Section 4 Contents

Tables

Figures

4 PROJECTS AND MANAGEMENT ACTIONS

DWR regulations require each GSP to include a description of projects and management actions necessary to achieve the basin sustainability goal. This must include projects and management actions to respond to changing conditions in the Basin.

In November 2018, the MGA Board discussed the MGA's role in implementing projects and management actions and agreed that the most efficient approach to project and management action implementation was to have the MGA member agencies perform this function. A major rationale for this decision was the long-standing engagement of MGA member agencies in groundwater management and water supply reliability planning work. In particular, both the City of Santa Cruz Water Department (SCWD) and the Soquel Creek Water District (SqCWD) have evaluated a number of supplemental supply options over the last five years, and in several cases work has proceeded far enough to make it significantly more efficient for these agencies to continue their efforts rather than switching project implementation actions to the MGA.

Projects and management actions discussed in this section are in the process of being developed to address sustainability goals, measurable objectives, and undesirable results identified for the Basin in Section 3. The primary applicable undesirable result that must be avoided is seawater intrusion. In addition, surface water depletions and impacts to groundwater dependent ecosystems (GDEs) were separately evaluated. The GSP's approach to address seawater intrusion is anticipated to provide ancillary benefits to interconnected surface waters and GDEs. Because the SCWD water system relies heavily on surface water, an additional focus of several of the management actions discussed in this section is creation of a supplemental drought supply to improve the reliability of the Santa Cruz water supply. SCWD is pursuing several alternative approaches for storing available wet season surface water flows in regional aquifers for eventual use in augmenting supply during dry conditions. SCWD acknowledges that the operation of its existing groundwater system in the Basin and the design and operation of any new facilities for groundwater storage and recovery would need to function in a manner that supports Basin sustainability.

Each MGA member agency will manage the permitting and other specific implementation oversite for its own projects. Inclusion in this GSP does not forego any obligations under local, state, or federal regulatory programs. While the MGA does have an obligation to oversee progress towards groundwater sustainability, it is not the primary regulator of land use, water quality, or environmental project compliance. It is the responsibility of the implementing agency to ensure that it is working with outside regulatory agencies to keep its projects and management actions in compliance with all applicable laws. That said, the MGA may choose to collaborate with regulatory agencies on specific overlapping interests such as water quality monitoring and oversight of projects developed within the Basin.

Section 4 is presented in three groups to provide the clearest description of how and when projects and management actions will be taken to reach sustainability.

Baseline Projects and Management Actions (Group 1)

Activities in Group 1 are considered existing commitments by MGA member agencies. These include projects and management actions that are currently being implemented and are expected to continue to be implemented, as needed, to assist in achieving the sustainability goal throughout the GSP implementation period. In the groundwater modeling scenarios, the Group 1 projects and management actions are incorporated into baseline conditions. As shown in modeling results of the baseline condition for seawater intrusion presented later in this section, Group 1 projects and management actions, by themselves, are not sufficient to achieve groundwater sustainability (see Table 4-1).

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

Activities in Group 2 have been developed and thoroughly vetted by MGA member agencies and are planned for near-term implementation by individual member agencies. The MGA used an integrated groundwater/surface water model (model) to evaluate the Group 2 projects against the Sustainable Management Criteria to determine if they contribute to achieving sustainability. The expected benefits of each of the projects presented in Section 4.2 as informed by the groundwater modeling simulations and documented in the model simulations report (Appendix 2-I), show that the implementation of a combination of these projects will be sufficient to achieve and maintain sustainability even under climate change scenarios. Therefore, ongoing implementation of Group 1 activities, coupled with the implementation of Group 2 projects and management actions, are required to reach sustainability to comply with SGMA (see Table 4-1).

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

The MGA's analysis indicates that the ongoing implementation of Group 1 and the added implementation of Group 2 projects and management actions will bring the Basin into sustainability. However, if one of the projects and management actions required for sustainability in Group 2 either fails to be implemented or does not have the expected results, further actions will be required to achieve sustainability. In that case, appropriate projects and/or management actions will be chosen from those listed under Group 3. As work on supplemental water supply and resource management efforts is ongoing, it may be the case that additional projects will be identified and added to the list in future GSP updates (see Table 4-2).

The specific Group 3 activity selected would be based on factors such as size of the water shortage, speed of implementation, scale of regulatory and political hurdles, and the metrics of success achieved in basin sustainability. The level of detail provided for Group 3 is significantly less detailed than Groups 1 and 2 because the activities listed are not currently planned for implementation.

Table 4-1. Projects and Management Actions (Groups 1 and 2)

Description	Agency	Category	Status	Anticipated Timeframe[1]
Group 1 – Baseline Projects and Management Actions				
Water Conservation and Demand Management	All	Mgmt. Actions	Ongoing	2020-2070 adaptive management
Installation and Redistribution of Municipal Groundwater Pumping	SCWD; SqCWD	Mgmt. Actions & Projects	Ongoing	2020-2070 adaptive management

Description	Agency	Category	Status	Anticipated Timeframe[2]
Group 2 – Projects and Management Actions Planned to Reach Sustainability				
Pure Water Soquel	SqCWD	Project	Permitting	2020-2022 development 2023-2070 operations & adaptive management
Aquifer Storage and Recovery (ASR)	SCWD	Project	Pilot Testing	2021-2027 development 2021-2070 operations & adaptive management
Water Transfers / In Lieu Groundwater Recharge	SCWD ; SqCWD	Project	Pilot Testing	2020-2025 development 2025-2070 operations & adaptive management
Distributed Storm Water Managed Aquifer Recharge (DSWMAR)	SCCo; SqCWD	Project	Few current facilities; ongoing assessment	Timing is project specific; ongoing operations & adaptive management

1. SGMA's required planning implementation horizon is 50 years.
2. Phased projects may include overlapping periods of development and operations. Adaptive management is ongoing during implementation.

Table 4-2. Identified Potential Future Projects and Management Actions (Group 3)

Group 3 - Identified Projects and Management Actions That May Be Evaluated in the Future		
Description	Category	Comment
Recycled Water – Groundwater Replenishment and Reuse (GRR)	Project	A new or expanded centralized GRR project could be developed by SCWD, the Soquel Creek Water District 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 Soquel Creek Water District Feasibility Study (2017) and the Pure Water Soquel EIR (2018) also identify expansion opportunities, if needed. Future need anticipated to be assessed as GSP Implementation proceeds.
Recycled Water – Surface Water (Reservoir) Water Augmentation	Project	Reservoir Augmentation would use advanced treated Santa Cruz WWTF effluent, to replenish Santa Cruz's Loch Lomond Reservoir. SCWD evaluated this option in its 2018 Recycled Water Facilities Planning Study 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. Future need anticipated to be assessed as GSP Implementation proceeds.
Recycled Water – Direct Potable Reuse	Project	Current state regulations do not allow the introduction of advanced treated recycled water directly into a public water system. State drinking water and public health regulatory agencies continue to assess the possible framework for the regulation of potable reuse projects. As state regulations develop, the feasibility and potential future need for this option will continue to be evaluated.
Groundwater Pumping Curtailment and/or Restrictions	Mgmt. 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 Projects and Management Actions are insufficient to reach and/or maintain sustainability and one 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 acre-fee per year (22 million gallons per day) of treated desalinated water available for purchase by local agencies.

4.1 Baseline Projects and Management Actions (Group 1)

4.1.1 Water Conservation and Demand Management

As described in Section 2, the 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. All MGA member agencies participate in the Water Conservation Coalition of Santa Cruz County (watersavingtips.org). The Coalition serves as a regional information source for county-wide water reduction measures, rebates, and resources.

Soquel Creek Water District's Water Demand Offset (WDO) program is a targeted water conservation program developed to mitigate the water demand of new and expanded development in Soquel Creek Water District's service area. This management action originally required new development to be "net neutral" to ensure that each new project contributed toward conservation projects proportional to their expected new water demand. Development project applicants have met this requirement through direct replacement of inefficient water fixtures for SqCWD customers or through payment into a SqCWD conservation fund that supports similar demand management projects and programs. Since 2013, WDO requires new development to offset 200% of their project's expected water demand so that new development will actually reduce water use in the Basin. Participation in this program is required to be eligible for SqCWD will-serve approval and installation of the new water service. Will-serve letters are also required to obtain building permits from land use jurisdictions where the new development is located.

The City of Santa Cruz Water Department (SCWD) uses fees paid by developers to support a robust rebate program that, along with its "retrofit on resale" program has resulted in a significant reduction in water demand from current customers and a long term demand forecast that is flat rather than increasing. The County of Santa Cruz (County), in order to promote more efficient water use in rural areas, adopted code requirements that all small water systems meter and report monthly water production beginning in October 2015. Additionally, by October 2017, all small water systems with 15 or more connections were required to install individual meters on each connection to be able to track individual water use and potentially excessive usage.

4.1.1.1 Project Implementation Discussion

Water Conservation and Demand Management strategies use a variety of management actions to reduce water demand that then results in reduced groundwater pumping. Depending on where pumping reductions occur, groundwater levels near the coast may increase, which results in reducing the threat of seawater intrusion, and surface water depletions may also be reduced, which supports maintaining or enhancing groundwater levels where groundwater dependent ecosystems exist. These management actions are implemented, planned to

continue, and will continue to evolve with technological advances and future legislative requirements to reduce regional water demand.

Management actions to reduce water demand were initially implemented in the 1990s and there is no plan to end 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 MGA member agency ongoing budgetary commitments and are not anticipated to be passed on to the MGA.

As water conservation and demand management projects and management actions within the Basin continue to evolve over time, any significant changes will be publicly noticed as necessary by MGA member's governing bodies. Existing California state law gives water districts the authority to implement water conservation programs. Local land use jurisdictions have police powers to develop similar permitting programs to conserve water. The Sustainable Groundwater Management Act of 2014 grants the MGA legal authority to pass regulations necessary to achieve sustainability. MGA member agencies are committed to successful implementation of their conservation programs and have among the lowest water consumption rates in California.

4.1.2 Planning and Redistribution of Municipal Groundwater Pumping

Municipal water agencies serve the majority of the population within the Basin. Although surface water from the Santa Cruz water system serves some customers in the Basin, all municipal groundwater supplies that are produced within the Basin come solely from groundwater pumped by MGA member agencies within their respective service areas.

Prior to SGMA, regional groundwater management planning 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. MGA member agencies developed and have already begun implementing plans to move municipal groundwater production further inland to reduce these pumping impacts. The SCWD has completed its planning and well development project with the installation of its Beltz 12 well and supporting infrastructure at its Research Park facility (SCWD 2012). Soquel Creek Water District's Well Master Plan (ESA 2010), identified moving pumping further inland by developing four new groundwater production well locations and the conversion of an existing irrigation well at a fifth location. The Polo Grounds irrigation well conversion in Aptos was completed in 2012. Two of the four new well sites, O'Neill Ranch in Soquel (completed in 2015) and Granite Way in Aptos (anticipated completion in 2019) have been constructed. Two remaining production well sites at Cunnison Lane in Soquel and Austrian Way in Aptos have yet to be constructed.

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. In addition, in 2015 the

City of Santa Cruz and Soquel Creek Water District signed the Cooperative Monitoring and Adaptive Groundwater Management Agreement to more conservatively manage groundwater pumping in the shared aquifer units of the Basin. Redistribution of municipal pumping is designed to be paired with projects (such as Pure Water Soquel, In-Lieu Recharge, and ASR) as a way to rest and reduce pumping of coastal wells and be consistent with Basin sustainability goals to protect the groundwater supply against seawater intrusion; prevent overdraft within the Basin, and resolve problems resulting from prior overdraft; support reliable groundwater supply and quality to promote public health and welfare; maintain or enhance groundwater levels where groundwater dependent ecosystems exist; and maintain or enhance groundwater contributions to streamflow.

4.1.2.1 Implementation Discussion

Planning, municipal well construction at locations further from the coast, and redistribution of municipal groundwater pumping is used to reduce the ongoing threat of seawater intrusion within the Basin. These projects and management actions are implemented, planned to continue, and will continue to evolve as we learn more about Basin groundwater management and climate change. Additional well construction within the Basin will be publicly noticed and permitted as necessary by MGA member agencies. Redistribution of municipal groundwater pumping was initially implemented in 1995 and has improved with careful expansion of municipal production wells further from the coast. There is no plan to end these successful water production strategies which have made significant progress to reduce groundwater pumping depressions and improve groundwater levels at the coast. Benefits are monitored using municipal production well meters, the Basin-wide groundwater monitoring network, and data management systems to compare production impacts with groundwater levels and groundwater quality over time.

Redistribution of groundwater pumping is direct management of groundwater extraction. While these management actions don't reduce overall Basin groundwater production, they do allow municipal groundwater production to consider and respond to changes in groundwater levels across the portions of the Basin within municipal service areas. These groundwater production management strategies do not require an additional water source. Costs of planning, new municipal well construction, and redistribution of municipal groundwater pumping are or are anticipated to be built into the City of Santa Cruz's, Central Water District's, and Soquel Creek Water District's operational budgetary commitments that would be paid for through water rates and/or grant funds. These costs are not anticipated to be passed on to the MGA. Redistributed groundwater pumping has contributed to increased Basin groundwater levels and supports the additional GSP elements outlined in section 2.1.4 and the Basin's sustainability goals to protect groundwater supplies against seawater intrusion and maintain or enhance groundwater levels where groundwater dependent ecosystems exist.

4.2 Projects and Management Actions Planned to Reach Sustainability (Group 2)

4.2.1 Pure Water Soquel

4.2.1.1 Project Description

Pure Water Soquel (PWS) would provide advanced water purification to existing secondary-treated wastewater that is currently disposed of in the Monterey Bay National Marine Sanctuary. The project would replenish the Basin with approximately 1,500 acre-feet per year of advanced purified water that meets or exceeds drinking water standards into aquifers within the Basin. Replenishment is currently planned at three locations in the central portion of Soquel Creek Water District's service area to mix with native groundwater. Purified water would contribute to the restoration of the groundwater basin, provide a barrier against seawater intrusion, and provide a drought proof and sustainable source of water supply. The conveyance infrastructure of PWS is being sized to accommodate the potential for future expansion of the Project's treatment system (if desired at a later time) and to convey up to approximately 3,000 AFY of purified water (ESA 2018).

4.2.1.2 Measurable Objective

Use of advanced purified water made from highly treated wastewater as a source has a proven track record and is already widely used in California and elsewhere throughout the world as a water supply. Model results indicate that consistent and ongoing recharge of advanced purified water into the groundwater basin would create a barrier against further seawater intrusion and could be leveraged to shift groundwater production to improve sustainability throughout the entire Basin.

4.2.1.3 Circumstances for Implementation

Groundwater management policies that predate this GSP established protective groundwater elevations at 13 coastal monitoring well locations necessary to prevent seawater intrusion. Protective elevations have been included in this GSP as a sustainability indicator for seawater intrusion. Currently, protective elevations have been met at eight of the 13 coastal monitoring locations, which is an increase since these wells were installed in the mid-1980s. Projects identified by the MGA and its member agencies to improve Basin sustainability will be implemented to achieve and maintain protective elevations at all 13 well locations. Pure Water Soquel is included in Group 2 projects, along with Aquifer Storage and Recovery (ASR), Water Transfer/In Lieu Groundwater Recharge, and Distributed Storm Water Managed Aquifer Recharge as projects planned for near-term implementation by MGA partner agencies to reach Basin sustainability.

4.2.1.4 Public Noticing

PWS was developed from public input received during Soquel Creek Water District's Community Water Plan (CWP) to develop a timely solution to seawater intrusion. The PWS project was developed by staff and refined during Soquel Creek Water District's publicly noticed

Board of Director's meetings as well as community meetings, workshops during the development of the CWP and the evaluation of the PWS project. The project is also discussed at publicly noticed meetings of Soquel Creek Water District's Water Resources Management and Infrastructure Committee. CEQA environmental review of PWS was first publicly noticed through the State Clearinghouse in November 2016 and review completed in December 2018. Applicable PWS project permits will be publicly noticed for meetings of the issuing agencies, as required.

4.2.1.5 Overdraft Mitigation and Management Actions

The Santa Cruz Mid-County Basin (Basin 3-001 (DWR 2016)) is identified by the State of California as a high priority basin in critical overdraft (DWR 2019). Groundwater levels have recovered from critically low levels identified in the 1980s. However, seawater intrusion exists in several Basin locations and remains a significant threat to regional groundwater supplies as groundwater levels at five of the Basin's 13 key coastal monitoring wells remain below protective elevations. In 2018, groundwater levels declined between 0.4 feet to 4.0 feet at various Basin locations from all-time highs recorded in Water Year 2017. As the first line of defense along the coastline, the replenishment with advanced purified water will increase Basin groundwater levels and create a fresh water barrier to reduce the threat of further seawater intrusion into the Basin.

4.2.1.6 Permitting and Regulatory Process

Soquel Creek Water District completed the California Environmental Quality Act (CEQA) review for Pure Water Soquel in December 2018 and is undergoing the permitting phase of project implementation. Implementation could require several permits for construction and operations as described in the Pure Water Soquel Environmental Impact Report (EIR) (ESA 2018).

4.2.1.7 Time-table for Implementation

The Pure Water Soquel EIR and project were approved by the lead agency in December 2018. The project is currently in the design and permitting phase and construction is anticipated to be complete in late 2022 with the project to come online in early 2023.

4.2.1.8 Expected Benefits

The Pure Water Soquel project is designed to replenish the Basin with approximately 1,500 acre-feet per year of advanced purified water into three locations in the Basin to increase groundwater elevations and create a seawater intrusion barrier (ESA 2018). The tertiary treatment portion of the project is also designed to produce an additional 300 acre-feet per year tertiary treated wastewater supply for reuse by the City of Santa Cruz suitable for non-potable landscape and other uses. PWS also supports in-lieu recharge in aquifer units and areas where water is not injected. In the simulation of PWS for the GSP, in-lieu recharge is facilitated by increasing pumping from the Purisima A and BC aquifer units that benefit from PWS injection to

allow for pumping reductions in the Tu, Purisima F, and Aromas Red Sands aquifer units. Therefore, project benefits are expected to raise groundwater elevations at all of Soquel Creek Water District's coastal monitoring wells to prevent seawater intrusion and improve groundwater levels at shallow wells along Soquel Creek to prevent additional surface water depletions. Expected benefits will be evaluated using the existing monitoring well network and data management systems to compare groundwater levels over time.

A simulation of the PWS project under projected future climate conditions using the model (Appendix 2-I) demonstrates expected Basin sustainability benefits including raising average groundwater levels at coastal monitoring wells throughout Soquel Creek Water District's service area to reduce the risk of seawater intrusion (Figure 4-1 and Figure 4-2). The figures below show running five-year averages of simulated groundwater levels at representative monitoring points for seawater intrusion (section 3.3.3.3) in the SqCWD's service area. The simulated groundwater levels are compared to groundwater level proxies (section 3.6) for minimum thresholds (black dots) and measurable objectives (black dashes) adjusted for sea level rise.[1]

Without the project (yellow line labeled Baseline), five-year averages of simulated groundwater levels are projected to be below the minimum threshold in the aquifer units pumped by Soquel Creek Water District. In the Purisima A and BC aquifer units where PWS injection occurs, groundwater levels are projected to rise to or above measurable objectives (blue dashes labeled PWS) even as pumping is increased from these aquifer units. In the Purisima F and Aromas Red Sands aquifer units where pumping is reduced under PWS, groundwater levels (blue dashes labeled PWS overlying green line labeled PWS+ASR) are projected to rise above or near measurable objectives by 2040 and to be maintained above minimum thresholds thereafter so that undesirable results for seawater intrusion do not occur. Figure 4-5 in Section 4.2.3.8 below shows how pumping reduction from the AA and Tu units under PWS (blue dashes) also is projected to raise groundwater levels above minimum thresholds to prevent undesirable results for seawater intrusion.

[1] Projected sea level rise of 2.3 feet is added to the groundwater level proxies (see Section 3.6.2.1.1).

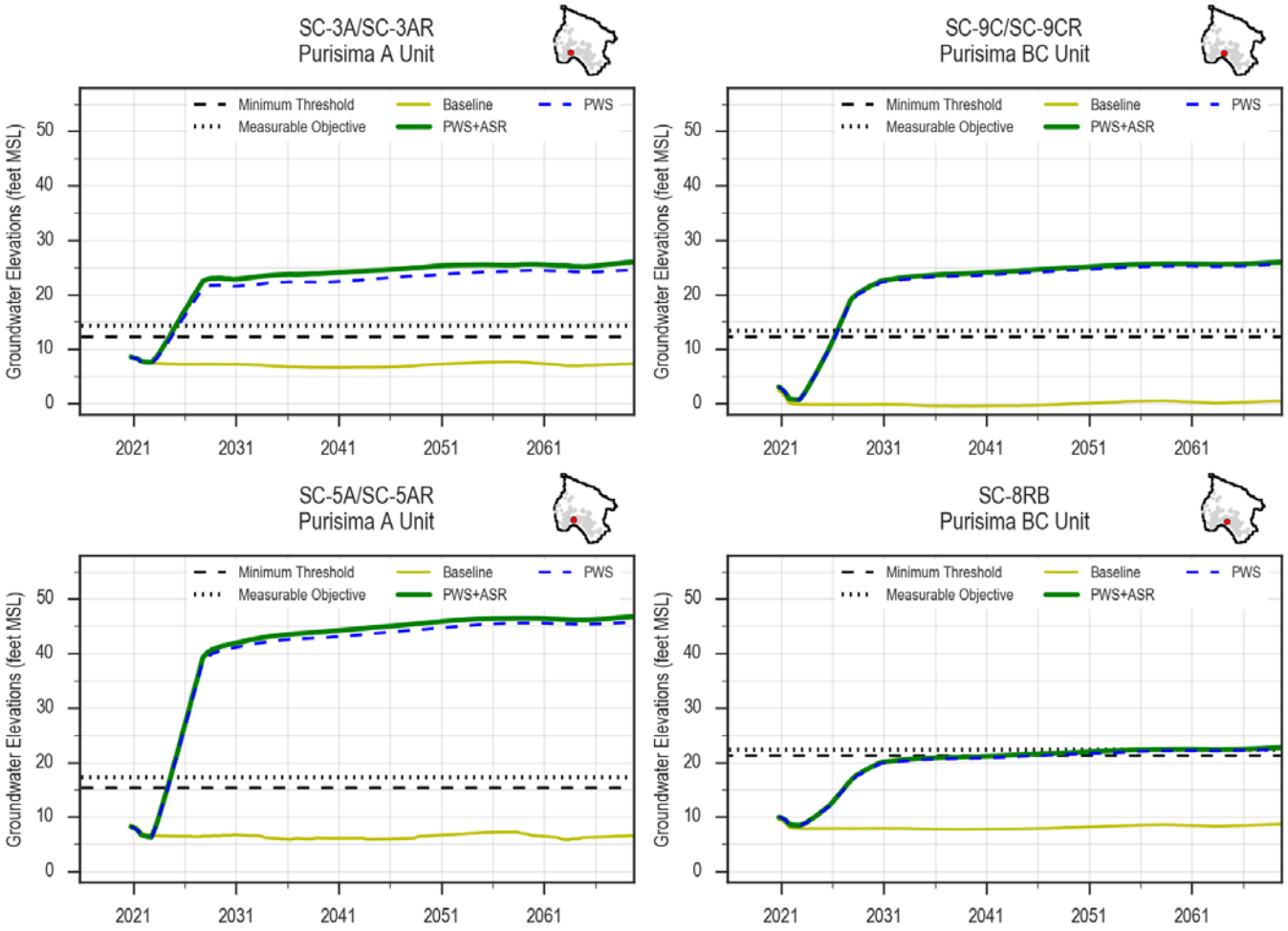

Figure 4-1. Five Year Averages of Model Simulated Groundwater Elevations at Coastal Monitoring Wells in Purisima A and BC Units

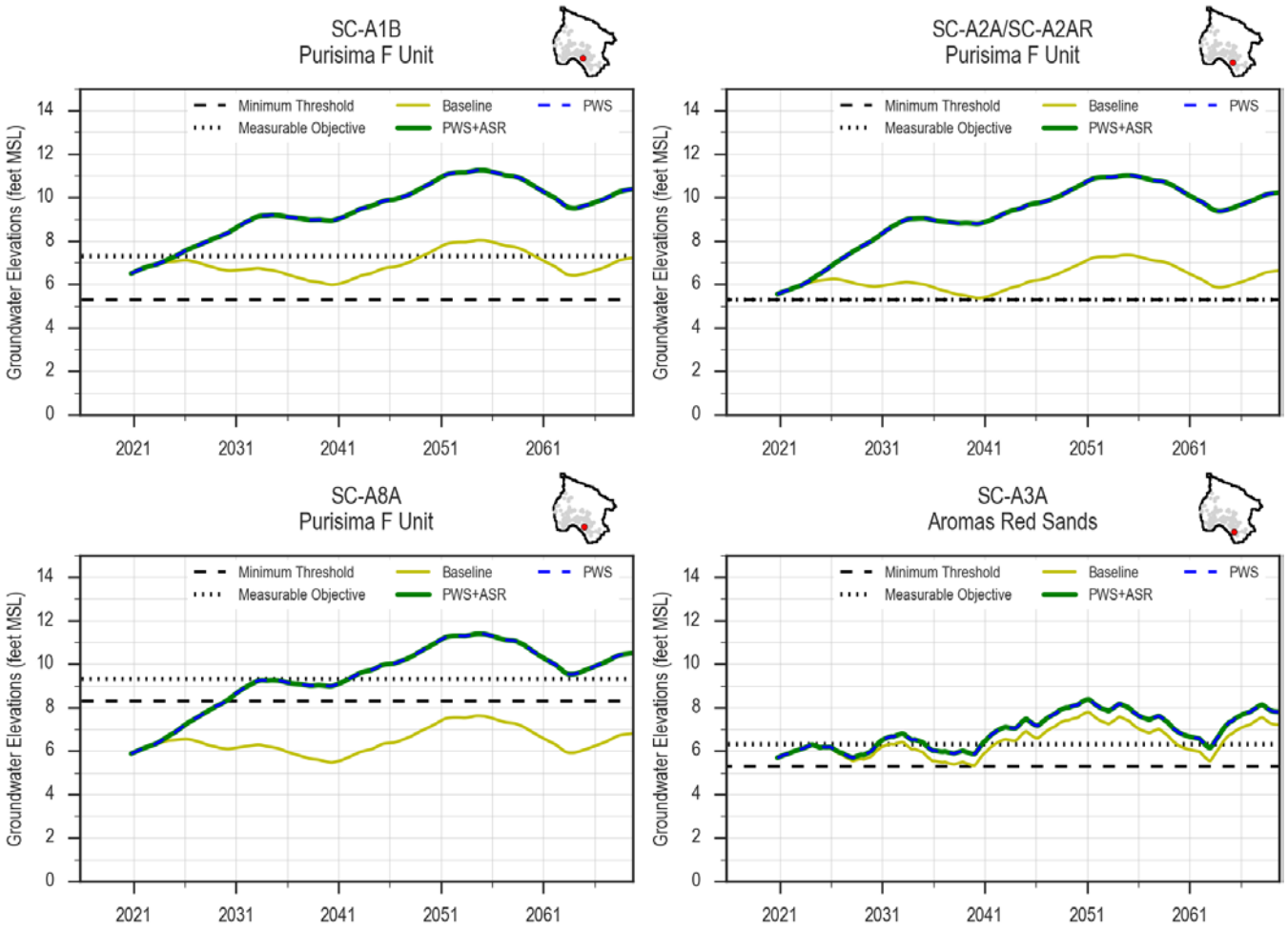

Figure 4-2. Five Year Averages of Model Simulated Groundwater Elevations at Coastal Monitoring Wells in Purisima F and Aromas Red Sands Units

Pure Water Soquel replenishment into the Purisima A unit also is expected to benefit the streamflow depletions indicator by raising shallow groundwater levels along Soquel Creek. Without the project (yellow line labeled Baseline), simulated monthly groundwater levels are projected to be below the minimum threshold at most of the shallow wells. With the PWS project, shallow groundwater levels (blue dashes labeled PWS) are projected to rise to measurable objectives and be maintained above minimum thresholds to prevent undesirable results for surface water depletions (Figure 4-3).

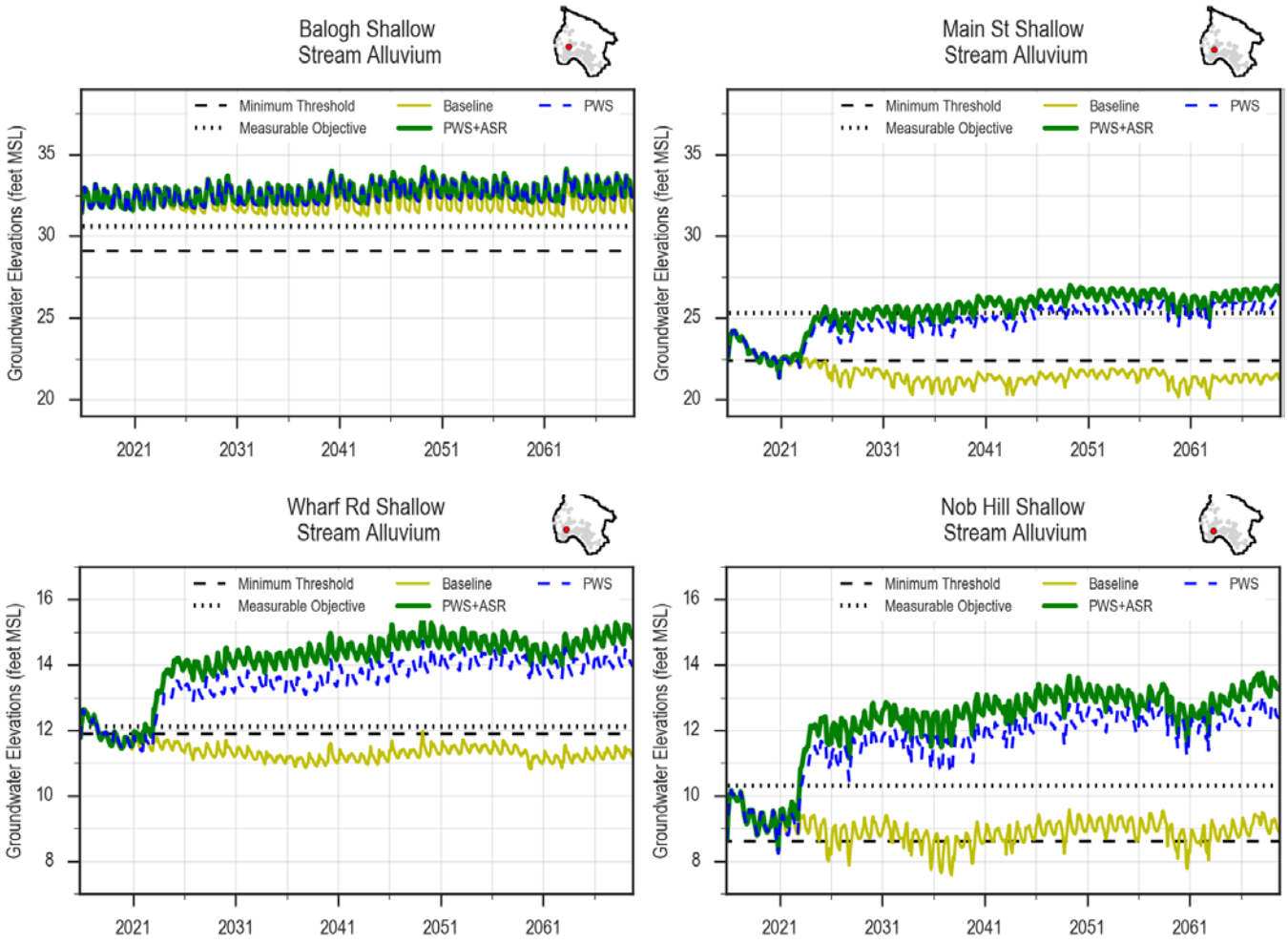

Figure 4-3. Monthly Model Simulated Groundwater Elevations in Shallow Wells along Soquel Creek

The hydrographs also show that the expected benefits are maintained when combining SCWD's ASR project to Pure Water Soquel (green line labeled PWS+ASR).

4.2.1.9 How the Project will be Accomplished

Pure Water Soquel would use advanced water treatment technology to reuse locally available treated secondary effluent for advanced purified water that meets or exceeds drinking water standards. Advanced purified water would then be replenished into the groundwater aquifer to ultimately mix with native groundwater and contribute to the restoration of the groundwater basin, provide a barrier to seawater intrusion, and contribute to a sustainable water supply. The source of supply is secondary treated wastewater from the City of Santa Cruz Wastewater Treatment Plant. In 2019, Soquel Creek Water District and the City of Santa Cruz approved a 35 year contractual project agreement to supply Soquel Creek Water District with enough secondary effluent to produce 1,500 acre-feet per year of advanced treated water for replenishment and an additional amount of secondary effluent for PWS to provide the City with 300 acre-feet per year of tertiary treated water for non-potable reuse by the City for irrigation and other purposes. At the end of the 35 year wastewater agreement, the project agreement contractual terms for source water automatically renews for consecutive 5 year periods. The proposed amount of secondary effluent to be provided is approximately 25% of the annual wastewater treated by the City Wastewater Treatment Plant.

If needed, the project has potential to be expanded if Basin sustainability goals have not been achieved.

4.2.1.10 Legal authority

California state law gives Water Districts the authority to take actions necessary to supply sufficient water for present or future beneficial use. Land use jurisdictions have regulatory authority to develop similar programs.

4.2.1.11 Estimated Costs and Funding Plan

Pure Water Soquel is projected to cost $90 million to permit and construct to deliver the 1,500 AFY of purified water to the Basin and ~300 AFY of tertiary treated water for City uses. The project will be funded entirely through SqCWD's water rates and/or low interest loans or grant funds; no direct costs are anticipated to the MGA. Soquel Creek Water District has received over $2M in planning grants from the State Water Resources Control Board and a $150,000 planning grant from the US Bureau of Reclamation to evaluate the PWS project. The project is eligible to compete for implementation money ($50M under Prop 1 Groundwater and $20M under Title XVI). Both grant applications were submitted in early 2019. SqCWD is also pursuing low-interest loans through USEPA's Water Infrastructure Finance and Innovation Act (WIFIA) program and State Revolving Funds (SFR).

4.2.1.12 Management of groundwater extractions and recharge

Monitoring wells and data management systems are used to record and compare groundwater elevations in the Basin to evaluate pumping impacts and ongoing sustainability. Municipal groundwater extraction is monitored by metering municipal production wells operated by SCWD and Soquel Creek Water District in the areas where the Pure Water Soquel project would be located. Project recharge wells to recharge the aquifer would be metered to control the amount and rate of water injected into the regional aquifer.

4.2.1.13 Relationship to Additional GSP Elements

Soquel Creek Water District's Pure Water Soquel project will be managed to ensure no negative impacts to any of the additional GSP elements outlined in GSP Section 2.1.4. The project will recharge the groundwater with purified recycled water to support groundwater replenishment. Increased groundwater levels will improve progress toward the Basin's sustainability goals to protect groundwater supplies against seawater intrusion and to maintain or enhance groundwater levels where groundwater dependent ecosystems exist.

4.2.2 Aquifer Storage and Recovery

4.2.2.1 Project Description

Aquifer Storage and Recovery (ASR) would inject excess surface water, treated to drinking water standards, into the natural structure of Basin aquifers for use as an underground storage reservoir. The ASR project modeled for this GSP optimizes existing SCWD infrastructure as a more efficient use of available resources to inject excess drinking water into Basin aquifers. However, since SCWD is in the process of developing its plans for the ASR project, eventual implementation of the ASR project may include new infrastructure. SCWD can produce excess surface water by improving the treatment process at its Graham Hill Water Treatment Plant to improve its ability to treat available surface water (within its water rights, above the amount of water required for City operations, and respecting water for fish flows). Drinking water stored in the Basin as a result of an ASR project would provide a drought supply for the SCWD service area and any ASR project would need to be designed with additional capacity to contribute to the restoration of the Basin. (Note: A SCWD ASR project to store treated drinking water in the Santa Margarita Groundwater Basin is also being evaluated.)

SCWD is actively evaluating the feasibility of injecting treated drinking water from its surface water sources into regional groundwater aquifers and is currently conducting pilot tests of ASR in the Basin. Pilot testing involves injecting potable drinking water into the Basin's aquifers and recovering it to assess injection and recovery capacities and monitor water quality impacts to native groundwater resources. Information generated by pilot test evaluations will help inform the degree to which ASR is a feasible part of SCWD's strategy to improve the reliability of its water supply, along with helping to evaluate whether or not an ASR project can be developed

and operated in a manner that will achieve both supply reliability and groundwater sustainability benefits.

4.2.2.2 Measurable Objective

A well designed and operated ASR project has the potential to raise groundwater levels in the Basin, thus reducing the threat of seawater intrusion, and store available surface water in regional aquifers for use as drought supply. However, any ASR project would need to manage groundwater extractions to prevent adverse impacts.

4.2.2.3 Circumstances for Implementation

SCWD water system simulation model analyses of projected water availability from SCWD surface water sources indicates that surface water from SCWD's water system, as a sole source, is insufficient to meet both drought supply demands and restore the Basin within the 20-year planning horizon. This result is based on an assessment of the availability of surface water to either offset existing pumping or create a reliable supply for a seawater barrier after the SCWD meets its own needs to provide instream flows, meet daily municipal and industrial demand and store water for its drought supply. Availability of surface water for possible use to achieve both Basin sustainability and SCWD 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. To determine the feasibility of an ASR project, the SCWD will be looking at:

- Basin hydrogeologic characteristics (well efficiency, specific capacity and injectivity)
- Loses of injected water due to off-shore movement
- Injection well plugging rates (both active and residual)
- Long-term sustainable injection rates
- Local aquifer response to injection and extraction, particularly to ensure that protective groundwater elevations are maintained at the coast.
- Water-quality changes during aquifer storage and recovery pumping

If any of these issues yields unfavorable results or information, it may result in a project that doesn't meet the SCWD's Basin sustainability and drought supply objectives.

4.2.2.4 Public Noticing

Public notice for aspects of the ASR pilot project was carried out by SCWD and the Santa Cruz City Council prior to initiating of the ASR project pilot tests (SCWD 2018). For the full-scale ASR project, public noticing is anticipated to occur through compliance with the California Environmental Quality Act (CEQA) for any facilities or plans associated with the project, as part

of development of a Groundwater Storage Supplement to permit the storage of water from the City's water rights in the Basin that is required by the State Water Resources Control Board and through publically noticed discussions of the proposed project at City Water Commission and City Council meetings.

4.2.2.5 Overdraft Mitigation and Management Actions

The Department of Water Resources designates the Santa Cruz Mid-County Basin (Basin 3-001 (DWR 2016)) as a high priority basin in critical overdraft (DWR 2019). To respond both to the state's designation and to the Basin's condition, which has been a high priority focus of local agencies for decades, in 2015 the City and the Soquel Creek Water District entered into the Cooperative Monitoring/Adaptive Groundwater Management Agreement. This agreement sets limits for each agency's use of groundwater under normal and drought conditions. Basin pumping limits in this agreement were specifically intended to support stabilizing basin drawdown and restoring and maintaining protective groundwater levels at the coast. Work done as part of that agreement, along with work done as part of ongoing groundwater management for the Basin indicates that groundwater levels have improved. However, seawater intrusion exists in some locations throughout the basin and remains a significant threat to regional groundwater supplies as groundwater levels at five of the Basin's 13 key coastal monitoring wells remain below protective elevations including the Soquel Point Medium well in the SCWD area. In 2018, groundwater levels declined between 0.4 feet to 4.0 feet from all-time highs recorded in Water Year 2017. ASR, if withdrawals are carefully managed, may help to increase groundwater levels and reduce the threat of further seawater intrusion into the Basin.

4.2.2.6 Permitting and Regulatory Process

As part of its efforts to update and align its water rights on the San Lorenzo River to incorporate fish flow requirements and provide additional operational flexibility, the SCWD has initiated a water rights change process with the State Water Resources Control Board (State Water Board). No additional water rights are being requested. SCWD is also working with the State Water Board to obtain the necessary Groundwater Storage Supplement for an ASR project in the Basin. An Environmental Impact Report is being developed to comply with CEQA and updated water rights and petitions are expected to be noticed for public comment before the end of calendar year 2019. Upon completion of the CEQA water rights process, and any necessary ASR CEQA process for a full-scale project, the Santa Cruz Water Commission and the City Council take actions to certify the CEQA work and approve projects.

The State Water Resources Control Board (SWRCB) has recently recognized that it in the best interest of the state to develop a comprehensive regulatory approach for ASR projects and has adopted general waste discharge requirements for ASR projects that inject drinking water into groundwater (Order No. 2012-0010-DWQ or ASR General Order). The ASR General Order provides a consistent statewide regulatory framework for authorizing both pilot ASR testing and permanent ASR projects. The City's ASR Pilot Tests and any future permanent ASR facility will be permitted under the ASR General Order. Oversight of these regulations is done through the

Regional Water Quality Control Boards (RWQCBs) and will require SCWD to comply with the monitoring and reporting requirements of the ASR General Order. Any additional permits required for the construction and operation of an ASR facility would be obtained as needed.

4.2.2.7 Time-table for Implementation

ASR pilot tests began in early 2019 at SCWD's Beltz 12 well. Additional pilot testing at an additional Beltz well is slated to occur this coming winter. Assuming results from the initial pilot testing conducted at SCWD's Beltz 12 well during 2019 continues to be favorable, full scale implementation of ASR at that facility would occur on a phased basis beginning in 2021. The current plan for developing ASR in the Basin would utilize to the greatest extent possible existing infrastructure, meaning that new infrastructure would be greatly limited and allowing for both incremental drought supply and groundwater sustainability benefits to begin accruing as early as 2022.

4.2.2.8 Expected Benefits

Basin groundwater elevations are expected to increase with ASR's injection of excess surface water, treated to drinking water standards, and continued basin management. ASR withdrawals would be managed to ensure they do not impact the attainment of or ongoing Basin sustainability. Benefits are evaluated using the existing groundwater monitoring well network and data management systems to compare groundwater levels over time. Potential impacts of recovering water from the Basin through ASR would be monitored to ensure ongoing groundwater sustainability is maintained.

Expected benefits for sustainability are evaluated based on a simulation of a potential ASR project, in combination with the Pure Water Soquel project, under projected future climate conditions using the model (Appendix 2-I). The potential ASR project simulated for evaluation of expected benefits is based on using existing SCWD Beltz wells for injection and recovery pumping. SCWD is in the process of evaluating different configurations of the project so the ASR project simulated for the GSP likely does not represent the ASR project that will be implemented.

The model simulation shows that expected benefits for sustainability are to raise average groundwater levels at coastal monitoring in SCWD's service area and reduce the risk of seawater intrusion. The figure below (Figure 4-4) shows running five-year averages of simulated groundwater levels at representative monitoring points for seawater intrusion (section 3.3.3.3) in SCWD's service area. The simulated groundwater levels are compared to groundwater level proxies (section 3.6) for minimum thresholds (black dots) and measurable objectives (black dashes) adjusted for sea level rise. Projected sea level rise of 2.3 feet is added to the groundwater level proxies (see Section 3.6.2.1.1).

Without a SCWD ASR project, five-year averages of simulated groundwater levels are not projected to achieve and maintain measurable objectives at the representative monitoring points

and are below the minimum threshold in the AA unit. This is the case whether or not the Pure Water Soquel project is implemented (yellow line labeled Baseline without Pure Water Soquel and blue dashes labeled PWS with Pure Water Soquel but no ASR) as the simulated Pure Water Soquel project does not substantially raise groundwater levels in much of the SCWD service area. With a simulated project that injects water at the existing SCWD Beltz wells and reduces overall pumping at the Beltz wells (green line labeled PWS+ASR), it is projected that measurable objectives will be achieved and maintained in the A unit that is the main source of groundwater supply for SCWD and minimum thresholds will be achieved and maintained in the AA unit such that undesirable results for seawater intrusion do not occur. The project is projected to raise groundwater levels sufficiently such that sustainability is maintained even as SCWD increases recovery pumping to meet drought demand from the 2050s into the early 2060s.

The model simulation also shows that an ASR project can help prevent undesirable results for the interconnected surface water depletion indicator. Figure 4-3 shows that adding an ASR project to Pure Water Soquel (green line labeled PWS+ASR) is projected to raise groundwater levels in shallow wells along Soquel Creek in almost all times and groundwater levels are maintained above the groundwater elevation proxies set as minimum thresholds.

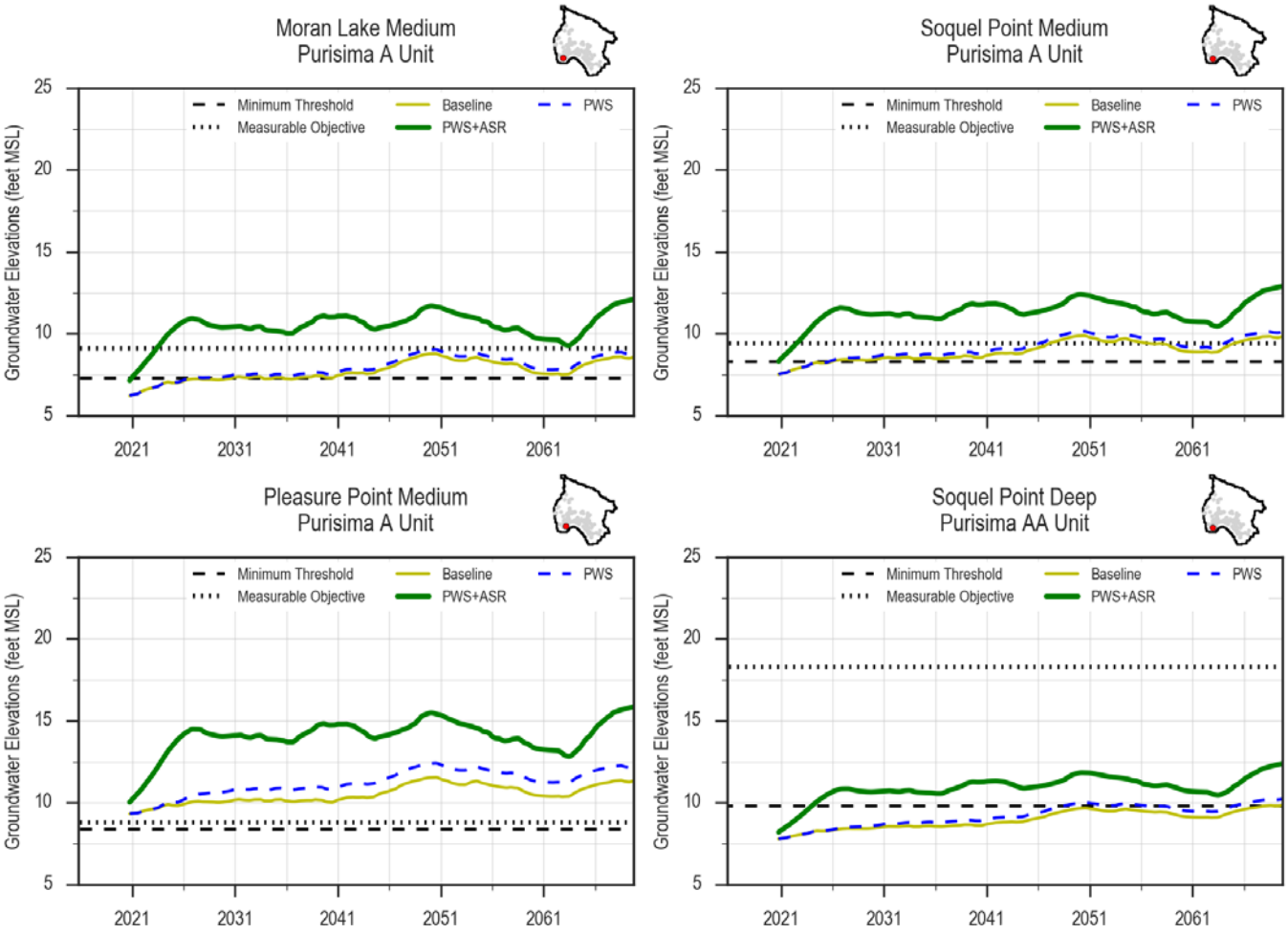

Figure 4-4. Five Year Averages of Groundwater Elevations at Purisima AA and A Units

4.2.2.9 How the Project will be Accomplished

Following the successful completion of additional ASR pilot testing, SCWD would develop a phased implementation plan for ASR in the Basin. The initial phases would emphasize leveraging existing water system infrastructure to the greatest extent possible, with new infrastructure being mostly limited to retrofitting existing wells in the Beltz system to function as both injection and extraction wells rather than just extraction wells. Available wet season surface water within the City's existing water rights quantities and diversion rates and after fish flow commitments are met would be treated to meet both primary and secondary federal and state drinking water standards at the Graham Hill Water Treatment Plant and distributed to the Beltz wells using existing water system infrastructure. During the dry season or drought periods, ASR water and native groundwater would be withdrawn from the Basin, treated as needed at existing groundwater treatment facilities and delivered to water system customers using existing water system infrastructure. Operation of an ASR system would be conducted in such a way that it avoids negative impacts on protective groundwater elevations and chloride concentrations at coastal monitoring wells. Over time, and depending on the availability of both additional surface

water and aquifer storage space, additional ASR system facilities in the western part of the Basin could be developed and operated to protect groundwater resources and provide additional drought supply.

4.2.2.10 Legal Authority

The City of Santa Cruz is a land use jurisdiction with police powers necessary to take actions to supply sufficient water for present and future beneficial uses. The City also has the authority to work with the State Water Resources Control Board as needed to pursue necessary updates to its water rights and authorization to store surface water in regional aquifers for both water supply benefits and to provide groundwater sustainability benefits.

4.2.2.11 Estimated Costs and Funding Plan

As described above, the current plan for development of ASR in the basin is intended to leverage the use of existing infrastructure to the greatest extent feasible. As proposed, this approach is substantially less expensive than an ASR project that was discussed by the Water Supply Advisory Committee during its work between April of 2014 and October of 2015. SCWD hasn't necessarily abandoned a potentially larger and significantly more expensive ASR project that might involve storing water and supporting groundwater sustainability objectives in both the Mid-County and Santa Margarita groundwater basins but, rather is pursuing a project in the Mid-County Basin first. This direction provides the opportunity to make near-term incremental improvements in the reliability of SCWD's water supply and also to take near term action to address and mitigate the threat of further seawater intrusion in the Basin.

SCWD staff have estimated that a more limited ASR project using existing Beltz well infrastructure as simulated for the GSP would cost roughly $21,000,000 in 2019 dollars. These funds would be used to support ongoing pilot testing of ASR at Beltz system wells, necessary design for permanent retrofitting of existing wells, any needed improvements or modifications to SCWD's groundwater treatment facilities, and planning for additional ASR facilities in the western portion of the Basin if and as needed. The SCWD will continue to develop and fund the ASR project planning and implementation through its individual agency budget at no cost to the MGA. Project funding is expected to come from the SCWD water rate payers generated funds and from grant programs if such funds are available and can be successfully obtained.

4.2.2.12 Management of Groundwater Extractions and Recharge

Monitoring wells and data management systems are in use in the Basin to record and compare groundwater elevations to evaluate pumping impacts and for monitoring the performance of the basin relative to the various Sustainable Management Criteria. SCWD's ASR project would inject potable drinking water into the Basin during the wet season, storing injected water for use during the dry season and during droughts, along with allowing the stored water to recover the Basin. Groundwater levels exceeding minimum thresholds may allow SCWD to also extract additional groundwater when needed.

4.2.2.13 Relationship to Additional GSP Elements

SCWD's ASR project is a conjunctive use project that will be managed to ensure no negative impacts to any of the additional GSP elements outlined in GSP Section 2.1.4. Injection of surface water, treated to potable drinking water standards, is expected to support groundwater replenishment and improve progress toward the Basin's sustainability goals. An ASR project will help protect groundwater supplies against seawater intrusion and maintain or enhance groundwater levels where groundwater dependent ecosystems exist, as well as provide drought supply to City water system customers.

4.2.3 Water Transfers / In Lieu Groundwater Recharge

4.2.3.1 Project Description

Water Transfers/In Lieu Groundwater Recharge 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, is sustainable over time, and the Basin's performance consistently reaches sustainability targets, then SCWD could recover some of the increase in groundwater in storage as a supplemental supply during droughts.

In the summer of 2016, SCWD and SqCWD signed an agreement to work together to conduct a five-year pilot water transfer project. Prior to initiating the pilot, evaluations of the potential for unintended consequences due to differing chemical characteristics of surface and groundwater resources were completed.

A water transfer pilot test was conducted between December 2018 and April 2019 in which SCWD delivered treated drinking water to SqCWD to serve a portion of SqCWD's service area. The pilot test used an existing intertie between the two water agencies, providing on average 400,000 gallons per day to SqCWD. During the pilot test, SqCWD reduced or eliminated pumping in its O'Neill Ranch, Garnet, and Main Street wells. It also tracked water quality as concerns about the potential incompatibility of surface and groundwater sources, particularly related to elevated levels of lead, copper, or colored water from exposing public and private plumbing used to less corrosive groundwater to more corrosive surface water. Additional pilot testing is expected to begin in late 2019 with a larger pilot area within SqCWD's service area to continue evaluating operational and water quality conditions to help inform the feasibility for a long-term transfer. For a long term project, additional surface water could be provided from the City's North Coast sources and the San Lorenzo River (if water rights allow) to meet more of Soquel Creek Water District's wet season demand, rebuild groundwater storage by eliminating or reducing pumping during some part of the year within the SqCWD's western area of its service area.

4.2.3.2 Measurable Objective

Water Transfers/In Lieu Groundwater Recharge is a project to passively recharge groundwater by resting SqCWD's groundwater wells using treated drinking water from SCWD as a source of supply. In Lieu Groundwater Recharge has the potential to reduce the threat of seawater intrusion and possibly create additional groundwater in storage if adequate amounts of treated surface water are consistently and reliably available when SqCWD customers have the demand needed to use SCWD excess surface water.

4.2.3.3 Circumstances for Implementation

Water Transfers/In Lieu Groundwater Recharge is in pilot testing. Availability of excess surface water is constrained by a number of factors, including drinking water treatment capacity, water rights place of use restrictions, required minimum fish flows, and availability of adequate surface water supplies to serve SCWD's customers prior to selling excess drinking water outside the SCWD's service area. Climate change factors could also impact water availability. The amount of in lieu groundwater recharge that can be achieved is also limited by the relatively low water demand in SqCWD's service area during the winter months when SCWD has excess surface water available.

4.2.3.4 Public Noticing

In Lieu Groundwater Recharge pilot testing began in the winter of 2018-2019. Public Notice for all aspects of the project was carried out by SCWD and SqCWD prior to the start of pilot tests, including a CEQA Negative Declaration adopted for the pilot project (SCWD 2016). Future notification of the public for any additional pilot testing or long-term implementation would be done prior to initiation of the transfer.

4.2.3.5 Overdraft Mitigation and Management Actions

The Department of Water Resources designates the Basin 3-001 as in a state of critical overdraft. To respond both to the state's designation and to the Basin's condition, which has been a high priority focus of local agencies for decades, in 2015 SCWD and SqCWD entered into the Cooperative Monitoring/Adaptive Groundwater Management Agreement. This agreement sets limits for each agency's use of groundwater under normal and drought conditions. Basin pumping limits in this agreement were specifically intended to support stabilizing basin drawdown and restoring and maintaining protective groundwater levels at the coast. Work done as part of the development of the GSP indicates that groundwater levels have recovered from critically low levels identified in the 1980s. However, seawater intrusion exists in several locations and remains a significant threat to regional groundwater supplies as groundwater levels at five of the Basin's 13 key coastal monitoring wells remain below protective elevations. In 2018, groundwater levels declined between 0.4 feet to 4.0 feet from all-time highs recorded during Water Year 2017. Water Transfer/In Lieu Groundwater Recharge would reduce groundwater pumping and is likely to increase Basin groundwater levels and

reduce the threat of further seawater intrusion into the Basin. Surface water transfers from SCWD would be expected to reduce regional groundwater dependence.

4.2.3.6 Permitting and Regulatory Process

SCWD completed a CEQA analysis, including opportunity for public comment, for the Pilot Water Transfer project (SCWD 2016). That CEQA analysis was completed in 2016 and focused on water from the City's North Coast Sources pre-1914 water rights, which are not constrained by formalized places of use. The City has initiated a process with the State Water Resources Control Board to update its San Lorenzo River water rights, and one of its requests to the State Board is to expand the places of use for all its San Lorenzo River water rights (Newell Creek License, Felton Permits, and Tait Diversion Licenses) to cover the boundaries of the municipal water providers and the general basin boundaries for the Santa Cruz Mid-County and Santa Margarita groundwater basins. No new water rights are being requested in this effort. An Environmental Impact Report (EIR) on the City's water rights changes is underdevelopment and is expected to be released for public review in the fall of 2019. A final EIR and State Board action on the requests is anticipated during calendar year 2020.

Prior to initiating the Pilot Water Transfer, SqCWD was required work with the State Division of Drinking Water (DDW) to modify its Operating Permit to allow it to take surface water during the pilot testing efforts. Any long-term water transfer would also need to be reflected in its Operating Permit from DDW.

4.2.3.7 Time-table for Implementation

Water Transfer/In Lieu Groundwater Recharge projects have been in the planning and engineering process for four years. In Lieu Groundwater Recharge is in pilot tested now and pilot testing will continue through at least the winter of 2019/2020. Longer term implementation of water transfers will require a new agreement, including compliance with Proposition 218 requirements to set the cost of service for water delivered and, depending on the annual quantity transferred, waiting for resolution of the places of use changes of the City's San Lorenzo River water rights. Given these factors, a likely timeline for implementation of a longer-term water transfer project is a minimum of two years.

The Basin is expected to see groundwater elevations continue to improve but model analysis of projected water availability from all surface water sources and groundwater recharge projections appear insufficient to restore the Basin within the 20-year planning horizon without additional water augmentation projects. The Basin is required to be sustainable by 2040, even during times of drought, which could limit large scale water transfers back to SCWD.

4.2.3.8 Expected Benefits

Groundwater elevations are expected to continue to increase with continued basin management and implementation of In Lieu Groundwater Recharge. Benefits are evaluated using the existing groundwater monitoring well network and data management systems to compare groundwater

levels over time. The potential expected benefits of in-lieu recharge is demonstrated by model simulations of the Pure Water Soquel project (Appendix 2-I), which similarly implements in-lieu recharge by reducing pumping in the three westernmost SqCWD production wells. It is most feasible for operation of a surface water transfer from SCWD to facilitate reduction of pumping at these wells closest to the interchange between SCWD and SqCWD. Reduction of pumping at these wells can raise groundwater levels at nearby representative monitoring points for seawater intrusion as shown by plots of five-year average simulated groundwater levels at the wells under Pure Water Soquel (blue dashes labeled PWS) compared to the baseline (yellow line labeled Baseline) in Figure 4-5. The simulation of Pure Water Soquel shows the concept of benefits of in-lieu recharge in this area, but does not simulate expected volumes of surface water transfer, the seasonality of the transfer, or any additional pumping to transfer water to SCWD to meet its drought shortage needs.

The MGA will continue to evaluate the amount and timing of water transferred between SCWD and SqCWD as part of the pilot and permanent In Lieu Groundwater Recharge projects. Use of this collected data and any changes to groundwater elevations will be used to better analyze the effect of project implementation on groundwater sustainability over time.

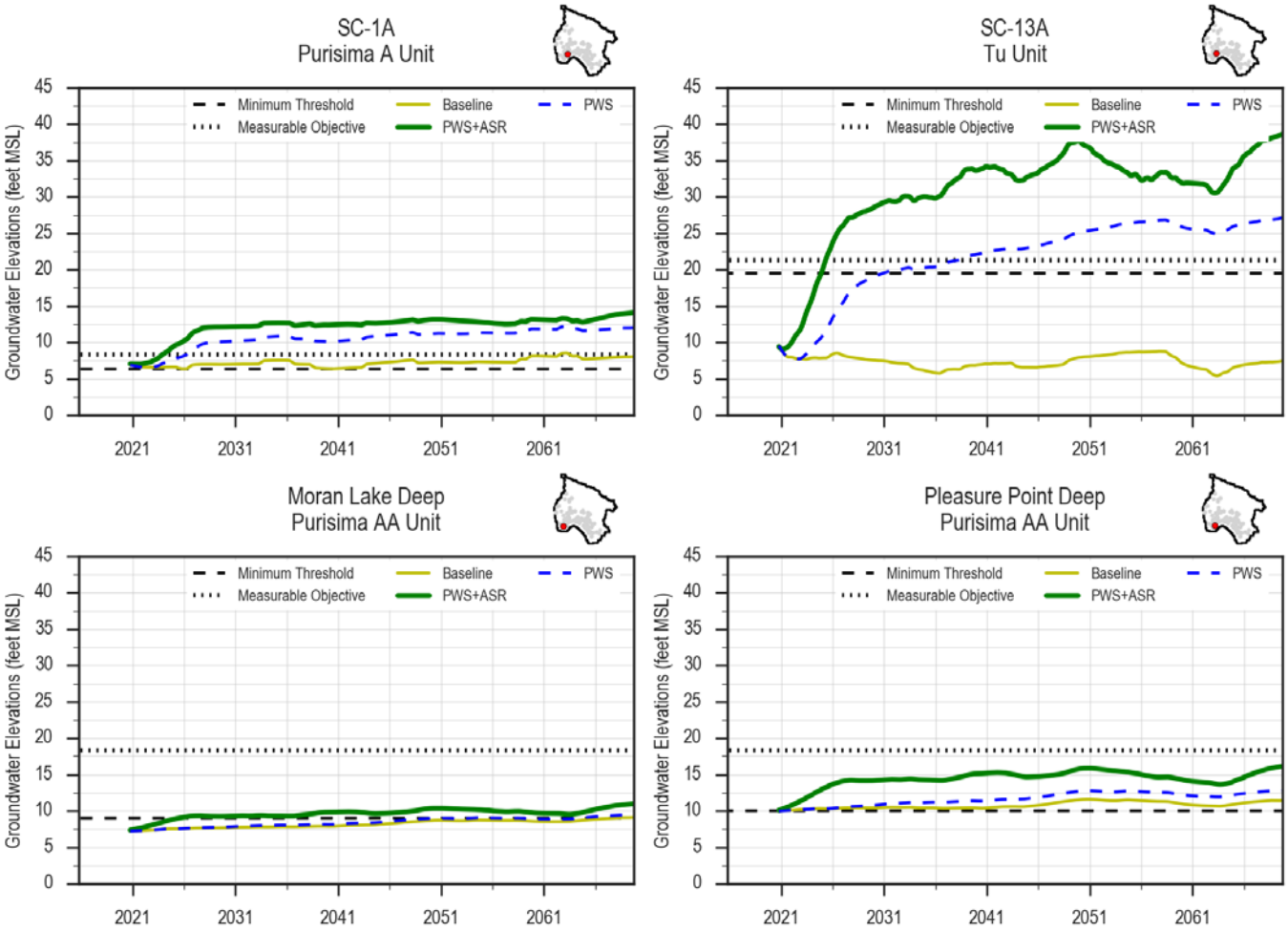

Figure 4-5. Five Year Averages of Groundwater Elevations at Coastal Monitoring Wells in Tu and Purisima AA and A Units (includes in-lieu recharge from Group 2 projects)

4.2.3.9 How the Project will be Accomplished

Water Transfers/In Lieu Groundwater Recharge projects can be implemented when SCWD has available excess surface water to provide to SqCWD. When available, water would come from SCWD's surface water sources and treated at the Graham Hill Water Treatment Plant, then delivered to the SqCWD via existing infrastructure at the O'Neill Ranch intertie. Excess surface water transferred by SCWD to SqCWD is treated at SCWD's Graham Hill Water Treatment Plant to meet both primary and secondary federal and state drinking water standards. Treated water delivered to customers is sampled by SqCWD, as required by the State Water Resource Control Board (SWRCB) regulators and tested to ensure the water delivered to its customers meets safe drinking water standards, these water quality sampling results will be reported monthly to SWRCB. If any water quality samples fail to meet safe drinking water standards, then notification of customers will be directed by the SWRCB staff.

Because of San Lorenzo surface water place of use restrictions, the volume of water available could be limited until place of use issues with the San Lorenzo River water rights are resolved. Volumes of water in the range of 300 to 500 acre feet per year (≈100 to 165 million gallons per year) are consistently available from the City's North Coast Sources. Larger volumes may be available in some years, but likely require use of water from San Lorenzo River sources. Analysis by SCWD shows that there is insufficient water available via Water Transfers to meet SCWD's drought supply requirements. In addition, Water transfers are constrained by both, the availability of water in the SCWD system and the demands of SqCWD's customers. There is no evidence to date that indicates an In Lieu Groundwater Recharge project by itself would achieve Basin sustainability.

4.2.3.10 Legal authority

California state law gives water districts the authority to take actions necessary to supply sufficient water for present or future beneficial use. Land use jurisdictions have police powers to develop similar programs. The Sustainable Groundwater Management Act of 2014 grants MGA legal authority to pass regulations necessary to achieve sustainability. San Lorenzo River water rights are restricted to place of use areas within SCWD water service areas. The City is applying to the State Water Board to expand the places of use for its San Lorenzo River water rights to allow for the expansion of the In Lieu Groundwater Recharge project.

4.2.3.11 Estimated Costs and Funding Plan

Water Transfer/In Lieu Groundwater Recharge projects utilize a significant amount of existing infrastructure. Costs for additional infrastructure to optimize In Lieu/Water Transfers are largely in the form of increased operating costs and could include increased water quality monitoring, increased public notification, and the cost of purchased water. Cost of water purchases between SCWD and SqCWD must comply with the legal requirements of Proposition 218, which sets the cost of service for water delivered.

4.2.3.12 Management of groundwater extractions and recharge

Water Transfer/In Lieu Groundwater Recharge projects are conjunctive use projects. In Lieu Groundwater Recharge reduces groundwater pumping to allow passive recharge that can contribute to groundwater level increases. Monitoring wells and data management systems are used to record and compare groundwater elevations in the Basin to evaluate pumping impacts and ongoing sustainability. Relationship to Additional GSP Elements

4.2.3.13 Relationship to Additional GSP Elements

SCWD and SqCWD's joint Water Transfer/In Lieu Groundwater Recharge projects are conjunctive use projects that will be managed to ensure no negative impacts to any of the additional GSP elements outlined in GSP Section 2.1.4. Passive recharge through resting groundwater wells by delivering excess surface water treated to drinking water standards to SqCWD customers is expected to support groundwater replenishment. Increased groundwater levels will improve progress toward the Basin's sustainability goals to protect groundwater

supplies against seawater intrusion and to maintain or enhance groundwater levels where groundwater dependent ecosystems exist.

4.2.4 Distributed Storm Water Managed Aquifer Recharge (DSWMAR)

4.2.4.1 Project Description

Distributed Storm Water Managed Aquifer Recharge (DSWMAR) redirects storm water flows for use as a groundwater recharge supply to increase groundwater storage (RCD 2014). Where feasible, small to medium scale facilities (up to 10 acre-feet/year/site) 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.

4.2.4.2 Measurable Objective

DSWMAR is a groundwater recharge project to increase groundwater storage in the shallow aquifer layers in the Basin for increased groundwater storage and added protection against seawater intrusion and improved surface water quality.

4.2.4.3 Circumstances for Implementation

The County has installed DSWMAR projects in the Live Oak and Aptos areas of the Basin. Bioswale filtration systems and dry wells were installed at Brommer Street County Park with a capacity to recharge 1 acre-foot per year from the parking lot runoff. Bioswales and dry wells were also installed to capture runoff from two parking lots at Polo Grounds County Park with a capacity to recharge 19 acre-feet per year. Eight more DSWMAR sites were evaluated in 2018. Three of these sites were identified for further site investigation. One of these sites was recently eliminated because depth to groundwater was too shallow for recharge to be effective at that site. The availability of suitable sites and the limited scale of DSWMAR projects may be a constraint to project implementation.

Topography, ground cover, local vegetation, and surface and sub-surface geology/hydrogeology can provide significant constraints for siting DSWMAR projects. DSWMAR introduces water to the upper levels of aquifers and most drinking water production draws from deeper levels. Depending on the configuration of aquifers, DSWMAR may never reach the aquifers from which drinking water is produced. DSWMAR projects vary in size and benefit to the Basin and are likely to be prioritized according to recharge efficiency/needs and implemented when funding is available.

4.2.4.4 Public Noticing

Installed DSWMAR projects were publicly noticed and approved by the Santa Cruz County Board of Supervisors during its regularly scheduled board meetings. This process included statewide notice of the submission of Negative Declarations under CEQA to the state clearing

house. Future DSWMAR projects would be noticed by the lead agency when a DSWMAR project is proposed.

4.2.4.5 Overdraft Mitigation and Management Actions

Groundwater levels have recovered from critically low levels identified in the 1980s. However, seawater intrusion exists in several Basin locations and remains a significant threat to regional groundwater supplies as groundwater levels at five of the Basin's 13 key coastal monitoring wells remain below protective elevations. In 2018, groundwater levels declined between 0.4 feet to 4.0 feet at various Basin locations from all-time highs recorded in Water Year 2017. The introduction of storm water into shallow Basin aquifers may increase groundwater levels in localized areas where DSWMAR projects are installed.

4.2.4.6 Permitting and Regulatory Process

Installed DSWMAR projects required permits from or notice to the following agencies:

- CEQA documentation
- Santa Cruz County grading permit
- USEPA - Class 7 dry well notice

Future projects may also require:

- Regional Water Quality Control Board - may require notice/permit

4.2.4.7 Time-table for Implementation

The County has developed and installed two DSWMAR projects to date, one in Aptos and another in Live Oak. The County installed dry wells in Aptos at Polo Grounds County Park became operational in 2012 and are estimated to add 19 acre-feet per year to the local shallow groundwater aquifer. In Live Oak, dry wells were installed and became operational at Brommer Street County Park in 2015 to add an estimated one acre-foot per year to the local shallow groundwater aquifer. The Polo Grounds project was accomplished with planning and funding through the Integrated Regional Water Management (IRWM) program and the Live Oak project was completed with IRWM and storm water grant funding.

Eight potential future sites were screened in 2018. Three of these eight potential sites were identified for further investigation, and one was eliminated after borings showed depth to groundwater too shallow to provide adequate conditions for recharge at that location. The two remaining sites are still under investigation. Time-table for development and expected benefits to groundwater recharge at these or any other potential future DSWMAR project sites are not available and would be speculative at this time

4.2.4.8 Expected Benefits

DSWMAR projects are expected to recharge shallow groundwater aquifers. Future projects of small to medium scale would be installed where feasible to capture storm water and recharge more shallow zones of aquifers through surface spreading or construction of dry wells. Existing

projects in Live Oak and Aptos use recorded local rainfall observations and project design parameters to estimate project recharge rates. Future DSWMAR projects would likely be designed to more accurately measure recharge rates to the groundwater aquifer. The expected benefit from each project would vary based on both project design parameters and the amount/timing of storm water runoff. Benefits are evaluated using the existing monitoring well network and data management systems to compare groundwater levels over time. Time-table for accrual of expected benefits to groundwater recharge for potential future DSWMAR projects is not currently available and would be speculative at this time.

Although a specific DSWMAR project was not specifically modeled, a theoretical project in Aptos was modelled and was shown to raise groundwater levels in the Aromas Red Sands aquifer and allow for pumping from the aquifer unit more than what simulations of Pure Water Soquel show is necessary to achieve measurable objectives to prevent seawater intrusion into the aquifer.

4.2.4.9 How the Project will be Accomplished

Future DSWMAR projects would be developed by identifying sites receptive to groundwater recharge in areas where shallow groundwater recharge would be beneficial to the Basin. The Resource Conservation District of Santa Cruz County (RCD) is working with land owners in the neighboring Pajaro Valley Sub-basin on surface spreading projects and has developed data to show project effectiveness with the right surface and subsurface hydrogeologic conditions. The County has installed dry wells to capture and recharge storm water in Live Oak and Aptos. MGA member agencies will leverage existing project information from members and regional partner agencies, like the RCD, to identify sites and design future DSWMAR projects within the Basin. DSWMAR water supply would come from redirecting local storm water runoff to areas suitable for shallow groundwater recharge.

4.2.4.10 Legal authority

California state law gives Water Districts the authority to take actions necessary to supply sufficient water for present or future beneficial use. Land Use Jurisdictions have police powers to develop similar programs. The Sustainable Groundwater Management Act of 2014 grants MGA legal authority to pass regulations necessary to achieve sustainability.

4.2.4.11 Estimated Costs and Funding Plan

Existing DSWMAR projects were developed with local and grant funding sources. Future DSWMAR projects sites are under investigation. Two of the three potential storm water recharge sites evaluated in a report prepared for the County (MME, June 2019) were found suitable for project development. Both suitable sites are at different locations on Seascape Golf Course. The MME report estimates costs per unit of water infiltrated over a 20 year project lifespan. These costs were developed per acre-foot of storm water recharge and varied between $1,649 and $2,786 per acre-foot. Project development costs for initial project installation were

estimated at $450,000 at the Los Altos site and $650,000 at the 14th Fairway site. MGA policy developed to date indicates project funding would come from member agencies and grants.

4.2.4.12 Management of groundwater extractions and recharge

Groundwater extraction is monitored by metering municipal production wells, small water systems, and the model estimates production by non-municipal private wells. DSWMAR projects recharge shallow groundwater. Basin recharge attributable to DWSMAR projects is estimated according to project design parameters and recorded precipitation. Basin groundwater recharge is monitored through a basin wide monitoring well network and data management system.

4.2.4.13 Relationship to Additional GSP Elements

Environmental impacts of future DSWMAR projects will be reviewed under the California Environmental Quality Act (CEQA). If implemented, future projects would avoid significant impacts to the environment including to the additional GSP elements outlined in GSP Section 2.1.4. Groundwater recharge related to DSWMAR is expected to support shallow groundwater replenishment and improve progress toward the Basin's sustainability goals to maintain or enhance groundwater levels where groundwater dependent ecosystems exist.

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

4.3.1 Recycled Water - Groundwater Replenishment and Reuse

Soquel Creek Water District: The Soquel Creek Water District Feasibility Study (Carollo 2017) and the Pure Water Soquel EIR (ESA 2018) both identify expansion opportunities for the Pure Water Soquel Project. The conveyance infrastructure of the Pure Water Soquel Project is currently sized to accommodate the potential for future expansion of the Project's treatment system (if desired at a later time) which is centrally-located and could convey up to approximately 3,000 AFY of purified water. This could be developed should SCWD need supplemental water supplies to meet drought needs or the Basin needs additional supplies to meet MGA sustainability goals based on project performance and monitoring of the GSP's implementation measures.

City of Santa Cruz: SCWD conducted planning and assessments of the potential use of recycled water to supplement SCWD's water supply. The City's Water Supply Advisory Committee's (WSAC) 2015 recommendations were to pursue a strategy of water conservation and enhanced groundwater storage, with a back-up option of advanced treated recycled water or desalinated water. WSAC recommended further evaluation of these water supply alternatives (SCWD 2015). The WSAC's charge, as represented in its final recommendations, was focused on addressing SCWD's water supply gap of 3,700 acre-feet (or 1.2 billion gallons) per year during times of extended drought. However, the potential recycled water strategies to augment

SCWD's water supply could also potentially benefit the Basin if implemented in a manner that targeted groundwater storage or seawater intrusion prevention.

In 2018, in response to WSAC's recommendations, SCWD concluded a Recycled Water Facilities Planning Study (RWFPS) that evaluated recycled water alternatives (Kennedy/Jenks 2018). This included a high-level feasibility study and conceptual level design of alternatives for recycled water. In addition to evaluating water supply benefit to SCWD, the RWFPS also provided a broader range of potential beneficial uses of the treated effluent from the regional Santa Cruz Wastewater Treatment Facility (WWTF). The RWFPS evaluated eight project alternatives, which included:

1) Centralized Non-Potable Reuse
2) Decentralized Non-Potable Reuse
3) SqCWD Led Groundwater Replenishment Reuse Project (Includes Pure Water Soquel)
4) Santa Cruz Led Groundwater Replenishment Reuse Project
5) Surface Water Augmentation
6) Streamflow Augmentation
7) Direct Potable Reuse
8) Regional Groundwater Replenishment Reuse Project (GRRP)

The evaluation of the project alternatives consisted of a conceptual-level engineering analysis to evaluate each project and to score and rank projects based on screening criteria for engineering and operational considerations, economic factors, environmental, and social considerations.

The RWFPS identified the near-term preferred alternative as strategies/projects under Alternative 1 Centralized Non-Potable Reuse; this consists of two separate projects (1. SCPWD Title 22 Upgrade (Alternative 1A) and 2. BayCycle (Alternative 1B Phase 4)) to increase production and recycled water reuse. Both would benefit SCWD but they are located outside of the Basin and would not assist in achieving sustainability within the Basin and therefore are not under consideration by the MGA.

The RWFPS identified a mid-term opportunity for a centralized Groundwater Replenishment Reuse Project (GRRP) led by the SCWD (Alternative 4). This alternative evaluated a GRRP (independent of Pure Water Soquel) in the Santa Cruz service area with a centralized Advanced Water Treatment Facility (AWTF) at or near the Santa Cruz Wastewater Treatment Facility (WWTF) to send advanced treated water for injection in the Beltz wellfield area and also deliver advanced treated water for non-potable reuse (NPR) along the way.

The Beltz wellfield is located in the Basin, so this potential project to assist with replenishing the Purisima aquifer and protecting against seawater intrusion. Santa Cruz WWTF secondary effluent would serve as the source of the water. The effluent would receive advanced water treatment at or near Santa Cruz WWTF employing full advanced treatment with microfiltration, reverse osmosis (RO) and ultra-violet (UV)/Peroxide for advanced oxidation. It is estimated the project would provide up to 2.0 MGD (2,240 AFY) advanced treated water for groundwater

replenishment at the Beltz Wellfield. In addition, it would provide an estimated 0.11 MGD (120 AFY) for NPR irrigation at approximately 35 customer sites in City along the pipeline alignment from the AWTF to SCWD's GRR injection sites. The RWFPS summarizes the other infrastructure required to implement the project including: advanced treated water pump station; approximately 43,000 linear feet (LF) of new advanced treated water pipeline (6 to 12-inch) to distribute water to the Beltz wellfield; 5 injection wells and 5 monitoring wells and associated buildings. The study's summary of probable costs estimated the total capital costs at $70.5 million (includes treatment, pipelines, pump station, site retrofit costs, wells) and presents a summary of loaded capital costs, by facility component, as well an annual unit life cycle costs.

The RWFPS summarizes the significant limitations and challenges of the project as:

1. Operational complexity and energy for treatment and injection;

2. Additional studies to confirm the groundwater basin capacity, ability to capture recharged flow and meet all regulatory requirements;

3. The produced water quality exceeds the needs for non-potable reuse.

Based upon the identified limitations and challenges, this project is included in Group 3 because there is insufficient information at this stage to fully evaluate its feasibility and merits. Pending the potential implementation of Group 2 projects and management actions and the Basin's hydrologic response as indicated in the assessments of the sustainable management criteria during the GSP implementation, the MGA may reevaluate the need and further evaluate a centralized Groundwater Replenishment Reuse Project (GRRP) led by SCWD.

4.3.2 Recycled Water – Surface Water (Reservoir) Augmentation

As discussed in Section 4.3.1 above, SCWD's Recycled Water Facilities Planning Study (RWFPS) evaluated recycled water alternatives (Kennedy/Jenks 2018). This included an evaluation of recycled water use for a Surface Water Augmentation (SWA) project (Alternative 5) to convey advanced treated water from the Santa Cruz WWTF to blend with raw water and store in Loch Lomond Reservoir, a source of municipal drinking water supply for the SCWD service area. Water from Loch Lomond would be conveyed to and treated at SCWD's Graham Hill Water Treatment Plan (GHWTP) before entering SCWD's potable water distribution system.

The study found that a SWA project at Loch Lomond would maximize the beneficial reuse of wastewater in summer months, and potentially provide more operational flexibility for reservoir operations. Instead of preserving storage to assure sufficient water supply for SCWD in the dry months, in all seasons Loch Lomond could be used as a climate independent resource for the region. Based upon the project assumptions and operational conditions, the project is estimated to produce up to 1,777 AFY of recycled water. The available supply for a SWA project would depend on the amount of secondary effluent available for reuse, the dilution ratio and the retention time in the reservoir needed to meet state regulations on the use of recycled water.

Due to the distance and lift required to convey advanced treated water to Loch Lomond Reservoir, there would be significant additional infrastructure, pumping and energy requirements for conveyance. The study estimated the total cost at $106.5 million and presents a summary of loaded capital costs, by facility component, as well an annual unit life cycle costs.

The RWFPS identifies the project's significant limitations and challenges as:

- High capital and unit costs due to extensive infrastructure required
- Challenging Regulatory, CEQA/NEPA And Permitting Requirements
- Operational complexity for treatment and reservoir management
- Significant energy for conveyance and treatment
- May limit future expansion at the Santa Cruz WWTF
- Additional limnological studies needed to confirm assumptions

The SWA project was not selected as a preferred alternative in the RWFPS; in the evaluation and sensitivity analysis of the eight alternatives, the SWA ranked towards the bottom. It should be noted that the assessment of this project was done within the context of the WSAC recommendations, to evaluate supplemental supply alternatives to address SCWD's water supply gap during times of extended drought. The MGA's principal planning objective is the Basin's sustainability goal. The initial feasibility assessment did not identify any regulatory "fatal flaws" for the implementation of a SWA project at Loch Lomond Reservoir. The identified limitations and challenges pertain to either addressing drought supply or the MGA's needs. Pending the potential implementation of Group 2 projects and management actions and the Basin's hydrologic response as indicated in the assessments of the sustainable management criteria as the GSP implementation progresses, the MGA may reevaluate the need to further evaluate SWA.

4.3.3 Recycled Water – Direct Potable Reuse

Current California regulations do not allow for the use of recycled water for Direct Potable Reuse (DPR). DRP is generally defined as the introduction of recycled water directly into a public water system. In 2010, the California Senate enacted legislation[2] to expand the Water Code regarding potable reuse of recycled water. In the decade since, state drinking water and public health regulatory agencies have continued the assessment and possible framework for the regulation of potable reuse projects. In its 2016 *Investigation on the Feasibility of Developing Uniform Water Recycling Criteria for Direct Potable Reuse,* the State Water Resources Control Board concluded "the use of recycled water for DPR has great potential but it presents very real scientific and technical challenges that must be addressed to ensure the public's health is reliably protected at all times (SWRCB, 2016).

No DPR projects currently exist in California and existing regulations have not been developed. However, it is conceivable that DPR will become a future strategy to augment public water

[2] Senate Bill (SB) 918 (Chapter 700, Statutes of 2010), which added sections 13560-13569 (Division 7, Chapter 7.3)

supplies. Accordingly, SCWD's Recycled Water Facilities Planning Study (RWFPS) evaluated the use of recycled water for Direct Potable Reuse (DPR) (Alternative 7) (Kennedy/Jenks, 2018). The source of supply would be wastewater effluent receiving secondary at the Santa Cruz WWTF. This effluent would receive full advanced treatment prior to blending with raw water coming from City's other flowing sources for further treatment at the GHWTP prior to distribution as potable water. The Advanced Water Treatment Facility's (AWTF) capacity would be sized based on the secondary effluent available in the summer, less secondary effluent delivered for other potential project demands. Up to 3.2 MGD (3,585 AFY) of advanced treated water production capacity at the City's WWTF would be utilized year-round. The study estimated the total cost at $110.6 million. In the future, if a mandate for additional treatment of wastewater effluent or a ban on ocean discharge is enacted SCWD would evaluate water recycling to achieve zero or near-zero discharge. If this situation occurs, DPR could be revisited to increase the amount of beneficial reuse.

The RWFPS evaluated these alternatives principally as a means to address SCWD's water supply needs during drought. However, conceptually DPR could serve to as a supplemental supply to address the sustainability goals of the GSP by reducing the need for groundwater pumping in the Basin. Conceptually, this would likely entail a dual-purpose approach designed to meet SCWD's drought needs and as well as serve as a supplemental supply to the MGA to assist in maintaining or enhancing protective water level elevations.

Based upon the current regulations and considerable uncertainty related to scientific, technical, and social considerations, DPR is not considered a viable strategy to achieve the basin sustainability goal. However, as the GSP implementation proceeds over the coming decades, the MGA anticipates evaluating the potential applicability of DPR in managing the Basin in a sustainable manner.

4.3.4 Groundwater Pumping Curtailment and/or Restrictions

In many of the groundwater basins subject to SGMA throughout the State, pumping restrictions are one of the key components of the GSP. The MGA believes that the current level of Basin pumping can be continued with the effective implementation of the Group 1 and Group 2 Projects and Management Actions. However, the MGA also acknowledges that pumping restrictions are an effective tool to achieve groundwater sustainability that may need to be used in the future.

For the purpose of the GSP, pumping restrictions are defined as reductions or limitations in the amount of water a current or future groundwater user can pump from the Basin. This would be applied in the case of a situation where the planned Projects and Management Actions are insufficient to reach and/or maintain sustainability and one or more sustainability indicator is likely to dip below the minimum threshold by 2040. Under such a curtailment scenario, the MGA would determine the amount of water that affected pumpers could take sustainably, and the pumpers would be required to reduce their groundwater extraction to that allocation. All pumpers subject to allocations and restriction would be required to be metered.

SGMA legislation allows for charging fees for pumping in excess of allocations or non-compliance with other GSA regulations (CWC Section 10732 (a)). The MGA will consider the adoption of fees and/or other penalties for violations of pumping allowance and/or reporting in the event that restrictions are implemented.

In the event of a need to restrict pumping, pumping restrictions could also be placed on new wells. Restrictions on permits for new groundwater wells would be considered if there was high demand for wells that, if constructed, could lead to the basin water extractions exceeding the sustainable yield for the basin. Alternatively, restrictions on permits in specific areas would be considered if additional localized pumping could drive one or more sustainability indicators below the minimum threshold. Limits could also be placed on which aquifers could be drawn from if there was a potential adverse impact in a particular zone that might affect seawater intrusion or surface water depletions. In the absence of a basin adjudication, pumping restrictions on new uses would need to be applied equitably and in a similar proportion to restrictions on existing users.

Considerably more work and discussion would need to be done to define the policies and procedures for pumping restrictions in the event that pumping restrictions are determined necessary to attain and maintain sustainability.

4.3.5 Local Desalination

The treatment techniques and processes used to produce drinking water from seawater have a track record of performance and are in use in California and elsewhere in the United States and the world. Concerns raised during the consideration of an earlier local desalination project known as scwd^2 jointly sponsored by SCWD and the SqCWD included the energy intensive nature of desalination facilities and potential impacts to marine life in the Monterey Bay National Marine Sanctuary related to the proposed project intake.

The City's Water Supply Advisory Committee (WSAC) identified local desalination as an element 3 project that could be pursued if element 1 and 2 projects either failed to be feasible or failed to fulfill SCWD's agreed upon water supply shortfall in a cost efficient manner (SCWD 2015). However, since WSAC prioritized projects in 2015, additional state regulatory requirements have substantially increased to permit a desalination ocean intake. These additional regulatory requirements and the potential project timing issues related to them, have led the City to further de-prioritize local desalination as a potential water supply source. In addition to regulatory hurdles, any project involving the City of Santa Cruz would also require voter approval before a legislative action could authorize, permit, construct, operate and/or acquire a desalination plant or incur any indebtedness for that purpose by the City.

While desalination is technologically feasible it has become an unlikely source of water supply in the foreseeable future based on local political opposition, environmental concerns, and regulatory uncertainties.

4.3.6 Regional Desalination

After the scwd[2] local desalination project was put on hold in 2014, SqCWD completed its Community Water Plan (SqCWD 2015). During the development of that Plan, community input gathered identified the need for a timely solution to the threat of seawater intrusion. Along with ongoing conservation projects, community members rated regional desalination among three water augmentation strategies for SqCWD to pursue to increase its water supply and reduce groundwater pumping in the Basin.

Based on the Community Water Plan, SqCWD entered into a memorandum of interest (MOI) with DeepWater Desal, LLC to express its interest in purchasing up to 1,500 acre-feet per year of desalinated water produced from a proposed desalination facility in Moss Landing. The MOI is non-binding and does not obligate SqCWD to make any financial commitment.

The DeepWater Desal project is in evaluation, with development of a draft Environmental Impact Report (EIR) and studies to support compliance with the California Ocean Plan Desalination Amendments (State Water Board 2015). There is uncertainty regarding the potential availability of water from the proposed regional desalination facility to meet the sustainability goals of the Basin. The regulatory hurdles required to permit an ocean intake for the desalination plant within the Monterey Bay National Marine Sanctuary and other factors contribute to this project uncertainty.