in lieu groundwater recharge is necessary to elevate groundwater levels further to meet MOs.

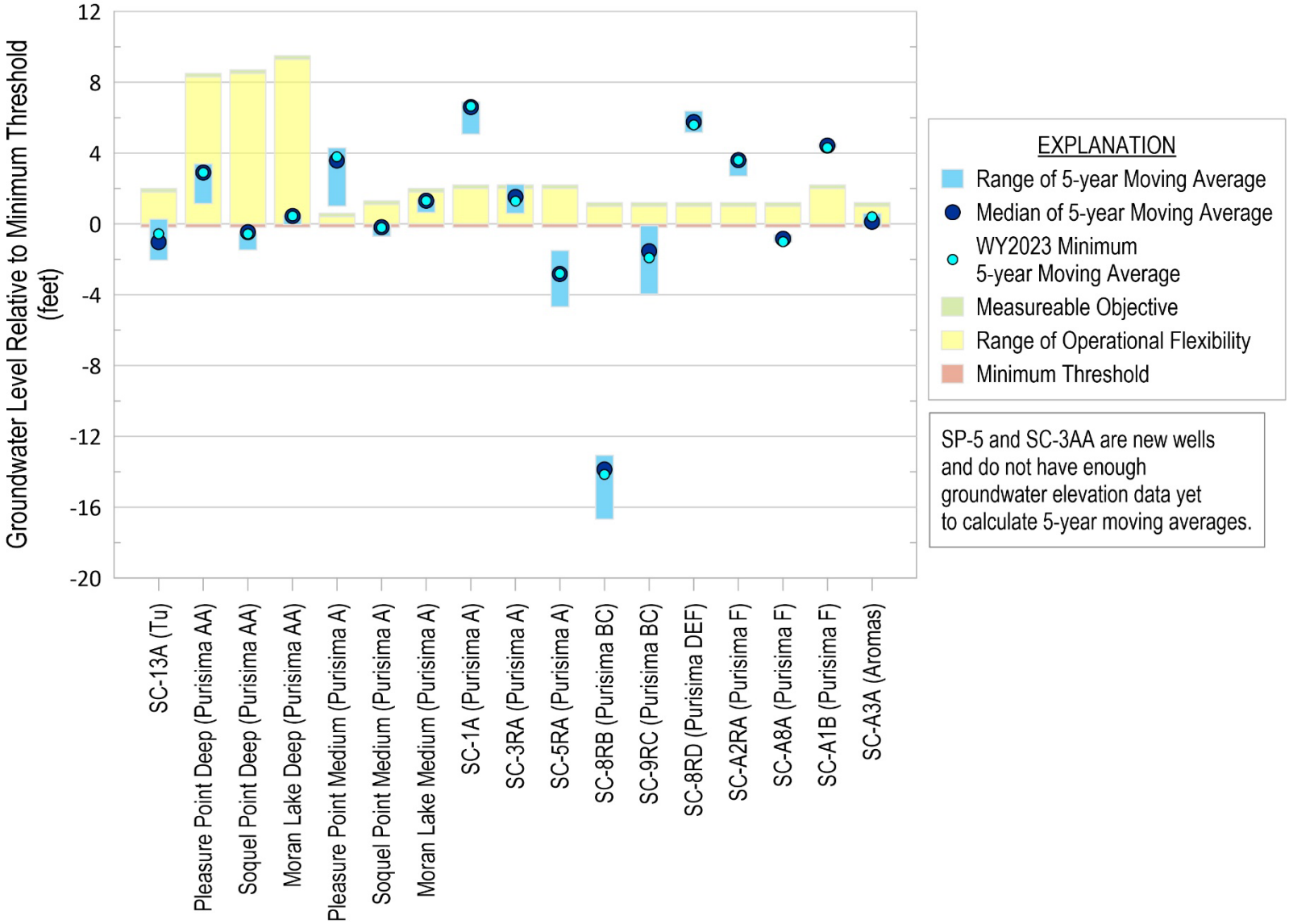

Figure 4-13. Seawater Intrusion Proxy Groundwater Levels Relative to Minimum Thresholds and Measurable Objectives between Water Years 2019 and 2023

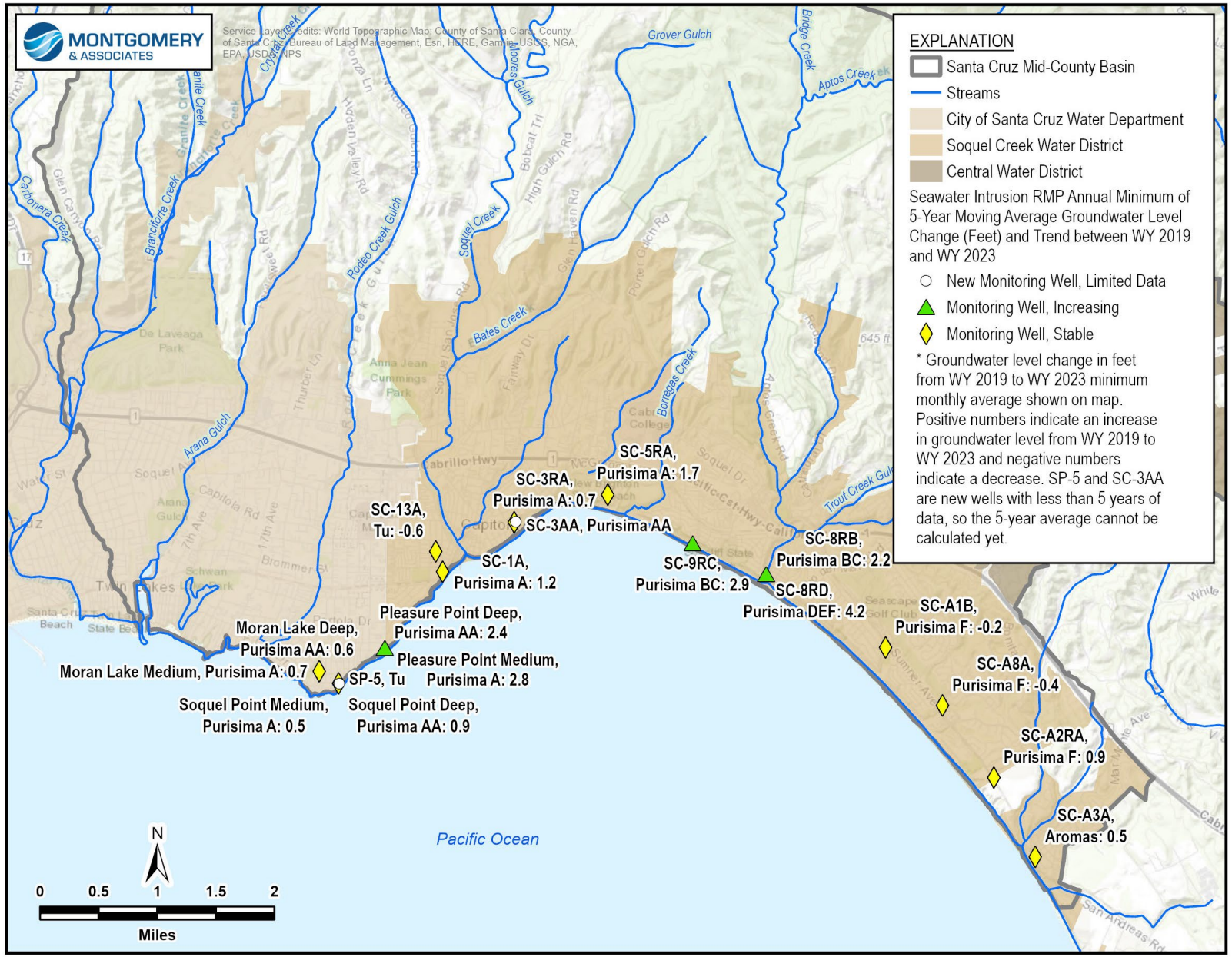

Figure 4-14. 5-Year Moving Average Seawater Intrusion Proxy Groundwater Elevation Change and Trends between WY 2019 to 2023

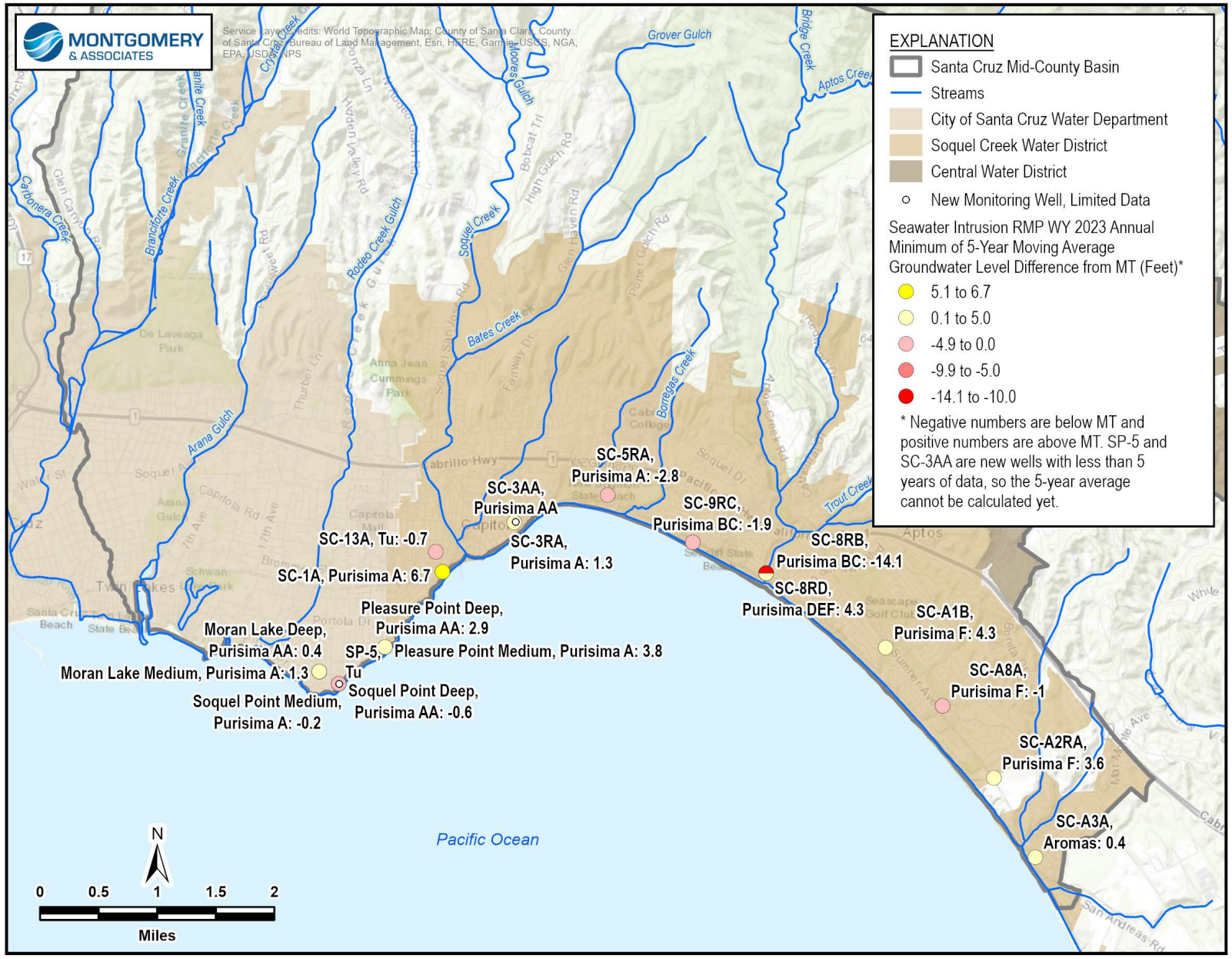

Figure 4-15. Water Year 2023 5-Year Moving Average Proxy Groundwater Elevation Compared to Minimum Thresholds

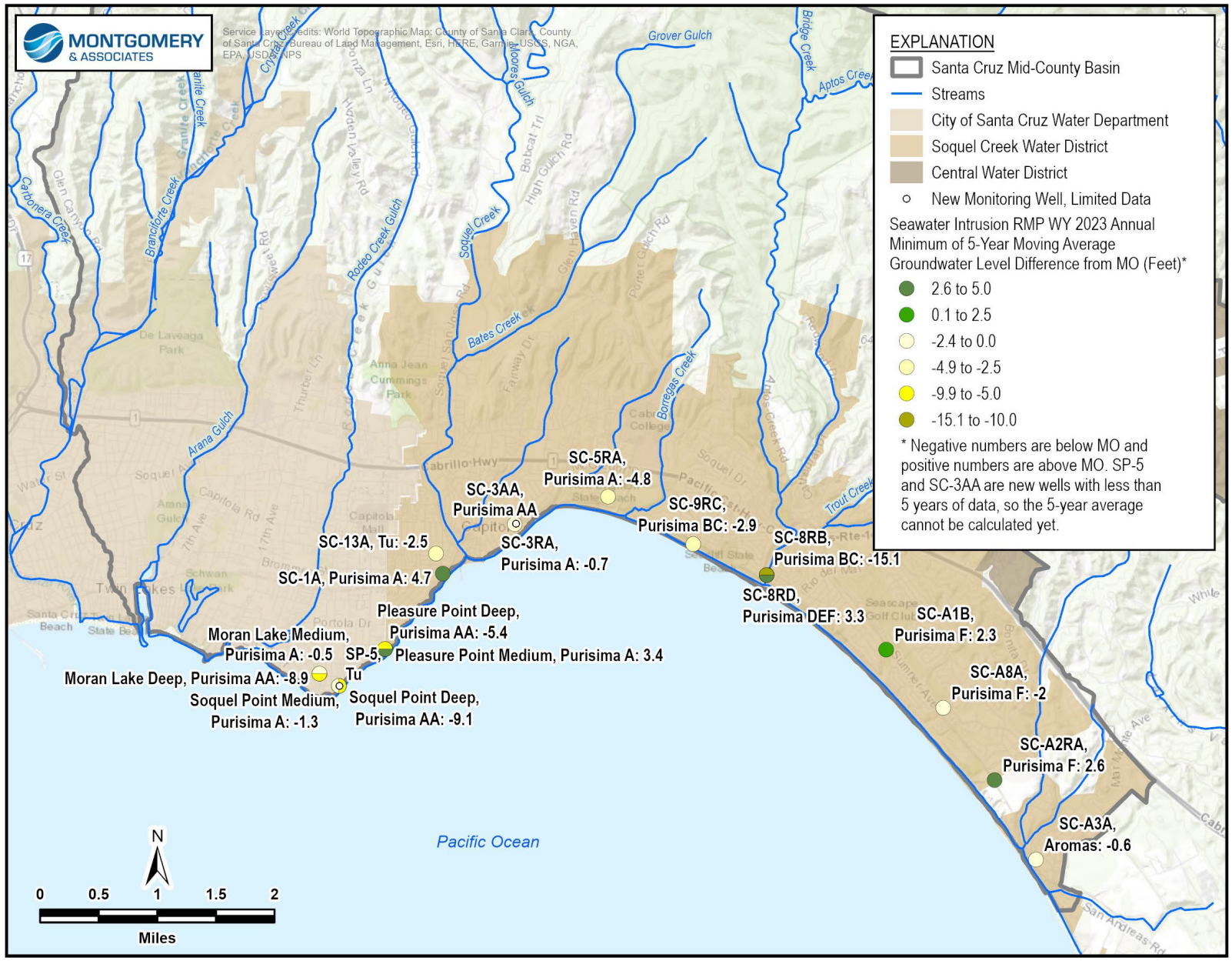

Figure 4-16. Water Year 2023 5-Year Moving Average Proxy Groundwater Elevation Compared to Measureable Objectives

4.5.2 Evaluation of Seawater Intrusion Sustainable Management Criteria

Although chloride is observed to be increasing in the Seascape area while proxy protective groundwater level MTs in SC-A2RA (Purisima A unit) are being achieved, there is not enough knowledge on what is causing increasing chloride to inform a change in SMC in this area. Once the mechanism for the chloride increases is understood, there may be a need to revise proxy protective groundwater level MTs in this area. Currently, no changes are recommended for the seawater intrusion SMC.

As mentioned previously, projects are being implemented to raise groundwater levels in coastal aquifers. Further characterization and management actions will be considered following additional study in the Seascape area and after observing the benefits from PWS once it is operating.

Two new seawater intrusion RMPs, SC-3AA and SP-5, are added to the seawater intrusion monitoring networks. These locations are RMPs for both chloride and groundwater levels as a proxy for seawater intrusion. The methodology used for determining SMC for these new RMPs is the same used in the GSP:

- The chloride SMC are identical to other unintruded coastal aquifers. The chloride MT is 250 mg/L and MO and IMs are 100 mg/L.
- The groundwater elevation as a proxy for seawater intrusion MT and MO at SC-3AA and SP-5 are calculated using the Ghyben-Herzberg equation. The MT is based on preventing seawater intrusion at the elevation of the bottom of the well screen and the MO is based on preventing seawater intrusion at bottom of the aquifer unit the well is screened. The GSP uses the Ghyben-Herzberg equation for the SWI groundwater elevation proxies when cross-sectional modeling results for the protective elevations to prevent SWI at the RMP are not available. Groundwater elevations as a proxy for these 2 new RMP wells, and potentially other wells, could be updated with future cross-sectional modeling.
- The 2025, 2030, and 2035 IMs for groundwater elevation as a proxy are the 5-year average of model simulated groundwater elevations for Alternative A (Section 5.2).

The new SMC are summarized in Table 4-6. Since SP-5 was installed at the base of the Tu unit, the MT is identical to the MO for groundwater elevation as a proxy for seawater intrusion.

Table 4-6. Sustainable Management Criteria for New Seawater Intrusion Representative Monitoring Points

RMP	Aquifer	Chloride SMC (mg/L*)		Groundwater Elevation as a Proxy (ft amsl)				
		MT	MO & IM	MT	MO	2025 IM	2030 IM	2035 IM
SC-3AA	Purisima AA	250	100	14.3	20.2	19.1	20.0	20.2
SP-5	Tu	250	100	24.8	24.8	22.7	24.8	24.8

*mg/L = milligrams per liter

No changes to existing SMC or a Plan amendment are needed at this time.

4.6 Depletion of Interconnected Surface Water

MGA's current understanding of surface water and groundwater interactions are informed by streamflow and groundwater level monitoring, surface and groundwater flow simulations using the integrated groundwater and surface water model, and groundwater dependent ecosystem (GDE) remote sensing surveys. Significant and unreasonable conditions for depletion of interconnected surface water are defined in the GSP as follows:

> *More depletion of surface water due to groundwater extraction in interconnected streams supporting priority species than experienced since the start of shallow groundwater level monitoring through 2015.*

Groundwater levels in shallow monitoring wells adjacent to streams are used as a proxy for monitoring and managing surface water depletion. The SMC for depletion of interconnected surface water are summarized in Table 4-7.

Table 4-7. Summary of Sustainable Management Criteria for Depletion of Interconnected Surface Water Using Groundwater Levels as a Proxy

Sustainable Management Criteria	Description
Minimum Threshold	The highest seasonal low elevation during below-average rainfall years from the start of monitoring through 2015
2025 Interim Milestone	Minimum groundwater model simulated elevation in 5-year period
Measurable Objective	Groundwater elevations higher than the creek bed
Undesirable Results	Any RMP has minimum monthly groundwater elevation below the minimum threshold

Interconnected streams and the habitat they support are influenced by many factors other than groundwater contribution. The MGA's objective is to maintain groundwater levels in shallow aquifers adjacent to interconnected streams to minimize depletion of streamflow and support viable GDEs during the dry season. This approach will not resolve other stream flow impacts

created by lack of precipitation, increased evapotranspiration with increasing temperatures, and surface water diversions during the dry season. Based on feedback from stakeholders during GSP development, the MGA understands that maintaining a groundwater contribution to support adequate streamflow for salmonids during the late summer and fall will support the needs of other identified critical species in the Basin. Depletion of interconnected surface water due to groundwater extraction during GSP implementation is expected to be less than from 2000 to 2015 because groundwater extraction is decreasing as water use becomes more efficient and PMAs are implemented.

4.6.1 Current Interconnected Surface Water Conditions Relative to Sustainable Management Criteria

The RMP network for ISW currently consists of 5 shallow wells, including 4 in shallow aquifers and 1 in Purisima A unit. As of WY 2023, 4 out of 5 RMPs meet the MT and 2025 IM, and 1 of the RMP currently meets the MO (Table 4-8). Groundwater levels in these wells were stable during the evaluation cycle, fluctuating by no more than 4 feet (Figure 4-17 and Figure 4-18). Some annual groundwater level fluctuation in the shallow wells is related to drier than average climate reducing streamflow from WY 2020 to WY 2022. The groundwater elevation at Balogh shallow well was less than the MT in WY 2023 (Figure 4-17 and Figure 4-19). In addition, Main St. Shallow and Nob Hill RMPs also exceeded MTs by less than 1 foot at times during the past 5 years (Figure 4-17). The MO is being met at Wharf Road shallow well, though groundwater elevation is within 3 feet of the MO in the 4 other wells (Figure 4-20).

Table 4-8. Summary of Depletion of Interconnected Surface Water Sustainable Management Criteria Achievement as of Water Year 2023

Aquifer	Number of Representative Monitoring Points (RMP)	Number and Percentage of RMP Meeting Sustainable Management Criteria			Undesirable Results
		Minimum Threshold	Interim Milestone 2025	Measurable Objective	
Shallow Groundwater	4	3 (75%)	3 (75%)	1 (25%)	1 (25%)
Purisima A	1	1 (100%)	1 (100%)	0 (0%)	0 (0%)
	Total	**4 of 5 (80%)**	**4 of 5 (80%)**	**1 of 5 (20%)**	**1 of 5 (20%)**

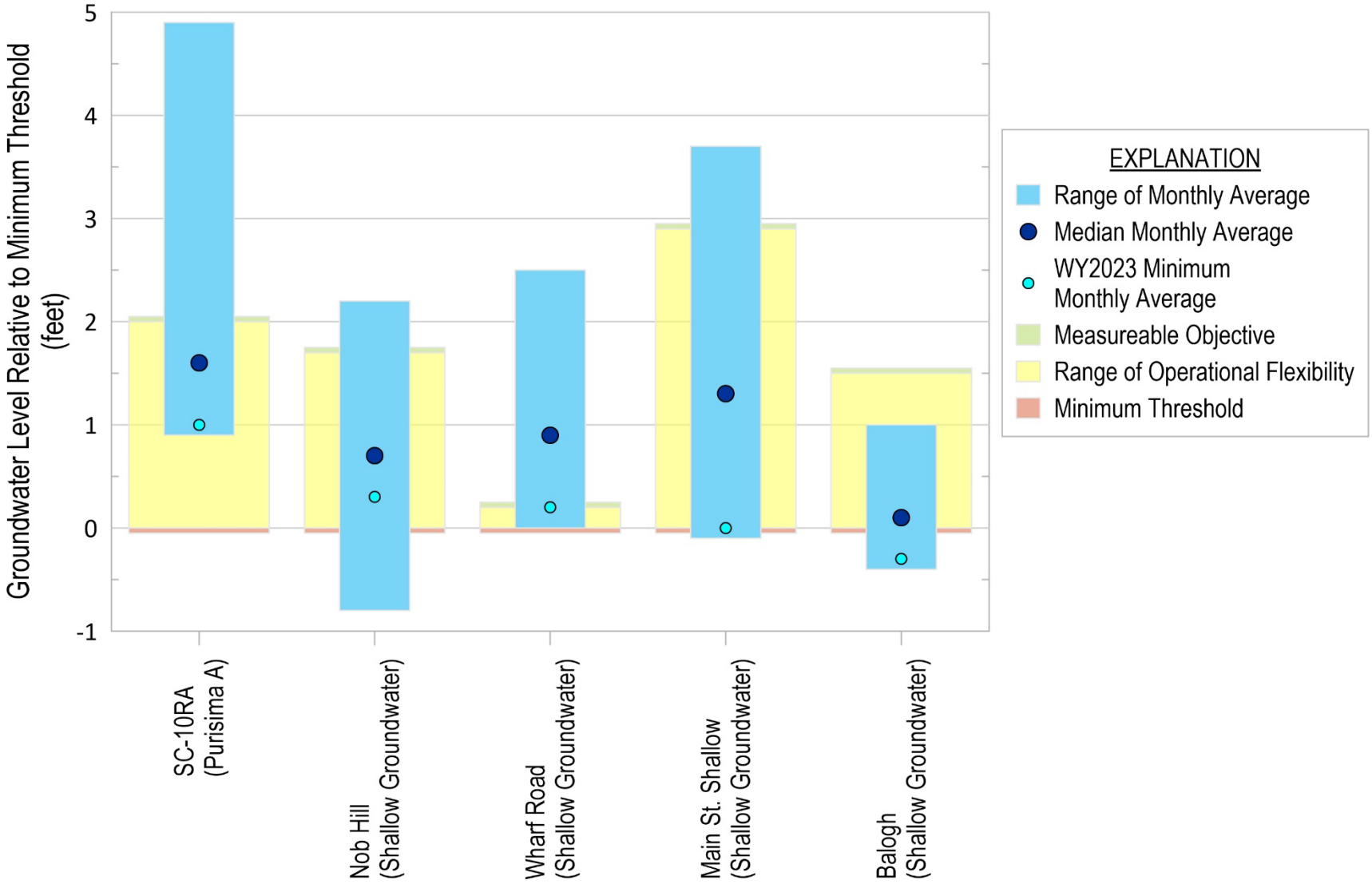

Figure 4-17. Interconnected Surface Water Proxy Groundwater Levels Relative to Minimum Thresholds and Measurable Objectives between Water Years 2019 and 2023

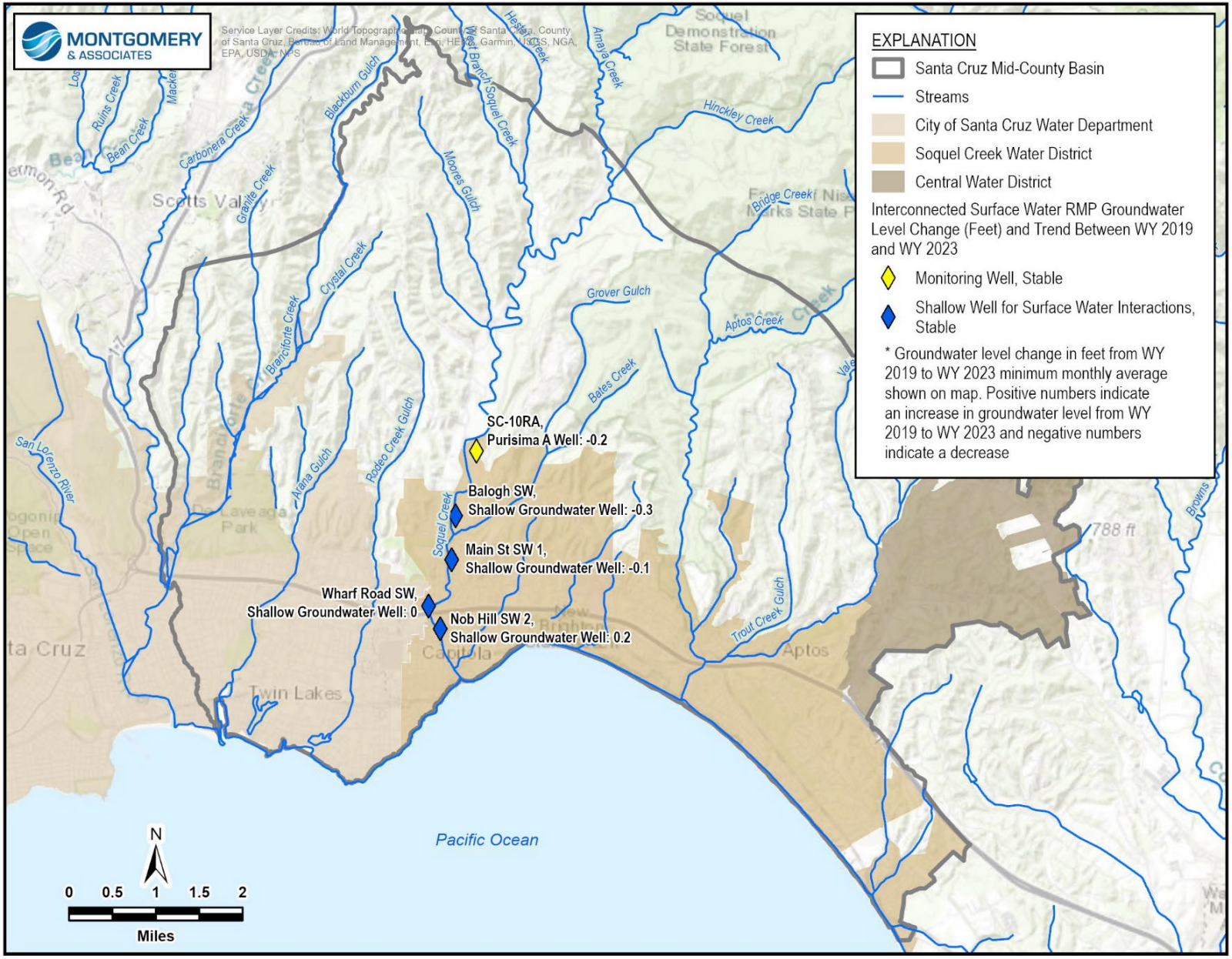

Figure 4-18. Interconnected Surface Water Proxy Groundwater Elevation Change and Trends between Water Years 2019 and 2023

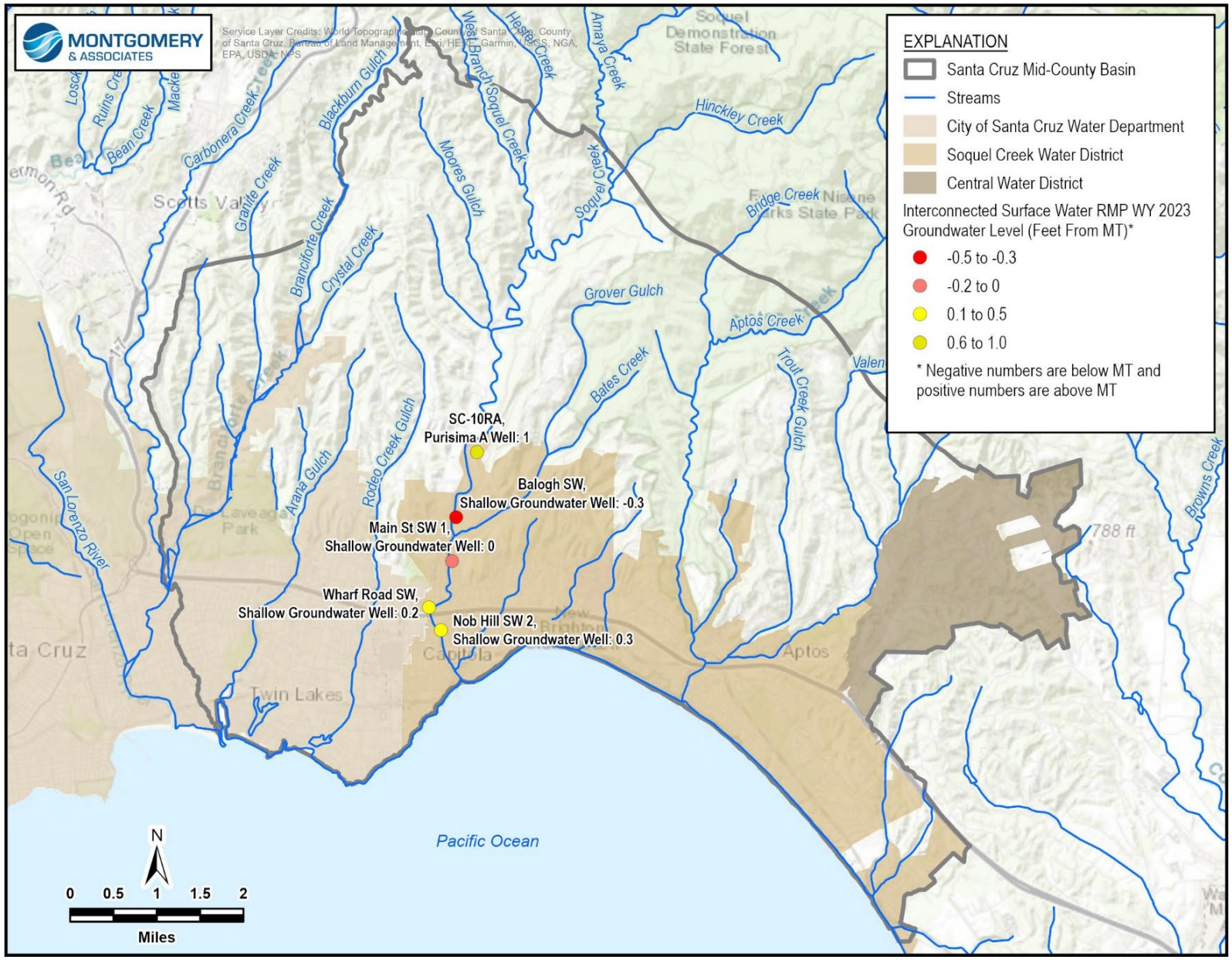

Figure 4-19. Water Year 2023 ISW Proxy Minimum Average Monthly Groundwater Elevation Compared to Minimum Threshold

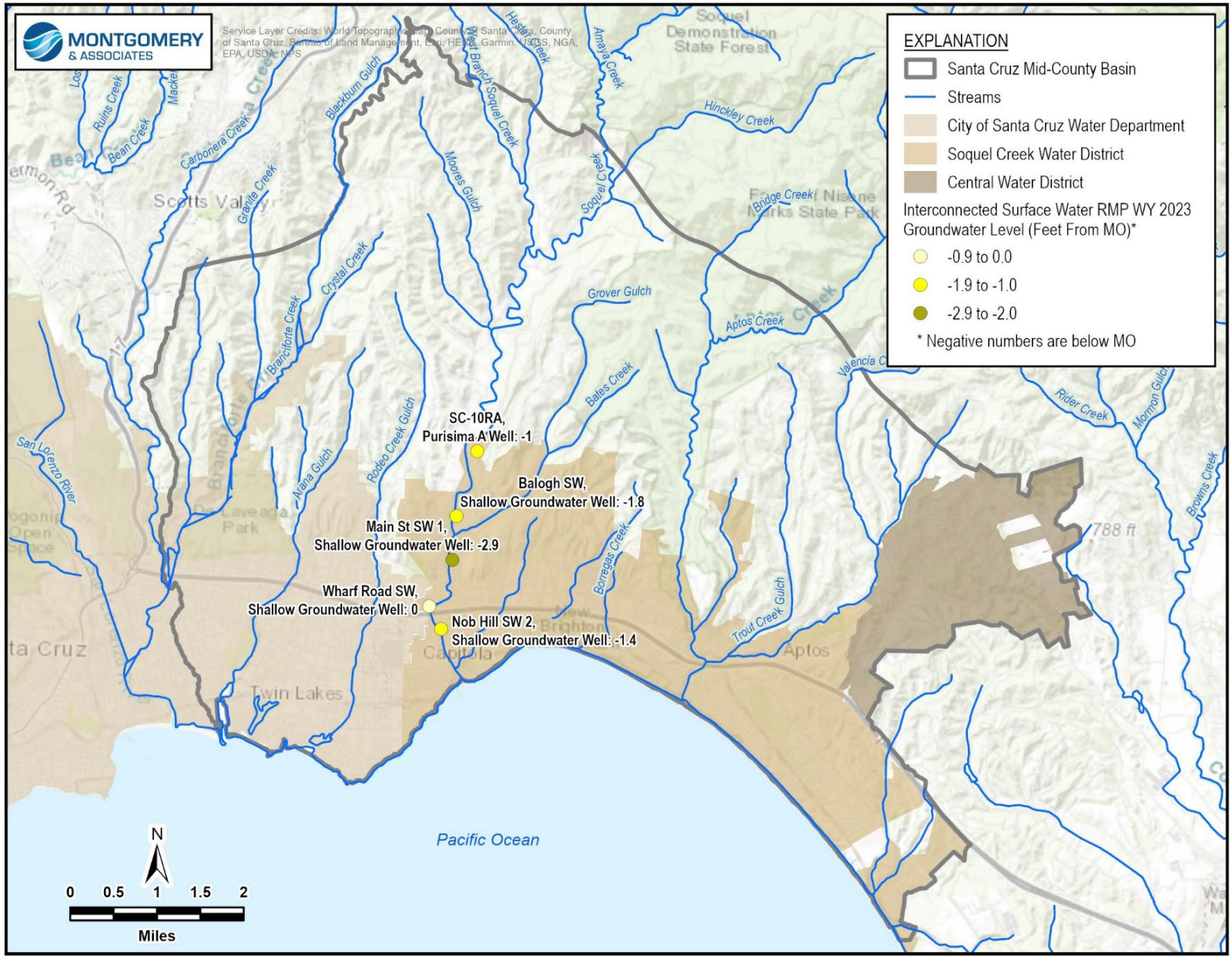

Figure 4-20. Water Year 2023 ISW Proxy Minimum Average Monthly Groundwater Elevation Compared to Measureable Objective

4.6.2 Current Groundwater Dependent Ecosystem Conditions

The Nature Conservancy maintains GDE Pulse, an interactive webmap for evaluating GDE vegetation health as it relates to streamflow depletion.[6] Normalized Derived Vegetation Index (NDVI), a measure of vegetation greenness, is 1 of 2 remote sensing datasets available for download on the webmap. The data are summarized in dry seasons at various time intervals for evaluating GDE health. The closest interval to the evaluation cycle available for download is 2018 to 2022. Healthy vegetation typically has a high NDVI, such as 0.72 or greater and unhealthy vegetation has a low NDVI, such as 0.14 or below. The average NDVI along streams in the Basin is relatively high, with values greater than 0.6 throughout most of the Basin in 2022 (Figure 4-21).

Between 2018 and 2022, NDVI fluctuated along streams in the Basin by +/- 10%. Areas with higher NDVI in 2022 are shown in darker green hues and areas with lower NDVI in 2022 are shown as light green and orange on Figure 4-22. When comparing the difference in NDVI between 2018 and 2022 with Figure 4-21, those GDEs with a decrease in NDVI are still classed as very healthy (NDVI greater than 0.66).

[6] https://gde.codefornature.org/#/home

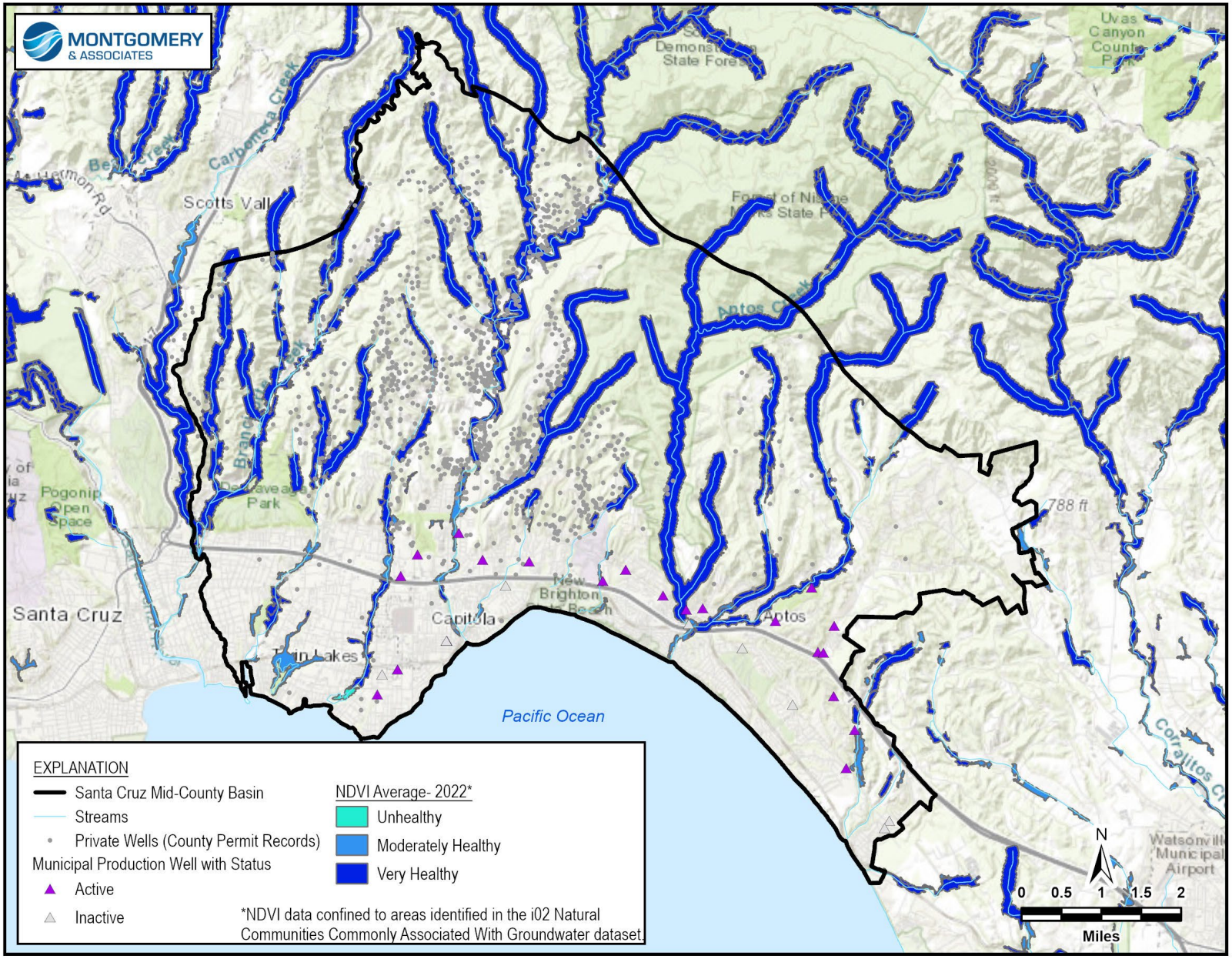

Figure 4-21. GDE Pulse Normalized Derived Vegetation Index Average for 2022

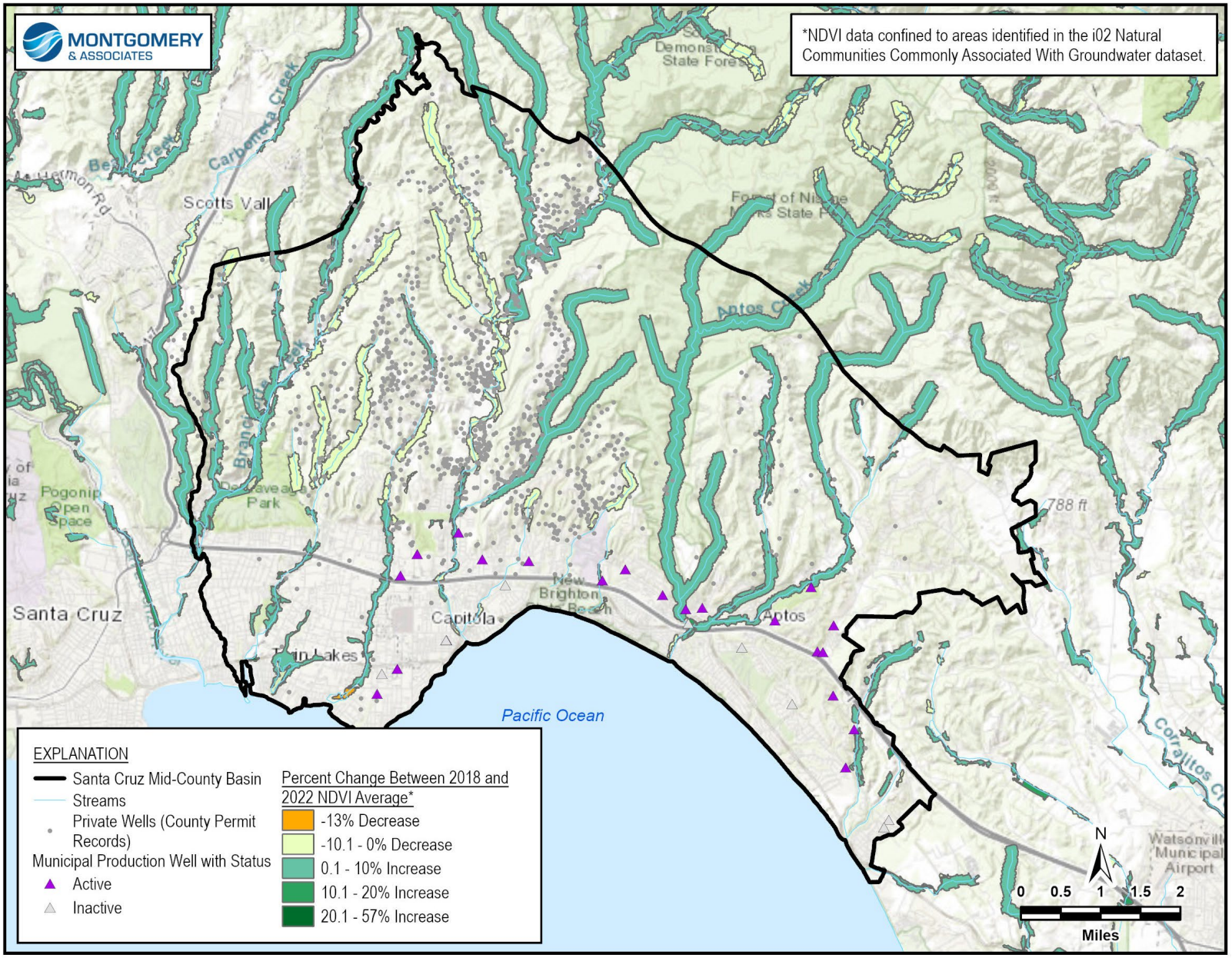

Figure 4-22. GDE Pulse Normalized Derived Vegetation Index Difference between 2018 and 2022

Seven new monitoring wells are anticipated to become RMPs for depletion of interconnected surface water monitoring in the future (discussed in Section 7.2). Six wells were installed and equipped with transducers in November 2022 and 1 well was installed in January 2024 and equipped with a transducer in April 2024. To establish SMC for these new wells, groundwater level and streamflow data are necessary from wet, dry, and normal water years to evaluate groundwater-surface water interconnection over a range of conditions. It may take 5 years or more to obtain sufficient data to establish these relationships. Comparing shallow groundwater levels to streamflow over the summer and fall months for different water year types will provide the information needed to determine when surface water at the monitoring sites is connected to groundwater. The integrated GSFLOW groundwater and surface water model will be updated with, and calibrated to, the observed data to improve its simulation of groundwater-surface water interconnection. The GSFLOW model will likely help estimate what shallow groundwater levels were over the 2001 to 2015 time period used to establish SMC groundwater level proxies at the other RMP wells (Table 4-7) and to update estimates for streamflow depletion during the 2001 to 2015 period that defines undesirable depletion.

4.6.3 Evaluation of Interconnected Surface Water Sustainable Management Criteria

No significant new information has been collected or provided to the MGA that leads to a change in ISW SMC or warrants a GSP amendment. Overall, SMC are either being achieved or are close to being achieved during the evaluation cycle. The MGA will integrate new shallow wells into the RMP network and consider incorporating forthcoming DWR guidance on depletion of interconnected surface water to the overall approach for evaluating interconnected surface water. No changes to SMC or a Plan amendment are needed at this time.

4.7 Degraded Groundwater Quality

Groundwater produced in the Basin is generally of good quality and does not regularly exceed primary drinking water standards. Iron and manganese historically exceed drinking water standards in parts of the Basin as they are naturally occurring. Groundwater with iron and manganese is treated or blended by municipal water providers to lower the concentration below taste and odor thresholds. Some RMP in parts of the Basin underlain by the Aromas Red Sands exceed the hexavalent chromium (chromium VI) drinking water standard instituted in April 2024. Groundwater from municipal supply wells will be blended or treated to meet chromium VI drinking water standards as required by regulation before being served to customers. Some coastal monitoring wells have chloride and total dissolved solids (TDS) at concentrations exceeding regulatory standards due to seawater intrusion, as discussed in Section 4.5.

Locally defined significant and unreasonable groundwater quality degradation in the Basin is:

> *Groundwater quality, attributable to groundwater pumping or managed aquifer recharge, that fails to meet state drinking water standards.*

Conditions that may lead to undesirable results for degraded groundwater quality include the following:

Changes to Basin Pumping. If the location and rates of groundwater pumping change as a result of projects implemented or management actions taken under the GSP, these changes could alter hydraulic gradients and cause movement of poor-quality groundwater toward a supply well at concentrations that exceed state drinking water standards.

Groundwater Recharge. Active recharge of water or captured runoff could modify groundwater gradients and move poor-quality groundwater toward a supply well in concentrations that exceed state drinking water standards.

Recharge of Poor-Quality Water. Recharging the Basin with water that exceeds state drinking water standards may lead to an undesirable result. Since the State Water Control Board is responsible for regulating recharge activities and enforces an anti-degradation policy, there is minimal likelihood of poor-quality water being recharged into the Basin.

SMC for degraded groundwater quality are summarized in Table 4-9.

Table 4-9. Summary of Sustainable Management Criteria for Groundwater Quality

Sustainable Management Criteria	Description
Minimum Threshold	Regulatory drinking water standard
2025 Interim Milestone	Same as the measurable objective
Measurable Objective	2013 – 2017 average concentrations, or laboratory reporting limit if not detected, for each constituent of concern for each RMP
Undesirable Results	Any representative monitoring well that exceeds a state drinking water standard as a result of groundwater pumping or managed aquifer recharge

4.7.1 Current Degraded Groundwater Quality Conditions Relative to Sustainable Management Criteria

Groundwater quality in the Basin is generally stable with conditions that meet regulatory standards with the exception of naturally occurring constituents. Iron, manganese, chromium VI, chloride, and TDS have MT exceedances in some wells depending on aquifer geochemistry and location relative to the seawater intrusion interface. These MT exceedances are not considered an undesirable result because they are either a preexisting natural condition, not associated with pumping or managed aquifer recharge, or are being managed by the seawater intrusion sustainability indicator. Locations that exceed a MT during the evaluation period are shown on Figure 4-23. A summary of groundwater quality SMC for WY 2023 is provided in Table 4-10.

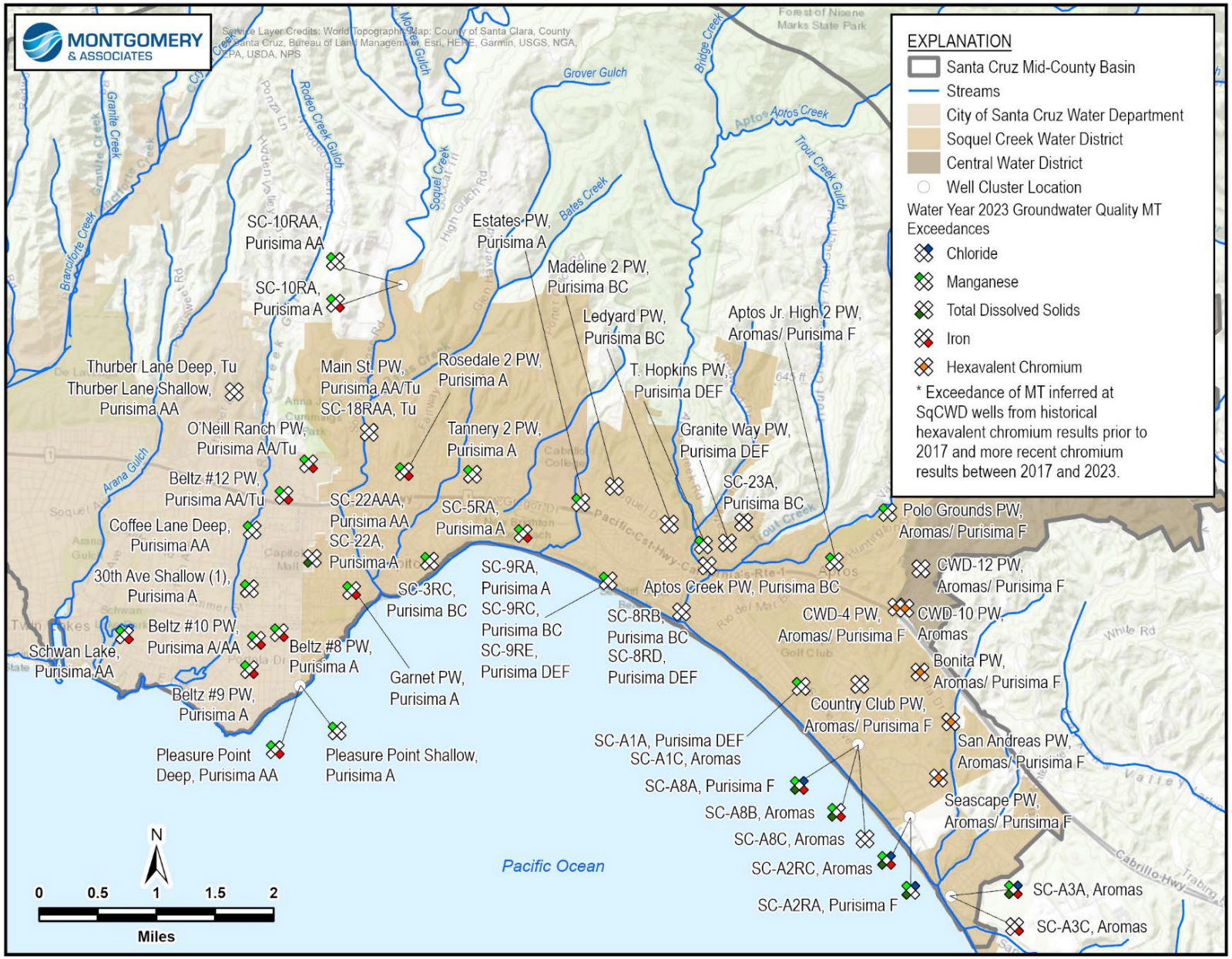

Figure 4-23. Groundwater Quality Exceedance of Minimum Thresholds between Water Years 2019 and 2023

Except for iron, manganese, and chromium VI, concentrations of COCs during the evaluation cycle are generally below MTs and close to MOs. Since the MOs are average WY 2013-2017 concentrations, or the laboratory reporting limit if the COC was not historically detected, RMPs with stable concentration trends may occasionally exceed the MO. Detections of arsenic, chromium, nitrate, and other organic compounds are occasionally reported by water providers, but these detections are sporadic and below regulatory standards, and do not warrant special management considerations.

Table 4-10. WY 2023 Groundwater Quality Sustainable Management Criteria Achievement

Constituent of Concern	Number of Representative Monitoring Points (RMP) Sampled	Number and Percentage of RMP Exceeding Sustainable Management Criteria		Undesirable Results
		Minimum Threshold	Interim Milestone 2025 / Measurable Objective	
Total Dissolved Solids	50	6 (12%)	9 (18%)	0 (0%)
Chloride	50	4 (8%)	11 (22%)	0 (0%)
Iron	50	19 (38%)	16 (32%)	0 (0%)
Manganese	50	30 (60%)	32 (64%)	0 (0%)
Arsenic	22	0 (0%)	8 (36%)	0 (0%)
Chromium (Total)	22	0 (0%)	12 (55%)	0 (0%)
Nitrate	50	0 (0%)	43 (86%)	0 (0%)
Organic Compounds	22	0 (0%)	21 (95%)*	0 (0%)
Chromium VI	22	5 (23%)	4 (18%)	0 (0%)
PFAS	12	0 (0%)	12 (100 %)	0 (0%)

Note: * 1 RMP had a detect of methyl tert-butyl ether (MTBE) that was lower than the MT (i.e., drinking water standard)

Chromium VI was identified as a COC in the GSP. The MO for chromium VI was calculated for each RMP based on the 2013-2017 average concentration, if detected, or the laboratory reporting limit if not detected. No MT was assigned for chromium VI in the GSP because the maximum contaminant level (MCL) that predated the GSP was withdrawn by the SWRCB. Minimal chromium VI sampling occurred during the evaluation period because there was no MCL; however, water providers continued to routinely sample for total chromium which had an MCL. For this evaluation, total chromium data was evaluated as a surrogate for chromium VI, since sample results prior to 2017 were comparable in wells with detectable concentrations of both total chromium and chromium VI. California adopted a new chromium VI MCL of 10 micrograms per liter (µg/L) for drinking water in April 2024. Five wells underlying the area of Aromas Red Sands exposure exceed the chromium VI MCL. Consistent with other COCs, the drinking water MCL is the MT for chromium VI. Blending or treatment of groundwater from those municipal supply wells to meet chromium VI drinking water standards is required by regulation, before being served to customers.

Per- and polyfluoroalkyl substances (PFAS) had MCLs established by the U.S. Environmental Protection Agency (EPA) in April 2024. Public water systems are required to monitor for PFAS and have 3 years to complete initial monitoring (by 2027), followed by ongoing compliance monitoring. PFAS has not been detected above laboratory reporting limits during initial sampling efforts. SCWD and CWD have tested all of their supply wells and SqCWD has tested 5 of their supply wells. PFAS is added as a COC and concentrations will be reported in the WY 2024 Annual Report, similar to other organic compounds with MCLs. PFAS MTs are the federal MCLs and the MO is the laboratory reporting limit.

A review of the State Water Resources Control Board SAFER 2021 through 2024 Aquifer Risk Maps[7] confirms that groundwater quality remains high for the most widespread constituents of concern in the state. Other than PFAS, no other COCs are identified during this evaluation cycle that were not previously included in the GSP.

4.7.2 Evaluation of Degraded Groundwater Quality Sustainable Management Criteria

The SMC for degraded groundwater quality generally maintains groundwater quality at concentrations that meet regulatory standards, with the exception of naturally occurring constituents iron, manganese, chromium VI, chloride, and TDS. Iron and manganese are treated or blended by water providers before supplying to customers. Groundwater from municipal supply wells will be blended or treated to meet chromium VI drinking water standards before being served to customers. Chloride and TDS related to seawater intrusion are only found above drinking water standards in coastal monitoring wells, not supply wells, and are addressed in Section 4.5.

Since no significant groundwater quality degradation has occurred and the Basin is being managed sustainably to maintain or raise groundwater levels and prevent seawater intrusion, no groundwater quality degradation is anticipated in the future related to MGA actions. Therefore, the MGA will continue to evaluate groundwater quality data to determine if degradation is occurring in the Basin, but no changes to SMC or a Plan amendment are needed at this time.

4.8 Reduction of Groundwater in Storage

The reduction of groundwater in storage sustainability indicator is measured as the total volume of groundwater that can be withdrawn from the Basin without causing conditions that lead to undesirable results. Locally defined significant and unreasonable conditions for a reduction of groundwater in storage are defined in the GSP as follows:

> *A net volume of groundwater extracted (pumping minus annual volume of managed aquifer recharge) that will likely cause other sustainability indicators to have undesirable results.*

[7] https://gispublic.waterboards.ca.gov/portal/apps/experiencebuilder/experience/?id=18c7d253f0a44fd2a5c7bcfb42cc158d

Per GSP Regulations, only a total extraction volume for the whole basin is required as a metric for the reduction of groundwater in storage sustainability indicator. However, due to the multiple principal aquifers in this Basin, separate SMC are developed for 3 aquifer groups that are typically screened across by extraction wells. The aquifer groups include: (1) Aromas Red Sands and Purisima F unit, (2) Purisima DEF, BC, A, and AA aquifer units, and (3) the Tu aquifer. The SMC metrics for this indicator are based on the sustainable yields for each of the 3 aquifer groups as determined in the GSP by using the groundwater model. A summary of the SMC for reduction of groundwater in storage is provided in Table 4-11.

Table 4-11. Summary of Sustainable Management Criteria for Reduction of Groundwater in Storage

Sustainable Management Criteria	Description
Minimum Threshold	Sustainable yields representing net annual volume of groundwater extracted (pumping minus volume of managed aquifer recharge) for each of the 3 groups of aquifers
2025 Interim Milestone	Based on planned schedule for implementation of projects and management actions to reduce net extraction to below sustainable yield
Measurable Objective	Annual net extraction that could occur while ensuring net annual groundwater extractions greater than the MT will not occur for any 1 of the 3 aquifer groups even if there were 4 subsequent years of maximum projected net groundwater extraction
Undesirable Results	Five-year average net extraction exceeding the sustainable yield (minimum threshold) for any 1 of the groups of aquifers

4.8.1 Current Groundwater in Storage Conditions Relative to Sustainable Management Criteria

Undesirable results are occurring for the reduction in groundwater storage sustainability indicator because extraction volumes exceed MTs or the sustainable yields. Until the MGA and its partners have implemented planned projects and management actions, these temporary undesirable results are expected for this sustainability indicator. A summary of reduction of groundwater in storage SMC through the first evaluation cycle is provided in Table 4-12.

Table 4-12. Summary of Reduction of Groundwater in Storage Sustainable Management Criteria Achievement as of Water Year 2023

Aquifer Unit Group	Minimum Threshold	Interim Milestone 2025	Measurable Objective	Undesirable Results
Aromas Red Sands and Purisima F	not met	not met	not met	yes
Purisima DEF, BC, A and AA	not met	not met	not met	yes
Tu	met	not met	not met	no

The Tu unit is the only aquifer group that has 5-year average net extraction less than the MT as of WY 2023. The 5-year average net extraction in the Tu unit through WY 2023 is approximately 100 AFY less than the MT and sustainable yield of 930 AFY. The 5-year average net extraction for the Aromas Red Sands and Purisima F aquifer group and Purisima DEF, BC, A, and AA aquifer group are greater than their respective MT and sustainable yields. The Aromas Red Sands and Purisima F aquifer group 5-year moving average is about 240 AFY more than the sustainable yield of 1,740 AFY. The Purisima DEF, BC, A, and AA aquifer group is only about 40 AFY more than the sustainable yield of 2,280 AFY. As discussed in Section 4.5.1, net extraction needs to be reduced to below the MTs to eliminate undesirable results for seawater intrusion in these 2 aquifer groups.

The MO and 2025 IM is based on planned implementation of the ASR and PWS recharge projects. Since these projects have not been implemented yet, they have not accrued the benefits anticipated in the GSP implementation timeline. For this reason, the 5-year net average extraction for all 3 aquifer groups through WY 2023 did not meet IMs.

Implementation of PWS and ASR will help the Basin limit net extractions to the sustainable yield thus meeting MOs. The planned ASR project will benefit the Tu aquifer group by prioritizing recharge in Tu unit screened ASR wells. Extraction in the Aromas Red Sands and Purisima F aquifer group was 1,747 acre-feet (AF) in WY 2023, which was only 7 AF greater than the MT. The SqCWD PWS project will recharge the Purisima DEF, BC, A, and AA aquifer group with 1,500 AFY of advanced purified treated wastewater. WY 2023 net extraction in this aquifer group was 2,326 AF, MT is 2,280 AF, and the MO is 960 AF. The MO is achievable with full-scale implementation of PWS starting in 2025. The SqCWD PWS project will also reduce pumping in the Aromas Red Sands and Purisima F aquifer group in order to meet the MT and stop undesirable results like seawater intrusion in the Seascape area.

4.8.2 Evaluation of Groundwater in Storage Sustainable Management Criteria

With imminent implementation of PWS and ASR, the MGA should be able to achieve the goals defined in the GSP. Consequently, no changes to the SMC or a Plan amendment are needed for the change in groundwater storage sustainability indicator.

4.9 Land Subsidence

Land subsidence due to lowering of groundwater levels is not known to occur in the Basin and therefore no SMC are set for this sustainability indicator in the GSP. The Basin is not susceptible to subsidence because the aquifers are primarily consolidated sandstones that are not prone to compaction from lowering of groundwater levels. Even though the subsidence indicator is not applicable, significant and unreasonable subsidence is defined in the GSP should subsidence be observed in the future. The definition of significant and unreasonable subsidence is:

Any land subsidence caused by lowering of groundwater levels occurring in the basin would be considered significant and unreasonable

Subsidence monitoring data are sparse in the Basin since there has been no indication of subsidence in the past. The TRE Altamira InSAR dataset provided by DWR shows no subsidence occurring over time or in dry years when groundwater levels temporarily decline. Between June 13, 2015 and January 1, 2024 (approximately 8.5 years), land surface elevations in the Basin fluctuated by less than 1 inch total. Over this period, there was approximately 0.3 inch increase in land surface elevation near the coast and up to 0.6 inch decrease in the middle of the Basin (Figure 4-24).

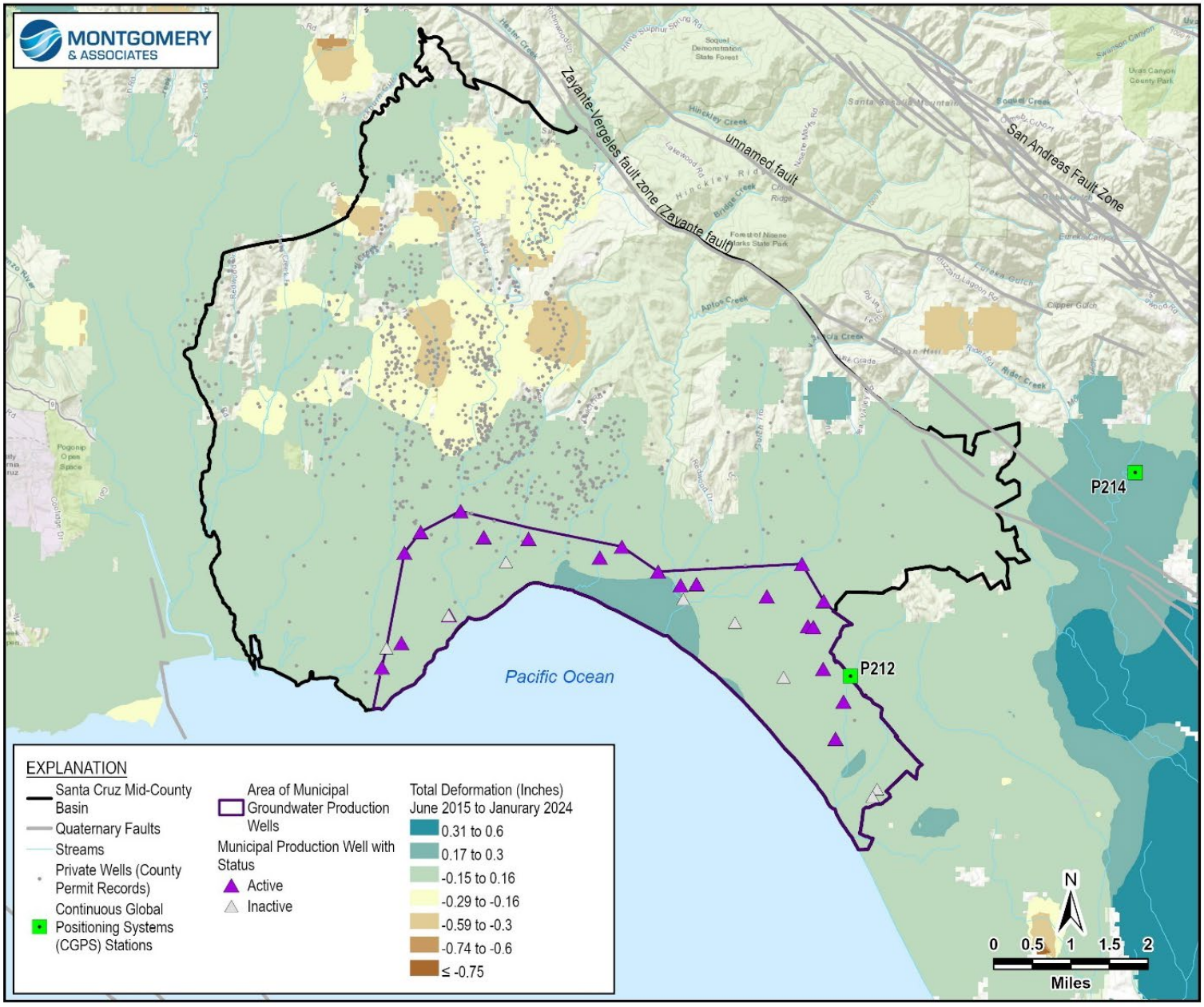

Figure 4-24. Location of CGPS Stations and Cumulative InSAR Deformation, June 2015 to January 2024

Land surface elevation change in the Basin is more likely attributed to tectonic forces than compaction of shallow sedimentary layers that overly the consolidated bedrock formations that form the basin's primary aquifers. There are 2 continuous global positioning system (CGPS) stations in the vicinity of the Basin in the Aromas area (Figure 4-24) that are used to monitor tectonic plate movement. The MGA periodically reviews the land surface elevation data from these 2 stations to monitor land surface movement. Both CGPS stations are located in areas underlain by the Aromas aquifer where groundwater levels have not experienced any significant declines. One of the stations, the Larkin Valley CGPS station (P212), is outside of the Basin but within 0.5 miles of some of the SqCWD's production well pumping from the Aromas Red Sands and Purisima F unit aquifers. Even though the station is outside of the Basin, it is still hydraulically connected with the same aquifers as the Santa Cruz Mid-County Basin and is representative of the Basin. No CGPS stations are located in areas of the Basin where the main Purisima aquifers are pumped and where historic long-term declines in groundwater have occurred.

Horizontal (North and East) and vertical displacement charts are shown on Figure 4-25 for the Larkin Valley CGPS station (P212) and Figure 4-26 for the Corralitos CGPS station (P214). Both stations show small amounts of elastic land surface elevation changes in the vertical dimension (height charts at the bottom). Elevation changes appear to be 2 inches or less in total between 2008 and 2024, and are possibly related to seasonal changes in groundwater levels. Although 2 inches appears to be quite a bit of subsidence, the movement is not noticeable in buildings and other structures because it is not differential subsidence but occurs more or less uniformly over a very large area. There is about 1.5 inches per year of lateral movement in these locations, which is about an order of magnitude greater than the amount of vertical displacement and may contribute to noise in the vertical data.

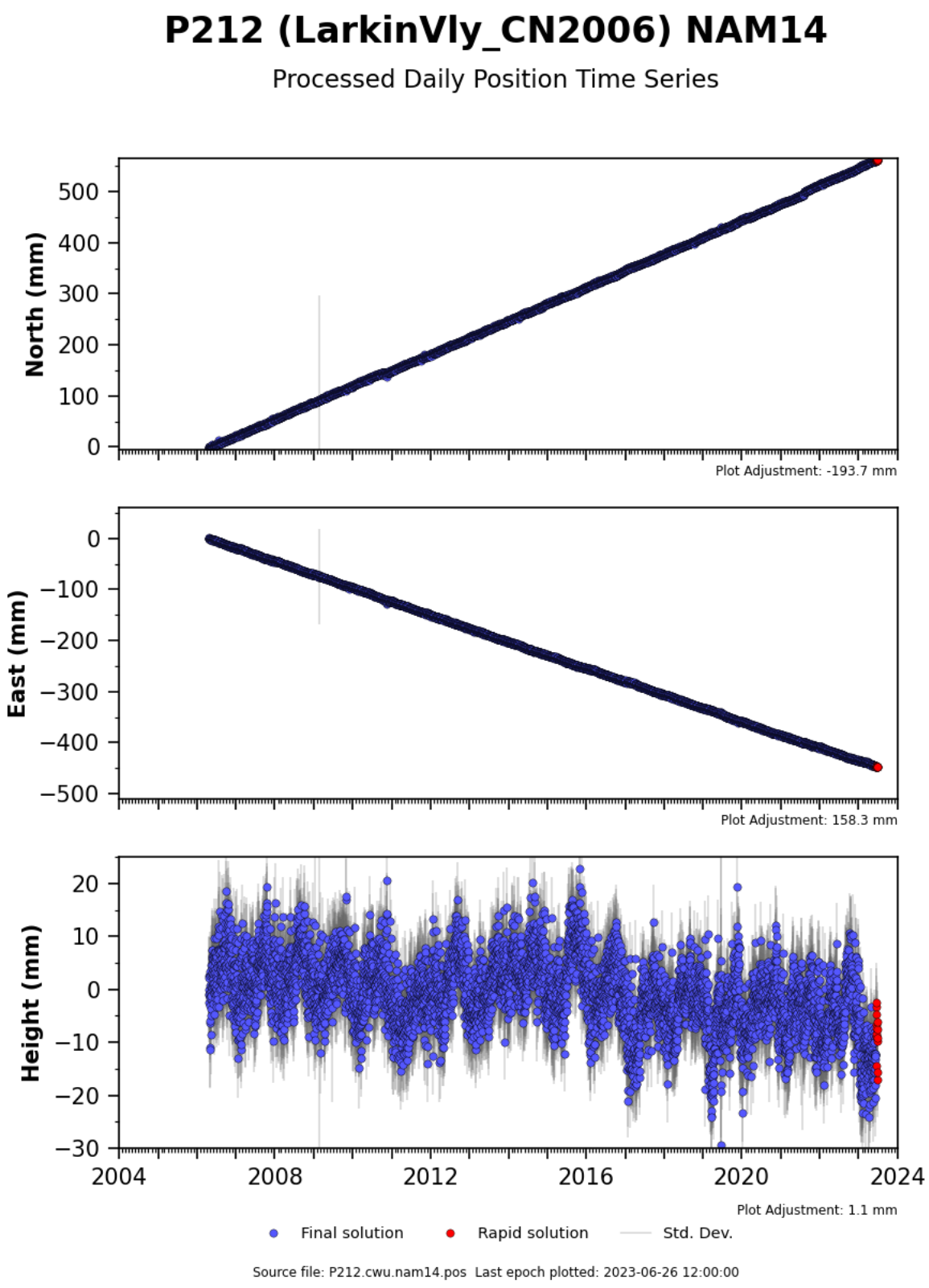

Figure 4-25. P212 Larkin Valley CGSP Station Daily Position

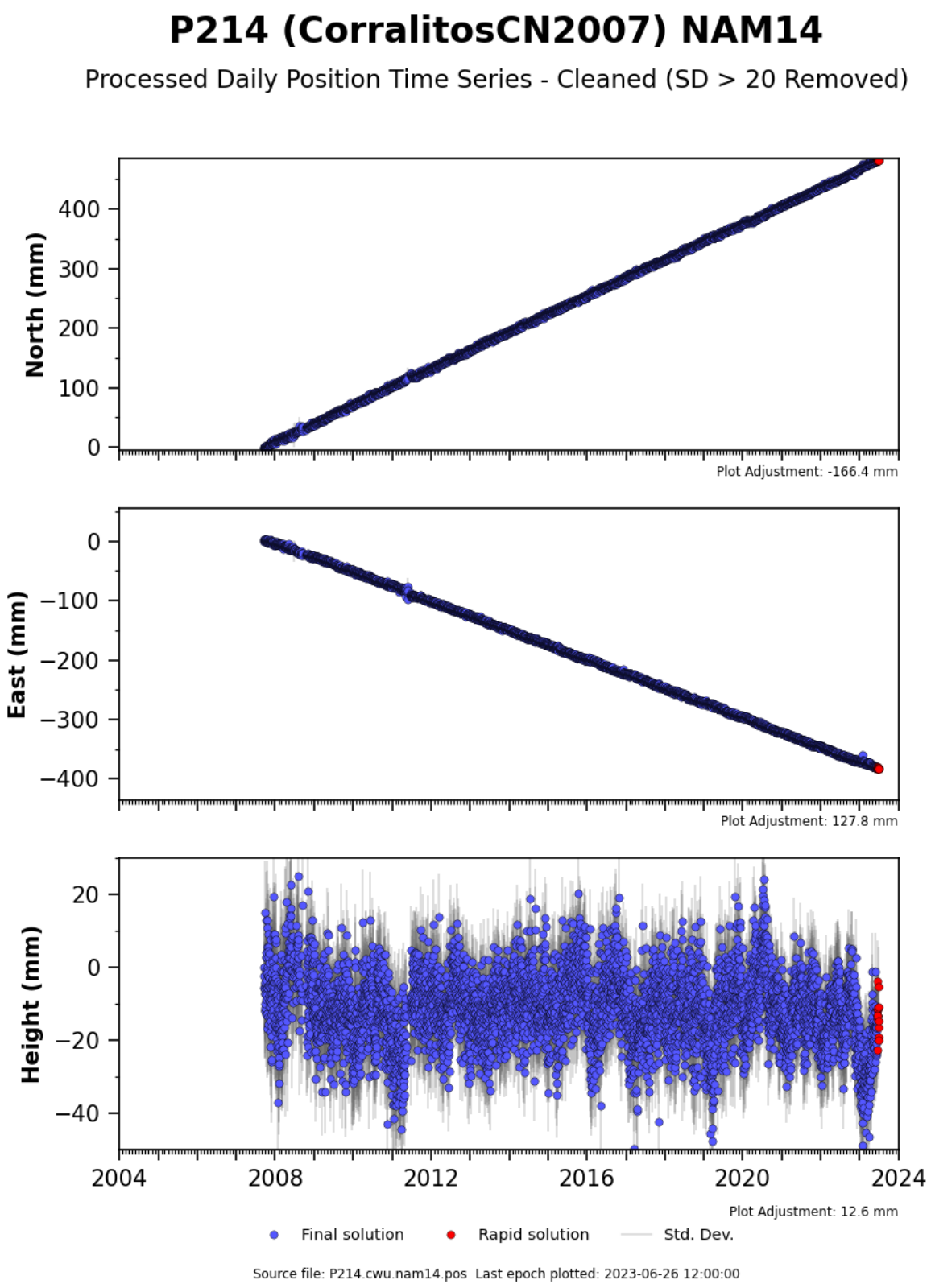

Figure 4-26. P214 Corralitos CGPS Station Daily Position

5 STATUS OF PROJECTS AND MANAGEMENT ACTIONS

The GSP identified PMAs to help the Basin achieve MOs and avoid undesirable results that were either already being implemented or were in early planning stages. The primary focus of PMAs is to prevent seawater intrusion, with mutual benefits to interconnected surface water, groundwater and GDEs. Because the City of Santa Cruz water system relies heavily on surface water, an additional focus of several PMAs is to improve water supply reliability by creating supplemental water supply, particularly for dry years when surface water flows are limited.

5.1 Projects and Management Actions included in the 2020 GSP

Baseline Projects and Management Actions (Group 1)

Group 1 activities represent existing groundwater management commitments by the MGA member agencies, including: water conservation and demand management; and installation and redistribution of municipal groundwater pumping. Group 1 activities are currently being implemented and are expected to continue to be implemented to achieve groundwater sustainability within the Basin.

Projects and Management Actions Evaluated Against the Sustainable Management Criteria (Group 2)

Activities in Group 2 have been developed and thoroughly vetted by the MGA member agencies and are planned for near-term implementation, including: SqCWD PWS; SCWD ASR; inter-agency transfers, and distributed storm water managed aquifer recharge.

Identified Projects and Management Actions That May Be Evaluated in the Future (Group 3)

The 2020 GSP demonstrated that ongoing implementation of Group 1 activities and the added implementation of Group 2 projects and management actions will bring the Basin into sustainability. However, if 1 of the Group 2 PMAs either fails to take place or does not have the expected results, further actions will be required. In that case, appropriate projects and/or management actions will be chosen from Group 3, which include recycled water reuse, desalination, water use curtailment, or other projects that may become possible through emerging technology. The specific activity selected will be based on factors such as size of the water shortage, speed of implementation, and scale of regulatory and political hurdles.

5.1.1 Ongoing or Completed Projects and Management Actions

MGA member agencies have implemented Group 1 PMAs to support sustainable groundwater management. Table 5-1 includes columns that indicate Group 1 PMAs targeted sustainability indicators, project status, expected schedule, benefits observed to date or anticipated benefits, and estimated accrued benefits at completion.

Table 5-1. GSP Projects and Management Actions (Groups 1 and 2)

Project or Management Action Name	Project or Management Action Description	Targeted Sustainability Indicator	Project Status	Expected Schedule	Benefits Observed to Date or Anticipated Benefits
Group 1 - Baseline Projects and Management Actions					
Water Conservation and Demand Management	MGA's member water agencies have a full range of water conservation programs in place and have actively and successfully implemented policies and programs promoting and incentivizing water conservation and efficient water use. SCWD's and SqCWD's residential water usage (gallons capita per day) are among the lowest in the state	SWI, GWL, GW STOR	Ongoing	Permanent management action	Groundwater demand has been reduced 41% since WY 1997. Figure 5-1 shows the ongoing reduction in groundwater use Increased groundwater levels in area supplied municipal water, even during the 2012-2015 drought
Installation and Redistribution of Municipal Groundwater Pumping	Management action to move pumping inland and/or in optimal locations relative to PWS and ASR to help avoid undesirable results	SWI, GWL, GW STOR, ISW	Ongoing	Cunnison Lane Well to be constructed in by the end of 2024	Coastal groundwater levels have increased over time as pumping has moved inland
Group 2 - Projects and Management Actions Planned to Reach Sustainability					
Pure Water Soquel (PWS) by SqCWD	Project to recharge purified recycled water at 3 recharge wells to replenish the aquifer and prevent seawater intrusion by raising groundwater levels above SWI MTs	SWI, GWL, GW STOR	Completing construction and performing demonstration testing with potable water	Planned completion of construction by the end of WY 2024 with start-up in WY 2025	Project not yet implemented Predictive groundwater modeling carried out during GSP development and for the Optimization Study demonstrates groundwater levels are expected to increase to protective levels (MTs) in all SWI RMP thereby avoiding undesirable results
Aquifer Storage and Recovery (ASR) by SCWD	Project to inject excess surface water treated to drinking water standards, into the Basin aquifers for use as an underground storage reservoir to be used when surface water supplies are limited	SWI, GWL, GW STOR	Demonstration testing	Phased implementation of full-scale ASR starting in calendar year 2025 and scheduled for completion in calendar year 2026	Project not yet implemented Contribute to City of Santa Cruz water supply resiliency while helping to achieve basin sustainability
Inter-Agency Transfers between SCWD and SqCWD	Water transfers from SCWD to SqCWD and from SqCWD to SCWD	SWI, GWL, GW STOR	Pilot testing and evaluation	Several years away	Project not yet implemented In lieu recharge to increase groundwater levels and storage Contribute to City of Santa Cruz water supply resiliency
Distributed Storm Water Managed Aquifer Recharge (DSWMAR)	Use of storm water flows for groundwater recharge to increase groundwater storage. Facilities with a capacity of up to 10 AF/year/site capture and treat storm water for shallow groundwater recharge. Recharge is accomplished through surface spreading and/or the construction of dry wells	SWI, GWL, GW STOR	2 facilities constructed 2 suitable sites are no longer available and a search for additional facilities is on hold	Speculative, dependent on availability of suitable sites	Increase groundwater levels and storage in shallow aquifers

Notes: SWI = seawater intrusion, GWL = chronic lowering of groundwater levels, GW STOR = reduction of groundwater in storage

5.1.1.1 Water Conservation and Demand Management (Group 1 Baseline Project)

The MGA member agencies continue to implement a full range of water conservation programs and have successfully implemented policies and programs promoting and incentivizing water conservation and efficient water use. The success of these programs in reducing water use is evident on Figure 5-1 which displays annual water use in the Basin since 1985. Figure 5-1 shows a clear decrease in water use after demand management was implemented in the 1990s. The MGA member agencies plan to continue these successful water use reduction strategies. Benefits are monitored with the Basin-wide groundwater monitoring network by comparing groundwater levels and groundwater quality against past observations. Costs of conservation and demand management programs are built into the MGA member agency ongoing budgetary commitments and are not expected to be passed on to the MGA. Reduced water demand and groundwater extraction benefits all beneficial users, especially domestic groundwater users and GDEs which typically rely on shallower aquifers.

5.1.1.2 Installation and Redistribution of Municipal Groundwater Pumping (Group 1 Management Action)

The MGA member agencies identified the need to move groundwater production further from the coast to reduce the threat of seawater intrusion related to pumping impacts from municipal wells. The MGA member agencies have started to implement this management action. Prior to GSP adoption, 3 SqCWD (Polo Grounds, O'Neill Ranch and Granite Way) and 1 SCWD (Beltz #12) new municipal wells were installed and operated in more inland locations. Since GSP adoption, 1 new inland SqCWD municipal well has been installed and will begin operation in the next evaluation cycle (Cunnison Lane in Soquel).

MGA member agencies have also adjusted the timing and pumping amounts from existing wells to redistribute pumping both vertically and horizontally within Basin aquifers. These efforts have been used to achieve more uniform drawdown of the Basin, to minimize localized pumping depressions, and reduce the Basin's susceptibility to seawater intrusion. Redistribution of groundwater pumping is direct management of groundwater extraction. While this management action does not reduce overall Basin groundwater extracted, it does allow municipal groundwater extraction to consider and respond to changes in groundwater levels across the portions of the Basin within municipal service areas. Benefits are monitored with the Basin-wide groundwater monitoring network by comparing groundwater levels and groundwater quality against past observations. Undesirable results are not occurring in inland areas, which shows nearby beneficial users are not being impacted.

Reduction of pumping at SqCWD's Seascape well is an example of where redistribution of its pumping to inland wells has been used as a management action to limit increasing chloride concentrations in the Seascape area.

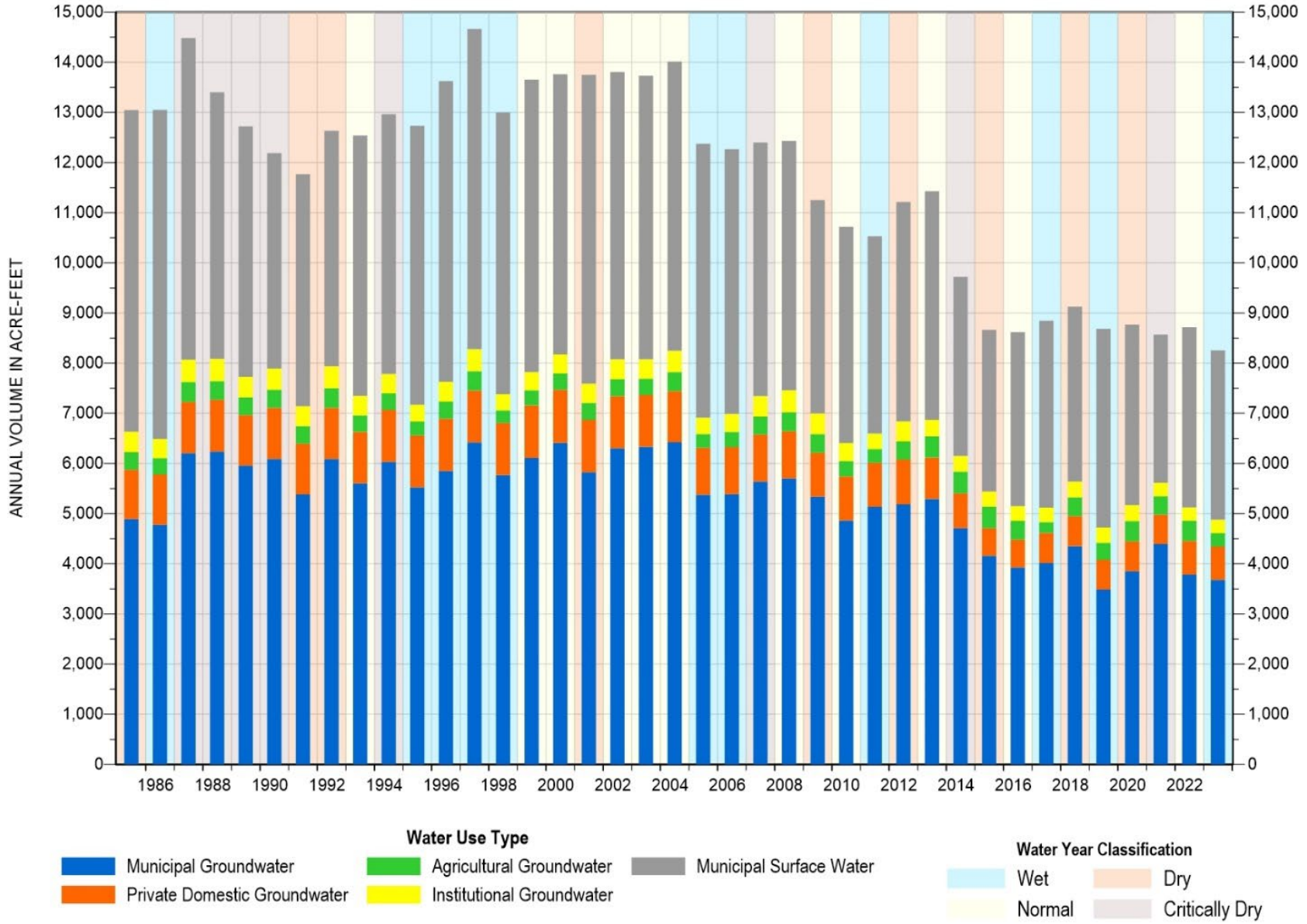

Figure 5-1. Annual Historical Water Use

5.1.2 Projects and Management Actions being Planned or Developed

SqCWD and SCWD have developed projects to promote groundwater sustainability in their respective service areas (Table 5-1). These projects have been in planning and development stages during the evaluation cycle. Two of the major projects are nearing project implementation after which it is anticipated benefits will start to be observed.

5.1.2.1 Soquel Creek Water District Pure Water Soquel (Group 2 Project)

The PWS project will recharge purified recycled water at 3 SWIP wells to replenish the aquifer and aid in raising groundwater levels above seawater intrusion MTs. The project is currently being constructed to produce up to 1,500 AFY of purified water. The project has completed California Environmental Quality Act environmental review with a certified Environmental Impact Report (EIR). Planned completion of construction is anticipated by the end of WY 2024 with project startup in WY 2025.

Project components include the following:

- Three SWIP wells – Twin Lakes, Willowbrook, and Monterey will be used to recharge Purisima A and BC aquifers with purified recycled water.
- Nine Monitoring wells – Monitoring wells have been strategically constructed adjacent to the SWIP wells. These will monitor groundwater quality and levels throughout the operation of Pure Water Soquel.
- Conveyance – The project involves the construction of approximately 8 miles of pipelines. These pipelines will transport water to and from the Santa Cruz Wastewater Treatment Facility to the Chanticleer Water Purification Center and convey purified water from the Purification Center to the SWIP wells for aquifer recharge. The pipelines are designed for potential future expansion, doubling the current design capacity if needed.
- Treatment facilities - 2 new water treatment facilities are being built. One is a recycled water treatment facility, and the other is a water purification center.
    - New Recycled Water Facility: Located at the Santa Cruz Wastewater Treatment Facility, this facility includes a source water pump station and brine return pipeline to support the new Water Purification Center; a Pacific Gas and Electric metering enclosure near Bay Street and California Street, a radio communication pole, and a tertiary treatment system (cloth filter and UV system). It will produce recycled water for on-site use, a future construction water fill station, and irrigation at a nearby park.
    - New Water Purification Center: Situated at the corner of Soquel Avenue and Chanticleer Avenue in the Live Oak area, this center will use a state-of-the-art, 3-step advanced purification process: microfiltration, reverse osmosis, and ultraviolet light with advanced oxidation and ozone pre-treatment. The purified

water will be pumped to the SWIP wells for underground recharge of the groundwater basin. The center will also feature an educational learning center.

SqCWD maintains an informative outreach and education program specific to the PWS that includes a dedicated section on its website[8] and periodically includes PWS Project updates in the SqCWD's monthly email blast. Weekly construction updates are also available on the District's website[9]:

The PWS project is needed to increase coastal groundwater levels to elevations protective of seawater intrusion. Predictive groundwater modeling during GSP development indicated that demand management and water conservation on their own would not achieve MT protective elevations or MOs for the seawater intrusion sustainability indicator. As predicted, some coastal groundwater levels are still below MTs, and therefore, recharging groundwater continues to be the planned approach to increase coastal groundwater levels.

5.1.2.2 Santa Cruz Water Department Aquifer Storage and Recovery (Group 2 Project)

SCWD is evaluating an aquifer storage and recovery (ASR) project as part of its effort to develop additional water supplies for use during extended drought periods while contributing to improved conditions in the Santa Cruz Mid-County Groundwater Basin. The project involves diverting available flows from the San Lorenzo River beyond what is needed to meet system demands, and injecting and storing the treated water in the aquifer.

It is expected the SCWD will receive California State Water Resources Control Board action in calendar year 2024 on water rights petitions for change that will lead to phased implementation of full-scale ASR at the SCWD's existing Beltz wells. The SCWD completed implementation of demonstration studies at both Beltz # 8 and #12 wells to reveal any operational issues associated with full-scale injection and extraction rates prior to implementing permanent design changes to these facilities. It is now in the design phase for modifications to convert these 2 wells to permanent ASR wells. This work is scheduled for completion in calendar year 2026. In addition, the SCWD has completed pilot testing at Beltz #9. Similar to Beltz #8 and #12, the pilot testing is conducted as a series of brief incremental cycles of injection and extraction to evaluate water quality and basin impacts. Data collected during pilot testing at Beltz #9 is being analyzed to evaluate whether to proceed with design and construction to convert the Beltz #9 well to a permanent ASR well.

SCWD uses a water system simulation model (Santa Cruz Water System Model or SCWSM) to analyze projected surface water availability. SCWD's water system is insufficient to meet demands during both drought and restore the Basin within the 20-year SGMA planning horizon. Availability of surface water for possible use to achieve both Basin sustainability and SCWD

[8] https://www.soquelcreekwater.org/pws
[9] https://www.soquelcreekwater.org/256/Construction-Updates

drought supply objectives is constrained by a number of factors, including drinking water treatment capacity, water rights, fish flows, and potential climate change impacts on the availability of surface water resources.

Most recently, the SCWSM has been used with 2 climate scenarios, the updated Catalog Climate and the 1270 Realization, to plan ASR implementation and potential ASR expansion in the Santa Cruz Mid-County Optimization Study. This study is currently examining the potential for ASR to be expanded or implemented differently to meet projected demands in a sustainable and feasible manner. A summary of the Optimization Study is provided in Section 5.2.

5.1.2.3 Inter-Agency Transfers (Group 2 Project)

SqCWD and SCWD are connected by an intertie linking their distribution systems. In the GSP, water transfers for in lieu groundwater recharge was included as a project that would deliver excess SCWD surface water, treated to drinking water standards, to SqCWD to reduce groundwater pumping and allow an increase in groundwater in storage in order to help prevent seawater intrusion. If water transfers benefit groundwater levels and reaches sustainability targets, then SCWD could recover some of the increase in groundwater in storage as a supplemental supply during droughts. The Optimization Study is evaluating the benefits and opportunities of water transfers and exchanges between the two agencies. A current maximum capacity of 850 gallons per minute (gpm) is estimated for transfers from SCWD to SqCWD (Akel Engineering, 2024). Future hydraulic infrastructure improvements could increase intertie capacity in either direction.

The Santa Cruz Mid-County Basin Optimization Study (Section 5.2) has recently identified water transfers from SqCWD to SCWD as a project to help SCWD meet its water supply gap while achieving sustainability. This potential new project was not included in the GSP and is still being evaluated. The current maximum capacity for transfers from SqCWD to SCWD (east to west) is estimated to be 1,000 gpm.

Water transfers between SqCWD and SCWD are still being evaluated and potential implementation is several years away.

5.1.2.4 Distributed Storm Water Managed Aquifer Recharge (Group 2 Project)

Distributed Storm Water Managed Aquifer Recharge (DSWMAR) redirects storm water flows for use as a groundwater recharge supply to increase groundwater storage. Where feasible, small to medium scale (up to 10 acre-feet per year per site) facilities are installed to capture and treat storm water for shallow groundwater recharge zones in Basin groundwater aquifers. Projects would be accomplished through surface spreading and/or the construction of dry wells.

Included in the GSP are 2 County-installed 2 DSWMAR projects in the Live Oak and Aptos areas of the Basin. Bioswale filtration systems and dry wells are installed at Brommer Street County Park with a capacity to recharge 1 AFY from the parking lot runoff. Bioswales and dry wells were also installed to capture runoff from 2 parking lots at Polo Grounds County Park with

a capacity to recharge 19 AFY. Eight more DSWMAR sites were evaluated in 2018, 3 of which were identified for further site investigation (MME, 2019). One of the 3 sites was eliminated because depth to groundwater was too shallow for recharge to be effective. The other 2 sites were located at the Seascape Golf Course. Unfortunately, the current owners of the golf course are not amenable to storm water recharge on their property.

The availability of suitable sites and the limited scale of DSWMAR projects may be a constraint to project implementation. The County has developed a parcel-based recharge suitability mapping tool that is used to identify properties that would be appropriate for recharge mitigation projects when development permit applications are received. The timetable for development at additional DSWMAR project sites is not available and continues to be speculative at this time.

5.1.3 Identified Potential Future Projects and Management Actions

MGA's analysis indicates the ongoing implementation of Group 1 activities and the added implementation of Group 2 PMAs should bring the Basin into sustainability. However, if 1 of the PMAs required for sustainability in Group 2 either fails to take place or does not have the expected results, further actions will be required. In that case, appropriate projects and/or management actions will be chosen from Group 3, which include recycled water reuse, desalination, water use curtailment, or other projects that may become possible through emerging technology (Table 5-2). The specific activity selected will be based on factors such as size of the water shortage, speed of implementation, and scale of regulatory and political hurdles.

Table 5-2. Identified Potential Future Projects and Management Actions (Group 3)

Group 3 - Identified Projects and Management Actions That May Be Evaluated in the Future		
Project	**Category**	**Description**
Recycled Water – Groundwater Replenishment and Reuse (GRR)	Project	A new or expanded centralized GRR project could be developed by SCWD, SqCWD, or as a joint project of these agencies. SCWD Recycled Water Facilities Planning Study (2018) identifies a GRR project as a future (mid-term) possibility requiring additional studies to confirm feasibility to meet drought shortfall needs and/or support basin sustainability goals in either or both the Mid-County and Santa Margarita groundwater basins. In addition, the SqCWD Feasibility Study (Carollo Engineers, 2017) and the PWS EIR (Environmental Science Associates, 2018) also identify expansion opportunities. If necessary, this project will be reassessed as GSP Implementation proceeds.
Recycled Water – Surface Water (Reservoir) Water Augmentation	Project	Reservoir Augmentation would use advanced treated Santa Cruz Wastewater Treatment Facility effluent to replenish Santa Cruz's Loch Lomond Reservoir. SCWD evaluated this option in its 2018 Recycled Water Facilities Planning Study (Kennedy/Jenks, 2018) and did not identify it as a preferred alternative. Conceptually this approach could serve to augment supply to the Basin as well as improve the reliability of Santa Cruz's water supply. If necessary, this project will be reassessed as GSP Implementation proceeds.
Recycled Water – Direct Potable Reuse	Project	Current state regulations now allow the introduction of advanced treated recycled water directly into a public water system. The feasibility and potential future need for this option will continue to be evaluated.
Groundwater Pumping Curtailment and/or Restrictions	Management Action	Potential policy to curtail and/or restrict groundwater extractions from areas at high risk of seawater intrusion or surface water depletions would be considered if the planned PMAs are insufficient to reach and/or maintain sustainability and 1 or more sustainability indicator is likely to dip below the minimum threshold by 2040.
Local Desalination	Project	Previously considered by SCWD in partnership with SqCWD. This is no longer being actively pursued but given the Basin's proximity to the Pacific Ocean this option will continue to be a potential option.
Regional Desalination	Project	DeepWater Desal LLC., is a private company seeking to establish a regional supply facility in Moss Landing. It would produce an estimated 25,000 AFY (22 million gallons per day) of treated desalinated water available for purchase by local agencies. The MGA is not actively considering this project at this time since there has not been any development with this project.

5.2 Santa Cruz Mid-County Basin Regional Optimization Study

The parallel implementation of ASR and PWS as planned in the GSP is anticipated to result in Basin sustainability (MGA, 2019). However, these projects as planned are not predicted to meet all member agency water demands while achieving sustainability. There may be configurations or combinations of projects that achieve SMC and better address water supply needs. Therefore, SqCWD and SCWD have conducted the Santa Cruz Mid-County Regional Water Optimization Study (Optimization Study) funded by a DWR Proposition 1 Groundwater Sustainability grant for critically overdrafted basins. The Optimization Study analyzes how different configurations and combinations of PMAs can improve Basin sustainability while better meeting supply needs. Specifically, the study examined reconfigurations and expansions of PWS, ASR, and inter-agency transfers.

This study represents the first large-scale effort following GSP adoption to coordinate, align, and optimize planning of PWS, ASR, and water transfers in the Basin. To achieve this goal, iterative optimization of a coupled GSFLOW model was conducted using traditional optimization supplemented by machine learning guided optimization. Optimization focused on maintaining sustainable groundwater elevations throughout the Basin while feasibly meeting as much of SCWD's water demand as possible. For the Optimization Study, SCWD water demand is assumed to be based on demand projected for 2045, an increase from the 2016-2018 demand for SCWD used to evaluate PMAs in the GSP.

The study identified 4 alternatives for managing groundwater and surface water in the Basin. These alternatives represent 4 levels of increased infrastructure added to GSP-identified projects. ASR as planned in the GSP is 4 ASR wells (Beltz 8, 9, 10, and 12) and PWS as planned in the GSP is 3 injection wells.

Alternative A: As planned ASR, as planned PWS, and transfers between the 2 agencies limited by existing intertie capacity.

Alternative B: As planned ASR plus 1 additional Purisima A/AA ASR well near the Capitola Mall, as planned PWS, and transfers from SqCWD to SCWD with an intertie upgrade.

Alternative C: As planned PWS plus 400 AFY of additional purified water recharge near Anna Jean Cummings Park at a new well in the Purisima AA/Tu, as planned ASR plus 1 additional AA/Tu ASR well near the Capitola Mall, and transfers from SqCWD to SCWD with an intertie upgrade.

Alternative D: As planned PWS plus 600 AFY of additional purified water recharge near Anna Jean Cummings Park at 2 new wells in the Purisima A/AA and AA/Tu, as planned ASR plus 2 additional ASR wells in the Purisima A/AA and AA/Tu near the Capitola Mall, and transfers from SqCWD to SCWD with an intertie upgrade.

In addition to these alternatives, numerous management options were examined and simulated in the groundwater model, including thousands of simulations created using Machine Learning

Guided Optimization. Results are highlighting the value of transfers to basin sustainability and supply reliability from: SqCWD to SCWD; ASR expansion near the Capitola mall; and the potential for multi-agency benefit when implementing a limited PWS expansion near Anna Jean Cummings Park.

These 4 alternatives reflects a departure from PMA scenarios used in the GSP which did not simulate inter-agency transfers and did not anticipate the larger supply gap being planned for today due to climate change planning. Further, Alternatives B-D represent expansion of the PWS and ASR projects modeled in the GSP. Since the Optimization Study has not been completed to inform which alternative to evaluate further, no changes are needed at this time to the GSP. Ultimately, while these alternatives reflect different possible configurations or expansions of planned projects, they are anticipated to similarly increase Basin sustainability while providing more supply and operational flexibility.

6 BASIN SETTING BASED ON NEW INFORMATION OR CHANGES IN WATER USE

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

6.1 Hydrogeologic Conceptual Model

None of the new studies and data collected during the evaluation cycle significantly change understanding of the Basin's HCM (see Section 2). The statuses of GSP-identified data gaps are summarized in Table 6-1.

Table 6-1. GSP-Identified Data Gap Status

GSP-Identified Data Gap	Status
1. The lateral extent of the Tu unit beneath the Purisima AA unit is uncertain due to limited wells that extend to the deeper depths where the Tu unit occurs. A few municipal wells in the western portion of the Basin are screened in the Tu unit, but no known private wells are screened in the Tu unit	A new deep coastal monitoring well (SP-5) was drilled and screened in the Tu unit (Figure 7-2). This location confirms the Tu unit extends at least that far to the west at the coast. A second deep coastal monitoring well (SC-3AA) to the east of SP-5 confirmed the presence and depth of Tu unit. AEM data (Figure 2-1) may be used to better delineate the lateral extent of the Tu unit to improve conceptual and numerical model geometry when a full model update occurs prior to the next Periodic Evaluation. Improved understanding will be gained when potential new ASR or production wells are drilled into the Tu unit wells.
2. Recharge sources to the Tu unit are not well understood because of a lack of wells completed to the west of production wells in the Tu unit and lack of definitive correlation between Tu unit sediments and mapping of geologic outcrops	There have not been Tu unit wells drilled to the west of Tu unit production wells or between Tu unit outcrop areas and production wells to improve understanding of recharge sources to the Tu unit. Use of the Tu unit for ASR and groundwater production is being carefully managed to avoid undesirable results.
3. The area north of the Aptos area faulting is poorly understood because there are only non-municipal domestic, agricultural, and non-municipal institutional wells that are relatively shallow and generally extend only to the shallowest water-bearing formation. The data from well driller's logs associated with these private wells generally do not allow for stratigraphy to be determined	AEM data (Figure 2-1) will be used to improve conceptual and numerical model geometry when a full model update occurs prior to the next Periodic Evaluation.
4. The Purisima units beneath the Aromas and Purisima F unit in the eastern portion of the Basin are not well understood because wells are not drilled deeper than the Purisima F unit.	There are limited AEM flight lines in the eastern portion of the Basin (Figure 2-1). Available AEM data will be used to improve conceptual and numerical model geometry when a full model update occurs prior to the next Periodic Evaluation.

GSP-Identified Data Gap	Status
5. The hydrogeology along the Basin's boundary with the Santa Margarita Basin is poorly understood because of limited good quality stratigraphy data.	2 AEM flight lines, perpendicular to each other, cross the basins' boundary (Figure 2-1) that will be used to improve conceptual and numerical model geometry when a full model update occurs prior to the next Periodic Evaluation.
6. The offshore outcrops of aquifer units are based on the intersection of seafloor elevations and offshore projections of hydrostratigraphic surfaces. Due to the submarine nature of these outcrops, there is a high level of uncertainty as to the exact location and extent of the outcrops.	Although this data gap was identified in the GSP as a source of uncertainty, there is no intention of addressing it because of the technical and economic infeasibility of offshore investigations. Additionally, SMC allow for management of the Basin to address seawater intrusion without resolving this uncertainty.

6.2 Groundwater Conditions

The understanding of regional groundwater conditions has not significantly changed in the past 5 years. The Basin was already relatively well characterized during GSP planning and development. Rather than change understanding of groundwater conditions, new data sources, applications, and tools made available to support sustainable management by DWR and other organizations have only enhanced the MGA's ability to monitor groundwater conditions.

Two new MCLs were published in 2024 that have bearing on Basin groundwater quality monitoring. In the GSP, chromium VI was identified as a COC, but an MT was not assigned because it did not yet have a maximum contaminant level (MCL). California adopted a new chromium VI MCL) of 10 µg/L for drinking water in April 2024. Consistent with degraded groundwater quality MTs being the same as drinking water MCL, the WY 2024 Annual Report will include a chromium VI MT of 10 µg/L. PFAS had MCLs established by the U.S. Environmental Protection Agency (EPA) in April 2024. Public water systems are required to monitor for PFAS and have 3 years to complete initial monitoring (by 2027), followed by ongoing compliance monitoring. PFAS will be added as a COC and concentrations will be reported in the WY 2024 Annual Report. No other new COCs are identified.

Section 7.2 describes the effort to add shallow monitoring wells paired with stream gages in data gap areas to better understand interconnected surface water across the Basin. Once sufficient data are collected from these monitoring points, an evaluation of groundwater's relationship to surface water at these added locations will be conducted to supplement the current understanding of ISW.

6.3 Water Use Changes and Associated Water Budget

The Basin continues to use less water overall and less groundwater as water demand decreases. Demand reduction and more efficient use of existing supply has been apparent since the 1990s due to water conservation efforts. PMAs implemented in the next evaluation cycle will also significantly increase available water supply through previously unused resources including purified recycled water and additional available surface water.

6.3.1 Basin Water Use

Water use has decreased in the Basin significantly since demand management measures were implemented in the 1990s. Total groundwater use in WY 2023 is 41% less than in WY 1997. Total water use in the Basin has similarly reduced 44% since WY 1997, demonstrating surface water use has also been reduced. Figure 5-1 shows annual water use in the Basin since 1985.

Over the evaluation cycle, less groundwater was pumped than in the past. Table 6-2 compares groundwater use against groundwater use in historical, current, and projected budgets. Compared to the projected budget, groundwater extracted during the evaluation cycle is just less than the projected use for the same period (WY 2019 – 2023), but 652 AFY more than the full projected period. This difference is expected because PWS and ASR have not been implemented yet; once operational they will support reductions in municipal groundwater use.

Table 6-2. Periodic Evaluation Cycle Water Use Compared to Historical, Current, and Projected Groundwater Budgets

Time Period		Average Annual Groundwater Use (acre-feet)
Evaluation Cycle (WY 2019 – 2023)		5,100
GSP Historical Budget (WY 1985 – 2015)		7,160
GSP Current Budget (WY 2010 – 2015)		6,380
Updated Current Budget (WY 2010 – 2023)		5,700
GSP Projected Budget	WY 2019 – 2023	5,220
	WY 2016 – 2069	4,450

There have not been any significant changes in land use that would increase water demand since the GSP was adopted. This is supported by the ongoing reduction in water used in the Basin.

6.3.2 Groundwater Budgets

This subsection provides updated historical, current, and projected groundwater budgets and compares them against the Periodic Evaluation period budgets.

6.3.2.1 Historical Groundwater Budget

The historical Basin groundwater budget is described in GSP Section 2.2.5.4.2 and presented visually on GSP Figure 2-60. The GSP historical period covers WY 1985-2015. Figure 6-1 presents an updated historical groundwater budget spanning WY 1985-2023, adding years since GSP submittal.

The 8 additional years now included in the budget encompass variable climate conditions including 3 wet years, 3 dry/critically dry years, and 2 normal years. Most notably, annual

groundwater extraction in these additional years is relatively low compared to the historical record because of improved water conservation and management practices. Reduced extraction leads to higher net offshore flows, indicating conditions are less susceptible to seawater intrusion. Figure 6-1 is useful to evaluate the longer-term cumulative change in groundwater storage which increased starting in WY 1994, corresponding with the start of a 4-year wet period and then with reducing groundwater extractions. Since WY 2006, cumulative change in storage has been stable.

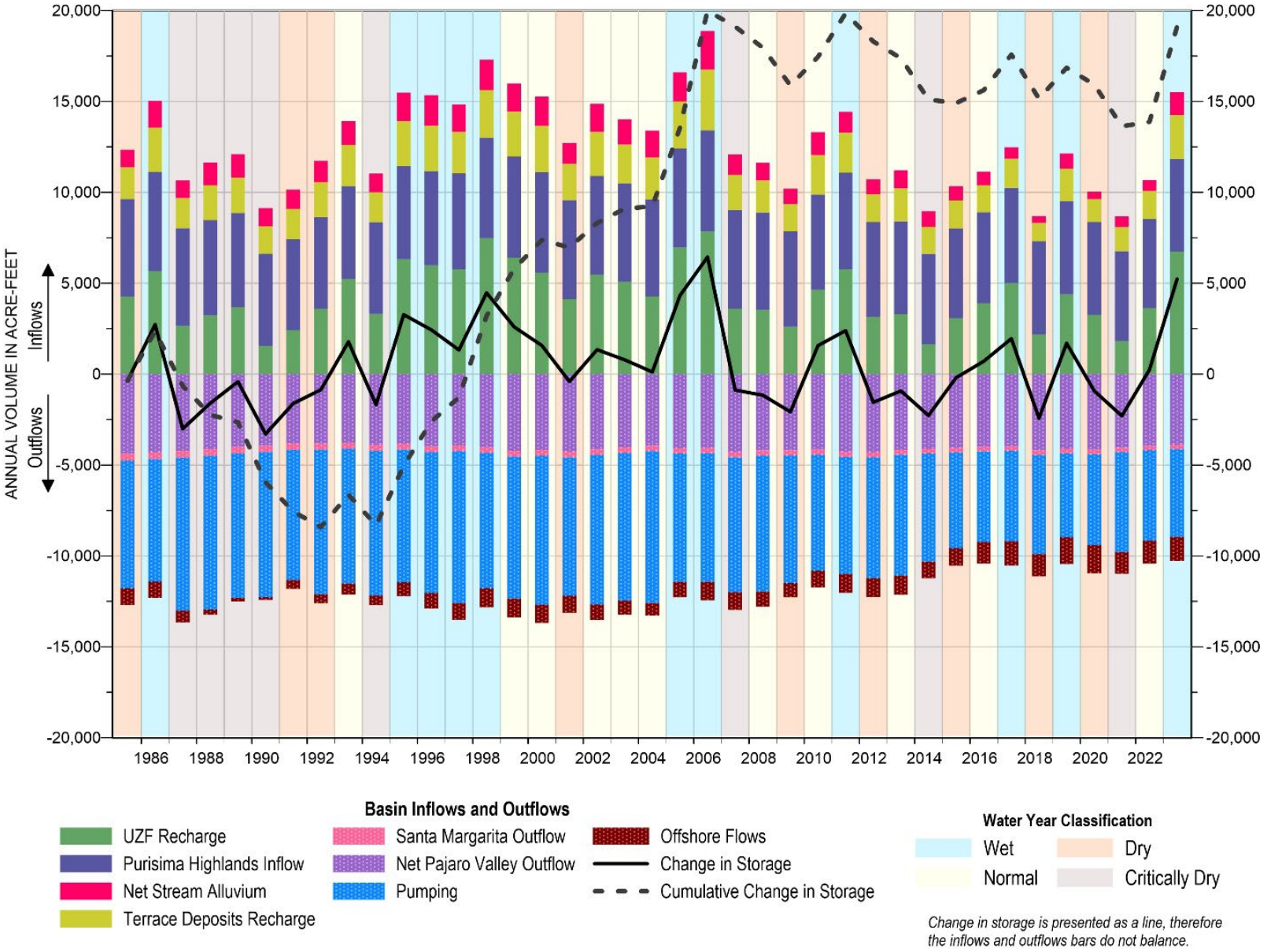

Figure 6-1. Historical Annual Groundwater Budget - Water Years 1985 to 2023

6.3.2.2 Current Groundwater Budget

The GSP's current groundwater budget, which covers WY 2010 to 2015, is described in GSP Section 2.2.5.5 and presented visually on GSP Figure 2-65. The updated current water budget adds the years after 2015 to cover the period from WY 2010 to 2023. The updated current groundwater budget is presented on Figure 6-2 and averaged by component in Table 6-3.

As described above for the historical groundwater budget period, continued reductions in pumping over the past 5 years have lowered average annual pumping and increased offshore flows. The added 5-year period reflects a range of water year types: wet years occur either side of a 3-year normal to critically dry period. While there is an average annual storage loss during dry and critically dry years, larger gains in storage in normal and wet years results in a cumulative increase in storage over the WY 2010 to WY 2023 current period. Table 6-4 compares average annual groundwater budget components for the updated current groundwater budget and the GSP's current budget. The most notable change is the substantial decrease in groundwater extraction when incorporating the last 5 years. This leads to a substantial increase (54%) in net offshore flow, lessening the risk for seawater intrusion. Interconnected surface water also benefits from reduced extraction. Table 6-4 shows a reduction in groundwater recharge from stream alluvium that approximates a 20% increase in flows from groundwater to streams and creeks.

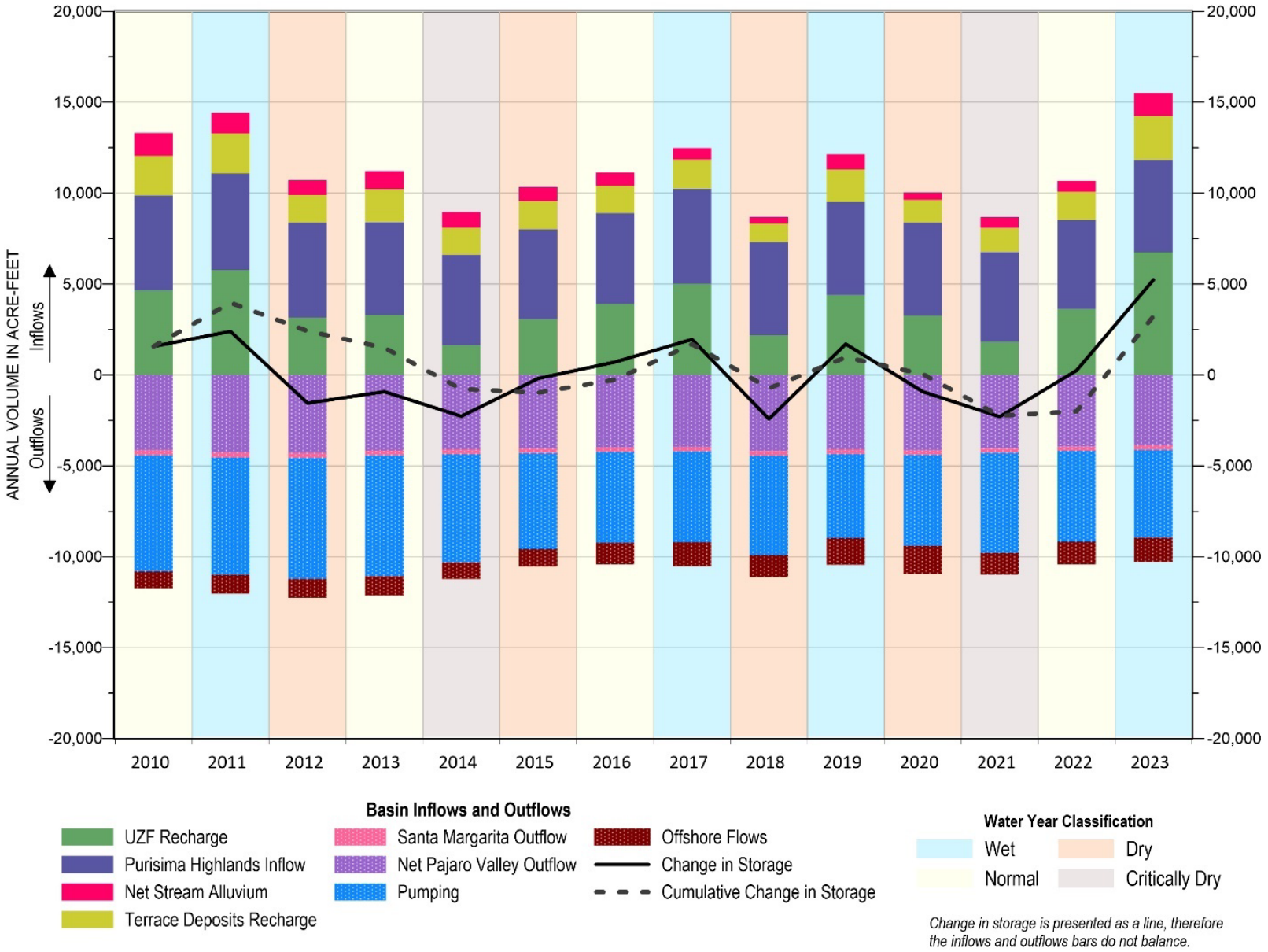

Figure 6-2. Current Groundwater Budget - Water Years 2010 to 2023

Table 6-3. Santa Cruz Mid-County Basin Updated Current Groundwater Budget, WY 2010 - 2023

Groundwater Budget Component	Average Annual Volume (acre-feet)			Average % (rounded)
	Minimum	Maximum	Average	
Inflows				
UZF Recharge*	1,643	6,745	3,754	33%
Net Recharge from Stream Alluvium	372	1,255	805	7%
Recharge from Terrace Deposits	1,010	2,413	1,656	15%
Subsurface Inflow from Purisima Highlands Basin	4,904	5,309	5,093	45%
		Total Inflow	**11,308**	**100%**
Outflows				
Groundwater Pumping	4,620	6,648	5,547	50%
Subsurface Outflow to Santa Margarita Basin	240	274	255	2%
Net Subsurface Outflow to Pajaro Valley Subbasin	3,885	4,299	4,093	37%
Net Outflow Offshore	921	1,552	1,182	11%
		Total Outflow	**11,077**	**100%**
	Cumulative		**Average**	
Change in Storage (acre-feet per year)	+3,223		+231	

Notes: * UZF recharge = direct percolation of precipitation, and irrigation municipal, institutional, and domestic use return flows

Table 6-4. Santa Cruz Mid-County Basin GSP Current Groundwater Budget Compared to Periodic Evaluation Updated Current Groundwater Budget

Groundwater Budget Component	GSP Current Budget WY2010 - 2015	Updated Current Budget WY 2010-2023
	Average Annual Volume, acre-feet	
Inflows		
UZF Recharge*	3,600	3,754
Net Recharge from Stream Alluvium	970	805
Recharge from Terrace Deposits	1,790	1,656
Subsurface Inflow from Purisima Highlands Basin	5,130	5,093
Total Inflow	**11,490**	**11,308**
Outflows		
Pumping	6,220	4,615
Subsurface Outflow to Santa Margarita Basin	270	196
Net Subsurface Outflow to Pajaro Valley Subbasin	4,170	3,576
Net Outflow Offshore	990	1,529
Total Outflow	**11,650**	**9,915**
Change in Storage (acre-feet per year)	-160	231

Notes: * UZF recharge = direct percolation of precipitation, and irrigation municipal, institutional, and domestic use return flows

6.3.2.3 Projected Groundwater Budget

The GSP's projected groundwater budget with planned PMAs is described in GSP Section 2.2.5.6 and presented visually on GSP Figure 2-73. The GSP projected period is from WY 2016 to 2069, while the updated projected budget period spans WY 2023 to 2075. The updated projected budget uses an updated version of the Catalog Climate scenario to match the GSP budgets. Specifically, the first 8 years of the scenario (WY 2015-2023) were moved to the end to preserve its length and climate ordering relative to project implementation, thereby extending it to WY 2075 without changing the overall statistics. This helps facilitate comparison between the 2 budgets.

The PMA implementation schedule and operations has changed slightly from the GSP in response to ongoing project planning, permitting, and implementation. The model has been updated as described in Section 6.4 to reflect those changes. The projected water budget with projects has also been updated to account for the ongoing Mid-County Basin Optimization Study (Section 5.2). For the updated projected budget, Optimization Study Alternative A is used, which is the most similar to the GSP's projected implementation budget. Alternative A is akin to the PMA scenario presented in the GSP, with higher assumed SCWD demand as described in Section 5.2 and the addition of simulated inter-agency transfers. This includes relatively limited transfers from SCWD to SqCWD during winter months, and extensive transfers from SqCWD to SCWD in high demand summer months. These transfers help SCWD sustainably and feasibly meet anticipated demands during dry periods. Apart from temporary and relatively minor MT exceedances following an extended 5 year drought period, Alternative A allows sufficient additional groundwater extraction to support transfers during dry periods while remaining sustainable. Table 6-5 summarizes the updated projected water budget for Optimization Study Alternative A, while Table 6-6 compares average annual groundwater budget components for the GSP's implementation budget and Alternative A.

The most notable change in the projected water budget is that average annual groundwater pumping increases 158 AFY (Table 6-6). This is a result of changing project assumptions and implementation. Specifically higher demand assumptions and the impact of transfers between the 2 agencies that are greater from SqCWD to the City of Santa Cruz which increases net pumping. Differences in the 2 budgets are not solely due to changing project implementation; several rounds of recalibration discussed in Section 6.4 also impact the water budget, causing decreases in both total inflow and total outflow. Average annual change in groundwater storage is approximately 237 AFY less than the GSP projected budget. This is partly from increased pumping to support transfers, but also due to improved model calibration.

Table 6-5. Santa Cruz Mid-County Basin Updated Projected Groundwater Budget with Alternative A, WY 2023 - 2075

Groundwater Budget Component	Average Annual Volume (acre-feet)			Average % (rounded)
	Minimum	Maximum	Average	
Inflows				
UZF Recharge*	1,065	7,725	3,577	35%
Net Recharge from Stream Alluvium	118	1,774	534	5%
Recharge from Terrace Deposits	957	3,068	1,455	14%
Subsurface Inflow from Purisima Highlands Basin	4,373	4,956	4,630	45%
		Total Inflow	**10,195**	**100%**
Outflows				
Groundwater Pumping	3,613	6,417	4,608	46%
Subsurface Outflow to Santa Margarita Basin	177	238	200	2%
Net Subsurface Outflow to Pajaro Valley Subbasin	3,318	4,008	3,686	37%
Net Outflow Offshore	831	2,120	1,588	16%
		Total Outflow	**10,082**	**100%**
	Cumulative		**Average**	
Change in Storage (acre-feet per year)	+6,015		+113	

Notes: * UZF recharge = direct percolation of precipitation, and irrigation municipal, institutional, and domestic use return flows

Table 6-6. Santa Cruz Mid-County Basin GSP Projected Groundwater Budget Compared to Periodic Evaluation Updated Projected Groundwater Budget

Groundwater Budget Component	GSP Projected Budget WY 2016 - 2069	Updated Projected Budget With Alternative A WY 2023-2075
	Average Annual Volume, acre-feet	
Inflows		
UZF Recharge*	3,860	3,577
Net Recharge from Stream Alluvium	670	534
Recharge from Terrace Deposits	1,740	1,455
Subsurface Inflow from Purisima Highlands Basin	4,650	4,630
Total Inflow	**10,920**	**10,195**
Outflows		
Pumping	4,450	4,608
Subsurface Outflow to Santa Margarita Basin	210	200
Net Subsurface Outflow to Pajaro Valley Subbasin	3,920	3,686
Net Outflow Offshore	1,990	1,588
Total Outflow	**10,570**	**10,082**
Change in Storage (acre-feet per year)	+350	+113

Notes: * UZF recharge = direct percolation of precipitation, and irrigation municipal, institutional, and domestic use return flows

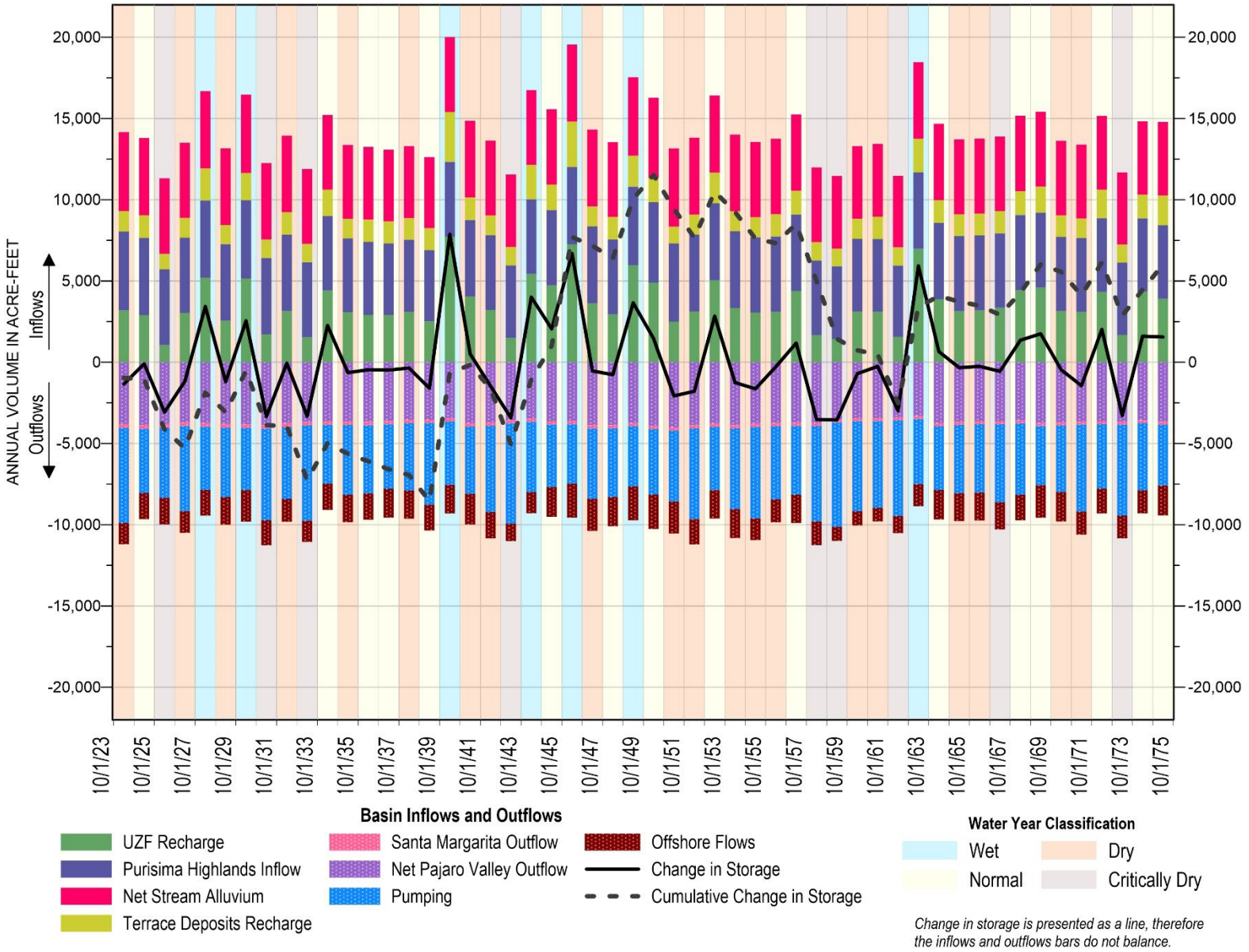

Figure 6-3. Updated Projected Groundwater Budget With Optimization Study Alternative A

6.3.2.4 Sustainable Yield and Change in Storage

Change in storage has been relatively stable since WY 2006 (Figure 6-1. Increasing coastal groundwater levels (Figure 4-2) are consistent with increasing storage and reduced groundwater extractions. The GSP calculates sustainable yield based on achieving sustainability for all indicators, seawater intrusion in particular, with implementation of projects and management actions. Therefore, sustainable yield should be reevaluated after implementation of PWS and ASR and is not warranted at this time.

With stable groundwater in storage, overdraft in the traditional sense is no longer occurring. However, DWR prioritized the Basin as in critical overdraft because of seawater intrusion. As long as coastal groundwater levels are below proxies for seawater intrusion MTs, there is significant and unreasonable risk of further seawater intrusion and the Basin is in overdraft.

6.4 Model Updates

Basin sustainability planning, GSP implementation, and project planning rely on the GSFLOW model of the Basin and surrounding areas constructed during GSP development. The model is updated annually to support annual reporting and was last updated to include historical data through WY 2023, for the WY 2023 Annual Report (M&A, 2024b).

The model was calibrated from WY 1985-2015 to support GSP development; calibration is described in GSP Appendix 2-F (MGA, 2019). The model has since been locally recalibrated to reflect new data acquired for PWS and ASR projects.

Local recalibration took place in 2020 for PWS permitting. Recalibration focused on better matching on-site flowmeter data and aquifer properties from a pilot injection test at the PWS SWIP recharge well at Twin Lakes Church. This work is described in Appendix E of the PWS Engineering Report (Brown & Caldwell, 2023).

Following the update, calibration was validated for the period from WY 2016-2023 to support the Mid-County Basin Optimization Study. Validation included analysis of simulated and observed groundwater levels and streamflow data. This analysis indicated that the model remained robust and accurately simulated the WY 2015-2023 period in most respects but did not properly reflect aquifer response to pilot injection testing in the western portion of the Basin at the Beltz 8 and Beltz 12 wells. Therefore, the model's aquifer parameters were locally recalibrated in the SCWD service area to better simulate aquifer response to injection and pumping. The model was also manually calibrated to better match observed data at the new SP-5 deep coastal monitoring well. Additionally, the near-well simulation of groundwater head was calibrated to better match in-borehole heads observed during injection and recovery testing at the Beltz 8 and Beltz 12 well sites, using the MODFLOW MNW2 package Theim equation with SKIN option to simulate a well skin. These improvements helped solidify the model's applicability for simulating direct recharge projects during GSP implementation. The model will continue to be updated as necessary to make sure ongoing project implementation is reflected properly in the model.

As projects are implemented, additional monitoring data will be collected that can help improve the models. This is especially valuable to inform future project planning of Optimization Study alternatives or other alternatives as these involve installing additional purified water recharge wells and/or ASR wells in addition to those described in the GSP. Data collected from PWS, ASR, and any new monitoring wells associated with these projects will be used to validate and improve the model as necessary.

As described in Section 7, the monitoring network has been expanded to monitor interconnected surface water, groundwater quality, and seawater intrusion. The new monitoring well observation data only spans 2 years, so it is useful for evaluating recent groundwater and surface water interconnection but is insufficient to interpret longer term regional trends to inform accurate model calibration. In the next evaluation cycle, model calibration will be performed with new monitoring well data for shallow aquifer interconnection with surface water.

7 MONITORING NETWORKS

This section describes monitoring network changes since the 2020 GSP was submitted and provides an assessment of each applicable sustainability indicator's monitoring network used to assess basin conditions and determine progress toward sustainability.

7.1 Summary of Monitoring Network Changes

The GSP monitoring network was expanded since the GSP to fill data gaps in the groundwater level, quality, extraction, and streamflow monitoring networks.

7.1.1 Groundwater Level and Quality Monitoring Network Changes

During the evaluation cycle, 19 new dedicated monitoring wells were added to the Basin's groundwater level and quality monitoring networks. Two of these new wells were established as deep RMPs. Table 7-1 and Table 7-2 summarize the number of wells currently in the groundwater level and groundwater quality monitoring networks, respectively. The tables also indicate the number of wells in parentheses that were included in the 2020 GSP.

Table 7-1. Summary of Groundwater Level Monitoring Network

Monitoring Agency	Number of Wells			
	Monitoring Wells	Production Wells	Total in Network	Representative Monitoring Wells
Santa Cruz Water Department	36 (34)	4	40 (38)	8 (7)
Soquel Creek Water District	86 (78)	17	103 (95)	27 (26)
Central Water District	6	3	9	2
Santa Cruz Mid-County Groundwater Agency	7 (0)	0	7 (0)	0
Santa Cruz County [a]	0	24 (27)	24 (27)	2
Total	*135 (118)*	*48 (51)*	*183 (169)*	*39 (37)*

Note: values in parentheses are number of wells in the 2020 GSP; each well in a nest of multi-depth wells is counted as a separate well.

[a] Private domestic wells monitored by Santa Cruz County

Table 7-2. Summary of Groundwater Quality Monitoring Network

Monitoring Agency	Number of Wells			
	Monitoring Wells	Production Wells	Total in Network	Representative Monitoring Wells
Santa Cruz Water Department	28 (28)	4	32 (32)	19 (18)
Soquel Creek Water District	60 (51)	17	77 (68)	48 (47)
Central Water District	0	3	3	3
Total	*88 (79)*	*24*	*112 (103)*	*70 (68)*

Note: values in parenthesis are number of wells in the 2020 GSP; each well in a nest of multi-depth wells is counted as a separate well.

The name, aquifer, and purpose of new monitoring wells in the GSP networks are summarized in Table 7-3. Nine monitoring wells are added to address 2020 GSP-identified data gaps, as discussed in in Section 7.2. Seven new wells address data gaps in the shallow surface water aquifers for evaluating interconnected surface water (i.e. “SW” wells). Two new wells, SC-3AA and SP-5, address groundwater level and quality data gaps for seawater intrusion in deeper aquifers used for water supply.

Ten new monitoring wells are added to monitor project-specific groundwater levels and quality impacts from activities:

- SqCWD installed 9 monitoring wells between 2019 and 2021 for performance monitoring associated with the PWS project (Section 5.1.2.1). SWIP monitoring wells will be used to collect groundwater quality and groundwater level data to comply with their project permit. The data collected for PWS can also be used to evaluate sustainability metrics during GSP implementation.
- SCWD installed 1 well, Beltz 8 MW, to monitor performance and impacts from still-to-be implemented ASR operations at ASR wells Beltz #8 and Beltz #12 (Section 5.1.2.2). Additionally, SCWD has recently installed a new monitoring well (Beltz 9 MW) in the Purisima A unit to monitor impacts from ASR at Beltz #9. This well has not yet been brought into the SCWD groundwater monitoring program due to on-going pilot testing at Beltz #9. Upon conclusion of pilot testing, SCWD will begin collecting routine groundwater quality samples and groundwater level measurements at Beltz 9 MW. The well will be added to the groundwater quality and levels networks in the future.

There are functional issues with 14 wells in the groundwater level or quality monitoring networks that currently prevent data collection (Table 7-4). The MGA has removed 7 monitoring wells from GSP monitoring networks for various reasons, including lost access, stuck equipment, and questionable construction factors. Five of these wells are groundwater level monitoring wells and 2 are water quality monitoring wells. Only 2 of the removed wells, Thurber Lane Shallow and Deep, are RMPs (for water quality only), though these wells have not been sampled since 2006 due to a permanent access issue. SC-21AA will be used to replace Thurber Lane Shallow in the Purisima AA unit. Replacement of Thurber Lane Deep is not necessary because domestic wells in the area are generally screened shallower than the Tu unit, and the Beltz #12 municipal water supply well is an RMP that is representative of the Tu unit in the area.

Table 7-3. Summary of Monitoring Wells Added to Monitoring Networks

Monitoring Well	Aquifer	Monitoring Network	Representative Monitoring Point	Purpose
Aptos Village County Park SW	Purisima F	GWL	potential ISW RMP	MGA filled 2020 GSP-identified ISW data gaps
Spreckels SW	Purisima F	GWL	potential ISW RMP	
SC-10 SW	Alluvium/ Purisima A	GWL	potential ISW RMP	
Balogh SW2	Purisima A	GWL	potential ISW RMP	
Mountain Elementary SW	Purisima A	GWL	potential ISW RMP	
Lupin SW	Purisima A	GWL	potential ISW RMP	
Olive Springs SW	Purisima AA	GWL	potential ISW RMP	
SC-3AA	Purisima AA	GWL, WQ	SWI RMP	SqCWD filled 2020 GSP-identified SWI data gap
SP-5	Tu	GWL, WQ	SWI RMP	SCWD filled 2020 GSP-identified SWI data gap
TLM-2BC	Purisima BC	GWL, WQ	potential WQ RMP	SqCWD PWS monitoring
TLM-3BC	Purisima BC	GWL, WQ	potential WQ RMP	
TLM-4BC	Purisima BC	GWL, WQ	potential WQ RMP	
MM-1	Purisima A	GWL, WQ	potential WQ RMP	
MM-2	Purisima A	GWL, WQ	potential WQ RMP	
WM-1	Purisima A	GWL, WQ	potential WQ RMP	
WM-2	Purisima A	GWL, WQ	potential WQ RMP	
TLM-1A	Purisima A	GWL, WQ	potential WQ RMP	
TLM-2A	Purisima A	GWL, WQ	potential WQ RMP	
Beltz 8 MW	Purisima A	GWL, WQ	potential WQ RMP	SCWD ASR monitoring

Notes: ISW = interconnected surface water, WQ = water quality, SWI = seawater intrusion, GWL = groundwater level, RMP = representative monitoring point, ASR = Aquifer Storage & Recovery, PWS = Pure Water Soquel

There are an additional 7 wells that are being considered for removal from the groundwater level and/or quality monitoring networks. Six of the wells are groundwater level monitoring wells and 2 are groundwater quality monitoring wells. Wells potentially removed from the groundwater level and quality network are those that cannot be accessed due to stuck equipment. The wells may be reinstated if the equipment can be removed. Only 1 of these, Pleasure Point Medium, is an RMP (for water quality only), and there is a potential replacement in the same cluster if the stuck equipment is not able to be removed.

Table 7-4. Summary of Monitoring Wells Removed or Potentially Removed from Monitoring Networks

Monitoring Well	Aquifer	Monitoring Network	RMP	Comments
SC-A7A	Purisima F	GWL	no	Flagged as having suspect data due to a potential leak in the seal. Data excluded from Annual Reports; SC-A7B also screened in the Purisima F unit can be used in its place.
SC-14B	Purisima BC	GWL	no	Inaccessible due to stuck airline since 2018. Co-located SC-14C also perforated in the BC unit can be used to collect groundwater level data in its place.
Private Well 4	Unknown	GWL	no	Well found dry several years back and groundwater level data is no longer collected.
Private Well 9	Unknown	GWL	no	Well has not been actively used to collect groundwater level data since 2017 due to a change in ownership.
Private Well 12	Unknown	GWL	no	Well has not been used to collect groundwater level data in recent years due to a plumbing change that blocked the sounding port.
Thurber Lane Shallow	Purisima AA	WQ	yes	Well has not been sampled for groundwater quality data since 2006 due to permanent access issues.
Thurber Lane Deep	Tu	WQ	yes	Well has not been sampled for groundwater quality data since 2006 due to permanent access issues.
SC-16B	Purisima BC	GWL	no	Inaccessible due to stuck airline since 2019. New PWS monitoring well TLM-2BC in the BC unit is nearby and can be used to collect groundwater level data in its place.
SC-14A	Purisima A	GWL	no	Inaccessible due to stuck airline since 2018. Contractor will attempt to remove stuck equipment.
SC-17A	Purisima A	GWL	no	Inaccessible due to stuck airline since April 2023. Contractor will attempt to remove stuck equipment. Even if access to SC-17B is gained, it will be removed from the water quality network since water quality is monitored at co-located Ledyard production well.
SC-17B	Purisima BC	GWL, WQ	no	
SC-17C	Purisima DEF	GWL	no	
SC-17D	Purisima DEF	GWL	no	
Pleasure Point Medium	Purisima A	WQ	yes	Inaccessible for water quality sampling due to stuck equipment since 2019, continues to be used for groundwater level monitoring. Pleasure Point shallow can be substituted as a chloride SWI RMP if equipment cannot be removed.

Note: grey shading indicates currently inaccessible wells that may either be reinstated if access can be regained or removed from network if access cannot be regained

7.1.2 Groundwater Extraction Monitoring Network Changes

The current metered groundwater extraction monitoring network includes production and recharge wells used by the 3 large public water suppliers and other small water systems in the Basin (Table 7-5). Direct injection recharge is tracked with extractions in the GSP, as recharge directly offsets extractions in the deeper aquifers used for water supply.

Since the GSP was adopted, 4 wells have been added to groundwater extraction/recharge monitoring networks. SqCWD installed 1 new backup water supply well (Country Club PW 2) to provide redundancy for Country Club PW. SqCWD also installed 3 SWIP recharge wells that will be used to recharge the Purisima A and B/C aquifers with purified recycled water. The future conversion of 3 existing SCWD production wells, Beltz #8, #9, and #12, is planned as part of the ASR project. Although the number of wells is unchanged, Santa Cruz County has improved timely reporting from small water systems since the GSP was developed, which has improved quantification of groundwater extractions for these groundwater users.

Table 7-5. Summary of Metered Groundwater Extraction Monitoring Network

Monitoring Agency	Number of Wells (Number of Wells in 2020 GSP)			
	Production Wells	SWIP Recharge Wells	ASR Wells	Total in Network
Santa Cruz Water Department	1 (4)	0	3[a] (0)	4
Soquel Creek Water District	19 (18)	3 (0)	0	22 (18)
Central Water District	3	0	0	3
Santa Cruz County regulated Small Water Systems	18[b]	0	0	18

[a] Existing production wells to be converted to ASR wells

[b] Small water systems do not report extraction to Santa Cruz County by well so the number in the table represents the number of small water systems reporting

7.1.3 Streamflow Monitoring Network Changes

The current streamflow monitoring network consists of 9 locations. The network has been improved with 6 new gages collocated near shallow wells for monitoring surface water interactions (Table 7-6; Balance Hydrologics, 2022a). Three of the new gages replace those included in the 2020 GSP and 1 of those gages remains in the network. In late 2023, the USGS reinstated a gage on Aptos Creek.

Table 7-6. Summary of Streamflow Monitoring Network

Monitoring Agency	Number of Gages in Current Network (Number of Gages in 2020 GSP)
Santa Cruz Mid-County Groundwater Agency (MGA)	7 (0)
United States Geological Survey (USGS)	2 (1)
Santa Cruz Resource Conservation District (RCD)	0(4[a])
Total	**9 (5)**

Note: values in parenthesis are number of gages in the 2020 GSP.

[a] Of the 4 gages monitored by Santa Cruz RCD, only 1 gage is still part of the GSP network and 3 are redundant.

7.2 Status of 2020 GSP-Identified Data Gaps

Seawater Intrusion Monitoring: Two data gaps were identified in the 2020 GSP in the deepest aquifers near the coast used for production and potentially storage. SCWD added deep coastal monitoring well SP-5 in the Tu unit in 2021 and SqCWD added a deep coastal monitoring well SC-3AA in the Purisima AA Unit in 2022. Both deep coastal monitoring wells are new seawater intrusion RMP. New SMC for these wells are summarized in Table 4-6.

Depletion of Interconnected Surface Water: Eight data gaps were identified in the 2020 GSP to better characterize interconnections between surface water and groundwater. Additional shallow groundwater level monitoring was proposed in the upper reaches of Soquel Creek and on other creeks that both support priority species and have a connection to groundwater. Locations for the shallow wells were selected based on whether groundwater is connected to surface water, is in an area of concentrated groundwater extraction, has a suitable nearby location for a streamflow gauge, and has potential site access. In October 2022, 6 of the 8 shallow monitoring wells were installed: Lupin SW, SC-10 SW, Balogh SW2, Speckels SW, Aptos Village County Park SW, and Mountain Elementary SW (Balance Hydrologics, 2022b). Due to driller access issues, Olive Springs SW was installed in a second mobilization in January 2024 (M&A, 2024c). The wells are co-located with stream gages to assess depletion of interconnected surface water. Locations of the shallow wells are shown on Figure 7-1.

Once sufficient data are collected for an evaluation of groundwater's relationship to surface water at these new wells, they may become interconnected surface water RMP. The eighth shallow well was 1 of 2 wells identified to supplement the existing Balogh SW to monitor groundwater gradient perpendicular to Soquel Creek. Due to limited well site availability in the area, only 1 of the 2 wells was drilled in 2022. Together with the existing Balogh SW, the single additional Balogh SW2 still achieves the goal of monitoring groundwater gradient so the eighth well will not be installed.

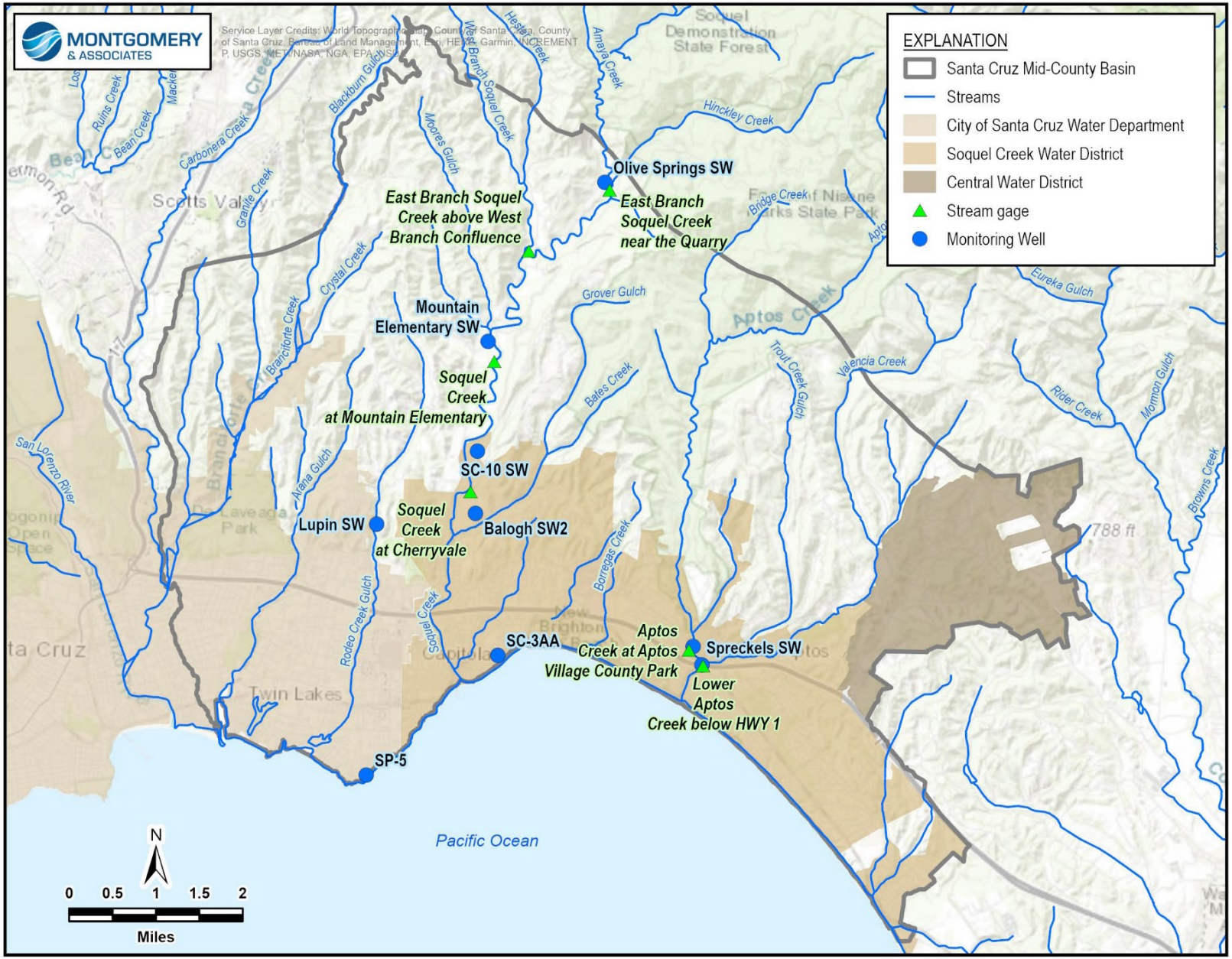

Figure 7-1. Monitoring Wells and Stream Gages Installed to Address 2020 GSP Data Gaps

7.3 New Data Gaps

Based on a re-evaluation of the monitoring networks, no new monitoring data gaps are identified. The current monitoring networks are sufficient to effectively manage groundwater in the Basin.

7.4 Monitoring Network Assessment

Monitoring networks for groundwater levels, groundwater quality, groundwater extraction, and streamflow are assessed for this evaluation to confirm they are providing the quantity and quality of data necessary to monitor groundwater conditions in the Basin during GSP implementation.

7.4.1 Groundwater Level Monitoring Network Assessment

This subsection assesses the functionality and frequency of the groundwater level monitoring networks for GSP implementation.

7.4.1.1 Groundwater Level Monitoring Network Functionality

The groundwater level monitoring network was evaluated to identify monitoring sites that are no longer functional. Groundwater level monitoring locations are shown on Figure 7-2. Appendix 6A contains the full groundwater level monitoring network with monitoring frequencies for both the 2020 GSP and re-evaluated network.

There are 11 wells in the 2020 GSP monitoring network that cannot currently be used to collect groundwater levels, as discussed in Section 7.1.1 and Table 7-4. None of the groundwater level wells that are not currently accessible are RMP. Of the 11 wells no longer functioning, 5 are removed from the MGA groundwater level monitoring network:

- SC-A7A in the Purisima F Unit has not been included in the MGA Annual Reports since Water Year 2021. It can no longer be used to collect groundwater level measurements because it likely has a broken seal and does not provide reliable data. SC-A7B also screened in the Purisima F unit can be used in its place to collect groundwater level data.
- SC-14B in the Purisima BC unit. SqCWD has not been able to measure depth to water since 2018 due to a stuck airline. SC-14C also screened in the Purisima BC unit can be used in its place to collect groundwater level data.
- Private Well 4. Santa Cruz County has not been able to measure depth to water since the well went dry. On the same property, Private Well 3 continues to be monitored by the County. Removal of Private Well 4 from the network does not result in a data gap.

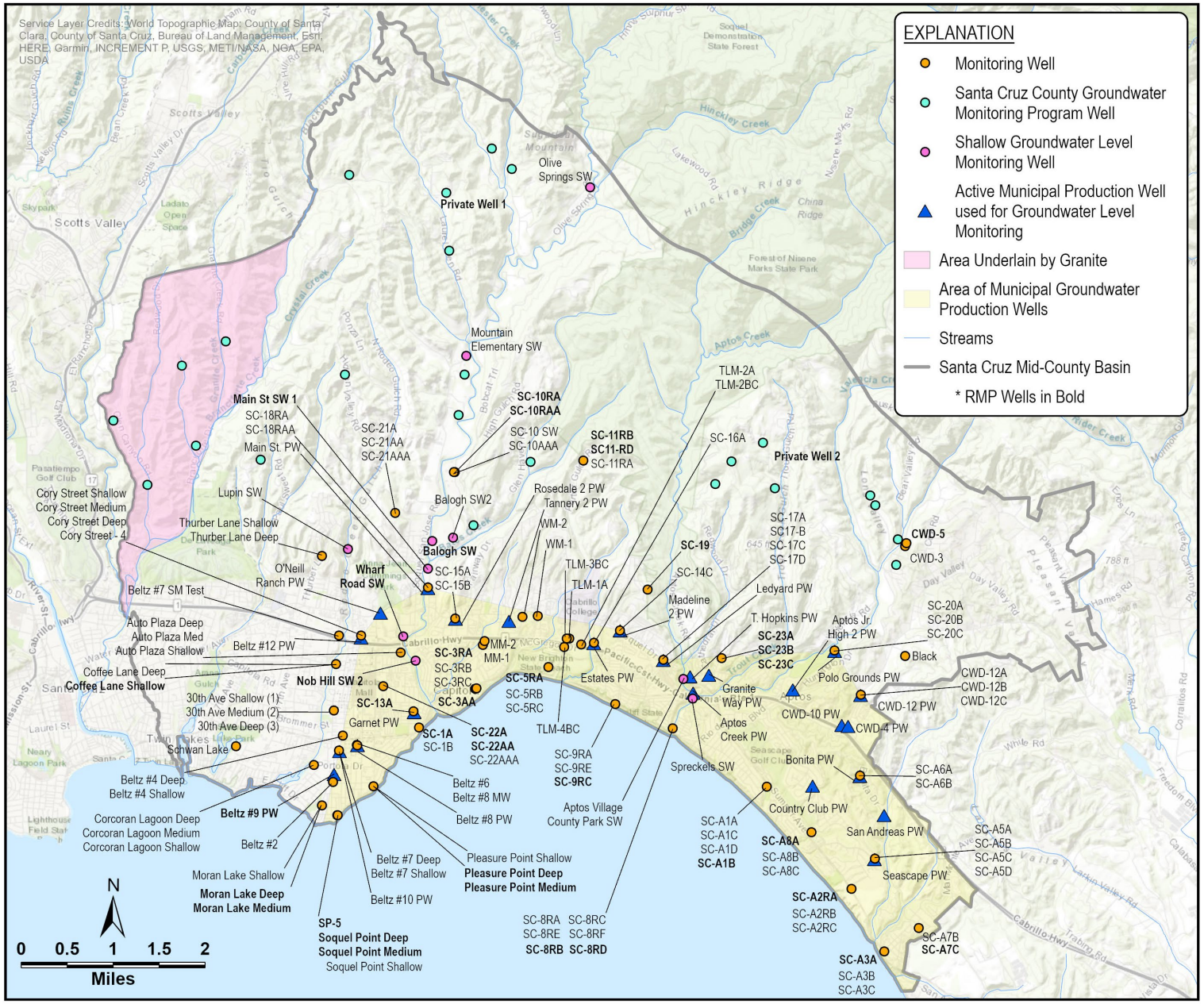

Figure 7-2. Groundwater Level Monitoring Network

- Private Well 9. Santa Cruz County has not been able to measure depth to water since the well changed ownership. This well is located in the area where wells are generally screened in granite, which is not a principal aquifer. Therefore, this is not considered a data gap if it is no longer part of the monitoring network.
- Private Well 12. Santa Cruz County has not been able to measure depth to water since a plumbing change blocked the sounding port. On the same property, Private Well 13 continues to be monitored by the County. This well is located in the area where wells are generally screened in granite, which is not a principal aquifer. Therefore, this is not considered a data gap if it is no longer part of the monitoring network.

Six wells tentatively remain in the groundwater level monitoring network even though they are currently inaccessible. Data collection will resume if the planned removal of airline equipment stuck in these wells is successful. Monitoring wells of concern are listed below with priority of reinstatement in parentheses:

- Purisima A unit wells: SC-14A (low priority, potentially substituted with SC-16A) and SC-17A (high priority)
- Purisima BC unit: SC-16B (low priority, can be substituted with TLM-2BC) and SC-17B (high priority)
- Purisima DEF unit: SC-17C (high priority only if SC-17D cannot be reinstated) and SC-17D (high priority)

The cluster of wells at the SC-17 site are important as control points for contouring because they are located fairly far inland and connect inland contours with the southeastern portion of the coast, especially in the deeper Purisima A unit. SC-17A and SC-17B may need to be replaced if equipment cannot be removed. The Ledyard production well can potentially be used in place of SC-17B in the Purisima BC unit to collect groundwater level data when not being pumped if the airline equipment is not able to be removed, although it is preferred to use a dedicated monitoring well.

Based on the re-evaluation of the groundwater level monitoring network, the chronic lowering of groundwater levels, seawater intrusion, and depletion of interconnected surface water sustainability indicators will continue to be effectively monitored by the current monitoring network. None of the non-functioning monitoring wells are RMP for groundwater levels.

7.4.1.2 Groundwater Level Monitoring Frequency

For consistency across multiple agencies that collect groundwater level data and to generate enough data to sufficiently monitor changes in the Basin, updates to the frequency of the monitoring network are made that generally adhere to the following criteria:

- Data collection in groundwater level RMPs, including those used for seawater intrusion as a proxy, are now monitored at quarterly frequency. At wells equipped with transducers, monthly manual groundwater level measurements are not necessary and quarterly will

suffice. Undesirable results for chronic lowering of groundwater levels relies on average monthly groundwater levels, so quarterly site visits for manual measurements and transducer downloads are needed to ensure any transducer issues can be identified before too much data are lost. Datalogger recording frequency has been decreased at some wells from 15 to 60 minutes, because evaluation of undesirable results uses daily, monthly, and 5-year averages of the transducer data.

- Groundwater levels are collected at the remaining GSP monitoring network wells semi-annually in March/April and August/September.

7.4.2 Groundwater Quality Monitoring Network Assessment

This section assesses the functionality and frequency of monitoring wells in the RMP and general groundwater quality monitoring network.

7.4.2.1 Groundwater Quality Monitoring Network Functionality

An assessment of the groundwater quality monitoring network was conducted to determine if any monitoring sites are no longer functional. Groundwater quality monitoring locations are shown on Figure 7-3. Appendix 6B contains the full groundwater quality monitoring network with monitoring frequencies for both the 2020 GSP and re-evaluated network. All but 4 wells remain accessible in the groundwater quality monitoring network.

Non-functioning SC-17B has been potentially removed from the MGA groundwater level and quality networks. The well has airline equipment obstructing access and cannot be sampled. SC-17B was included in the 2020 GSP groundwater quality monitoring network but had not historically been sampled regularly; the only available water quality data are 2 water quality samples collected in 1985. The monitoring well is not a seawater intrusion or degraded groundwater quality RMP, and because it is co-located with SqCWD's Ledyard municipal supply well, removing it from the MGA water quality network does not create a data gap since all municipal supply wells are included in the groundwater quality monitoring network.

The SCWD's Pleasure Point Medium monitoring well (Purisima A unit) has equipment stuck in it that has prevented a water sample being collected since 2019. The well is an RMP for seawater intrusion and can be replaced by the shallower completion of the well cluster (Pleasure Point Shallow) if equipment cannot be removed from it. Pleasure Point Shallow is also screened in the Purisima A unit and has very similar groundwater levels.

The SCWD's Thurber Lane Shallow (Purisima AA unit) and Deep (Tu unit) monitoring wells have not been sampled since 2006 due to accessibility issues. These wells are RMP for groundwater quality. SC-21AA will be used to replace Thurber Lane Shallow in the Purisima AA unit. Replacement of Thurber Lane Deep is not necessary because domestic wells in the area are generally screened shallower than the Tu unit, and Beltz #12 is an RMP that is representative of the Tu unit in the area.

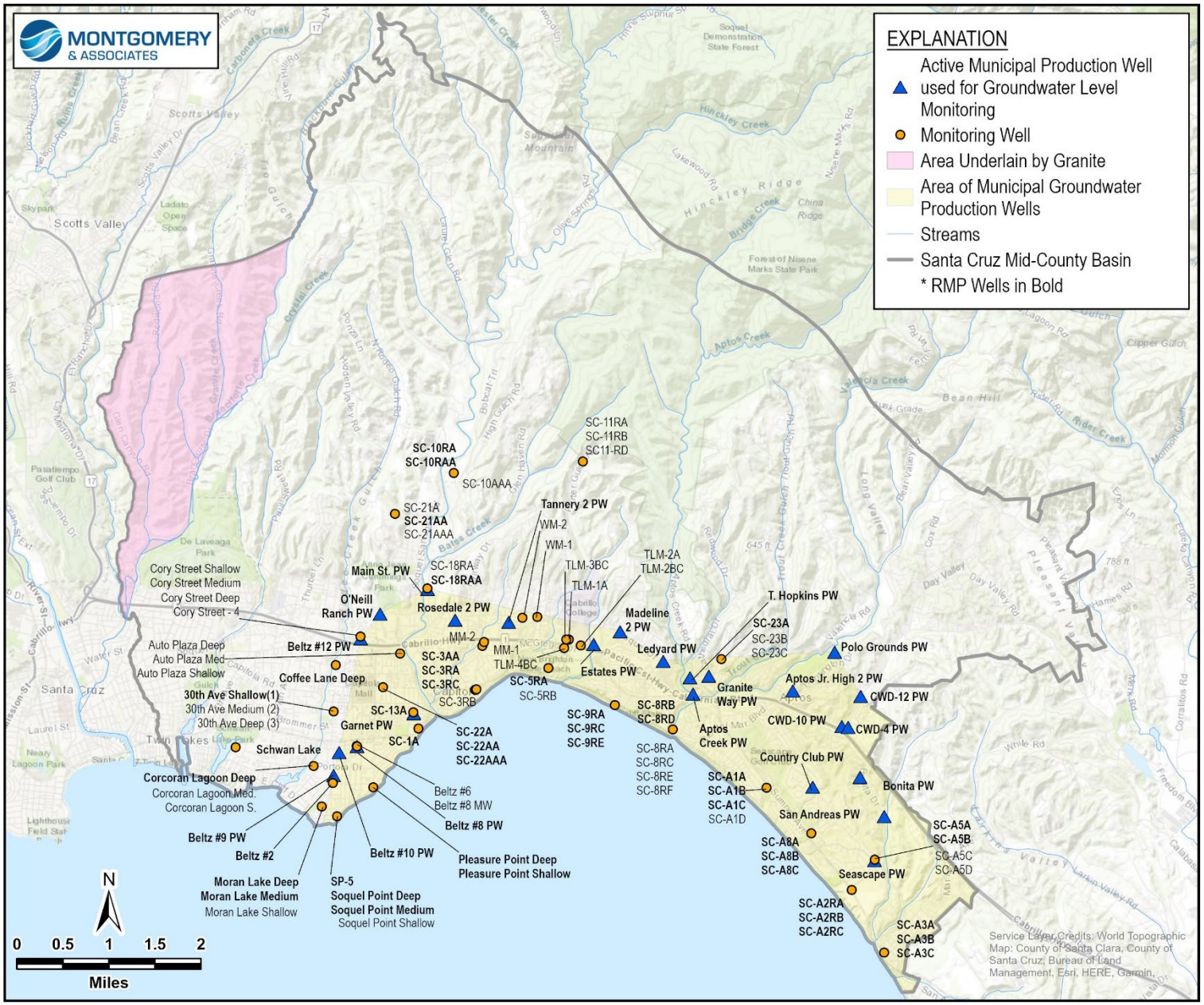

Figure 7-3. Groundwater Quality Monitoring Network

Based on the re-evaluation of the groundwater quality monitoring network, the degraded groundwater quality and seawater intrusion sustainability indicators will continue to be effectively monitored by the current monitoring network.

7.4.2.2 Groundwater Quality Monitoring Frequency

For consistency across multiple agencies that collect groundwater quality data and to generate enough data to sufficiently monitor changes in the Basin, updates to the frequency of the monitoring network are made that generally adhere to the following criteria:

- Seawater intrusion RMPs are sampled annually for general minerals, except if chloride is increasing and are above the MO, then general minerals are sampled semi-annually.
- Chloride at seawater intrusion RMP are tested semi-annually, except if groundwater elevations are below the proxy groundwater level MT or chloride concentrations are higher than the MO, then the RMP is sampled quarterly.
- Nitrate for all seawater intrusion RMP are tested annually.
- All groundwater quality RMP and non-RMP wells are sampled at least annually for general minerals and all constituents of concern including chloride, TDS, and nitrate.

7.4.3 Groundwater Extraction Monitoring Network Assessment

The reduction of groundwater in storage sustainability indicator is measured by the volume of groundwater extracted and recharged in each of the principal aquifers. New municipal extraction, recharge, or ASR wells added to the network are summarized in Table 7-7. All discharge or recharge by these wells is metered and reported to the MGA. No wells were removed from the network.

Table 7-7. Summary of Wells Added to Groundwater Extraction Monitoring Network

Well	Aquifer	Agency	Comments
TLC SWIP	Purisima A/BC	SqCWD	Recharge well, added
Willowbrook SWIP	Purisima A	SqCWD	Recharge well, added
Monterey SWIP	Purisima A	SqCWD	Recharge well, added
Country Club #2 PW	Purisima F/ Aromas	SqCWD	Backup for Country Club PW, added

7.4.4 Streamflow Monitoring Network Assessment

The depletion of interconnected surface water sustainability indicator is measured by comparing surface water elevations to shallow groundwater elevations to estimate depletion due to groundwater extraction. The surface water monitoring network in relation to shallow monitoring wells is shown on Figure 7-4. Streamflow gages added and removed from the surface water monitoring network are summarized in Table 7-8. Rating curves for 6 added streamflow gages were developed in WY 2023. As discussed above, 7 new shallow groundwater level monitoring wells supplement stream gages for ISW evaluation.

Table 7-8. Summary of Gages in Surface Water Monitoring Network

Collecting Agency	Gage	Date Range	Comments
MGA	East Branch Soquel Creek near the Quarry	8/24/2022 to present	Added, dry season monitoring only
	East Branch Soquel Creek above West Branch Confluence	8/24/2022 to present	Added, dry season monitoring only
	Soquel Creek at Mountain Elementary	7/27/2022 to present	Added, dry season monitoring only
	Soquel Creek at Cherryvale	7/27/2022 to present	Added, dry season monitoring only
	Aptos Creek at Aptos Village County Park	5/3/2022 to present	Added, dry season monitoring only
	Lower Aptos Creek below HWY 1	5/3/2022 to present	Added, dry season monitoring only
	West Branch Soquel Creek (Lower West Branch)	7/25/2017 to present	Was monitored by RCD but now taken over by MGA, replaces SqCWD Upper West Branch, dry season monitoring only
USGS	Aptos Creek near Aptos CA – 11159690 (USGS)	1/10/1971 – 9/29/1985 11/03/2023 to present	Added, wet season monitoring only
	Soquel Creek at Soquel – 11160000 (USGS)	10/1/1988 to present	Remains in network, year-round monitoring
RCD	Soquel Creek near Olive Springs	8/2017 to 5/31/2022	Removed from network, replaced by East Branch Soquel Creek near the Quarry
	Soquel Creek above West Branch Confluence	7/25/2017 to 5/31/2022	Removed from network, replaced by Soquel Creek at Cherryvale
	Soquel Creek above Bates Creek	7/2017 to 5/31/2022	Removed from network, replaced by West Branch Soquel Creek (Lower West Branch)
SqCWD	West Branch Soquel Creek (Upper West Branch)	11/17/1983 to present	Removed from network, replaced by West Branch Soquel Creek (Lower West Branch), year-round monitoring

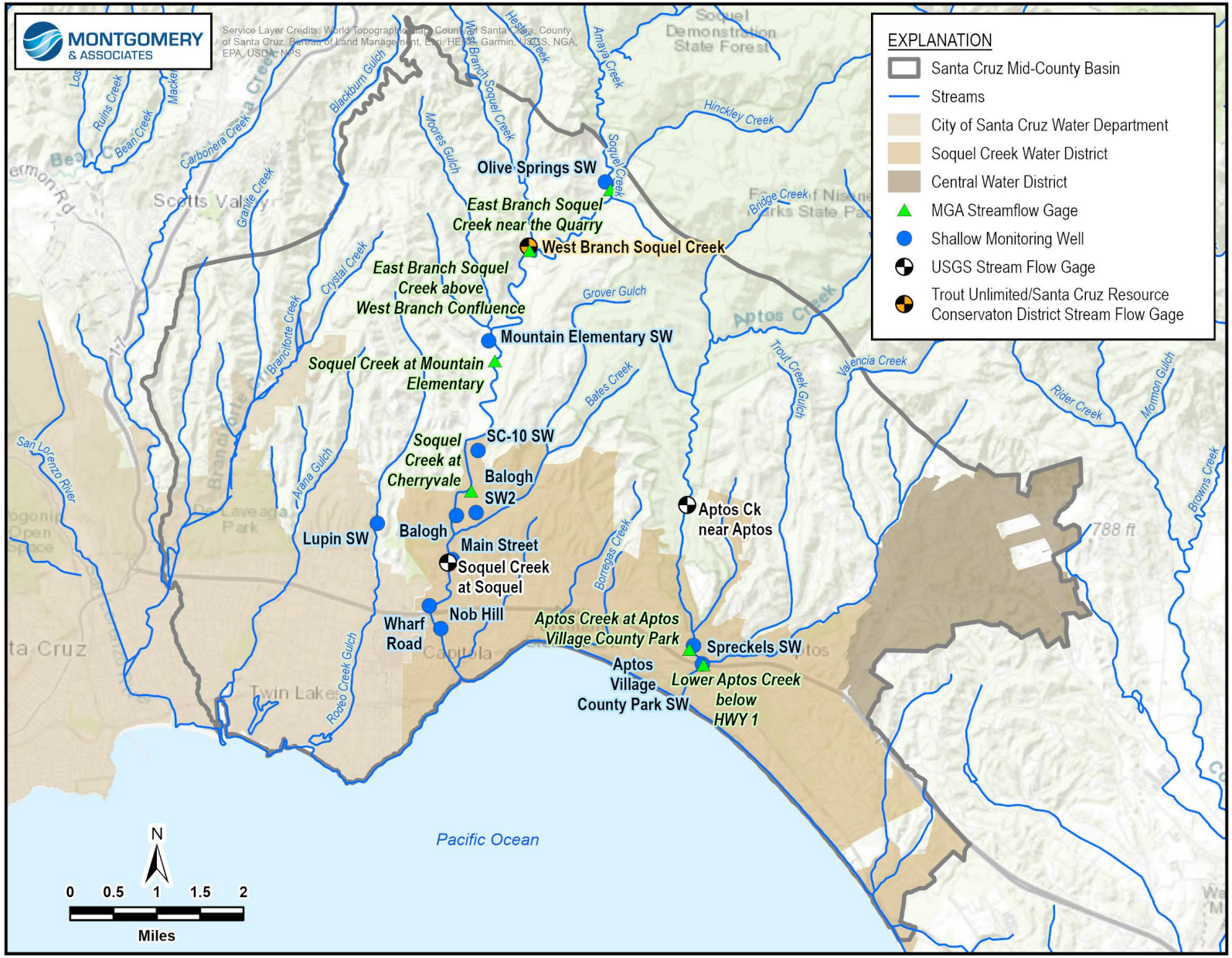

Figure 7-4. Surface Water Monitoring Network in Relation to Shallow Wells

7.5 Remaining Actions to Improve Monitoring Networks

No new actions are planned to improve the monitoring networks. Any future monitoring wells or streamflow gages associated with groundwater-related projects will be added to the GSP monitoring networks.

7.6 SGMA Monitoring Network Module

The SGMA Monitoring Network Module (MNM) has been updated with the changes documented in this section of this Periodic Evaluation.

All new monitoring wells identified in this Periodic Evaluation have been added to the MNM with their unique identification, reference surfaces, geography, well use, and construction. Since only DWR can remove wells from the MNM, DWR has been notified of wells to be removed. The MNM has also been updated with SMC associated with new RMP wells.

8 MGA AUTHORITIES AND ENFORCEMENT ACTIONS

Original MGA Joint Powers Agreement (JPA), effective March 17, 2016 and the MGA By-Laws were amended in 2021. There were both minor and substantive revisions made to the JPA. The more substantive revisions are summarized below:

- Update Recital D for consistency with the basin boundary modifications previously approved by the Department of Water Resources and Bulletin 118;
- Revise Section 8.2 which stated the Board would meet at least semi-annually as it implied the Board would meet twice per year and the Board intends to meet more frequently. The revised language allows the Board to establish the meeting schedule on an annual basis; and
- Removal of the term “capital” to the Section 9.3 requirement that Member Agency Directors unanimously approve any capital expenditure over $100,000 whereby the term is removed.

The First Amended JPA[10] is effective from August 10, 2021.

No substantive change was made to the MGA By-Laws, however the document title was changed to the “First Amended Bylaws” due to a change the tense of a sentence in Section 1.1. The First Amended By-Laws[11] are effective from September 9, 2021.

The MGA adopted the Groundwater Well Registration and Metering Policy for Non-De Minimis Users on June 20, 2024. The requirement was identified in the GSP and requires well registration, metering and reporting by groundwater users that extract more than 2 AFY in priority zones or users that extract more than 5 AFY anywhere in the basin. Well registration is required by applicable well owners by December 31, 2024. Meter installation is required by September 30, 2025 and the first annual report of extracted volumes is due by October 31, 2025. Non-compliance will result in MGA submitting a notice of non-compliance to the property owner and Santa Cruz County Environmental Health. The policy is available at [insert weblink]. MGA is currently investigating options for providing financial assistance for well owners to which the policy may apply.

[10] https://www.midcountygroundwater.org/sites/default/files/uploads/First_Amended_JPA.pdf
[11] https://www.midcountygroundwater.org/sites/default/files/uploads/MGA_First_Amended_Bylaws_2021-0909_0.pdf

9 OUTREACH, ENGAGEMENT, AND COORDINATION WITH OTHER AGENCIES

This section describes continued outreach, engagement, and communication with stakeholders and agencies in the Basin since the GSP was approved by the MGA Board of Directors (Board) in November 2019.

9.1 Public Outreach and Engagement

The MGA has maintained active public outreach and engagement throughout GSP development and implementation as documented in the sections below.

9.1.1 Assessment of Public Comments Submitted to the MGA during Periodic Evaluation

While there are no specific requirements for public comment on the Periodic Evaluation, the MGA has taken public comment during the Periodic Evaluation agenda item at 4 publicly noticed Board meetings. In addition, the MGA released a Board draft of the Periodic Evaluation 30 days prior to the September 20, 2024, the MGA Board meeting to provide ample time for the public to consider comments prior to that meeting. A summary of comments received at each meeting and the MGA response is provided in Table 9-1.

Table 9-1. Summary of Comments Received at MGA Board Meetings on Periodic Evaluation

December 14, 2023 Meeting
Comment from Becky Steinbruner: The MGA will need to consider the effect of increased water demands associated with state housing mandates. The MGA response: MGA will monitor and coordinate with the member agencies that have responsibility for preparing updated demand projections as part of their mandated Urban Water Management Plan updates in 2025.
Comment from Becky Steinbruner: The MGA should work closely with the state to ensure that the region gets useful information related to seawater intrusion from aerial electromagnetic (AEM) surveys. The MGA response: The MGA has and will continue to work closely with the state in coordinating AEM surveys. The MGA will proactively share the results of its seawater intrusion investigations for consideration by the state in planning for any future AEM surveys.
Comment from Becky Steinbruner: Concerned that pumping from the new Soquel Creek Water District Country Club well could exacerbate the seawater intrusion issue in the area. The MGA response: The Final Initial Study – Mitigated Negative Declaration adopted in December 2021 indicates that this is a replacement well that will not extract more than the previous well. Based on this, Soquel Creek concluded that it will not increase the risk of seawater intrusion over past use. The MGA will closely track the quarterly chloride data collected at 2 nearby coastal monitoring wells to observe for any potential emerging concerns.

Comment from Becky Steinbruner: To help manage the high chloride issue, should consider using Pure Water Soquel water at Seascape Golf Course. Additional efforts to collect stormwater and recharge it into the area should also be considered. MGA response: The MGA is not responsible for capital facility and operational decisions of the water suppliers in the Mid-County Basin. Santa Cruz County evaluated recharge opportunities in this area and was unable to find suitable recharge locations.
March 21, 2024 Meeting
Comment from Becky Steinbruner: Need to consider soil strata composition in areas as contributing factor for occurrence of high chloride. The MGA response: The MGA will consider the role of local geologic formations as it collects and assesses various water quality data.
Comment from Becky Steinbruner: Should evaluate areas around the KOA and Renaissance High School with land-based electromagnetic surveys. The MGA response: These sites are outside of the MGA jurisdictional area. However, MGA is coordinating with Pajaro Valley GSA to explore where there are opportunities to conduct electromagnetic surveys and collect additional data that may be useful in characterizing the nature and extent of high chloride.
Comment from Becky Steinbruner: Should consider how previous AEM surveys would relate to land-based electromagnetic surveys. The MGA response: The MGA will consider past AEM results from 2017 and 2023 in prioritizing where additional electromagnetic survey work will be conducted.
Comment from Becky Steinbruner: The MGA will need to consider the effect of increased water demands associated with state housing mandates. The MGA response: The MGA will monitor and coordinate with the member agencies that have responsibility for preparing updated demand projections as part of their mandated Urban Water Management Plan updates in 2025.
Comment from Becky Steinbruner: Pure Water Soquel water should be used at Seascape Golf Course and Seascape Greens. The MGA response: The MGA is not responsible for capital facility and operational decisions of the water suppliers in the Mid-County Basin.
June 20, 2024 Meeting
Comment from Becky Steinbruner: Requested an explanation of the groundwater model changes that will be included in the Periodic Evaluation. The MGA response: Model updates are described in section 5.4 of the Periodic Evaluation.
Comment from Becky Steinbruner: Requested information on how the public would be notified of the availability of the draft Periodic Evaluation. The MGA response: An MGA Board draft of the Periodic Evaluation will be posted 30 days in advance of the September 20, 2024, Board meeting. An MGA electronic newsletter (also known as an E-blast) will be sent to the nearly 1,200 subscribers of the availability of the draft when it is posted.
September 20, 2024 Meeting
Content to be added following meeting.

9.1.2 Public Engagement

The MGA has continually and actively engaged the public since GSP adoption through public The MGA Board meetings, maintenance of the MGA website[12], and maintenance of an extensive distribution list of interested parties. These are described further under the outreach methods below.

In addition to the MGA public engagement, 2 GSP projects have either had, or are planning for, additional public engagement. SqCWD's PWS project (see Section 5.1.2.1) has been subject to extensive public engagement throughout its development. SqCWD created a webpage[13] to comprehensively inform and update the public on the PWS project. Figure 9-1 is a screen capture of the PWS webpage documenting the thoroughness of information made available to the public. SqCWD addressed public comment on the PWS EIR, which was certified by its Board on December 18, 2018. SqCWD also held a public hearing on December 1, 2022, and addressed public comment on the PWS Title 22 Engineering Report submitted to DDW in March 2023.

On December 15, 2023, the RWQCB issued a permit for the PWS project (Order R3-2023-0033, Waste Discharge and Water Reclamation Requirements)[14]. The order identifies operating limitations and required sampling and notification protocols to address potential impacts to beneficial users in the Basin.

The second GSP project in the active development stage is the ASR project (see Section 5.1.2.2). The ASR project is currently conducting pilot feasibility testing, and as it . As advances through pilot testing, an outreach work plan is being developed for additional project phases. Updates on progress will be provided in GSP annual reports.

[12] midcountygroundwater.org
[13] https://www.soquelcreekwater.org/184/Pure-Water-Soquel
[14] https://waterboards.ca.gov/centralcoast/board_decisions/adopted_orders/2023/pws-2023-0033.pdf

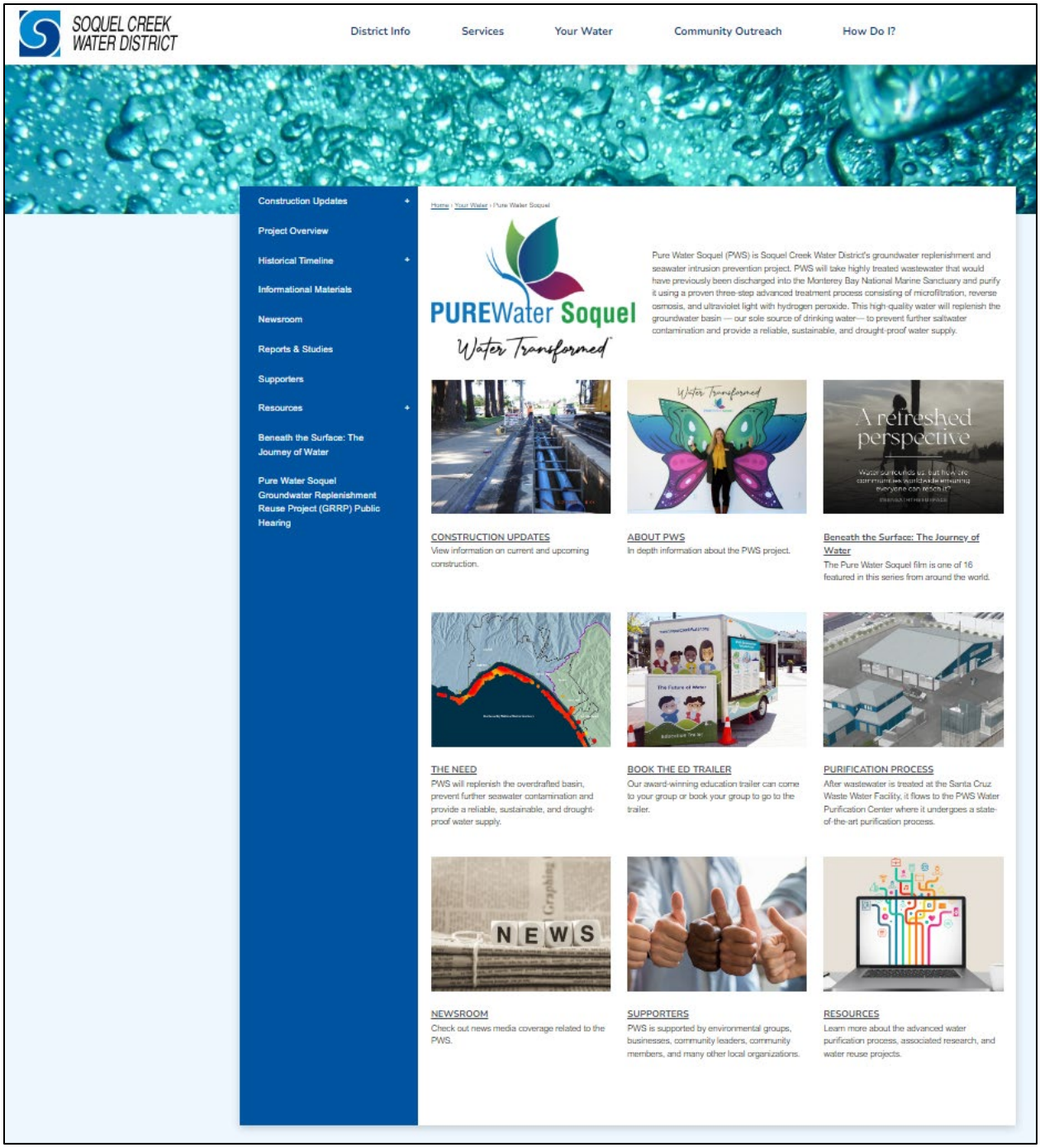

Figure 9-1. Pure Water Soquel Public Communication Portal

9.1.3 Evaluation of Methods for Outreach and Engagement

The GSP Communication and Engagement Plan focused on activities up to adoption of the GSP. While there was no specific description of activities for post-adoption, many of the outreach methods were carried forward into GSP implementation. Table 9-2 lists outreach methods during GSP development and describes relevant activities that have been carried forward post GSP-adoption.

Table 9-2. Outreach Methods

Outreach Method	Notes on Post GSP-Adoption
Website	The MGA website[15] has been at the heart of the MGA's outreach since GSP adoption. The site is actively maintained with an announcements section for noteworthy items of interest (20 postings since GSP adoption through June 2024). An active Board meeting calendar with agenda packets (dating back to 2014) and past meeting recordings (dating back to 2017) are on the web site. A sign-up for our newsletter icon is prominently featured on the home page to actively recruit new interested parties.
Press Releases	Since GSP adoption, press releases have been limited. The MGA issued a press release in June 2021 announcing DWR approval of the GSP and another press release in July 2023 encouraging private well owners to apply for vacancies on the MGA Board.
Public Meetings/Workshops	Regular meetings of the MGA Board have served as the primary forum for public meetings since GSP adoption. Beginning in December 2023, the MGA has been utilizing its Board meetings for public engagement on its GSP Periodic Evaluation. In addition to regular Board meetings, the MGA held 2 public workshops on the development of a metering program for non-de minimis groundwater users.
MGA Drop-Ins	The MGA held bi-monthly drop-in office hours for the public to ask questions during GSP development. That practice dropped off following GSP adoption due to lack of public attendance.
Mailings	Direct mailings are sent to targeted interested parties for specific management actions or projects. Since adoption of the GSP, direct mailings associated with the non-*de minimis* user metering program development (66 letters sent in March 2022; 22 letters sent in February 2024) and monitoring well construction project (approximately 25 letters sent to nearby homeowners).
MGA E-Newsletter	Prior to each Board meeting, an E-blast is distributed to an extensive distribution list (1,177 as of February 2024). The E-blast serves to both announce the meeting and to provide updates on other GSP-related activities. There have been 20 E-blasts since GSP adoption through June 2024.
Recorded Meetings	To ensure engagement with interested parties not able to attend and to ensure transparency, all MGA meetings since GSP adoption (20 meetings through June 2024) have been recorded and posted online at the MGA website.

[15] midcountygroundwater.org

9.2 Responsibilities of the MGA Board

The MGA Board has continued to meet regularly since GSP adoption, including:

- 3 times in 2020 (March 2020 meeting was canceled and subsequent meetings were held remotely due to COVID-19 public health emergency)
- 4 times in 2021 (all meetings held remotely due to COVID-19)
- 5 times in 2022 (all meetings held remotely due to COVID-19 concerns)
- 4 times in 2023 (March and June meetings were in-person; beginning in September meetings also include a live stream to improve public access)
- 4 times in 2024 (In person meetings with live stream remote for public access)

Board meetings are open to the public and all required meeting materials are posted on the MGA website a minimum of 72 hours prior to the meeting in compliance with the Brown Act. Notices of Board meetings are emailed to a distribution list of 1,177 (as of February 2024) interested parties. The list has been developed through sign-ups at public meetings, outreach events, and at the MGA website. All Board meetings are recorded and posted[16] to allow for continued public engagement. Board meetings begin at 6:00 pm to avoid most work-related conflicts for members of the public that wish to participate or otherwise observe the meeting.

The MGA uses a collaborative staffing model to accomplish its work. Professional and technical staff from the MGA member agencies provide staff leadership, management, work products, and administrative support for the MGA. The MGA contracts with the Regional Water Management Foundation (RWMF) for administrative and planning support. The MGA member agency executive staff (Executive Team), comprised of the 4 member agency executive and senior staff, provide staff support for the MGA officers and Board members. The Executive Team and RWMF typically meet on a monthly basis to receive updates and provide direction on the priority activities of the MGA, including the development of Board agendas.

The GSP Advisory Committee concluded its work in June 2019 with further GSP implementation actions being referred to the MGA Executive Team and the MGA Board.

9.3 Coordination with Other Agencies

The MGA and its member agencies have coordinated with adjacent basins, reached out to applicable agencies, developed inter-agency agreements, and participated in inter-agency planning efforts. These are discussed in the subsections below.

[16] https://www.midcountygroundwater.org/committee-meetings

9.3.1 Coordination with GSAs in Hydrologically Connected Basins

The 2 adjacent groundwater basins to the Santa Cruz Mid-County Basin are the Santa Margarita Basin (3-027) and the Pajaro Valley Subbasin (3-002.01). Only the Pajaro Valley Subbasin is directly hydrologically connected to the Mid-County Basin. While staff representing the Mid-County Basin and Pajaro Valley Subbasin routinely communicate with each other in a variety of venues in Santa Cruz County, more formal coordination is commencing in 2024. The subbasins will conduct a coordination meeting at least once annually upon completion of their respective GSP annual reports. On April 19, 2024, representatives of the subbasins met to share information on monitoring results, progress on GSP implementation projects, and issues of common concern with sustainability criteria near their common boundaries. In particular, the meeting discussed the observed increases in evidence of seawater intrusion and upcoming studies to continue to evaluate the issue. Representatives also discussed future coordination in sharing groundwater level and quality data relevant to the preparation of annual reports and other GSP implementation activities (e.g., cross boundary water levels to improve groundwater elevation contour maps).

9.3.2 Coordination with Tribal, Federal, State, and Other Local Agencies

Because there are no tribal lands or federal water supply facilities in the Basin, engagement with those entities has been limited, with the exception that the PWS project has received federal grants for project funding. The most extensive outreach related to implementing projects in this category of agencies has been with the SWRCB and the RWQCB related to project-related permits. SqCWD has worked with the Central Coast RWQCB to secure its PWS permit as described above. The City of Santa Cruz has worked with the SWRCB and submitted a final water rights change petition in January 2021 to support its ASR project and water transfers. That application is still under review.

9.3.3 New Inter-Agency Agreements

The MGA Board entered into a Memorandum of Agreement (MOA) with agencies throughout Santa Cruz County to commit to participation in the Santa Cruz Integrated Regional Water Management (IRWM) Plan on June 20, 2024. Initiated in 2005 in the Santa Cruz Region, participants in the IRWM Program include local agencies with authority and responsibility to carry out water resources management within the region including water supply, water quality, flood management, stormwater, wastewater, land use, and natural resources. The MOA creates opportunities for engagement with agencies representing the diverse communities and interested parties as projects are being developed and implemented, and it creates opportunities for seeking more integrated benefits from future projects that may be considered.

9.3.4 Inter-Agency Coordination

The most notable inter-agency coordination has been with Santa Cruz County Environmental Health. Environmental Health began updating its well ordinance to include, among other items, metering requirements for new or replacement wells for non-*de minimis* users and updating

construction and review standards for wells proposed near interconnected surface water. The effort is consistent with, and supportive of, the MGA GSP. The MGA is represented on the Technical Advisory Committee (TAC) for the ordinance update, which is expected to conclude by 2025. When complete, the updated ordinance will support the MGA GSP goals. The TAC is diverse in terms of agency representation and technical expertise as shown in the table below.

Table 9-3. Well Ordinance Update Techncial Advisory Committee Composition

Technical Expertise	Representative
Small farmers	Alma Fernandez
Large working lands/Agriculture	Dennis Lebow
Large working lands/Agriculture alternate	Robert Wall
Well driller	Aaron Lingemann
Well driller	Dave Landino
County Water Advisory Commission	Bryan Largay
County Water Advisory Commission	Nate Gillespie
Santa Cruz Mid-County and Santa Margarita Groundwater Agencies	Rob Swartz
Pajaro Valley Water Management Agency	Brian Lockwood
Biotic resources - National Marine Fisheries Service	Rick Rogers
Biotic resources - California Department of Fish and Wildlife	Jessie Maxfield
Public utilities/Soquel Creek Water District	Brice Dahlmeier
Department of Water Resources	Benjamin Brezing

Additional notable inter-agency coordination occurred with Santa Cruz County Environmental Health during its development of a DROP for small water systems and domestic wells in compliance with Senate Bill 552 (see Section 3.1.5.1 of this report for plan description). To develop a comprehensive and inclusive plan, the County Water Advisory Commission recommended convening a subcommittee to serve as a Drought Response Working Group. The working group met 4 times between May and August 2022 and provided recommendations for consideration of inclusion in the final DROP. An MGA Board member represented the MGA on the working group.

10 OTHER INFORMATION

This section describes relevant issues related to potential impacts to adjacent basins as well as GSP implementation challenges and legal challenges.

10.1 Consideration of Adjacent Basins

As described above, the Mid-County Basin and the Pajaro Valley Subbasin began more formal coordination in April 2024. The most significant area of coordination from the Mid-County Basin perspective is the observed increase in evidence of seawater intrusion near the border with the Pajaro Valley Subbasin. Because the respective basins use a similar approach to SMC (e.g., use of a 250 mg/L chloride isoconcentration line as a MT), we believe that they are in alignment. Neither Plan proposes significant stresses being introduced along the shared boundary, so we do not believe that either Plan will impact the ability of the other to reach its sustainability goal. For the Mid-County Basin, the PWS project is expected to improve groundwater level conditions; no other significant actions are expected until we can see the results of that project. In the meantime, the most effective coordination will be around sharing information on monitoring results in the area and possibly coordination on characterizing the nature and extent of the seawater intrusion being observed in the Mid-County Basin.

The Mid-County Basin and Santa Margarita Basin have had beneficial coordination in the sharing of costs for the development and maintenance of a data management system as well as sharing contracted staffing expenses. The Mid-County Basin is not significantly interconnected with the adjacent Santa Margarita Basin, so there has been no need to align SMC, no concerns related to impacts due to Plan implementation, and no concern that Plan implementation will affect the basins' abilities to achieve their respective sustainability goals.

10.2 Challenges not Previously Discussed

There are 2 primary challenges that the MGA believes are important for DWR to be aware of. The first is the cost of ongoing SGMA compliance. For GSAs managing basins with very large groundwater extraction, there is an economy of scale presented by spreading the cost of compliance over tens to hundreds of thousands of AFY. For example, basic SGMA compliance in the Salinas Valley 180/400 Foot Aquifer Basin, which pumps more than 120,000 AFY, results in a compliance cost around $3 per AF. For the MGA area, where only about 5,000 AFY is extracted, the recent compliance cost is around $115 per AF. That cost does not include any of the projects intended to improve the basin condition; it is simply administration, monitoring and reporting to comply with SGMA. Further, the pumping is mostly for domestic use by either municipal water providers or rural well owners, there is very little commercial or agricultural pumping. Finding the funding to maintain the agency once existing grant funding has been expended is an ongoing concern for the MGA and many other small GSAs throughout the State.

The second challenge is with the continued increase in dissolved chloride, which is a possible indicator of active seawater intrusion, in the eastern part of the Basin. While the Basin has taken

actions to reduce groundwater extraction in the area, the increase appears to be continuing. Assistance with specific studies related to characterizing and managing the issue would be most appreciated. For example, more refined electromagnetic surveys intended to characterize the extent of intrusion would be helpful. More frequent water quality analysis to track temporal changes would also be helpful. The analytical costs will add up, so potential assistance with analysis from DWR laboratories as part of the study could also help.

10.3 Legal Challenges

The MGA itself has not faced any legal challenges. However, the SqCWD PWS project, which is 1 of the primary projects identified in the GSP as a critical component needed to help bring the Basin into sustainability, has been challenged through the courts. As of July 15, 2024, there have been 8 lawsuits filed by 1 individual, challenging the ongoing implementation of the PWS project. Of those, 4 have been fully resolved in SqCWD's favor, and the other 4 are in the process of being resolved. The litigant acting in pro-per (Ms. Steinbruner) has cost over $1,000,000 in legal fees to date to SqCWD customers and as noted, has not won any of the cases thus far brought forth. The MGA does not believe these challenges will affect GSP implementation.

11 SUMMARY OF PROPOSED OR COMPLETED REVISIONS TO PLAN ELEMENTS

Based on the information evaluated and presented in this Periodic Evaluation, the GSP is still a viable Plan for achieving sustainability. Since the GSP does not need to be changed, a Plan Amendment is not necessary. The MGA will continue to implement the GSP as adopted by the MGA with the understanding that there is potential for some elements of the Plan to require an update in the future based on additional analysis of increasing chloride in the Seascape area and results from the Optimization Study.

Since the GSP has been adopted by the MGA there has been significant progress implementing the Plan and collecting new information to support understanding of the Basin. Key activities, findings, and next steps (where applicable) from this Periodic Evaluation are:

- Monitoring networks used to evaluate Basin conditions have been expanded to fill all GSP-identified data gaps. Additional new monitoring wells associated with the PWS and ASR projects supplement existing networks and provide a means for monitoring project performance. No additional monitoring data gaps are identified currently. As data from these new wells are collected over the next few years, SMC will be established and included by the next Periodic Evaluation.
- There has been substantial progress made on constructing the PWS project and planning and testing for the ASR project. Although the 2 projects are slightly behind the schedule projected in the GSP, they will be operational towards the end of 2024 and in 2026, respectively. These projects will utilize locally available water supplies to raise coastal groundwater levels, prevent seawater intrusion, and contribute to regional water supply resiliency.
- Redistributing coastal pumping is on track with the construction of a new inland SqCWD municipal supply well at Cunnison Lane to be drilled by the end of 2024. A Sustainable Management (SGM) Grant Program's SGMA Implementation – Round 1 grant provided funds for this planned groundwater extraction well that will assist with reducing reliance on groundwater extracted near the coast.
- Water use in general, and especially groundwater extraction, continues to decrease in response to effective water conservation programs. Water Year 2023 had the lowest total municipal water use since tracking began in 1984, despite increasing population over that period.
- Groundwater levels in deeper confined aquifers near the coast continue to increase from historical lows in the 1980s as municipal groundwater extraction has decreased over time. This is important because higher groundwater levels are still needed in some coastal areas to ensure no further seawater intrusion.
- The southeastern portion of the Basin at Seascape is experiencing increasing chloride concentrations at depths shallower than historically observed in the Purisima F-unit. This may be associated with an upward vertical gradient of high chloride groundwater observed

in deeper zones. It is uncertain what impact wells pumping from the overlying Aromas aquifer have on increasing chloride in the Seascape area. Additional analysis is being conducted by the MGA to better understand pumping operations and dynamics, groundwater geochemistry, and to potentially delineate the onshore extent of seawater intrusion using ground-based electromagnetic surveys. Information from this analysis will be used to determine if there should be revisions to SMC in the Seascape area.

- In April 2024, the SWRCB established an MCL of 10 µg/L for chromium VI and the U.S. EPA established MCLs for PFAS. These constituents are added as COCs and will be monitored along with the other COCs.
- The PWS and ASR projects planned in the GSP are not predicted to meet all member agency water demands while achieving sustainability Therefore, SqCWD and SCWD are conducting the Optimization Study funded by a DWR Proposition 1 Groundwater Sustainability grant for critically overdrafted basins. The study evaluates configurations or combinations of projects that achieve SMC and better address water supply needs. Results of the study are not available in time to include in the Periodic Evaluation, but significant refinement and implementation of the PWS and ASR are expected by the next Periodic Evaluation.
- The MGA adopted the Groundwater Well Registration and Metering Policy for Non-De Minimis Users on June 20, 2024. The requirement was identified in the GSP and requires well registration, metering and reporting by groundwater users that extract more than 2 AFY in priority zones or users that extract more than 5 AFY anywhere in the basin. Well registration is required by applicable well owners by December 31, 2024. Meter installation is required by September 30, 2025 and the first annual report of extracted volumes is due by October 31, 2025.

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Appendix 6A

Groundwater Level Monitoring Network

Santa Cruz Mid-County Basin Groundwater Level Monitoring Network

Aquifer Unit	Well Name	Monitoring Agency	Previous Sounding Frequency	Datalogger	Revised Sounding Frequency	Comments
Shallow Well to Monitor Surface Water Interactions	**Balogh SW** [1]	SqCWD	Quarterly	y	Quarterly	No change
	Main St SW 1 [1]	SqCWD	Quarterly	y	Quarterly	No change
	Wharf Road SW [1]	SqCWD	Quarterly	y	Quarterly	No change
	Nob Hill SW 2[1]	SqCWD	Quarterly	y	Quarterly	No change
	Lupin SW	MGA	N/A	y	Quarterly	Added to network to fill GSP-idendified data gap
	SC-10 SW	MGA	N/A	y	Quarterly	Added to network to fill GSP-idendified data gap
	Balogh SW 2	MGA	N/A	y	Quarterly	Added to network to fill GSP-idendified data gap
	Spreckels SW	MGA	N/A	y	Quarterly	Added to network to fill GSP-idendified data gap
	Aptos Village County Park SW	MGA	N/A	y	Quarterly	Added to network to fill GSP-idendified data gap
	Mountain Elementary SW	MGA	N/A	y	Quarterly	Added to network to fill GSP-idendified data gap
	Olive Springs SW	MGA	N/A	y	Quarterly	Added to network to fill GSP-idendified data gap
Various	27 Private Domestic Wells Unnamed for Privacy Reasons **(2 wells used as RMPs)** [3]	Santa Cruz County	Semi- Annual	n	Semi- Annual	3 non-RMP wells removed due to access issues: Private Wells 4, 9 and 12 Deploy transducer at 2 RMP wells
Aromas	SC-A1C	SqCWD	Quarterly	y	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-A1D	SqCWD	Quarterly	y	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-A2RC	SqCWD	Quarterly	y	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-A3A [2]	SqCWD	Quarterly	y	Quarterly	No change
	SC-A3B	SqCWD	Quarterly	y	Quarterly	No change
	SC-A3C	SqCWD	Quarterly	y	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-A5C	SqCWD	Quarterly	y	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-A5D	SqCWD	Quarterly	y	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-A6C	SqCWD	Monthly	n	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-A7C [3]	SqCWD	Monthly	y	Quarterly	Reduced to quarterly because data logger installed
	SC-A7D	SqCWD	Monthly	n	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-A8B	SqCWD	Quarterly	y	Quarterly	No change
	SC-A8C	SqCWD	Quarterly	y	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	CWD-12A	CWD	Quarterly	n	Quarterly	No change
	CWD-12B	CWD	Quarterly	n	Quarterly	No change
	CWD-10 PW	CWD	Monthly	y	Monthly	No change, transducer added
Aromas/ Purisima F	Country Club PW	SqCWD	Annual	y	Annual	No change
	Bonita PW	SqCWD	Annual	y	Annual	No change
	San Andreas PW	SqCWD	Annual	y	Annual	No change
	Seascape PW	SqCWD	Annual	y	Annual	No change
	CWD-4 PW	CWD	Monthly	y	Monthly	No change
	CWD-12 PW	CWD	Monthly	y	Monthly	No change

Aquifer Unit	Well Name	Monitoring Agency	Previous Sounding Frequency	Datalogger	Revised Sounding Frequency	Comments
Purisima F	SC-20A	SqCWD	Quarterly	y	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-20B	SqCWD	Quarterly	y	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-20C	SqCWD	Quarterly	y	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-23C [3]	SqCWD	Quarterly	y	Quarterly	No change
	SC-8RF	SqCWD	Quarterly	y	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-A1B [2]	SqCWD	Quarterly	y	Quarterly	No change
	SC-A2RA [2]	SqCWD	Quarterly	y	Quarterly	No change
	SC-A2RB	SqCWD	Quarterly	y	Quarterly	No change
	SC-A5A	SqCWD	Quarterly	y	Quarterly	No change
	SC-A5B	SqCWD	Quarterly	y	Quarterly	No change
	SC-A6A	SqCWD	Quarterly	n	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-A6B	SqCWD	Quarterly	n	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-A7A	SqCWD	Monthly	n	None	Remove from network due to broken seal causing suspect data, has not been used in MGA Annual Reports; SC-A7B screened also in the Purisima F unit can be used instead, PV Water should be notified
	SC-A7B	SqCWD	Monthly	n	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-A8A [2]	SqCWD	Quarterly	y	Quarterly	No change
	Polo Grounds PW	SqCWD	Annual	y	Annual	No change Grouped with Pruisima F Unit instead of Aromas/Purisima F to be consistent with GSFLOW model layering
	Aptos Jr. High 2 PW	SqCWD	Annual	y	Annual	No change Grouped with Pruisima F Unit instead of Aromas/Purisima F to be consistent with GSFLOW model layering
	CWD-12C	CWD	Quarterly	n	Quarterly	No change
	Black [3]	CWD	Monthly	n	Monthly	No change
	CWD-3	CWD	Monthly	n	Monthly	No change
	CWD-5 [3]	CWD	Monthly	y	Monthly	No change
Purisima DEF	**SC-8RD** [2]	SqCWD	Quarterly	y	Quarterly	No change
	SC-8RE	SqCWD	Quarterly	y	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-9RE	SqCWD	Quarterly	y	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-11RD [3]	SqCWD	Quarterly	y	Quarterly	No change
	SC-17C	SqCWD	Monthly	n	Semi-Annual*	Potentially removed if airline equipment stuck in well cannot be extracted Not a RMP, so changed from monthly to semi-annual
	SC-17D	SqCWD	Monthly	n	Semi-Annual*	Potentially removed if airline equipment stuck in well cannot be extracted Not a RMP, so changed from monthly to semi-annual
	SC-23B [3]	SqCWD	Quarterly	y	Quarterly	No change
	SC-A1A	SqCWD	Quarterly	y	Quarterly	No change
	T. Hopkins PW	SqCWD	Annual	y	Annual	No change
	Granite Way PW	SqCWD	Annual	y	Annual	No change

Aquifer Unit	Well Name	Monitoring Agency	Previous Sounding Frequency	Datalogger	Revised Sounding Frequency	Comments
Purisima BC	SC-1B	SqCWD	Monthly April – Nov, otherwise Quarterly	y	Semi-Annual	Not a RMP, so changed from monthly to semi-annual
	SC-3RC	SqCWD	Quarterly	y	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-5RC	SqCWD	Quarterly	y	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-8RB [2]	SqCWD	Quarterly	y	Quarterly	No change
	SC-8RC	SqCWD	Quarterly	y	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-9RC [2]	SqCWD	Quarterly	y	Quarterly	No change
	SC-11RB [3]	SqCWD	Quarterly	y	Quarterly	No change
	SC-14B	SqCWD	Monthly	n	None	Remove from network due to stuck equipment; not measured since 2018; SC-14C (BC unit) can be used as substitute
	SC-14C	SqCWD	Monthly	n	Semi-Annual	Not a RMP, so changed from monthly to semi-annual
	SC-16B	SqCWD	Monthly	n	Semi-Annual*	Potentially removed if airline equipment stuck in well cannot be extracted; can substitute with TLM-2BC Not a RMP, so changed from monthly to semi-annual
	SC-17B	SqCWD	Monthly	n	Semi-Annual*	Potentially removed if airline equipment stuck in well cannot be extracted Not a RMP, so changed from monthly to semi-annual
	SC-19 [3]	SqCWD	Monthly	y	Quarterly	Reduced to quarterly because data logger installed
	SC-23A [3]	SqCWD	Quarterly	y	Quarterly	No change
	Madeline 2 PW	SqCWD	Annual	y	Annual	No change
	Ledyard PW	SqCWD	Twice monthly	n	Twice monthly	No change
	Aptos Creek PW	SqCWD	Annual	y	Annual	No change
	TLM-2BC	SqCWD	N/A	y	Quarterly	Added to the monitoring network
	TLM-3BC	SqCWD	N/A	y	Quarterly	Added to the monitoring network
	TLM-4BC	SqCWD	N/A	y	Quarterly	Added to the monitoring network
Purisima B (Aquitard)	SC-3RB	SqCWD	Quarterly	y	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-5RB	SqCWD	Quarterly	y	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
Purisima A	**SC-1A** [2]	SqCWD	Monthly April – Nov, otherwise Quarterly	y	Quarterly	Changed to quarterly to be consistent with other SWI RMP
	SC-5RA [2]	SqCWD	Quarterly	y	Quarterly	No change
	SC-8RA	SqCWD	Quarterly	y	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-9RA	SqCWD	Quarterly	y	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-10RA [1]	SqCWD	Quarterly	y	Quarterly	No change
	SC-15B	SqCWD	Quarterly	y	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-17A	SqCWD	Monthly	n	Semi-Annual*	Potentially removed if airline equipment stuck in well cannot be extracted Not a RMP, so changed from monthly to semi-annual
	SC-21A	SqCWD	Quarterly	y	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-22A [3]	SqCWD	Monthly April – Nov, otherwise Quarterly	y	Quarterly	Changed to quarterly to be consistent with other GWL RMP
	Tannery 2 PW	SqCWD	Annual	y	Annual	No change
	Estates PW	SqCWD	Annual	y	Annual	No change
	Garnet PW	SqCWD	Annual	y	Annual	No change
	Rosedale PW	SqCWD	Annual	y	Annual	No change
	Corcoran Lagoon Med.	SCWD	Monthly	y	Semi-Annual	Not a RMP, so changed from monthly to semi-annual
	Corcoran Lagoon S.	SCWD	Monthly	n	Semi-Annual	Not a RMP, so changed from monthly to semi-annual
	Moran Lake Medium [2]	SCWD	Monthly	y	Quarterly	Changed to quarterly to be consistent with other seawater intrusion RMP
Purisima A	Moran Lake Shallow	SCWD	Monthly	n	Semi-Annual	Not a RMP, so changed from monthly to semi-annual

Aquifer Unit	Well Name	Monitoring Agency	Previous Sounding Frequency	Datalogger	Revised Sounding Frequency	Comments
	Beltz #2	SCWD	Monthly	y	Semi-Annual	Not a RMP, so changed from monthly to semi-annual
	Beltz #4 Deep	SCWD	Monthly	y	Semi-Annual	Not a RMP, so changed from monthly to semi-annual
	Beltz #4 Shallow	SCWD	Monthly	n	Semi-Annual	Not a RMP, so changed from monthly to semi-annual
	Soquel Point Shallow	SCWD	Monthly	n	Semi-Annual	Not a RMP, so changed from monthly to semi-annual
	Soquel Point Medium [2]	SCWD	Monthly	y	Quarterly	Changed to quarterly to be consistent with other seawater intrusion RMP
	Pleasure Point Medium [2]	SCWD	Monthly	y	Quarterly	Changed to quarterly to be consistent with other seawater intrusion RMP
	Pleasure Point Shallow	SCWD	Monthly	n	Semi-Annual	Not a RMP, so changed from monthly to semi-annual
	Coffee Lane Shallow [3]	SCWD	Monthly	y	Quarterly	Changed to quarterly to be consistent with other groundwater level RMP
	Auto Plaza Med	SCWD	Monthly	y	Semi-Annual	Not a RMP, so changed from monthly to semi-annual
	Auto Plaza Shallow	SCWD	Monthly	n	Semi-Annual	Not a RMP, so changed from monthly to semi-annual
	Cory Street Medium	SCWD	Monthly	y	Semi-Annual	Not a RMP, so changed from monthly to semi-annual
	Cory Street Shallow	SCWD	Monthly	n	Semi-Annual	Not a RMP, so changed from monthly to semi-annual
	30th Ave Shallow (1)	SCWD	Monthly	y	Semi-Annual	Not a RMP, so changed from monthly to semi-annual
	Beltz #8 PW	SCWD	Annual	y	Annual	No change
	Beltz #9 PW	SCWD	Annual	y	Annual	No change
	Beltz #7 Shallow	SCWD	Monthly	n	Semi-Annual	Not a RMP, so changed from monthly to semi-annual
	Beltz #6	SCWD	Monthly	n	Semi-Annual	Not a RMP, so changed from monthly to semi-annual
	SC-3RA [2]	SqCWD	Quarterly	y	Quarterly	No change Grouped with Pruisima A Unit instead of Purisima A/AA to be consistent with GSFLOW model layering
	SC-11RA	SqCWD	Quarterly	y	Quarterly	Not a RMP, so changed from monthly to semi-annual Grouped with Pruisima A Unit instead of Purisima A/AA to be consistent with GSFLOW model layering
	SC-16A	SqCWD	Quarterly	y	Semi-Annual	Not a RMP, so changed from monthly to semi-annual Grouped with Pruisima A Unit instead of Purisima A/AA to be consistent with GSFLOW model layering
	Beltz #8 MW	SCWD	N/A - new well	y	Quarterly	Added to the network to monitor City ASR
	MM-1	SqCWD	N/A - new well	y	Quarterly	Added to the network to monitor PWS
	MM-2	SqCWD	N/A - new well	y	Quarterly	Added to the network to monitor PWS
	WM-1	SqCWD	N/A - new well	y	Quarterly	Added to the network to monitor PWS
	WM-2	SqCWD	N/A - new well	y	Quarterly	Added to the network to monitor PWS
	TLM-1A	SqCWD	N/A - new well	y	Quarterly	Added to the network to monitor PWS
	TLM-2A	SqCWD	N/A - new well	y	Quarterly	Added to the network to monitor PWS
Purisima A/AA	SC-14A	SqCWD	Monthly	n	Semi-Annual*	Potentially removed if airline equipment stuck in well cannot be extracted Not a RMP, so changed from montly to semi-annual. Not measured since 2018 due to stuck equipment
	Beltz #10 PW	SCWD	Annual	y	Annual	No change
	Beltz #7 Deep	SCWD	Monthly	n	Semi-Annual	Not a RMP, so changed from monthly to semi-annual

Aquifer Unit	Well Name	Monitoring Agency	Previous Sounding Frequency	Datalogger	Revised Sounding Frequency	Comments
Purisima AA	**SC-10RAA** [3]	SqCWD	Quarterly	y	Quarterly	No change
	SC-15A	SqCWD	Quarterly	y	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-18RA	SqCWD	Quarterly	y	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-21AA	SqCWD	Quarterly	y	Quarterly	No change
	SC-21AAA	SqCWD	Quarterly	y	Quarterly	No change
	SC-22AA [3]	SqCWD	Monthly April – Nov, otherwise Quarterly	y	Quarterly	Changed to quarterly to be consistent with other GWL RMP
	SC-3AA [2]	SqCWD	N/A - new well	y	Quarterly	Added to the network to fill data gap
	Corcoran Lagoon Deep	SCWD	Monthly	y	Semi-Annual	Not a RMP, so changed from monthly to semi-annual
	Moran Lake Deep [2]	SCWD	Monthly	y	Quarterly	Changed to quarterly to be consistent with other SWI RMP
	Soquel Point Deep [2]	SCWD	Monthly	y	Quarterly	Changed to quarterly to be consistent with other SWI RMP
	Pleasure Point Deep [2]	SCWD	Monthly	y	Quarterly	Changed to quarterly to be consistent with other SWI RMP
	Schwan Lake	SCWD	Monthly	y	Semi-Annual	Not a RMP, so changed from monthly to semi-annual
	Coffee Lane Deep	SCWD	Monthly	y	Semi-Annual	Not a RMP, so changed from monthly to semi-annual
	Auto Plaza Deep	SCWD	Monthly	y	Semi-Annual	Not a RMP, so changed from monthly to semi-annual
	Cory Street Deep	SCWD	Monthly	y	Semi-Annual	Not a RMP, so changed from monthly to semi-annual
	30th Ave Medium (2)	SCWD	Monthly	y	Semi-Annual	Not a RMP, so changed from monthly to semi-annual
	Thurber Lane Shallow	SCWD	Monthly	y	Semi-Annual	Not a RMP, so changed from monthly to semi-annual
Purisima AA/Tu	Beltz #12 PW	SCWD	Annual	y	Annual	No change
	Main St. PW	SqCWD	Annual	y	Annual	No change. Grouped with Pruisima AA/Tu Unit instead of Purisima A to be consistent with GSFLOW model layering
	O'Neill Ranch PW	SqCWD	Annual	y	Annual	No change
Tu	SC-10AAA	SqCWD	Quarterly	n	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	SC-13A [2]	SqCWD	Quarterly	y	Quarterly	No change
	SC-22AAA	SqCWD	Quarterly, with Monthly visits April - Nov	y	Semi-Annual	Not a RMP, so changed from monthly to semi-annual Grouped with Tu Unit instead of Purisima AA to be consistent with GSFLOW model layering
	SC-18RAA	SqCWD	Quarterly	y	Semi-Annual	Not a RMP, so changed from quarterly to semi-annual
	Cory Street-4	SCWD	Monthly	y	Semi-Annual	Not a RMP, so changed from monthly to semi-annual
	30th Ave Deep (3)	SCWD	Monthly	y	Semi-Annual	Not a RMP, so changed from monthly to semi-annual
	Beltz #7 SM Test	SCWD	Monthly	y	Semi-Annual	Not a RMP, so changed from monthly to semi-annual
	Thurber Lane Deep	SCWD	Monthly	y	Semi-Annual	Not a RMP, so changed from monthly to semi-annual
	SP-5 [2]	SCWD	N/A - new well	y	Quarterly	Added to the monitoring networkto fill data gap

PW = production well; SCWD = City of Santa Cruz Water Department, SqCWD = Soquel Creek Water District; CWD = Central Water District; MGA = Santa Cruz Mid-County Groundwater Agency
monitoring wells in bold are representative monitoring points (RMP) for groundwater elevations;
[1] RMP for depletion of interconnected surface water; [2] = RMP for seawater intrusion; [3] = RMP for chronic lowering of groundwater levels
* = Unable to execute recommended frequency. Currently cannot be used to collect groundwater levels due to stuck airline equipment. We are working with SqCWD to see if data collecdtion can be restored.

Appendix 6B

Groundwater Quality Monitoring Network

Santa Cruz Mid-County Basin Groundwater Quality Monitoring Network

Aquifer Unit	Well Name	Previous General Mineral Sampling Frequency	Revised General Mineral Sampling Frequency	Comments	Previous Chloride & TDS Sampling Frequency	Revised Chloride & TDS Sampling Frequency	Comments
Aromas	Altivo PW	Semi-Annual	Semi-Annual	No change	Quarterly	Quarterly	No change
	CWD-10 PW [1]	Semi-Annual, except Annual nitrate (as N)	Semi-Annual, except Annual nitrate (as N)	No change	Triennial	Triennial	No change
	SC-A1C [1]	Annual	Annual	No change	Quarterly	Annual	Changed to Annual to be consistent with other Water Quality RMP
	SC-A1D	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual	Quarterly	Annual	Not a RMP, so changed from quarterly to annual
	SC-A2RC [1]	Semi-Annual	Annual	Changed to annual to be consistent with other Water Quality RMP	Quarterly	Annual	Changed to Annual to be consistent with other Water Quality RMP
	SC-A3A [1 2]	Annual	Annual	No change	Quarterly	Quarterly	No change, groundwater elevations are below the proxy groundwater level MT or chloride concentrations higher than the MO
	SC-A3B [2]	Annual	Annual	No change	Quarterly	Quarterly	No change, groundwater elevations are below the proxy groundwater level MT or chloride concentrations higher than the MO
	SC-A3C [1]	Annual	Annual	No change	Quarterly	Annual	Changed to Annual to be consistent with other Water Quality RMP
	SC-A5C	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual	Quarterly	Annual	Not a RMP, so changed from quarterly to annual
	SC-A5D	Annual	Annual	No change	Quarterly	Annual	Not a RMP, so changed from quarterly to annual
	SC-A8B [1 2]	Semi-Annual	Annual	Changed to annual to be consistent with other Seawater Intrusion RMP	Quarterly	Semi-Annual	Changed to Semi-Annual to be consistent with other Seawater Intrusion RMP
	SC-A8C [1]	Annual	Annual	No change	Quarterly	Annual	Changed to Annual to be consistent with other Water Quality RMP
Aromas/ Purisima F	**Country Club PW** [1]	Semi-Annual, except Annual nitrate (as N)	Semi-Annual, except Annual nitrate (as N)	No change	Quarterly	Quarterly	No change
	Bonita PW [1]	Semi-Annual, except Annual nitrate (as N)	Semi-Annual, except Annual nitrate (as N)	No change	Quarterly	Quarterly	No change
	San Andreas PW [1 2]	Semi-Annual, except Annual nitrate (as N)	Semi-Annual, except Annual nitrate (as N)	No change	Quarterly	Quarterly	No change
	Seascape PW [1 2]	Semi-Annual, except Annual nitrate (as N)	Semi-Annual, except Annual nitrate (as N)	No change	Quarterly	Quarterly	No change
Purisima F	**CWD-4 PW** [1]	Semi-Annual, except Annual nitrate (as N)	Semi-Annual, except Annual nitrate (as N)	No change	Triennial	Triennial	No change
	CWD-12 PW [1]	Semi-Annual, except Annual nitrate (as N)	Semi-Annual, except Annual nitrate (as N)	No change	Triennial	Triennial	No change
	Polo Grounds PW [1]	Semi-Annual, except Annual nitrate (as N)	Semi-Annual, except Annual nitrate (as N)	No change	Quarterly	Quarterly	No change Grouped with Pruisima F Unit instead of Aromas/Purisima F to be consistent with GSFLOW model layering
	Aptos Jr. High 2 PW [1]	Semi-Annual, except Annual nitrate (as N)	Semi-Annual, except Annual nitrate (as N)	No change	Quarterly	Quarterly	No change Grouped with Pruisima F Unit instead of Aromas/Purisima F to be consistent with GSFLOW model layering
	SC-23C	Annual	Annual	No change	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual
	SC-8RF	Annual	Annual	No change	Semi-Annual	Annual	Not a RMP, so changed from quarterly to annual
	SC-A1B [2]	Annual	Annual	No change	Semi-Annual	Semi-Annual	No change
	SC-A2RA [1 2]	Annual	Semi-Annual	Changed to semi-annual because chlorides are increasing and are above the MO	Quarterly	Quarterly	No change, groundwater elevations are below the proxy groundwater level MT or chloride concentrations higher than the MO
	SC-A2RB [2]	Semi-Annual	Semi-Annual	No change, because chlorides are increasing and are above the MO	Quarterly	Quarterly	No change, groundwater elevations are below the proxy groundwater level MT or chloride concentrations higher than the MO
	SC-A5A [2]	Annual	Semi-Annual	Changed to semi-annual because chlorides are increasing and are above the MO	Quarterly	Quarterly	No change, groundwater elevations are below the proxy groundwater level MT or chloride concentrations higher than the MO
	SC-A5B [2]	Annual	Semi-Annual	Changed to semi-annual because chlorides are increasing and are above the MO	Quarterly	Quarterly	No change, groundwater elevations are below the proxy groundwater level MT or chloride concentrations higher than the MO
	SC-A8A [1 2]	Annual	Semi-Annual	Changed to semi-annual because chlorides are increasing and are above the MO	Quarterly	Quarterly	No change, groundwater elevations are below the proxy groundwater level MT or chloride concentrations higher than the MO

Aquifer Unit	Well Name	Previous General Mineral Sampling Frequency	Revised General Mineral Sampling Frequency	Comments	Previous Chloride & TDS Sampling Frequency	Revised Chloride & TDS Sampling Frequency	Comments
Purisima DEF	**T-Hopkins PW** [1] [2]	Annual	Annual	No change	Annual	Annual	No change
	Granite Way PW [1]	Annual	Annual	No change	Annual	Annual	No change
	SC-8RD [1] [2]	Annual	Annual	No change	Semi-Annual	Semi-Annual	No change
	SC-8RE	Annual	Annual	No change	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual
	SC-9RE [1]	Annual	Annual	No change	Semi-Annual	Annual	Changed to Annual to be consistent with other Water Quality RMP
	SC-11RD	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual
	SC-23B	Annual	Annual	No change	Annual	Annual	No change
	SC-A1A [1] [2]	Semi-Annual	Annual	Changed to annual to be consistent with other Seawater Intrusion RMP	Quarterly	Semi-Annual	Changed to Semi-Annual to be consistent with other Seawater Intrusion RMP
Purisima BC	**Ledyard PW** [1] [2]	Annual	Annual	No change	Annual	Annual	No change
	Madeline 2 PW [1]	Annual	Annual	No change	Annual	Annual	No change
	Aptos Creek PW [1]	Annual	Annual	No change	Annual	Annual	No change
	SC-3RC [1]	Annual	Annual	No change	Semi-Annual	Annual	Changed to Annual to be consistent with other Water Quality RMP
	SC-23A [1]	Annual	Annual	No change	Annual	Annual	No change
	SC-8RB [1] [2]	Semi-Annual	Annual	Changed to annual to be consistent with other Seawater Intrusion RMP	Semi-Annual	Quarterly	Changed to Quarterly to be consistent with other Seawater Intrusion RMP, groundwater elevations are below the proxy groundwater level MT or chloride concentrations higher than the MO
	SC-8RC	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual
	SC-9RC [1] [2]	Annual	Annual	No change	Semi-Annual	Quarterly	Changed to Quarterly to be consistent with other Seawater Intrusion RMP, groundwater elevations are below the proxy groundwater level MT or chloride concentrations higher than the MO
	SC-11RB	Annual	Annual	No change	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual
	SC-17B	Annual	None	Removed, cannot be sampled due to stuck airline	Semi-Annual	None	Removed, cannot be sampled due to stuck airline
	TLM-2BC	N/A - new well	Annual	Added to Monitoring Network	N/A - new well	Annual	Added to Monitoring Network
	TLM-3BC	N/A - new well	Annual	Added to Monitoring Network	N/A - new well	Annual	Added to Monitoring Network
	TLM-4BC	N/A - new well	Annual	Added to Monitoring Network	N/A - new well	Annual	Added to Monitoring Network
Purisima B (Aquitard)	SC-3RB	Annual	Annual	No change	Annual	Annual	No change
	SC-5RB	Annual	Annual	No change	Annual	Annual	No change
Purisima A	**30th Ave Shallow (1)** [1]	Semi-Annual	Annual	Changed to annual to be consistent with other Water Quality RMP	Semi-Annual	Annual	Changed to Annual to be consistent with other Water Quality RMP
	Auto Plaza Medium	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual
	Auto Plaza Shallow	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual
	Corcoran Lagoon Med.	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual
	Corcoran Lagoon S.	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual
	Cory Street Medium	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual
	Cory Street Shallow	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual
	Pleasure Point Medium [2]	Quarterly	Annual	Changed to annual to be consistent with other Seawater Intrusion RMP	Quarterly	Semi-Annual	Potentially remove. Stuck equipment in well cannot be removed; Pleasure Point shllow can be used as substitute RMP
	Pleasure Point Shallow [1]	Quarterly	Annual	Changed to annual to be consistent with other Water Quality RMP	Quarterly	Semi-Annual	Changed to Semi-Annual to be consistent with other Seawater Intrusion RMP since this well will be used as a substitute for Pleasure Point medium chloride concentrations
	Beltz #2 [2]	Semi-Annual	Annual	Changed to annual to be consistent with other Seawater Intrusion RMP	Semi-Annual	Semi-Annual	Changed to Semi-Annual to be consistent with other Seawater Intrusion RMP
	Moran Lake Medium [2]	Quarterly	Annual	Changed to annual to be consistent with other Seawater Intrusion RMP	Quarterly	Semi-Annual	Changed to Semi-Annual to be consistent with other Seawater Intrusion RMP
	Moran Lake Shallow	Quarterly	Annual	Not a RMP, so changed from semi-annual to annual	Quarterly	Annual	Not a RMP, so changed from quarterly to annual
	Soquel Point Medium [2]	Quarterly	Annual	Changed to annual to be consistent with other Seawater Intrusion RMP	Quarterly	Quarterly	No change, groundwater elevations are below the proxy groundwater level MT or chloride concentrations higher than the MO

Aquifer Unit	Well Name	Previous General Mineral Sampling Frequency	Revised General Mineral Sampling Frequency	Comments	Previous Chloride & TDS Sampling Frequency	Revised Chloride & TDS Sampling Frequency	Comments
Purisima A	Soquel Point Shallow	Quarterly	Annual	Not a RMP, so changed from semi-annual to annual	Quarterly	Annual	Not a RMP, so changed from quarterly to annual
	Tannery II PW [1]	Annual	Annual	No change	Annual	Annual	No change
	Estates PW [1 2]	Annual	Annual	No change	Annual	Annual	No change
	Rosedale 2 PW [1]	Annual	Annual	No change	Annual	Annual	No change
	Garnet PW [1 2]	Annual	Annual	No change	Annual	Annual	No change
	Beltz #6	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual
	Beltz #8 PW [1 2]	Triennial, except quarterly iron & manganese and annual nitrate (as N)	Triennial, except quarterly iron & manganese and annual nitrate (as N)	No change	Triennial	Triennial	No change
	Beltz #9 PW [1]	Triennial, except quarterly iron & manganese and annual nitrate (as N)	Triennial, except quarterly iron & manganese and annual nitrate (as N)	No change	Triennial	Triennial	No change
	SC-1A [2]	Annual	Annual	No change	Annual	Semi-Annual	Changed to Semi-Annual to be consistent with other Seawater Intrusion RMP
	SC-3RA [2]	Annual	Annual	No change	Annual	Semi-Annual	Changed to Semi-Annual to be consistent with other Seawater Intrusion RMP
	SC-5RA [1 2]	Semi-Annual	Annual	Changed to annual to be consistent with other Seawater Intrusion RMP	Semi-Annual	Quarterly	Changed to Quarterly to be consistent with other Seawater Intrusion RMP, groundwater elevations are below the proxy groundwater level MT or chloride concentrations higher than the MO
	SC-8RA	Quarterly	Annual	Not a RMP, so changed from quarterly to annual	Quarterly	Annual	Not a RMP, so changed from quarterly to annual
	SC-9RA [1]	Quarterly	Annual	Changed to annual to be consistent with other Water Quality RMP	Quarterly	Annual	Changed to Annual to be consistent with other Water Quality RMP
	SC-10RA [1]	Annual	Annual	No change	Annual	Annual	No change
	SC-11RA	Annual	Annual	No change	Annual	Annual	No change Grouped with Pruisima A Unit instead of Purisima A/AA to be consistent with GSFLOW model layering
	SC-21A	Annual	Annual	No change	Annual	Annual	No change
	SC-22A [1]	Annual	Annual	No change	Annual	Annual	No change
	Beltz #8 MW	N/A - new well	Annual	Added to Monitoring Network	N/A - new well	Annual	Added to Monitoring Network
	MM-1	N/A - new well	Annual	Added to Monitoring Network	N/A - new well	Annual	Added to Monitoring Network
	MM-2	N/A - new well	Annual	Added to Monitoring Network	N/A - new well	Annual	Added to Monitoring Network
	WM-1	N/A - new well	Annual	Added to Monitoring Network	N/A - new well	Annual	Added to Monitoring Network
	WM-2	N/A - new well	Annual	Added to Monitoring Network	N/A - new well	Annual	Added to Monitoring Network
	TLM-1A	N/A - new well	Annual	Added to Monitoring Network	N/A - new well	Annual	Added to Monitoring Network
	TLM-2A	N/A - new well	Annual	Added to Monitoring Network	N/A - new well	Annual	Added to Monitoring Network
Purisima A/AA	**Beltz #10 PW** [1]	Triennial, except quarterly iron & manganese and annual nitrate (as N)	Triennial, except quarterly iron & manganese and annual nitrate (as N)	No change	Triennial	Triennial	No change

Aquifer Unit	Well Name	Previous General Mineral Sampling Frequency	Revised General Mineral Sampling Frequency	Comments	Previous Chloride & TDS Sampling Frequency	Revised Chloride & TDS Sampling Frequency	Comments
Purisima AA	**SC-10RAA** [1]	Annual	Annual	No change	Annual	Annual	No change
	SC-18RA	Annual	Annual	No change	Annual	Annual	No change
	SC-21AA [1]	Annual	Annual	To replace Thurber Lane Shallow as RMP, no change	Annual	Annual	To replace Thurber Lane Shallow as RMP, no change
	SC-21AAA	Quarterly	Annual	Not a RMP, so changed from quarterly to annual	Quarterly	Annual	Not a RMP, so changed from quarterly to annual
	SC-22AA [2]	Semi-Annual	Annual	Changed to annual to be consistent with other Seawater Intrusion RMP	Quarterly	Semi-Annual	Changed to Semi-Annual to be consistent with other Seawater Intrusion RMP
	SC-3AA [2]	N/A - new well	Annual	Added to Monitoring Network	N/A - new well	Semi-Annual	Added to Monitoring Network
	30th Ave Medium (2)	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual
	Auto Plaza Deep	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual
	Coffee Lane Deep [1]	Semi-Annual	Annual	Changed to annual to be consistent with other Water Quality RMP	Semi-Annual	Annual	Changed to Annual to be consistent with other Water Quality RMP
	Corcoran Lagoon Deep [2]	Semi-Annual	Annual	Changed to annual to be consistent with other Seawater Intrusion RMP	Semi-Annual	Semi-Annual	Changed to Semi-Annual to be consistent with other Seawater Intrusion RMP
	Cory Street Deep	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual
	Pleasure Point Deep [1 2]	Quarterly	Annual	Changed to annual to be consistent with other Seawater Intrusion RMP	Quarterly	Semi-Annual	Changed to Semi-Annual to be consistent with other Seawater Intrusion RMP
	Moran Lake Deep [2]	Quarterly	Annual	Changed to annual to be consistent with other Seawater Intrusion RMP	Quarterly	Semi-Annual	Changed to Semi-Annual to be consistent with other Seawater Intrusion RMP
	Soquel Point Deep [2]	Quarterly	Annual	Changed to annual to be consistent with other Seawater Intrusion RMP	Quarterly	Quarterly	No change, groundwater elevations are below the proxy groundwater level MT or chloride concentrations higher than the MO
	Thurber Lane Shallow [1]	Annual	NA	Removed, cannot be accessed	Annual	NA	Removed, cannot be accessed
	Schwan Lake [1 2]	Semi-Annual	Annual	Changed to annual to be consistent with other Seawater Intrusion RMP	Semi-Annual	Semi-Annual	Changed to Semi-Annual to be consistent with other Seawater Intrusion RMP
Purisima AA/Tu	**O'Neill Ranch PW** [1]	Annual	Annual	No change	Annual	Annual	No change
	Main Street PW [1]	Annual	Annual	No change	Annual	Annual	No change Grouped with Pruisima AA/Tu Unit instead of Purisima A to be consistent with GSFLOW model layering
	Beltz #12 PW [1]	Triennial, except quarterly iron & manganese and annual nitrate (as N)	Triennial, except quarterly iron & manganese and annual nitrate (as N)	No change	Triennial	Triennial	No change
Tu	30th Ave Deep (3)	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual
	Cory Street-4	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual
	Thurber Lane Deep [1]	Annual	NA	Removed, cannot be accessed	Annual	NA	Removed, cannot be accessed
	SC-22AAA [1]	Semi-Annual	Annual	Changed to annual to be consistent with other Water Quality RMP	Quarterly	Annual	Changed to Annual to be consistent with other Water Quality RMP Grouped with Tu Unit instead of Purisima AA to be consistent with GSFLOW model layering
	SC-10AAA	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual	Semi-Annual	Annual	Not a RMP, so changed from semi-annual to annual Well name Changed to be consistent with SqCWD
	SC-13A [2]	Quarterly	Annual	Changed to annual to be consistent with other Seawater Intrusion RMP	Quarterly	Quarterly	No change, groundwater elevations are below the proxy groundwater level MT or chloride concentrations higher than the MO
	SP-5 [2]	N/A - new well	Annual	Added to Monitoring Network	N/A - new well	Semi-Annual	Added to Monitoring Network
	SC-18RAA [1]	Semi-Annual	Annual	Changed to annual to be consistent with other Water Quality RMP	Quarterly	Annual	Changed to Annual to be consistent with other Water Quality RMP

PW = production well; monitoring wells in bold are representative monitoring points (RMP) for groundwater quality; [1] RMP for degraded groundwater quality; [2] RMP for seawater intrusion