Table of Contents

Section 4: Projects and Management Actions 4-1

4.1 History and Context 4-1
4.2 Project and Management Actions Under SGMA.....4-3
4.3 Group 1: Existing Projects.....4-6
4.4 Group 2: Near-term Planned Projects 4-7
4.5 Group 3: Supplemental Projects 4-19
4.6 Results of Model Scenarios 4-22
4.7 Management Actions 4-39

List of Tables

Table 4-1: Regional Conjunctive Use Program 4-17
Table 4-2: Projects and Management Actions Analyzed Using CoSANA Model.....4-22
Table 4-3: Summary of Project Management Action Modeling Scenarios Without Consideration for Climate Change 4-38
Table 4-4: Summary of Project Management Action Modeling Scenarios With Consideration of Climate Change 4-38

List of Figures

Figure 4-1: The Process of Identifying, Screening, Evaluating and Selecting PMAs.....4-5
Figure 4-2: Map of Proposed Recycled Water Pipeline Alignment and Program Area.....4-8
Figure 4-3: Location of Omochumne-Hartnell Water District Groundwater Recharge Project 4-12
Figure 4-4: Map of Participating Conjunctive Use Program Agencies.....4-16
Figure 4-5: Map of Potential Recharge Areas for Water Delivered by the Folsom South Canal 4-20
Figure 4-6: Changes in Groundwater Level Hydrographs from Scenario 1.....4-25
Figure 4-7: Changes in Groundwater Level Hydrographs from Scenario 2.....4-26
Figure 4-8: Cumulative Storage Change in Scenarios 1 and 2 4-27
Figure 4-9: Cumulative Storage Change with Climate Change in Scenario 2 4-28
Figure 4-10: Changes in Groundwater Level Hydrographs from Scenario 3.....4-30
Figure 4-11: Cumulative Storage Change in Scenario 3.....4-31
Figure 4-12: Changes in Groundwater Level Hydrographs from Scenario 4.....4-33
Figure 4-13: Cumulative Storage Change in Scenario 4.....4-34
Figure 4-14: Changes in Groundwater Level Hydrographs from Scenario 5.....4-36
Figure 4-15: Cumulative Storage Change in Scenario 5.....4-37

Table of Contents (cont'd)

List of Appendices

4-A Projects and Management Actions
4-B Project Descriptions

Section 4: Projects and Management Actions

To achieve the sustainability goal for the South American Subbasin (SASb) by 2042, and to avoid undesirable results over the remainder of a 50-year horizon, as required by SGMA regulations, multiple projects and management actions (PMAs) have been identified and considered by the SASb Groundwater Sustainability Agencies (GSAs) in this Groundwater Sustainability Plan (GSP).

4.1 History and Context

The projects and management actions described in this section build upon a long effort that started prior to the adoption of the Sustainable Groundwater Management Act (SGMA). Efforts to manage the SASb groundwater resources started as early as 1972 and became quite intensive in the 1990s. During that decade, a collaborative process involving a wide array of stakeholders resulted in a basin-wide agreement to manage both surface waters and groundwater and set a sustainable yield metric for the Basin. The timeline of these efforts is provided below.

1. Formation of the Sacramento County Water Agency (SCWA) by a special legislative act and creation of countywide groundwater policies – 1952.

2. Adoption of policies by the County of Sacramento recognizing that groundwater should be conserved, managed, and protected – 1972.

3. Voluntary groundwater elevation (spring and fall) monitoring as part of State Well Monitoring Program and development of groundwater elevation contour maps utilized by the State and local agencies to monitor groundwater use – 1974.

4. Partnerships with DWR in Bulletin 118 studies to specifically characterize the region's aquifer and local groundwater conditions – 1975.

5. Adoption of a master plan, creation of a benefit zone (i.e., Zone 40 of SCWA), establishing a fee structure to implement conjunctive use programs to support all new growth within groundwater impacted areas – 1986.

6. Adoption of county-wide water policies limiting new development's use of groundwater and requiring that alternative supplies be identified to offset increased water demands – 1990.

7. Development of the Sacramento County Integrated Groundwater and Surface water Model (SacIGSM), which was renamed the Sacramento Integrated Water Resources Model (SacIWRM), along with corresponding analyses of groundwater quality conditions – 1993.

8. Development of current and projected water demands for Water Forum planning models (*The Estimate of Annual Water Demand within the Sacramento Metropolitan Area*) – 1995.

9. Delivery of first increment of surface water as part of the SCWA Zone 40 conjunctive use program – 1995.

10. Quantitative impacts analysis of undesirable effects and groundwater modeling to support Water Forum negotiations – 1995.

11. Establishment of a stakeholder process and significant education to define Sacramento County groundwater management areas and acceptable sustainable yields (Water Forum Process) – 1994-2000.

12. Self-imposed and locally financed consensus-based stakeholder process leading to a quantitative threshold-based groundwater management plan identified as the Central Sacramento County Groundwater Management Plan (GMP) in accordance with the provisions of SB-1938 and a proposed governance structure – 2000-2006.

13. Development of GMP, along with the corresponding hydrologic database management system, which implemented a monitoring program for groundwater levels and groundwater quality with thresholds to manage the basin within the sustainable conditions as set forth by the Water Forum Agreement – 2002-2006.

14. Establishment of a Joint Powers Authority Governance Structure creating the Sacramento Central Groundwater Authority (SCGA) and adoption of the GMP – 2006.

15. Development of the California Statewide Groundwater Elevation Monitoring (CASGEM) program for the SASb, per State requirements – 2009.

16. Voluntary groundwater management activities through SCGA and member agencies and stakeholders who represent all subbasin groundwater use sectors – 2006-Present.

17. Completion of the Freeport Intake and associated pipelines by Freeport Regional Water Authority (SCWA and East Bay Municipal Utility District (EBMUD)) to deliver surface water supplies to users within the SASb - 2007.

18. Completion of the Vineyard Surface Water Treatment Plant by SCWA to produce potable water for the communities of eastern Sacramento County – 2011.

19. Completion of Regional Water Reliability Plan prepared for Regional Water Authority – 2019.

A key output of the pre-SGMA planning efforts was the development of a sustainable yield value of 273,000 AF per year for the SASb. This sustainable yield metric has served as the basis for agreements on land and water use planning in the region and is referenced explicitly in planning documents produced by land use management entities and water purveyors in the SASb, including the 2006 GMP, which serves as the overarching groundwater management document for the SASb.

4.2 Project and Management Actions Under SGMA

For the SGMA process, a description of PMAs that will contribute to the achievement of the sustainability goal in the SASb is provided in accordance with §354.42 and §354.44 of the SGMA regulations. “Projects” generally refer to structural features whereas “management actions” refer to non-structural programs or policies (e.g., designed to incentivize reductions in groundwater pumping or optimize management of the subbasin). PMAs discussed in this section will support the sustainability goal in the context of the measurable objectives and minimum thresholds to avoid undesirable results identified for the Basin in **Section 3: Sustainable Management Criteria**.

At the outset, it is important to distinguish between projects that will be directly funded and implemented by the GSAs in the SASb, as opposed to projects that are currently sponsored and planned and will be implemented by specific entities within the SASb, in coordination with the respective GSAs. This GSP takes such planned projects into account to evaluate whether additional projects will be needed in the future to reach the sustainability goal. An evaluation of the impact of various planned projects on groundwater levels and storage volumes is provided in this Section through the use of scenarios developed with stakeholder input and modeled using the CoSANA model.

It is also important to acknowledge that the basin's beneficial uses and users will receive significant benefits from PMAs that provide multiple benefits and embrace innovation and new technologies. This Plan prioritizes multi-benefit PMAs that stress the utilization of natural infrastructure, including the basin itself for storage and its waterway floodplains as recharge areas. The Plan emphasizes coordination among users and neighboring basins to improve the region's groundwater condition. For example, the multi-benefit Harvest Water program (described in detail later in this section) will provide recycled water, which is treated to the tertiary level, to agricultural water users in the southwestern area of the basin in lieu of groundwater use, resulting in recovery of groundwater levels. The Cosumnes River is expected to gain water by this rise in groundwater levels which will also provide ecosystem benefits in southern parts of the Subbasin. This recycled water is currently discharged to the Sacramento River.

The PMAs identified in this Section will be periodically assessed during the GSP implementation period. The PMAs are in various stages of development so complete information is not uniformly available on construction requirements, operations, costs, permitting requirements, and other details. A conceptual description of the operation of PMAs as part of the overall GSP is provided in this section and in **Section 5: Plan Implementation**.

Each individual project proponent will manage the permitting and other specific implementation oversight for its own projects. Inclusion of PMAs in this GSP does not forego any obligations regarding individual project implementation under local, state, or federal regulatory programs. While the GSAs do have an obligation to oversee progress towards groundwater sustainability, they are not necessarily the primary regulator of land use, water quality, or environmental compliance. It is the responsibility of the implementing agencies of planned projects to ensure compliance with all applicable laws and regulatory requirements. The GSAs will collaborate with project proponents to track progress and support project implementation. The implementation of PMAs will be enhanced by the development of clear policy and guidance by the GSAs that lay out sustainable management criteria for the SASb (as described in **Section 3: Sustainable**

Management Criteria) as well as the monitoring and reporting framework that serve to protect the Subbasin and ensure it achieves and maintains sustainability. The GSP includes a management action to coordinate implementation of each of the key planned projects in such a way that the Subbasin sustainability is achieved in a collaborative environment among the GSAs and the project proponents and sponsors.

The process of identifying, screening and selecting PMAs for detailed consideration in this GSP is illustrated in **Figure 4-1**. Existing and planned projects were first identified from available reports, documents, and websites including:

- American River Basin IRWMP Database
- SCGA Basin Management Plan
- City of Sacramento Urban Water Master Plan (UWMP) and Groundwater Master Plan
- Northern Division Sacramento District UWMP
- Regional Water Authority Regional Water Reliability Plan

New projects were also identified through brainstorming sessions with GSPWG members and other stakeholders, including representatives from the following entities with jurisdictional responsibility in the South American Subbasin:

- Sacramento Central Groundwater Authority
- City of Sacramento
- City of Folsom
- Sacramento County Water Agency
- Sacramento County
- Sloughhouse Resource Conservation District
- Omochumne-Hartnell Water District (OHWD)
- Elk Grove Water District
- Sacramento Regional County Sanitation District
- Golden State Water Company
- California American Water Company
- Northern Delta Groundwater Sustainability Agency
- Sacramento Area Flood Control Agency
- Regional Water Authority
- Cosumnes Coalition
- Environmental Coalition of Sacramento (ECOS)
- The Nature Conservancy

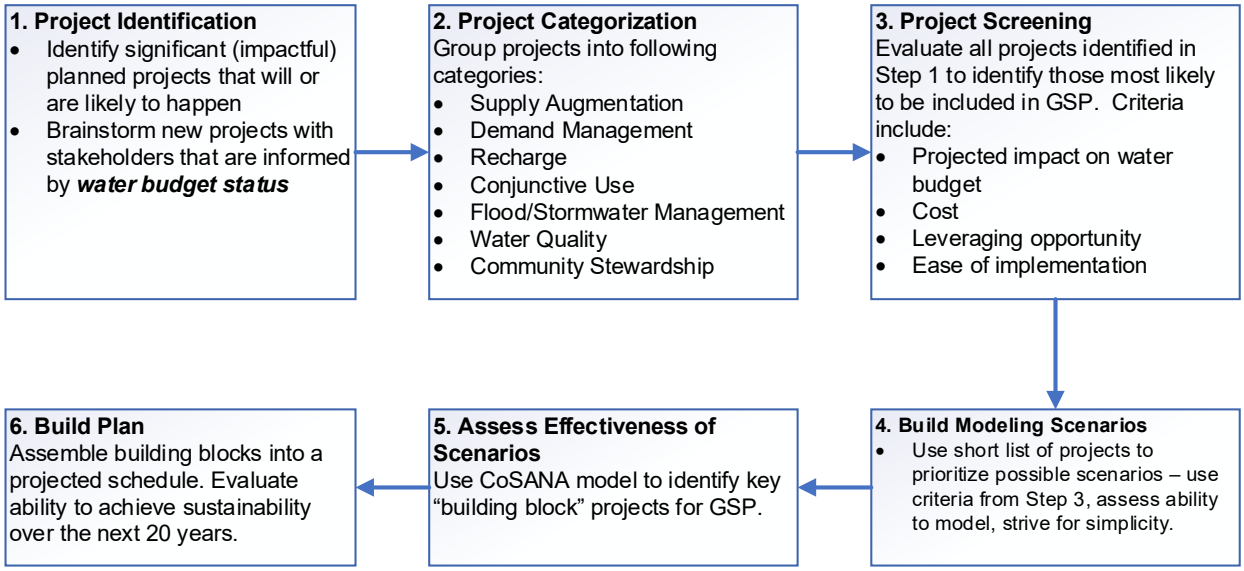


Figure 4-1: The Process of Identifying, Screening, Evaluating and Selecting PMAs

Identified projects are summarized in **Appendix 4-A** and have been grouped into seven categories: Recharge, Flood/Stormwater Management, Water Quality, Supply Augmentation, Demand Management, Community Stewardship, and Conjunctive Use. Projects in each category were evaluated to identify those with the highest potential to impact groundwater conditions and sustainability indicators within the SASb.

The projects identified from the list in **Appendix 4-A** and the stakeholder interviews were then categorized into three groups:

Group 1 – Existing PMAs currently being implemented and expected to continue to be implemented, as needed, to support achievement of the sustainability goal. These PMAs are considered as baseline conditions in the groundwater modeling projections described in this section and in **Section 2: Plan Area and Basin Setting**.

Group 2 – PMAs already planned for near-term implementation by individual entities, which may, individually or in aggregate, contribute to achieving sustainability in the SASb over the implementation horizon.

Group 3 – Supplemental PMAs that are in conceptual stages which may be implemented in the future and would provide additional benefit in improving groundwater conditions and/or adapting to changes in future conditions.

From this list of projects and management actions, those that had adequate information to allow a modeling evaluation, that were deemed likely to be implemented, and are projected to have a significant impact on groundwater conditions in the SASb were chosen as components for modeling scenarios. Some multi-benefit projects that are described in this Section were not included in the modeling scenarios due to lack of adequate information (e.g., the SAFCA project) but are included herein based on widespread support from GSP Working Group

members and local stakeholders. Other projects that have been identified as part of the PMA research effort are listed in **Appendix 4-B**.

Using the CoSANA model, the effectiveness of the different PMA scenarios were assessed to determine the range of impacts of the selected scenarios on sustainability of the Subbasin based on sustainability indicators in the SASb (Groundwater levels, Groundwater storage, and Inter-connected surface water). The projects included in the modeling scenarios and described in detail below fall in Group 2, as described above. These projects would ultimately be implemented by individual entities, in coordination with the GSAs in the SASb, and are therefore not considered as an obligation of the GSAs as part of this GSP. The results of the model scenario runs are provided in **Section 4.7** below.

4.3 Group 1: Existing Projects

In response to the recognized need to diversify water supplies, water management entities in the SASb have historically implemented and continue to implement projects to achieve this goal. Below is a partial list of those actions focusing on the larger efforts that are included in the CoSANA Baseline modeling scenario.

1. The 2005 Zone 40 Water Supply Master Plan recommended the Freeport Regional Water Project as the preferred alternative, which resulted in the collaboration of SCWA and EBMUD to jointly construct the 185 MGD diversion on the Sacramento River, completed in 2007. As part of the recommendation, SCWA also constructed the 50 MGD Vineyard Surface Water Treatment Plant (Vineyard WTP), completed in 2011.

2. Ongoing efforts to increase operational flexibility and capacity for conjunctive use by construction of system interties, treatment plant improvements, and development of groundwater wells. These efforts have been and are being taken by California-American Water, City of Sacramento, SCWA, and the Golden State Water Company.

3. The City of Sacramento Groundwater Master Plan was developed in 2017 to address an extensive well replacement program (as the majority of their wells are near or at the end of their useful life) and to analyze the fiscal implications of well replacement in comparison with surface water treatment expansion. The City has firm water rights on the Sacramento and American Rivers and has historically relied on groundwater from the wells north of the American River. Nevertheless, the City developed a plan to utilize groundwater in both their north and south service areas, as part of the City-wide conjunctive use program to increase water supply reliability for retail and wholesale water supplies in the City. This Groundwater Master Plan includes rehabilitation and/or replacement of wells in the north service area, and installation of new wells in the south service area (i.e., the SASb).

4.4 Group 2: Near-term Planned Projects

Near-term projects are in the planning or design phase and are expected to be operational within the next five (5) years. For these projects, details are provided for implementation, in addition to their expected impact on the groundwater basin.

4.4.1 Harvest Water

4.4.1.1 Project Description

Sponsored by the Sacramento Regional County Sanitation District (Regional San), Harvest Water will provide a safe and reliable supply of disinfected tertiary-treated recycled water for agricultural uses. This project is expected to reduce groundwater pumping, support habitat protection efforts, enhance groundwater dependent ecosystems, and provide near-term benefits to the SASb and the Sacramento-San Joaquin Delta. The project will support efforts at maintaining sustainability indicators for groundwater storage, groundwater levels, and depletions of interconnected surface water in the SASb.

The project will use the upgraded Sacramento Regional Wastewater Treatment Plant (scheduled to be completed in 2023) to deliver up to 50,000 acre-feet per year (AFY) of drought-resistant recycled water to irrigate more than 16,000 acres of permanent agriculture and habitat conservation lands near the Cosumnes River and Stone Lakes Wildlife Refuge (**Figure 4-2**).

The project is in the design phase and is expected to be operational by 2025. After start-up, the project will run continuously.

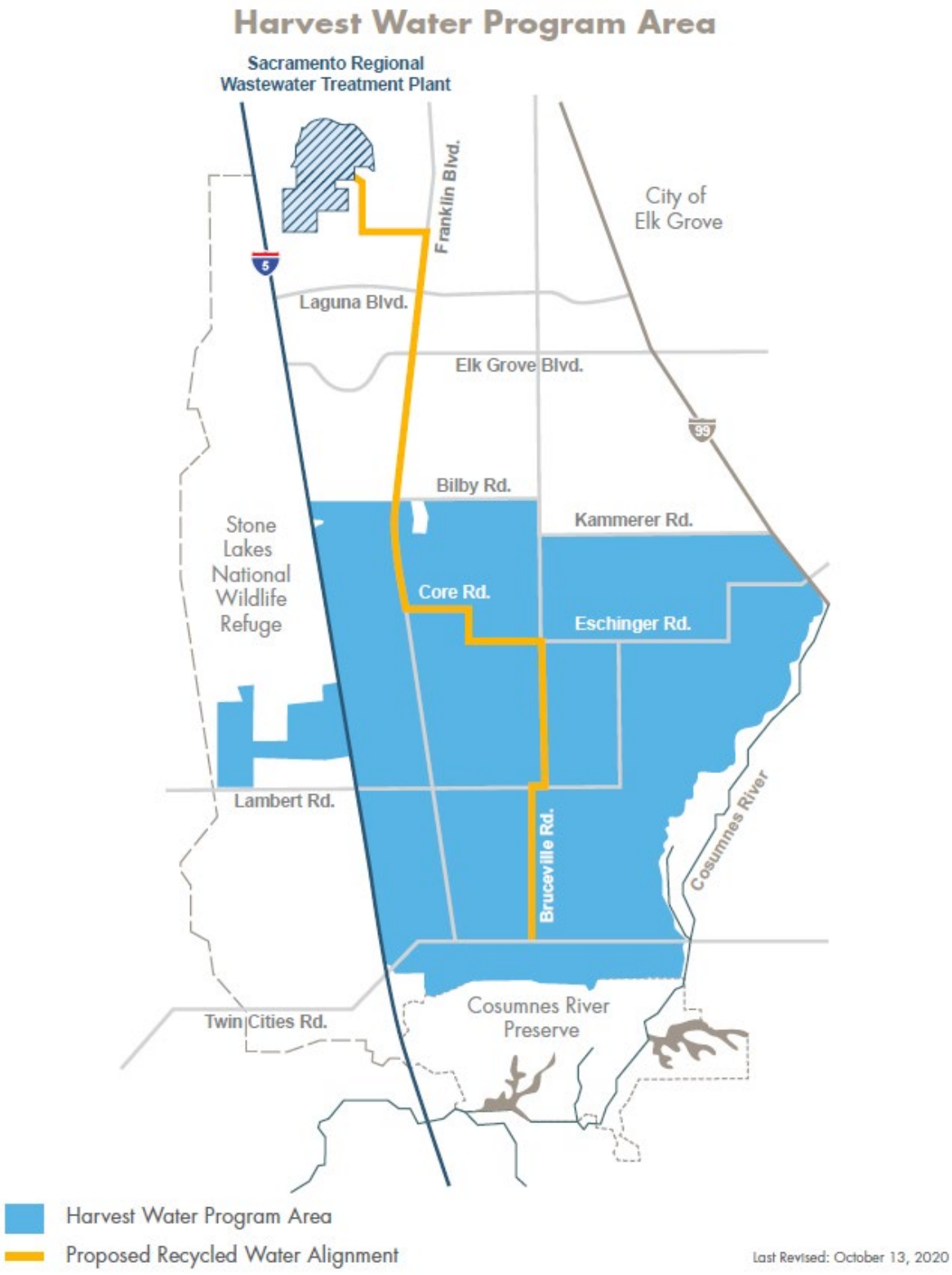


Figure 4-2: Map of Proposed Recycled Water Pipeline Alignment and Program Area

4.4.1.2 Public Noticing

Regional San is in the process of fulfilling public noticing and disclosure requirements under CEQA for Harvest Water and has conducted an extensive public outreach effort and will fulfill all additional public notifications to support implementation of the project.

4.4.1.3 Permitting and Regulatory Process

Regional San is in the process of fulfilling all permitting requirements for the construction and operation of the Harvest Water.

4.4.1.4 Status

This project is currently in the design phase. The project schedule is as follows:

2011 – 2012: Feasibility Study
2015 – 2023: Program Planning
2020 – 2021: Design Reports
2021 – 2023: Final Design
2022 – 2025: Construction
2025: Startup

4.4.1.5 Expected Benefits

- Provides up to 50,000 AFY of recycled water to irrigate more than 16,000 acres of agricultural and habitat lands.
- Increases regional and state water supply reliability through in-lieu groundwater recharge which will increase groundwater in storage via this conjunctive use process.
- Improves water quality by increasing groundwater levels and in-stream flows in the Cosumnes River.
- Restores low groundwater levels up to 35 feet within 15 years and helps advance GSP goals of basin sustainability.
- Increases volume of groundwater in storage by approximately 245,000 AF within 10 years, and approximately 450,000 AF in 40 years.
- Supports and increases riparian and wetland habitat on over 5,000 acres.
- Supports a variety of special status species, such as Swainson's Hawk, Sandhill Cranes and Giant Garter Snake.
- Increases frequency of Cosumnes River instream flows to support fall-run Chinook Salmon.
- Supports the State and U.S. Bureau of Reclamation goals of increased use of recycled water.
- Provides reliable agricultural water supplies, and drought resiliency.

4.4.1.6 Implementation

The project will be implemented by the Regional San in coordination with the local GSAs and consistent with this GSP.

4.4.1.7 Legal Authority

Regional San is in the process of establishing its legal authority for the project, including obtaining a recycled water permit.

4.4.1.8 Estimated Costs and Funding Plan

The total project cost is expected to be $444.2 million. This total includes:

- $257.4 million for recycled water infrastructure construction
- $76.7 million for ecological program
- $86 million for planning, design, permitting, construction management and other program implementation elements
- $24.1 million for construction and program contingencies

To date, the project has been awarded $287.5 million in grant funds by the California Water Commission from the Water Storage Improvement Program and $4.2 million in grant funds from US Bureau of Reclamation's Water Infrastructure Improvements for the Nation (WIIN) Act. Regional San continues to pursue additional funding opportunities and will finance the balance of capital costs through cash reserves and user rate revenues.

4.4.1.9 Management of Groundwater Extractions and Recharge

The project will provide recycled water from the Sacramento Regional Wastewater Treatment Plant. The recycled water is derived from wastewater originating in the SRWTP service area, which includes the Cities of Sacramento, Rancho Cordova, Folsom, Elk Grove, West Sacramento, Citrus Heights, and unincorporated areas of Sacramento County. During the growing season, this water will be delivered to growers that currently rely on groundwater for irrigation, thereby reducing groundwater pumping in the project service area (**Figure 4-2**). Recycled water is also planned to ultimately be delivered to the Stone Lakes National Wildlife Refuge to further reduce the need for groundwater pumping. Approximately 20 years after recycled water deliveries begin, once the groundwater levels recover and the basin is in sustainable excess, groundwater stored in the basin could be available in the future for potential groundwater accounting partners, such as growers and local municipalities to use in dry years instead of surface water. Through an extensive monitoring well system, Regional San will track progress toward realizing project benefits associated with increased groundwater levels and evaluate conjunctive use operations, as they occur.

4.4.2 Omochumne-Hartnell Water District Groundwater Recharge Project and Groundwater Monitoring

4.4.2.1 Project Description

The Cosumnes River is the last major undammed river draining the western slope of the Sierra Nevada. The river experiences an intermittent and perennial cycle of large peak flows in the winter and low flows in the summer. Historically, the Cosumnes River has had a physical connection to the underlying groundwater basin, which helped improve the flow within the river for fish migration and other beneficial uses. However, the installation of levees in the 1940s which reduced the river flooding that recharged the basin and years of groundwater pumping have lowered groundwater levels and severed the basin's interconnectivity with surface water in some reaches, reducing the viable times for migration of Chinook salmon and other fish.

In 2011, OHWD received funding to implement a groundwater banking project through a Proposition 84 Integrated Regional Water Management (IRWM) grant submitted by the Regional Water Authority (RWA). That project was re-designed as an off-season irrigation project to enhance recharge to the underlying aquifer in the South American and Cosumnes subbasins. A revised Proposition 84 grant proposal, including detailed scope and budget, was submitted to the Department of Water Resources (DWR); the proposal received project approval by DWR.

The grant funding has been used to construct pipelines and other facilities to divert up to 4,000 AF per year of surface water from the Cosumnes River to a 1,168-acre area between the Cosumnes River and Deer Creek (**Figure 4-3**). In the future, up to 6,000 AFY are planned to be diverted from the Cosumnes River.

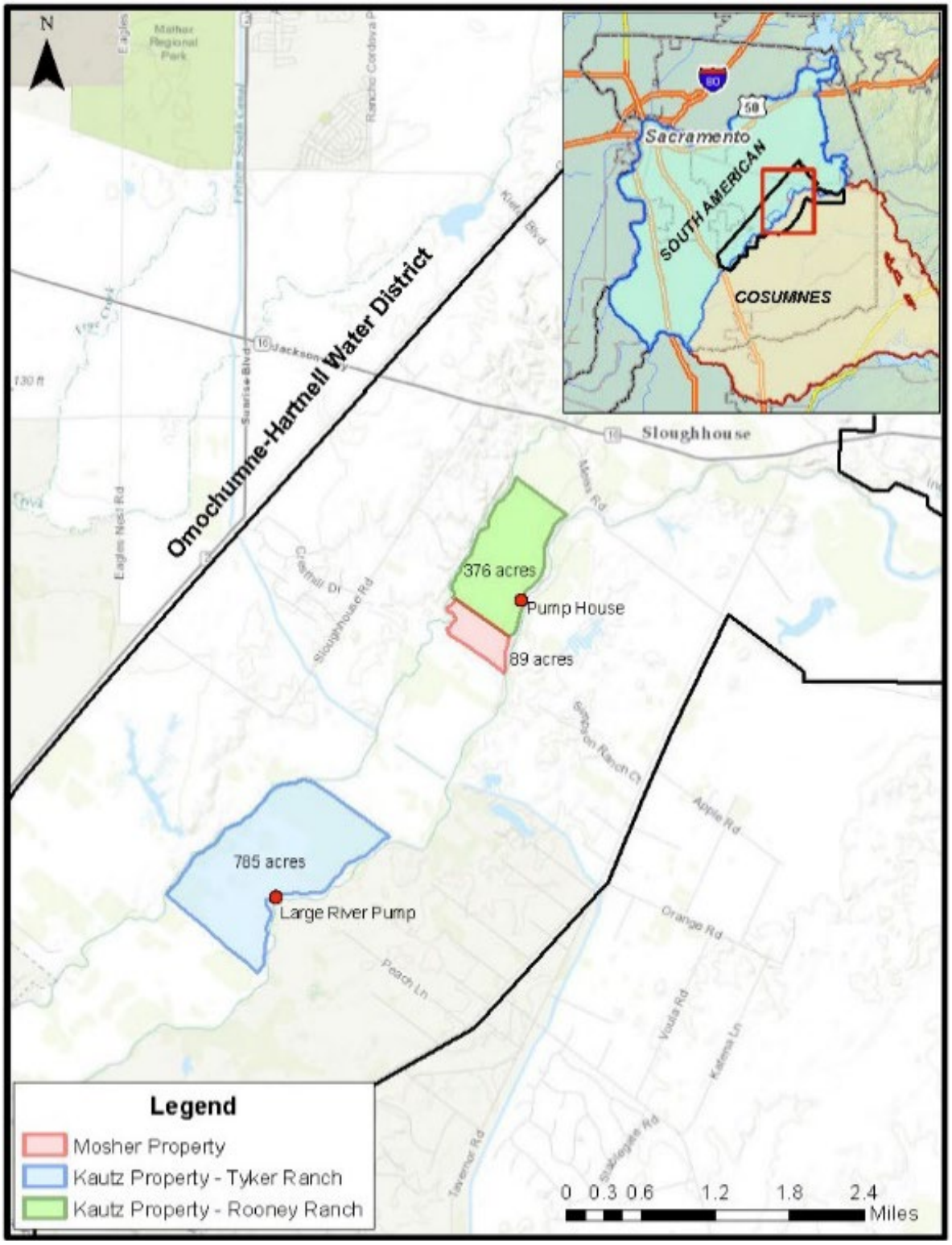


Figure 4-3: Location of Omochumne-Hartnell Water District Groundwater Recharge Project

The project, when fully operational, will help alleviate groundwater overdraft in both the South American and Cosumnes subbasins. The project will also support efforts at maintaining sustainability indicators for water table elevations, and depletion of interconnected surface water.

4.4.2.2 Public Noticing

OHWD satisfied all public noticing and disclosure requirements under CEQA for the existing pilot project. OHWD will fulfill all additional public notifications to support implementation of the final project.

4.4.2.3 Permitting and Regulatory Process

On September 18, 2018, OHWD adopted a final Mitigated Negative Declaration approving the Pilot Project and determining that the Project's environmental impacts will be less than significant with mitigation.

In Phase 1 of the pilot study, a temporary diversion permit was obtained from the State Water Resources Control Board allowing diversions from the Cosumnes River during periods of high flow from December 1, 2020 to February 15, 2021. This permit allowed for pumping at two locations at a rate of 2000 gallons per minute (gpm) and 5000 gpm, totaling 16 cubic feet per second (cfs).

A second Phase of the pilot study will upgrade the pumping and conveyance systems to allow a maximum diversion rate of 50 cfs and total diversion to underground storage of 6000 AF during wet years. This phase will require a new temporary permit.

Ultimately, the plan is to apply for the right to divert a portion of the peak winter flows in the Cosumnes River to allow permanent implementation of the second phase of the pilot study, i.e., a 6,000-AFY diversion during wet years for groundwater recharge, with extraction of this recharged volume during the next growing season to offset groundwater pumping demands.

OHWD will fulfill all permitting and regulatory requirements prior to implementation of the second Phase of the pilot study and the final project.

4.4.2.4 Status

The project has just completed Phase 1 of the pilot study. Project proponents are currently working to implement Phase 2 and to obtain the necessary permit for diversions during water year 2022. Implementation of the ultimate project is projected to occur after completion of the Phase 2 pilot study.

4.4.2.5 Expected Benefits

- The project will facilitate sustainable groundwater management by increasing recharge, utilizing the available groundwater storage capacity, and thereby increasing the safe yield available to overlying users.

- If OHWD's efforts are successful in restoring groundwater/surface water connectivity, use of high flow events could allow the watershed to recover and cause longer flows in the Cosumnes River to persist during the dry season as the groundwater levels are incrementally increased through the recharge. To the extent the flow window for the Cosumnes River is extended, the local ecosystem will be enhanced by the project.

Due to the heterogeneity of the local geology, there is some difficulty in predicting the degree to which these benefits will be realized. For that reason, a data collection program has been designed to capture hydrologic data that will assist managers in determining the impact of the project. The data collection program builds on OHWD's streamflow and temperature monitoring program between Rancho Murieta and State Highway 99 and adds instrumentation for the monitoring of levels and quality in numerous groundwater wells in the floodplain.

4.4.2.6 Implementation

The project has been implemented by OHWD, and Phase 1 is now complete. Phase 2 is scheduled to begin in water year 2022, depending on wet-season flow conditions in the Cosumnes River.

4.4.2.7 Legal Authority

The Omochumne-Hartnell Water District is a California Water District formed under the California Water District Act in 1953; it is located in both the South American and Cosumnes Subbasins. OHWD works to manage surface water flows in the Cosumnes River and groundwater supply in these subbasins to facilitate its landowners' exercise of their own water rights.

4.4.2.8 Estimated Costs and Funding Plan

Estimated costs for the Phase 2 pilot and the final project are not yet available.

4.4.2.9 Management of Groundwater Extractions and Recharge

An extensive monitoring program has been established to monitor the amount of water recharged and the amount of water extracted. Additionally, some existing wells have been outfitted with instrumentation to monitor groundwater levels in real time to ensure that extraction does not exceed recharge, as indicated by a drop in groundwater levels.

4.4.3 Regional Conjunctive Use Program

4.4.3.1 Project Description

This project is a comprehensive regional conjunctive use program that will increase conjunctive use among both NASb and SASb municipal and industrial (M&I) water purveyors, including California American Water Company, Citrus Heights Water District, City of Lincoln, City of Sacramento, Golden State Water Company, SCWA, and Sacramento Suburban Water District. The project will utilize existing infrastructure and leverage ongoing planning processes to use available surface water through water transfers, groundwater recharge projects, wholesale agreements, or wheeling agreements (**Figure 4-4**). The goal is to provide long-term basin benefits through additional surface water supplies during wet years which would result in reduction of groundwater use. In addition, the program includes groundwater recovery operations by select entities during dry years. It is anticipated that project implementation will be heavily integrated with the Regional Reliability Program (RWA, 2018) and, ultimately, the future Sacramento Regional Water Bank, to track and manage the usage of water.

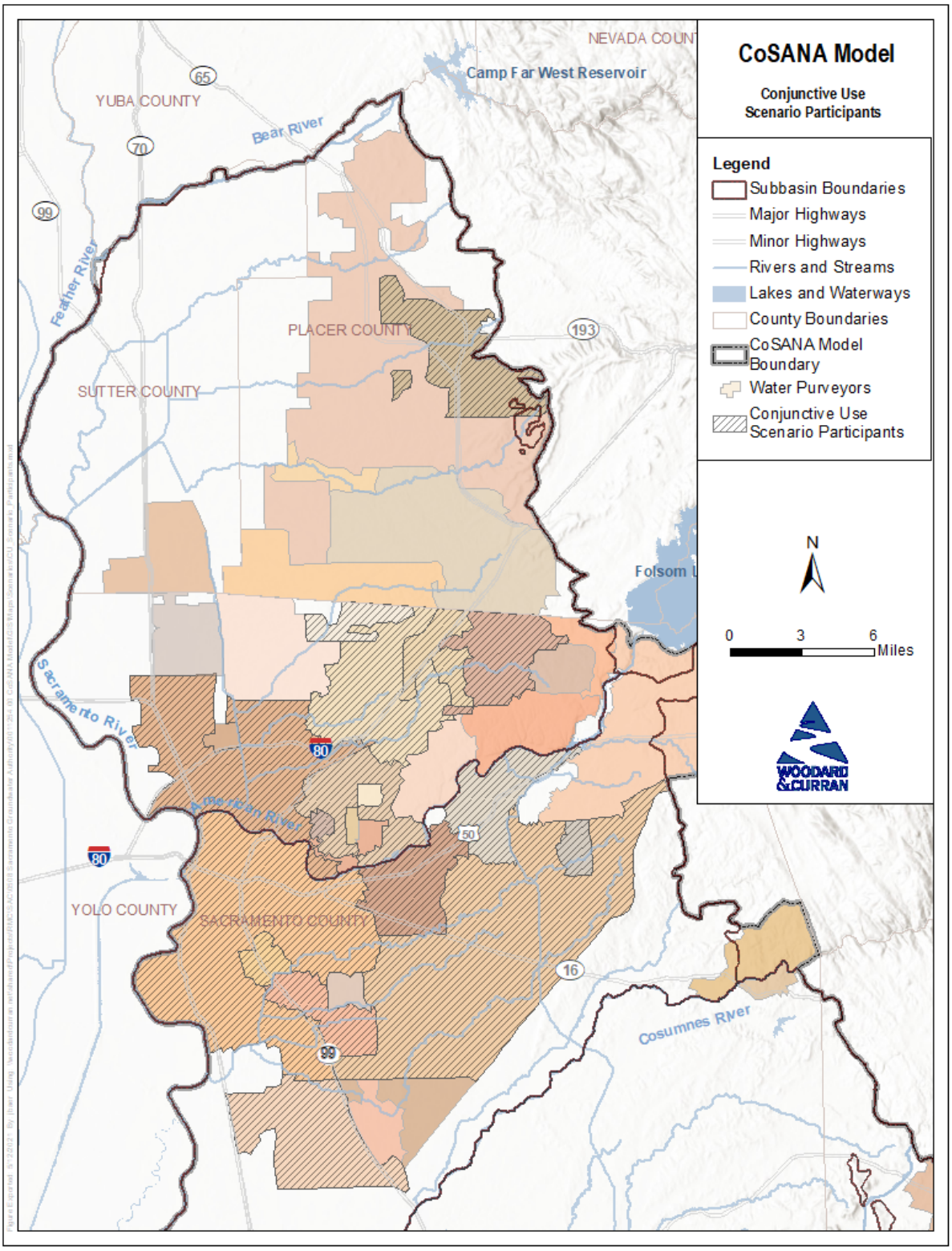


Figure 4-4: Map of Participating Conjunctive Use Program Agencies

The project will allow participating agencies to increase surface water usage during wet years, during short-duration periods such as storm events, or during other year types when surface water is available to be transferred. It is expected that an average of 20,400 AF of surface water would be made available during wet years within the SASb, directly offsetting the use of groundwater. This project is estimated to yield an average annual benefit of about 7,200 AF/year based on CoSANA model output. The program, as currently defined, includes surface water supplies and groundwater pumping reduction as shown in **Table 4-1**.

Table 4-1: Regional Conjunctive Use Program

Entity	Projected Demand	Wet Year Additional SW Supply	Wet Year GW Pumping Reduction	Long-Term (50-Yr) Avg. Annual Pumping Reduction	Dry Year GW Pump Back
California American WC – Parkway	16,604	5,351	5,351	1,819	0
California American WC – Suburban Rosemont	13,227	6,902	6,885	2,341	0
California American WC – Fruitridge Vista	6,609	0	0	0	0
California American WC – Security Park	97	0	0	0	0
Golden State WC – Cordova	19,752	6,177	6,108	2,077	0
City of Sacramento – South	101,306	1,000	1,000	340	0
Sacramento County Water Agency – Laguna Vineyard	72,423	1,000	1,000	612	0
Subtotal SASb	***230,018***	***20,431***	***20,344***	***7,189***	***0***

4.4.3.2 Public Noticing

The agencies sponsoring this project will meet applicable public noticing and CEQA requirements.

4.4.3.3 Permitting and Regulatory Process

The agencies sponsoring this project will obtain necessary permits and meet regulatory requirements.

4.4.3.4 Status

A defined schedule for implementation of this project does not currently exist.

4.4.3.5 Expected Benefits

On a long-term average annual basis, approximately 7,200 AF/year of groundwater would be left in the basin, which would provide both environmental benefits as well as provide long-term water reliability for the water agencies. Benefits include:

- Increased regional and state water supply reliability through groundwater storage and conjunctive use.
- Improved water quality by restoring groundwater levels and increasing in-stream flows in the Cosumnes River.
- Increased reliability of local water supplies, enhanced groundwater storage opportunities, and drought resiliency.

4.4.3.6 Implementation

The project will be implemented through cooperation between the seven agencies listed in **Table 4-1**. The project will require that any direct or in-lieu groundwater recharge precedes groundwater extractions and that a percentage of the recharged volume will be left in the aquifer to account for losses and groundwater storage mitigation.

4.4.3.7 Legal Authority

The entities sponsoring this project have the legal authority to implement this project.

4.4.3.8 Estimated Costs and Funding Plan

The current budget estimate is provided below.

- $0.5 million for interconnection upgrade between Golden State Water Company and California American Water Company
- $0.5 million for interconnection upgrades between Golden State Water Company and Sacramento County Water Agency
- $0.5 million to upgrade the interconnection between Golden State Water Company and the City of Folsom (would upgrade a temporary interconnection into a permanent interconnection)
- Unknown cost for a possible interconnection between the City of Folsom and OHWD at the Folsom South Canal
- Unknown cost for ASR wells for Sacramento County Water Agency
- $663 million for 75 MGD surface water expansion of the City of Sacramento River Water Treatment Plant. Planning has been completed, project in in design phase.

- $30-$40 million for a 36”-54” pipeline along Power Inn Road to move surface water from the City of Sacramento EA Fairbairn surface water treatment plant to southern portions of the American River Place of Use (ARPOU) – Planned

4.4.3.9 Management of Groundwater Extractions and Recharge

The project will require that any direct or in-lieu groundwater recharge precedes groundwater extractions and that a percentage of the recharged volume will be left in the aquifer to account for losses and groundwater storage mitigation.

4.5 Group 3: Supplemental Projects

Supplemental projects are still in the conceptual stage and not expected to be operational within the next 10-15 years, and therefore, have less detailed information related to project implementation. These projects would be beneficial to the attainment of the sustainability goal in the SASb.

4.5.1 SAFCA Flood-MAR

4.5.1.1 Introduction

This project is part of the Sacramento Area Flood Control Agency’s (SAFCA) response to climate driven changes in precipitation patterns and recent advances in meteorological forecasting. Recent research in atmospheric rivers has found that 30-50% of precipitation on the West Coast is due to atmospheric rivers. Using modern forecasting techniques, it is now feasible to more intensively operate flood control reservoirs and structures to capture flood flows and utilize them for various purposes, including groundwater recharge. This project includes modifications to the outlet works of the three largest non-federal dams in the American River Basin so that these facilities can be operated to create reservoir storage space for flood control when extreme atmospheric rivers are forecasted to occur in the American River Basin. In combination with ongoing improvements to Folsom Dam and the downstream levee system, these modifications will allow the flood system to safely contain floods with a 1-in-500 annual probability of occurrence. To secure the broadest level of public support and funding for these improvements, the SAFCA project also includes measures to conserve water for environmental, agricultural, and urban use. These measures include allowance of conditional storage of winter runoff in space normally designated for flood control in Folsom Reservoir; use of the Folsom South Canal and other existing water conveyance facilities to convey this stored water to groundwater infiltration sites for storage in the aquifers underlying the South American and Cosumnes subbasins (**Figure 4-5**); and use of the stored water to improve flow and temperature conditions along the American and Cosumnes rivers, sustain agricultural productivity in South Sacramento County and meet urban water needs during drought conditions.

While not specifically analyzed as a project scenario in this GSP, it is clear that this project, if implemented, will improve groundwater levels and storage volumes in the SASb, and would enhance the attainment of the sustainability goal in the SASb.

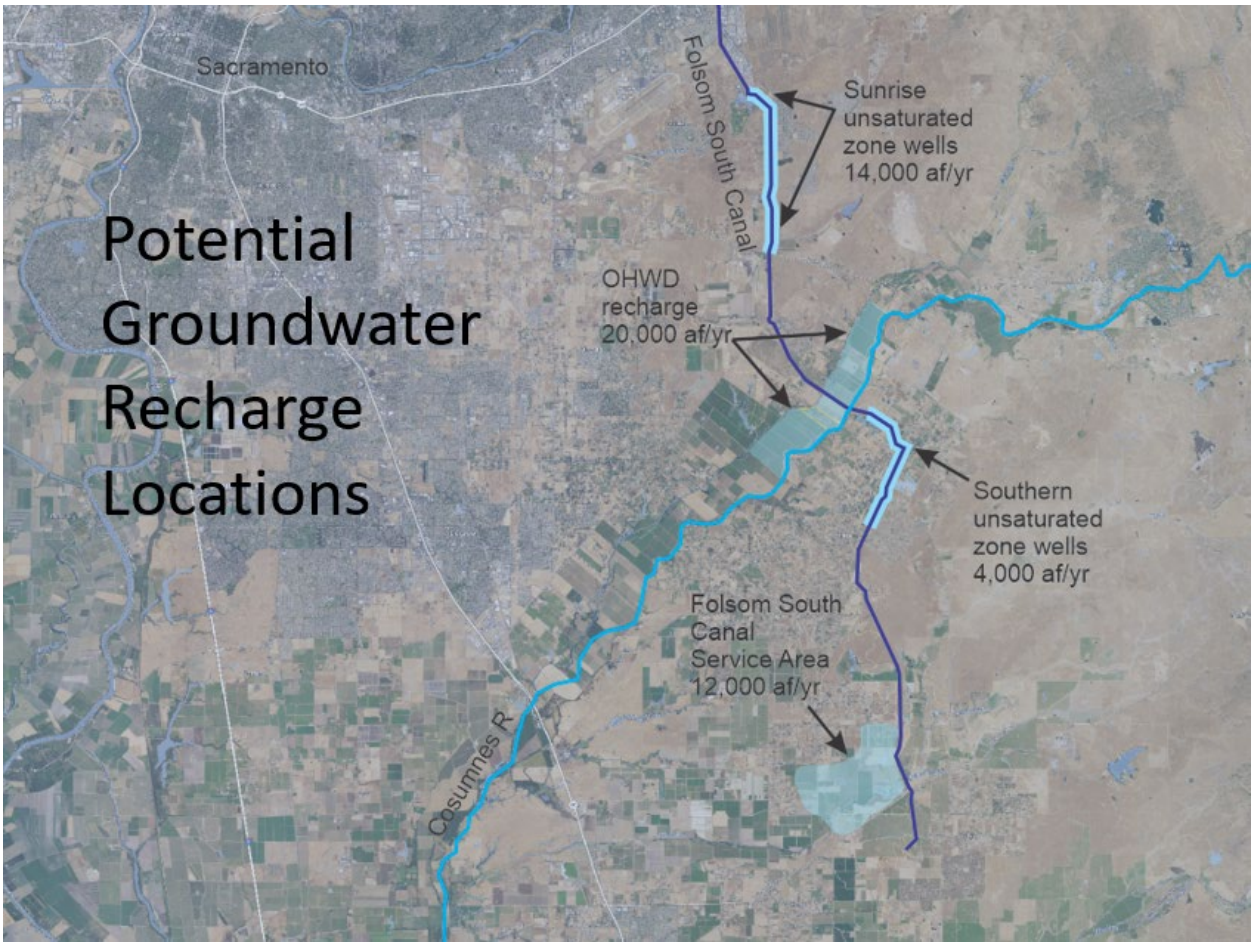


Figure 4-5: Map of Potential Recharge Areas for Water Delivered by the Folsom South Canal

4.5.1.2 Stakeholder Outreach

As project conceptualization continues, the SAFCA leadership team has created a stakeholder outreach and engagement plan. The focal points of this effort are:

- Water Forum Agreement Updates
- South American Subbasin Groundwater Sustainability Plan
- Cosumnes Subbasin Groundwater Sustainability Plan
- Sacramento Regional Water Bank
- American River Basin Study

As this effort proceeds, stakeholder outreach tasks will be addressed and will include:

- Identification of a facilitation team
- Development of a program webinar
- Incorporation of stakeholder technical information
- Creation of a stakeholder partner advisory group

Currently, the expected list of stakeholders include:

- Regional Water Authority
- Sacramento Water Forum
- US Bureau of Reclamation
- Environmental NGOs
- Environmental justice entities
- Water agencies and GSAs
- Landowners and growers
- Resource Conservation Districts
- Native Tribes
- California Department of Water Resources

The stakeholder outreach and engagement plan will be modified as needed in the future as this project develops.

4.5.1.3 Technical Analyses/Pilot Projects

To date, project proponents at SAFCA have articulated an overall vision for the implementation of the project and are now working on specific components. It is projected that the needed institutional and infrastructure improvements will be in place for excess floodwater from the American River to be delivered down the Folsom South Canal by 2027. Recent and ongoing efforts are discussed below:

4.5.1.3.1 Technical analyses

Initial analyses have been completed by MBK Engineers to estimate the volume of available water. That analysis found that surplus flood water will be available in many years and could be used to support an average annual volume of 50,000 AF for managed aquifer recharge. That analysis found that approximately 125,000 AF per year will be available in four out of every ten years.

4.5.1.3.2 Identification of recharge sites

Promising recharge sites have been identified based on proximity to the Folsom South Canal and due to hydrogeologic analyses conducted by UC Davis. The locations are shown in **Figure 4-5**.

4.5.1.3.3 Well demonstration project

In 2021-2022, project proponents are conducting an unsaturated zone well demonstration project in the SASb at locations along the Folsom South Canal where recharge can occur. In

2021, boreholes will be drilled to evaluate the local geology. Concurrently, the necessary permits for CEQA compliance, water transfers, well drilling, and use of the Folsom South Canal will be obtained. In 2022, two wells will be constructed for a demonstration project.

4.5.1.3.4 Farmland recharge demonstration project

In 2021-2022, a farmland recharge demonstration project will be conducted on land in the SASb portion of the OHWD (**Figure 4-5**) using water conveyed in the Folsom South Canal. In 2021, permits will be obtained, and a pipeline will be constructed to the recharge area. In 2022, the recharge demonstration project will be operated.

4.6 Results of Model Scenarios

To evaluate the potential effects of proposed projects and management actions in meeting the sustainability goal of the SASb GSP, the Group 2 (near-term) projects described above have been analyzed using the Cosumnes-South American-North American (CoSANA) model, the fully integrated surface and groundwater flow model that covers the entire South American Subbasin as well as the adjoining North American and Cosumnes Subbasins. The CoSANA model is described in greater detail in the water budget section of this GSP (**Section 2**). The CoSANA model has been used to develop the water budget estimates for historical, current, and projected conditions, as well as basin groundwater levels, streamflows, and inter-connected surface water bodies under baseline and various project conditions.

The analysis below considers the proposed projects using the Projected Conditions Baseline in CoSANA without climate change. The Projected Conditions Baseline applies future land and water use conditions and uses the 50-year hydrologic period of WY 1970-2019 as a planning period for purposes of the GSP. A total of ten scenarios were analyzed, three of which constitute baseline conditions, and seven of which represent additional PMA scenarios (see **Table 4-2** below).

Table 4-2: Projects and Management Actions Analyzed Using CoSANA Model

Scenario	Current Condition Baseline	Projected Condition Baseline	Projected Condition Baseline with Climate Change	Demand Reduction		Harvest Water	OHWD Recharge	Regional Conjunctive Use Program
				5% Ag 10% Urban	10% Ag 10% Urban			
CCBL	✓							
PCBL		✓						
PCBL - CC			✓					
1		✓		✓				
2					✓			
2a			✓		✓			
3		✓				✓	✓	
4		✓						✓
4a			✓					✓
5		✓				✓	✓	✓
5a			✓			✓	✓	✓

Specific assumptions used for the modeling scenarios are included here.

Demand Reduction scenarios:

- Scenario 1 assumes a 5% reduction in agricultural demand and 10% reduction in urban demand (and corresponding reductions in pumping) relative to the Projected Conditions Baseline Scenario

- Scenario 2 assumes a 10% reduction in agricultural demand and 10% reduction in urban demand (and corresponding reductions in pumping) relative to the Projected Conditions Baseline Scenario

Harvest Water:

- Harvest Water is designed to improve groundwater conditions to benefit groundwater conditions, wildlife and ecosystems.

- Harvest Water includes delivery of approximately 41,250 AFY of recycled water from the Sacramento Regional Wastewater Treatment Plant, providing an in-lieu net recharge of approximately 22,500 AFY and winter delivery of approximately 8,750 AFY to enhance wildlife habitat. This water is delivered to farmland within the Harvest Water Project area. Ultimately, Harvest Water is intended to deliver 50,000 AFY to the project area.

- Harvest Water also includes a potential extraction component. The extraction component, if implemented, would not be implemented until certain benefit triggers (e.g., groundwater level increases) have been met, which is expected to take approximately 20 years. The extraction component is conceptualized to allow up to 30% of the recycled water recharge to be extracted, with the remaining 70% of recycled recharge and all winter application assumed not to be extracted. Any extractions, if performed, would be done in a manner to preserve key program benefits to wildlife and ecosystems and to meet SMC and the sustainability goal of this GSP.

- Modeling performed for this GSP has used a net recharge approach that recognizes a future extraction component that has not yet been specified or finalized. Rather than delivering 100% of the recycled recharge water and then extracting 30% of that water, the net recharge approach simulated delivery of 70% of the recycled supply for application in the growing season. This effectively accounts for the extraction of up to 30% of this water without a need to define extraction details that are currently unknown. All winter application is modeled as not being extracted.

OHWD Recharge Project:

- The project assumes a diversion of 6,000 AFY from the Cosumnes River.

- The maximum diversion is assumed to be 50 cfs, which occurs during the period of December 1 through February 28 in any year where adequate peak flows occur in the Cosumnes River.

- Water is applied to 1,168 acres between Cosumnes River and Deer Creek (Rooney Ranch and Teichert Ranch)

- The project is expected to enhance groundwater levels along the Cosumnes River resulting in the river running for longer periods during the spring and summer, with flows beginning earlier in the fall.

Regional Conjunctive Use Program:

- The program is a comprehensive Regional Conjunctive Use Program, with participation by both NASb and SASb urban entities, including California American Water Company, Citrus Heights Water District, City of Lincoln, City of Sacramento, Golden State Water Company, SCWA and Sacramento Suburban Water District.

- Existing infrastructure and planning are assumed to remain in place.

- The program will be integrated with the Regional Water Reliability Program (RWA, 2018).

- Project operations include delivery of wet year surface water supplies to reduce groundwater use and dry year groundwater recovery operations by select entities.

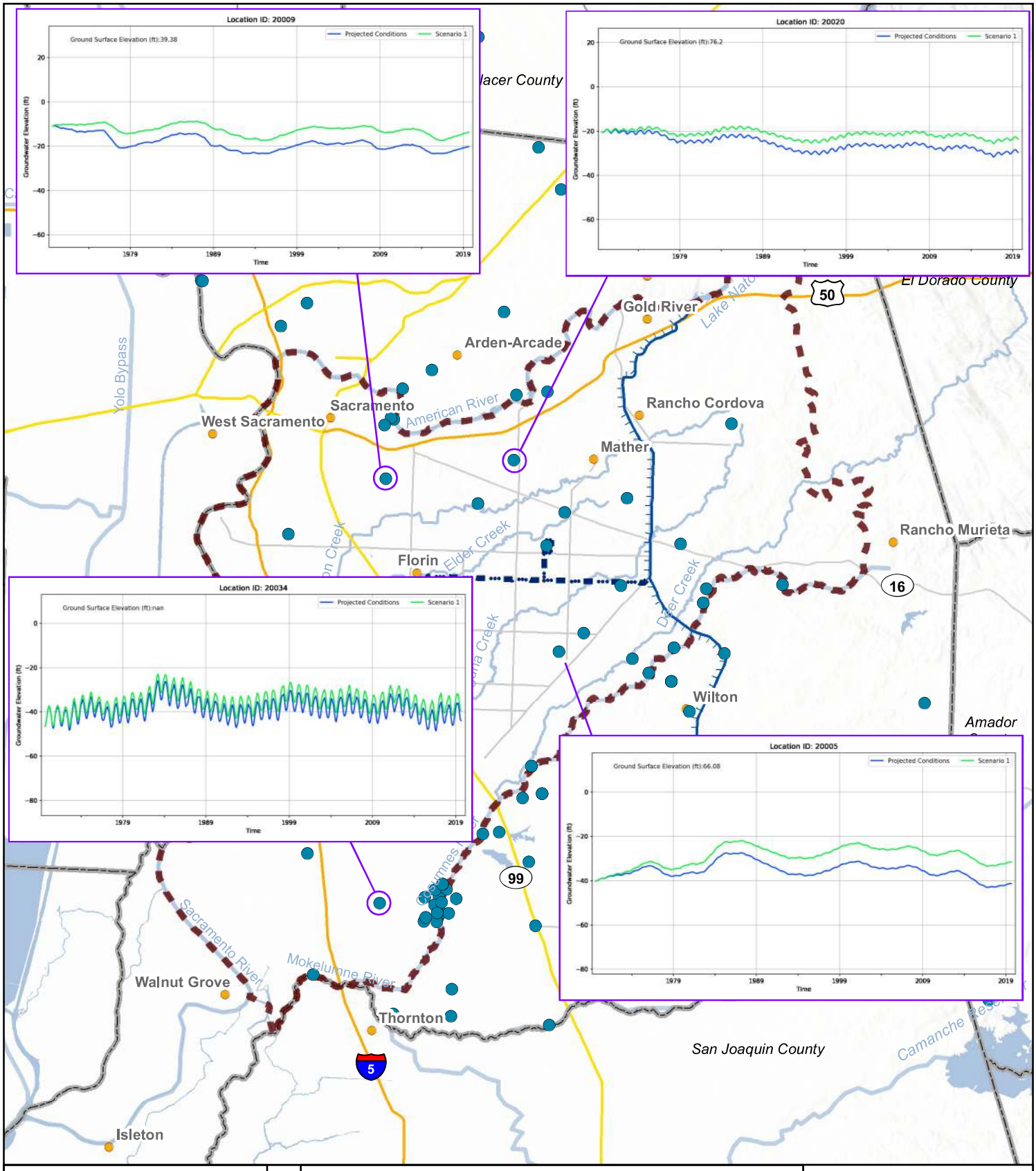
Note that while the SAFCA project was included in the list of supplemental projects above, it was not included in the modeling scenarios for the GSP because of significant uncertainties with respect to the recharge and extraction cycle, including location and fate of extracted water.

The following subsections describe the results of the modeled scenarios.

4.6.1 Results of Demand Reductions Scenarios (Scenarios 1 and 2)

Scenarios 1 and 2 include different potential combinations of reductions in groundwater pumping over the projected 50-year hydrologic period. These scenarios were run to assess the sensitivity of future conditions to potential reductions in demand. Scenario 1 is compared with the Projected Conditions Baseline, and Scenario 2 is compared with the Projected Conditions both without and with Climate Change.

Figure 4-6 and **Figure 4-7** shows groundwater hydrographs that result from Scenarios 1 and 2, respectively, in various locations throughout the subbasin, each compared to the Projected Conditions Baseline without climate change. Both demand reduction scenarios result in higher groundwater levels as compared to the Projected Condition baseline. Scenario 1 results in increases in groundwater levels ranging from 2-10 feet over the 50-year hydrologic period. The increases in groundwater elevations can potentially be greater in the vicinity of the agricultural areas in the southern portions of the subbasin in Scenario 2, with the overall changes ranging from 2-12 feet.



Changes in Groundwater Levels for Scenario 1

South American Subbasin

Figure 4-6

Legend

- Cities and Towns
- Monitoring Wells
- Rivers and Creeks
- Folsom South Canal
- Freeport Pipeline
- Counties
- South American Subbasin

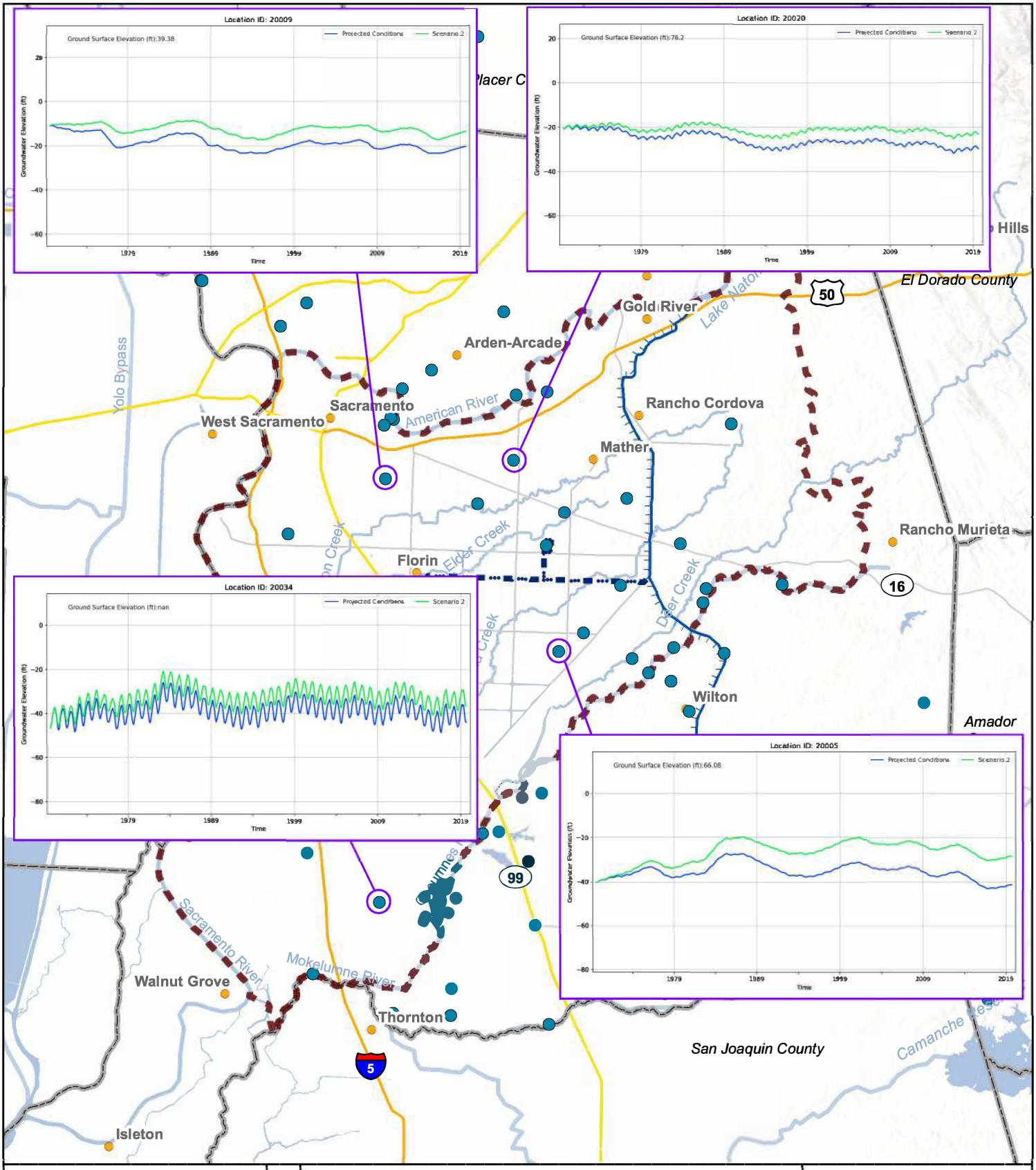
0 1.25 2.5 5 Miles

N

South American SUBBASIN

Map Created: June 2021

Figure Exported: 6/3/2021 By: ceggleton Using: \\woodardcurran.net\shared\Projects\RMC\SAC\0509 Sac Central Groundwater Authority\0011575.00- SCGA GSPG, GIS\2. MXD\4-8 Model Results with Hydrographs.mxd



Changes in Groundwater Levels for Scenario 2

South American Subbasin

Figure 4-7

Legend

- Cities and Towns
- Monitoring Wells
- Rivers and Creeks
- Folsom South Canal
- Freeport Pipeline
- Counties
- South American Subbasin

0 1.25 2.5 5 Miles

N

South American SUBBASIN

Map Created: June 2021

Figure Exported: 6/3/2021 By: ceggleton Using: \\woodardcurran.net\shared\Projects\RMC\SAC\009 Sac Central Groundwater Authority\001\575.00- SCGA GSP\G. GIS\2. MXD\4-9 Model Results with Hydrographs.mxd

Figure 4-8 shows the cumulative change in storage in Scenarios 1 and 2 as compared to the respective Projected Conditions Baseline over the 50-year projected hydrologic period. Both scenarios show a similar pattern of increase and decrease in overall storage during various hydrologic conditions over time. However, while the Projected Conditions Baseline indicates an average annual deficit in groundwater storage of about 1,100 AFY, both demand reduction scenarios have a storage surplus over the course of the 50-year hydrologic period. The average annual storage surplus is about 2,000 AFY in Scenario 1 and about 2,800 AFY in Scenario 2. This reflects the effects of reduction in groundwater pumping under each scenario.

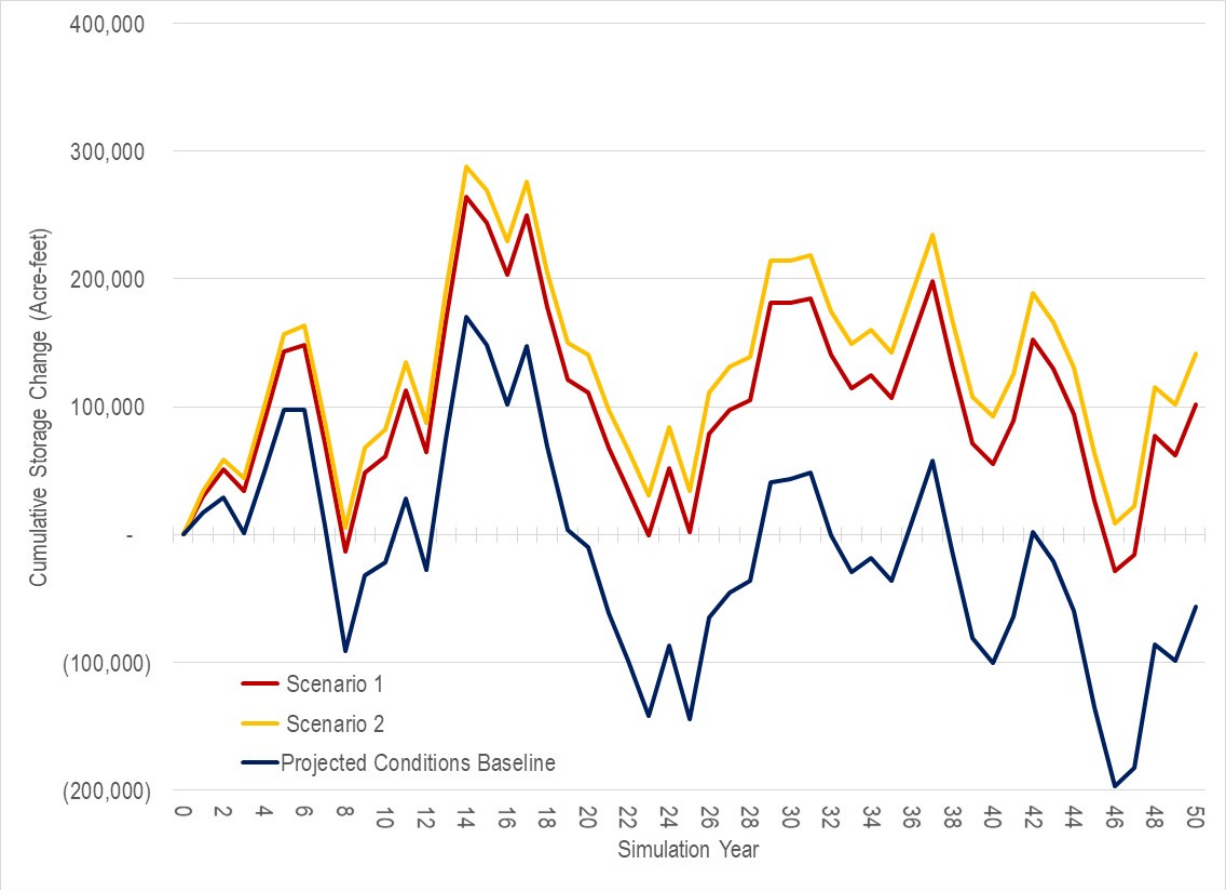


Figure 4-8: Cumulative Storage Change in Scenarios 1 and 2

Additionally, Scenario 2 was simulated using the Projected Conditions with climate change Baseline. **Figure 4-9** shows the cumulative storage change for the Projected Conditions Baseline and Scenario 2 with climate change over the course of the 50-year simulation period. With climate change, the Projected Conditions Baseline has an average annual reduction in storage of about 6,200 AFY. The average annual reduction in storage is about 1,500 AFY in Scenario 2. Therefore, implementation actions resulting in a total basin-wide demand reduction of 10% would be projected to bring the subbasin closer to balance but will not achieve sustainability under climate change.

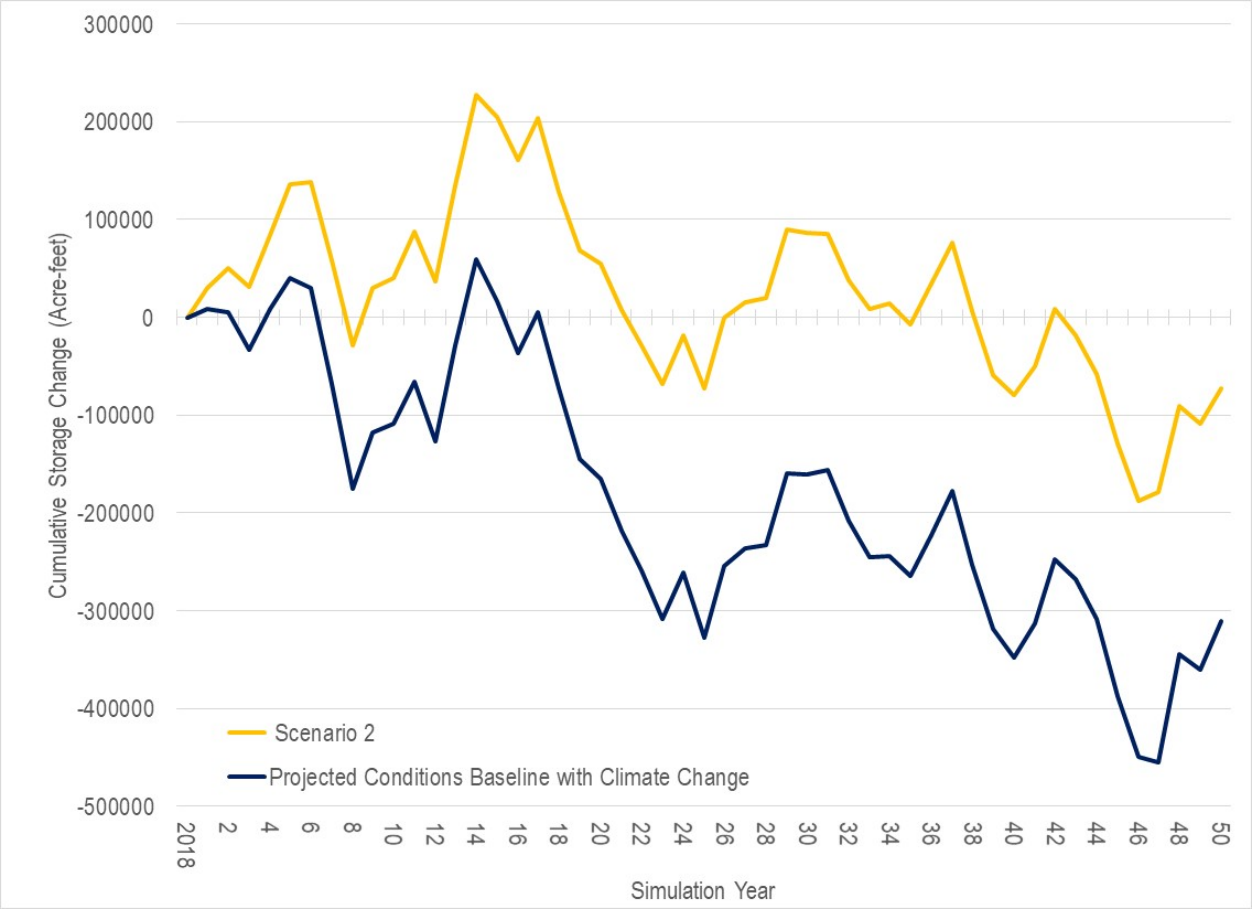


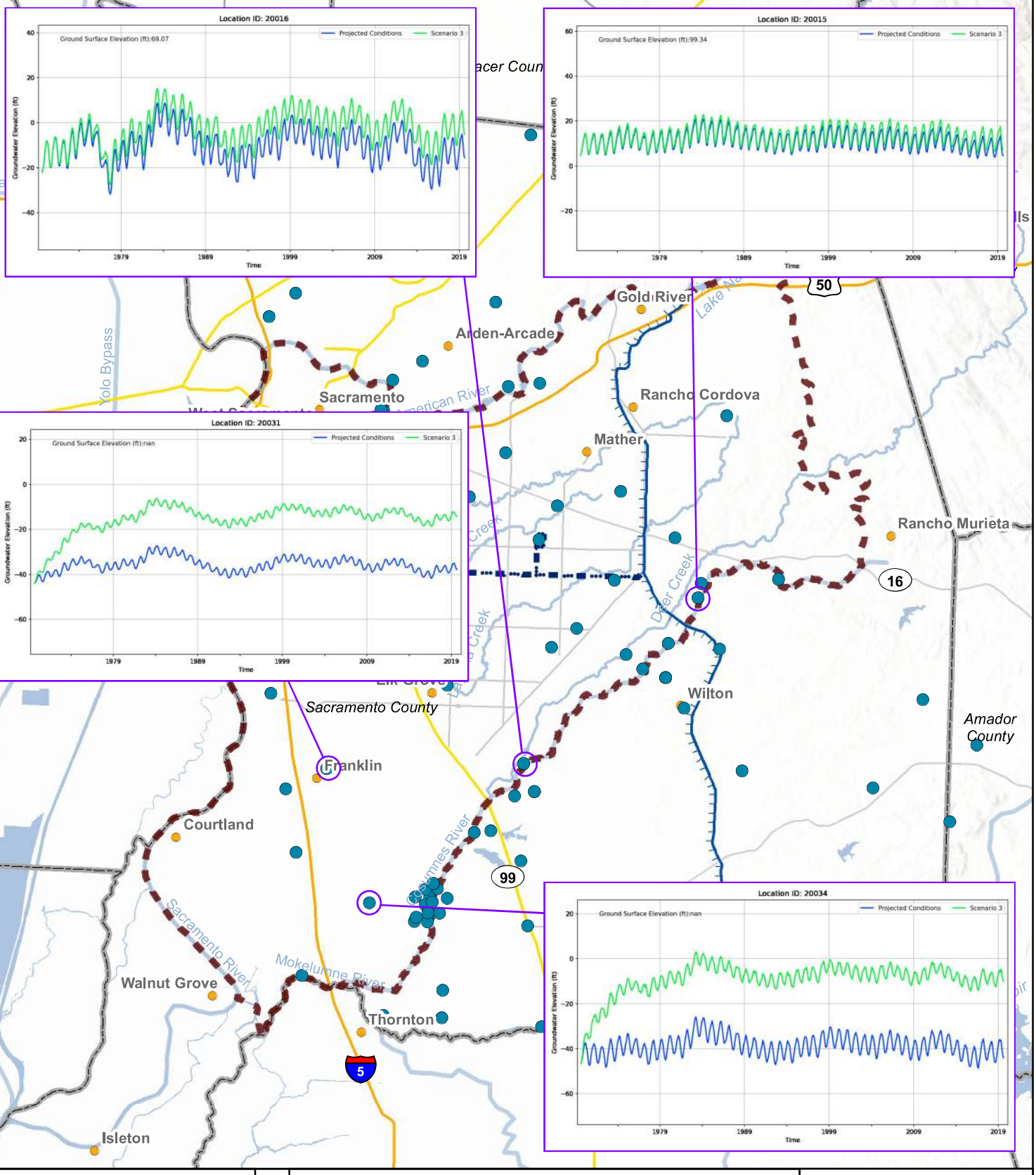
Figure 4-9: Cumulative Storage Change with Climate Change in Scenario 2

4.6.2 Results of Project Implementation Scenario 3

Scenario 3 includes implementation of Harvest Water and the OHWD recharge project over the projected 50-year hydrologic period. Modeling results are compared to the Projected Conditions Baseline without climate change.

Figure 4-10 shows the changes in groundwater hydrographs that result from Scenario 3. In Scenario 3, there is a significant increase in groundwater levels of about 30-40 feet in the vicinity of the Harvest Water project areas in the southwestern portion of the basin in southern Sacramento County. In the OHWD area along the Cosumnes River, there are more moderate increases in groundwater levels of about 10 feet in the southwestern portion of the OHWD GSA and about 5 feet near the intersection of the Folsom South Canal and the Cosumnes River. Note that both the Harvest Water and OHWD projects will provide benefits in the form of increased stream flow in the Cosumnes River and increased subsurface flows to the Cosumnes Subbasin due to the locations of these projects.

Figure 4-11 shows the cumulative change in storage in Scenario 3 as compared to the Projected Conditions Baseline over the 50-year simulation period. There is a similar pattern of increase and decrease in overall storage as the simulation moved through time. However, while the Projected Conditions Baseline has an average annual reduction in storage of about 1,100 AFY, Scenario 3 has a storage surplus of about 3,200 AFY over the course of the 50-year simulation period, reflecting a net benefit to the SASb of about 4,300 AFY. Scenario 3 will provide storage benefits to the Cosumnes Subbasin due to increased subsurface flows to that subbasin.



Changes in Hydrograph Levels for Scenario 3

South American Subbasin

Figure 4-10

Legend

- Cities and Towns
- Monitoring Wells
- Rivers and Creeks
- Folsom South Canal
- Freeport Pipeline
- Counties
- South American Subbasin

0 1.25 2.5 5 Miles

N

South American SUBBASIN

Map Created: June 2021

Figure Exported: 6/3/2021 By: ceggleton Using: \\woodardcurran.net\shared\Projects\RMC\SAC\0509 Sac Central Groundwater Authority\0011575.00- SCGA GSPG, GIS\2. MXD\4-11 Model Results with Hydrographs.mxd

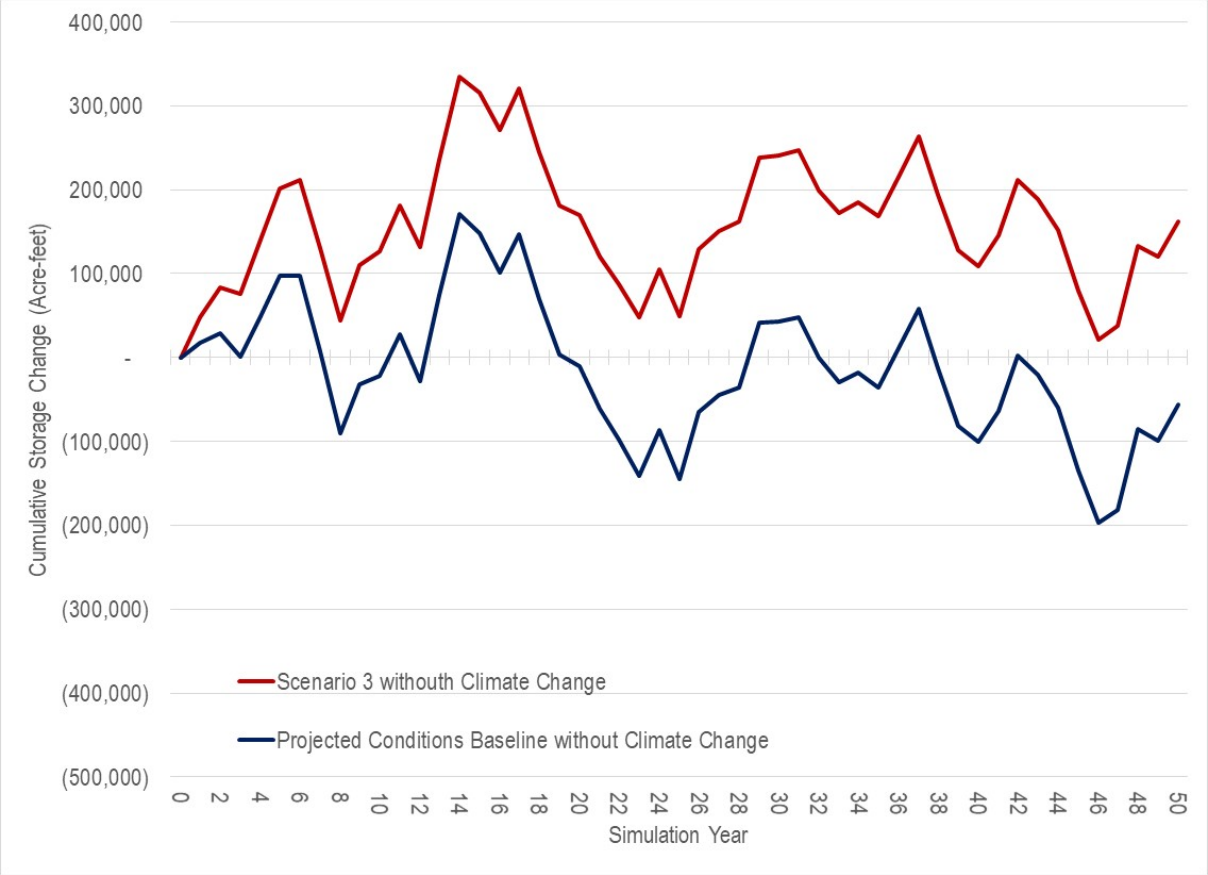


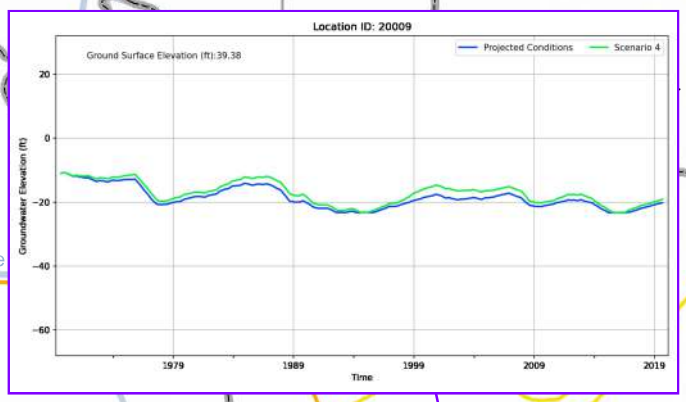
Figure 4-11: Cumulative Storage Change in Scenario 3

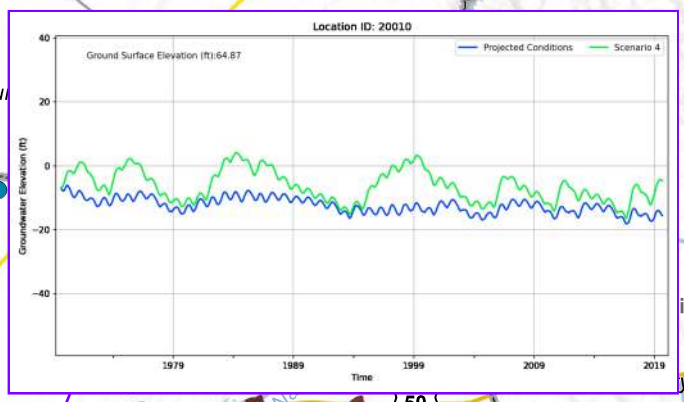
4.6.3 Results of Project Implementation Scenario 4

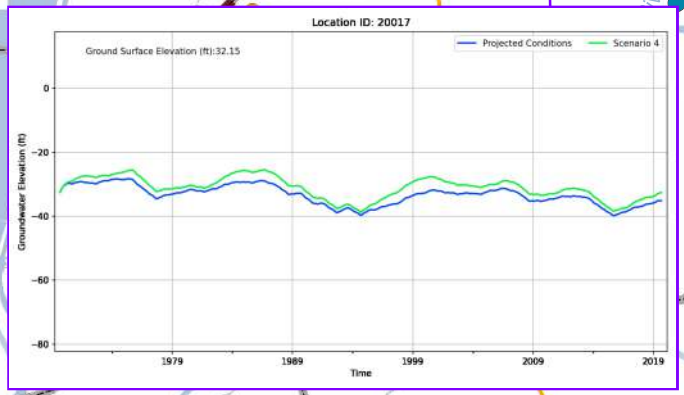
Scenario 4 include includes implementation of the M&I entities' regional conjunctive use program. Modeling results are compared to the Projected Conditions Baseline both without and with climate change.

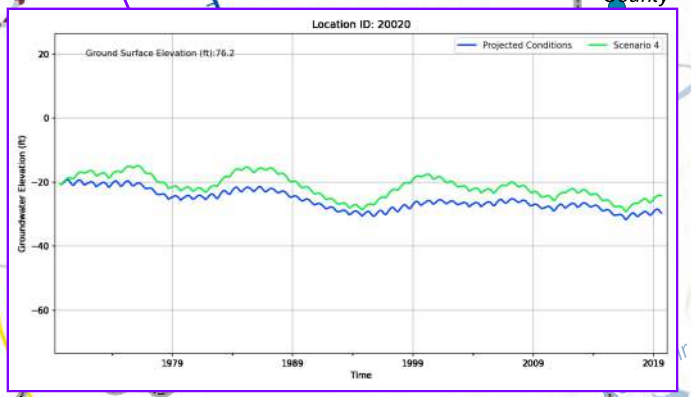
Figure 4-12 shows the changes in groundwater hydrographs that result from Scenario 4 using the Projected Conditions Baseline without climate change. In Scenario 4, there are increases in groundwater levels over the 50-year simulation period ranging from 2-10 feet in the areas of recharge. This includes an increase of about 10 feet in the vicinity of the American River, which results in increased stream flow in the American River and increased subsurface flows to the North American Subbasin.

Figure 4-13 shows the cumulative change in storage in Scenario 4 as compared to the Projected Conditions Baseline both without and with climate change over the 50-year simulation period. While the Projected Conditions Baseline has an average annual reduction in storage of about 1,100 AFY without climate change, in Scenario 4 there is an average annual storage surplus of about 200 AFY. Similarly, while the Projected Conditions Baseline with climate change has an average annual reduction in storage of about 6,200 AFY, the average annual reduction in storage in Scenario 4 is about 4,800 AFY. Therefore, Scenario 4 provides an average annual storage benefit to the subbasin of about 1,300-1,400 AFY, in addition to storage benefits to the North American Subbasin.









Cache
Yolo Bypass
Arden-Arcade
Gold River
Lake Natoma
50
Sacramento
West Sacramento
American River
Rancho Cordova
Mather
Rancho Murieta
Florin
Elder Creek
Morrison Creek
Deer Creek
Freeport
16
Yolo County
Laguna Creek
Elk Grove
Wilton
Sacramento County
Amador County
Franklin
Courtland
99
San Joaquin County
Camanche
Isleton

Changes in Groundwater Levels for Scenario 4

South American Subbasin

Figure 4-12

Legend

- Cities and Towns
- Monitoring Wells
- Rivers and Creeks
- Folsom South Canal
- Freeport Pipeline
- Counties
- South American Subbasin

0 1.25 2.5 5 Miles

N

South American SUBBASIN

Map Created: June 2021

Figure Exported: 6/3/2021 By: ceggleton Using: \\woodardcurran.net\shared\Projects\RMC\SAC\0509 Sac Central Groundwater Authority\0015575.00- SCGA GSPG, GIS\2. MXD\4-12 Model Results with Hydrographs.mxd

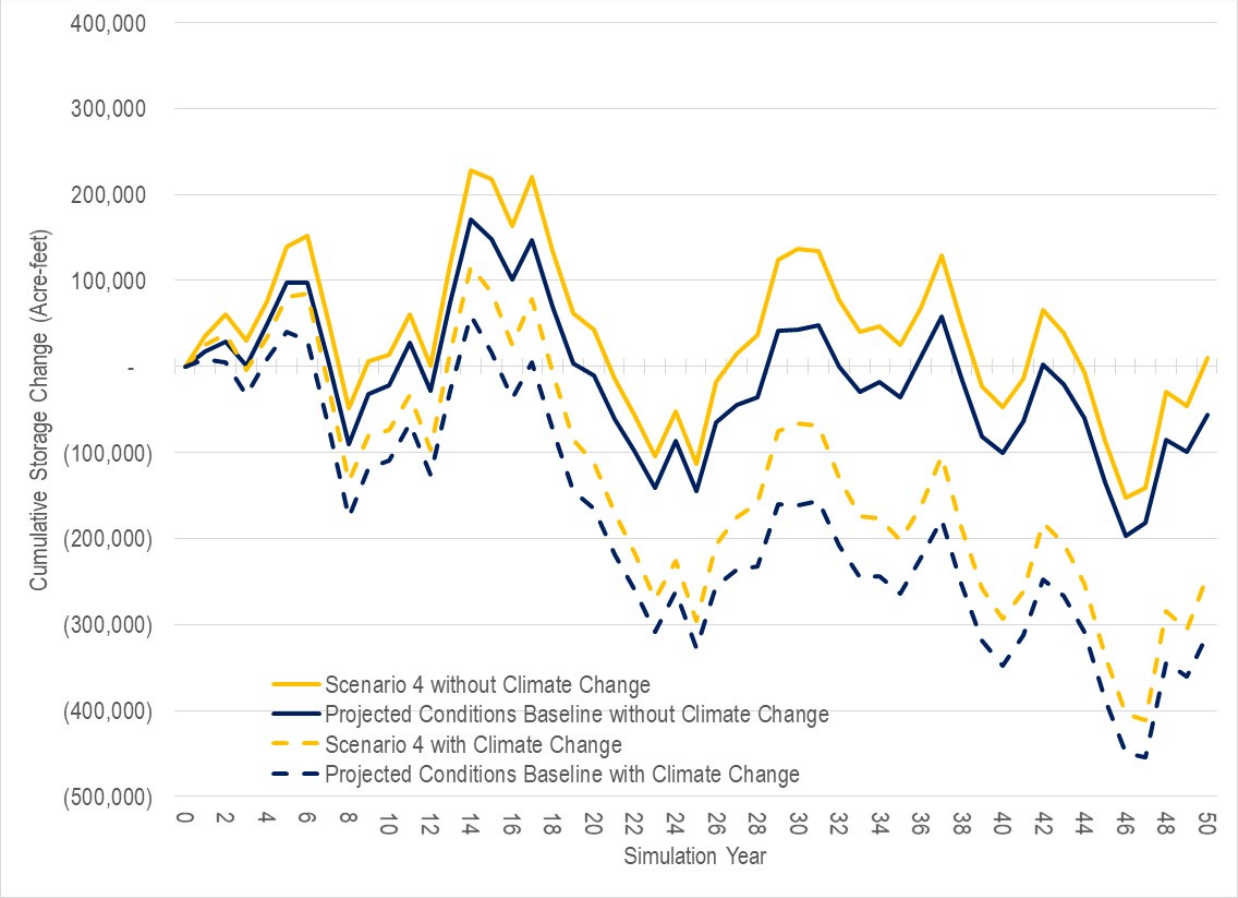


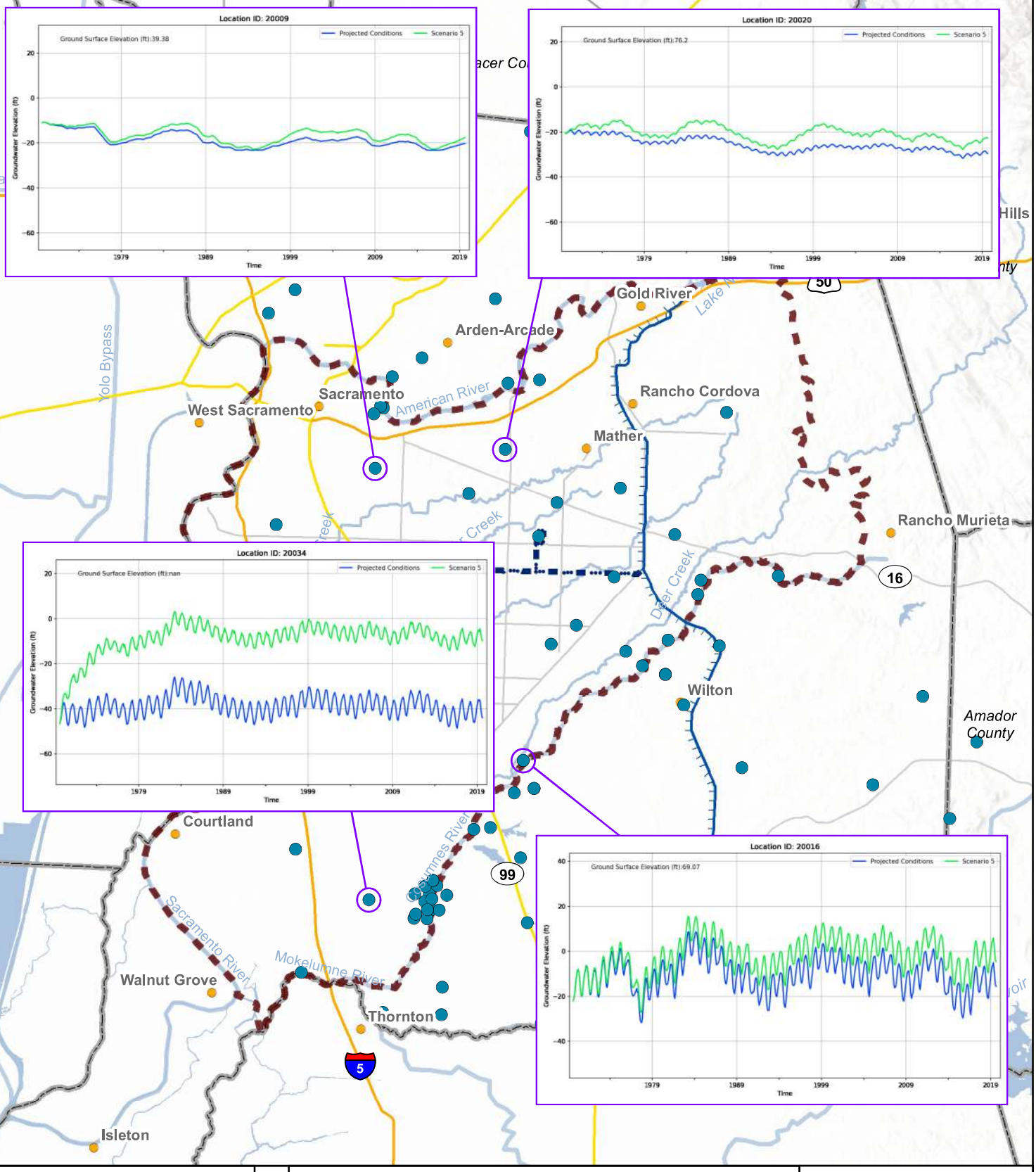
Figure 4-13: Cumulative Storage Change in Scenario 4

4.6.4 Results of Project Implementation Scenario 5

Scenario 5 includes all of the projects that were in Scenarios 3 and 4, which include implementation of Harvest Water and the OHWD recharge project, and implementation of the M&I entities' regional conjunctive use program. Modeling results are compared to the Projected Conditions Baseline both without and with climate change.

Figure 4-14 shows the changes in groundwater hydrographs that result from Scenario 5 using the Projected Conditions Baseline without climate change. Similar to Scenario 3, there is a significant increase in groundwater levels of about 30-40 feet in the vicinity of the Harvest Water project area in the southwestern portion of the basin in southern Sacramento County and more moderate increases in groundwater levels of about 10 feet along the Cosumnes River in the vicinity the OHWD GSA. Similar to Scenario 4, there are increases in groundwater levels over the 50-year simulation period ranging from 2-10 feet in the northern portion of the subbasin in the areas of recharge, including increases of about 10 feet in the vicinity of the American River. These relative groundwater level changes provide benefits to the American and Cosumnes Rivers in the form of increased streamflow and to the North American and Cosumnes Subbasins in the form of increased subsurface flows.

Figure 4-15 shows the cumulative change in storage in Scenario 5 as compared to the Projected Conditions Baseline, both without and with climate change over the 50-year simulation period. While the Projected Conditions Baseline has an average annual reduction in storage of about 1,100 AFY without climate change, in Scenario 5 there is an average annual storage surplus of about 4,500 AFY. Similarly, while the Projected Conditions Baseline with climate change has an average annual reduction in storage of about 6,200 AFY, the average annual reduction in storage in Scenario 5 is only about 100 AFY. Therefore, Scenario 5 provides an average annual net benefit to the subbasin in the range of 5,600 to 6,100 AFY, in addition to storage benefits provided to the North American and Cosumnes Subbasins. It is anticipated that planned demand management (as considered in either Scenario 1 or 2) resulting from implementation of future conservation measures (e.g., as described in 2020 Urban Water Management Plans) would offset the small storage deficit of 100 AFY predicted for Scenario 5 with climate change.



Changes in Groundwater Levels for Scenario 5

South American Subbasin

Figure 4-14

Legend

- Cities and Towns
- Monitoring Wells
- Rivers and Creeks
- Folsom South Canal
- Freeport Pipeline
- Counties
- South American Subbasin

0 1.25 2.5 5 Miles

N

South American SUBBASIN

Map Created: June 2021

Figure Exported: 6/3/2021 By: ceggleton Using: \\woodardcurran.net\shared\Projects\RMC\SAC\0509 Sac Central Groundwater Authority\0011575.00- SCGA GSPG, GIS\2. MXD\4-13 Model Results with Hydrographs.mxd

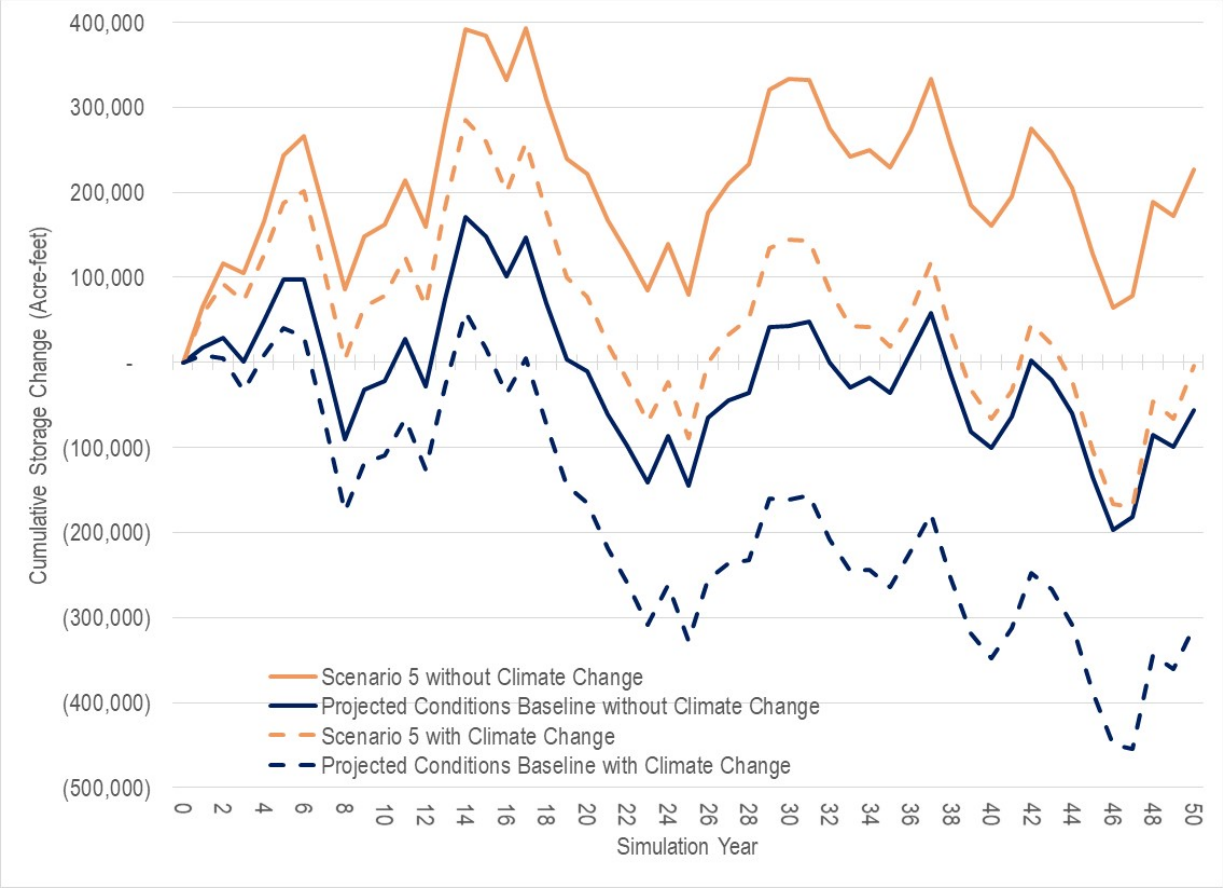


Figure 4-15: Cumulative Storage Change in Scenario 5

4.6.5 Summary of Project Management Scenario Results

The results of the project management scenarios are summarized for scenarios simulated without consideration of climate change in **Table 4-3** below and for the scenarios simulated with consideration of climate change in **Table 4-4** below. Both without and with climate change, all scenarios result in lower average annual groundwater pumping and an improvement in groundwater storage. Note that Scenarios 1 and 2 (Demand Reduction) were run separately from Scenarios 3, 4 and 5 (Projects) to assess the isolated benefit of either expected urban demand reductions or potential agricultural demand reductions. Therefore, estimated storage benefits resulting from Scenarios 1 and 2, which fall in the Group 1 category, are additive to the outcomes from the other scenarios, which are comprised of Group 2 projects. Long-term groundwater basin sustainability can be achieved under any of the projected management scenarios if projected conditions without climate change were to occur. If, as anticipated, the projects that were included in Scenario 5 all occur as planned, and accounting for an expected planned reduction in demand, long-term groundwater basin sustainability will occur under the climate change conditions that have been modeled.

Table 4-3: Summary of Project Management Action Modeling Scenarios Without Consideration for Climate Change

CoSANA Model Scenarios	Description	Average Annual Groundwater Pumping (AFY)	Average Annual Groundwater Storage Condition (Inflows minus Outflows) (AFY)
PCBL	Projected Condition Baseline	234,000	-1,100
Scenario 1	Demand reduction (5% Ag; 10% Urban)	216,500	+2,000
Scenario 2	Demand reduction (10% Ag; 10% Urban)	210,900	+2,800
Scenario 3	Harvest Water & OHWD Recharge	211,800	+3,200
Scenario 4	Regional Conjunctive Use	227,400	+200
Scenario 5	Harvest Water, OHWD Recharge & Regional Conjunctive Use	205,200	+4,500

Table 4-4: Summary of Project Management Action Modeling Scenarios With Consideration of Climate Change

CoSANA Model Scenarios	Description	Average Annual Groundwater Pumping (AFY)	Average Annual Groundwater Storage Condition (Inflows minus Outflows) (AFY)
PCBL CC	Projected Condition Baseline with Climate Change	245,800	-6,200
Scenario 2	Demand reduction (10% Ag; 10% Urban)	220,400	-1,800
Scenario 4	Regional Conjunctive Use	239,100	-4,800
Scenario 5	Harvest Water, OHWD Recharge & Regional Conjunctive Use	216,600	-100

4.7 Management Actions

In this subsection, proposed management actions to be taken by SASb GSAs as an element of GSP implementation are identified and described.

4.7.1 Shallow/Vulnerable Well Protection Program

The concept of a shallow/vulnerable well protection program has been discussed at numerous GSPWG meetings and public meetings. The purpose of the program would be to provide relief to users of shallow wells in the SASb impacted by declines in groundwater levels in the vicinity of their wells due to groundwater management activities associated with the GSP. Based on best available information, an analysis has been performed (**Appendix 3-C: Shallow Well Protection Technical Memorandum**) which indicates that the incidence of such impacts is projected to be low over the GSP planning horizon. However, uncertainty in measured and modeled groundwater elevations, the number of shallow/vulnerable wells in the SASb, well completion data, and age of active wells requires additional coordination, monitoring, and data collection to ensure ongoing protection of shallow and vulnerable wells. The creation of a shallow well protection program is intended to address the cases where such impacts may occur.

The development, implementation and funding of a shallow/vulnerable well protection program would be consistent with historical action in the SASb; a well protection program was previously considered by SCGA, as part of the Zone 40 Water Supply Master Plan and SCWA developed and implemented the North Vineyard Well Protection Program in the Sunrise-Douglas area within the City of Rancho Cordova. The new program would be developed with knowledge of the details of these previous efforts.

The Sacramento County Environmental Management Department Wells Program (Wells Program) is the entity with responsibility for oversight of well construction, modification, repair, inactivation, or destruction of wells in Sacramento County. Any water supply or monitoring well that is constructed in Sacramento County must first obtain a permit from the Wells Program. Therefore, the development of a shallow well protection program will be done in close coordination with the Wells Program.

An incremental approach to a well protection program is favored by the GSAs, with early emphasis on information gathering, outreach, program development and engagement. This includes formation of a shallow well advisory group (SWAG) comprised of local well owners and agency representatives, increased coordination, improved risk assessment based on additional data collection through a volunteer well monitoring network to assess groundwater depths, revision of well completion data, and early contributions to a well mitigation fund to address rehabilitation or replacement needs. After the first two (2) years (Phase I), an assessment will be made regarding future direction of the program (Phase II).

The SASb well protection program is organized around three core tasks: (1) stakeholder engagement and outreach, (2) coordination with and analysis of data from a volunteer well monitoring program, and (3) a well impact mitigation fund. Tasks 1 and 2 aim to acquire and integrate new information into well protection planning over time, and Task 3 provides a set-aside for reasonable financial protection to wells that may be impacted by drops in groundwater levels.

Task 1 – Stakeholder coordination and outreach:

The SASb GSAs will assist in the formation of a "shallow well advisory group" (SWAG) with representatives from the GSAs and local community members. The SWAG will meet bi-annually to coordinate community outreach, engage with stakeholders on well construction standards (e.g., Sacramento County EMD Wells Program), support the volunteer monitoring effort (task 2 below), and support further development of the well protection program. A critical objective of the SWAG is to assist in the definition of the scope and administrative details of the mitigation element of the well protection program.

Task 2 – Volunteer Monitoring Program (VMP):

Interest exists within the SASb agricultural-residential community to develop and participate in a volunteer well monitoring program (VMP). Data properly collected at individual wellheads is valuable information for identifying vulnerable wells and ascertaining if wells may be impacted by declining groundwater levels. In addition to groundwater levels, samples at selected wells may be used to assess water quality constituents of interest (e.g., nitrates, EC, arsenic, iron, manganese). Monitoring hundreds of wells in a single GSP is infeasible for the GSP[1];but, by involving many residents in a volunteer monitoring process, the VMP can improve the spatial and temporal resolution of groundwater level information, well completion data and water quality data. These improved data will in turn improve the accuracy of future well impact analysis, inform preventative rehabilitation (e.g., lowering pumps before wells are impacted), and empower local well owners to better understand the status of local groundwater conditions.

- Administration of the VMP includes outreach, communication, and training. It is assumed that activities will be coordinated by community representatives that also participate in the SWAG (task 1 above).

- Instrumentation (e.g., sensors) and administration (e.g., program support and training) needs will be assessed by the SWAG.

- Groundwater level and (in a subset of wells) groundwater quality data collection will take place at the scale of the individual participants. It is assumed that data interpretation will occur at the group level.

[1] For scale and reference, the CA-DWR monitors around two thousand wells per year across the entire state as part of their ambient groundwater level monitoring.

- Solutions to automatically collect, transform, visualize, and report data collected by the VMP may be explored by the GSP working group during the first two (2) years of GSP implementation (i.e., Phase I – see next section).

- Using the DWR OSWCR database as a starting point, a well inventory for the basin will be developed. Processes will be developed by which residents can refine their well's location in the well inventory, and input key information.

Task 3 – Well impact mitigation fund:

In addition to increased monitoring, data collection, and coordination, modeled well impact estimates will be used to assess the risk to shallow/vulnerable wells in the SASb and to assess the need for a mitigation fund – built up over time – to rehabilitate or replace wells directly impacted by declining groundwater levels. The need and amount of the fund will be informed by the best available estimates of the number of wells that may be impacted if MTs are reached, and the value attributable to those wells. Importantly, if a well is impacted, data collected by the VMP will help determine the likely cause. Eligibility conditions that define the well impacts that are covered by the fund will be scoped by the GSAs, in coordination with the DWAG, and may include factors such as well age, construction status, and the nature of the problem with the well. Throughout implementation, the size of the fund will be adjusted in accordance with the best available information on well vulnerability.

Timing

The timing of Tasks 1, 2 and 3 in GSP implementation will proceed in two phases:

Phase I: For the first two (2) years of GSP implementation (2022-2023), additional effort will be placed on establishing agency-community relationships, building a volunteer monitoring network, and improving well completion data (Tasks 1 and 2). A well rehabilitation fund will be progressively built, commensurate in amount to current estimates of vulnerable wells. Data collected in this phase will inform the need, scope and structure of a rehabilitation fund (Task 3).

Phase II: By the third year of GSP implementation (2024), the GSP will re-assess and adjust startup efforts to focus on program maintenance and will determine the appropriate scope of a rehabilitation fund (Task 3). These activities will continue as appropriate throughout the implementation period.

Details of Program that are to be Developed

The administrative details to be resolved in the development of a Shallow Well Protection Program during the Phase I period may include the following. Note that this list of questions is provided only as an example of possible considerations and does not represent the content of the eventual Shallow Well Protection Program for the SASb.

1) Who should be covered by a Shallow Well Protection Program?
   - Domestic well owners
   - Agricultural irrigation well owners
   - Other private wells (industrial, commercial, institutional)

2) What area should be covered?
   - Only outside the boundaries of municipal water suppliers
   - Outside the distribution system of municipal water suppliers
   - Within water supplier service areas

3) What services should be covered?
   - Emergency water supply (bottled water, water truck)
   - Pump lowering
   - Pump replacement
   - Well deepening
   - Drilling of a replacement well

4) Would the full cost of services be covered?

5) What conditions in the groundwater basin are covered?
   - Regional decline in water levels
   - Local decline in water levels, i.e., influenced by a neighboring well

6) Is a Water Well Drillers Report necessary to cover a well in the program?

7) Should well owners be required to register in advance and provide information on their well to be a candidate for assistance under the program?

8) Should the program be proactive , i.e., identify wells at greatest risk and take early actions, reactive, or both?

9) How should the program be funded and administered?

It is intended that the GSAs will work in concert with the SWAG and other stakeholders to develop the administrative and policy details of the Shallow Well Protection Program for the SASb during the Phase 1 period, as described above. This management action is the commitment to develop and fund the phased program described above in the first several years of GSP implementation.

4.7.2 Well Permit Coordination

A second management action under this GSP is the development and implementation of a process for SASb GSAs to coordinate with the EMD Wells Program. The GSAs will work with EMD and the Sacramento County Board of Supervisors to modify well construction ordinances or take other measures to establish:

- Minimum screen depth requirements to limit high-capacity wells from impacting the shallow zone of the SASb aquifer and users on that shallow zone (i.e., shallow domestic and agricultural wells, groundwater-dependent ecosystems, inter-connected surface waters)

- Well spacing requirements for high-capacity wells to limit impacts on existing wells

- Consultation/coordination between EMD Wells Program and SASb GSAs to ensure new wells do not impact the performance or quality of information derived from wells in the GSP Monitoring Network.

4.7.3 Coordination Activities

A third management action under this GSP is a commitment to provide resources for ongoing coordination with various entities on various topics to support GSP implementation. Each of the proposed coordination activities are consistent with effective management of groundwater resources in the SASb and are also consistent with the requirements of SGMA for GSP development and implementation.

The specific activities included in this management action include:

a. Coordination with GSAs on overarching groundwater management issues consistent with the GSP (through a governance structure that is provided as a companion document to this GSP).

b. Coordination with agencies with local land use authority in the SASb to ensure that future land use plans consider the information generated through GSP implementation, including monitoring data and specific modeling results. The GSP has been developed using available information from existing land use plans. Identify and evaluate significant changes in those land use plans that may significantly impact the future groundwater conditions in the SASb. Proactively work with land use agencies to ensure future development is compatible with GSP goals, attainment of SMC and implementation actions by GSAs through information sharing and annual meetings with those agencies.

c. Coordination with entities sponsoring beneficial projects identified in this GSP to provide support and otherwise facilitate implementation of these projects, including support for grant funding opportunities, as appropriate

d. Coordination with water supply agencies to support their implementation of water use efficiency measures. For agencies responsible for the development of urban water management plans, it is anticipated that the 2020 versions of those plans will lead to increased water conservation practices. This coordination activity will encourage implementation of the urban demand management scenarios that were modeled with CoSANA. Coordination with RWA, Water Forum, and local agencies regarding regional water supply planning and water resources management.

e. Coordination with GSAs in adjacent basins, including consideration and/or development of formal agreements to support ongoing information sharing during GSP implementation (e.g., groundwater levels, boundary fluxes, outreach messages). Coordination with the Cosumnes Subbasin to address data gaps along the middle reach of the Cosumnes River to address uncertainties regarding interconnectedness between surface water and groundwater. Coordination with NASb and Water Forum to ensure Lower American River Flow standards are addressed appropriately, and that the

subsurface flow conditions and movement of regional contamination plumes are properly controlled within the context of regional contamination cleanup efforts.

f. Coordination with Regional Water Authority and other regional partners to support development of a groundwater banking and accounting framework to enable effective implementation of future conjunctive use projects and other water resource management actions, consistent with attainment of the sustainability goal in the SASb. The Sacramento Regional Water Bank is envisioned as an institutional and legal framework for operating a sustainable storage and recovery program in the NASb and SASb. Participation in the Regional Water Bank will be voluntary, with incentives in place to expand conjunctive use operations. The primary goal will be to manage the subbasins sustainably and to enhance climate change resiliency, while protecting all beneficial uses and users. Fundamental principles of the Regional Water Bank are that water must be stored before it can be recovered, that losses must be taken into account, and that the net effect of its operations are to enhance groundwater conditions in the subbasins, in the form of increasing groundwater levels and storage. Operation of the Regional Water Bank will require monitoring, modeling and mitigation to ensure the protection of all users and beneficial uses. Planning for the Regional Water Bank, led by the RWA, is projected to proceed over the next several years, with active participation by the GSAs and other entities in the NASb and SASb.

g. Coordination with Regional Water Authority and other regional partners in the development of a refined climate change assessment for use in the 5-year update of the SASb GSP.

4.7.4 Address Data Gaps

A fourth management action under this GSP to be implemented by the GSAs is the collection of information to fill data gaps that are identified in the GSP. Specifically, this includes the following:

a. Collection of well depth and screened interval information for specific wells in the Monitoring Network as described in **Section 3**.

b. Collection of groundwater and surface water information in the stretch of the Cosumnes River between Deer Creek and Twin Cities Road which has been identified in **Section 3** as an area where the interconnectedness of surface and groundwater is uncertain.

c. Analysis of water quality samples collected by shallow well owners under the Shallow Well Protection Program Voluntary Monitoring Network. The number of samples and the water quality constituents to be analyzed will be determined by the GSAs in coordination with the Shallow Wells Advisory Group described in **Section 4.7.1** above.

The GSAs will develop a plan, schedule and budget estimate for actions to address the data gaps identified above within the first year of GSP implementation.