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Appendix

4 PROJECTS AND MANAGEMENT ACTIONS

This chapter describes a range of potential projects and management actions that will allow the Santa Margarita Basin (Basin) to attain sustainability in accordance with §354.42 and §354.44 of the Sustainable Groundwater Management Act (SGMA) regulations.

As a Joint Powers Authority, the Santa Margarita Groundwater Agency (SMGWA) is comprised of 3 member agencies: San Lorenzo Valley Water District (SLVWD), Scotts Valley Water District (SVWD), and County of Santa Cruz (County). The SMGWA Board consists of representatives from the 3 member agencies and from other public agencies and private groups that rely directly or indirectly on groundwater from the Basin: City of Scotts Valley, City of Santa Cruz, Mount Hermon Association, and private well owners. Projects and management actions presented herein may provide benefits to just a single agency, to multiple agencies, and/or other groundwater or surface water users within the Basin. The term *cooperating agencies* is used throughout this section to represent the diverse water supply and land use planning agencies, organizations, and other operations that have a role in developing or implementing projects and/or management actions within the Basin. It includes SMGWA member agencies, other public agencies, and private parties.

Projects and management actions discussed in this section are in varying stages of development. They are proposed to achieve one or more of the following outcomes:

- Achieve groundwater sustainability in the Basin by meeting sustainable management criteria by 2042
- Meet the water supply goals of the cooperating agencies
- Provide a framework for future collaboration and cost sharing for cooperating agencies

Groundwater is a primary source of drinking water for residents and businesses within the Basin. Groundwater supports important creek baseflows for municipal agencies and aquatic species throughout the year, but most importantly, in the summer and fall. The City of Santa Cruz indirectly uses groundwater from the Basin because the surface water it diverts from the San Lorenzo River for municipal use partially comprises baseflows supported by Basin groundwater discharge to creeks.

Projects introduced within this section focus on achieving high return on investment using existing supply and infrastructure resources within the Basin, transferring surface water sources from outside the Basin, or recharging the Basin with purified wastewater. Several projects have the benefit of creating supplemental supply to improve water supply reliability for the City of Santa Cruz, SLVWD, and SVWD. Some projects benefit areas pumped by *de minimis* groundwater users.

The primary groundwater condition in the Santa Margarita Basin that projects and management actions aim to improve is lowered groundwater levels in one of the Basin's primary aquifers. The affected aquifer is the Lompico aquifer in the Mount Hermon / South Scotts Valley area where there has been a 150 to 200-foot historical decline in groundwater levels as described in Section 2.2.4.1. The long-term decline has been halted by successful water use efficiency programs and supplying recycled water for non-potable uses. Increasing groundwater levels to meet the SMGWA's sustainability goal will require additional projects and management actions to achieve sustainability under the assumed future climate conditions.

Projects and management actions are presented in 3 groups that provide distinction of the general status of projects and management actions representing a range of scale, cost, and state of planning and implementation, and timeframe which they may be implemented.

Group 1 - Baseline Projects and Management Actions: Activities in Group 1 are considered existing commitments by cooperating 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. Group 1 projects and management actions are incorporated into baseline conditions in the groundwater model used to evaluate projected groundwater conditions. Group 1 projects and management actions, by themselves, are not sufficient to achieve groundwater sustainability.

Group 2 - Projects and Management Actions in Planning Process: Projects in Group 2 are considered the Basin's best options for reaching sustainability. Many Group 2 projects require detailed feasibility and environmental review. Continuation of Group 1 projects along with the select Group 2 projects is anticipated to bring the Basin into sustainability. It is anticipated that the continuation of Group 1 projects along with a subset of Group 2 projects should allow the Basin to reach sustainability. If this combination is not able to meet the SMGWA's sustainability goals, additional Group 2 projects and even Group 3 projects may be implemented.

Group 2 projects are further organized into tiers based on their source of water:

- Tier 1 – Projects that rely on existing water sources within the Basin
- Tier 2 – Projects that rely on water from existing surface water sources outside the Basin
- Tier 3 – Projects that rely on purified wastewater

Group 3 - Projects and Management Actions Requiring Future Evaluation: If groundwater model projections and assumptions of future supply availability change or if Group 2 projects do not end up having the expected results further projects and/or actions will be required to achieve sustainability. Similarly, if Group 2 projects fail to become feasible either due to costs, environmental requirements, or any other reason, SMGWA may need to look to additional projects. In either case, appropriate projects may be chosen from those listed under Group 3. As work continues on water supply and resource management efforts, it may be prudent to incorporate additional projects into future GSP updates.

4.1 How Projects will be Accomplished

Projects and management actions included in Sections 4.2 through 4.6 provide a framework for achieving the outcomes described above, however project feasibility analysis must be completed, funding secured, and necessary cooperation agreements negotiated before any of the projects and management actions proceed with design, permitting, water rights, environmental review, and ultimately implementation. Costs for implementing projects are in addition to the costs for operation of the SMGWA ~~as~~ described in the GSP's implementation plan in Section 5.

~~The SMGWA's first implementation activity in Section 5 is to evaluate its membership and funding structure. A 5-year GSP implementation budget is also included in Section 5 for operation of the SMGWA, including monitoring and required reporting.~~

Group 2 and 3 projects are not developed enough for cooperating agencies to fully commit to any projects prior to submission of the GSP to DWR in January 2022. Project implementation will ultimately be led by cooperating agencies, not the SMGWA, working in coordination with one another for projects with multi-stakeholder benefits. Many projects have significant costs and their viability for implementation ~~that~~ depends on obtaining grants and/or low-interest loans to supplement local revenue streams.

Through project feasibility analysis, cooperating agencies will need to demonstrate to the SMGWA that their projects meet SMGWA's groundwater sustainability goals, water supply goals of the individual cooperating agencies without causing undesirable effects to other groundwater beneficial uses or users.

Feasibility and analysis of projects will require additional information, technical and financial analysis, modeling, and potentially, pilot scale testing. Findings and results of such feasibility and analysis will be provided to the SMGWA Board for final evaluation and approval. SMGWA Board involvement in project evaluation is likely limited to determining if projects interfere with achieving the Basin's sustainability goals or have negative impacts on other GSP-related projects or management actions. Cooperating agencies are encouraged to coordinate with one another on projects to ensure multi-stakeholder benefits, thereby decreasing the likelihood of project interference. The process described herein is shown in Figure 4-1.

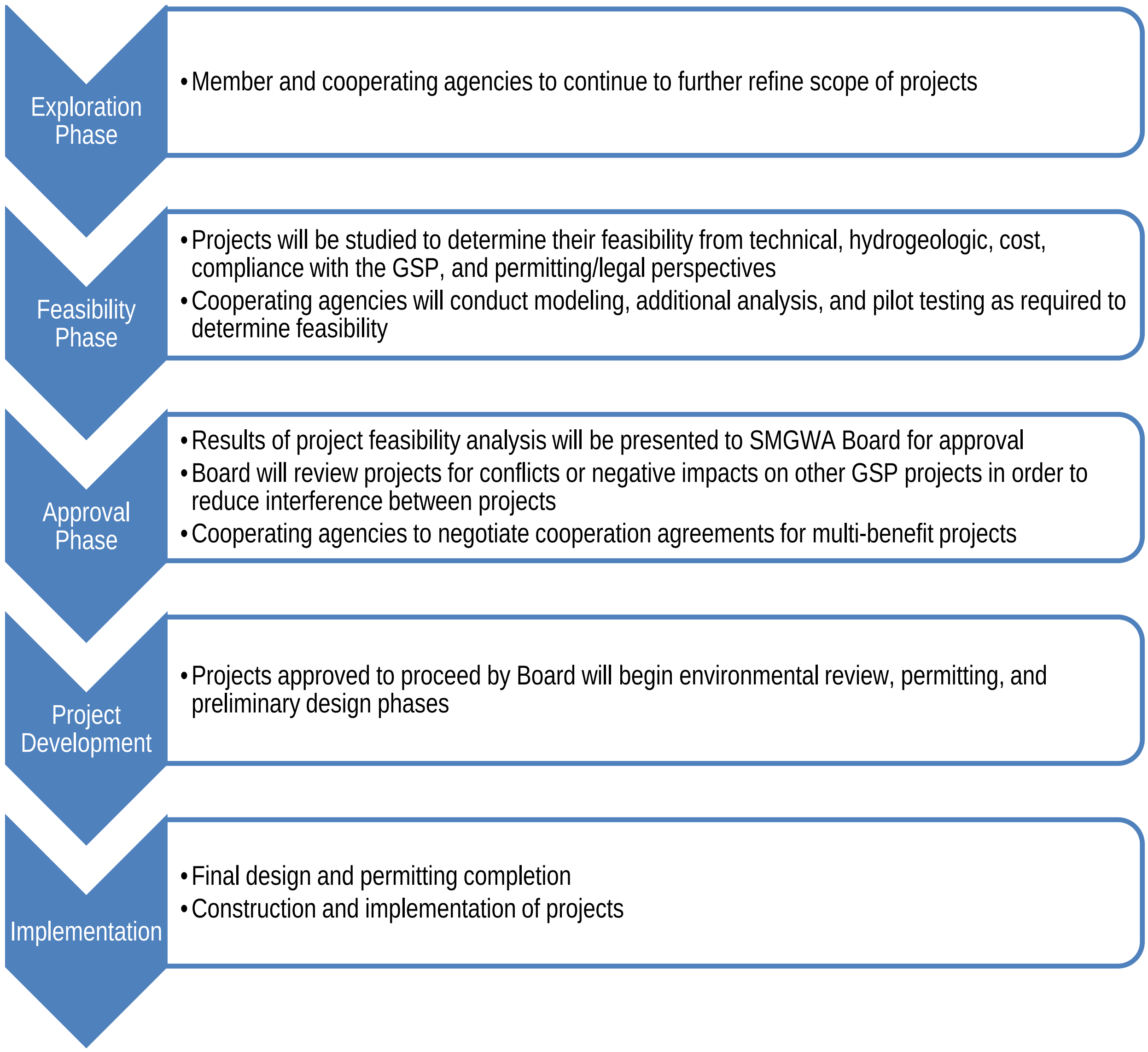


Figure 4-1. Project Feasibility Process

Aside from feasibility and analysis, each SMGWA member and cooperating agency will be responsible for 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.

Most of the projects presented within Groups 2 and 3 are conceptual and still within the development phase shown on Figure 4-1. Very few projects within these groupings have had any feasibility analysis performed. For those where feasibility analysis has been performed, additional analysis is likely needed to update project scopes, benefits, limitations, and costs.

4.2 Baseline Projects and Management Actions (Group 1)

Projects and management actions in Group 1 are existing commitments by cooperating agencies and are currently being implemented. These baseline projects and management actions are expected to continue, as needed, throughout the GSP implementation period. As mentioned previously, these projects and management actions alone do not achieve basin sustainability on their own.

4.2.1 Existing Water Use Efficiency

SLVWD and SVWD are already implementing a number of water use efficiency and conservation activities. These successful programs have been in place for some time and have contributed to significant demand reduction. These programs are regularly updated to continue to incentivize conservation and promote efficient use of water. The programs are supported by extensive public outreach and education measures.

SLVWD, SVWD, the County, and City of Santa Cruz are members of the Water Conservation Coalition of Santa Cruz County, which serves as a regional information source for countywide water reduction measures, rebates, and resources. The Water Conservation Coalition provides water saving tips, information on countywide rebate programs, and educational materials (e.g., drought-tolerant plants suitable for local conditions). The organization works collaboratively to produce press releases, newspaper ads, radio ads, and informational booths at local events.

SLVWD, SVWD, the County, and the City of Santa Cruz have adopted water waste ordinances (incorporating State of California Executive Order B-37-16), which allow agencies to address incidents of water waste by investigating, recommending corrective action, providing follow-up documentation of resolution, and administering penalties, fines, and water service disconnection commensurate with the excessiveness of the action.

SLVWD promotes public awareness and education through a variety of water use efficiency programs. SLVWD provides information to customers regarding the water supply sources, the San Lorenzo River watershed, and the public's role in conserving water and protecting shared resources. The SLVWD website provides seasonal water use efficiency tips, informs customers when the drought contingency plan is in effect, posts restrictions or prohibitions for outdoor water use, provides rebate and landscape waterwise assistance and provides contacts for other partner organizations supporting water conservation. As mentioned previously SLVWD is part of the Water Conservation Coalition of Santa Cruz County.

SVWD, like SLVWD, also promotes public awareness and education through a variety of water efficiency programs. SVWD established the Think Twice Water Use Efficiency program which prescribes a set of activities to support SVWD's long-term sustainable water supply planning efforts. The program outlines a multi-pronged approach that increases awareness about indoor and outdoor water use efficiencies, promotes water efficient behaviors, and continuously reduces water waste. A key Think Twice program component is education and outreach. SVWD promotes public awareness and education of SVWD water supply sources, the San Lorenzo River watershed, and the public's role in conserving water and protecting shared resources. The SVWD website provides water use efficiency tips, informs customers when the drought contingency plan is in effect, posts restrictions or prohibitions for outdoor water use, provides rebate and landscape waterwise assistance and provides contacts for other resources that support water conservation. As mentioned previously, SVWD is part of the Water Conservation Coalition of Santa Cruz County.

Although the City of Santa Cruz is not in the Basin, it does divert water from the San Lorenzo River in the Basin. Consequently, conservation measures implemented by the city lessen the need for surface water diversions in the Basin. The City of Santa Cruz actively values and promotes public awareness and education about its water resources and the importance of water conservation. In 2017, the City of Santa Cruz initiated a Water Conservation Master Plan to define the next generation of water conservation activities and serve as a road map to help the community achieve maximum, practical water use efficiency. The City of Santa Cruz disseminates information to the public in different forms including media, workshops and community events, billing and customer service, and school education programs. In addition to education and outreach the City of Santa Cruz implements the following conservation programs: metering infrastructure improvements to monitor water losses, large landscape budget-based water rates, residential leak assistance, high efficiency plumbing fixture rebates, turf removal and lawn rebates, sprinkler nozzle rebates, gray water retrofits and rain barrels, and overall system water loss reductions.

These management actions will continue to evolve with technological advances and future legislative requirements. Existing water use efficiency activities lower water demand and consequently reduce groundwater pumping and surface water diversions. Depending on where pumping and diversion reductions occur, groundwater levels may increase, and surface water depletions may be reduced.

There is currently no plan to end these successful water use efficiency activities. SVWD's peak water usage was in 2003 and they have since reduced consumption by 45% (data from 1995 to 2020 water years, WSC & M&A, 2021). SLVWD's peak water usage was in 2002 and they have since reduced consumption by 26% (data from 1995 to 2020 water years, WSC & M&A, 2021). City of Santa Cruz's peak water usage was in 2000 and they have since reduced consumption by 45% (data from 1951 to 2015 water years, City of Santa Cruz, 2016). Costs of conservation and demand management programs are built into respective agency's budgets and are not anticipated to be passed on to the SMGWA. As existing water use efficiency activities within the Basin continue to evolve over time, any significant changes will be publicly noticed as necessary by each implementing agency'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. SGMA grants the SMGWA legal authority to pass regulations necessary to achieve sustainability. Cooperating agencies are committed to successful implementation of their conservation programs.

4.2.2 SVWD Low-Impact Development

SVWD has implemented 3 low impact development (LID) projects, largely with grant funds that apply stormwater best management practices – such as infiltration basins, vegetated swales, bio-retention and/or tree box filters – to retain and infiltrate stormwater that is currently being diverted into the storm drain system. SVWD has installed monitoring equipment to assess the performance of the facilities. The total amount of stormwater captured at the three LID facilities in the SVWD service area in 2019 was 40.38 acre-feet (AF) and in 2020 was 19.42 AF (Montgomery & Associates, 2021). The location of the LID facilities is described in Section 2.1.3.4.6.3 and shown on Figure 2-7. The 3 LID projects are:

- Transit Center LID: SVWD obtained grant funding through a Santa Cruz County Proposition 84 grant from the State Water Resources Control Board (SWRCB) for the planning, design, and construction of a LID retrofit at the Scotts Valley Transit Center site. The design included construction of a vegetated swale, a below-ground infiltration basin, and pervious pavement. Construction began in October 2016 and was completed in May 2017. In 2020, SVWD recorded a total of 1.5 AF of infiltrated stormwater at this location (Montgomery & Associates, 2021).
- Woodside Homeowner's Association LID: As part of the Proposition 84 grant match, SVWD worked with a local developer to install a stormwater recharge facility at the Woodside Homeowner's Association along Scotts Valley Drive. This facility includes a large below-ground infiltration basin. Stormwater is routed from the development to the basin where it can percolate down into the groundwater. Initial hydrology reports estimate recharge on the order of 20 to 40 acre-feet per year (AFY) (Ruggeri, Jensen, and Azar, 2010). In 2020, SVWD recorded, a total of 14.97 AF of infiltrated stormwater at this location (Montgomery & Associates, 2021).
- Scotts Valley Library LID: An earlier grant-funded project installed a below-ground infiltration basin at the Scotts Valley Library. In 2020 SVWD recorded, a total of 2.94 AF of infiltrated stormwater at this location (Montgomery & Associates, 2021).

In addition to the 3 LID projects described above, SVWD was part of the Strategic and Technical Resources Advisory Groups for Ecology Action's regional sponsorship of the Proposition 84 LID Incentives Grant. SVWD staff provided input on rating criteria for the landscape certification program and the structure of grant reporting. Through 2018, 32 SVWD customers were awarded grant incentives for making stormwater management improvements to their properties, with strategies such as rainwater harvesting, lawn and hardscape removal, and stormwater retention methods, such as swales and rain gardens. According to SVWD staff records, the program provided 31,733 square-feet of permeable recharge area.

The infiltrated stormwater recharges the shallow aquifers in a manner similar to natural processes. The infiltration helps augment groundwater levels and sustains groundwater contributions to stream baseflow that supports local fishery habitats. In the case of the existing LID facilities, all 3 overlie percolate stormwater into the Santa Margarita Sandstone in areas where the underlying Monterey Formation restricts recharge of that water into the Lompico aquifer beneath the Monterey Formation. Because of this geological sequence there is limited potential of the LID facilities recharging the Lompico aquifer which has the greatest need for recovery and is the source of most of SVWD's water supply. A complicating factor in implementing LID projects in the Scotts Valley area is that there is no centralized stormwater collection system. This limits the ability to do large scale projects to direct groundwater augmentation to the most beneficial areas. Costs of existing projects have been offset by grant funding. SVWD will continue to evaluate additional LID projects in the future and look for opportunities to gain additional funding as needed.

4.2.3 SLVWD Conjunctive Use

SLVWD owns, operates, and maintains 2 permitted water systems: San Lorenzo Valley System (comprising 2 connected distribution systems: North System and South System) and Felton System (Figure 2-3), which supply separate areas from independent water sources. A conjunctive use program is already implemented in the North System, as this water system relies on surface water when available and groundwater when surface water diversion is not possible.

The North System is approximately 57 square miles and includes the unincorporated communities of Boulder Creek, Brookdale, and Ben Lomond. The North System is supplied by both stream diversions and groundwater wells. Six active points of diversion are located on Peavine, Foremen, Clear, and Sweetwater creeks. Two active groundwater wells draw from the Santa Margarita aquifer in each of the Quail Hollow and Olympia areas. On average, the North System obtains 56% of its water supply from stream diversions and 44% from groundwater pumping (Exponent, 2019).

Conjunctive use in this sense refers to the optimized, sustainable use of multiple water sources throughout repeated climatic cycles under physical, legal, and environmental constraints. As practiced in the North System, conjunctive use requires water production from stream diversions whenever possible. This allows a significant portion of unused and recharging groundwater to remain essentially stored for use during dry periods. The conjunctive use of these sources has met annual production demands since 1984, without a substantial decline in groundwater levels.

This successful conjunctive use program has allowed SLVWD to optimize the use of surface water and groundwater in the North System by utilizing stream flows while they are high and groundwater during low flow times. The resulting impacts are reduced groundwater pumping, increased groundwater levels around the wells that are resting, and increased creek baseflow.

The existing conjunctive use program uses operational changes to increase surface diversions when there is enough flow available that results in reduced groundwater pumping. The conjunctive use program can only be operated when there is available surface water. When surface water is not available due to sustained drought, groundwater pumping will increase. SLVWD currently has no plan to end the conjunctive use strategy it has been applying toward its 2 water sources, and instead has plans to expand the diversions in the North System to offset additional groundwater pumping (see Section 4.3.1.2). Costs of implementing additional diversions are built into ongoing SLVWD budgetary commitments and are not anticipated to be passed on to the SMGWA.

4.2.4 SVWD Recycled Water Program

The Recycled Water Program is a cooperative effort between SVWD and the City of Scotts Valley. Recycled water has been used by SVWD since 2002 in lieu of groundwater for non-potable uses. This augments the water supply and helps to meet water use efficiency goals. Recycled water is produced at the City of Scotts Valley Tertiary Treatment Plant, where it undergoes treatment including nitrate removal, ultra-violet disinfection, and chlorination. Recycled water is then distributed by SVWD to customers through a dedicated recycled water system. Recycled water is mostly used for landscape irrigation and dust control to a lesser extent.

The following specific recycled water programs are implemented by SVWD:

- The City of Scotts Valley has an order mandating use of recycled water for irrigation for new construction when permissible and economically feasible.
- Recycled Water Fill Station was activated in 2016-2018 and 2021 to offer free recycled water to District customers and City residents for permitted uses.
- In 2016, the City of Scotts Valley and Pasatiempo Golf Club, located outside of the Basin, reached an agreement for the City of Scotts Valley to provide treated wastewater to the golf course for irrigation. This allows Pasatiempo Golf Club to reduce its reliance on potable water from the City of Santa Cruz during peak-use months when irrigation demand is high. In support of this regional effort, SVWD released 10% of its total recycled water allocation in exchange for compensation that can be applied toward funding future projects. SVWD did not have a current identified use for the amount of recycled water that it supplied to the golf course.

Recycled water use within the Basin represents an equivalent reduction in groundwater pumping. Groundwater not pumped from the basin is assumed to be available for future beneficial use. Therefore, recycled water use results in a reduction in groundwater pumping and an increase in groundwater levels in the Basin.

SVWD continues using recycled water use in lieu of groundwater pumping and is exploring options to maximizing the beneficial use of recycled water in the future (see Section 4.6.7). Costs of operating the recycled water system are built into SVWD and City of Scotts Valley budgets and are not anticipated to be passed on to the SMGWA.

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

4.3.1 Project Descriptions, Objectives, and Circumstances for Implementation

Group 2 projects represent current thinking regarding the Basin's best option for reaching sustainability. Projects and management actions presented in this section have been designated under Group 2, Tier 1 and comprise projects that rely on existing water sources within the Basin, often cases within each agencies' own systems. Tier 1 projects and management actions also include expansion of some of the baseline, Group 1 projects presented in the previous section. These projects and management actions describe strategies for additional water use efficiency and conjunctive use of existing water sources in the Basin. Some of the potential projects in Tier 1 are the result of work and ideas emanating from a 2017 Memorandum of Agreement (MOA) between SLVWD, SVWD, City of Santa Cruz, and County of Santa Cruz (City of Santa Cruz *et al.*, 2017) to explore and evaluate potential projects for the conjunctive use of surface and groundwater resources in the Basin and San Lorenzo River watershed.

The following subsections provide detailed project descriptions followed by a summary of objectives and discussion of circumstances for implementation.

4.3.1.1 SLVWD, ~~and~~ SVWD, and Santa Cruz County Additional Water Use Efficiency

Project Description

As discussed in Section 4.2.1, SLVWD and SVWD have a long history of implementing successful water use efficiency activities resulting in significant demand reduction. Further expansion of these programs will allow SLVWD and SVWD to reach more customers and expand the awareness. This management action establishes a set of activities to support the SLVWD and SVWD's long-term sustainable water supply planning efforts. The management action outlines a multi-pronged approach that increases awareness about indoor and outdoor water use efficiencies, promotes water efficient behaviors, and continuously reduces water waste.

The program components include additional education and outreach measures such as free house calls to provide consultation and devices for efficient water use, continued participation in countywide conservation coalition activities, continued public speaking and local media placements, irrigation scheduling guidelines, commercial kitchen pre-rinse spray valve project repeating in 5 years (2023), and community outreach at Scotts Valley and Felton Farmers Market and other events. SLVWD and SVWD will continue to provide rebates on a variety of activities and equipment and free devices, which enhance water use efficiencies. Both SLVWD and SVWD will continue implementation and enforcement of the water waste policies (SLVWD Ordinance 106 and SVWD P500-15-1). In addition, SVWD will evaluate feasibility and effectiveness of a program that sets water targets for landscape customers.

While education and outreach programs increase awareness and efficiency on the customer side, both SLWVD and SVWD will look to continue to increase efficiencies within their respective distribution systems through improvements to the metering infrastructure, evaluation and remediation of non-revenue water, and system pressure reduction. New metering infrastructures allow for increased accuracy, leak detection, and customer involvement and awareness. In 2016, SLVWD began deployment of new meters in its Lompico service area, and a multi-year system wide meter change out program that has upgraded 27% of meters system wide at the time of writing this GSP. In 2016, SVWD began system-wide deployment of Advanced Metering Infrastructure and achieved 100% completion in spring 2021.

As part of regular capital improvements, SLVWD is planning to begin replacement of older storage tanks and pipelines. Many of these facilities are parts of older distribution systems that have been acquired by SLVWD. Several storage tanks within SLVWD are made of redwood and known sources of water loss. Systemically addressing water losses increases overall efficiency and reduces non-revenue loss thereby decreasing consumption and groundwater pumping.

Santa Cruz County can facilitate improved water use efficiency for non-municipal groundwater users, many of whom rely on the climate-vulnerable Santa Margarita aquifer. To achieve this, the County would provide small water systems and private well owners education, outreach and support for water conservation practices and opportunities.

Project Objectives

Management actions to reduce water demand have been implemented at various times depending on the agency and are continued to this day. Benefits from already implemented water use efficiency programs have resulted in overall reduction of pumping and halting the long-term decline in Lompico aquifer and Monterey Formation groundwater levels in the Scotts Valley area. Expected project benefits from expanding water use efficiency projects include further reductions in groundwater pumping that results in increased groundwater levels, and the ancillary benefits such as increased groundwater storage and reduction in surface water depletion. Additional water use efficiency on its own is not expected to increase groundwater levels to meet measurable objectives for chronic lowering of groundwater levels and depletion of interconnected surface water, but it is expected to contribute to keeping water demand flat while population increases slightly.

Circumstances for Implementation

Majority of water use efficiency measures are already in place and covered in existing budgets of the respective agencies. Since existing water use efficiency programs are well received and successful, expansion of these programs where viable is not expected to face any significant setbacks.

4.3.1.2 SLVWD Existing Infrastructure Expanded Conjunctive Use (Phase 1)

Project Description

As discussed in Section 4.2.3, SLVWD has been practicing conjunctive use in their North System for decades, however, SLVWD has an opportunity to expand conjunctive use in their South System. Expanding conjunctive use will allow SLVWD to optimize use of currently available treated surface water sources in their North System and Felton System by using existing system interties and potential capacity enhancements to offset groundwater pumping in their South System where lowered groundwater levels have occurred. The South System is supplied groundwater pumped from the Lompico aquifer by SLVWD’s Pasatiempo wellfield. SLVWD would achieve reductions in groundwater pumping in this area by substituting Pasatiempo pumping with excess surface water from the North System and/or Felton System. In very wet years when there is more surface water available than needed to meet SLVWD’s South System and SVWD demands, the Santa Margarita aquifer will benefit by resting SLVWD’s Quail Hollow and Olympia wellfields in the North System. This project is the first of 2 phases to increase surface water use in an effort to reduce groundwater pumping in areas with depressed groundwater levels. A second phase requiring additional infrastructure is described in Section 4.3.1.3.

Estimated available excess surface water from the North System is approximately 99 AFY and the Felton System may have up to 128 AFY. Available excess surface water is based primarily on runoff simulated to occur in response to the future climate projection developed for the GSP. The following constraints are considered in the analysis of availability:

- Minimum Fall Creek winter (November 1 through March 31) bypass flow of 0.75 cubic feet per second (cfs) for dry years, and 1.5 cfs for otherwise. Dry years are defined based on cumulative flow volume in the San Lorenzo River at Big Trees from the beginning of the water year, and it should be noted that the administrative definition of dry year used to constrain Felton System diversions differs from the definition of dry year used for the GSP.

- SLVWD' permitted appropriative right to divert at a maximum total diversion rate of 1.7 cfs from Fall and Bull Creeks, and Bennett spring, with a maximum total annual diversion volume of 1,059 AF.
- Diversions from streams serving SLVWD's Felton System are permitted only if streamflow in the San Lorenzo River at Big Trees is at least 20 cfs.

Details on the climate projection and water availability analysis is described in the groundwater model report included as Appendix 2D. Excess surface water in the North and Felton Systems would be transferred to the South System in lieu of pumping groundwater from the Pasatiempo wellfield during the winter/springs months. This would allow the unpumped groundwater to remain stored for use during dry periods. On average, an estimated 227 AFY of excess surface water from SLVWD's North and Felton Systems is potentially available for expanded conjunctive use (Appendix 2D).

In general, 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 SLVWD customers in the North System. SLVWD's Fall Creek diversion that supplies the Felton System is currently limited by the water right place of use to the town of Felton.

SLVWD has been studying expanded conjunctive use for several years. Currently, SLVWD is completing a California Environmental Quality Act (CEQA) analysis and a final Conjunctive Use Plan, which has been funded with grant funds. The following supporting studies have been completed:

- Fisheries Resource Considerations for the San Lorenzo River Watershed Conjunctive Use Plan (Podlech, 2019)
- Water Availability Assessment for San Lorenzo River Watershed Conjunctive Use Plan (Exponent, 2019)

Project Objectives

The project objective is to use existing infrastructure to expand conjunctive use to passively recharge groundwater in SLVWD's Quail Hollow, Olympia, and Pasatiempo wellfield areas by resting those wells when excess North and Felton Systems surface water is available while also increasing stream baseflows. Groundwater stored by in-lieu recharge can be pumped in years when surface water flows are less available. As a result of expanding conjunctive use in the

Basin, it is expected that there will be increased groundwater levels, increased stored groundwater, and increased baseflows.

Circumstances for Implementation

SLVWD's expanded conjunctive use project is already in the early planning stages and is likely to be implemented in the next year or two. As presented in Section 4.3.8, it is the lowest capital cost of the projects and management actions included in this GSP to implement assuming future excess surface water is available.

4.3.1.3 SLVWD and SVWD Inter-District Conjunctive Use with Loch Lomond (Phase 2)

As a second phase to the expanded conjunctive use project presented in Section 4.3.1.2, the Inter-District Conjunctive Use project with Loch Lomond would provide an additional 313 AF of treated surface water from Loch Lomond each year to offset wet season demand in SLVWD's South System and, once that need is satisfied, in SVWD's service area. Combined with Phase 1, there would be on average 540 AFY to offset all or almost all wet season groundwater demand. Through this demand offset SLVWD and SVWD could recover groundwater resources by reducing or eliminating pumping during the wet part of the year. Water transfers through existing and to be constructed system interties will allow the transfer and purchase of surface water from City of Santa Cruz to SLVWD and SVWD.

SLVWD has entitlements to a portion of Loch Lomond yield. In 1958, SLVWD sold 2,500 acres encompassing a portion of the Newell Creek watershed to the City of Santa Cruz with the agreement that SLVWD would be entitled to purchase 500 AFY, which was12.5% of the annual safe yield from a future Newell Creek reservoir planned by the City of Santa Cruz. In 1960, the City completed the Newell Creek Dam which created Loch Lomond Reservoir. The reservoir has a drainage area of 8.3 square miles and a reservoir capacity of approximately 9,000 AF. The City of Santa Cruz's appropriative right allows a maximum direct diversion of 3,200 AFY and a maximum use of 5,600 AFY.

SLVWD began receiving a portion of the reservoir yield in 1963. In 1965 SLVWD constructed the Glen Arbor Treatment Plant for treating its Loch Lomond deliveries. Toward the end of the 1976-77 drought, the City of Santa Cruz stipulated that SLVWD was not entitled to an allocation of 500 AFY, merely 12.5% of the safe yield. This decision, based on a reduction to the estimated annual safe from the Newell Creek Reservoir, reduced SLVWD's contractual allocation. This determination led to several years of water disputes between the City of Santa Cruz and SLVWD. In June 1977, SLVWD filed a Complaint for Declaratory Relief, which requested the Court to make a judicial determination of the respective parties' duties and rights. In June 1980, a court order fixed the estimated annual safe yield from Newell Creek Reservoir at reduced quantity, which resulted in a reduction to SLVWD's contractual allocation. SLVWD can currently purchase up to 313 AFY. Since implementation of the Surface Water Treatment Rule, SLVWD has not had the means to adequately treat diversions from Loch Lomond. For that reason, SLVWD has not exercised its contractual allotment of 313 AFY of raw Loch Lomond water. In 2010, the City of Santa Cruz and SLVWD discussed an option that would allow SLVWD to purchase up to 313 AFY (102 MGY) of treated City of Santa Cruz water. During the discussion, however, the City indicated that the treated water allocation would be reduced or interruptible during declared water-shortage emergencies. This was unacceptable to SLVWD, so the discussion did not lead to an agreement.

SLVWD commissioned a study to evaluate the feasibility and cost of utilizing its allotment of Loch Lomond (SPH Associates Consulting Engineers, 2010). The 2010 study presented costs of a project to upgrade the Kirby WTP and interconnect the Felton and San Lorenzo North and South Systems at a cost of approximately $6.4 million. This cost estimate is now outdated and would need to be updated, and the project scope and assumptions revisited.

An alternative would be purchasing treated water from the City of Santa Cruz. This would require conveyance lines, upgrades to the Graham Hill WTP, a booster pump from the Graham Hill WTP, and additional interties to route treated water to SLVWD's South System and SVWD. In previous discussions, the City of Santa Cruz indicated that the availability of treated water sales would carry drought restrictions. During drought is exactly when SLVWD would most need the water. Upgrading the Kirby WTP, on the other hand, would allow SLVWD unrestricted use of its Loch Lomond entitlement during all seasons and water quality conditions.

Project Objectives

The project objective is to use both existing and new infrastructure to expand conjunctive use beyond Phase 1 to passively recharge groundwater in SLVWD's Quail Hollow, Olympia, and Pasatiempo wellfield areas and in Scotts Valley where SVWD's extraction wells are located by resting those wells when Loch Lomond and excess North and Felton System surface water is available. Groundwater stored by in-lieu recharge can pumped in years when surface water flows are less available. As a result of expanding conjunctive use in the Basin, it is expected that there will be increased groundwater levels, increased stored groundwater, and increased baseflows.

Circumstances for Implementation

Adding the Loch Lomond component (Phase 2) to the Expanded Conjunctive Use project (Phase 1) is currently a conceptual project. Apart from the constraints outlined for the Phase 1 project above, the major factor constraining use of Loch Lomond water is adequate water treatment. Additionally, a study will be required to determine if there are water quality issues from mixing surface and groundwater across interties between SLVWD and SVWD.

It is expected that Phase 1 (227 AFY of in-lieu recharge) will not be able to achieve the increases in groundwater levels required to reach measurable objectives for chronic lowering of groundwater levels on its own. Sustainable management criteria developed for this GSP are based on the model results of combined 313 AFY of Loch Lomond and 227 AFY of North System and Felton System surface water being used in lieu of groundwater pumping in the winter and spring months (totaling an average of 540 AFY). Work to complete Phase 2 will likely follow completion of Phase 1.

4.3.2 Public Noticing

Public notice for all aspects of the conjunctive use will be carried out by member agencies prior to the start of the project. Public noticing is anticipated to occur through compliance with CEQA for any facilities or plans associated with the project.

Projects will be approved through regular member agency public board or council meetings in which public discussions or comments will occur. Future notification of the public for any additional pilot testing or long-term implementation will be carried out prior to initiation of any project.

4.3.3 Overdraft Mitigation and Management Actions

The water budget described in Section 2.2.5 identifies there have been historical losses of groundwater in storage in the Basin and those losses will continue in the future without projects and management actions. The historical declines in groundwater levels in the Mount Hermon / south Scotts Valley started to lessen in the mid-2000s due to water use efficiency efforts by SLVWD and SVWD as well as elimination of pumping by Hansen Quarry to the point that groundwater levels are no longer declining.

While the stabilization of groundwater levels in recent years is promising, cooperating agencies will need to implement projects that recharge the areas of the Basin that have lowered groundwater levels. Projects and management actions presented within this section offer existing sources of water to offset groundwater pumping to raise groundwater levels through increased water use efficiency (reducing demand) or conjunctive use (in-lieu recharge). If existing sources and groundwater pumping are managed prudently, groundwater levels will increase resulting in basin sustainability.

4.3.4 Permitting and Regulatory Process

No permitting is required for water use efficiency and public education programs. However, the conjunctive use projects will require compliance with CEQA. An Initial Study – Mitigated Negative Declaration is currently being prepared for the expanded conjunctive use project with Loch Lomond water. Upon completion of the CEQA process, the SMGWA member and cooperating agency boards must take actions to certify the CEQA work and approve projects. No new water rights are being requested as part of any of the projects presented under this section, however, change of water rights place of use will be needed for excess surface water available from the Fall Creek diversion in the Felton System.

4.3.5 Timetable for Implementation

Additional water use efficiency programs are expected to start being implemented in 2022. Of the conjunctive use and replenishment projects relying on similar water sources, expanded conjunctive use (Phase 1) and addition of Loch Lomond water (Phase 2) are those most likely to be implemented first.

SLVWD is in the planning stage for Phase 1 of expanded conjunctive use and is currently preparing CEQA documentation for routine use of existing emergency interties which would be required as part of both the conjunctive use and replenishment projects (SLVWD, 2020). As such, the expanded conjunctive use and replenishment projects are not included in SLVWD's or SVWD's most recent capital improvement plans or fiscal planning budgets. It is anticipated that expanded conjunctive use (Phase 1) will be fully implemented within the next 5 years, while planning, environmental documentation, and construction of the infrastructure required to access Loch Lomond water will be completed before 2032.

4.3.6 Expected Benefits

While Basin groundwater levels have stabilized in the last few decades, it is anticipated that further water use efficiency efforts will not be able to increase groundwater levels on their own. Additional conjunctive use and/or groundwater replenishment will help increase Basin groundwater levels in areas where wells are rested. Current projections indicate that the combined projects of expanded conjunctive use (Phase 1) and addition of Loch Lomond water (Phase 2) will meet the sustainable management criteria described in Section 3. The severity of climate change over the next 20 years will determine whether supplemental projects are needed to achieve groundwater sustainability.

The Basin groundwater model described in Appendix 2D was used to simulate groundwater conditions in the Basin in response to implementing the combined projects of expanded conjunctive use (Phase 1) and addition of Loch Lomond water (Phase 2) for a total of 540 AFY in-lieu recharge in the areas where SLVWD and SVWD extract groundwater. The Basin groundwater budget and groundwater levels for the project simulation are compared against a baseline "no project" simulation. Both the project and baseline simulations account for projected climate change described in Appendix 2D. It is important to note that the simulations used to evaluate benefits are based on an assumed climate projection that will not reflect the year-to-year climate that transpires. The climate projection was selected to allow for a drier future to conservatively guide sustainability planning. Actual projects and management actions benefits will be understood by monitoring groundwater responses to their implementation. Recognizing the impossibility of predicting future climate and how much groundwater is pumped and where it is pumped, some of the smaller volumes in the water budgets are smaller than the noise or statistical uncertainty of those simulated volumes.

Table 4-1 compares baseline “no project” conditions to 540 AFY Phase 1 and 2 conjunctive use water budgets. An average 510 AFY reduction in pumping due to conjunctive use has the following benefits, on average, over the 50-year simulation:

- 100 AFY more groundwater is left in storage
- 400 AFY more net groundwater discharge to creeks as baseflow

The baseline and conjunctive use simulations both have cumulative losses of groundwater in storage (Table 4-1). This is predominantly because the climate change projection in those simulations has 940 AFY less precipitation than WY2010 through WY2018 average precipitation. Storage losses are mostly in the Santa Margarita aquifer which is the most vulnerable to drought because it is directly recharged by rainfall and loses much of its recharge to creeks (Table 4-2). The projected average of all critically dry water years when there is only 27% of average projected rainfall, results in storages losses of up to 6,500 AF regardless of whether there is a conjunctive use project or not (Table 4-1). This is because there will be less available surface water for conjunctive use and so groundwater will be pumped more. Wet years may result in gains in storage of up to 7,600 AFY (Table 4-1).

The groundwater model is used to simulate benefits to groundwater levels from the expanded conjunctive use project (magenta line on Figure 4-2 through Figure 4-5) in the areas where SLWVD and SVWD extraction wells are rested during the wet season months. In the Olympia wellfield area (Figure 4-2) extracting from the Santa Margarita aquifer, there is little increase in groundwater levels because the simulation assumes that to improve groundwater levels in the Lompico aquifer, excess surface water is used to first offset SLVWD Pasatiempo pumping, followed by SVWD pumping. Any remaining surface water is used to offset SLVWD pumping from its Olympia and Quail Hollow wellfields, which only occurs in a few very wet years. The projected baseline and expanded conjunctive use lines on Figure 4-2 are very similar and as a result the baseline is obscured.

Figure 4-3 and Figure 4-4 show simulated groundwater levels for Lompico aquifer wells in the vicinity of SLVWD and SVWD extraction wells that are rested in the wet season months. A conjunctive use project of 540 AFY is simulated to recover groundwater levels around the Pasatiempo wellfield (Figure 4-3) by an average of 25 feet and in south Scotts Valley (Figure 4-4) by an average of 20 feet. Monitoring well SVWD #15 screened in both the Lompico and Butano aquifers is simulated to have a benefit of around 50 feet of groundwater level recovery (Figure 4-5).

Table 4-1. Baseline and 540 AFY Conjunctive Use Project Groundwater Budget

Water Budget Components Average Total for Water Budget Period in parenthesis (AF)		Projected Baseline 2020-2072				540 AFY Conjunctive Use 2020-2072			
		Wet Water Year Average	Critically Dry Water Year Average	Annual Average (AF)	Average Percent of Total Inflow or Outflow	Wet Water Year Average	Critically Dry Water Year Average	Annual Average (AF)	Average Percent of Total Inflow or Outflow
Inflows	Precipitation Recharge	23,700	3,300	12,100	56%	23,700	3,300	12,100	56%
	Subsurface Inflow	100	100	100	<1%	100	100	100	<1%
	Return flows (System Losses, Septic Systems, Quarry, Irrigation)	1,100	1,100	1,200	~~6~~5%	1,100	1,100	1,100	5%
	Streambed Recharge	10,700	6,600	8,400	39%	10,600	6,500	8,300	38%
	Total Inflow	*35,600*	*11,100*	*21,800*		*35,500*	*11,000*	*21,600*	
Outflows	Groundwater Pumping	2,600	2,900	2,800	12%	1,900	2,500	2,300	10%
	Subsurface Outflow	100	100	100	1%	100	100	100	1%
	Discharge to Creeks	25,600	14,600	19,400	87%	25,900	15,000	19,700	89%
	Total Outflow	*28,300*	*17,600*	*22,300*		*27,900*	*17,600*	*22,100*	
Storage	Average Annual Change in Storage	7,400	-6,400	-500	-	7,600	-6,500	-400	-
	Cumulative Change in Storage	-	-	-24,000	-			-19,700	-

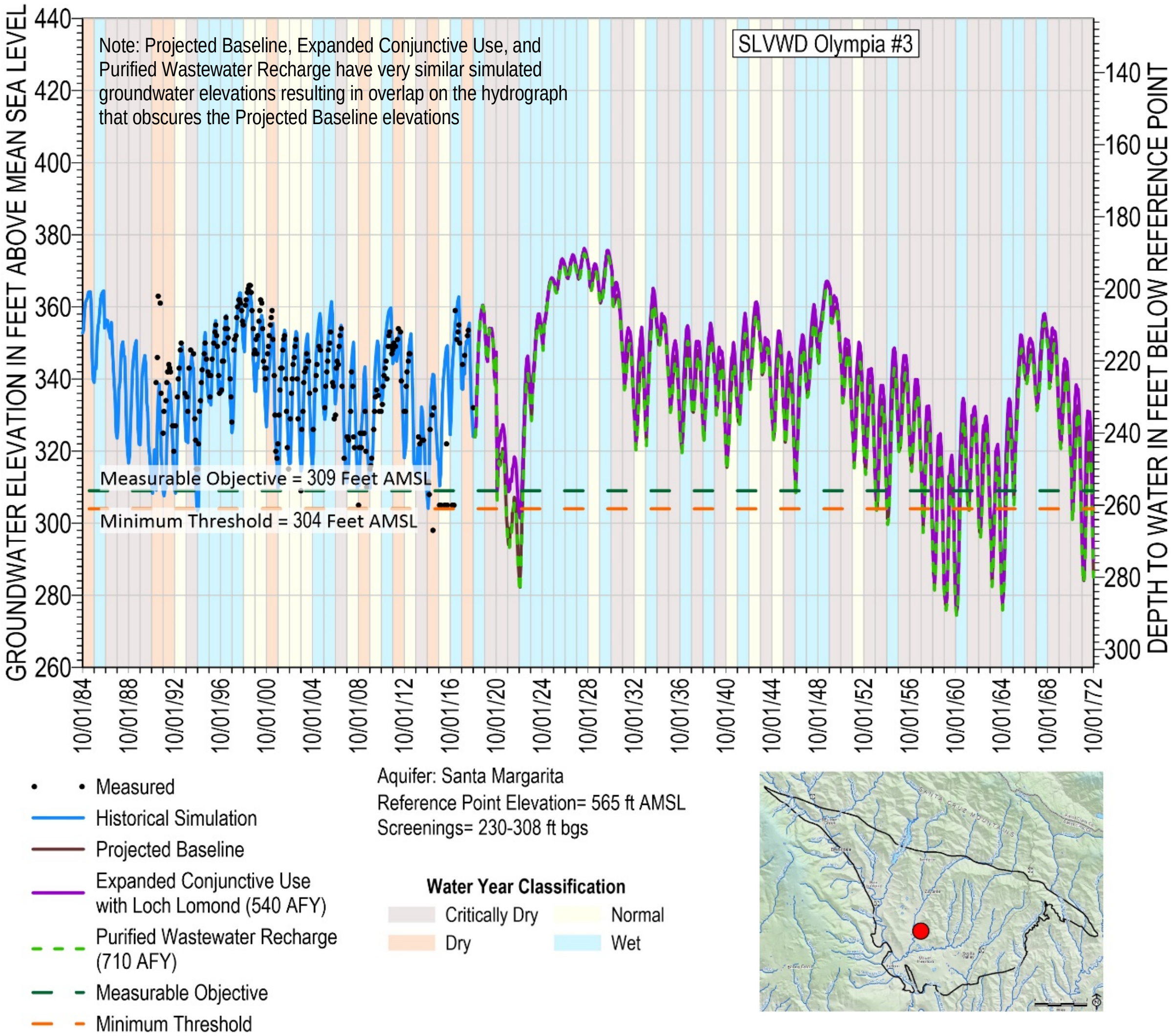
*Small discrepancies between total inflow and outflow may occur due to rounding

Table 4-2. 540 AFY Conjunctive Use Project Groundwater Budget by Aquifer

Water Budget Components Average Total for Water Budget Period in parenthesis (AF)		540 AFY Conjunctive Use 2020-2072			
		Santa Margarita Aquifer	Monterey Formation	Lompico Aquifer	Butano Aquifer
Inflows	Precipitation Recharge	5,700	1,300	900	3,600
	Subsurface Inflow	0	0	0	100
	Return flows (System Losses, Septic Systems, Quarry, Irrigation)	500	200	200	200
	Streambed Recharge	1,600	800	400	3,300
	Flow from Other Aquifers	0	300	1,600	600
	Inflow Totals	*7,800*	*2,600*	*3,000*	*7,700*
Outflows	Groundwater Pumping	700	100	1,000	400
	Subsurface Outflow	0	0	0	100
	Discharge to Creeks	6,300	2,120	1,400	6,900
	Flow to Other Aquifers	1,100	400	600	400
	Outflow Totals	*8,000*	*2,600*	*3,000*	*7,800*
Storage	Average Annual Change in Storage	-200	0	0	-100
	Cumulative Change in Storage	-9,600	-2,400	-2,700	-4,500

*Small discrepancies between total inflow and outflow may occur due to rounding

Figure 4-2. SLVWD Olympia #3 Simulated Groundwater Levels (Santa Margarita Aquifer)



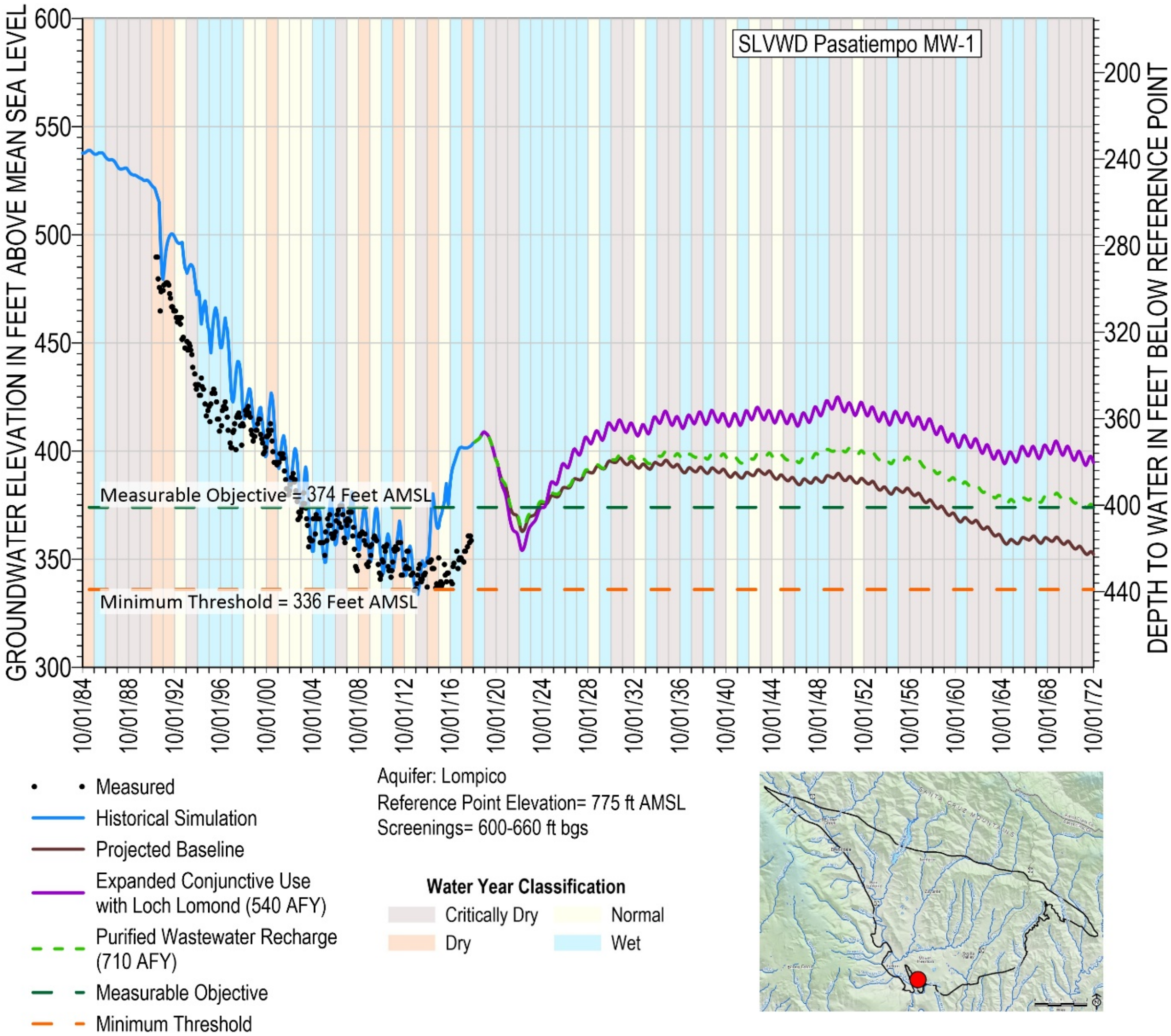


Figure 4-3. SLVWD Pasatiempo MW-1 Simulated Groundwater Levels (Lompico Aquifer)

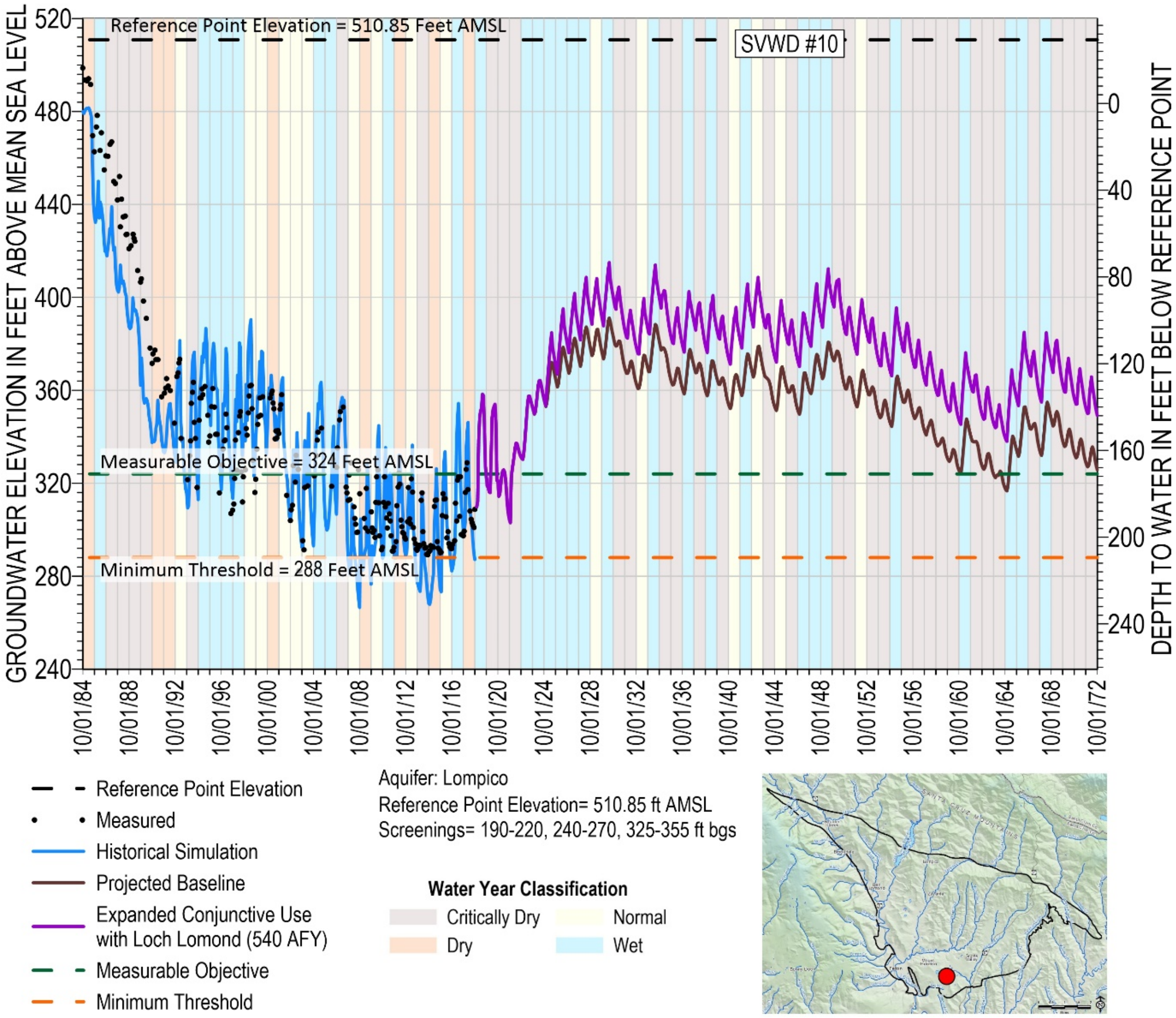


Figure 4-4. SVWD #10 Simulated Groundwater Levels (Lompico Aquifer)

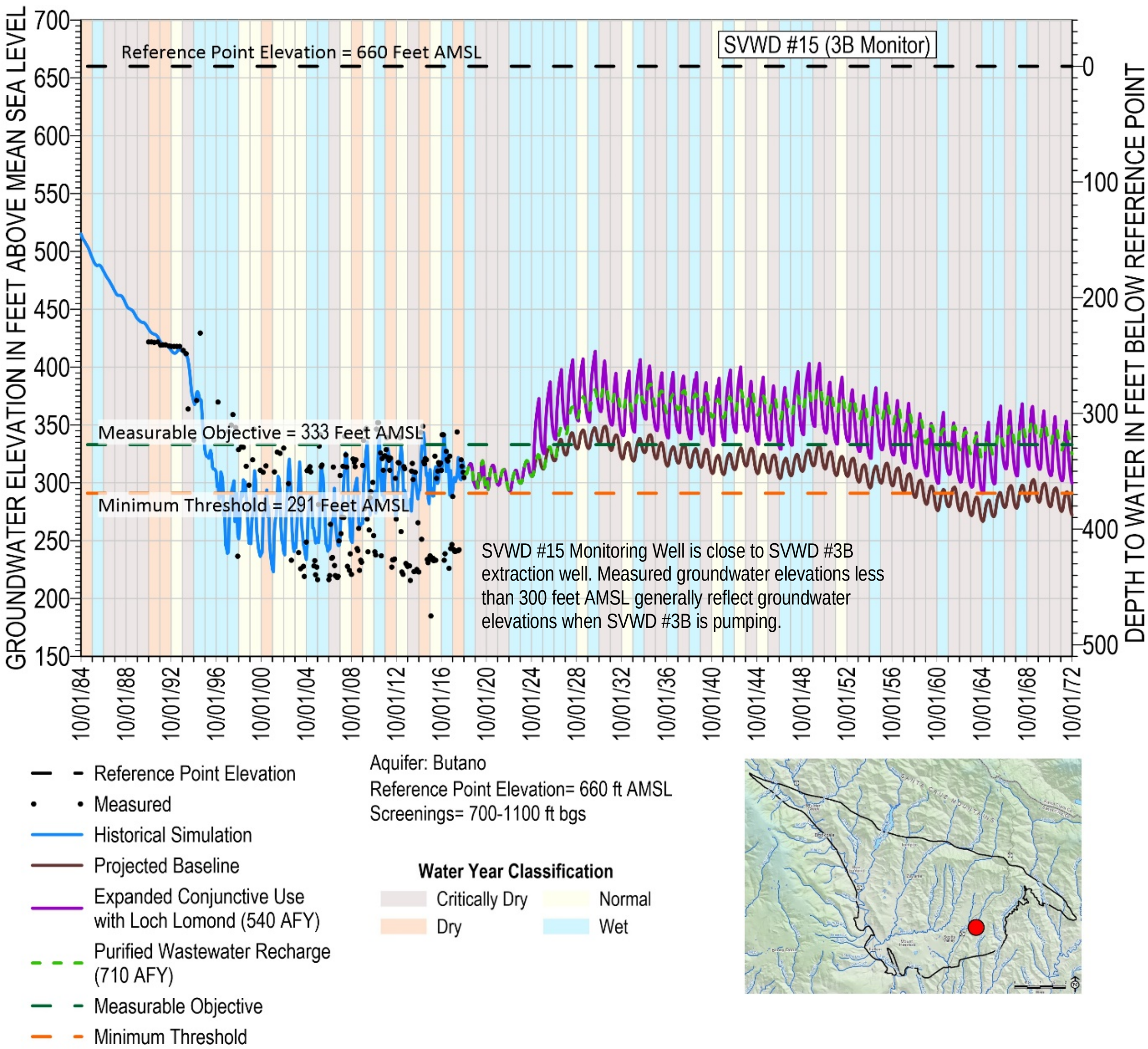


Figure 4-5. SVWD #15 Monitor Simulated Groundwater Levels (Butano Aquifer)

4.3.7 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 SGMA grants SMGWA legal authority to adopt rules, regulations, ordinances, and resolutions necessary to achieve sustainability. Water use efficiency and conjunctive use projects make use of preserving existing water resources already within each member agency's system to which each agency already has access. Water transfers and purchases between agencies will comply with all legal requirements.

4.3.8 Estimated Costs and Funding Plan

Projects and management actions within this section will rely on a significant amount of existing infrastructure and in the case of additional water use efficiency will expand currently implemented programs. Additional infrastructure such as pipelines, pump stations, interties, injection wells and treatment capacity expansions will be required as part of the expanded conjunctive use with Loch Lomond and groundwater replenishment projects. Costs associated with these projects will be funded through a combination of increased operating revenue and outside funding sources. SLVWD has already received Proposition 50 grant funds for CEQA permitting required to expand conjunctive use within their system. Potential outside funding sources include Integrated Regional Water Management Grant Programs (IRWM), Sustainable Groundwater Management Grant Program, State Revolving Fund low interest loans, USDA grants and/or low interest loans, or USBR Drought Resiliency and/or Title XVI Recycled Water grants. For the more costly projects, securing outside funding ~~in some form~~ will be needed for the projects to be affordable for ~~local~~beneficial users.

A summary of estimated costs is included in Table 4-3. Other project related costs presented below include engineering, permitting, land acquisition, environmental, special studies, legal, water rights, and other indirect costs. Cost estimates were prepared to Advancement of Cost Engineering (AACE) Estimate Class 5 intended for conceptual and planning level uses.

Table 4-3. Group 2, Tier 1 Estimated Project Costs

Project	Capital Construction Cost	Other Project Related Cost	Total Capital Cost	Annual O&M Costs
SLVWD, and SVWD and County Additional Water Use Efficiency	$0.9 M	$1.0 M	$1.9 M	$0.9 M
SLVWD Existing Infrastructure Expanded Conjunctive Use (Phase 1)	$0.5 M	$2.8 M	$3.3 M	$0.2 M
SLVWD and SVWD Inter-District Conjunctive Use with Loch Lomond (Phase 2)	$25.1 M	$26.7 M	$51.7 M	$2.0 M

4.3.9 Management of Groundwater Extractions and Recharge

The Additional Water Use Efficiency activities and Expanded Conjunctive Use with Loch Lomond projects target to reduce groundwater pumping by SLVWD and SVWD. Reductions in groundwater pumping allow aquifers to passively recharge around the extraction wells being pumped less. Reduced pumping will contribute to increased groundwater levels and groundwater in storage. Increased groundwater extractions in dry years when surface water is less available will need to be managed such that minimum thresholds are not exceeded. Management actions are described in the 2020 Water Shortage Contingency Plan included in SVWD and SLVWD's joint 2020 Urban Water Management Plan (UWMP). These actions are developed to address supply shortages that take into account groundwater levels approaching minimum thresholds and extraction averages compared to projected long-term average baseline pumping (WSC and M&A, 2021).

The GSP monitoring network will be used to track groundwater levels, groundwater extraction, and groundwater quality by cooperating agencies to evaluate pumping impacts, measures of sustainability, and effects of implemented GSP projects and management actions on beneficial groundwater users and uses.

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

4.4.1 Project Descriptions, Objectives, and Circumstances for Implementation

Projects and management actions presented in this section are designated as Group 2, Tier 2 and comprise projects that rely on surface water sources outside of the Basin. The following subsections provide a detailed project description followed by a summary of objectives and discussion of any circumstances for implementation for Tier 2 projects.

4.4.1.1 Transfer for Inter-District Conjunctive Use

Project Description

Similar to the expanded conjunctive use projects presented in Sections 4.3.1.2 and 4.3.1.3, this is a conjunctive use project, but it relies on treated surface water from outside of the Basin to offset some or all SLVWD and SVWD groundwater pumping during the wet season months. Treated source water would be provided by the City of Santa Cruz from its San Lorenzo River and North Coast sources when excess water is available.

A majority of the City of Santa Cruz water system relies on local surface water supplies, which include the North Coast sources, the San Lorenzo River, and Loch Lomond. The North Coast sources consist of surface diversions from three coastal streams and a natural spring. The San Lorenzo River is the City's largest source of water supply through their primary surface water diversion, Tait Diversion, and is supplemented by shallow, auxiliary wells located directly across the river. The City of Santa Cruz's Felton Diversion is a secondary diversion on the San Lorenzo River within the Basin. The diversion is an inflatable dam and intake structure about 6 miles upstream from the Tait Diversion. Water is pumped from this diversion to Loch Lomond to augment storage in the reservoir during dry years when natural inflow from Newell Creek, which feeds Loch Lomond, is low.

Project Objectives

The City of Santa Cruz Transfer for Inter-District Conjunctive Use project has the primary objective of helping recover groundwater levels in the Lompico aquifer in the Scotts Valley area. It would allow for passive groundwater recharge in the areas where the SLVWD and SVWD extract groundwater by using treated surface water supply from City of Santa Cruz in lieu of groundwater pumping. Conjunctive use projects have the potential to increase groundwater levels and create additional groundwater in storage if adequate amounts of treated surface water are available.

Circumstances for Implementation

The City of Santa Cruz Transfer for Inter-District Conjunctive Use is currently a conceptual project. In general, 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 SLVWD's and SVWD's demands. Some of the City of Santa Cruz's surface water is currently limited by water right place of use restrictions and the City has prepared a draft EIR evaluating the potential for significant environmental impacts from improved flexibility for operation of the City's water system while enhancing stream flows for local anadromous fisheries. The draft EIR public review period is from June 10 to July 26, 2021. To improve operational flexibility of the water system, the City of Santa Cruz is proposing water rights modifications to its existing rights, permits, and licenses to expand the authorized place of use, to better utilize existing diversions, and to extend the City's time to put water to full beneficial use. A purchase water agreement would need to be established between inter-SMGB agencies (i.e., SLVWD and SVWD) and the City of Santa Cruz.

If a conjunctive use project using sources from within the Basin is implemented, it is unlikely a conjunctive use project using water from outside of the Basin would also be implemented (and vice versa) because there is not enough wet season demand for both conjunctive use projects at the same time.

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

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

The City of Santa Cruz has used the Basin groundwater model to simulate some preliminary ASR options for different ASR configurations and operations. However, its ASR feasibility study in the Basin has generally been deferred while this GSP is developed to ensure an ASR project is designed and operated in a manner that does not prevent the Basin from achieving sustainability. The City of Santa Cruz is also evaluating and pilot testing ASR in the neighboring Santa Cruz Mid-County Basin.

Project Objectives

The potential ASR project is a drought storage project for the City of Santa Cruz because it has limited water storage options. The objective is to store treated surface water in the Lompico aquifer for use in drought years. For the SMGWA to support a storage project such as this, there must be benefits to the Basin that would likely need to include a reduction in depletion of interconnected surface water and increased groundwater levels. To achieve this, the project will need to leave an agreed amount of water in the aquifer to provide a benefit to the Basin.

The ASR project feasibility study will need to include an evaluation of potential adverse impacts, such as property damage from high groundwater levels, groundwater quality degradation, reduction in groundwater baseflows to creeks, and groundwater levels falling below minimum thresholds when the City of Santa Cruz needs to use their drought storage.

Circumstances for Implementation

The potential ASR project is a drought storage project for the City of Santa Cruz, however, for it to be supported by the SMGWA it needs to operate within the GSP's sustainable management criteria. If a feasibility study shows an ASR project to be technically feasible, it will also need to demonstrate that it has benefits to groundwater beneficial users and uses, such as groundwater dependent ecosystems, municipal users, and private domestic users.

4.4.2 Public Noticing

Public notice for all aspects of an ASR project will be carried out by the City of Santa Cruz prior to the start of the project. Public noticing is anticipated to occur through compliance with CEQA for any facilities or plans associated with the project.

Projects will be approved through regular member agency public board or council meetings in which public discussions or comments will occur. Future notification of the public for pilot testing or long-term implementation will be done prior to initiation of the project.

4.4.3 Overdraft Mitigation and Management Actions

An ASR project will not permanently stop overdraft of the Basin on its own. It is not designed for that purpose, although if combined with another potential project(s) included in this GSP it may cumulatively increase groundwater in storage.

4.4.4 Permitting and Regulatory Process

The conjunctive use and ASR projects presented under this section will require an EIR to be developed in compliance with CEQA. Upon completion of the CEQA process, the cooperating agencies' boards and/or councils shall take actions to certify the CEQA work and approve projects. At this early stage of planning, it is unknown if any modifications to existing water rights would be required for these projects, or if a storage supplement could be filed through an administrative process.

4.4.5 Timetable for Implementation

The ASR project is only in the preliminary planning stages. Key next steps are to fully determine project feasibility and Basin benefits. The ASR project will continue to be evaluated over the next year or two.

The Transfer for Inter-District Conjunctive Use project is purely conceptual at this stage with no plan to conduct a feasibility study. If Phase 2 of the Expanded Conjunctive Use project is completed with treated Loch Lomond water being treated by the City of Santa Cruz and piped back up to south Scotts Valley in lieu of pumping groundwater by SLVWD and SVWD, the infrastructure will then be in place to supply the treated water needed for both ASR and transfer of surface water to the Basin for inter-district conjunctive use.

4.4.6 Expected Benefits

The transfer of treated surface water from outside the Basin for inter-district conjunctive use will have similar benefits as described in Section 4.3.6, if the volume transferred averages at least 540 AFY over the long-term. Benefit will be proportional to the volume of water available for conjunctive use and resulting in-lieu recharge.

Expected benefits from ASR are temporary increased groundwater levels and groundwater in storage. The benefits are temporary until a drought period when the stored water is needed and groundwater levels and storage decline until more drought storage can be injected into the aquifer. How the ASR project can be configured and operated so it does not negatively impact the Basin is still being evaluated. To provide a benefit to the Basin, the project will need to leave an agreed amount of water in the aquifer to improve groundwater levels and groundwater discharge to creeks.

4.4.7 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 SGMA grants SMGWA legal authority to adopt rules, regulations, ordinances, and resolutions necessary to achieve sustainability. Water use efficiency and conjunctive use projects make use of preserving existing water resources already within each member agency's system to which each agency already has access. Water transfers and purchases between agencies will comply with all legal requirements.

4.4.8 Estimated Costs and Funding Plan

Projects included in this section will require additional new infrastructure such as pipelines, interties, pump stations and treatment capacity expansions and costs associated with these would be funded through a combination of increased operating revenue and outside funding sources. Potential outside funding sources could include IRWM Grant Programs, Sustainable Groundwater Management Grant Program, State Revolving Fund low interest loans, USDA grants and/or low interest loans, or USBR Drought Resiliency and/or Title XVI Recycled Water grants. Without outside funding, these projects are very likely not financially feasible.

A summary of estimated costs is presented in Table 4-4. Other project related costs presented below include engineering, permitting, land acquisition, environmental, special studies, legal, water rights, and other in-direct costs. Cost estimates were prepared to AACE Estimate Class 5, intended for conceptual and planning level uses.

Table 4-4. Group 2, Tier 2 Estimated Project Costs

Project	Capital Construction Cost	Other Project Related Cost	Total Capital Cost	Annual O&M Costs
Inter-District Transfer for Conjunctive Use	$15 M	$16 M	$31 M	$2.5 M
Aquifer Storage & Recovery Project in Scotts Valley Area of the Basin	$25 M	$26.6 M	$51.6 M	$2.5 M

4.4.9 Management of Groundwater Extractions and Recharge

The Transfer for Inter-District Conjunctive Use project intends to reduce groundwater pumping by SLVWD and SVWD. Reductions in groundwater pumping allow aquifers to passively recharge around the extraction wells being pumped less. Reduced pumping will contribute to increased groundwater levels and groundwater in storage. Increased groundwater extractions in dry years when surface water is less available will need to be managed such that minimum thresholds are not exceeded. Management actions are described in the 2020 Water Shortage Contingency Plan included in SVWD and SLVWD's joint 2020 Urban Water Management Plan (UWMP). These actions are developed to address supply shortages that take into account groundwater levels approaching minimum thresholds and extraction averages in comparison with projected long-term average baseline pumping (WSC et al., 2021).

The ASR project will need to be designed to operate such that it does not draw groundwater levels down below minimum thresholds for extended periods of time without the means to recharge the aquifers again before significant and unreasonable conditions occur.

The GSP monitoring network will be used to track groundwater levels, groundwater extraction, and groundwater quality by cooperating agencies to evaluate pumping impacts, measures of sustainability, and effects of implemented GSP projects and management actions on beneficial groundwater users and uses.

Of the potential projects included in Tier 2 of Group 2, ASR using treated surface water from the City of Santa Cruz's San Lorenzo River and North Coast is the only project with a potential to change groundwater quality. A project feasibility study for ASR would include, amongst other things, an evaluation of the potential for groundwater quality degradation. Two potential causes of degradation are 1) dissolution of metals, such as arsenic, from the geologic formation into groundwater because of changes in geochemistry caused by mixing surface water and groundwater, and 2) fate and transport of a contaminant plume causing contamination of previously unimpacted wells or surface water. A feasibility study would identify which beneficial groundwater users would be impacted and whether minimum thresholds (drinking water standards) would be exceeded at RMPs. With potential ASR targeting the Lompico aquifer in an area of Scotts Valley, beneficial users of groundwater most likely directly impacted are Mount Hermon, SLVWD, and SVWD extraction wells screened in the Lompico aquifer. Surface water baseflow quality may indirectly be impacted because even though the Lompico aquifer does not contribute baseflows to Bean Creek, ASR model simulations show increased baseflows from the Santa Margarita aquifer in response to storing water in the Lompico aquifer. Current understanding is that increasing groundwater levels in the Lompico aquifer where there are currently lowered levels will reduce induced recharge through the Santa Margarita aquifer thereby keeping more recharge in the Santa Margarita aquifer for baseflows. There are very few private domestic wells in the area with a potential to be impacted because residents of the City of Scotts Valley and Mount Hermon are supplied municipal water. Private wells outside of the City limits are upgradient of where ASR may take place. The DAC will not be impacted as that community is over 8 miles upgradient from where ASR would potentially take place.

4.5 Projects and Management Actions Using Purified Wastewater Sources (Group 2, Tier 3)

4.5.1 Project Descriptions, Objectives, and Circumstances for Implementation

Projects and management actions presented in this section have been designated under Group 2, Tier 3 and represent projects that obtain their source water from purified wastewater supplies. The following subsections provide a detailed project description followed by a summary of objectives and discussion of any circumstances for implementation.

4.5.1.1 Purified Wastewater Recharge in Scotts Valley Area of the Basin (710 – 1,500 AFY Treated at Existing Facility Outside of the Basin)

A purified wastewater recharge project in the Scotts Valley area would use advanced water purification technology to treat existing secondary-treated effluent source water from the City of Santa Cruz Wastewater Treatment Facility (WWTF). Advanced treated wastewater would be injected into the Lompico aquifer in the Scotts Valley area. The project could use the expanded capacity of Soquel Creek Water District's (SqCWD) Chanticleer Advanced Water Purification Facility (AWPF) that is scheduled to begin construction in 2021 as part of the Pure Water Soquel project.

SVWD is in the process of assessing the feasibility and benefit to the Basin of using purified wastewater to replenish the Lompico aquifer. In 2020, SVWD performed an alternatives analysis to assess alternative purified wastewater projects ranging between 250 to 2,600 AFY (Kennedy/Jenks, 2020). Modeling performed in preparation of this GSP shows 710 AFY of replenishment would be enough to raise groundwater levels in the Lompico aquifer by 20 to 80 feet (see Section 4.5.6 for results) and meet measurable objectives. Preliminary modeling results indicate that if the expanded conjunctive use project with Loch Lomond (Phase 1 and 2) is not implemented, recharge of purified wastewater in excess of 710 AFY will create drought storage that can be used while still meeting measurable objectives.

To generate 710 AFY of purified wastewater, Pure Water Soquel Chanticleer AWPF would require a partial expansion, while full expansion of the Pure Water Soquel Chanticleer AWPF would generate 1,500 AFY of purified wastewater. In both the 710 and 1,500 AFY alternatives, secondary-treated effluent would be conveyed to the Chanticleer AWPF via planned infrastructure as part of the Pure Water Soquel project. Secondary-treated effluent would be treated using micro-filtration, reverse osmosis, and ultraviolet light and advanced oxidation process. Purified wastewater would be conveyed to the SVWD's El Pueblo yard for final conditioning and injected into wells near El Pueblo yard to recharge the Lompico aquifer. Brine is intended to be discharged via the Santa Cruz outfall.

A purified wastewater project is a high-cost option, but with regional participation it could provide greater water availability as well as the benefit of shared infrastructure and costs.

Project Objectives

The 710 AFY alternative's objective is to recharge the Lompico aquifer in the Scotts Valley area to increase groundwater levels and groundwater discharge to creeks. For alternatives recharging more than 710 AFY, the excess water recharged may be used as drought supply.

Circumstances for Implementation

The expanded conjunctive use with Loch Lomond (Phase 1 and 2) projects are a cheaper option for raising groundwater levels in the Lompico aquifer than a purified wastewater recharge project. However, the advantage of using purified wastewater is that it is a drought resilient source, while conjunctive use is reliant on having excess surface water. With concerns that changing climate is altering the timing and intensity of rainfall events that impact surface water runoff, conjunctive use may not solely provide the benefits needed to achieve sustainability.

As a backup option for achieving sustainability, and as a source of drought supply storage that can have multi-agency benefits, purified wastewater recharge is a potential project that the cooperating agencies are now considering.

Technical feasibility of the project is still largely unknown and further investigation is required. Several key factors that will determine feasibility are:

- Public perception related to perceived public health issues associated with using purified wastewater as a source
- Groundwater modeling required to assess available capacity in the groundwater basin and ability to meet regulatory travel times
- Pilot testing of Lompico aquifer injection capacity

- Water quality testing is required to assess potential impacts to the Basin and to meet regulatory and GSP requirements
- Dependability on other agencies to supply the source wastewater and treatment at the Chanticleer AWPF (i.e., City of Santa Cruz and SqCWD)
- Concept for Pure Water Soquel expansion capacity was initially intended for the Santa Cruz Mid-County Basin and not for the Santa Margarita Basin
- Complex multi-agency partnerships and institutional agreements would be required (i.e., cost sharing, operational agreements, etc.)
- Lack of conveyance network with other agencies to sell excess recharged water and considerable capital and operations and maintenance (O&M) cost for treatment of purified water and conveyance to Scotts Valley

4.5.1.2 Purified Wastewater Recharge in Scotts Valley Area of the Basin (3,500 AFY Treated at New Facility inside the Basin)

Similar to the purified wastewater recharge project presented in the previous subsection, this larger project utilizes advanced water purification technology to treat existing secondary-treated effluent source water from the City of Santa Cruz WWTF for injection into the Lompico aquifer. The difference between this 3,500 AFY project and the previous project with a 710 to 1,500 AFY capacity is that this project requires a new AWPF site in or near Scotts Valley. A project of this capacity would need to be a regional project with separate infrastructure from that used by Pure Water Soquel. Cooperating agencies are still in early discussions amongst themselves to determine if this project has potential regional support before assessing its feasibility.

Under this project 4 million gallons per day (MGD) of secondary-treated effluent would be conveyed to a new Scotts Valley based-AWPF via new conveyance infrastructure. Secondary-treated effluent would be put through a rigorous advance treatment using technology that meets regulatory requirements and industry best practices for similar sites throughout California. Purified wastewater would be conveyed and injected into injection wells near SVWD's El Pueblo yard and at several other suitable location in Scotts Valley. Brine discharge will need new infrastructure to connect to the Santa Cruz outfall.

Project Objectives

The 3,500 AFY purified wastewater recharge alternative's objective is to recharge the Lompico aquifer through active injection in the Scotts Valley area to increase groundwater levels, groundwater in storage, and groundwater discharge to creeks. Recharged purified wastewater in excess of 710 AFY may be used by multiple cooperating agencies as drought supply.

Circumstances for Implementation

A project of this size and cost can only be implemented if there is regional multi-agency benefit to the cooperating agencies. Longer drought periods and the threat of wildfires are considerations that need to be weighed against the costs and benefits of a drought resilient supply. This is a long-range project that needs to be studied together with the lesser capacity alternatives described in Section 4.5.1.1. The different project sizes will have different cost-benefits and operational strategies to maximize storage potential and control loses to creeks that may dictate which project size is the most beneficial to the Basin and its users.

4.5.1.3 Purified Wastewater Augmentation at Loch Lomond

This project involves augmenting Loch Lomond storage with purified wastewater. Advanced treatment would occur via an AWTF located at or near City of Santa Cruz WWTF employing full advanced treatment technology that meets regulatory requirements and industry best practices. The project would convey purified wastewater from the AWFT to Loch Lomond where it would be blended with raw water in the reservoir, a source of municipal drinking water supply for the City of Santa Cruz. Brine discharge would be via connection to the existing City of Santa Cruz ocean outfall. Other infrastructure would include a pump station near the treatment facility, conveyance pipelines and diffuser discharge facility at Loch Lomond (Kennedy/Jenks, 2018).

The available supply for a surface water augmentation 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 regulation. Monthly wastewater flows are generally their lowest during summer months thereby limiting the size of the surface water augmentation project. This also happens to correspond with the time in which there is more available capacity in Loch Lomond. The ability to augment Loch Lomond may be limited to when there is available capacity in the reservoir to accept advanced treated flows. Reservoir augmentation would take place about half of each year and be sized to produce 3.2 MGD of advanced treated water when the reservoir is being drawn down to meet demands. Production would scale down in the winter months when the reservoir is filled naturally by rainfall and runoff. The project could be sized larger to draw the reservoir down in the summer as source of water for conjunctive use or ASR type projects (Kennedy/Jenks, 2018).

Project Objectives

A purified wastewater augmentation 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 the City of Santa Cruz in the dry months, in all seasons Loch Lomond could be used as a climate independent resource for the region. If sized appropriately, the project could offset groundwater pumping by the City of Santa Cruz in the Santa Cruz Mid-County Basin, or if sold to SLVWD or SVWD offset pumping in the Santa Margarita Basin thereby raising groundwater levels in the locations where pumping is offset.

Circumstances for Implementation

The project provides an alternative means of utilizing drought resilient purified wastewater to augment Loch Lomond instead of for aquifer recharge and use as drought supply. Technical feasibility of the project is still largely unknown and further investigation is required. Several key factors that will determine feasibility are:

- There is a regulatory pathway for reservoir water augmentation projects, and though no projects are currently permitted in California, there are three projects in various stages of planning, design, and construction
- Requires meeting reservoir retention and dilution times
- Facility operation would be limited when the reservoir is full due to natural runoff
- Climate change and resiliency study by the City of Santa Cruz is in progress to understand true benefit of supply in dry years
- Project may require the City of Santa Cruz to operate Loch Lomond differently in the future
- Public perception related to perceived public health issues associated with using wastewater as a source supply for drinking water

4.5.2 Public Noticing

Public notice for all aspects of the project will be carried out by member agencies prior to the start of the project. Public noticing is anticipated to occur through compliance with CEQA for any facilities or plans associated with the project.

Projects will be approved through regular member agency public board or council meetings in which public discussions or comments will occur. Future notification of the public for any additional pilot testing or long-term implementation would be done prior to initiation of the project.

4.5.3 Overdraft Mitigation and Management Actions

The purified wastewater recharge projects presented within this section use outside purified wastewater sources to recharge the Lompico aquifer and increase groundwater levels in the Scotts Valley area, thereby eliminating overdraft conditions. Where recharge capacity of the project exceeds 710 AFY, recharge provides for drought supply through indirect potable reuse.

The purified wastewater augmentation at Loch Lomond project will only help address lowered groundwater levels in the Lompico aquifer if a portion of the water can be used by SLVWD and/or SVWD in lieu of pumping groundwater from the Lompico aquifer in the Scotts Valley area.

4.5.4 Permitting and Regulatory Process

The projects presented under this section will require an EIR to be developed in compliance with CEQA. Upon completion of the CEQA process, cooperating agencies' boards and/or councils shall take actions to certify the CEQA work and approve projects. No new water rights are being requested as part of any of the projects presented under this section.

Any project involving recycled water is required to comply with the State's Water Quality Control Policy for Recycled Water. This policy includes the need for an antidegradation analysis demonstrating that the existing projects, reasonably foreseeable future projects, and other sources of loading to the basin included within the plan will, cumulatively, satisfy the requirements of State Water Board Resolution No. 68-16, Statement of Policy with Respect to Maintaining High Quality of Waters in California (Antidegradation Policy).

4.5.5 Timetable for Implementation

The projects presented herein are only in the conceptual planning stages. Project scopes and benefits are subject to change based on further analysis. Key next steps are properly determining feasibility of the projects and defining key benefits.

4.5.6 Expected Benefits

While basin groundwater levels have stabilized in the last few decades, supplemental sources of water from outside the Basin may be needed to increase Lompico aquifer groundwater levels and meet Basin sustainability objectives. After recharging enough purified wastewater to increase groundwater levels to measurable objectives, any additional water stored in the aquifer may be used to augment groundwater or surface water providing a drought resilient supply that will increase the cooperating agencies' water supply resiliency.

The groundwater model was used to simulate groundwater conditions in the Basin in response to injecting 710 AFY in the central and northern Scotts Valley area. The Basin groundwater budget and groundwater levels for the project simulation are compared against a baseline "no project" simulation. Both the project and baseline simulations account for projected climate change described in Appendix 2D. A project of greater capacity was not modeled.

Table 4-5 compares the Basin groundwater budgets for baseline conditions with injecting 710 AFY of purified wastewater into the Lompico aquifer. The project is simulated to, on average, have the following benefits to the Basin:

- 200 AFY more groundwater is left in storage
- 300 AFY more net groundwater discharge to creeks as baseflow

Compared to 540 AFY conjunctive use (Section 4.3.6, Table 4-1), the amount of groundwater discharge to creeks from 710 AFY purified wastewater recharge (Table 4-5) is very similar, but there is 75% more groundwater in storage because of direct injection into the Lompico aquifer.

Like the expanded conjunctive use with Loch Lomond project, groundwater storage losses for the 710 AFY purified wastewater injection simulation is mostly in the Santa Margarita aquifer due to reduced precipitation in the climate change projection used in the simulations (Table 4-6). With injection, storage losses in critically dry water years are simulated to be half of that if there was no project because of the cumulative benefits of leaving 710 AFY in storage each year (Table 4-5).

The groundwater model is used to simulate benefits to groundwater levels from injection of 710 AFY of purified wastewater (green dashed line on Figure 4-2 through Figure 4-5, and Figure 4-6). In the Olympia wellfield area (Figure 4-2), there is no increase in groundwater levels because all injection takes place into the Lompico aquifer south of Bean Creek and there is no direct connection to the Santa Margarita aquifer north of Bean Creek. The most distant monitoring well from where injection takes place is SLVWD Pasatiempo MW-1. The hydrograph for this well shown on Figure 4-3 simulates around 20 feet of recovery which is a smaller groundwater level improvement than expanded conjunctive use. The difference in benefit is because resting the Pasatiempo wellfield through conjunctive use is more impactful than injection some 2 miles to the northeast. SVWD #10 (Figure 4-4), in the south Scotts Valley area, also has a smaller groundwater level increase than expanded conjunctive use because injection is about 1 mile away.

At a location close to injection, SVWD #11A (Figure 4-6), groundwater levels are simulated to increase up to 80 feet, well above those predicted for expanded conjunctive use at this location. SVWD #15 Monitor (Figure 4-5) is a monitoring well screened in the Lompico and Butano aquifers. It has a 50-foot groundwater level benefit, which is similar to the expanded conjunctive use but without the seasonal fluctuations that occur in the expanded conjunctive use simulation. Its resultant groundwater levels do not have seasonal fluctuations since injection occurs uniformly throughout the year.

The purified wastewater augmentation at Loch Lomond project has unknown benefits to the Basin at this early stage of the City of Santa Cruz’s recycled water planning efforts.

Table 4-5. Baseline and 710 AFY Purified Wastewater Recharge Project Groundwater Budget

Water Budget Components Average Total for Water Budget Period in parenthesis (AF)		Projected Baseline 2020-2072				710 AFY Injection 2020-2072			
		Wet Water Year Average	Critically Dry Water Year Average	Annual Average (AF)	Average Percent of Total Inflow or Outflow	Wet Water Year Average	Critically Dry Water Year Average	Annual Average (AF)	Average Percent of Total Inflow or Outflow
Inflows	Precipitation Recharge	23,700	3,300	12,100	56%	23,700	3,300	12,100	54%
	Subsurface Inflow	100	100	100	<1%	100	100	100	<1%
	Return flows (System Losses, Septic Systems, Quarry, Irrigation)	1,100	1,100	1,200	56%	1,100	1,100	1,100	5%
	Streambed Recharge	10,700	6,600	8,400	39%	10,700	6,500	8,400	37%
	Injection	0	0	0	0%	600	600	620	3%
	Inflow Totals	*35,600*	*11,100*	*21,800*		*36,200*	*11,600*	*22,400*	
Outflows	Groundwater Pumping	2,600	2,900	2,800	12%	2,600	3,100	2,900	13%
	Subsurface Outflow	100	100	100	1%	100	100	100	<1%
	Discharge to Creeks	25,600	14,600	19,400	87%	25,800	15,000	19,700	87%
	Outflow Totals	*28,300*	*17,600*	*22,300*		-2,600	-3,100	*22,700*	
Storage	Average Annual Change in Storage	7,400	-6,400	-500	-	2,600	-3,100	-300	-
	Cumulative Change in Storage	-	-	-24,000	-			-16,300	-

*Small discrepancies between total inflow and outflow may occur due to rounding

Table 4-6. 710 AFY Purified Wastewater Recharge Project Groundwater Budget by Aquifer

Water Budget Components Average Total for Water Budget Period in parenthesis (AF)		710 AFY Injection 2020-2072			
		Santa Margarita Aquifer	Monterey Formation	Lompico Aquifer	Butano Aquifer
Inflows	Precipitation Recharge	5,700	1,300	900	3,600
	Subsurface Inflow	0	0	0	90
	Return flows (System Losses, Septic Systems, Quarry, Irrigation)	500	200	200	150
	Streambed Recharge	1,600	800	400	3,330
	Flow from Other Aquifers	3,300	600	2,300	1,160
	Inflow Totals	*7,800*	*2,500*	*2,800*	*7,800*
Outflows	Groundwater Pumping	900	100	1,400	520
	Subsurface Outflow	0	0	0	100
	Discharge to Creeks	6,100	2,100	1,500	6,920
	Flow to Other Aquifers	4,400	700	1,500	860
	Outflow Totals	*8,000*	*2,500*	*3,500*	*7,900*
Storage	Average Annual Change in Storage	-200	0	-700	-100
	Cumulative Change in Storage	-9,300	-1,600	-3,000	-3,400

*Small discrepancies between total inflow and outflow may occur due to rounding

~~The groundwater model is used to simulate benefits to groundwater levels from injection of 710 AFY of purified wastewater (green dashed line on Figure 4-2 through Figure 4-5, and Figure 4-6). In the Olympia wellfield area (Figure 4-2), there is no increase in groundwater levels because all injection takes place into the Lompico aquifer south of Bean Creek and there is no direct connection to the Santa Margarita aquifer north of Bean Creek. The most distant monitoring well from where injection takes place is SLVWD Pasatiempo MW-1. The hydrograph for this well shown on Figure 4-3 simulates around 20 feet of recovery which is a smaller groundwater level improvement than expanded conjunctive use. The difference in benefit is because resting the Pasatiempo wellfield through conjunctive use is more impactful than injection some 2 miles to the northeast. SVWD #10 (Figure 4-4), in the south Scotts Valley area, also has a smaller groundwater level increase than expanded conjunctive use because injection is about 1 mile away.~~

4.5.7 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 SMGWA legal authority to pass regulations necessary to achieve sustainability. Water use efficiency projects make use of preserving existing sources already within each member agency's specific system to which each agency already has rights.

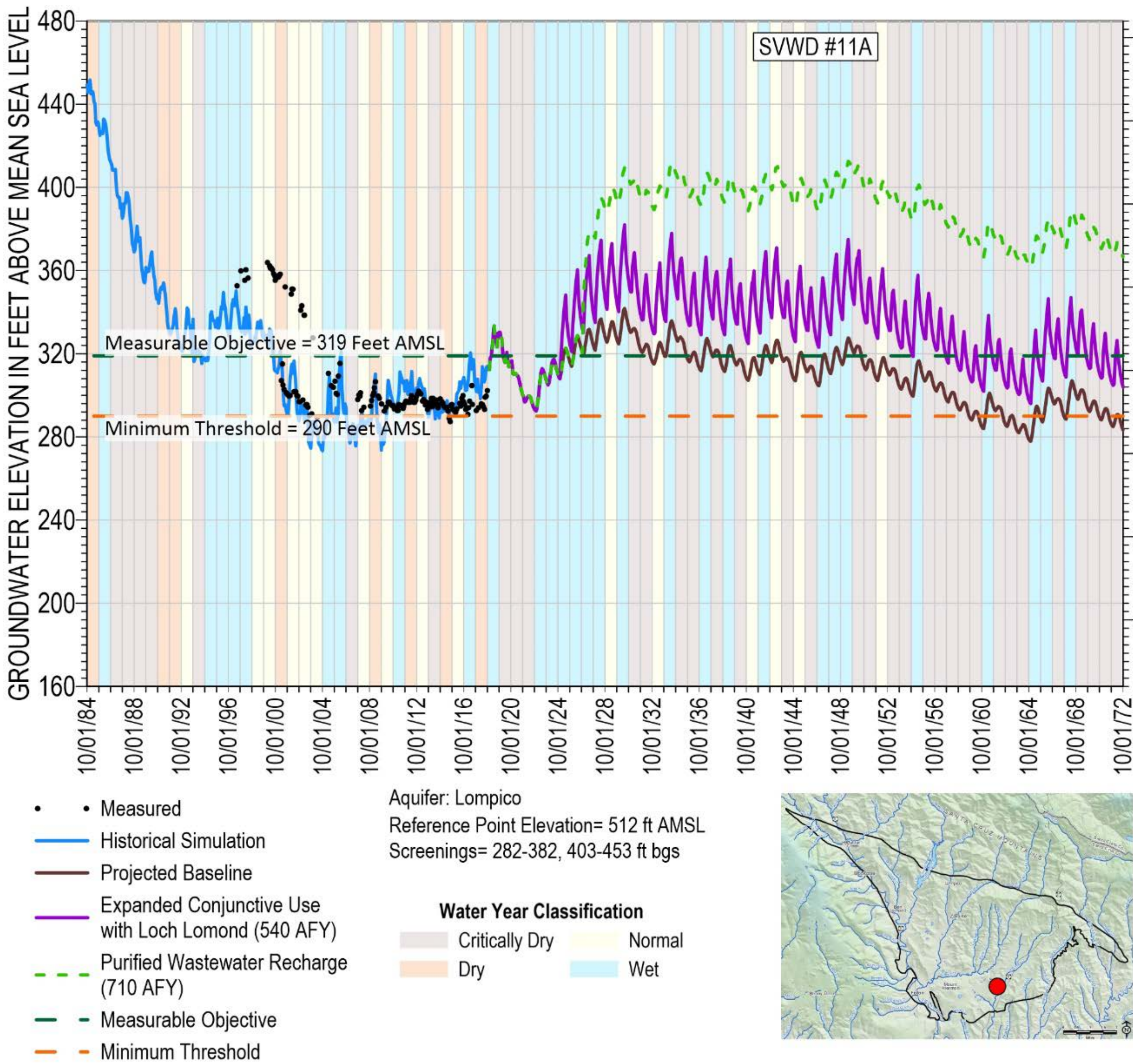


Figure 4-6. SVWD #11A Simulated Groundwater Levels (Lompico Aquifer)

4.5.8 Estimated Costs and Funding Plan

Projects included in this subsection require new infrastructure such as pipelines, interties, pump stations, injection wells, and new treatment facilities. Costs associated with the new infrastructure would be funded through a combination of increased operating revenue and outside funding sources. Potential outside funding sources could include IRWM Grant Programs, Sustainable Groundwater Management Grant Program, State Revolving Fund low interest loans, USDA grants and/or low interest loans, or USBR Drought Resiliency and/or Title XVI Recycled Water. The significant cost of the projects in this tier will require multi-agency collaboration, plus substantial outside funding to make them financially feasible.

A summary of costs is presented in Table 4-7. Other project related costs presented below include engineering, permitting, land acquisition, environmental, special studies, legal, water use rights, and other in-direct costs. Cost estimates were prepared to AACE Estimate Class 5 intended for conceptual and planning level uses.

Table 4-7. Group 2, Tier 3 Estimated Project Costs

Project	Capital Construction Cost	Other Project Related Cost	Total Capital Cost	Annual O&M Costs
Purified Wastewater Recharge in Scotts Valley Area of the Basin (710 – 1,500 AFY Treated at an Existing Facility Outside of the Basin)[1]	$61.4 M	$46.1 M	$107.5 M	$2.6 M
Purified Wastewater Recharge in Scotts Valley Area of the Basin (3,500 AFY Treated at a New Facility inside the Basin)	$167.9 M	$126 M	$293.9 M	$5.9 M
Purified Wastewater Augmentation at Loch Lomond	$117.2 M	$76.1 M	$193.3 M	$7.5 M

[1] Costs are shown for the larger 1,500 AFY project. The smaller 710 AFY project is estimated at $97.9 million in total costs with $2.1 million in annual O&M.

4.5.9 Management of Groundwater Extractions and Recharge

Two potential projects included in Tier 3 of Group 2 have the potential to impact groundwater quality by recharging purified wastewater into groundwater. To ensure a project does not degrade groundwater quality, the project proponent of a groundwater recharge project using purified wastewater must submit an antidegradation analysis to the CCRWQCB with the report of waste discharge to demonstrate compliance with the State's Antidegradation Policy. The antidegradation study needs to consider project impacts on the fate and transport of existing contaminant plumes causing contamination of previously unimpacted wells or surface water, and changes to the geochemistry of an aquifer thereby causing the dissolution of metals from the geologic formation into groundwater.

SWRCB approved projects are required to meet the following criteria (SWRCB, 2018):

- Compliance with regulations related to purified wastewater for groundwater recharge projects, including monitoring requirements for priority pollutants contained in California Code of Regulations, title 17 and California Code of Regulations, title 22 (including subsequent revisions), and recommendations by the SWRCB for the protection of public health pursuant to Water Code section 13523.

- Implementation of a monitoring program for CECs that is consistent with the SWRCB's Water Quality Control Policy for Recycled Water and any additional recommendations from the SWRCB.

Furthermore, a feasibility study would identify which beneficial groundwater users would be impacted and whether minimum thresholds (drinking water standards) would be exceeded at RMPs. With potential projects targeting the Lompico aquifer in Scotts Valley, beneficial users of groundwater most likely directly impacted are Mount Hermon, SLVWD, and SVWD extraction from the Lompico aquifer. Surface water baseflow quality may indirectly be impacted because even though the Lompico aquifer does not contribute baseflows to Bean Creek, modeled simulations of injection show increased baseflows from the Santa Margarita aquifer in response to injecting water in the Lompico aquifer. Current understanding is that increasing groundwater levels in the Lompico aquifer where there are currently lowered levels will reduce induced recharge through the Santa Margarita aquifer thereby keeping more recharge in the Santa Margarita aquifer for baseflows. There are very few private domestic wells in the area with the potential to be impacted because residents of the City of Scotts Valley and Mount Hermon are supplied municipal water. Private wells outside of the City limits are upgradient of where injection may take place. DACs will not be impacted at all as that community is over 8 miles upgradient from where injection would potentially take place.

All ~~recharge~~ water ~~by~~ injected~~ion wells~~ will be metered and subject to reporting to the CCRWQCB, ~~SWRCB~~ as well as to the SMGWA to be included in the GSP's Annual Reports. Monitoring wells associated with the project proponent's permit requirements will monitor groundwater quality changes from the project. Some of the monitoring wells may be included as representative monitoring points (RMPs) in future updates to the GSP. Extractions to recover water stored for drought supply will be metered and accounted for separately from native groundwater extractions. Data collected as part of recharge operations will create a record of changes in groundwater levels and quality by the project and will be used to evaluate project impacts on all beneficial users of groundwater and its contribution to achieving sustainability.

4.6 Identified Projects and Management Actions Requiring Future Evaluation (Group 3)

If Group 2 projects are deemed infeasible or anticipated outcomes change, SMGWA may look to Group 3 projects to meet SMGWA sustainability goals. The level of detail provided for Group 3 is significantly less detailed than Groups 1 and 2 because the activities listed have not yet been seriously considered for implementation.

4.6.1 SLVWD Olympia Groundwater Replenishment

The Olympia groundwater replenishment project is a potential aquifer replenishment project in SLVWD's North System. Injection wells at the Olympia wellfield would be used to replenish the Santa Margarita aquifer with treated surface water from available winter flows. The winter surface water flows available for replenishment would be those greater than ongoing operations, water rights, and fish flows.

Since the Olympia area Santa Margarita aquifer is a major contributor to baseflow in Zayante Creek, the project could only provide for operational storage for one season rather than as a drought reserve. It is unknown currently what the losses to baseflow would be as groundwater modeling of the project has not been undertaken.

Replenishment of the Santa Margarita aquifer in this area may be needed in the future if groundwater extraction in the area caused significant and unreasonable surface water depletions or chronic lowering of groundwater levels. Currently, there is some slight long-term declines in groundwater levels in the Olympia area.

Similar to the projects presented in the previous Sections 4.3.1.2 and 4.3.1.3, replenishing the Olympia wellfield area would be sourced by excess surface water in the North System and Felton System. If the Expanded Conjunctive Use project (Phase 1) and Inter-District Conjunctive Use project with Loch Lomond (Phase 2) are implemented and all available excess surface water is used by those projects, the Olympia Groundwater Replenishment project would not have source water. It is therefore considered an alternative project that would only be needed if groundwater extraction in the area caused significant and unreasonable surface water depletions or chronic lowering of groundwater levels.

Use of excess surface water for replenishment would directly recharge groundwater and increase groundwater levels instead of indirect or in-lieu passive recharge from conjunctive use presented in Sections 4.3.1.2 and 4.3.1.3. In addition to increasing groundwater storage in the Santa Margarita aquifer through direct recharge, a portion of the replenished water will discharge to creeks as baseflow.

4.6.2 Public/Private Stormwater Recharge and Low Impact Development

This project includes, where feasible, installation of small to medium scale, 10 AFY to 1,000 AFY per site, facilities to capture stormwater to recharge the Santa Margarita aquifer through surface spreading and/or constructed dry wells. Preliminary siting of such facilities could be within the Lockhart Gulch area where stormwater runoff is currently diverted, near an existing detention basin on Marion Avenue, or one of several previously disturbed sites in public ownership or on property owned by the Santa Cruz Land Trust. Benefits would be location dependent but would likely locally increase groundwater levels around the recharge site and increase Santa Margarita aquifer baseflows to creeks. If stormwater recharge location can be found in the Camp Evers area where the Monterey Formation is absent, it will also benefit the Lompico aquifer underlying the Santa Margarita aquifer. While low-impact development projects do have positive impacts on basin recharge their individual flow contributions are typically small due to their limited footprints.

4.6.3 Enhanced Santa Margarita Aquifer Conjunctive Use

This conceptual conjunctive use operational strategy builds on Phase 1 and 2 Expanded Conjunctive use project described in Section 4.3.1.2. and 4.3.1.3. Its objective is to maximize the conjunctive use of the Santa Margarita and Lompico aquifers based on wet and dry years.

It is proposed that SLVWD extract from the Santa Margarita aquifer (Olympia and Quail Hollow wellfields) instead of its Pasatiempo wells extracting from the Lompico aquifer in years when the Santa Margarita aquifer has high groundwater levels. This allows the SLVWD Pasatiempo wellfield to provide for in-lieu recharge of the Lompico aquifer. In dry years, when Santa Margarita aquifer groundwater are lowered in response to reduced recharge from rainfall and impacting baseflows to creeks, SLVWD’s Santa Margarita aquifer wells are rested by extracting instead Lompico aquifer groundwater recharged in the wet years.

The anticipated benefits of operating Santa Margarita and Lompico aquifer extractions in this way are that it maximizes the storage capacity of the Santa Margarita aquifer, operating it much like a surface reservoir. The expectation is that Santa Margarita aquifer groundwater will be available in the critical high water demand late summer and fall months when surface water is less available thereby maximizing conjunctive of the Lompico aquifer. By eliminating or reducing pumping from the SLVWD’s Santa Margarita aquifer wellfields in drought years, groundwater that would have been pumped can remain in the aquifer to support creek baseflows. It also provides SLVWD with drought storage in the Lompico aquifer when groundwater levels in its Santa Margarita aquifer wells are too low to pump. There are also potential benefits to SVWD and the City of Santa Cruz.

Groundwater modeling of this operational concept will be needed to determine if it is feasible given climate change is expected to result in more dry years than wet years, and that the wet years will be wetter than historically experienced. Understanding potential impacts on the Santa

Margarita aquifers contribution to creek baseflow and fate of the groundwater stored in the Lompico aquifer will also be important factors in determining its feasibility.

4.6.4 SLVWD Quail Hollow Pumping Redistribution

This project would add a new well within the SLVWD's system in order to redistribute pumping at the Quail Hollow area. SLVWD operates and maintains 2 active groundwater extraction wells in the Quail Hollow area which were constructed in the early 2000s. Prior to 1995, SLVWD operated wells at 3 additional locations in the Quail Hollow area. SLVWD plans to construct a third Quail Hollow extraction well to provide needed redundancy, additional capacity, and redistribute pumping in the area. Redistribution will help address drawdown impacts that may negatively affect some groundwater dependent ecosystems.

Wells sites in the vicinity of Quail Hollow Ranch are being considered to minimize potential interference with the two active Quail Hollow extraction wells with the intent of widening and reducing the depth of the pumping cone of depression caused by the existing wells.

4.6.5 Santa Margarita Aquifer Private Pumpers Connect to Public Water System

Public water systems operated by SMGWA member agencies could be expanded to incorporate parcels or developments dependent on private wells extracting from the Santa Margarita aquifer. A project of this nature would only be considered if it were found that private pumping was impacting surface water sources, if there was concern about shallower private wells going dry, or if there are climate change impacts not accounted for in current models. If this were the case, some parcels or developments could choose to be connected to the nearest public water system.

Preliminary analysis undertaken as part of GSP development using the groundwater model indicates that private pumping is not causing significant depletion of interconnected surface water and so this is not a necessary project. Additionally, connecting rural parcels to a water system will require significant additional infrastructure for minimal benefit given the size and relatively low population density of the region.

4.6.6 Direct Potable Reuse

Current California regulations do not allow direct potable reuse (DPR). DPR is the purposeful introduction of advanced treated wastewater into a drinking water supply, typically upstream of a drinking water treatment plant or directly into the potable water supply distribution system downstream of a water treatment plant. Unlike IPR projects, there is no environmental buffer that limits the capacity of a DPR project.

The report entitled "A Proposed Framework for Regulating Direct Potable Reuse in California" was released by the SWRCB in April 2018 and identifies key research areas to fill the identified knowledge gaps prior to the adoption of water recycling criteria for DPR through raw water augmentation by December 2023 (per AB 574). Given the outcome of the framework and interest in potable reuse statewide, raw water blending should continue to be tracked as a potential long-term strategy to maximize reuse and reduce ocean discharge. In general, future feasibility of the technology will be tied to overcoming the perception that there are public health issues associated with using wastewater as a source water for drinking water supplies.

4.6.7 Groundwater Use Restrictions

SGMA grants the SMGWA the authority to restrict pumping if the need or situation arises. At the time of submission of this GSP, pumping curtailment or restrictions are not currently being considered. However, should a future extreme scenario arise where the SMGWA fails to reach sustainability, the SWRCB will most likely enforce pumping restrictions as a management action to achieve sustainability.

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 implemented projects and management actions are insufficient to reach and/or maintain sustainability and one or more sustainability indicator is forecast to fall below minimum thresholds by 2042. Under such a curtailment scenario, the SMGWA would determine the amount of water that affected groundwater beneficial users could pump 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.

Should this dire option need to be considered at some point in the future, considerable technical work, discussion, and stakeholder input would be needed for the SMGWA to define the policies and procedures required to implement groundwater pumping restrictions.

4.6.8 Scotts Valley Non-Potable Reuse

Recycled water has been available for use in the City of Scotts Valley since 2002. Its availability increased steadily through expansion of the distribution system and the addition of service connections.

In 2021, the City of Scotts Valley is planning to conduct a study of potential upgrades or replacement projects for its existing Wastewater Recovery Facility. The full range of options has yet to be identified at the time of writing this GSP, however, it is anticipated to include looking at alternatives such as refurbishment of the existing treatment plant technology, upgrading to new technology such as membrane bioreactors, or other opportunities. Part of this study will be to review other reuse and system expansion opportunities for adjacent water agencies such as the City of Santa Cruz or Soquel Creek Water District. Recycled water demand for irrigation primarily occurs in the summer months. SVWD provides recycled water for use by irrigation at parks, schools, homeowners associations, landscaped medians, and businesses. Recycled water use has tapered off in the last decade and has historically been climate dependent with higher usage during periods of reduced rainfall. While additional customers have been connected to the recycled water distribution system, overall demand has not increased significantly. Expansion of the system is currently limited by the economics of large capital costs required to connect a limited number of additional customers.