

Salinas Valley Groundwater Basin Forebay Aquifer Subbasin Groundwater Sustainability Plan



Salinas Valley Basin
Groundwater Sustainability Agency

(Approved by Salinas Valley Basin Groundwater Sustainability Agency Board of Directors on January 13, 2022
and by the Arroyo Seco Groundwater Sustainability Agency Board of Directors on December 28, 2021)



Photo courtesy of Steve McIntyre

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ACRONYMS AND ABBREVIATIONS

\$/AF	dollar per acre-foot
AF	acre-foot or acre-feet
AF/yr.	acre-feet per year
ASCMA	Arroyo Seco Cone Management Area
ASGSA	Arroyo Seco Groundwater Sustainability Agency
Basin	Salinas Valley Groundwater Basin
Basin Plan	Water Quality Control Plan for the Central Coast Basin
BLM.....	U.S. Bureau of Land Management
BMPs.....	Best Management Practices
CASGEM.....	California Statewide Groundwater Elevation Monitoring
CCGC.....	Central Coast Groundwater Coalition
CCRWQCB....	Central Coast Regional Water Quality Control Board
CEQA.....	California Environmental Quality Act
COC	constituents of concern
CPE Actions...	Communication and Engagement Actions
CSD.....	Community Services District
CCGC.....	Central Coast Groundwater Coalition
CCRWQCB....	Central Coast Regional Water Quality Control Board
CEQA.....	California Environmental Quality Act
COC	constituents of concern
CPE Actions...	communication and public engagement actions
CSD.....	Castroville Community Services District
CSIP	Castroville Seawater Intrusion Project
DACs.....	Disadvantaged Communities
DDW	Division of Drinking Water
DEM.....	Digital Elevation Model
DMS	Data Management System
D-TAC	Drought Advisory Technical Committee
DTSC	The California Department of Toxic Substances Control
DWR	California Department of Water Resources
EIR	Environmental Impact Report
EPA	Environmental Protection Agency
ET.....	evapotranspiration
eWRIMS	Electronic Water Rights Information Management System
GAMA	Groundwater Ambient Monitoring and Assessment Program
GDE	groundwater-dependent ecosystem
GEMS	Monterey County Groundwater Extraction Management System
GIS	Geographic Information Systems
GMP	Groundwater Management Plan
GSA.....	Groundwater Sustainability Agency/Agencies

GSP or Plan....Groundwater Sustainability Plan
 HCMhydrogeologic conceptual model
 HCPHabitat Conservation Plan
 ILRPIrrigated Lands Regulatory Program
 InSARInterferometric Synthetic Aperture Radar
 IRWMPIntegrated Regional Water Management Plan
 ISWinterconnected surface water
 JPAJoint Powers Authority
 MCLsMaximum Contaminant Levels
 MCWRA.....Monterey County Water Resources Agency
 NAVD88North American Vertical Datum of 1988
 NCCAG.....Natural Communities Commonly Associated with Groundwater
 NEPANational Environmental Policy Act
 NMFS.....National Marine Fisheries Service
 O&Moperations and maintenance fees
 OWSCROnline System for Well Completion Reports Database
 RCDMCResource Conservation District of Monterey
 RMSRepresentative Monitoring Sites
 RWMG.....Greater Monterey County Regional Water Management Group
 SAGBI.....Soil Agricultural Groundwater Banking Index
 SDACsSeverely Disadvantaged Communities
 SGMA.....Sustainable Groundwater Management Act
 SMCSustainable Management Criteria
 SMCLsSecondary Maximum Contaminant Levels
 SMC TACSustainable Management Criteria Technical Advisory Committee
 SMP.....Salinas River Stream Maintenance Program
 SRDF.....Salinas River Diversion Facility
 Subbasin.....Forebay Aquifer Subbasin
 SVBGSA.....Salinas Valley Basin Groundwater Sustainability Agency
 SVIHM.....Salinas Valley Integrated Hydrologic Model
 SVOM.....Salinas Valley Operational Model
 SWRCB.....State Water Resources Control Board
 TAC.....Technical Advisory Committee
 TDStotal dissolved solids
 URCs.....Underrepresented Communities
 USACEU.S. Army Corps of Engineers
 USFWSU.S. Fish and Wildlife Service
 USGSU.S. Geological Survey
 UWMPUrban Water Management Plan

EXECUTIVE SUMMARY

ES-1 INTRODUCTION (GSP CHAPTER 1)

The 2014 California Sustainable Groundwater Management Act (SGMA) requires that medium- and high-priority groundwater basins and subbasins develop Groundwater Sustainability Plans (GSPs) that outline how groundwater sustainably will first be maintained for 50 years. This GSP fulfills that requirement for the Salinas Valley—Forebay Aquifer Subbasin (Subbasin, or Forebay Subbasin), which is designated by the DWR as a medium priority groundwater subbasin.

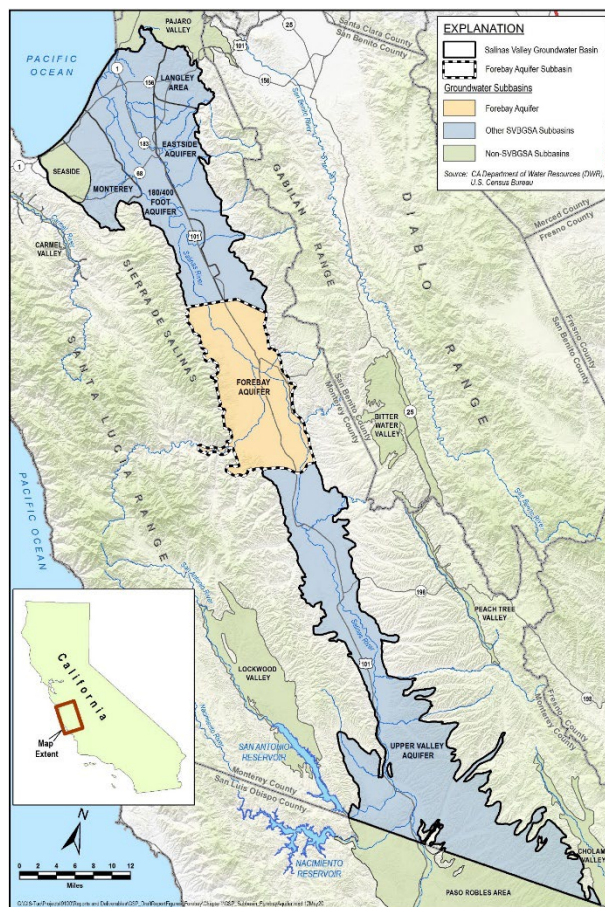
The Forebay Subbasin is within the jurisdiction of both the Salinas Valley Groundwater Sustainability Agency (SVBGSA) and Arroyo Seco Groundwater Sustainability Agency (ASGSA). ASGSA will manage the Arroyo Seco Cone Management Area (ASCMA) and SVBGSA will manage the remaining area of the Subbasin as shown on the figure at right. Both implementation areas will be managed to a single GSP for the entire Forebay Subbasin.

In 2017, local GSA-eligible entities formed the SVBGSA to develop and implement the GSPs for the Salinas Valley. The SVBGSA is a Joint Powers Authority (JPA) with membership comprising the County of Monterey, Monterey County Water Resources Agency (MCWRA), City of Salinas, City of Soledad, City of Gonzales, City of King, Castroville Community Services District, and Monterey One Water. The SVBGSA is governed by an 11-member Board of Directors, representing public and private groundwater interests throughout the Salinas Valley Groundwater Basin. In addition, an Advisory Committee ensures participation by, and input to, the Board by constituencies whose interests are not directly represented on the Board.

The Arroyo Seco Groundwater Sustainability Agency (ASGSA) was formed through agreement with the City of Greenfield and nearby lands, consisting of the Clark Colony Water Company (CCWC) and contiguous surrounding lands. The

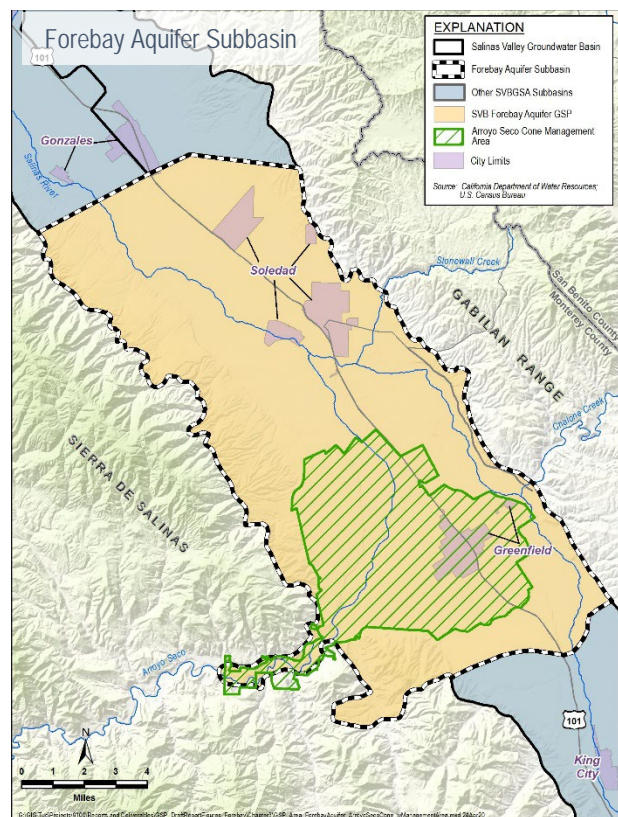
ASGSA is governed and administered by a 5-member Board of Directors, representing public and private groundwater interests throughout the Arroyo Seco area. The Board has the ultimate decision-making authority for ASGSA and arrives at decisions based on input from the General manager, Advisory Committee, public workshops, and attendees of the monthly Board meetings.

The Salinas Valley Groundwater Basin consists of 9 subbasins, of which 6 are entirely or partially under the SVBGSA's jurisdiction. One of the 9 subbasins, the Seaside Subbasin, is adjudicated and not managed by the SVBGSA. Another 2 subbasins, the Paso Robles and Atascadero Subbasins, lie completely in San Luis Obispo County and are managed by other groundwater sustainability agencies.



The SVBGSA developed this GSP for the Forebay Subbasin (DWR subbasin number 3-004.04) in concert with the GSPs for its 5 other Salinas Valley Subbasins: the 180/400-Foot Aquifer Subbasin (DWR subbasin number 3-004.01), the Eastside Aquifer Subbasin (DWR subbasin number 3-004.02), the Upper Valley Aquifer Subbasin (DWR subbasin number 3-004.05), the Langley Area Subbasin (DWR subbasin number 3-004.09) and the Monterey Subbasin (DWR subbasin number 3-004.10). Having a single GSA prepare all or part of the 6 plans promotes coordination and cooperation across subbasin boundaries.

This GSP covers the entire 94,000 acres of the Forebay Subbasin, as shown on the figure at right. The GSP describes current groundwater conditions, develops a hydrogeologic conceptual model, establishes the water budget, outlines locally defined sustainable management criteria, and provides management actions and projects that can be used to maintain sustainability until 2042.



ES-2 COMMUNICATIONS AND PUBLIC ENGAGEMENT (GSP CHAPTER 2)

The SVBGSA designed all phases of SGMA implementation to be open collaborative processes with active stakeholder engagement that allows stakeholders and public participants opportunities to provide input and to influence the planning and development process and subsequently GSP implementation. The communications and public engagement process included the following:

- **GSA formation and coordination.** SVBGSA formation and coordination took place from 2015 through 2017 and included completing a Salinas Valley Groundwater Stakeholder Issues Assessment which resulted in recommendations for a transparent, inclusive process for the local implementation of SGMA and formation of the SVBGSA.
- **GSP preparation.** Given the importance of the Subbasin and the development of the GSP to the communities, residents, landowners, farmers, ranchers, businesses,

and others, it is essential that inclusive stakeholder input is a primary component of the GSP process. A rigorous review process for each chapter in this GSP and for the final plan ensured that stakeholders had multiple opportunities to review and comment on the draft GSP.

- **Subbasin Planning Committee.** The Forebay Subbasin Planning Committee provides overall direction for GSP development. It comprises local stakeholders and a Board of Directors member, all of whom were appointed by the Board following a publicly noticed application process by the GSA. This Committee represents constituencies that are considered important stakeholders in the Forebay Subbasin, and who may not be represented on the Board of Directors. During the planning process, the SVBGSA held more than 38 Forebay planning meetings including 11 workshops.

- **Forebay Subbasin and ASCMA Coordination Committee.** The SVBGSA and ASGSA established a Coordination Committee that meets quarterly through the year and is comprised of 2 board members each from each GSA. The Committee does not have decision making authority but will make recommendations to each respective GSA Board of Directors that promote the sustainability goal of the entire Subbasin or individually in the ASCMA or greater Forebay Subbasin.
- **Communication and public engagement actions (CPE Actions).** CPE Actions provide the SVBGSA Board and staff a guide to ensure consistent messaging about SVBGSA requirements and other related information. CPE Actions provide ways that beneficial users and other stakeholders can provide timely and meaningful input into the GSA decision-making process, are informed of milestones, and offered

opportunities to participate in GSP implementation and plan updates.

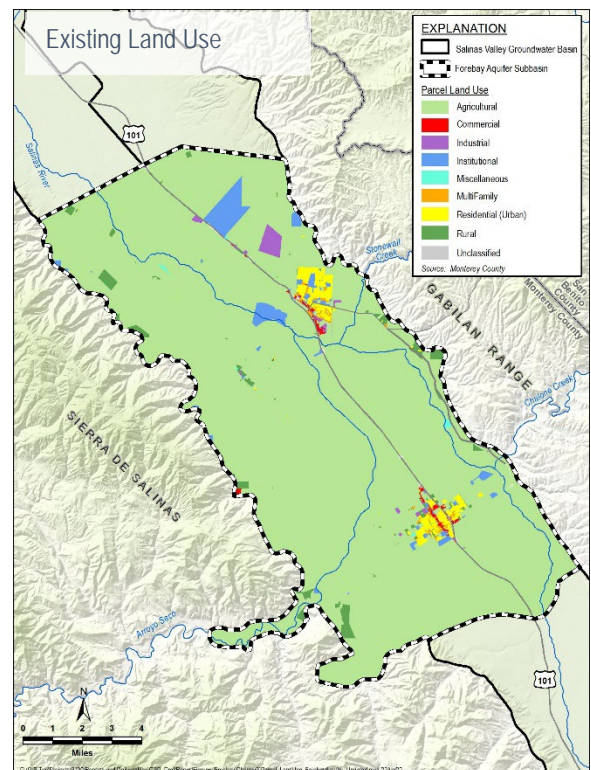
- **Underrepresented communities (URCs) and disadvantaged communities (DACs).** During development of the 2022 GSPs SVBGSA assessed how URCs and DACs may be engaged with the GSA and how to develop GSA materials that are accessible and culturally responsive (visual and in Spanish). These materials will communicate impacts of groundwater management on local water conditions to engage URCs and DACs into GSA plan reviews and develop pathways for future involvement.

SVBGSA supports public participation by the development of an interactive website that allows access to all planning and meeting materials, data sets, and meeting notifications. The website can be accessed at: <https://svbgsa.org>.

ES-3 DESCRIPTION OF PLAN AREA (GSP CHAPTER 3)

The Forebay Subbasin is located in the middle of Monterey County. The Forebay Subbasin is bounded by the Gabilan Range to the east, the 180/400-Foot Aquifer and Eastside Subbasins to the north, the Sierra de Salinas to the west, and the Upper Valley Subbasin to the south. The Salinas River runs through the Forebay Subbasin and its main tributary, the Arroyo Seco, joins it in the middle of the Subbasin. Historical flows in the Arroyo Seco formed a significant alluvial fan in the Subbasin, known as the Arroyo Seco Cone. The Subbasin contains portions of the municipalities of Greenfield and Soledad. United States Highway 101 runs generally north-south along the middle of the Subbasin.

The figure at right shows that the majority of land in the Subbasin is used for agriculture, and accordingly, agriculture uses a majority of water in the Subbasin. Groundwater is the main water source in the Subbasin, although some surface water is



diverted, such as the water for CCWC within the ASCMA. The Forebay Subbasin falls partially within the jurisdiction of the SVBGSA and partially within the jurisdiction of the ASGSA. This GSP

takes into consideration and incorporates existing water resource management, monitoring, and regulatory programs. The sustainability goal, sustainable management criteria, and management actions and projects in this GSP reflect and build on existing local plans and programs. Any potential limits to operational flexibility have already been incorporated into this GSP. Implementation of this

GSP is not anticipated to affect water supply assumptions of relevant land use plans over the planning and implementation horizon. The GSAs do not have authority over land use planning. However, the GSAs will coordinate with the County on General Plans and land use planning/zoning as needed when implementing the GSP.

ES-4 HYDROGEOLOGIC CONCEPTUAL MODEL (GSP CHAPTER 4)

The geology of the Forebay Subbasin is characterized by the intersection of the fluvial and marine dominated deposits of the main Salinas Valley and the Arroyo Seco alluvial fan originating in the Sierra de Salinas on the west side of the Subbasin. The eastern boundary of the Subbasin is the contact between the unconsolidated alluvial fan deposits and the mostly granitic rocks of the Gabilan Range. The western boundary of the Forebay Subbasin is the contact with the metamorphic and sedimentary rocks of the Sierra de Salinas. However, many reports indicate that groundwater recharge occurs through stream channels originating in the Gabilan Range. The northwestern boundary with the adjacent 180/400-Foot and Eastside Aquifer Subbasins generally coincides with the southeastern limit of confining conditions. The Salinas Valley Aquitard is not found in the Forebay Subbasin, but many of the sediments that define the 180/400-Foot Aquifers are generally found in the Subbasin. There is no reported hydraulic barrier between the Forebay and the 180/400-Foot or Eastside Aquifer Subbasins, but connection might be limited by the change from confined to unconfined conditions. The southeastern boundary with the adjacent Upper Valley Aquifer Subbasin is located south of Greenfield and generally coincides with the narrowing of the Valley floor and shallowing of the base of the groundwater basin (DWR, 2004b). There are no reported hydraulic barriers separating these subbasins.

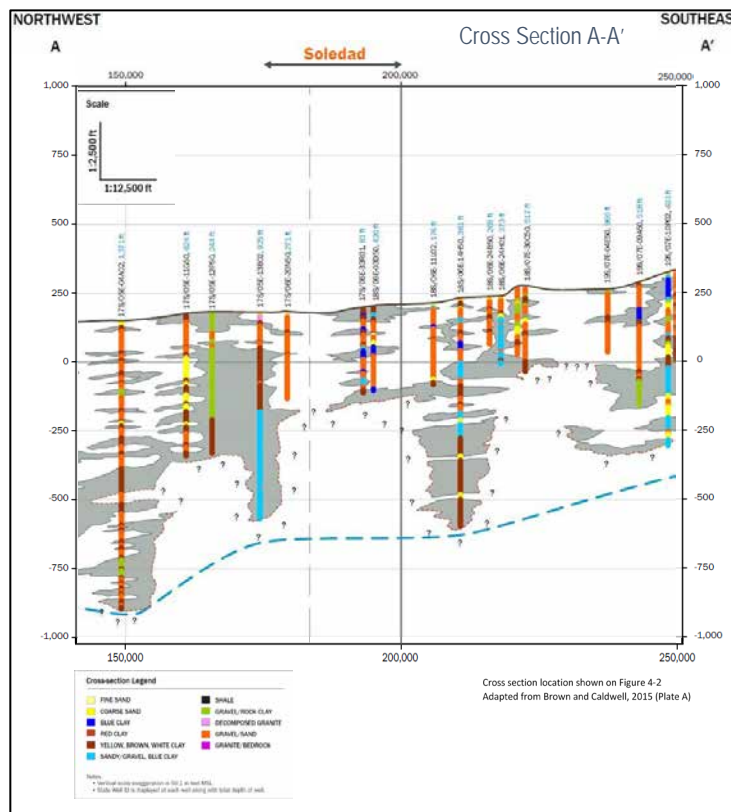
The Basin Fill Aquifer is the Forebay Subbasin's sole principal aquifer and it increases in thickness from the east to west, from Greenfield northward. Its sandy water-bearing layers roughly correlate to, and are hydraulically connected to, the 180-Foot, 400-Foot, and Deep Aquifers in the neighboring 180/400-Foot Aquifer Subbasin (Kennedy/Jenks, 2004). The deepest sediments of the Basin Fill Aquifer are the same sediments as, and potentially hydraulically connected to, the Deep Aquifers in the 180/400-Foot Aquifer Subbasin. The Deep Aquifers are not currently defined as a separate principal aquifer for the Subbasin as their presence in this Subbasin is not fully investigated. This is a data gap that will be addressed during implementation. The Basin Fill Aquifer also includes the Arroyo Seco Cone sediments that cross almost the entire width of the Salinas Valley in the Forebay Subbasin, and are interfingered with the greater Basin sediments. The primary water-bearing sediments of the Arroyo Seco Cone consist of relatively uniform and highly permeable coarse alluvial fill that are generally more coarse-grained than those found in the main valley's fluvial and

marine deposits. The figure to the right shows a geologic cross section of the Subbasin.

This GSP adopts the base of the Subbasin defined by the USGS (Durbin, et al., 1978). The base of the Subbasin is defined by the sharp interface between alluvium and the underlying rock that exists near the Gabilan Range and the Sierra de Salinas; however, the Subbasin does not have a well-defined base across the entire Subbasin. The usable portion of the Subbasin does not always include the full thickness of alluvium and with depth the viability of the sediments as productive freshwater principal aquifer becomes increasingly limited.

Detailed aquifer property values (storativity, conductivity, and transmissivity) for the Basin Fill Aquifer were not available at the time of GSP development. Specific capacity data is used as a proxy for transmissivity data and indicate that the Basin Fill Aquifer is relatively transmissive with high well yields. The Hydrogeologic Investigation, Arroyo Seco Cone (Staal, Gardner, and Dunne Inc., 1994) estimated transmissivities for the Arroyo Seco Cone to be relatively high; however, these estimates were based on application of an equation rather than field tests and data. The SVBGSA will fill this data gap during GSP implementation for both the Basin Fill Aquifer and the Arroyo Seco Cone.

Natural groundwater recharge occurs through infiltration of surface water from streams and rivers, deep percolation of excess applied irrigation water, deep percolation of infiltrating precipitation, and subsurface inflow from adjacent subbasins. The areas with the highest potential for surficial recharge are found along the Salinas River, Arroyo Seco, and tributary streams. Most other soils in the Subbasin are classified as moderately good to moderate for recharge potential. However, the



relationship between surficial soils and subsurface units must be clearly understood because actual recharge to deeper productive zones of the Subbasin could be limited due to discontinuous alluvial sediments and the interfingering clay lenses. Subsurface recharge is primarily through the Arroyo Seco and from inflow from the adjacent Upper Valley Subbasin to the south (DWR, 2004).

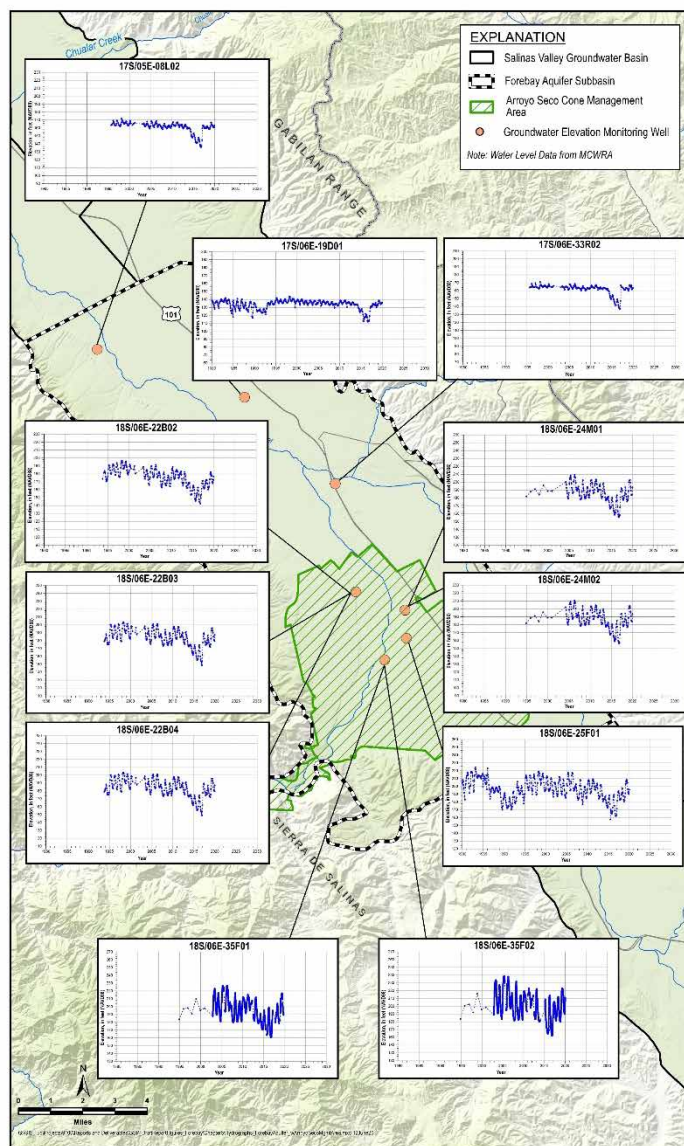
Groundwater can leave the aquifer in locations where surface water and groundwater are interconnected. There are potential locations of interconnected surface water mainly along the Salinas River and partially along the Arroyo Seco. In areas of interconnection, groundwater dependent ecosystems (GDEs) may depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface and may discharge groundwater through evapotranspiration (ET).

ES-5 GROUNDWATER CONDITIONS (GSP CHAPTER 5)

Historical groundwater conditions in the Subbasin occurred before January 1, 2015 and current conditions occurred after January 1, 2015. Where possible, 2019 was chosen as the representative current year for groundwater conditions.

- Groundwater elevations.** Historically, groundwater hydrographs show that groundwater elevations are generally stable throughout most the Forebay Subbasin. Groundwater elevations lowered during drought conditions but subsequently rebound during wetter conditions. The figure at right shows example hydrographs for the Subbasin.
- Change in groundwater storage.** Defined as the average change in groundwater that can be safely used for domestic, industrial, or agricultural purposes, the historical average annual loss of storage based on groundwater elevation change between 1944 and 2019 is approximately 970 acre-feet per year (AF/yr.) in the Forebay Subbasin, most of which occurred after the mid-1980s. Since this value only reflects these start and end years, and groundwater elevations have fluctuated over this time period, the Subbasin has historically not been considered in overdraft.
- Groundwater quality.** Elevated nitrate concentrations in groundwater were locally present in the 1960s and significantly increased in 1970s and 1980s. In 2018, nitrate levels exceeded the drinking water MCL in 58% of on-farm domestic wells and 61% of irrigation supply wells in the Subbasin (CCRWQCB, 2018). Other

Map of Example Hydrographs



constituents found at levels of concern for either potable or irrigation uses include 1,2 dibromo-3-chloropropane, iron, manganese, specific conductance, sulfate, total dissolved solids, and vinyl chloride.

- Subsidence.** No measurable subsidence has been recorded anywhere in the Subbasin between June 2015 and June 2019.

- **Interconnected surface water.** Provisional model results show that depletion of interconnected surface water (ISW) along the Salinas River due to groundwater pumping averages about 9,300 AF/yr. from June to September when

MCWRA makes conservation releases to the Salinas River and 20,400 AF/yr. from May to October. For other surface waters, such as those along the Arroyo Seco, depletion of ISW averaged about 2,100 AF/yr.

ES-6 WATER BUDGETS (GSP CHAPTER 6)

Water budgets provide an accounting and assessment of the total annual volume of surface water and groundwater entering and leaving the Subbasin. This GSP presents water budgets for three time periods – historical (1980 to 2016), current (2016), and projected with estimated 2030 and 2070 climate change factors. Water Year 2016 was the last year included in the models that could be used to develop water budgets for the GSP. Water Year 2016 meets the definition of current year found in the SGMA regulations (23 California Code of Regulations §354.18 (c)(1)); however, Water Year 2016 was preceded by multiple dry or dry-normal years and may not necessarily represent average current conditions. This chapter presents the surface water budget and groundwater budget for each time period. The groundwater budget contains aggregate numbers for the Subbasin and is not differentiated spatially.

The water budgets are developed using the historical Salinas Valley Integrated Hydrologic Model (SVIHM) and the predictive Salinas Valley Operational Model (SVOM), both developed by the USGS. The models are representations of natural conditions and are limited by assumptions and uncertainty associated with the data upon which they are based. The water budgets produced by the models are adjusted with reported extraction data to ensure the water budgets are based on the best available science and data.

Historical and Current Water Budgets and Historical Sustainable Yield. The groundwater budget accounts for the inflows and outflows to and

from the Subbasin's groundwater system. This includes subsurface inflows and outflows of groundwater at the Subbasin boundaries, recharge, pumping, ET, and net streambed exchange.

The historical and current groundwater budget figures on the next page show the annual groundwater inflows and outflows, annual change in groundwater storage, and cumulative change in storage for the entire Forebay Subbasin, and for just the ASCMA, respectively. Changes in groundwater storage for the whole Subbasin and ASMCA are generally driven by deep percolation of precipitation, applied irrigation water, and streamflow, increasing during wet periods and declining during dry periods. Through analysis and comparison of groundwater level changes over time and model results, it is determined that the Subbasin, including the ASCMA, has historically not been in overdraft so the change in storage is set to zero AF/yr. Therefore, the sustainable yield is assumed to be equivalent to the estimated range of historical pumping of 150,900 to 174,300 AF/yr. for the entire Subbasin and 44,400 to 53,000 AF/yr. for the ASCMA only. The sustainable yield of the Subbasin is an estimate of the quantity of groundwater that can be pumped on a long-term average annual basis without causing any of the 5 undesirable results defined in ES-8. The current sustainable yield represents a snapshot in time and is not used for groundwater management planning. These results are provisional and are subject to change in future GSP updates after the SVIHM and SVOM are released by the USGS.

Summary of Historical and Projected
2070 Sustainable Yields in AF/yr.

	Forebay Historical Sustainable Yield Range	Forebay 2070 Projected Sustainable Yield	ASCMA Historical Sustainable Yield Range	ASCMA 2070 Projected Sustainable Yield
Groundwater Pumping	150,900 to 174,300	181,200	44,000 to 53,000	55,300
Change in Storage	0	0	0	0
Sustainable Yield	150,900 to 174,300	181,200	44,000 to 53,000	55,300

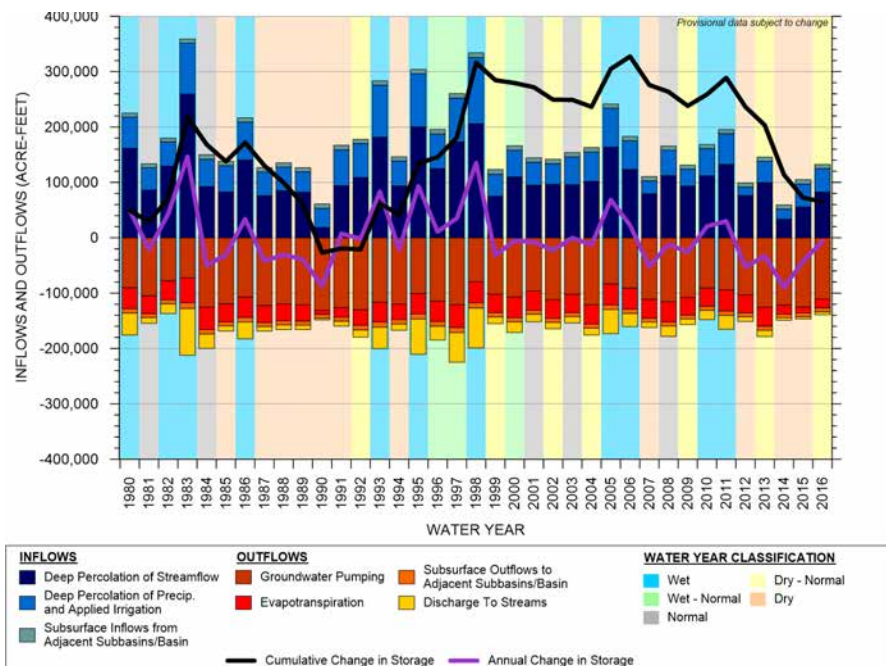
Projected Water Budgets and Projected Sustainable Yield.

Projected water budgets for 2030 and 2070 are extracted from the SVOM, which simulates future hydrologic conditions with assumed climate change based on the climate change factors recommended by DWR. Results are then adjusted based on extraction data to produce the water budget based on best available data. The projected water budget includes a surface water budget and groundwater budget, each quantifying all inflows and outflows. Assuming an average change in storage of zero AF/yr., the projected pumping and projected sustainable yield are 171,500 AF/yr. and 181,200 AF/yr. for 2030 and 2070, respectively, for the entire Subbasin. For the ASCMA, the projected pumping and sustainable yield are 52,100 AF/yr. and 55,400 AF/yr. for the 2030 and 2070, respectively.

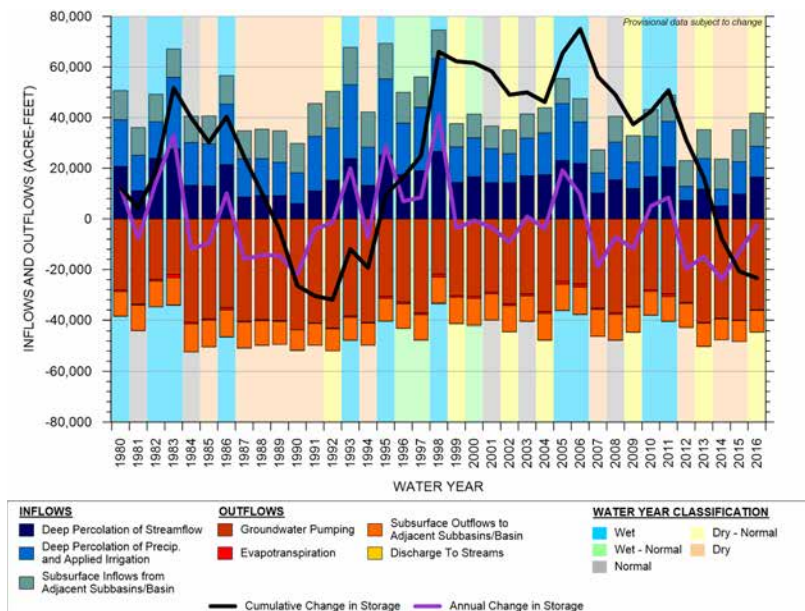
The projected sustainable yield is the long-term estimate of the quantity of groundwater that can be pumped if all 5 undesirable results have been prevented; however, it does not include projects, management

actions, or pumping reductions that might be needed to avoid undesirable results and maintain sustainability according to the 5 sustainability indicators. Although the sustainable yield values provide guidance for maintaining sustainability, simply increasing groundwater recharge or reducing pumping to within the sustainable yield is not proof of sustainability. Sustainability must be demonstrated through avoiding all 5 undesirable results. The projected water budgets are based on a provisional version of the SVOM and are subject to change. Model information and assumptions are based on provisional documentation on the model. The sustainable yield value will be updated in future GSP updates as more data are collected and additional analyses are conducted. The tables below summarizes the historical and projected sustainable yields for the entire Forebay Subbasin, and for just the ASCMA, respectively.

SVIHM Simulated Historical and Current
Groundwater Budget for the Greater Forebay Subbasin



SVIHM Estimated Groundwater Budget
for Arroyo Seco Cone Management Area

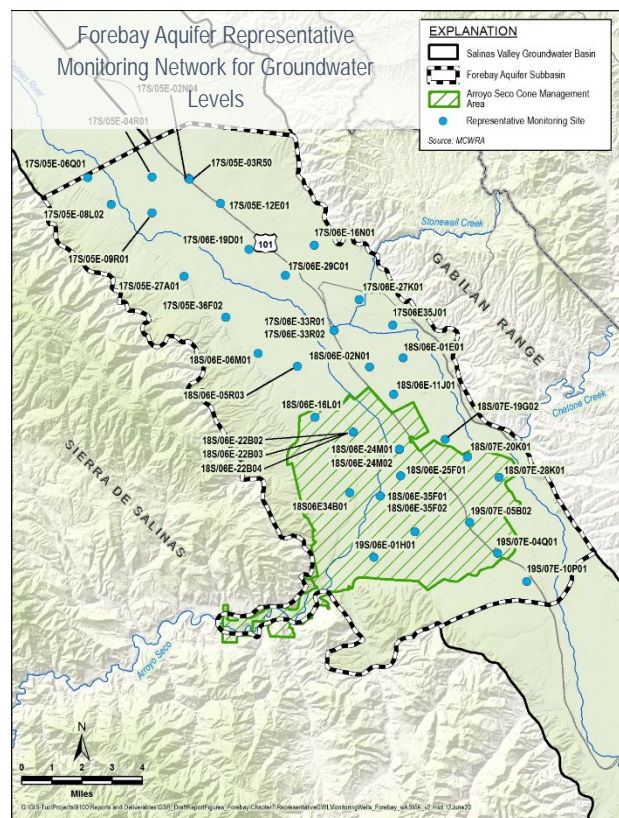


This data (model and/or model results) are preliminary or provisional and are subject to revision. This model and model results are being provided to meet the need for timely best science. The model has not received final approval by the U.S. Geological Survey (USGS). No warranty, expressed or implied, is made by the USGS or the U.S. Government as to the functionality of the model and related material nor shall the fact of release constitute any such warranty. The model is provided on the condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from the authorized or unauthorized use of the model.

ES-7 MONITORING NETWORKS (GSP CHAPTER 7)

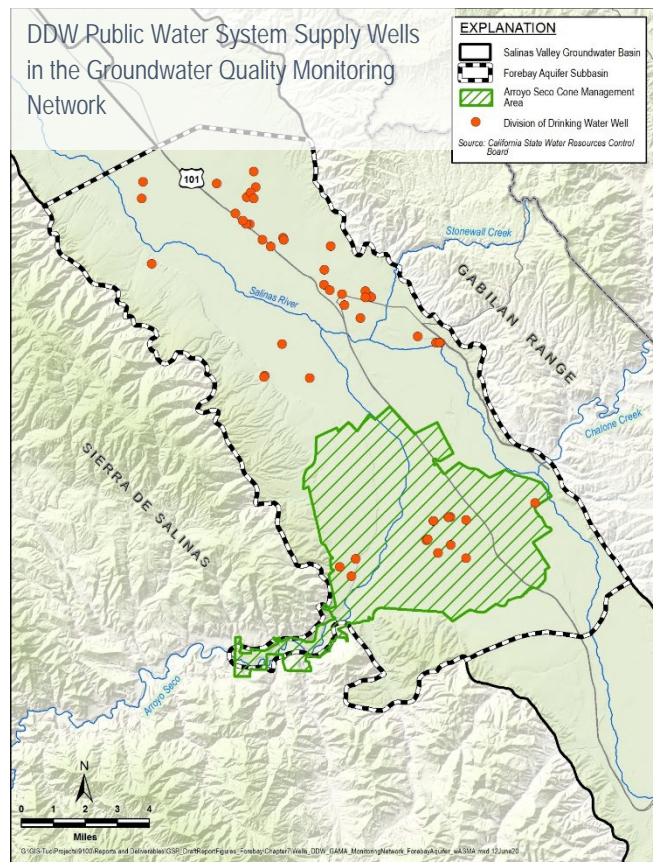
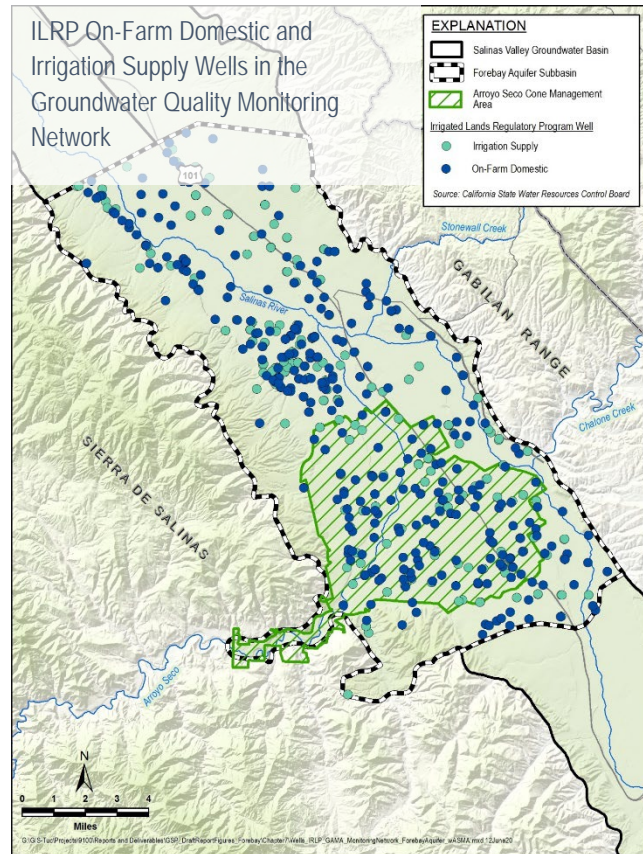
Monitoring networks are developed for data collection of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the Subbasin, inclusive of ASCMA, and to evaluate changing conditions that occur as the Plan is implemented. The SVBGSA developed monitoring networks for each of the 5 sustainability indicators, based on existing monitoring sites to the extent possible. Where needed monitoring networks will be expanded and data gaps filled to improve the SVBGSA's ability to demonstrate sustainability and refine the hydrogeologic conceptual model.

- **Groundwater levels** are measured in 39 designated monitoring wells that form a network sufficient to demonstrate



groundwater occurrence, flow directions, and hydraulic gradients. The figure at right shows the existing monitoring network, all monitoring is conducted by MCWRA.

- **Groundwater storage** is measured by groundwater elevations thus the groundwater storage and groundwater level monitoring networks are identical.
- **Groundwater quality** is evaluated by monitoring groundwater quality at a network of existing water supply wells. Drinking water constituents of concern will be assessed at public water system supply wells through the Division of Drinking Water program and at on-farm domestic wells through the Irrigated Lands Regulatory Program (IRLP), shown on the figures at right and below right, respectively. Agricultural constituents of concern will be assessed at irrigation supply wells that are also monitored through the IRLP.
- **Land subsidence** is assessed based on the land subsidence data DWR has collected with InSAR satellite data.
- **Interconnected surface water** will be assessed through monitoring shallow groundwater elevations near locations of interconnection. Given the lack of shallow well near location of interconnection, a new shallow well will be installed along the Arroyo Seco.



- **Other monitoring networks** are not necessary to monitor the 5 sustainability indicators in the Subbasin; however, DWR requires annual reporting of pumping and surface water use in the Subbasin
- 1. **Groundwater extraction** monitoring includes municipal and agricultural pumping reported to the MCWRA.
- 2. **Salinas River Watershed Diversion** data from the Electronic Water Rights Information Management System (eWRIMS) is used to monitor the surface water diversions in the Subbasin.

The SVBGSA has developed a Data Management System (DMS) to store, review, and upload data collected as part of GSP development and implementation. The DMS includes a publicly accessible web-map hosted on the SVBGSA website; accessed at <https://svbgsa.org/gsp-web-map-and-data/>.






ES-8 SUSTAINABLE MANAGEMENT CRITERIA (GSP CHAPTER 8)

The sustainability goal of the Forebay Subbasin is to manage groundwater resources for long-term community, financial, and environmental benefits to the Subbasin's residents and businesses. The goal of this GSP is to ensure long-term viable water supplies while maintaining the unique cultural, community, and business aspects of the Subbasin. It is the express goal of this GSP to balance the needs of all water users in the Subbasin. Both the ASCMA and the greater Forebay Subbasin will be managed cooperatively by SVBGSA and ASGSA to meet the sustainability goal. The undesirable results for all sustainability indicators are defined consistently throughout the Subbasin.

Sustainable Management Criteria (SMC) define the conditions that constitute sustainable groundwater management. The table on the next page provides a summary of the SMC for each of the 5 sustainability indicators.

Measurable objectives reflect the subbasin's goals for desired groundwater conditions for each sustainability indicator. These provide operational flexibility above the minimum thresholds. The minimum thresholds are quantitative indicators of the Subbasin's locally defined significant and unreasonable conditions. The undesirable result is a combination of minimum threshold exceedances that show a significant and unreasonable condition across the Subbasin. This GSP is designed to avoid undesirable results, and to maintain the sustainability goals within 20 years, along with interim milestones every 5 years that show progress. The management actions and projects provide sufficient options for reaching the measurable objectives within 20 years and maintaining those conditions for 30 years for all 5 sustainability indicators.

Sustainable Management Criteria Summary

Sustainability Indicator	Minimum Threshold	Measurable Objective	Undesirable Result
Chronic lowering of groundwater levels 	Minimum thresholds are set to December 2015 groundwater elevations.	Measurable objectives are set to 2015 groundwater elevations plus 75% of the difference between 2015 and 1998 groundwater elevations.	More than 15% of groundwater elevation minimum thresholds are exceeded. Allows for 5 exceedances per year in the Forebay Subbasin.
Reduction in groundwater storage 	Minimum threshold is set to 267,000 AF below the measurable objective. This reduction is based on the groundwater level minimum thresholds. This number will be refined as additional data are collected and other projects are implemented.	Measurable objective is set to zero when the groundwater elevations are held at the groundwater level measurable objectives. Since the goal is to manage to the measurable objective, additional water in storage is needed until groundwater elevations are at their measurable objectives.	There is an exceedance of the minimum threshold.
Degraded groundwater quality 	Minimum thresholds are zero additional exceedances of the regulatory drinking water standards (potable supply wells) or the Basin Plan objectives (irrigation supply wells) beyond those observed on December 31, 2019 for groundwater quality COC. Exceedances are only measured in public water system supply wells and ILRP on-farm domestic and irrigation supply wells.	Measurable objectives are identical to the minimum thresholds.	Future or new minimum thresholds exceedances are caused by a direct result of GSA groundwater management action(s), including projects or management actions and regulation of groundwater extraction.
Land subsidence 	Minimum threshold is 0.133 feet per year. This is the rate that results in less than one foot of cumulative subsidence over a 30-year implementation horizon, plus 0.1 foot per year of estimated land movement to account for InSAR measurement errors.	Measurable objective is 0.1 foot per year. This is a long-term rate of zero feet per year plus 0.1 foot per year of estimated land movement to account for InSAR measurement errors.	There is an exceedance of the minimum threshold for subsidence due to lowered groundwater elevations that surpass historical lows.
Depletion of interconnected surface water 	Minimum thresholds are established by proxy using shallow groundwater elevations observed in December 2015 near locations of ISW.	Measurable objectives are established by proxy using shallow groundwater elevations near locations of ISW and are set to 75% of the distance between 2015 and 1998 shallow groundwater elevations.	There is an exceedance of the minimum threshold in a shallow groundwater monitoring well used to monitor ISW.

ES-9 MANAGEMENT ACTIONS AND PROJECTS (GSP CHAPTER 9)

This GSP identifies management actions and projects that provide stakeholders with options to maintain sustainability. The set of projects and actions achieve the following objectives:

- Maintaining groundwater sustainability through 2042 by meeting Subbasin-specific SMC
- Providing equity between who benefits from projects and who pays for projects
- Providing incentives to constrain groundwater pumping within the sustainable yield

The management actions and projects included in this GSP outline a framework for maintaining sustainability; however, many details must be negotiated before any of the management actions and projects can be implemented. The set of management actions and projects provide sufficient options for maintaining sustainability throughout the planning horizon, but they do not all necessarily need to be implemented.

This GSP is developed as part of an integrated effort by the SVBGSA to achieve groundwater sustainability in all 6 subbasins of the Salinas Valley under its authority. Therefore, the management actions and project included in this GSP are part of a larger set of integrated actions for the entire Valley.

This GSP focuses on the projects that directly help the Forebay Subbasin, inclusive of the ASCMA, maintain sustainability, but also includes multi-subbasin projects outside the Subbasin that will likely benefit the Subbasin and reduce the need for additional management actions and projects. In addition, the chapter includes implementation actions that contribute to groundwater management and GSP implementation but do not directly help the Subbasin reach or maintain sustainability. The management actions, projects, and implementation actions for this GSP are listed in table on the next page.

Management Actions and Projects

Project/ Management Action #	Name	Description	Project Benefits
A	MANAGEMENT ACTIONS		
A1	Forebay SMC Technical Advisory Committee (TAC)	Establish TAC to review groundwater conditions and provide advice on management actions and projects	Potential for increased groundwater elevations, increased groundwater storage, decreased groundwater extraction, protection of water quality
A2	Conservation and Agricultural BMPs	Promote agricultural BMPs and support use of ET data as an irrigation management tool for growers	Better tools assist growers to use water more efficiently; decreased groundwater extraction
A3	Improve Rural Residential Water Quality in ASCMA	Educate rural residents about common groundwater quality issues and options for obtaining safe and aesthetic potable water in their homes	Improve rural domestic water quality by supplying bottled water, installing reverse osmosis units, and/or extending public water supply systems

Project/ Management Action #	Name	Description	Project Benefits
A4	Watershed Protection Policy for Arroyo Seco River	Establish a Watershed Protection Policy for protecting the Arroyo Seco River watershed	Ensure continued recharge from Arroyo Seco River and habitat for threatened fish
A5	Fallowing, Fallow Bank, and Agricultural Land Retirement	Includes voluntary fallowing, a fallow bank whereby anybody fallowing land could draw against the bank to offset lost profit from fallowing, and retirement of agricultural land	Decreased groundwater extraction for irrigated agriculture
A6	MCWRA Drought Reoperation	Support the existing Drought Technical Advisory Committee (D-TAC) when it develops plans for how to manage reservoir releases during drought conditions	Additional regular winter reservoir releases; drought resilience
A7	Reservoir Reoperation	Collaborate with MCWRA to evaluate potential reoperation scenarios	Additional regular annual reservoir releases; drought resilience
B PROJECTS			
B1	Multi-benefit Stream Channel Improvements	Prune native vegetation and remove non-native vegetation, manage sediment, and enhance floodplains for recharge. Includes 3 components: Stream Maintenance Program Invasive Species Eradication Floodplain Enhancement and Recharge	Groundwater recharge, flood risk reduction, returns streams to a natural state of dynamic equilibrium
B2	Managed Aquifer Recharge with Overland Flow	Construct basins for managed aquifer recharge of overland flow before it reaches streams	Groundwater recharge, less stormwater and erosion, more regular surface temperature
C IMPLEMENTATION ACTIONS			
C1	Well Registration	Register all production wells, including domestic wells	Better informed decisions, more management options
C2	GEMS Expansion and Enhancement	Update current GEMS program by collecting groundwater extraction data from wells in areas not currently covered by GEMS and improving data collection	Better informed decisions
C3	Dry Well Notification System	Develop a system for well owners to notify the GSA if their wells go dry. Refer those owners to resources to assess and improve their water supplies. Form a working group if concerning patterns emerge.	Support affected well owners with analysis of groundwater elevation decline
C4	Water Quality Coordination Group	Form a working group for agencies and organizations to collaborate on addressing water quality concerns	Improve water quality
C5	Land Use Jurisdiction Coordination Program	Review land use plans and efforts to coordinate with land use planning agencies to assess activities that potentially create risks to groundwater quality or quantity.	Better aligned land use and water use planning

Mitigation of Overdraft. The Forebay Subbasin has not historically been in overdraft. Based on the water budget components, the historical sustainable yield of the Subbasin is between 150,900 and 174,300 AF/yr. From 1980 to 2016, the Subbasin was in overdraft during only 3 years; therefore, the calculation of the mitigation of overdraft is not needed at this time. However, these results are

provisional and subject to change in future GSP updates after the SVIHM is released by the USGS so their use as a basis to implement a management action or project is limited. Given that the Subbasin's extraction is currently close to the sustainable yield, this chapter includes a robust set of potential management actions and projects that could be undertaken if needed.

ES-10 IMPLEMENTATION (GSP CHAPTER 10)

This GSP lays out a roadmap for addressing all of the activities needed for GSP implementation between 2022 and 2042, focusing mainly on the activities between 2022 and 2027. Implementing this GSP requires the following formative activities:

Data, monitoring, and reporting. SGMA requires submittal of annual monitoring data and development of an annual report to track groundwater conditions with respect to the SMC. Monitoring will mostly rely on existing monitoring programs, and expansion of those programs. The groundwater level and groundwater extraction monitoring networks will be improved to provide sufficient temporal and spatial coverage of the Subbasin. Only ISW needs the establishment of a new monitoring network, which will comprise existing monitoring wells and a new shallow well along the Arroyo Seco. Data from the monitoring programs will be maintained in the DMS and evaluated annually. SVBGSA also plans to fill the aquifer properties and lithologic and hydrostratigraphic data gaps in the HCM to gain a better understanding of the principal aquifer.

Continuing communication and stakeholder engagement. The SVBGSA website will be maintained as a communication tool for posting data, reports, and meeting information. Additionally, the SVBGSA will routinely report information to the public about GSP implementation, progress towards sustainability, and the need to use groundwater efficiently.

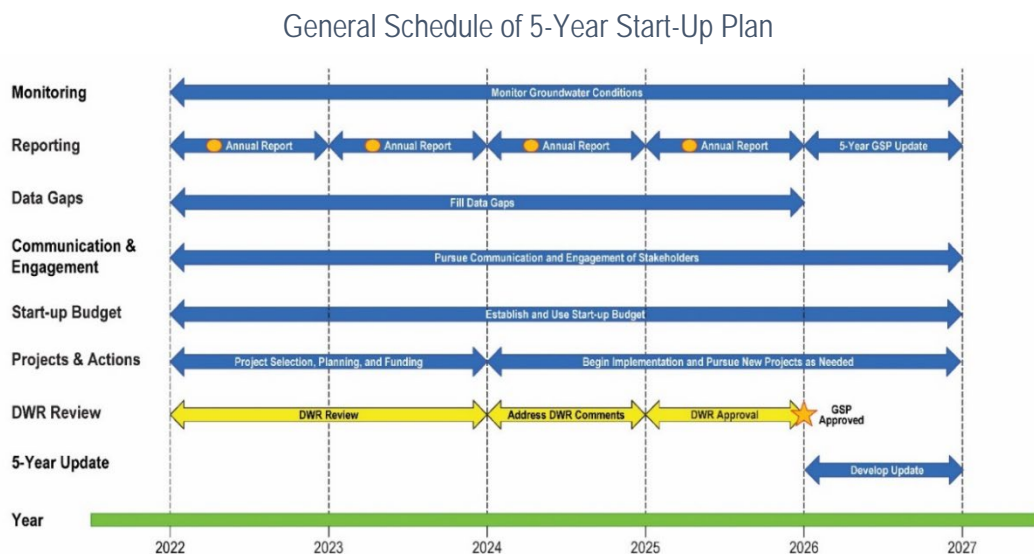
Refining and implementing management actions and projects. The management actions and projects in this GSP have been identified as beneficial and sufficient for maintaining sustainability in the Forebay Subbasin. During GSP implementation, they will be refined and prioritized, and impacts of management actions and projects on adjacent subbasins will be analyzed as part of the project selection process. The SVBGSA-ASGSA Coordination Committee will play an important role of annually reviewing management actions and projects and making recommendations to the Boards of Directors of SVBGSA and ASGSA.

Adapting management with the 5-year update. SGMA requires assessment reports every 5 years to assess progress towards sustainability, a description of significant new information or data, and whether the GSP needs to be adapted. The 5-year update will include updating the SVIHM and SVOM with newly collected data and updating model scenarios to reflect both the additional data and refinements in project design or assumptions.

Developing a funding strategy. SVBGSA established a valley-wide Operational Fee to fund the typical annual operational costs of its regulatory program authorized by SGMA, including regulatory activities of management groundwater to sustainability (such as GSP development), day-to-day administrative operations costs, and prudent reserves. The cost is relatively low because SVBGSA can spread its administrative costs over

the 6 subbasins it manages. In addition, this GSP provides an estimate of the start-up budget needed to implement this GSP within the Forebay Subbasin. The SVBGSA estimates that these planned activities will cost \$633,000 over the first 5 years of implementation in the Forebay Subbasin. The start-up budget does not include funding for implementing specific management actions and projects. For management actions and projects funded by SVBGSA or funding SVBGSA raises to contribute to the implementation of management actions and projects, this GSP includes a list of potential funding mechanisms, and SVBGSA will evaluate the most appropriate mechanism for each management actions and project. Should the ASGSA desire to implement a project set forth in the Forebay GSP with the ASCMA, the SVBGSA will cooperate with the ASGSA on the implementation of any necessary funding mechanism.

Schedule. Implementation of the Forebay Subbasin GSP must be integrated with that of the 5 other GSPs in the Salinas Valley to ensure all subbasins can reach and maintain sustainability. The general implementation schedule for management actions and projects, provided on the figure below, focuses on implementation actions and the SMC TAC within the first 2 to 3 years. The D-TAC has already been created. Other management actions could be pursued at any point that groundwater conditions warrant them or at any point Subbasin stakeholders and the SVBGSA decide is appropriate. Projects will be considered for the Forebay Subbasin if conditions warrant it. Management actions and projects will be revisited and adjusted as needed throughout GSP implementation. Implementation of this GSP will rely on best available science and will be continually updated as new data and analyses are available. The GSP is intended to include adaptive management that will refine the implementation and direction of this GSP over time.



1 INTRODUCTION TO THE FOREBAY AQUIFER SUBBASIN GROUNDWATER SUSTAINABILITY PLAN

1.1 Introduction and Purpose

The 2014 Sustainable Groundwater Management Act (SGMA) requires groundwater basins or subbasins that are designated as medium or high priority to be managed sustainably. In general, satisfying the requirements of SGMA requires 4 activities:

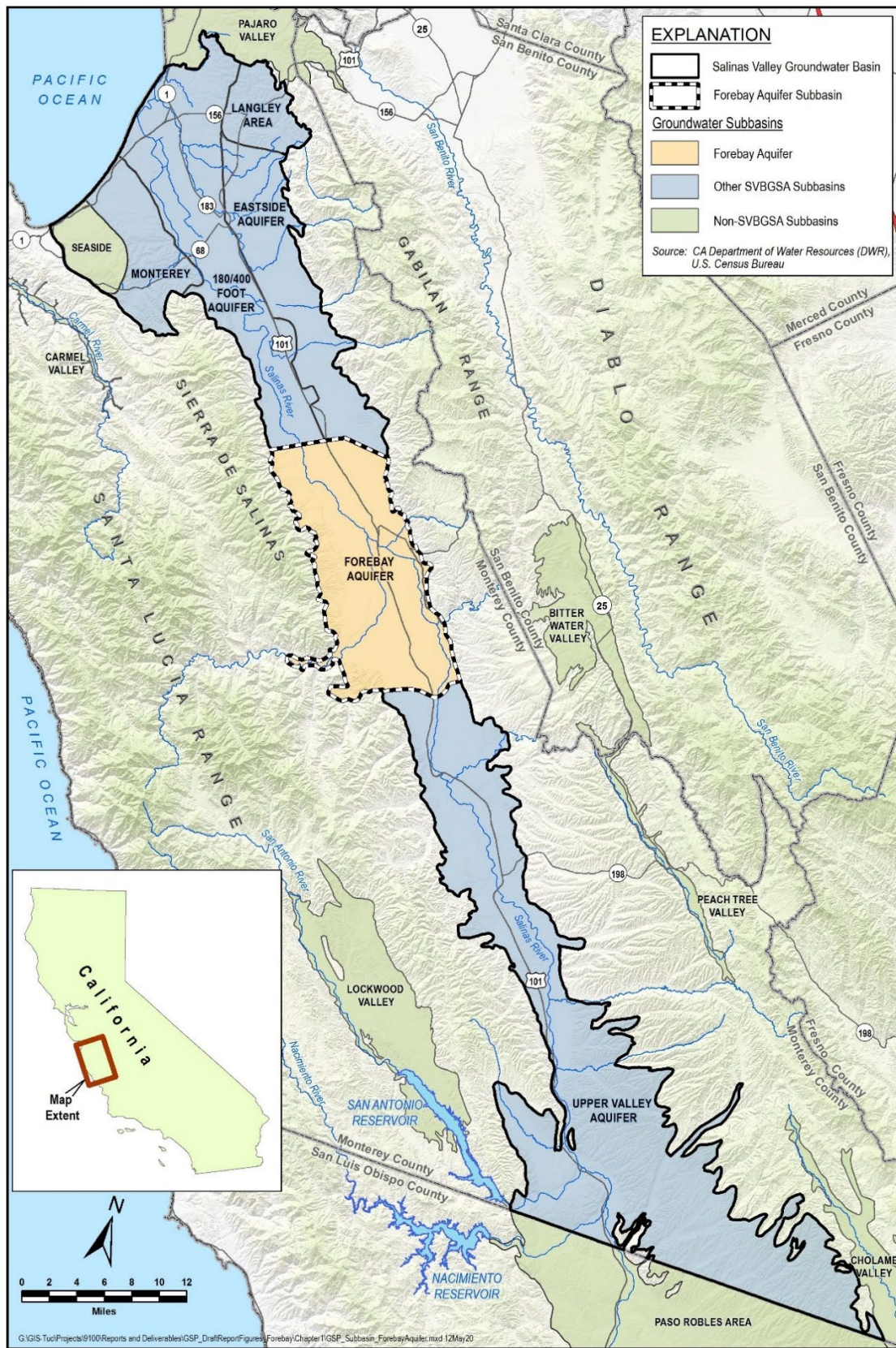
1. Forming one or more Groundwater Sustainability Agency(s) (GSAs) in the basin
2. Developing a Groundwater Sustainability Plan (GSP, or Plan)
3. Implementing the GSP and managing to measurable, quantifiable objectives
4. Providing regular reports to the California Department of Water Resources (DWR)

DWR has designated the Salinas Valley – Forebay Aquifer Subbasin (Subbasin, or Forebay Subbasin) as a medium priority basin. The Forebay Subbasin is one of 9 subbasins in the Salinas Valley, and it is located near the middle of the Salinas Valley (Figure 1-1). This document satisfies the GSP requirement for the Forebay Subbasin and meets all of the regulatory standards.

Groundwater level has declined somewhat in recent decades, and many wells were impacted or rendered unusable during the 2012 to 2016 drought. The purpose of this GSP is to outline how the Salinas Valley Basin GSA (SVBGSA) and Arroyo Seco Groundwater Sustainability Agency (ASGSA) will address the declining groundwater conditions and achieve groundwater sustainability in the Subbasin. Sustainability is the absence of undesirable results for any of the 6 sustainability indicators applicable in the subbasin: chronic lowering of groundwater levels, groundwater storage reductions, seawater intrusion, groundwater quality degradations, land subsidence, and interconnected surface water (ISW) depletion. Sustainability must be achieved in 20 years and maintained for an additional 30 years.

This GSP first presents the stakeholders, plan area, geologic and hydrogeologic data, groundwater conditions, and water budget necessary to develop an informed and robust plan. This GSP is based on best available data and analyses. As additional data are collected and analyses are refined, the GSP will be modified to reflect changes in the local understanding.

Following the foundational hydrogeologic information, the GSP introduces the current agreed-to sustainability goal for the Subbasin. It also locally defines significant and unreasonable conditions, which underpin the quantifiable minimum thresholds, measurable objectives, and interim milestones for each of the corresponding sustainability indicators. The final chapters detail projects and actions that should be implemented to achieve sustainability and provide an implementation plan for maintaining sustainability. The GSP is intended to include adaptive management that will refine the implementation and direction of this GSP over time.



1.2 Agency Information

The Forebay Subbasin falls partially within the jurisdiction of the SVBGSA and partially within the jurisdiction of the ASGSA. Figure 1-2 shows the current extent of the 2 GSAs' boundaries. In accordance with the Forebay Implementation Agreement (2021), approved by the ASGSA Board of Directors on April 7, 2021, and the SVBGSA Board of Directors on April 8, 2021, the ASGSA will manage the Arroyo Seco Cone Management Area (ASCMA), and the SVBGSA will manage the remaining area of the Subbasin.

1.2.1 Agency Names, Mailing Addresses, and Plan Manager

Pursuant to California Water Code § 10723.8, the name and contact information for each GSA representative that is a signatory to this GSP are provided:

Salinas Valley Basin Groundwater Sustainability Agency
Attn.: Donna Meyers, General Manager
1441 Schilling Place
Salinas, CA 93901
<https://svbgsa.org>

Arroyo Seco Groundwater Sustainability Agency
Attn.: Curtis Weeks
599 El Camino Real
Greenfield, CA 93927
<http://ci.greenfield.ca.us/379/ASGSA>

The Plan Manager and her contact information are:

Ms. Donna Meyers, General Manager
Salinas Valley Basin Groundwater Sustainability Agency
1441 Schilling Place
Salinas, CA 93901 | (831) 682-2592
meyersd@svbgsa.org
<https://svbgsa.org>

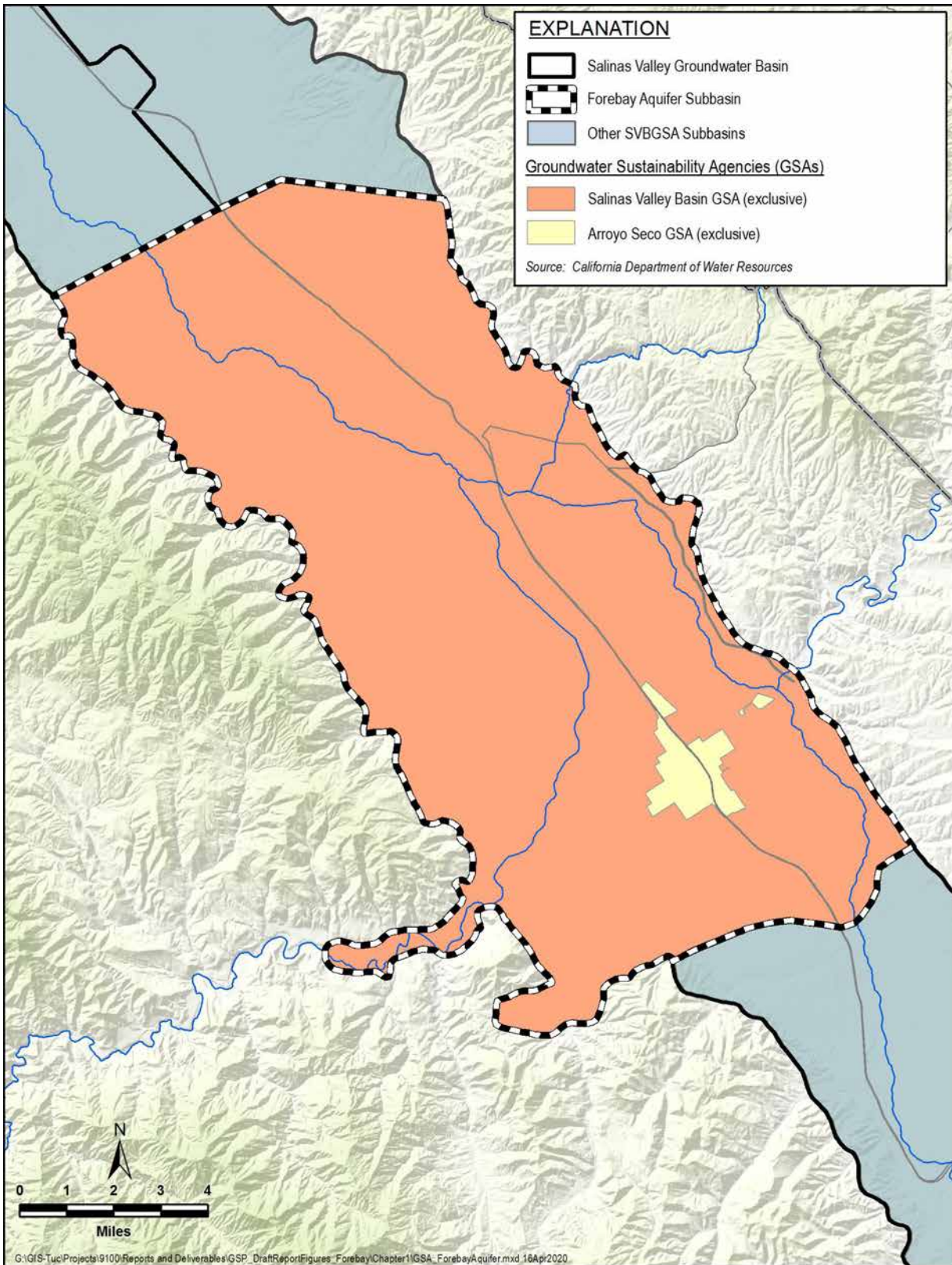


Figure 1-2. Map of Area Covered by the SVBGSA and ASGSA in the Forebay Aquifer Subbasin

1.2.2 SVBGSA Organization and Management Structure

Local GSA-eligible entities formed the SVBGSA in 2017. The SVBGSA represents agriculture, public utility, municipal, county, and environmental stakeholders, and is partially or entirely responsible for developing GSPs in 6 of the Salinas Valley Groundwater Subbasins.

The SVBGSA is a Joint Powers Authority (JPA), and its membership includes the County of Monterey, Monterey County Water Resources Agency (MCWRA), City of Salinas, City of Soledad, City of Gonzales, City of King (King City), the Castroville Community Services District (CSD), and Monterey One Water (formerly the Monterey Regional Water Pollution Control Agency). The SVBGSA is governed and administered by an 11-member Board of Directors (Board), representing public and private groundwater interests throughout the Valley. When a quorum is present, a majority vote is required to conduct business. Some business items require a super majority vote or a super majority plus vote. A super majority requires an affirmative vote by 8 of the 11 Board members. A super majority vote is required for:

- Approval of a GSP
- Amendment of budget and transfer of appropriations
- Withdrawal or termination of Agency members

A super majority plus requires an affirmative vote by 8 of the 11 Board members, including an affirmative vote by 3 of the 4 agricultural representatives. A super majority plus vote is required for:

- Decisions to impose fees not requiring a vote of the electorate or property owners
- Proposals to submit to the electorate or property owners (as required by law) decisions to impose fees or taxes
- Limitations on well extractions (pumping limits)

In addition to the Board of Directors, SVBGSA includes a Budget and Finance Committee consisting of 5 Directors, an Executive Committee consisting of 5 Directors, and an Advisory Committee consisting of Directors and non-directors. The Advisory Committee is designed to ensure participation by constituencies whose interests are not directly represented on the Board. The SVBGSA's activities are coordinated by a general manager. The SVBGSA established individual subbasin planning committees to advise the Board on each of the subbasins under its jurisdiction for which it is developing a 2022 GSP. This GSP has been guided and reviewed by the Forebay Subbasin Planning Committee, which consists of local representatives from the Subbasin. Once all GSPs are adopted, the subbasin planning committees will transition to implementation committees to advise on the implementation of the GSPs.

1.2.3 ASGSA Organization and Management Structure

The ASGSA was formed through agreement with the City of Greenfield and nearby lands, consisting of the Clark Colony Water Company and contiguous surrounding lands. The ASGSA is governed and administered by a 5-member Board of Directors, representing public and private groundwater interests throughout the Arroyo Seco area. The Board has the ultimate decision-making authority for ASGSA and arrives at decisions based on input from the General manager, Advisory Committee, public workshops, and attendees of the monthly Board meetings.

In addition to the Board of Directors, the ASGSA has an Advisory Committee consisting of Directors and non-Directors including Greenfield City residents and environmental interests. The Advisory Committee is designed to ensure participation by, and input to, the Board of Directors by constituencies whose interests are not directly represented on the Board. The ASGSA's activities are staffed by a General Manager, City of Greenfield staff, and contract services provided by Clark Colony Water Company and the City of Greenfield.

1.2.4 Authority of Agency

1.2.4.1 SVBGSA

The SVBGSA was formed in accordance with the requirements of California Water Code § 10723 *et seq.* This section lists its specific authorities for GSA formation and groundwater management.

SVBGSA is a JPA that was formed for the Salinas Valley Groundwater Basin in accordance with the requirements of California Government Code § 6500 *et seq.* The JPA agreement is included in Appendix 1A. In accordance with California Water Code § 10723 *et seq.*, the JPA signatories are all local agencies under California Water Code § 10721 with water or land use authority that are independently eligible to serve as GSAs:

- The County of Monterey has land use authority over the unincorporated areas of the County, including areas overlying the Forebay Subbasin.
- The MCWRA is a California Special Act District with broad water management authority in Monterey County.
- The City of Salinas is incorporated under the laws of the State of California. The City provides water supply and land use planning services to its residents.
- The City of Soledad is incorporated under the laws of the State of California. The City provides water supply and land use planning services to its residents.
- The City of Gonzales is incorporated under the laws of the State of California. The City provides water supply and land use planning services to its residents.

- King City is incorporated under the laws of the State of California. The City provides water supply and land use planning services to its residents.
- The Castroville CSD is a local public agency of the State of California, organized and operating under the Community Services District Law, Government Code § 6100 *et seq.* Castroville CSD provides water services to its residents.
- Monterey One Water is itself a joint powers authority whose members include many members of the SVBGSA.

Upon establishing itself as a GSA, the SVBGSA retains all the rights and authorities provided to GSAs under California Water Code § 10725 *et seq.* as well as the powers held in common by the members.

1.2.4.2 ASGSA

The ASGSA was formed in accordance with the requirements of California Water Code § 10723 *et seq.* The Notices of Intent to form a GSA were filed with the California Department of Water Resources on April 27, 2017 and modified on June 30, 2017. The Resolution whereby the City of Greenfield reinstates the ASGSA as a groundwater sustainability agency, adopted on February 12, 2019, is included in Appendix 1B.

1.2.4.3 Coordination Agreement

The SVBGSA and ASGSA completed a Forebay Subbasin Groundwater Sustainability Plan Implementation Agreement in April 2021. The agreement establishes the ASCMA. The agreement establishes the preparation of a single GSP for the Subbasin and that the ASGSA shall implement in the ASCMA and the SVBGSA shall implement in the balance of the Forebay Subbasin. The agreement establishes a Coordination Committee in order to provide a forum for the Parties to consult on the progress of implementing the Forebay GSP and maintaining sustainability in the Forebay and the ASCMA.

1.3 Overview of this GSP

The SVBGSA and ASGSA jointly developed this GSP for the entire Forebay Subbasin. This GSP is developed in concert with GSPs for 5 other Salinas Valley Groundwater Subbasins under SVBGSA jurisdiction: the 180/400-Foot Aquifer Subbasin, the Eastside Aquifer Subbasin, the Upper Valley Aquifer Subbasin, the Langley Area Subbasin, and the Monterey Subbasin. While this GSP is focused on the Forebay Subbasin, the GSP will be implemented in accordance with SVBGSA's role in maintaining and achieving sustainability for all subbasins within the Salinas Valley Groundwater Basin. The Forebay Subbasin is referred to as the Subbasin throughout this GSP, and the collection of Salinas Valley Groundwater Subbasins that fall partially or entirely under SVBGSA jurisdiction are collectively referred to as the Basin or the Valley.

The SVBGSA used a collaborative process to develop this GSP. Chapter 2 details the stakeholders who participated, and the process followed, to develop this GSP. Stakeholders worked together to gather existing information, define sustainable management criteria (SMC) for the Subbasin, and develop a list of management actions and projects.

This GSP describes the basin setting, presents the hydrogeologic conceptual model, and describes historical and current groundwater conditions. It further establishes estimates of the historical, current, and future water budgets based on the best available information. This GSP defines local SMC, details required monitoring networks, and outlines management actions and projects for maintaining sustainability in the Subbasin by 2042.

The SVBGSA developed this GSP as part of an adaptive management process. This GSP will be updated and adapted as new information and more refined models become available. This includes updating SMC and management actions and projects to reflect updates and future conditions. Adaptive management will be reflected in the required 5-year assessment to GSPs and annual reports.

2 COMMUNICATIONS AND PUBLIC ENGAGEMENT

2.1 Introduction

The SVBGSA was formed in 2017 to implement SGMA locally within the Salinas Valley Groundwater Basin. GSA formation and coordination took place from 2015 through 2017 and included completing a Salinas Valley Groundwater Stakeholder Issues Assessment which resulted in recommendations for a transparent, inclusive process for the local implementation of SGMA and the formation of the SVBGSA. Through the development and implementation of the GSPs SVBGSA is committed to following the requirements for stakeholder engagement as defined by SGMA:

- Consider the interests of all beneficial uses of water and users of groundwater (§ 10723.2)
- Encourage the active involvement of diverse social, cultural, and economic elements of the population within the groundwater basin (§ 10727.8)
- Establish and maintain a list of persons interested in receiving notices regarding plan preparation, meeting announcements and availability of draft plans, maps, and other relevant documents (§ 10723.4)
- Make available to the public and DWR a written statement describing the manner in which interested parties may participate in the development and implementation of the GSP (§ 10723.2)

2.2 Defining and Describing Stakeholders for Public Engagement

The SVBGSA stakeholders are highly diverse. Groundwater supports economic activities from small domestic scale to large industrial scale. Groundwater is an important supply for over 400,000 people living within the Salinas Valley Groundwater Basin. Beneficial users in the Basin are the key stakeholders targeted for robust public engagement for GSP development and implementation. Beneficial users in the Basin are listed below:

Agriculture. Includes row crops, field crops, vineyards, orchards, cannabis, and rangeland. The Salinas Valley agricultural region supports a \$4.25 billion dollar production value and produces a large percentage of the nation's produce and healthy foods including 61% of the leaf lettuce, 57% of celery, 56% of head lettuce, 40% of broccoli, and 38% of spinach. Agriculture is the largest user of groundwater in the Basin accounting for approximately 250,000 irrigated acres and 94% of pumping in the Basin. In the Forebay Subbasin, Clark Colony Water Company provides irrigation water to approximately 2,000 irrigated acres.

Domestic Water Users. Includes urban water use assigned to non-agricultural water uses in the cities and census-designated places and rural residential wells used for drinking water. In the Forebay Subbasin the City of Greenfield is a domestic water provider. Urban water use includes small local water systems, small state water systems, and small and large public water systems.

Industrial Users. Includes industrial water users, such as quarries and oil production. There is little industrial use within the Basin.

Environmental Users. Environmental users include the habitats and associated species maintained by conditions related to surface water flows such as steelhead trout and groundwater dependent ecosystems including brackish and freshwater marsh and riparian habitats. Environmental users include native vegetation and managed wetlands.

Stakeholders associated with these beneficial users and uses include the following. These users are also represented on the SVBGSA Board and Advisory Committees as described in the next section.

- **Environmental organizations.** Environmental organizations that are stakeholders include Sustainable Monterey County, League of Women Voters of Monterey County, Landwatch Monterey County, Friends and Neighbors of Elkhorn Slough, California Native Plant Society Monterey Chapter, Trout Unlimited, Surfriders, the Nature Conservancy and the Carmel River Steelhead
- **Underrepresented communities (URCs) and Disadvantaged Communities (DACs).** URCs and DACs include the City of Greenfield, Castroville Community Services District, San Jerardo Cooperative, San Ardo Water District, San Vicente Mutual Water Company, Environmental Justice Coalition for Water
- **City and county government.** Cities of Gonzales, Soledad, Greenfield, King City, Marina, and Salinas, Monterey County, Monterey County Environmental Health Department
- **Land use nonprofits.** Sustainable Monterey County, League of Women Voters of Monterey County, Landwatch Monterey County, Friends and Neighbors of Elkhorn Slough
- **Residential well owners.** Represented by public members and members of mutual water companies and local small or state small water systems.
- **Water agencies.** MCWRA, Marina Coast Water District, ASGSA, Castroville Community Services District, Monterey One Water, Monterey Peninsula Water Management District
- **CPUC-regulated water companies.** Alco Water Corporation, California Water Service Company, California American Water.

2.3 SVBGSA Governance Structure

SVBGSA is governed by a local and diverse 11-member Board of Directors (Board) and relies on robust science and public involvement for decision making. The Board meets monthly and all meetings are open to the public. The Board is the final decision-making body for adoption of GSPs completed by the GSA.

The SVBGSA Advisory Committee advises the SVBGSA Board. The Advisory Committee is comprised of 25 members. The Advisory Committee strives to include a range of interests in groundwater in the Salinas Valley and outlined in SGMA. Advisory Committee members live in the Salinas Valley or represent organizations with a presence or agencies with jurisdiction in the Basin including:

- All groundwater users
- Municipal well operators, Public-Utilities Commission-Regulated water companies, and private and public water systems
- County and city governments
- Planning departments/land use
- Local landowners
- URCs
- Business and agriculture
- Rural residential well owners
- Environmental uses

The Advisory Committee, at this time, does not include representation from:

- Tribes
- Federal government

The Advisory Committee will review its charter following GSP completion for additional members if identified as necessary by the Board. The Advisory Committee provides input and recommendations to the Board and uses consensus to make recommendations to the Board. The Advisory Committee was established by Board action and operates according to a Committee Charter which serve as the bylaws of the Advisory Committee. The Advisory Committee reviews and provides recommendations to the Board on groundwater-related issues that may include:

- Development, adoption, or amendment of the GSP

- Sustainability goals
- Monitoring programs
- Annual work plans and reports
- Modeling scenarios
- Inter-basin coordination activities
- Management actions and projects to maintain sustainability
- Community outreach
- Local regulations to implement SGMA
- Fee proposals
- General advisory

Subbasin planning committees were established in May 2020 by the Board of Directors to inform and guide planning for the 5 GSPs due in January 2022. Membership is 7-12 people per subbasin planning committee and all meetings are subject to the Brown Act.

Together the Board, Advisory Committee, and subbasin planning committees are working to complete the 6 GSPs required within the SVBGSA jurisdiction. Subsequent to that SVBGSA, will complete a Salinas Valley Basin-wide Integrated Implementation Plan that is intended to be consistent with the GSPs of the subbasins within the Salinas Valley Groundwater Basin will detail project portfolios and groundwater sustainability programs to meet SGMA compliance for subbasins by 2040 and maintain sustainability through 2050. Once all the GSPs are filed, the subbasin planning committees will transition to implementation committees.

The following graphic captures the phases of GSA development and GSP planning and implementation intended by the SVBGSA through 2050.

Phases of Planning and Community Outreach

Salinas Valley Basin Groundwater Sustainability Agency

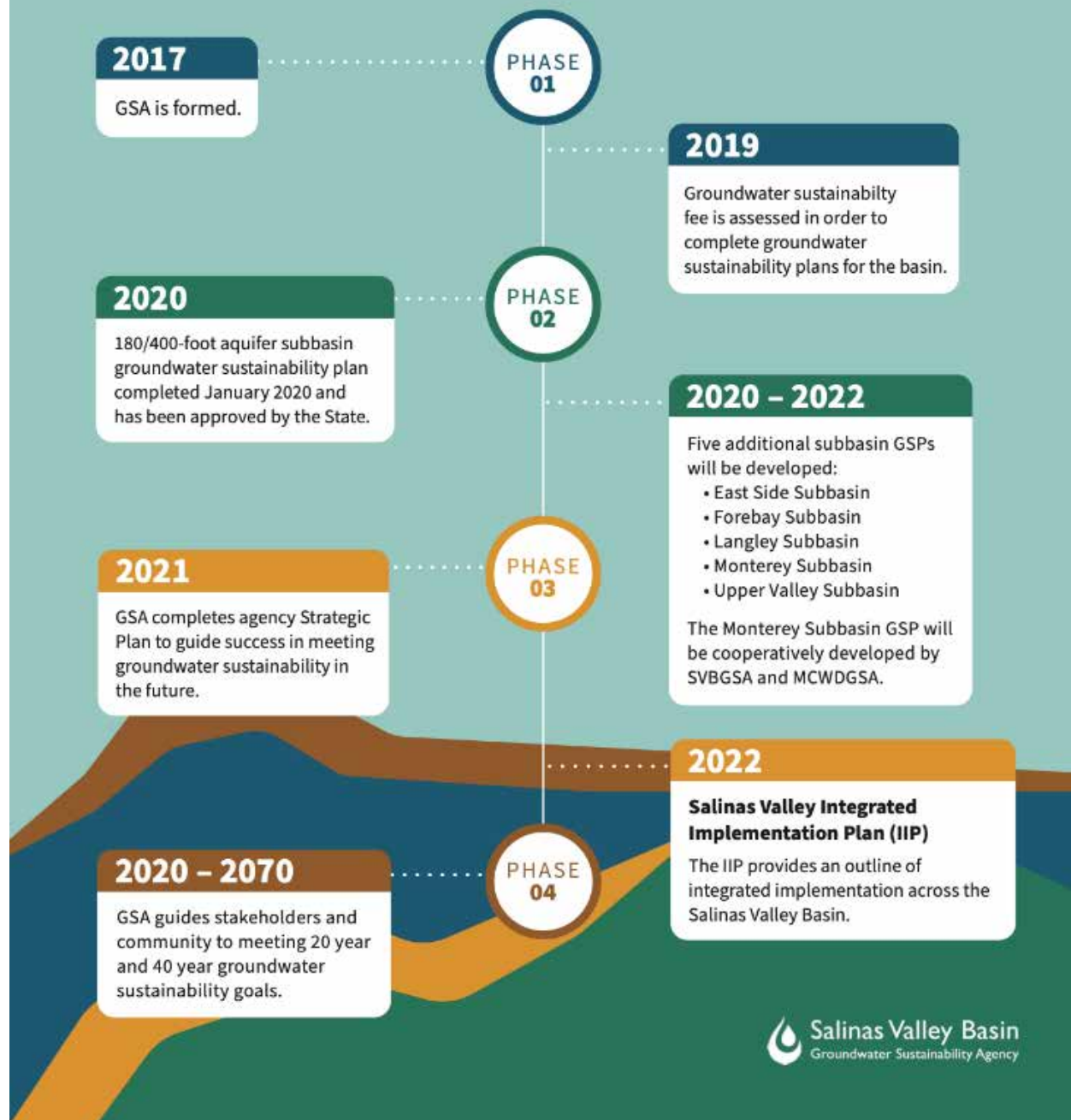


Figure 2-1. Phases of Planning and Community Outreach

2.4 Forebay Subbasin GSP Preparation

Given the importance of the Basin and the development of the Forebay GSP to the communities, residents, landowners, farmers, ranchers, businesses, and others, inclusive stakeholder input was a primary component of the Forebay GSP process. In order to encourage ongoing stakeholder engagement SVBGSA deployed the following strategies in the preparation of the Forebay Subbasin GSP:

- An inclusive outreach and education process conducted that best supports the success of a well- prepared GSP that meets SGMA requirements.
- Kept the public informed by distributing accurate, objective, and timely information.
- Invited input and feedback from the public at every step in the decision-making process.
- Established Subbasin Planning Committee for the Subbasin and completed a comprehensive planning process with this Committee including engagement on key items with the Board and Advisory Committee
- Publicly noticed drafts of the Forebay Subbasin GSP and allowed for required public comment periods as required by SGMA. Comments received and responses are included in Appendix 2A.

Additionally, a rigorous review process for each chapter in the Forebay GSP and for the final plan was completed. This process ensured that stakeholders had multiple opportunities to review and comment on the development of the chapters. A graphical presentation of the planning process is presented below.

Groundwater Sustainability Plan Development Process

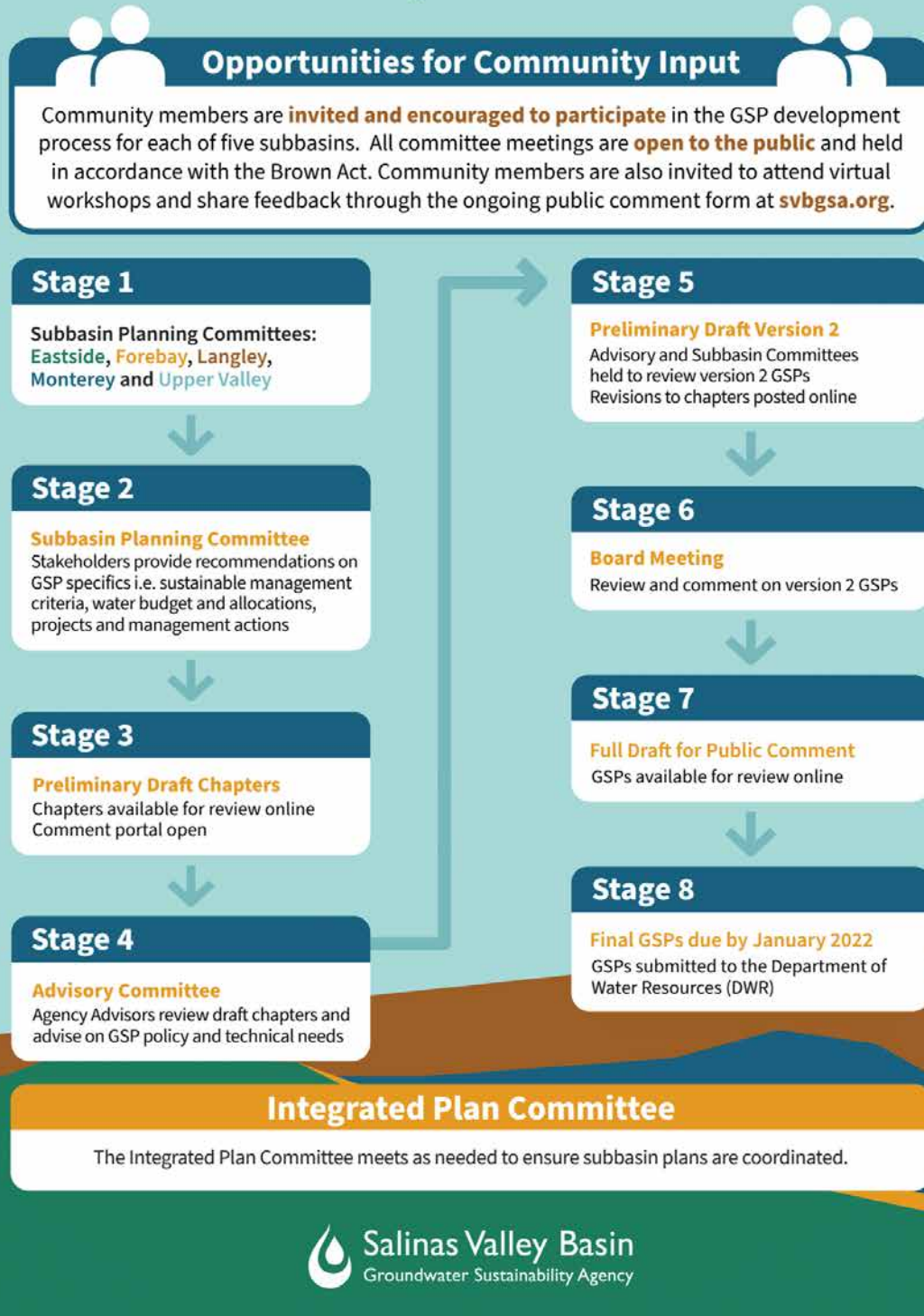


Figure 2-2. GSP Development Process

2.5 Forebay Subbasin Planning Committee

Subbasin planning committees are comprised of local stakeholders and Board members and were appointed by the Board of Directors following a publicly noticed application process by the GSA. Subbasin planning committees were convened in June and July 2020. Subbasin planning committees do the comprehensive work of plan development, review, and recommendations, with assistance provided by SVBGSA staff and technical consultants.

These committees represent constituencies that are considered important stakeholders to developing comprehensive subbasin plans for the Salinas Valley or are not represented on the Board. A list of the Forebay Subbasin Planning Committee is included in the Acknowledgements section of this GSP.

Subbasin planning committee meetings are subject to the Brown Act and noticed publicly on the SVBGSA website. Public comment is taken on all posted agenda items. Subbasin planning committees have been engaged in an iterative planning process that combines education of pertinent technical topics through presentations and data packets and receiving GSPs chapters for review and comment. A live GSP comment form is available on the SVBGSA website for ongoing comment submission on all GSP chapters. All GSP chapters were posted for public review and comment.

GSP chapters that have been taken to the Subbasin Planning Committee were also taken to the Advisory Committee for further review and comments. Community engagement and public transparency on SVBGSA decisions is paramount to building a sustainable and productive solution to groundwater sustainability in the Basin. At the conclusion of the planning process in August 2021 for the Forebay GSP the SVBGSA will have held more than 38 planning meetings and technical workshops on each aspect of the Forebay Subbasin GSP.

In addition to regularly scheduled committee meetings, a series of workshops were held for the Forebay Subbasin Planning Committee as detailed below. These workshops were informational for committee members, stakeholders, and the general public and cover pertinent topics to be included in the GSPs. Workshops were timed to specific chapter development for the GSP. Subject matter experts were brought in as necessary to provide the best available information to Subbasin Planning Committee members.

Table 2-1. Subject Matter Workshops Held During GSP Preparation

Topic	Date
Brown Act and Conflict of Interest	July 22, 2020
Sustainable Management Criteria	July 28, 2020
Water Law	August 10, 2020
Salinas Valley Watershed Overview	August 26, 2020
Web Map Workshop	September 30, 2020

Topic	Date
Town Hall – Domestic Wells & Drinking Water	October 28, 2020
Pumping Allocations	November 18, 2020
Funding Mechanisms	January 27, 2021
Water Budgets	February 24, 2021
Communications and Implementation	March 31, 2021
Technical Modeling Workshop – SVIHM & SVOM	June 30, 2021

2.6 Forebay Subbasin and Arroyo Seco Cone Management Area Coordination Committee

The Forebay Subbasin GSP includes the ASCMA to be managed by the ASGSA. Under an Implementation Agreement completed by the SVBGSA and ASGSA in April 2021, the 2 agencies have established a Coordination Committee which is subject to the Brown Act and will meet quarterly through the year. The Committee is comprised of 2 board members each from the SVBGSA and ASGSA. The Committee does not have decision making authority but will make recommendations to each respective GSA Board of Directors. The Coordination Committee provides a forum for the GSAs to discuss the implementation or elimination of management actions, projects, or funding mechanisms in each Agency’s implementation area to ensure that those actions do not negatively impact or impede the goal of sustainability for the Forebay Subbasin as a whole or individually in the greater Forebay Subbasin or ASCMA.

2.7 Communication and Public Engagement Actions

SVBGSA is focused on communication and public engagement targeted at the public, including beneficial users, regarding the development of the SVBGSA’s GSP for the Forebay Subbasin. Communication and public engagement actions (CPE Actions) that have taken place during GSP development will continue during implementation of all SVBGSA GSPs. Communication and public engagement actions provide the SVBGSA Board and staff a guide to ensure consistent messaging about SVBGSA requirements and other related information. CPE Actions provide ways that beneficial users and other stakeholders can provide timely and meaningful input into the GSA decision-making process. CPE Actions also ensure beneficial users and other stakeholders in the Basin are informed of milestones and offered opportunities to participate in GSP implementation and plan updates. Appendix 2B includes the SVBGSA’s marketing and communications plan.

Notice and communication, as required by GSP Regulations § 354.10, was focused on providing the following activities during the development of the Forebay Subbasin GSP:

- Clear decision-making process on GSP approvals and outcomes
- Robust public engagement opportunities

- Encouragement of active involvement in GSP development
- Completion of the Forebay Subbasin Implementation Agreement and creation of the ASCMA in the Forebay Subbasin GSP

2.7.1 Goals for Communication and Public Engagement

Ultimately, the success of the Forebay Subbasin GSP will be determined by the collective action of every groundwater user. In order to meet ongoing water supply needs, both for drinking water and for economic livelihoods, the Subbasin must maintain sustainability into the future. This outreach strategy engages the public early and frequently, and keeps the internal information flow seamless among staff, consultants, committee members and the SVBGSA Board and ASGSA Board regarding the goals and objectives of the Forebay Subbasin GSP and associated monitoring and implementation activities.

Critical to the success of the Forebay GSP implementation will be public understanding of the management actions and projects planned for sustainability, as well as sustainability implementation actions and other groundwater management activities. These important actions are identified below (not in order of priority) and specifically described in Chapter 9 of the Forebay GSP.

Management Actions

- Forebay SMC TAC
- Conservation and Agricultural BMPs
- Improve Rural Residential Water Quality
- Watershed Protection Policy for Arroyo Seco River
- Fallowing, Fallow Bank, and Agricultural Land Retirement
- MCWRA Drought Reoperation
- Reservoir Reoperation

Projects

- Multi-benefit Stream Channel Improvements
- Managed Aquifer Recharge of Overland Flow

Implementation Actions

- Well Registration

- Groundwater Extraction Management System (GEMS) Expansion and Enhancement
- Dry Well Notification System
- Water Quality Coordination Group
- Land Use Jurisdiction Coordination Program

Additional important actions of GSP implementation will be the production of the required Annual Report by April 1 each year for the Forebay Subbasin. The Annual Report covers annual data collected each water year from October 1 through September 30. The Annual Report provides an annual benchmark for SVBGSA and ASGSA to provide to the public and stakeholders to assess progress towards sustainability. The Annual Report also includes assessment of the 5 sustainable management criteria for the Subbasin. The Annual Report provides an important opportunity to reengage the Forebay Subbasin Planning Committee in its review and to discuss sustainability status and goals.

CPE Actions provide outreach during the Subbasin planning efforts and assists SVBGSA and ASGSA in being receptive to stakeholder needs through communication tools. The CPE Actions also forecast how SVBGSA and ASGSA will communicate during GSP implementation.

The goals of the CPE Actions are:

1. To keep stakeholders informed through the distribution of accurate, objective, and timely information while adhering to SGMA requirements for engagement (noted above).
2. To articulate strategies and communications channels that will foster an open dialogue and increase stakeholder engagement during the planning process.
3. To invite input from the public at every step in the decision-making process and provide transparency in outcomes and recommendations.
4. To ensure that the Board, staff, consultants, and committee members have up-to-date information and understand their roles and responsibilities.
5. To engage the public on GSP Implementation progress especially for project and management actions and Annual Reports.

2.7.2 Communication and Outreach Objectives

The following are the communications and outreach objectives of the CPE Actions:

- Expand Audience Reach

- Maintain a robust stakeholder list of interested individuals, groups and/or organizations.
- Secure a balanced level of participants who represent the interests of beneficial uses and users of groundwater.
- Increase Engagement
 - Keep interested stakeholders informed and aware of opportunities for involvement through email communications and/or their preferred method of communications.
 - Publish meeting agendas, minutes, and summaries on the SVBGSA website: www.svbgsa.org.
 - Inform and obtain comments from the general public through GSP online comment form and public meetings held on a monthly basis.
 - Facilitate productive dialogues among participants throughout the GSP planning process.
 - Seek the input of interest groups during the planning and implementation of the GSP and any future planning efforts.
- Increase GSP Awareness
 - Provide timely and accurate public reporting of planning milestones through the distribution of outreach materials and posting of materials on the SVBGSA website for the GSP.
 - Secure quality media coverage that is accurate, complete, and fair.
 - Utilize social media to engage with and educate the general public.
- Track Efforts
 - Maintain an active communications tracking tool to capture stakeholder engagement and public outreach activities and to demonstrate the reporting of GSP outreach activities.

2.7.3 Target Audiences and Stakeholders

SVBGSA stakeholders consist of other agencies and interested parties including all beneficial users of groundwater or representatives of someone who is. Under the requirements of SGMA, all beneficial uses and users of groundwater must be considered in the development of GSPs, and GSAs must encourage the active involvement of diverse social, cultural, and economic elements of the population.

There are a variety of audiences targeted within the Basin whose SGMA knowledge varies from high to little or none. Given this variance, SVBGSA efforts are broad and all-inclusive. Target audiences include:

- SVBGSA Board of Directors, Advisory Committee, and Subbasin Planning Committees
- ASGSA Board of Directors and Advisory Committee
- Forebay Subbasin and ASCMA Coordination Committee
- SVBGSA Groundwater Sustainability Fee Payers
- Partner agencies including ASGSA, Monterey County Environmental Health Department, County of Monterey, MCWRA, and the Greater Monterey County Integrated Regional Water Management Group (RWMG)
- Municipal and public water service providers
- Private and small water system providers
- Local municipalities and communities
- Elected officials within the Basin
- Beneficial uses and users of groundwater including, agriculture, domestic wells and small water systems, and environmental uses such as wetlands
- Diverse social, cultural, and economic segments of the population within the Basin including URCs
- The general public

Stakeholder involvement and public outreach is critical to the GSP development because it helps promote the plan based on input and broad support. The following activities summarize involvement opportunities and outreach methods to inform target audiences and stakeholders. It is important to note that levels of interest will evolve and shift according to the GSP's implementation opportunities and priorities.

2.7.4 Stakeholder Database

A stakeholder database of persons and organizations of interest will be created and maintained. The database will include stakeholders that represent the region's broad interests, perspectives, and geography. It will be developed by leveraging existing stakeholder lists and databases and by conducting research of potential stakeholders that may be interested in one or all of the following categories: municipal users and groundwater users including agricultural, urban, industrial, commercial, institutional, rural, environmental, URCs, state lands and agencies, and integrated water management.

2.7.5 Key Messages and Talking Points

SVBGSA developed key messages focused on getting to know your GSA, an overview of groundwater sustainability planning for our community, and how we intend to continue outreach through implementation. These messages were guided by the underlying statements:

- The GSP process, both planning and implementation, is transparent and direct about how the GSP will impact groundwater users.
- SVBGSA represents the groundwater interests of all beneficial uses/users of the basin equitably and transparently to ensure that the basin achieves and maintains sustainable groundwater conditions.
- SVBGSA is committed to working with stakeholders using an open and transparent communication and engagement process.
- As the overall GSP will be more comprehensive with an engaged group of stakeholders providing useful information, SVBGSA will create as many opportunities as possible to educate stakeholders and obtain their feedback on the GSP implementation and plan updates.

These messages are being used as the basis for specific talking points/Q&A to support effective engagement with audiences. The SVBGSA Key Messages are also used to support communication with audiences (Appendix 2C).

2.7.6 Engagement Strategies

SVBGSA utilizes a variety of tactics to achieve broad, enduring, and productive involvement with stakeholders during the development and implementation of the GSPs. Below are activities that SVBGSA uses to engage the public currently and anticipated activities for GSP implementation:

- Develop and maintain a list of interested parties
- Offer public informational sessions and subject-matter workshops and provide online access via Facebook Live or via Zoom
- Basin tours (currently on hold due to COVID restrictions)
- SVBGSA Web Map
- Annual Report presentations
- FAQs – Offer FAQs on several topics including SGMA, SVBGSA, ASCMA, GSP, projects, Monitoring Program, Annual Report, Programs and Groundwater Sustainability Fee
- Science of Groundwater – new examples (studies, etc.)

- Board, Advisory Committee, and other Committee Meetings
 - Regular public notices and updates; Brown Act compliance
 - Develop talking points for various topics and evolve as necessary
- Subbasin Implementation Committees
 - Each subbasin's planning committee for GSP development will transition to a subbasin implementation committee to be convened for GSP updates and annual report reviews.
- Integrated Implementation Committee
 - The Integrated Implementation Committee will be convened to discuss Basin-wide aspects to the 6 GSPs in the Basin including public outreach.
- Online communications
 - SVBGSA website: maintain with current information
 - SVBGSA Facebook page: maintain and grow social media presence
 - Direct email via Mailchimp newsletter
- Mailings to most-impacted water users and residents – topics to include: Annual Report dashboard, What does your GSA do with the Sustainability Fee?, newsletter that accompanies each tax bill.
- Media coverage. Appendix 2D includes SVBGSA's media policy.
 - Op-eds in the local newspapers
 - Press releases
 - Radio interviews
- Promote/Celebrate National Groundwater Week (held in December)
- Co-promotional opportunities and existing channels with agencies, committees, and organizations including email newsletters, social media, board meetings and mailings to customers.
- Talks and presentations to various stakeholder groups, associations, community organizations, and educational institutions.
- Educational materials

2.7.7 CPE Actions Timeline and Tactics

CPE Actions and GSP milestone requirements by phase include:

- Prior to initiating plan development: Share how interested parties may contact the GSA and participate in development and implementation of the plan submitted to DWR. (23 California Code of Regulations § 353.6)
- Prior to GSP development: Establish and maintain an interested persons list. (California Water Code § 10723.4)
- Prior to and with GSP submission:
 - Record statements of issues and interests of beneficial users of basin groundwater including types of parties representing the interests and consultation process
 - Lists of public meetings
 - Inventory of comments and summary of responses
 - Communication section in GSP (23 California Code of Regulations § 354.10) that includes: agency decision-making process, identification of public engagement opportunities and response process, description of process for inclusion, and method for public information related to progress in implementing the plan (status, projects, actions)
- Supporting tactics to be used to communicate messages and supporting resources available through GSP development and GSP implementation:
 - SVBGSA website, updated regularly to reflect meetings and workshop offerings
 - Direct email via Mailchimp sent approximately monthly to announce board meetings, special workshop offerings and other opportunities for engagement
 - Outreach to local media to secure coverage of announcements and events, radio interviews, op-ed placement
 - Workshops, information sessions and other community meetings
 - Social media, specifically Facebook, updated regularly to share information and support other outreach efforts

2.7.8 CPE Actions – Annual Evaluation and Assessment

CPE Actions and GSP milestone requirements by phase include:

- What worked well?
- What didn't go as planned?
- Are stakeholders educated about the GSP development process and their own role?
- Is the timeline for implementation of the GSP clear?
- Has the GSA received positive press coverage?

- Do diverse stakeholders feel included?
- Has there been behavior changes related to the program goals? Or improved trust/relationships among participants?
- Community meeting recaps and next steps
- Lessons learned
- Budget analysis

2.8 Underrepresented Communities and Disadvantaged Communities Strategic Engagement and Communications

During development of the 2022 GSPs SVBGSA conducted the scoping of an engagement strategy for URCs and DACs that would provide both an assessment of how URCs and DACs may be engaged with the GSA and to develop GSA materials that are accessible and culturally responsive (visual and in Spanish). These materials will communicate impacts of groundwater management on local water conditions in order to engage URCs and DACs into GSA plan reviews and develop pathways for future involvement.

2.8.1 Underrepresented Communities and Disadvantaged Communities in the Salinas Valley

In this GSP, URCs and DACs are considered communities that currently have little or no representation in water management, or who historically have had disproportionately less representation in public policy decision making. URCs and DACs are inclusive of Severely Disadvantaged Communities (SDACs), Economically Distressed Areas (EDAs) and other communities that are traditionally underrepresented. The City of Greenfield is a DAC.

The basin wide SVBGSA program area also has well documented DAC designation including 7 Census Designated Places, 60 Block Groups and 20 Tracts. Additionally, work conducted by the Greater Monterey County Integrated Regional Water Management Program (IRWMP) identified 25 small DACs, SDACs, and suspected disadvantaged communities in unincorporated areas of the IRWMP region (RWMG, 2018). Figure 2-3 shows where DACs, SDACs, and EDAs are located within the Salinas Valley Groundwater Basin, and Appendix 2E further describes DACs.

SVBGSA seeks to engage more constructively with URCs and DACs moving forward in subbasin planning processes and ultimately GSP implementation. In August 2019, SVBGSA hired the Consensus Building Institute (CBI) to conduct an assessment with URC and DAC community leaders via formal interviews. The purpose of the assessment was to capture insights and recommendations to inform an engagement strategy for URCs and DACs. CBI conducted 14 interviews and summarized findings from the assessment to identify initial strategic steps for

work with URCs and DACs for GSP planning and implementation. Based on this work, an initial set of short and middle term actions to complete from January 2021-August 2021 was identified and work has begun on these items during the GSP development period and will be operational for implementation in Fall 2021. The Board of Directors affirmed these short and middle term actions on February 11, 2021 and are intended for focus during implementation of the GSP. Middle and long-term actions with URCs were identified for 2022. The *Spectrum of Community to Ownership* will be utilized as a guide in further shaping SVBGSA work with URCs and DACs communities in the Basin in consultation with community leaders.

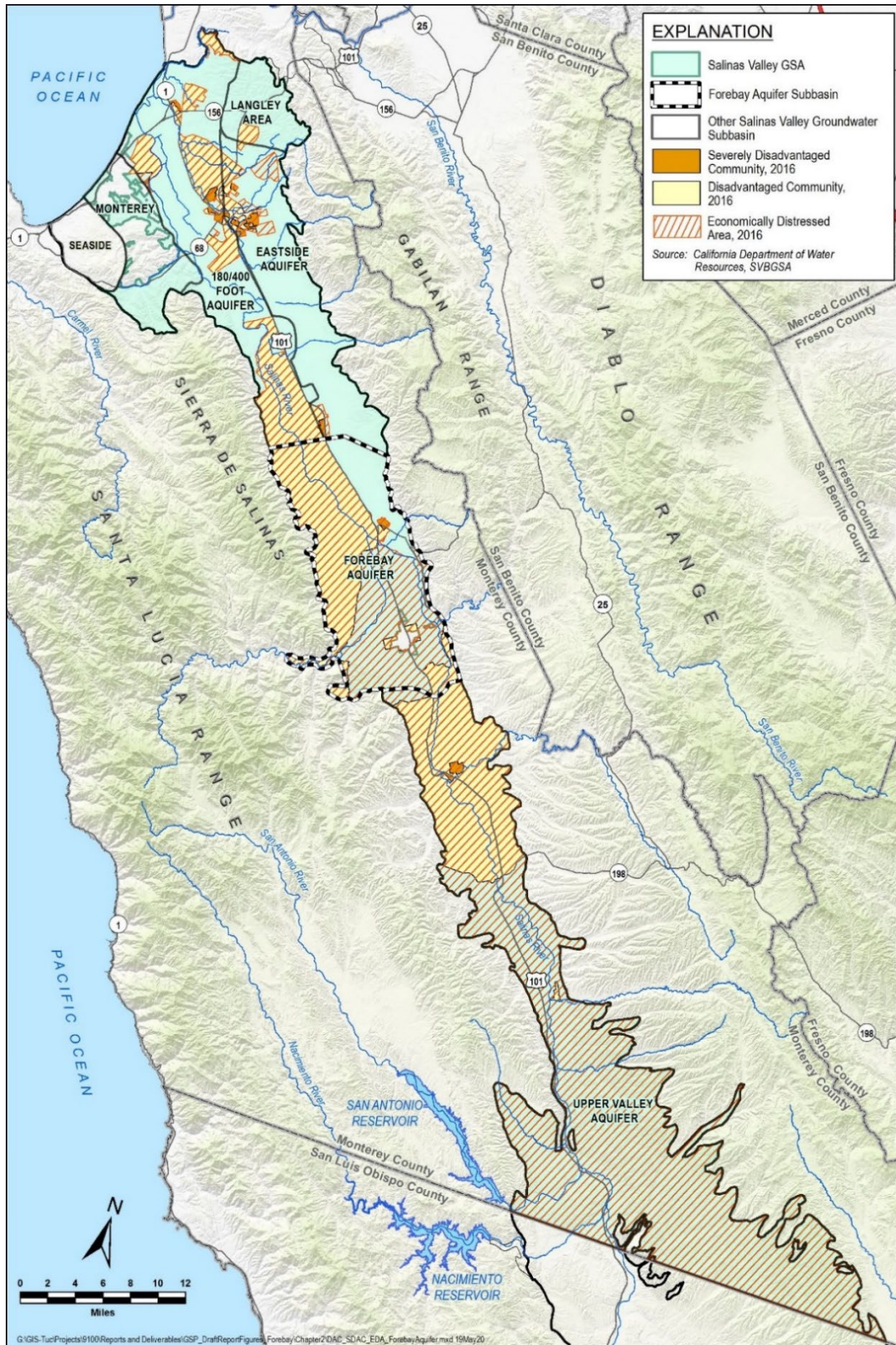


Figure 2-3. Disadvantaged Communities in the Salinas Valley Groundwater Basin

2.8.2 Additional activities scoped for engagement of Underrepresented Communities and Disadvantaged Communities

Additional activities scoped for engagement of URCs and DACs include:

- Conduct workshops with partners on importance of water and groundwater sustainability
- Identify URC and DAC concerns and needs for engagement
- Plan listening sessions around GSA milestones
- Coordinate with partner organizations to develop a “resource hub” where people can go for support
- Identify community allies in groundwater engagement work and bring down barriers for participation
- Consider particular URC and DAC impacts during routine GSA proceedings
- Convene a working group on domestic water, including URCs and DACs

3 DESCRIPTION OF PLAN AREA

This GSP covers the entire Forebay Subbasin, as shown on Figure 3-1. The Subbasin covers an area of approximately 94,000 acres, or 147 square miles (DWR, 2004a). It lies in the middle of Monterey County, and the middle of the Salinas Valley Groundwater Basin. The Forebay Subbasin is bounded by the Gabilan Range to the east, the 180/400-Foot Aquifer and Eastside Subbasins to the north, the Sierra de Salinas to the west, and the Upper Valley Subbasin to the south. Figure 3-3 shows the overlap between the Forebay Subbasin and MCWRA's Forebay Subarea.

The Salinas River runs through the Forebay Subbasin, entering from the Upper Valley Subbasin from the south and draining into the 180/400-Foot Aquifer Subbasin to the north. The main tributary to the Salinas River is the Arroyo Seco, which joins with it in the middle of the Subbasin. Historical flows in the Arroyo Seco formed a significant alluvial fan in the Subbasin, known as the Arroyo Seco Cone. The ASCMA within the Forebay Subbasin reflects the unique hydrogeologic, water quality, and water supply characteristics of the Arroyo Seco Cone region. The ASCMA is shown on Figure 3-1. The limits of the Arroyo Seco Cone may be modified when more data become available. The Forebay Subbasin contains the municipalities of Greenfield and Soledad. United States Highway 101 runs generally north-south along the Subbasin. Rivers and streams, urban areas, and major roads are shown on Figure 3-1.

This description of the plan area has been prepared in accordance with the GSP Regulations § 354.8. Information from existing water resource monitoring, management, and regulatory programs have been incorporated into this GSP through the development of the sustainability goal, SMC, and management actions and projects. This GSP has been developed to reflect the principles outlined in existing local plans, programs, and policies, and will build off them during GSP implementation.

3.1 Summary of Adjudicated and Jurisdictional Areas

3.1.1 Adjudicated Areas, Other GSAs, and Alternatives

The Forebay Subbasin is not adjudicated. The only adjudicated area in the Salinas Valley Groundwater Basin is the Seaside Subbasin (DWR subbasin number 3-004.08), which is not adjacent to the Forebay Subbasin.

No alternative plans have been submitted for any part of the Subbasin, or for any other Salinas Valley Groundwater Subbasin.

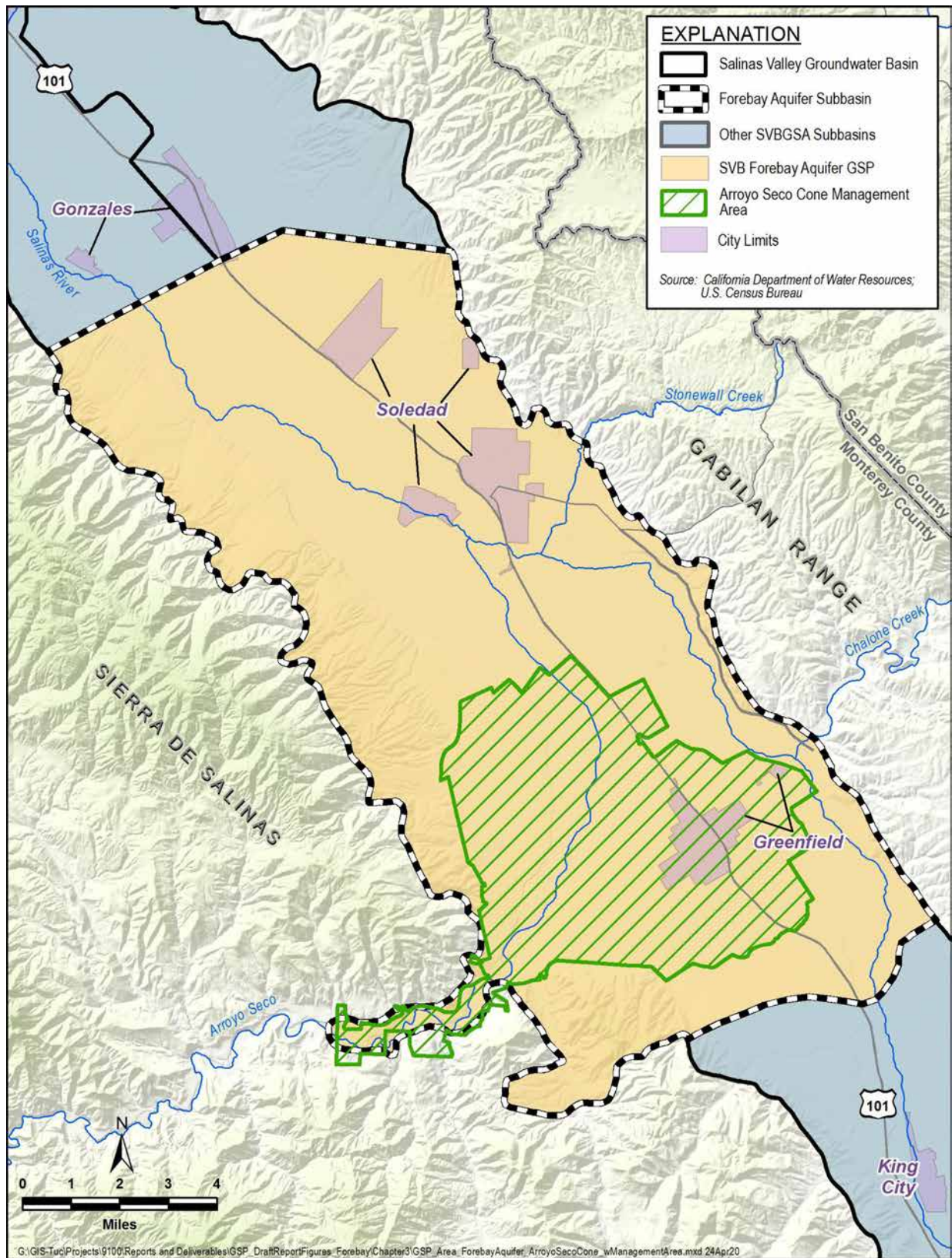


Figure 3-1. Forebay Aquifer Subbasin Area Covered by GSP

3.1.2 Jurisdictional Areas

3.1.2.1 Federal and State Jurisdictional Areas

Maps of federal and state jurisdictional areas are based on data from the U.S. Bureau of Land Management (BLM) National Surface Management Agency National Geospatial Data Asset (BLM, 2020). There are several areas in the Subbasin with federal or state jurisdiction over water management authority. BLM manages a 27.5-acre parcel in the Salinas River floodplain approximately 3.5 miles north of Greenfield. BLM additionally owns several parcels of land approximately 5.5 miles southwest of Soledad; a portion of these are within the Subbasin. The California Department of Corrections and Rehabilitation manages the Salinas Valley State Prison and the adjacent Correctional Training Facility; both located 5 miles north of Soledad. The Subbasin does not contain any tribal lands (RWMG, 2018).

3.1.2.2 County Jurisdiction

The County of Monterey has jurisdiction over the unincorporated area of the Subbasin. There are no County conservation areas or parks within the Subbasin (BLM, 2020).

MCWRA has broad water management authority in Monterey County, with its jurisdiction covering the entire Forebay Subbasin, as shown on Figure 3-2. MCWRA manages, protects, stores, and conserves water resources in Monterey County for beneficial and environmental use. Originally formed under a different name for flood control and management, it also has jurisdiction over water conservation, purveying water, and preventing extractions that are harmful to the groundwater basin. Key assessment zones for various projects and programs administered by MCWRA are shown in Figure 3-3. MCWRA is governed by a 9-member Board of Directors who are appointed by the 5-member MCWRA Board of Supervisors. The Board of Supervisors of the County is *ex officio* Board of Supervisors of MCWRA (Monterey County Water Resources Agency Act, Sec. 15).

3.1.2.3 City and Local Jurisdiction

The jurisdictional boundaries of cities and local jurisdictions shown on Figure 3-2 (U.S. Census Bureau, 2018). The cities of Soledad and Greenfield are located within the Subbasin and have water management authority.

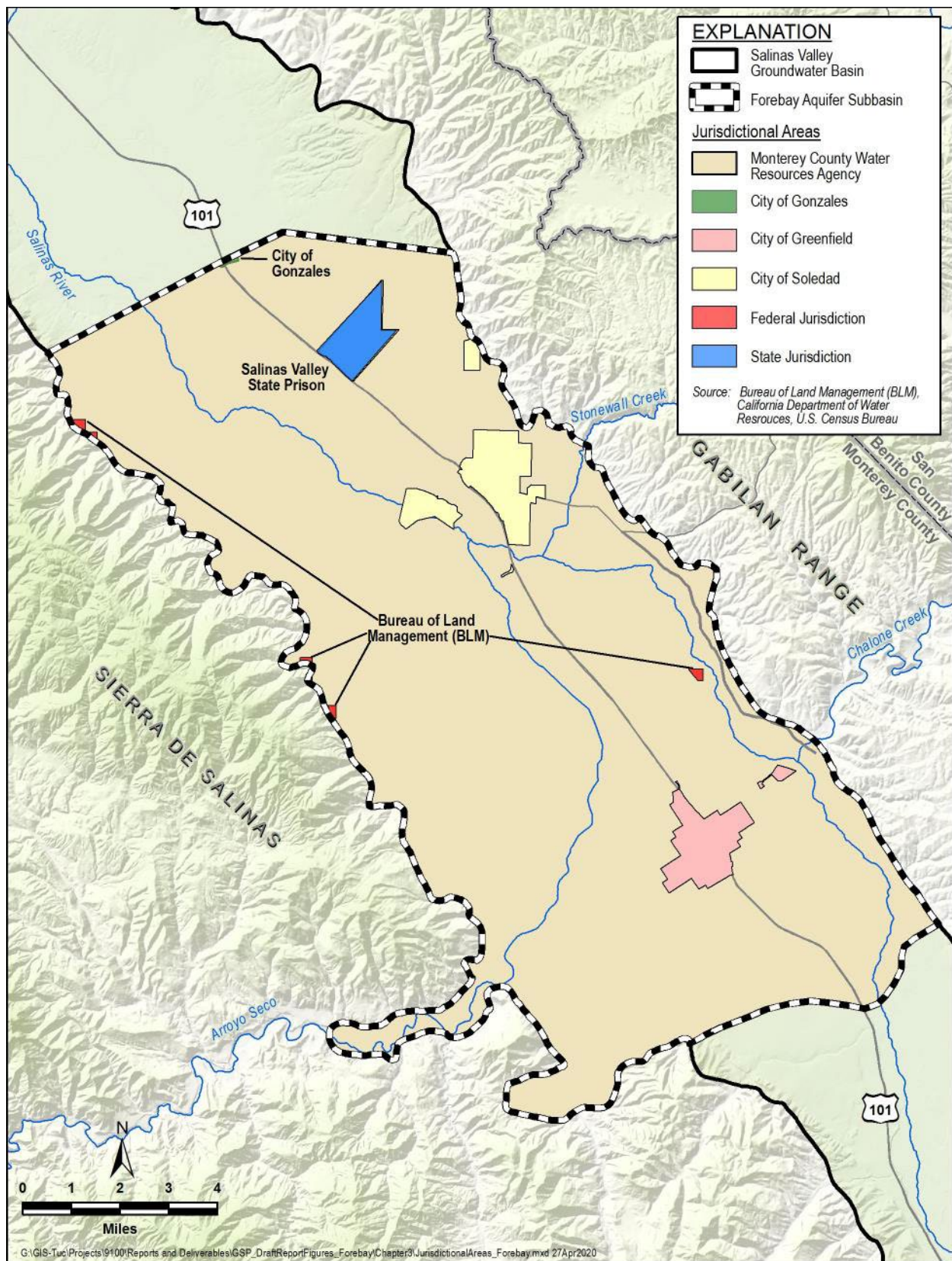


Figure 3-2. Federal, State, County, City, and Local Jurisdictional Areas

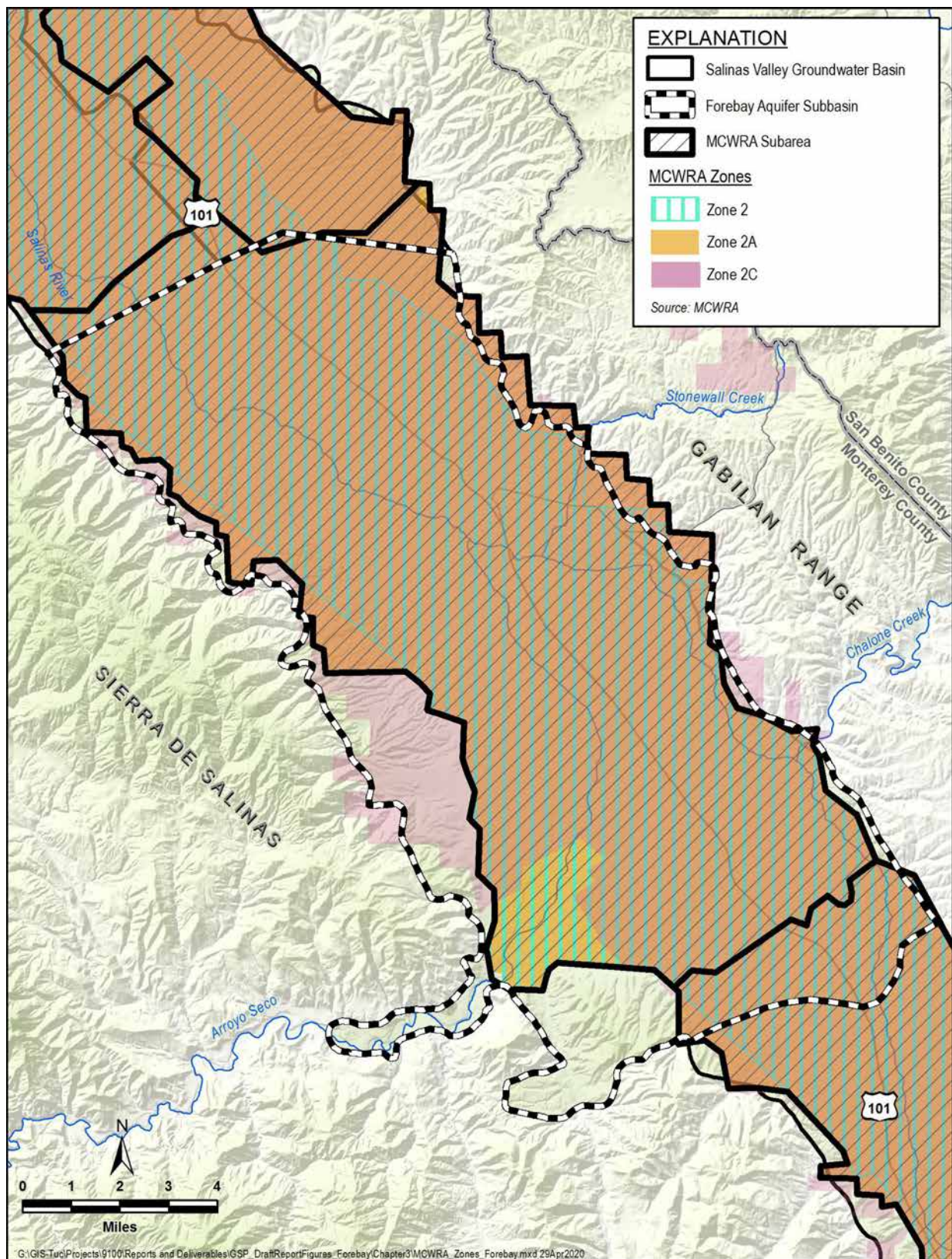


Figure 3-3. MCWRA Zones in the Forebay Aquifer Subbasin

3.2 Land Use

The Monterey County Assessor's office maintains a Geographic Information System (GIS) database of land use at the parcel level. Current (2019) land use categories in the Forebay Subbasin are shown on Figure 3-4 and summarized by major category in Table 3-1. The difference between the land use area in Table 3-1 and the total Subbasin area of 94,000 acres is the result of 1) some parcels having null land use values and 2) small gaps between parcels that are not counted.

Table 3-1. Land Use Summary

Category	Area in Subbasin (acres)
Agriculture (Row Crops)	72,728
Agriculture (Grazing)	13,106
Commercial	232
Industrial	615
Institutional	2,266
Miscellaneous	154
Multi-Family	275
Residential (Urban)	1,112
Rural	1,542
Not Classified	81
Total	92,111

Source: Monterey County Assessor's Office parcel data

The majority of land in the Subbasin is used for agriculture; the top 3 crops by value in Monterey County in 2017 were lettuce, strawberries, and broccoli (Monterey County Agriculture Commissioner, 2018). Grapes are also a major crop in Monterey County. Other crops included under irrigated agriculture are various row crops, field crops, alfalfa, pasture, orchards (fruits and nuts), and irrigated agricultural preserves.

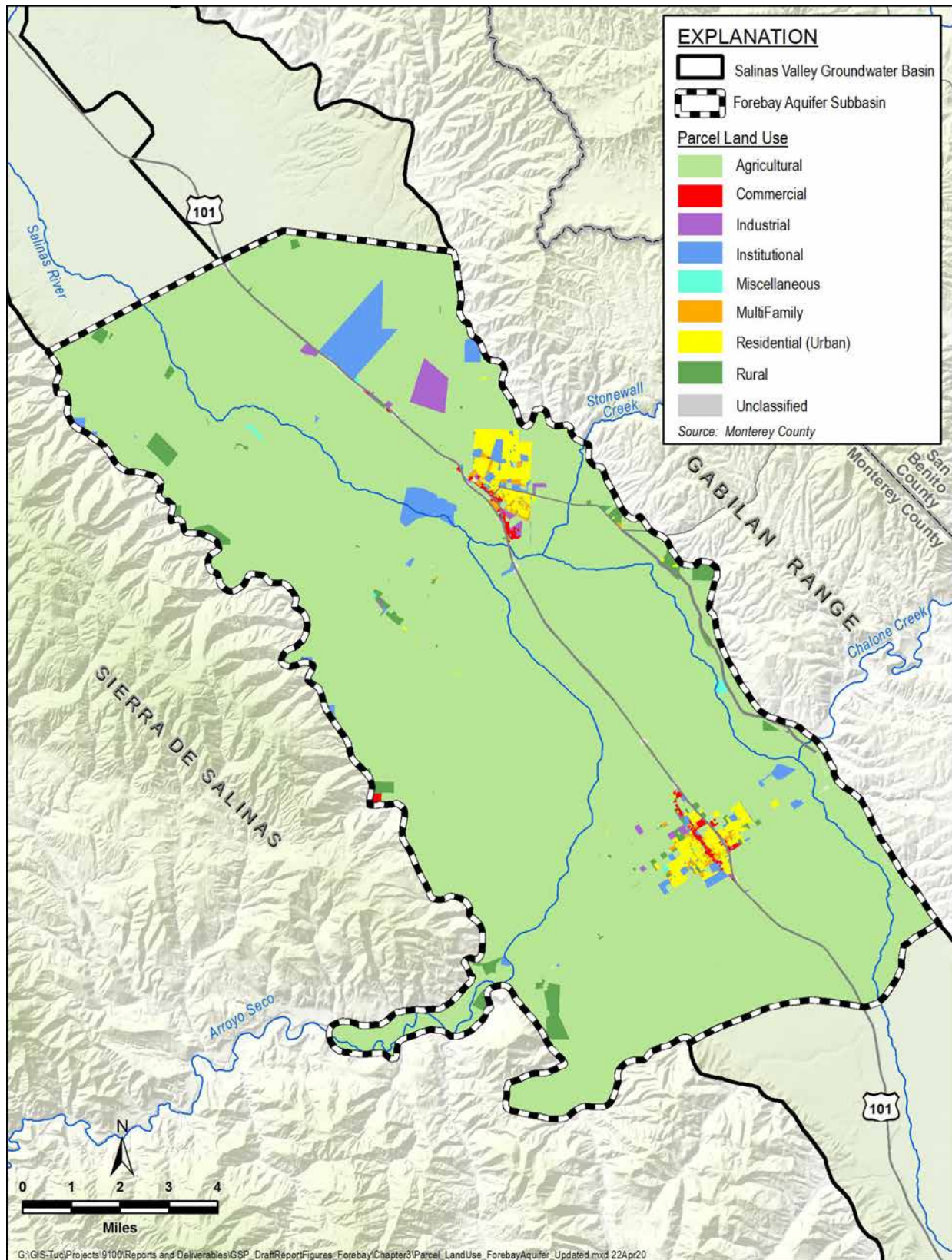


Figure 3-4. Existing Land Use

3.2.1 Water Source Types

No recycled water is used within the Subbasin. Surface water diversions within the Salinas River watershed are reported to the State Water Resources Control Board (SWRCB) under Electronic Water Rights Information Management System (eWRIMS). The locations of the reported surface water diversions are shown on Figure 3-5.

This figure does not show land that is dependent on the reported diversions, but rather infers areas through locations of diversion permits. Some reported surface water diversions are also reported to MCWRA as groundwater extractions. Based on an initial analysis comparing Water Year 2018 SWRCB diversion data and MCWRA pumping data, the estimated locations that reported both surface water diversions and groundwater pumping are identified with pink dots on Figure 3-5. Groundwater is the primary water source for all water use sectors in the Subbasin.

Communities that depend on groundwater are shown on Figure 3-6. The large public water systems shown on this figure are derived from data provided by Tracking California (Tracking California, 2020). Monterey County provided the boundaries for the small public water systems and the local small or state small water systems shown on Figure 3-6. More information on these water systems can be found on SVBGSA's Web Map, accessible at:

<https://portal.elmontgomery.com>. Groundwater is also used for rural residential areas, small community systems, and small commercial operations such as wineries and schools. The complete list of water systems and their number of connections, if available, are listed in Appendix 3A.

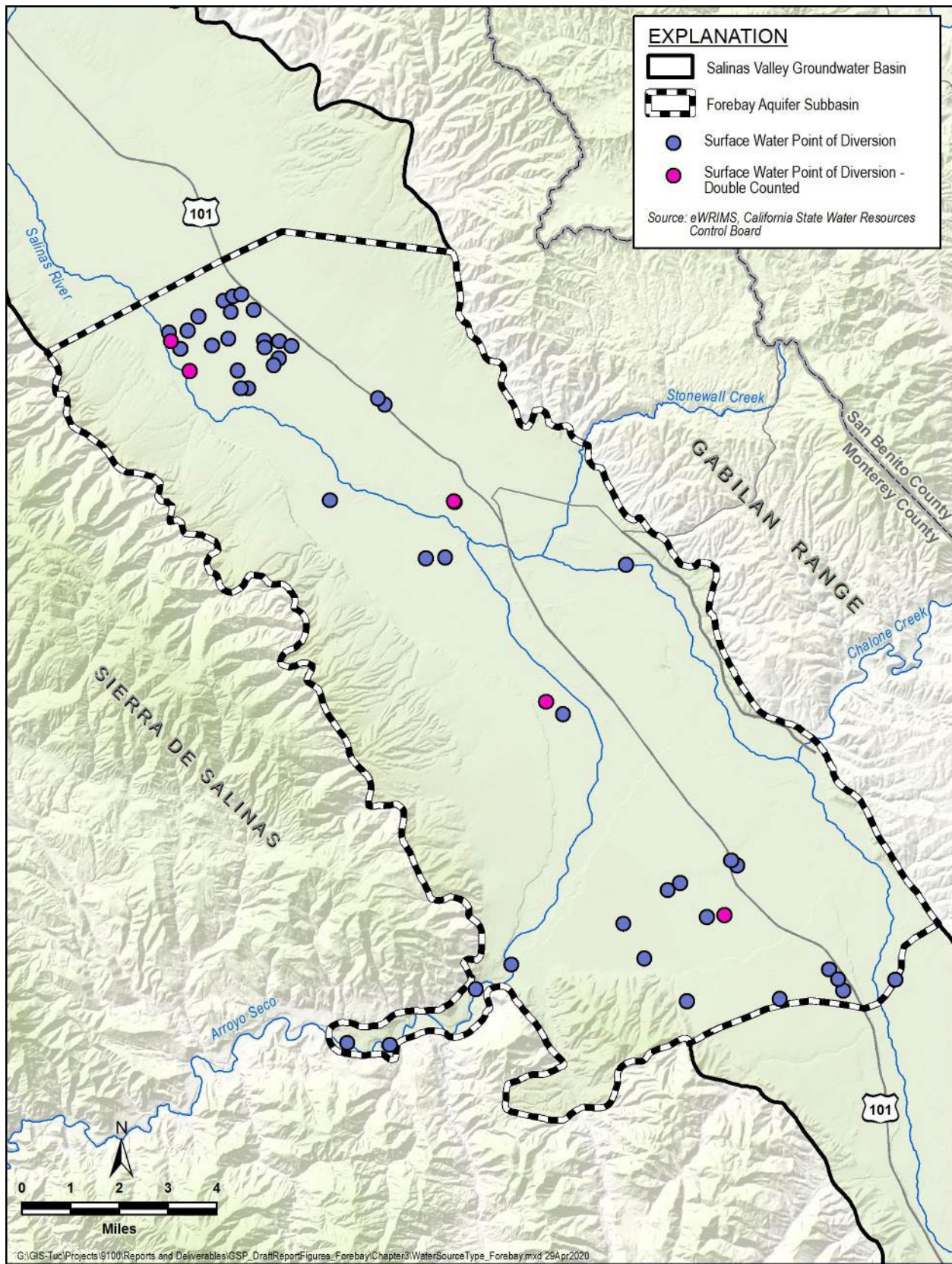


Figure 3-5. Salinas River Watershed Surface Water Points of Diversion in the Forebay Aquifer Subbasin

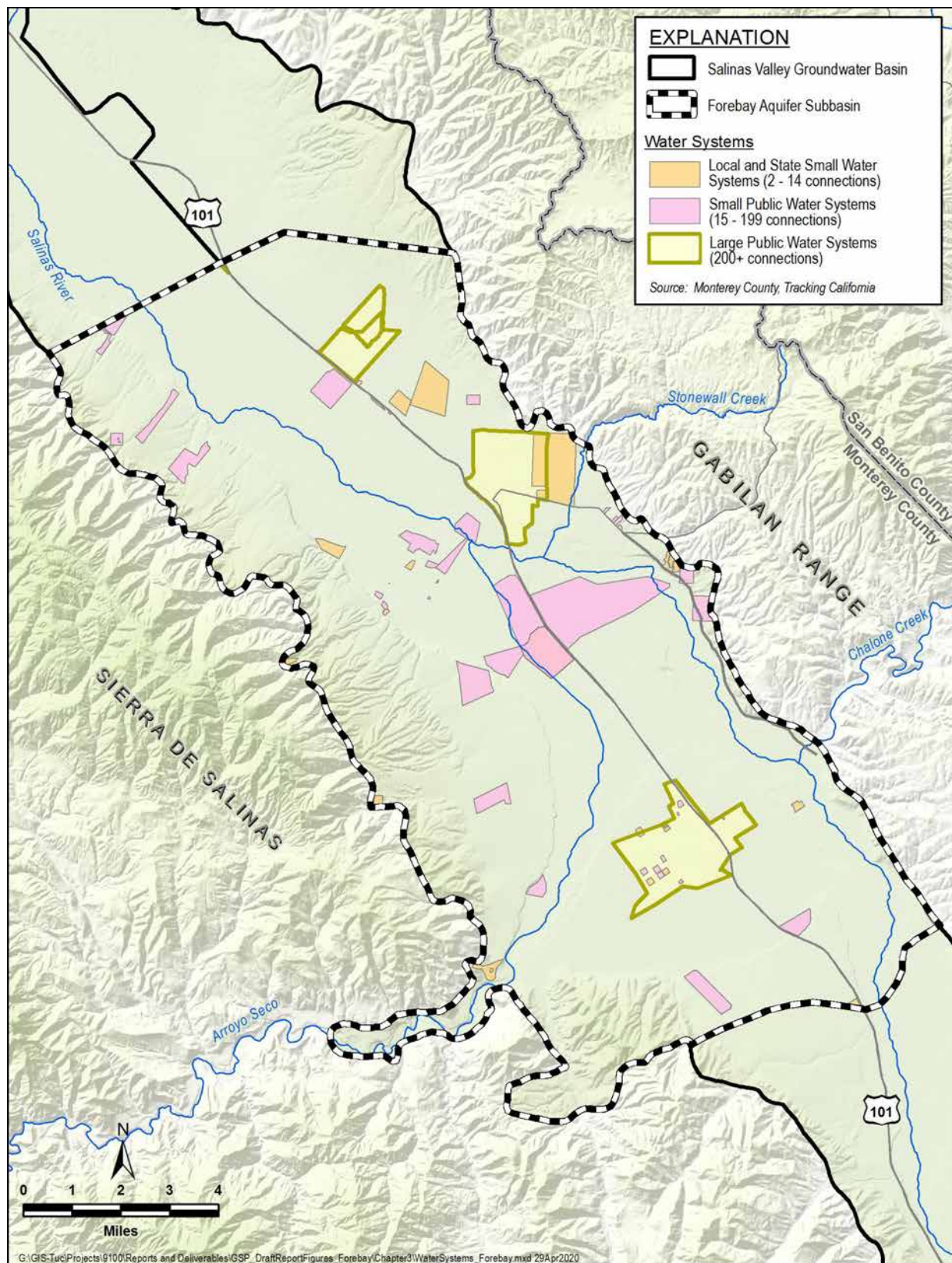


Figure 3-6. Communities Dependent on Groundwater

3.2.2 Water Use Sectors

Groundwater demands in the Subbasin are classified into the 6 water use sectors identified in the GSP Regulations. The water use sectors are shown on Figure 3-7. Groundwater demand categories include the following:

- **Urban.** Urban water use is assigned to non-agricultural water uses in the cities and census-designated places. Domestic use outside of census-designated places is not considered urban use.
- **Industrial.** There is limited industrial use in the Subbasin.
- **Agricultural.** This is the largest water use sector in the Subbasin, including grazing land.
- **Managed wetlands.** DWR land use records indicate that there are no managed wetlands in the Forebay Subbasin.
- **Managed recharge.** There is no managed recharge in the Subbasin.
- **Native vegetation.** Groundwater use by native vegetation is minimal. Although not a native species, water use by *Arundo donax* is estimated between 32,000 and 64,000 acre-feet per year (AF/yr.) in the entire Salinas Valley Groundwater Basin (Giessow, 2011); an unknown quantity occurs within the Forebay Subbasin.
- **Other.** This includes rural residential water use and any water use not captured in the other water use sector.

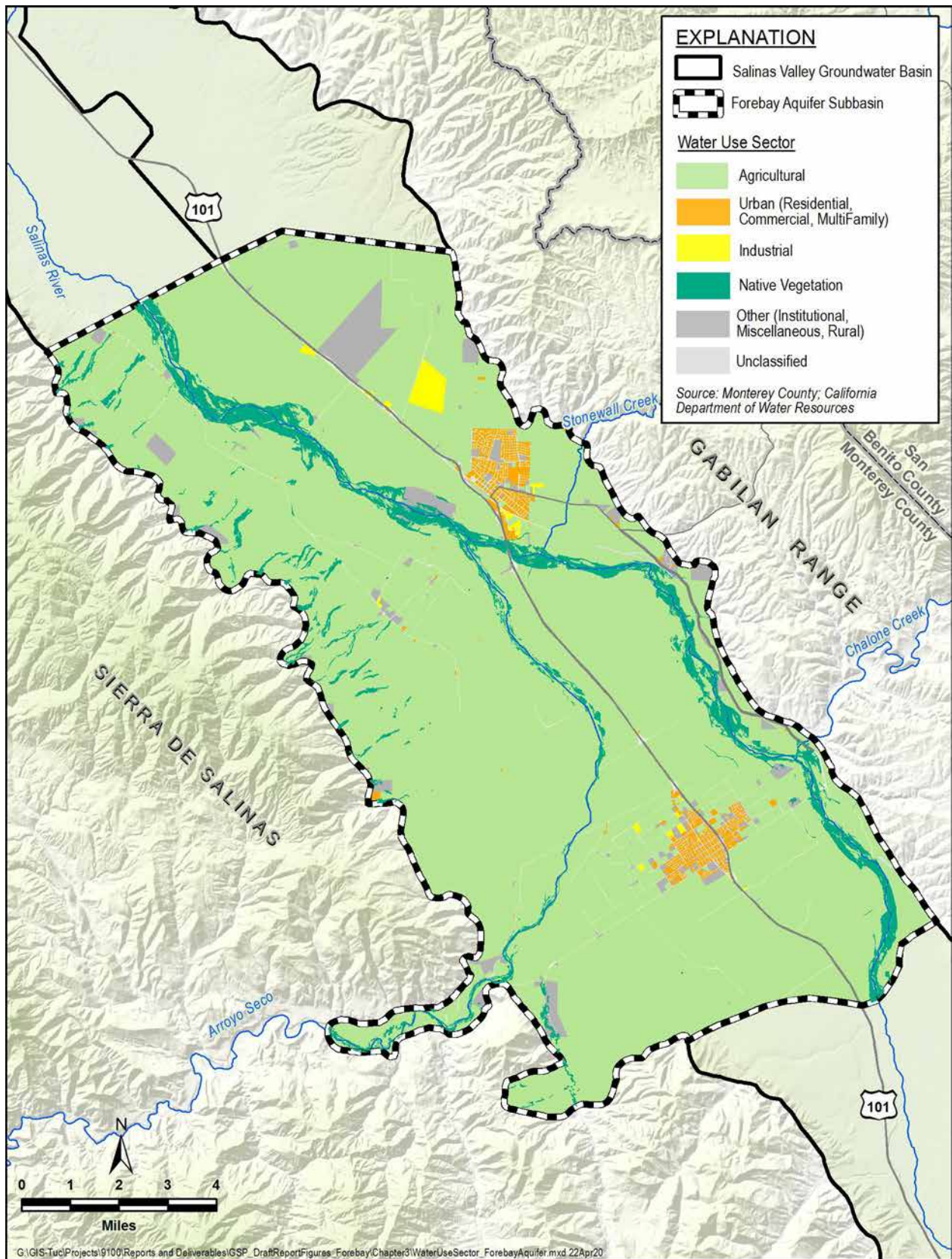


Figure 3-7. Map of Water Use Sectors

3.3 Existing Well Types, Numbers, and Density

Well density data were derived from DWR's Online System for Well Completion Report (OSWCR) Map Application (DWR, 2020a). Other data sources are available from MCWRA or other sources, and they may result in different well densities that are not reflected in DWR's OSWCR database. However, the DWR data were used for simplicity and consistency with other DWR data used in this GSP.

DWR's OSWCR Map Application classifies wells as domestic, production, and public supply; production wells include wells that are designated as irrigation, municipal, public, or industrial, and only exclude those designated as domestic. Most of the wells in the Subbasin are designated production wells. Fewer than 4% of wells in the Subbasin are classified as public supply wells, even though groundwater is the primary water source for urban and rural communities in the Subbasin. Domestic wells account for most of the remaining wells and have an average depth of approximately 281 feet. Some of the domestic wells identified by DWR may be classified as *de minimis* extractors, defined as pumping less than 2 AF/yr. for domestic purposes. Approximate well counts in the Subbasin are summarized in Table 3-2, with public supply wells subtracted from the production category to avoid double counting. DWR provides well counts by Public Land Survey System sections; well counts for sections that are only partially in the Subbasin use the proportion of the section in the subbasin to apportion the respective well count. These well counts may not be reflective of active wells in the Subbasin, as some wells may have been abandoned or are inactive. Figure 3-8, Figure 3-9, and Figure 3-10 show the density of domestic, production, and public supply wells, respectively, in the Subbasin, with the production wells being inclusive of the public supply wells.

Table 3-2. Well Count Summary

Category	Number of Wells
Domestic	145
Production	340
Public Supply	18
Total	521

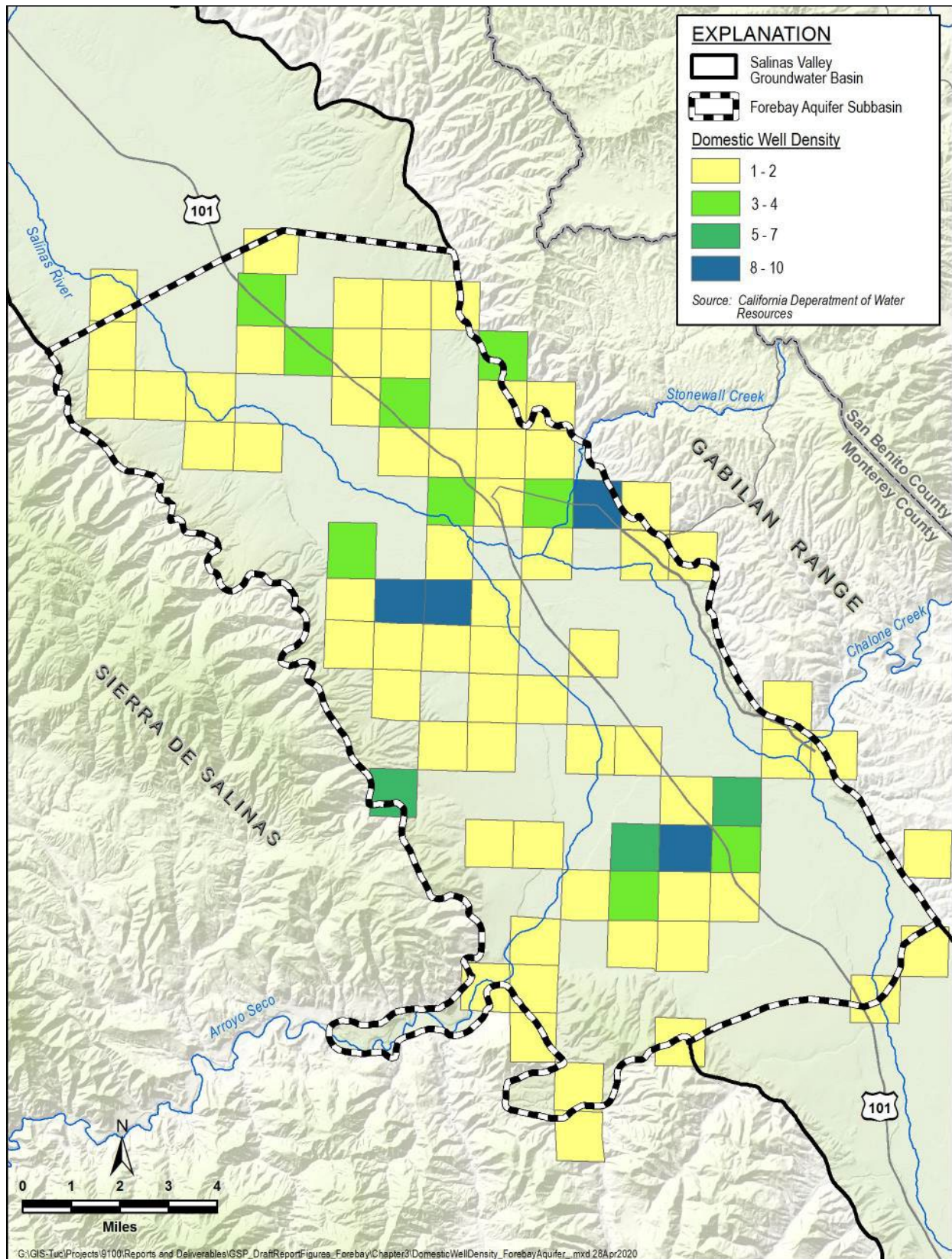


Figure 3-8. Density of Domestic Wells (Number of Wells per Square Mile)

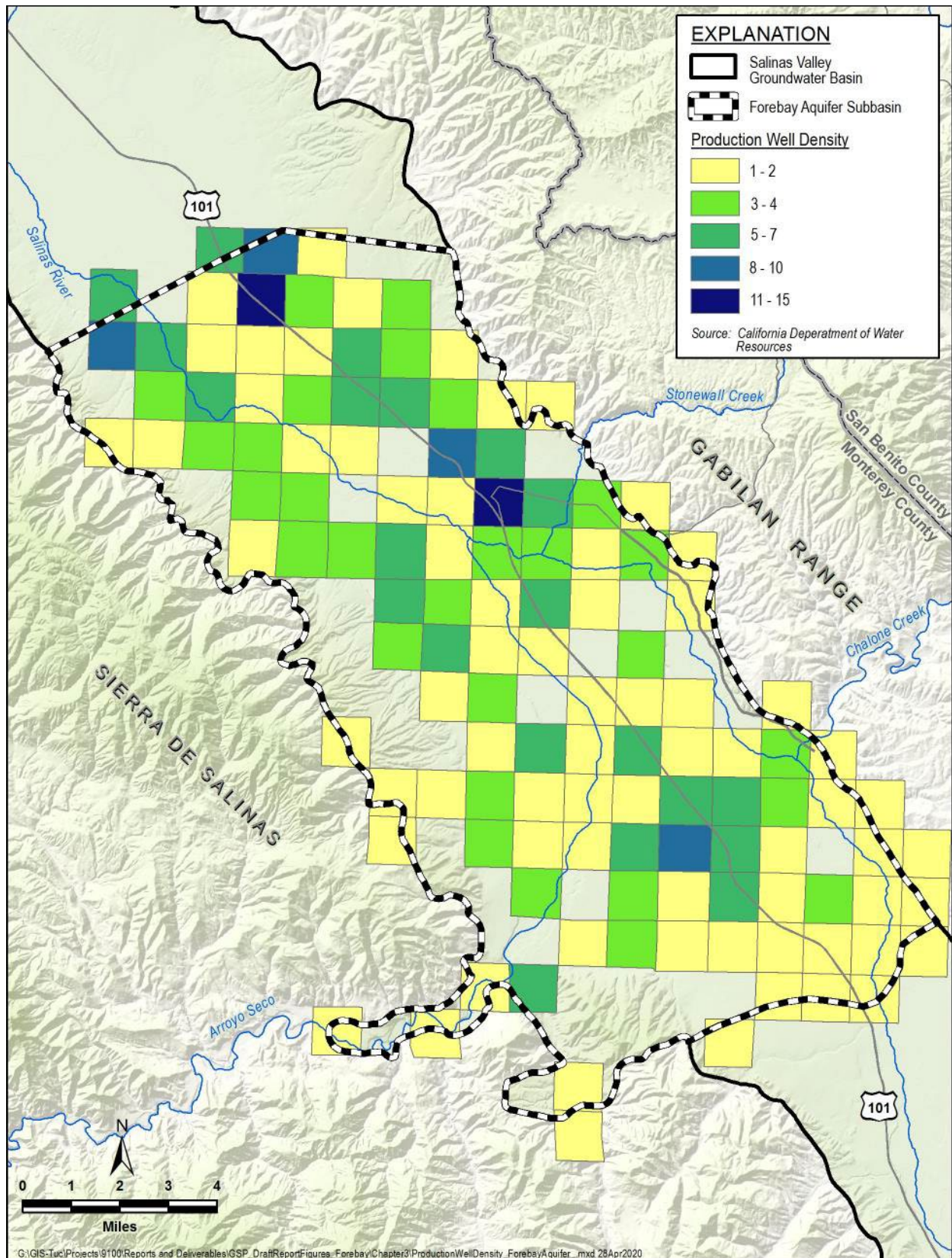


Figure 3-9. Density of Production Wells (Number of Wells per Square Mile)

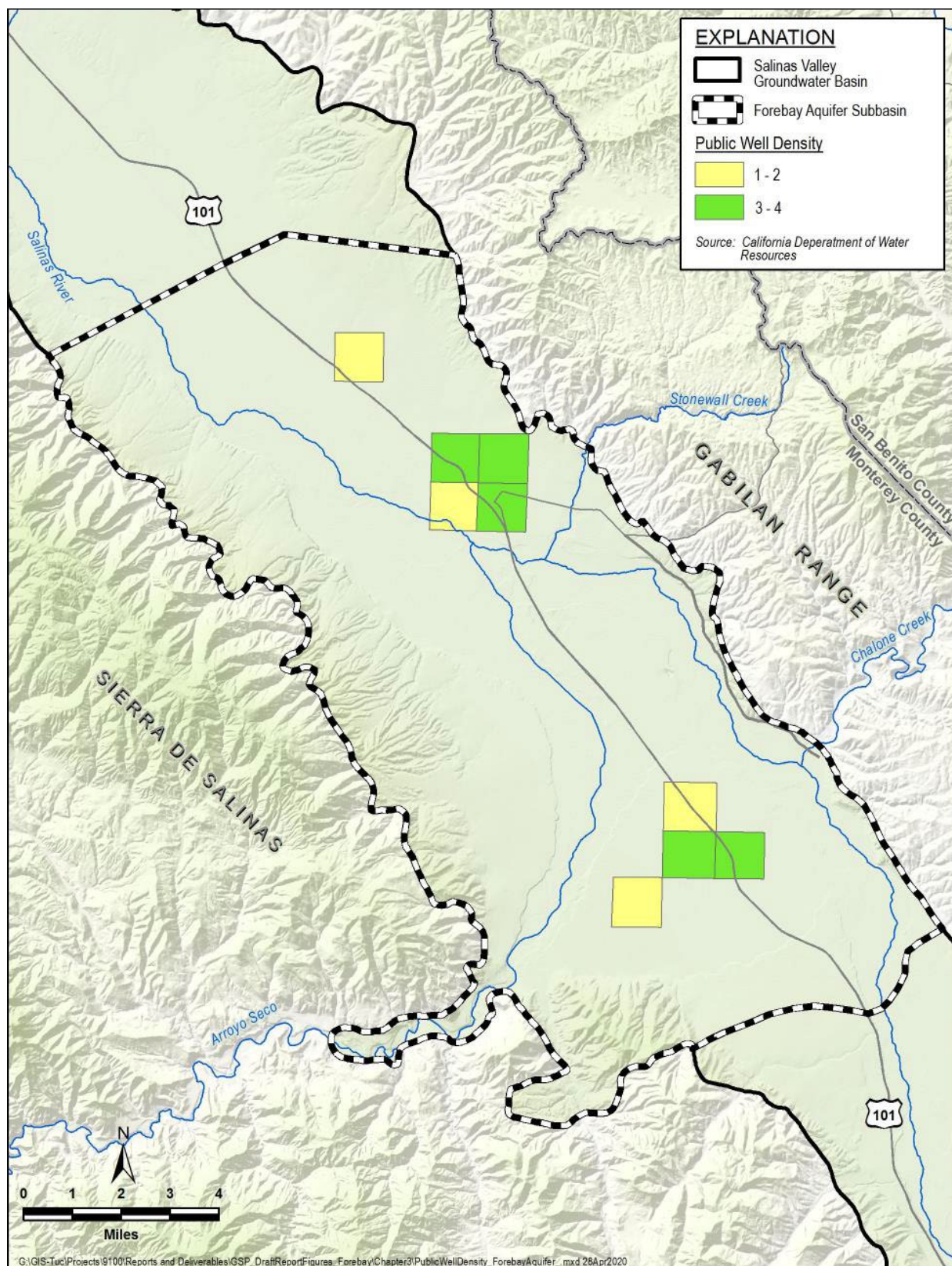


Figure 3-10. Density of Public Wells (Number of Wells per Square Mile)

3.4 Existing Monitoring Programs

3.4.1 Groundwater Elevation Monitoring

MCWRA operates existing groundwater elevation monitoring programs in the Salinas Valley Groundwater Basin, which are incorporated into the monitoring plan of this GSP as appropriate. MCWRA has annual fall, August, and monthly groundwater elevation monitoring programs, and is the responsible agency for the California Statewide Groundwater Elevation Monitoring (CASGEM) program in most areas of Monterey County. The existing groundwater elevation monitoring programs will be updated and improved to document the avoidance of undesirable results in the principal aquifer in the Subbasin.

MCWRA historically has monitored 11 wells within the Forebay Subbasin as part of the CASGEM network. Nine of the CASGEM monitoring wells are owned by MCWRA and the others are privately owned by owners who have volunteered the well for inclusion in the CASGEM program. MCWRA collects monthly groundwater elevation data from the CASGEM wells, except for a few that are monitored biannually, and reports the groundwater elevation data to DWR twice per year. The CASGEM wells have been migrated to the SGMA monitoring network and will be supplemented with 28 other wells that are already part of the MCWRA groundwater elevation monitoring networks. Groundwater elevation data from all wells in the monitoring network are publicly available. This network will be used for water elevation monitoring under this GSP, as described further in Chapter 7. It will be updated and improved as needed to monitor groundwater elevations for this Subbasin.

3.4.2 Groundwater Extraction Monitoring

MCWRA collects groundwater extraction information from all wells within Zones 2, 2A, and 2B that have discharge pipes of 3 inches or greater in diameter. These zones cover most of the Forebay Subbasin, including all of the valley floor and some of the foothills as shown on Figure 3-3. These data have been collected since 1993.

This network will be used for groundwater extraction monitoring under this GSP, as described in Chapter 7. SVBGSA will work with MCWRA to update and enhance the program to enable it to sufficiently monitor groundwater extractions for this Subbasin.

3.4.3 Groundwater Quality Monitoring

Groundwater quality is monitored under several different programs and by different agencies including the following:

- Municipal and community water purveyors must collect water quality samples on a routine basis for compliance monitoring and reporting to the SWRCB Division of

Drinking Water (DDW). These purveyors include municipal systems; community water systems; non-transient, non-community water systems; and non-community water systems that provide drinking water to at least 15 service connections or serve an average of at least 25 people for at least 60 days per year.

- Local small or state small water system wells are regulated by the Monterey County Department of Public Health. Local small water systems serve 2 to 4 service connections and state small water systems serve 5 to 14 connections.
- To fulfill the groundwater quality regulatory requirements of the Irrigated Lands Regulatory Program (ILRP), the Central Coast Regional Water Quality Control Board (CCRWQCB) requires monitoring of both on-farm domestic wells and agricultural wells for irrigation and livestock supply.
- In addition to the ILRP, the CCRWQCB conducts groundwater quality monitoring at multiple sites as part of investigation or compliance monitoring programs. These sites are discussed further in Chapter 5.

For this GSP, groundwater quality data will be downloaded and reviewed from SWRCB's DDW for municipal public water system supply wells and the ILRP irrigation supply wells and on-farm domestic wells monitored under the CCRWQCB's Agricultural Order, as described in Section 3.6.2.

3.4.4 Surface Water Monitoring

Three streamflow gauges operated by the U.S. Geological Survey (USGS) are within the Forebay Subbasin: Arroyo Seco near Soledad (USGS Site #11152000), Arroyo Seco below Reliz Creek near Soledad (USGS Site #11152050), and Salinas River near Soledad (USGS Site #11151700). The locations of these stream gauge surface-water monitoring facilities are shown on Figure 3-11.

On years when there are conservation releases from the Nacimiento and San Antonio Reservoirs, the MCWRA and USGS conduct the Salinas River Discharge Measurement Series (River Series) to monitor changes in streamflow along different river reaches. Reservoir releases are held constant for 5 days to ensure that the discharge measurements account for losses to the aquifer, stream vegetation, or evapotranspiration.

The SWRCB eWRIMS is used to collect surface water rights data in the Salinas River watershed for the points of diversion in the Subbasin that are shown on Figure 3-5. This includes monthly surface water diversions from the Salinas River and its tributaries, like the Arroyo Seco.

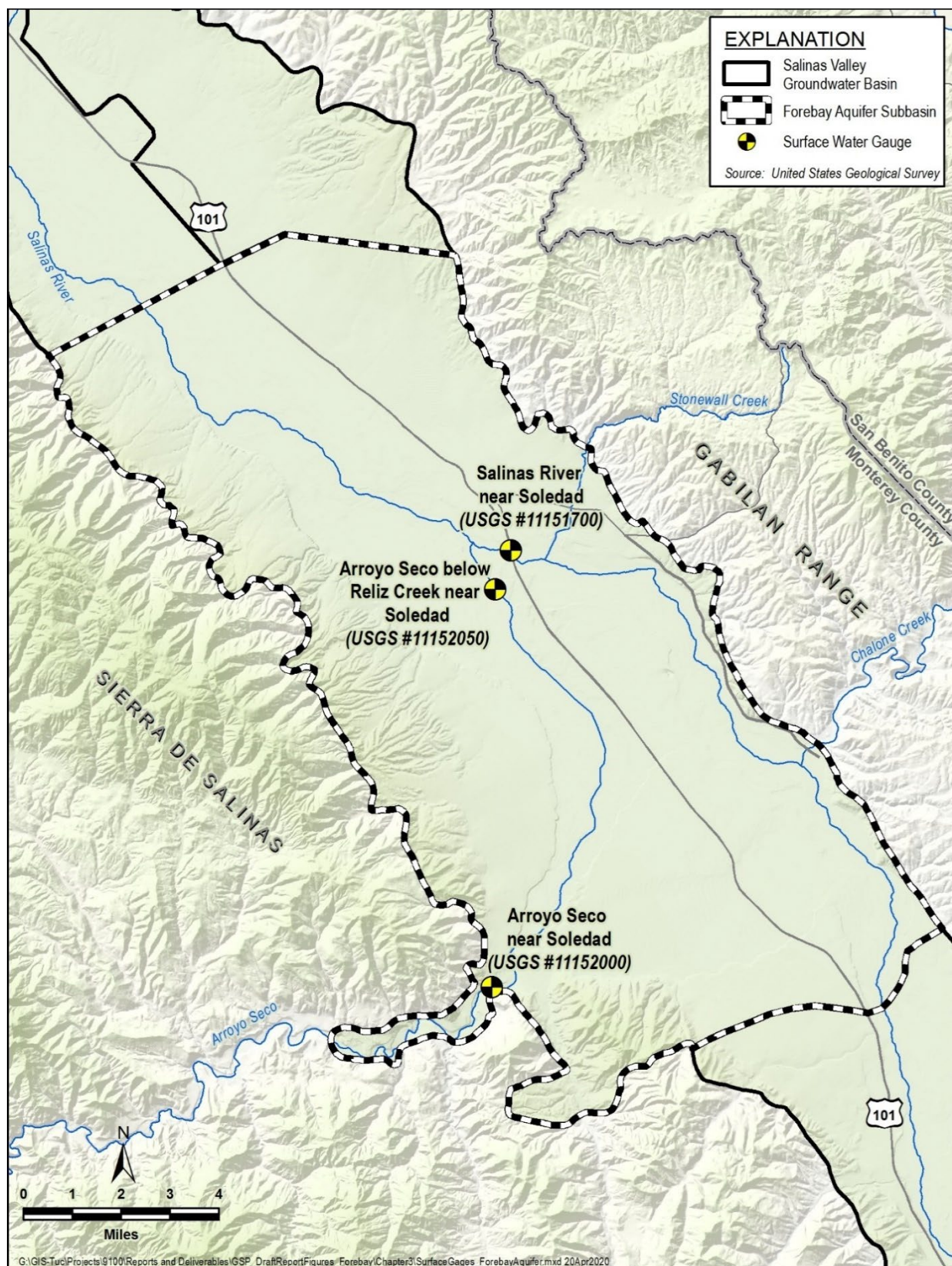


Figure 3-11. Surface Water Gauge Location

3.5 Existing Water Management Plans

3.5.1 Monterey County Groundwater Management Plan

MCWRA developed a Groundwater Management Plan (GMP) that is compliant with AB3030 and SB1938 legislation (MCWRA, 2006). This GMP exclusively covered the Salinas Valley Groundwater Basin in Monterey County. This GSP replaces the GMP.

The GMP identified 3 objectives for groundwater management:

- Objective 1:** Development of Integrated Water Supplies to Meet Existing and Projected Water Requirements
- Objective 2:** Determination of Sustainable Yield and Avoidance of Overdraft
- Objective 3:** Preservation of Groundwater Quality for Beneficial Use

To meet these 3 objectives, the GMP identified 14 elements that should be implemented by MCWRA:

- Plan Element 1:** Monitoring of Groundwater Elevations, Quality, Production, and Subsidence
- Plan Element 2:** Monitoring of Surface Water Storage, Flow, and Quality
- Plan Element 3:** Determination of Basin Yield and Avoidance of Overdraft
- Plan Element 4:** Development of Regular and Dry Year Water Supply
- Plan Element 5:** Continuation of Conjunctive Use Operations
- Plan Element 6:** Short-Term and Long-Term Water Quality Management
- Plan Element 7:** Continued Integration of Recycled Water
- Plan Element 8:** Identification and Mitigation of Groundwater Contamination
- Plan Element 9:** Identification and Management of Recharge Areas and Wellhead Protection Areas
- Plan Element 10:** Identification of Well Construction, Abandonment, and Destruction Policies
- Plan Element 11:** Continuation of Local, State, and Federal Agency Relationships

Plan Element 12: Continuation of Public Education and Water Conservation Programs

Plan Element 13: Groundwater Management Reports

Plan Element 14: Provisions to Update the Groundwater Management Plan

3.5.2 Integrated Regional Water Management Plan

The Integrated Regional Water Management (IRWM) Plan for the Greater Monterey County Region was developed by the Greater Monterey County Regional Water Management Group (RWMG), which consists of government agencies, nonprofit organizations, educational organizations, water service districts, private water companies, and organizations representing agricultural, environmental, and community interests.

The Forebay Subbasin falls within the IRWM Plan area. The IRWM Plan consists of a set of goals and objectives that were identified by the RWMG as being critical to address water resource issues within the planning area in the areas of:

- Water Supply
- Water Quality
- Flood Protection and Floodplain Management
- Environment
- Regional Communication and Cooperation
- Disadvantaged Communities
- Climate Change

The IRWM Plan includes more than 25 projects that could assist regional groundwater management (RWMG, 2018).

3.5.3 Urban Water Management Plans

Two Urban Water Management Plans (UWMPs) have been developed in the Subbasin for the Cities of Soledad and Greenfield.

3.5.3.1 City of Soledad Urban Water Management Plan

The City of Soledad UWMP was updated in 2011 (Harris & Associates, 2021). The UWMP describes the service area, reports historical and projected population, identifies historical and projected water demand by category (single-family, multi-family, commercial, industrial, institutional/government, and other), and describes the distribution system. Groundwater is the

sole supply source for the City of Soledad, and the UWMP notes that several of its wells had to be replaced due to nitrate contamination. None of the City's wells are currently exceeding the nitrate Title 22 Maximum Contaminant Level (MCL). The City of Soledad UWMP indicates that it does not plan to develop alternative sources of water; rather it will focus on maintaining and expanding its existing infrastructure to meet demand. Desalination was not deemed a viable option due to the City's inland location. The City's wastewater treatment system was upgraded in 2010 and will be upgraded again within the next year, recycled wastewater can be used to offset non-potable demand.

Soledad is located near the confluence of the Salinas and Arroyo Seco rivers. Overdraft conditions have not been identified in this area by MCWRA, according to the UWMP. It is expected that groundwater will continue to be a reliable supply for the City of Soledad. The UWMP contains sections on water conservation, demand management, and water shortage and emergency supply contingencies. A drought risk assessment is also included in the UWMP to determine the impact of a 5-year drought on the City's water supply.

3.5.3.2 City of Greenfield Draft Urban Water Management Plan

The 2015 City of Greenfield UWMP was adopted in 2018 (City of Greenfield, 2018). The UWMP describes the service area, reports current and projected population, identifies current and projected water demand by category (single family, multi-family, commercial, industrial, landscape irrigation, and other), and describes the distribution system. Groundwater is the sole supply source for the City of Greenfield. The UWMP indicates that the City does not plan to develop alternative sources of water; rather it will focus on maintaining and expanding its existing infrastructure to meet demand. Desalination was not deemed a viable option due to the City's inland location.

Greenfield is in MCWRA's Forebay Subarea between the Salinas and Arroyo Seco rivers. The UWMP states that groundwater is not overdrafted in that area. It is expected that groundwater will continue to be a reliable supply for the City. The UWMP includes sections on water conservation, demand management, and emergency supply contingencies.

3.6 Existing Water Regulatory Programs

3.6.1 Groundwater Export Prohibition

The MCWRA Act, § 52.21 prohibits the export of groundwater for uses outside the Salinas Valley Groundwater Basin from any part of the Basin, from any part of the Basin including the Forebay Subbasin. In particular, the Act states:

For the purpose of preserving [the balance between extraction and recharge], no groundwater from that basin may be exported for any use outside the basin, except that

use of water from the basin on any part of Fort Ord shall not be deemed such an export. If any export of water from the basin is attempted, the Agency may obtain from the superior court, and the court shall grant, injunctive relief prohibiting that exportation of groundwater.

3.6.2 Agricultural Order

In 2021 the CCRWQCB issued Agricultural Order No. R3-2021-0040, the Proposed General Waste Discharge Requirements for Discharges from Irrigated Lands (CCRWQCB, 2021). The permit requires that growers implement practices to reduce nitrate leaching into groundwater and improve receiving water quality. Specific requirements for individual growers are structured into 3 phases based on the relative risk their operations pose to water quality. Each of the 3 phases encompass a different area of the Central Coast Basin. Monitoring results from this new Agricultural Order (Ag Order 4.0) will be incorporated into this GSP's groundwater quality network.

3.6.3 Water Quality Control Plan for the Central Coast Basins

The Water Quality Control Plan for the Central Coastal Basin (Basin Plan) was most recently updated in June 2019 (CCRWQCB, 2019). The objective of the Basin Plan is to outline how the quality of the surface water and groundwater in the Central Coast Region should be managed to provide the highest water quality reasonably possible. Water quality objectives for both groundwater and surface water are provided in the Basin Plan.

The Basin Plan lists beneficial users, describes the water quality that must be maintained to allow those uses, provides an implementation plan, details SWRCB and CCRWQCB plans and policies to protect water quality, and describes statewide and regional surveillance and monitoring programs. Present and potential future beneficial uses for water in the Basin are municipal supply; agricultural supply; groundwater recharge; recreation; sport fishing; warm freshwater habitat; wildlife habitat; rare, threatened or endangered species habitat; and spawning, reproduction, and/or early development of fish.

3.6.4 Title 22 Drinking Water Program

The SWRCB Division of Drinking Water (DDW) regulates public water systems in the State to ensure the delivery of safe drinking water to the public. A public water system is defined as a system for the provision of water for human consumption that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out of the year. Private domestic wells, wells associated with drinking water systems with fewer than 15 residential service connections, industrial, and irrigation wells are not regulated by the DDW.

The DDW enforces the monitoring requirements established in Title 22 of the California Code of Regulations for public water system wells, and all the data collected must be reported to the DDW. Title 22 also designates the MCLs and Secondary Maximum Contaminant Levels (SMCLs) for various waterborne contaminants, including volatile organic compounds, non-volatile synthetic organic compounds, inorganic chemicals, radionuclides, disinfection byproducts, general physical constituents, and other parameters.

3.7 County Public Policy of Safe and Clean Water

To recognize the Human Right to Water, in December 2018 the County of Monterey established a public policy that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes and that the human right to water extends to all residents of Monterey County, including disadvantaged individuals and groups and communities in rural and urban areas. The County intended for the policy to inform the County when implementing policies and regulations affecting water supply and usage and to help the County to focus on the issue of drinking water pollution in certain Monterey County domestic wells and water systems as well as potential future threats due to drought and a lack of available drinking water, while not impacting water rights or expanding or creating new County obligations.

3.8 Incorporating Existing Programs into the GSP and Limits on Operational Flexibility

Information from existing water resource monitoring, management, and regulatory programs have been incorporated into this GSP. They are taken into consideration during the preparation of the sustainability goal, when establishing sustainable management criteria, and when developing management actions and projects. This GSP has been developed to reflect the principles outlined in those existing local plans and builds off existing plans during GSP implementation. Some of the existing management plans and ordinances may limit operational flexibility. These potential limits to operational flexibility have already been incorporated into the management actions and projects included in this GSP. Examples of limits on operational flexibility include:

- The groundwater export prohibition included in the MCWRA Act prevents export of water out of the Salinas Valley Groundwater Basin. This prohibition is not expected to adversely affect SVBGSA's ability to reach sustainability.
- The Basin Plan and the Title 22 Drinking Water Program restrict the quality of water that can be recharged into the Subbasin.

- The Habitat Conservation Plan (HCP) being developed by MCWRA on the Salinas River will limit operational flexibility for Nacimiento and San Antonio reservoir releases for groundwater recharge in the Basin.

The other monitoring, management, and regulatory programs do not limit the operational flexibility in this Subbasin.

3.9 Conjunctive Use Programs

There are currently no conjunctive use programs in the Forebay Subbasin.

3.10 Land Use Plans

3.10.1 Land Use Plans in the Subbasin

Land use is an important factor in water management. Monterey County and the cities of Greenfield and Soledad have land use authority over portions of the Forebay Subbasin. Each of these entities has developed a general plan that guides land use in the Subbasin. General descriptions of these land use plans and how implementation may affect groundwater management in the Forebay Subbasin are included in Appendix 3B.

3.10.2 Land Use Plans Outside of Basin

Monterey County's General Plan is applicable throughout the unincorporated area of the County, including the adjoining 180/400-Foot Aquifer Subbasin and the Upper Valley Subbasin. The Cities of Salinas and Marina have general plans with land use elements in the neighboring 180/400-Foot Aquifer Subbasin and King City in the Upper Valley Subbasin. Because they are members of the SVBGSA or the SVBGSA has a cooperation agreement with their water district, management actions taken by the SVBGSA will be in alignment with the concerns and plans of the County and those cities. Therefore, it is unlikely that these land use plans will affect the ability of the SVBGSA to achieve sustainable groundwater management.

3.10.3 Well Permitting

The Public Service element of the Monterey County General Plan addresses permitting of individual wells in rural or suburban areas. Table 3-3 summarizes the Monterey County General Plan's water supply guidelines for the creation of new residential or commercial lots (Monterey County, 2010, Table PS-1).

Table 3-4 depicts the decision matrix from the Monterey County General Plan for permitting new residential or commercial wells for existing lots (Monterey County, 2010, Table PS-2).

On August 29, 2018, the State Third Appellate District Court of Appeal published an opinion in *Environmental Law Foundation v. State Water Resources Control Board* (No. C083239), a case that has the potential to impact future permitting of wells near navigable surface waters to which they may be hydrologically connected. The Court of Appeal found that while groundwater itself is not protected by the public trust doctrine, the doctrine does protect navigable waters from harm caused by extraction of groundwater if it adversely affects public trust uses. Further, it found that Siskiyou County, as a subdivision of the State, shares responsibility for administering the public trust. Similarly, Monterey County is responsible for well permitting. Therefore, it has a responsibility to consider the potential impacts of groundwater withdrawals on public trust resources when permitting wells near areas where groundwater may be interconnected with navigable surface waters.

Moreover, California Supreme Court’s decision in *Protecting Our Water and Environmental Resources v. County of Stanislaus* (2020) held that Stanislaus County could not categorically classify its issuance of groundwater well construction permits as ministerial decisions exempt from environmental review under the California Environmental Quality Act (“CEQA”). Chapter 15.08 of the Monterey County Code sets forth the application and decision-making process for the County in considering applications for well construction permits. The Chapter sets forth certain technical requirements that appear to be purely ministerial in their application; however, the Chapter also gives the Health Officer discretion to impose unspecified conditions on a permit, grant variances, and deny an application if in his/her judgment it would defeat the purposes of the Chapter. The Monterey County Code has not yet been amended, so permits are currently issued according to Chapter 15.08 and the 2010 General Plan, as applicable. The Monterey County Health Department, Environmental Health Bureau issues well permits and receives input from the County of Monterey Housing and Community Development to determine what, if any, level of CEQA review is necessary.

Table 3-3. Monterey County Water Supply Guidelines for the Creation of
New Residential or Commercial Lots

Major Land Groups	Water Well Guidelines
Public Lands	Individual Wells Permitted in Areas with Proven Long-Term Water Supply
Agriculture Lands	Individual Wells Permitted in Areas with Proven Long-Term Water Supply
Rural Lands	Individual Wells Permitted in Areas with Proven Long-Term Water Supply
Rural Centers	Public System; Individual Wells Allowed in limited situations
Community Areas	Public System

Table 3-4. Monterey County Well Permitting Guidelines for Existing Residential and Commercial Lots

Characteristics of Property	Water Connection Existing or Available from the Water System	Not Within a Water System or a Water Connection Unavailable
Greater than or equal to 2.5 acres connected to a Public Sewage System or an on-site wastewater treatment system	Process Water Well Permit	Process Water Well Permit
Less than 2.5 acres and connected to a Public Sewage System	Process Water Well Permit	Process Water Well Permit
Less than 2.5 acres and connected to an on-site wastewater treatment system	Do not Process Water Well Permit	Process Water Well Permit

3.10.4 Effects of Land Use Plan Implementation on Water Demand

The GSA does not have authority over land use planning. However, the GSA will coordinate with the County on general plans and land use planning/zoning as needed when implementing the GSP.

A lawsuit filed against the County of Monterey's 2010 General Plan led to a settlement agreement that could affect water supplies. The settlement agreement requires the County of Monterey to develop a study of the Salinas Valley Groundwater Basin within Zone 2C which largely overlaps the Basin and includes, among other items:

- An assessment of whether the total water demand for all uses designated in the General Plan for the year 2030 is likely to be reached or exceeded
- An evaluation and conclusions regarding future expected trends in groundwater elevations
- An evaluation and conclusions regarding expected future trends in seawater intrusion

Should the study conclude the following, the study shall make recommendations on how to address these conditions:

- Total water demand for all uses is likely to be exceeded by 2030, or
- Groundwater elevations are likely to decline by 2030, or
- The seawater intrusion boundary is likely to advance inland by 2030.

The outcomes from this study may affect the GSP implementation. However, the GSP will consider multiple approaches to keep extraction within the sustainable yield through the measures laid out in Chapter 9. The study and GSP implementation are 2 parallel efforts, and the results of the County's study will be reviewed when finalized and considered during GSP implementation. SGMA may preempt implementation of the County's study if it were to conflict with the purposes of SGMA and the efforts of the SVBGSA to attain sustainability in the Basin.

Monterey County has chosen to retain the USGS to develop the Salinas Valley Integrated Hydrologic Model (SVIHM), which will be used during implementation of this GSP. The USGS is currently planning to publicly release it in 2022.

3.10.5 Effects of GSP Implementation on Water Supply Assumptions

Implementation of this GSP is not anticipated to affect water supply assumptions of relevant land use plans over the planning and implementation horizon. This GSP includes sufficient management actions and projects to keep extraction within the sustainable yield, should they need to be implemented. Changes in the cost of groundwater may affect whether surface water or groundwater is used. Land use changes may occur as a result of these activities and based on financial decisions by individual growers. However, GSP implementation has no direct impact on land use management.

4 HYDROGEOLOGIC CONCEPTUAL MODEL

The hydrogeologic conceptual model (HCM) characterizes the geologic and hydrologic framework of the Subbasin in accordance with the GSP Regulation § 354.14. It is based on best available data, technical studies, and qualified maps that characterize the physical components and surface water/groundwater interaction in the Subbasin. This HCM provides comprehensive written descriptions and illustrated representations of subsurface conditions. The chapter describes the Subbasin characteristics and processes that govern the flow of water across the Subbasin boundaries, and outlines the general groundwater setting that may be encountered in the subsurface environment. Current and historical groundwater conditions are discussed in greater detail in the subsequent chapter. This current HCM in this GSP will be part of an iterative process where current conditions and data gaps are described, investigated, and then updated accordingly.

4.1 Subbasin Setting and Topography

The Forebay Subbasin is in the central portion of the Salinas Valley Groundwater Basin, an approximately 90-mile-long alluvial basin underlying the elongated, intermountain valley of the Salinas River. The Subbasin is oriented southeast to northwest, with several streams that drain the mountains on the western and eastern sides of the valley. The largest of these streams is the Arroyo Seco. These streams flow to the Salinas River which then drains towards the northwest into the Pacific Ocean at Monterey Bay (Figure 4-1).

The colored bands on Figure 4-1 show the topography of the Subbasin, derived from the USGS Digital Elevation Model (DEM). The Subbasin slopes at an average grade of approximately 10 feet/mile to the northwest along the river. The ASCMA, on the southwestern boundary of the Subbasin, slopes at an average grade of approximately 40 feet/mile to the northeast toward the Salinas River. Land surface elevations in the Subbasin range from approximately 1,800 feet along the Sierra de Salinas alluvial fans to less than 200 feet at the boundary with the 180/400-foot Aquifer Subbasin.

Although the ASCMA encompasses distinct hydrogeological characteristics compared to the rest of the Subbasin, this Chapter will generally discuss the hydrogeologic conditions of the Subbasin as a whole. Where the Arroyo Seco Cone has unique characteristics, they are noted and detailed.

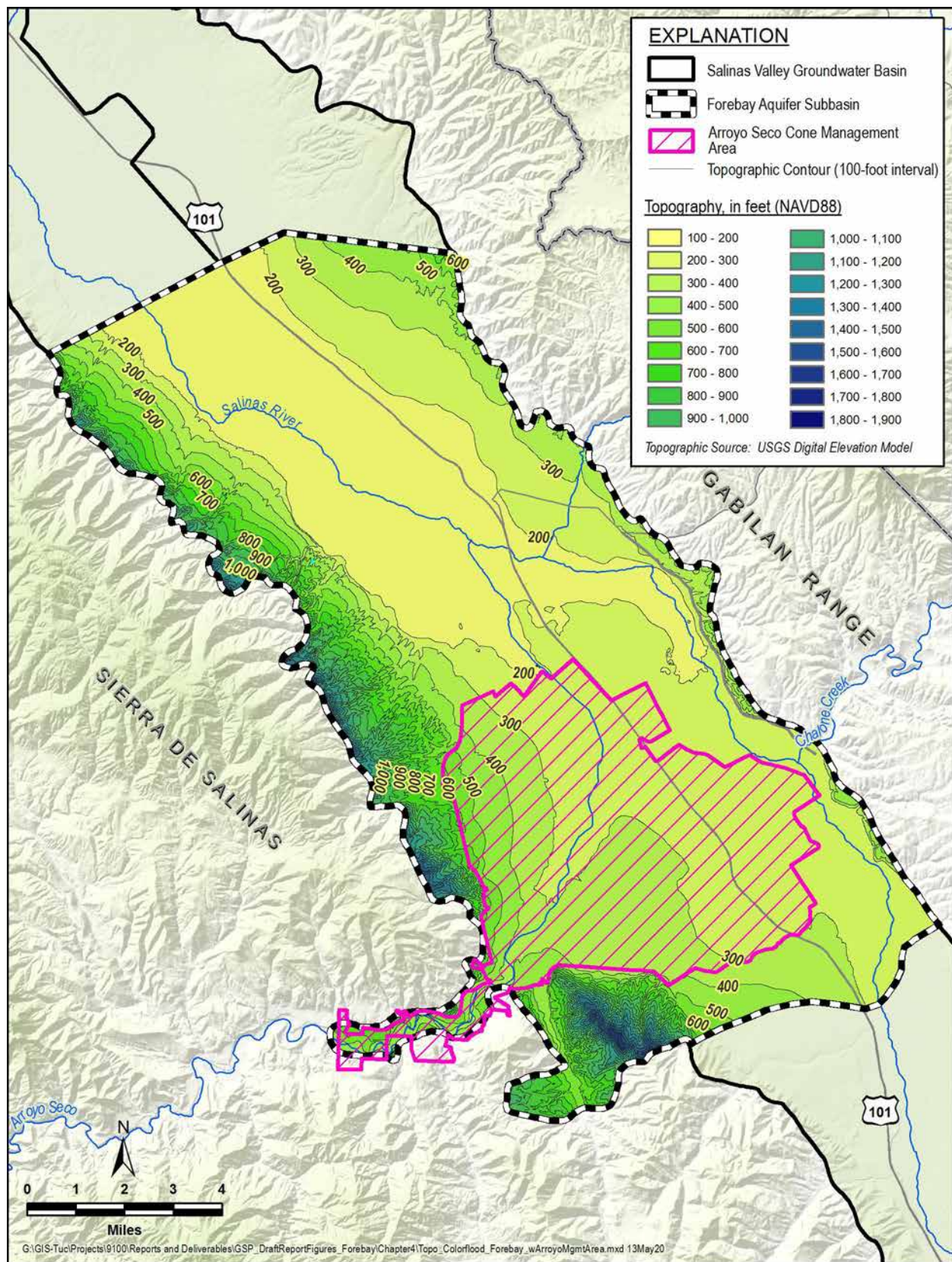


Figure 4-1. Forebay Aquifer Subbasin Topography

4.2 Subbasin Geology

The Subbasin geology describes the physical framework in which groundwater occurs and moves. The geology of the Subbasin controls the locations and depths of aquifers and aquitards, as well as the Subbasin boundaries. The geologic descriptions provided here are derived from previously published scientific reports, and from investigations conducted by the USGS, State of California, and academic institutions.

The Subbasin was formed through periods of structural deformation and periods of marine and terrestrial sedimentation in a tectonically active area on the eastern edge of the Pacific Plate. Figure 4-2 presents a geologic map of the Subbasin and vicinity. This geologic map was adopted from the 2001 Digital Geologic Map of Monterey County as well as the California Geologic Survey's 2010 statewide geologic map (Rosenberg, 2001; Jennings, *et al.*, 2010). The locations of cross sections used to define principal aquifers in Section 4.4 are also shown on Figure 4-2. The legend on Figure 4-2 presents the age sequence of the geologic materials from the youngest unconsolidated Quaternary sediments to the oldest pre-Cambrian basement rock.

The geology of the Forebay Subbasin is characterized by 2 intersecting geologic facies: the fluvial and marine dominated deposits of the main Salinas Valley; and the Arroyo Seco alluvial fan originating in the Sierra de Salinas on the west side of the Subbasin. In general, the alluvial sediments encountered in the Arroyo Seco Cone are more coarse-grained than those found in the main valley's fluvial and marine deposits. Because of these differences, and the Arroyo Seco Cone's separate source of recharge the 2006 Groundwater Management Plan identified the Arroyo Seco Cone as a separate subarea (MCWRA, 2006). Both the main Valley deposits and the Arroyo Seco Cone deposits are in contact with the basement rocks that form both the Sierra de Salinas and the Gabilan Range, which mark the western and eastern boundaries of the Subbasin, respectively.

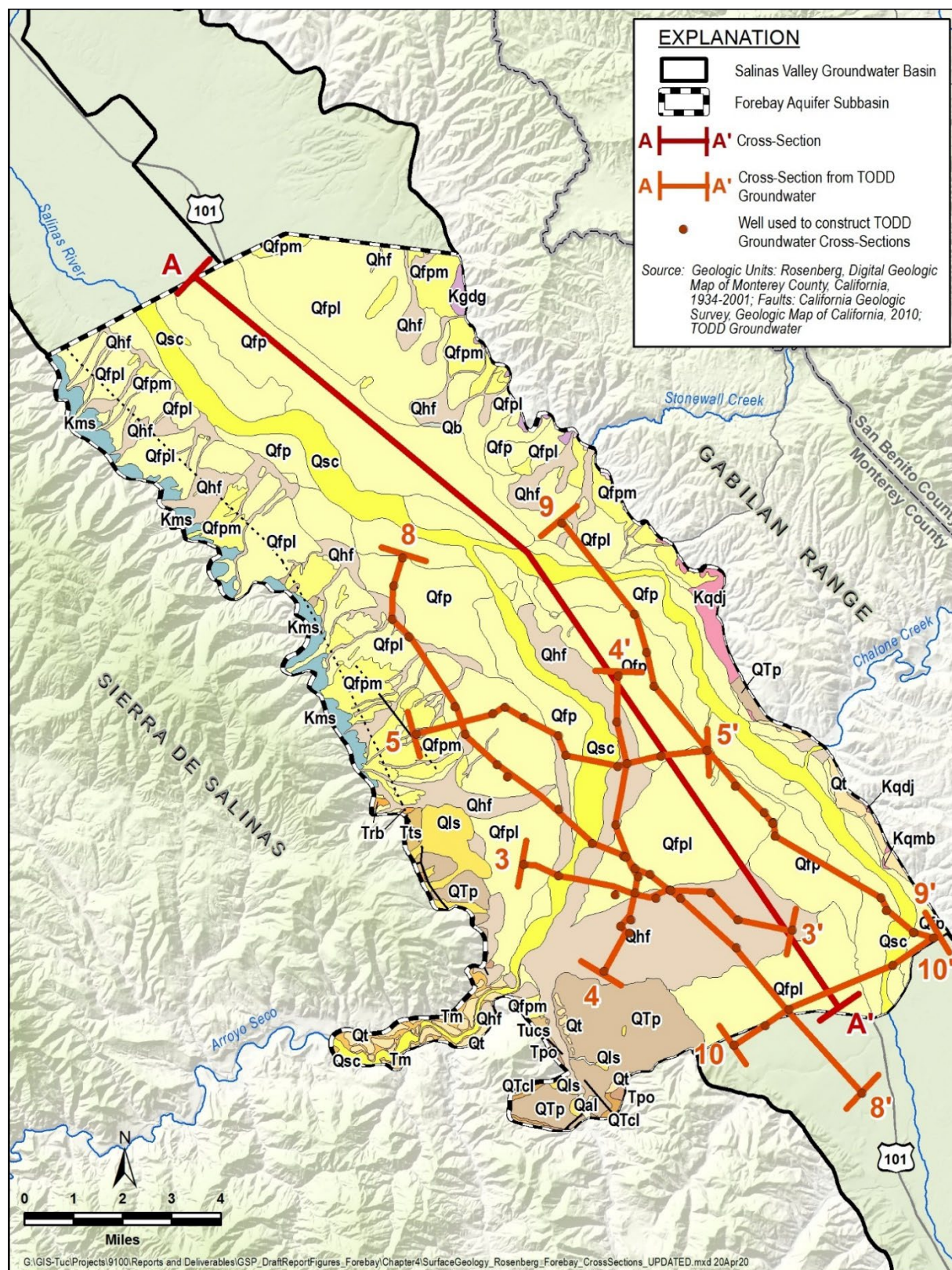


Figure 4-2. Subbasin Geology
(from Rosenberg, 2001; Jennings, *et al.*, 2010; and TODD Groundwater, personal communication, 2020)

FIGURE 4-2. EXPLANATION

QUATERNARY

Qal	Alluvial deposits, undifferentiated
Qb	Basin deposits
Qd	Dune deposits
Qfp	Flood-plain deposits, undifferentiated?
Qfpl	Alluvial fans, late Pleistocene
Qfpm	Alluvial fans, middle Pleistocene
Qhf	Alluvial fan deposits, Holocene
Qls	Landslide deposits
Qsc	Stream channel deposits
Qt	Fluvial terrace deposits, undifferentiated

QUATERNARY-TERTIARY

QTcl	Paso Robles Formation
QTp	Paso Robles Formation, undifferentiated

TERTIARY

Tm	Monterey Formation, siliceous
Tmc	Monterey Formation, clay shale
Tml	Monterey Formation, semi-siliceous
Tpo	Pancho Rico Formation, mudstone
Trb	Red beds
Tts	Marine sandstone
Tucs	Unnamed clastic sedimentary unit

CRETACEOUS

Kgdg	Granodiorite of Gloria Road
Kms	Schist of Sierra de Salinas
Kqdg	Gneissic quartz diorite of Stonewall Canyon
Kqdj	Quartz diorite-granodiorite of Johnson Canyon
Kqmb	Quartz monzonite of Bickmore Canyon

GEOLOGIC FEATURES

——	fault, certain
-----	fault, concealed

4.2.1 Geologic Formations

Major geologic units present in the Forebay Subbasin are described below, starting at the surface and moving through the geologic layers from youngest to oldest. Geologic descriptions are derived from the USGS's 2001 Monterey County Geologic Map as well as the California Geologic Survey's 2010 statewide geologic map (Jennings, *et al.*, 2010). The corresponding designation on Figure 4-2 is provided in parentheses.

Quaternary Deposits

- *Flood Plains and Stream Channel Deposits* (Qfp and Qsc) – These deposits consist of unconsolidated, relatively fine grained, mixed deposits of sand and silt. There are thin, discontinuous layers of clay present. The gravel content is variable and is locally abundant within channel and lower point bar deposits. The thicknesses of the youngest deposits are generally less than 20 ft. These deposits are typically incised within older flood-plain deposits proximal to the stream channel.
- *Alluvial Fans* (includes Qfpl, Qfpm, Qhf) – Alluvial fans are sediments deposited in a distributary manner at the base of mountain fronts where streams emerge (Kennedy/Jenks, 2004). They consist of weakly to moderately consolidated, moderately to poorly sorted sand, silt, and gravel deposits. Gravel content increases toward the head of the alluvial fans, particularly the Arroyo Seco Cone which is the most prominent alluvial fan in this subbasin. Finer sediments such as clay and silt increase towards the furthest extents of the Cone, interfingering with the silts and clays often found in flood-plain and stream-channel deposits.
- *Landslides and Terraces* (Qls and Qt) – These features occur as debris flows and slope washouts along the boundaries with the Sierra de Salinas. Terraces occur as erosional remnants of former stream channels of the Arroyo Seco. These terrace deposits consist of weakly consolidated to semi-consolidated, moderately to poorly sorted, fine- to coarse-grained silty sand with gravels and cobbles. Their thickness is highly variable.

These quaternary deposits are sometimes grouped together in other reports as Alluvium or Valley Fill Deposits. The thickness of the alluvium in the Forebay Subbasin is greatest near the mouth of Arroyo Seco, where depth to the bottom of the basin is approximately 6,000 feet (Taylor, *et al.*, 2017).

Quaternary-Tertiary Deposits

- *Paso Robles Formation* (QTcl and QTp) – This Pliocene to lower Pleistocene (1.6 million to 5 million years ago) unit is composed of lenticular beds of sand, gravel, silt, and clay from terrestrial deposition (Thorup, 1976, Durbin *et. al.*, 1978). The depositional environment is largely fluvial but also includes alluvial fan, lake, and

floodplain deposition (Durbin, 1974; Harding ESE, 2001; Thorup, 1976; Greene, 1970). The alternating beds of fine and coarse materials typically have bed thicknesses of 20 to 60 feet (Durbin *et. al.*, 1978). The Paso Robles Formation is exposed on the southernmost portion of the subbasin where Reliz Creek meets the Arroyo Seco Cone.

Tertiary Deposits

- *Pancho Rico Formation* (TPo) – This Pliocene (1.6 million to 5 million years ago) unit consists of sandy marine strata and interbedded finer grained rocks (Durham and Addicott, 1965). This unit conformably underlies the Paso Robles formation and conformably overlies the Monterey Shale, or non-conformably overlies the basement rocks northeast of King City (Durham and Addicott, 1965). This unit crops out near the Arroyo Seco tributary, along Reliz Canyon, and ranges from approximately 20 feet to more than 1,000 feet in thickness (Durham and Addicott, 1965).
- *Monterey Formation* (Tm, Tmc, Tml) – These Miocene (5 million to 24 million years ago) units consists of shale and mudstone, with lower deposits being slightly more sandy deposited in a shallow marine environment (Harding ESE, 2001; Greene, 1977). This units typically underlies the Salinas Valley Groundwater Basin.

Cretaceous Rocks

The Gabilan Range, which borders the Subbasin to the northeast, is composed of Mesozoic intrusive rocks and is important as a geologic boundary in the Subbasin and greater Salinas Valley Groundwater Basin. The Sierra de Salinas, which borders the Subbasin to the southwest, is composed of metamorphic and sedimentary rocks and is important as a geologic boundary in the Subbasin and greater Salinas Valley Groundwater Basin as well.

4.2.2 Structural Restrictions to Flow

There are no known structural features, such as geologic folds or faults that restrict groundwater flow inside the Forebay Subbasin. However, lack of stratigraphic continuity associated with contrasting geologic depositional environments may restrict groundwater flow in some areas. The transition from the Arroyo Seco alluvial fan facies to the layered fluvial deposits may be observed as a slight depositional change and may restrict or redirect groundwater flow between the subareas. The Reliz fault is mapped on the west side of the Forebay Subbasin, with normal movement on the Salinas Valley side (Taylor, *et al.*, 2017). There is no evidence this fault restricts groundwater flow.

4.2.3 Soils

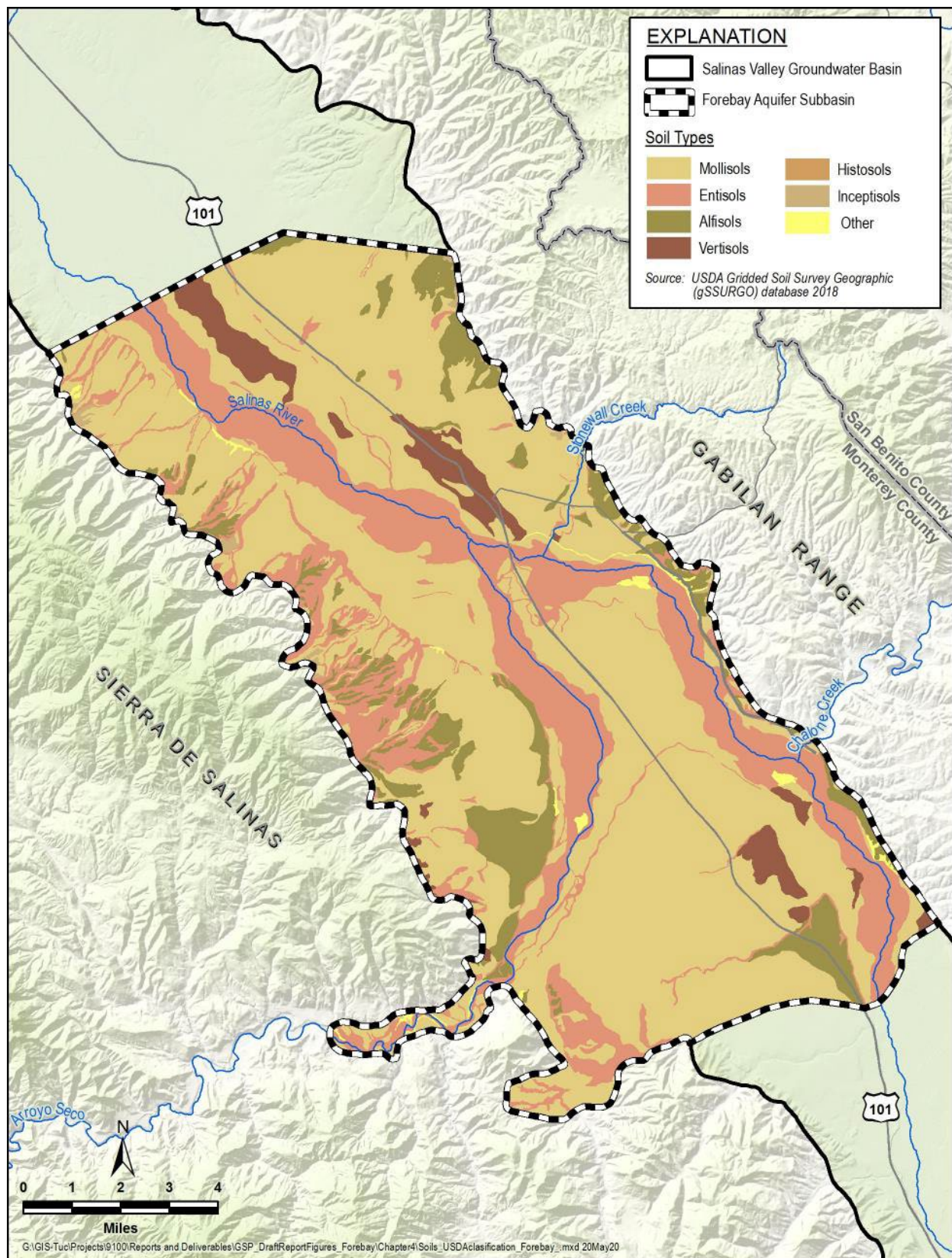
The soils of the Subbasin are derived from the underlying geologic formations and influenced by the historical and current patterns of climate and hydrology. Soil types can influence

groundwater recharge and the placement of recharge projects. Productive agriculture in the Subbasin is supported by deep, dark, fertile soils. The arable soils of the Subbasin historically are classified into 4 groups (Carpenter and Cosby, 1925): residual soils, old valley-filling soils, young valley-filling soils, and recent-alluvial soils.

More recent surveys classify the soils into categories based on detailed soil taxonomy (U.S. Department of Agriculture, 2018). Figure 4-3 is a composite soil map of soils in the Subbasin from the USDA Natural Resources Conservation Service (NRCS) and the Gridded Soil Survey Geographic (gSSURGO) Database that is produced by the National Cooperative Soil Survey (NCSS).

The Subbasin is dominated by 4 soil orders: mollisols, entisols, alfisols, and vertisols. Minor soils include histosols and inceptisols. The 4 major soil orders are described below.

- **Mollisols** are the most widespread soil order in the Forebay Subbasin. Mollisols are characterized by a dark surface horizon, indicative of high organic content. The organic content often originates from roots of surficial grasses or similar vegetation. They are highly fertile and often alkaline rich (calcium and magnesium). Mollisols can have any moisture regime, but typically have enough available moisture to support perennial grasses.
- **Entisols** are the predominant soil order along the river corridor. Entisols are mineral soils without distinct soil horizons because they have not been in place long enough for distinct horizons to develop. These soils are often found in areas of recent deposition such as active flood plains, river basins, and areas prone to landslides. Nearly all the soils along active river and stream corridors are entisols.
- **Alfisols** are present along portions of the Subbasin. Alfisols are known to have natural fertility both from the tapering of clay in the subsurface horizons and from leaf litter when under forested conditions. This order of soils is commonly associated with high base minerals such as calcium, magnesium, sodium, and potassium.
- **Vertisols** are present over some areas on the Subbasin lowlands in the northern portion of the Subbasin. Vertisols are predominantly clayey soils with high shrink-swell potential. Vertisols are present in climates that have distinct wet and dry seasons. During the dry season, these soils commonly have deep, wide cracks. During the wet season, these soils trend to have water pooling on the surface due to the high clay content.



4.3 Subbasin Extent

The Subbasin extents describe both the lateral and vertical extents of the Subbasin. The Subbasin extents are defined by the DWR and are documented in Bulletin 118, (DWR, 2003; DWR, 2016a). Figure 3-1 illustrates the extent of the Subbasin.

4.3.1 Lateral Subbasin Boundaries

The Forebay Subbasin is laterally bounded by a combination of Subbasin boundaries and physical boundaries of the Salinas Valley Groundwater Basin, all shown on Figure 1-1.

4.3.1.1 Boundaries with Adjacent Subbasins

The Forebay Subbasin is bounded by the following subbasins:

- **The Upper Valley Subbasin.** The sediments that confine the 400-Foot Aquifer in the 180/400-Foot Aquifer Subbasin extend intermittently into the Forebay Subbasin, and the southeastern extent of these sediments is the boundary with the adjacent Upper Valley Subbasin (DWR, 2004b). At this boundary there is also a constriction of the Valley floor caused by encroachment from the west by the Arroyo Seco Cone and Monroe Creek (DWR, 2004b). Additionally, this boundary marks the shallowing of the base of the groundwater basin. There are no reported hydraulic barriers separating these subbasins.
- **The 180/400-Foot and Eastside Subbasins.** The northwestern boundary with the adjacent 180/400-Foot and Eastside Subbasins generally coincides with the southeastern limit of confining conditions in the 180/400-Foot Aquifer Subbasin, which is extrapolated to the Gabilan Range to define the boundary with the Eastside Subbasin (DWR, 2004c). Many of the sediments which define the aquifer of the 180/400-Foot Aquifer Subbasin are generally found in the Forebay Subbasin, but the Salinas Valley Aquitard is not found in the Subbasin. There is no reported hydraulic barrier between the Forebay and the 180/400-Foot Aquifer Subbasins; however, the sediments are more stratified in the 180/400-Foot Aquifer Subbasin than in the Forebay Subbasin.

4.3.1.2 Physical Basin Boundaries

The Forebay Subbasin is bounded by the following physical features:

- **The Gabilan Range.** The eastern boundary of the Subbasin is the contact between the unconsolidated alluvial fan deposits and the Gabilan Range, which is comprised mostly of granitic rocks. Groundwater flow across this boundary has not been studied extensively, and many reports indicate there is groundwater recharge for this Subbasin through the stream channels originating in the Gabilan Range. There are no published

mapped faults or significant fracture sets that could contribute to mountain block recharge for the Subbasin.

- **The Sierra de Salinas.** The western boundary of the Forebay Subbasin is the contact with the metamorphic and sedimentary rocks of the Sierra de Salinas. Groundwater flow across this boundary has not been studied extensively. There are no published mapped faults or significant fracture sets that could contribute to mountain block recharge for the Subbasin.

4.3.2 Vertical Subbasin Boundaries

The base, or bottom, of the Subbasin does not contain a sharp interface between permeable sediments and lower-permeability basement rock across the entire Subbasin. While a sharp interface between alluvium and the underlying granitic rocks exists near the Gabilan Range and Sierra de Salinas, the usable portion of the Subbasin does not always include the full thickness of sedimentary sequences. Previous investigations have estimated that the entire sedimentary sequence in the Salinas Valley Groundwater Basin might range between 10,000 and 15,000 feet thick (Brown and Caldwell, 2015). However, the productive freshwater principal aquifer in this Subbasin are at shallower depths.

With increasing depth, 3 factors limit the viability of the sediments as a productive, principal aquifers:

1. Increased consolidation and cementation of the sediments decrease well yields.
2. Deeper strata contain poor-quality brackish water unsuitable for most uses.
3. Discontinuous alluvial fan deposits interfingering with clay lenses impede vertical and horizontal groundwater flow.

Because these factors gradually change with depth, there is not a sharp, well-defined bottom of aquifers throughout the Salinas Valley Groundwater Basin. This GSP adopts the bottom of the aquifer that was defined by the USGS (Durbin, *et al.*, 1978) and extrapolates that surface to the Subbasin's boundary. Figure 4-4 shows a map of elevation contours of the bottom of the Subbasin. Figure 4-5 shows a contour map of depth to bottom of the Subbasin prepared using the extrapolated bottom elevation and ground surface elevation.

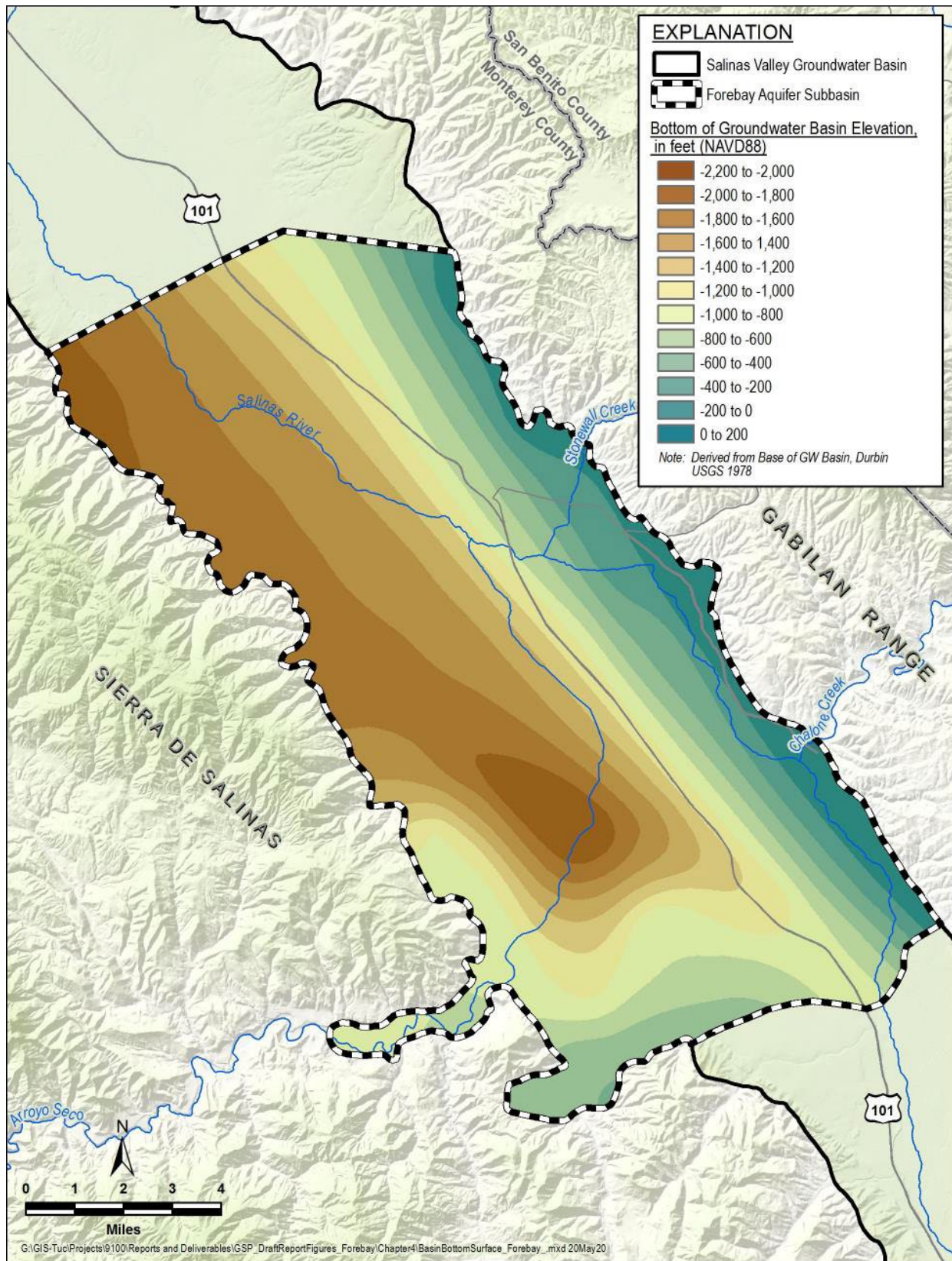


Figure 4-4. Elevation of the Bottom of the Forebay Aquifer Subbasin

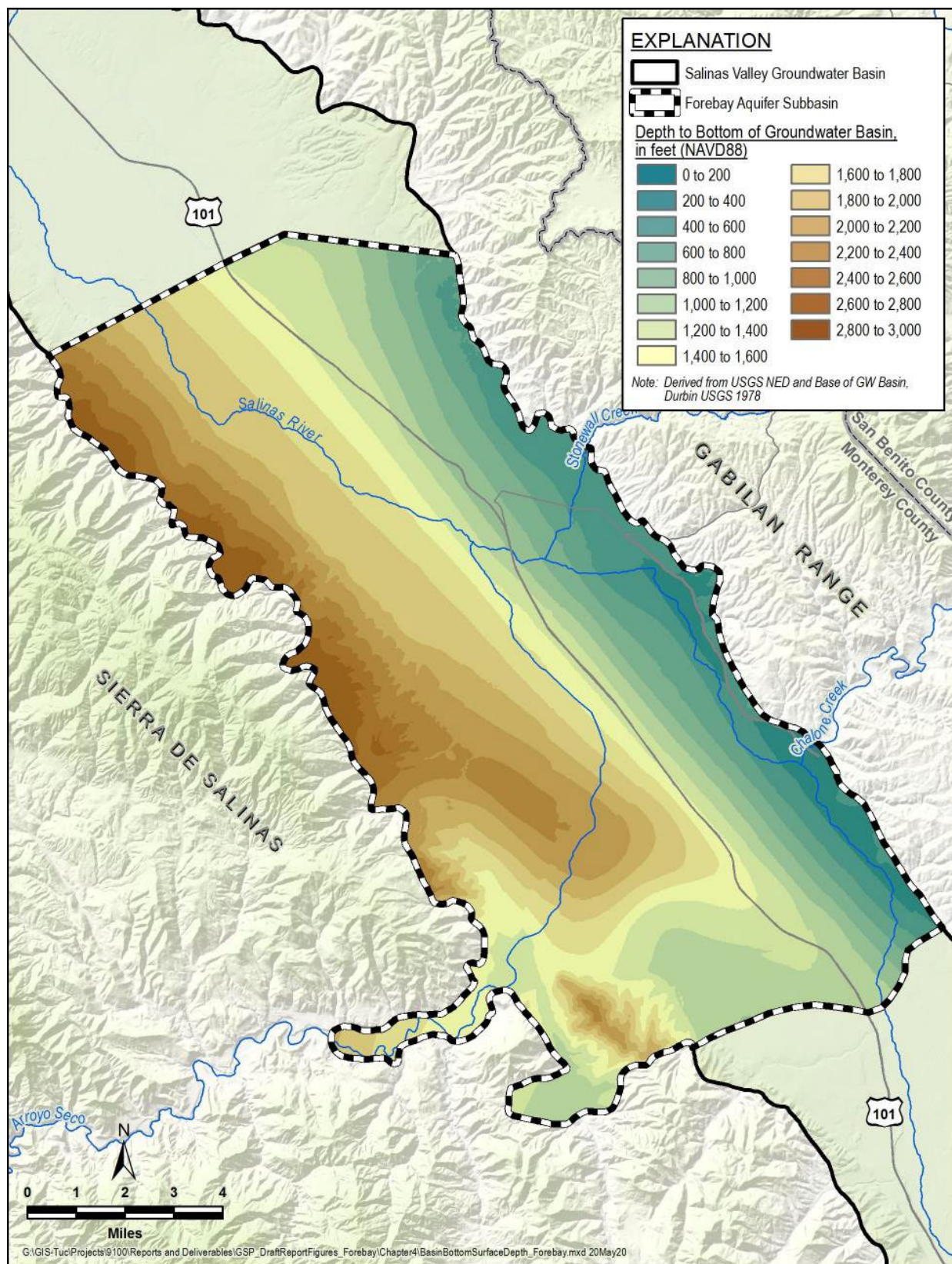


Figure 4-5. Depth to Bottom of the Forebay Aquifer Subbasin

4.4 Subbasin Hydrogeology

The Subbasin hydrogeology details the principal aquifers and aquitards that occur in the Subbasin, inventories known aquifer properties, and identifies naturally occurring groundwater inputs and outputs, which will be incorporated into the groundwater budgets described in Chapter 6. This section also includes cross sections that give graphical representations of what is described in the following subsections.

4.4.1 Principal Aquifers and Aquitards

The Forebay Subbasin has 1 principal aquifer, the Basin Fill Aquifer, which varies spatially with source material for the matrix. The most recent detailed hydrostratigraphic analysis of the Forebay Subbasin was published in 2015 (Brown and Caldwell, 2015). Three other reports offer detailed geologic analysis of the Arroyo Seco Cone, which has unique geologic and hydrogeologic characteristics:

1. *Quaternary Geologic Map of the North-Central Part of the Salinas River Valley and Arroyo Seco, Monterey County, California*, developed by Emily M. Taylor and Donald S. Sweetkind for the USGS illustrates the strath, or abandoned stream deposits, terraces of the Arroyo Seco stream, and their relative ages (Taylor and Sweetkind, 2014).
2. *Hydrogeologic Investigation, Arroyo Seco Cone* explored the feasibility of enhancing water storage in the Arroyo Seco Cone with a water spreading facility. This report explored the hydrogeology of the Arroyo Seco Cone and calculated aquifer properties (Staal, Gardner, and Dunne Inc., 1994).
3. *Selected Geological Cross Sections in the Salinas Valley Using GEOBASE*, developed detailed cross sections from driller's reports throughout the Salinas Valley, with 3 cross sections traversing the Arroyo Seco (Hall, 1992).

The principal aquifer of the Forebay Subbasin has minor lithological differences based on slightly varying depositional environments and ages. Additionally, the sediments in the principal aquifer is similar, if not the same as, the sediments in the principal aquifers of the neighboring 180/400-Foot Aquifer Subbasin. However, the near-surface confining unit, the Salinas Valley Aquitard, does not extend into the Forebay Subbasin (DWR, 2004a).

4.4.1.1 Basin Fill Aquifer

The Basin Fill Aquifer is the principal aquifer, and comprises sandy water-bearing layers that roughly correlate to, and are hydraulically connected to, the 180-Foot, the 400-Foot, and the Deep Aquifers as defined in the neighboring 180/400-Foot Aquifer Subbasin (Kennedy/Jenks, 2004). These sediments are deposited in thin beds, are laterally discontinuous, and may be locally perched due to the interbedded stratigraphy of the Arroyo Seco Cone and smaller alluvial

fans where they occur in the Subbasin. These sediments include intermittent clay layers which may act as locally confining units. These sediments also increase in confinement with depth throughout the Subbasin.

The Basin Fill Aquifer includes the sediments that have built the Arroyo Seco Cone over time. The Arroyo Seco Cone covers approximately 22,000 acres on the west side of the Subbasin, near Greenfield (MCWRA, 2006). The interpreted extent of the Arroyo Seco Cone suggests that the Arroyo Seco Cone sediments are connected to sediments that cross almost the entire width of the Salinas Valley in the Forebay Subbasin. The primary water-bearing sediments of the Arroyo Seco Cone consists of coarse alluvial fill with a significant presence of boulders and coarse gravels to depths of 500 to 700 feet. This alluvial fill is relatively uniform and highly permeable with layers of coarse sand and reddish yellow clay (MCWRA, 2006). These sediments are primarily derived from native rock in the Santa Lucia Range, transported by the Arroyo Seco and deposited in the Salinas Valley.

The Basin Fill Aquifer is currently understood to be a single hydrogeologic unit that increases in thickness from approximately 200 feet near the eastern edge of the valley to greater than 2,000 feet along the western edge from Greenfield northward (Figure 4-5). The deepest sediments of the Basin Fill Aquifer in the Forebay Subbasin are the same as, and potentially hydraulically connected to, the sediments that comprise the Deep Aquifers in the 180/400-Foot Aquifer Subbasin. These Deep Aquifers sediments may be up to 900 feet thick and have alternating sandy-gravel layers and clay layers, which do not differentiate into distinct aquifer and aquitard units (DWR, 2003). Some previous investigators have hypothesized that the Deep Aquifers present within the 180/400-Foot Aquifer Subbasin extend into the Forebay Subbasin (Greene, 1970; Hanson et al, 2002; Brown and Caldwell, 2015; DWR, 2004a) however, not all available studies have reached the same conclusion (Staal, Gardner, & Dunne Inc., 1994). This deeper portion of the Basin Fill Aquifer has not been investigated or developed in a substantial way, and may not exist beneath the entirety of the Forebay Subbasin. This is a data gap that will be filled within the first two years of implementation. Subsequently, this GSP does not make a conclusion from these previous investigations and the Deep Aquifers are not currently defined as a delineated, separate principal aquifer for this Subbasin.

Understanding the complete depth and extent of the Basin Fill Aquifer, as well as the presence of the sediments which comprise the deeper sediments, is a data gap that will be addressed during implementation. Some of these data gaps potentially may be addressed by a Deep Aquifers Study led by SVBGSA. The results of both implementation as this potential study will refine this HCM further.

4.4.1.2 Cross Sections

Four cross sections showing the general nature of the Forebay Aquifers are shown on Figure 4-6 through Figure 4-7. The locations of these cross sections are shown on Figure 4-2.

Cross section A-A' was developed and published in the *State of the Basin* report, and is part of a cross section that extends down the entire Salinas Valley (Brown and Caldwell, 2015). On this cross section, finer sediments are grouped with hatch lines; coarser sediments have no hatching. Individual aquifers are not explicitly identified on this cross section. This cross section is based on geologic logs provided in DWR Water Well Drillers Reports. In some cases, the logs may be old, the depth resolution poor, or the lithologic distinction suspect, and therefore the lithology shown on the well logs should not be viewed as precise. The generalized relationships of finer or coarser sediments between boreholes shown on the cross sections should be interpreted with caution.

Cross sections 3-3' through 10-10' were developed by TODD Groundwater for the ASGSA, and are included here as part of the technical coordination between the SVBGSA and ASGSA. These cross-sections show generalized groupings of deposited sediments based on textural qualities such as sand, gravel, clay, and a mix of these 3 textures. The textures shown are do not signify exclusive deposits of these sediments, rather an abundance of said texture encountered during drilling.

Cross section 5-5' begins in an alluvial fan close to the Arroyo Seco Cone, and traverses eastward across the Arroyo Seco Cone. This section shows thick deposits of gravels, along with a few distinct and thick clayey layers. The gravels occur primarily from ground surface to a depth of 400 feet below surface, with another layer occurring below a large clay deposit of clayey materials.

Cross section 3-3' begins in, and traverses, the Arroyo Seco Cone from the northwest to the southeast. The section shows an abundance of gravelly materials in the northwest, to an abundance of clayey materials in the southeast. The gravelly materials coincide with the Arroyo Seco River and Reliz Creek, whereas the clayey materials coincide with the further extents of the Arroyo Seco Cone. There is a mix of sand, gravel, and clay between these 2 dominant sediment deposits shown in light green.

Cross section 4-4' begins in the upper reaches of the Arroyo Seco Cone and traverses north. This section shows an abundance of gravels interspersed with mixed sediments. Gravels occur in the majority of this section, and the section generally follows the topography of the Arroyo Seco Cone down towards the Salinas River.

Cross section 8-8' begins outside the end of the Arroyo Seco Cone and traverses southeast through the Arroyo Seco Cone until it ends outside both the Cone and the Subbasin. This section shows an abundance of sandy gravelly material in the northwest, and an abundance of clayey materials in the southeast. The primary break in these sediment groupings occurs around where the Arroyo Seco River is. There are interspersed lenses of clayey and gravelly material in the northwest sandy region, and there are interspersed lenses of sandy and gravelly material in the southeast clayey region. The Salinas River is noted at each end of this cross section.

Cross section 9-9' begins outside the end of the Arroyo Seco Cone and traverses southeast close to the Salinas River. This section is characterized by sandy and gravelly materials closer to land surface, and clayey materials at depth. There is a small portion of this section which shows decomposed granite below the surface where the section gets close to the Gabilan Range.

Cross section 10-10' generally occurs along the boundary between the Forebay and the Upper Valley Subbasins. This section shows the sandy and clayey layers of alluvial material deposited towards the Salinas River, and the proximity to the Gabilan Range as evidenced by the presence of decomposed granite.

The cross sections show the depositional environments that drive certain groupings of sediments. There is an abundance of coarser material higher up section in the Arroyo Seco Cone, and an abundance of finer material proximal to the Salinas River. These cross sections also show generally interbedded lenses of sediments deposited in competing alluvial, fluvial, and marine environments with respect to climatic influences. The facies changes are difficult to discern since many of the materials are similar in texture, and the deposits are reflective of environments in flux. The lack of extensive and traceable aquifers or aquitards have resulted in assigning all the alluvial material in the Forebay Subbasin to a single aquifer.

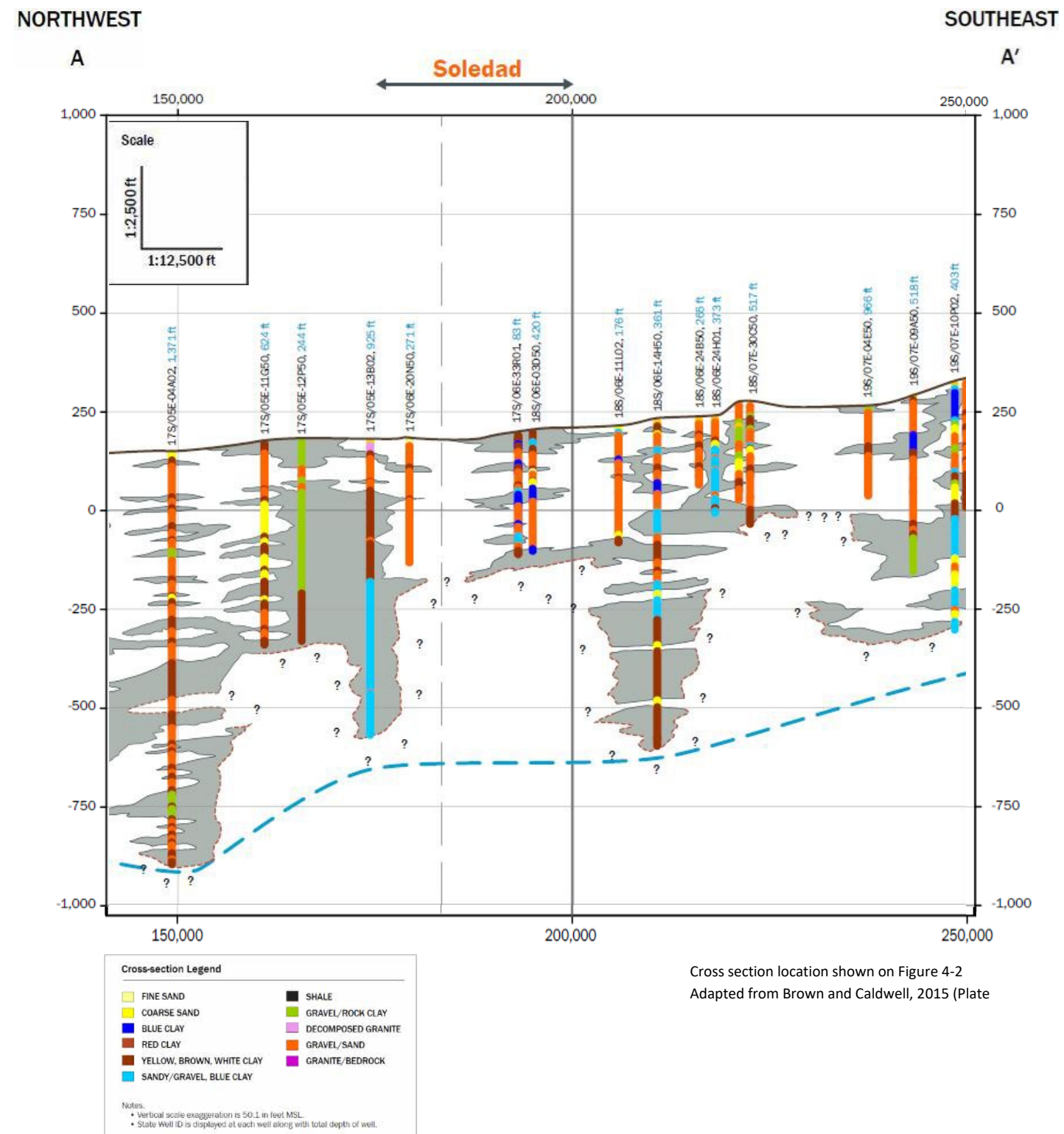


Figure 4-6. Cross Section A-A'
(modified from Brown and Caldwell, 2015)

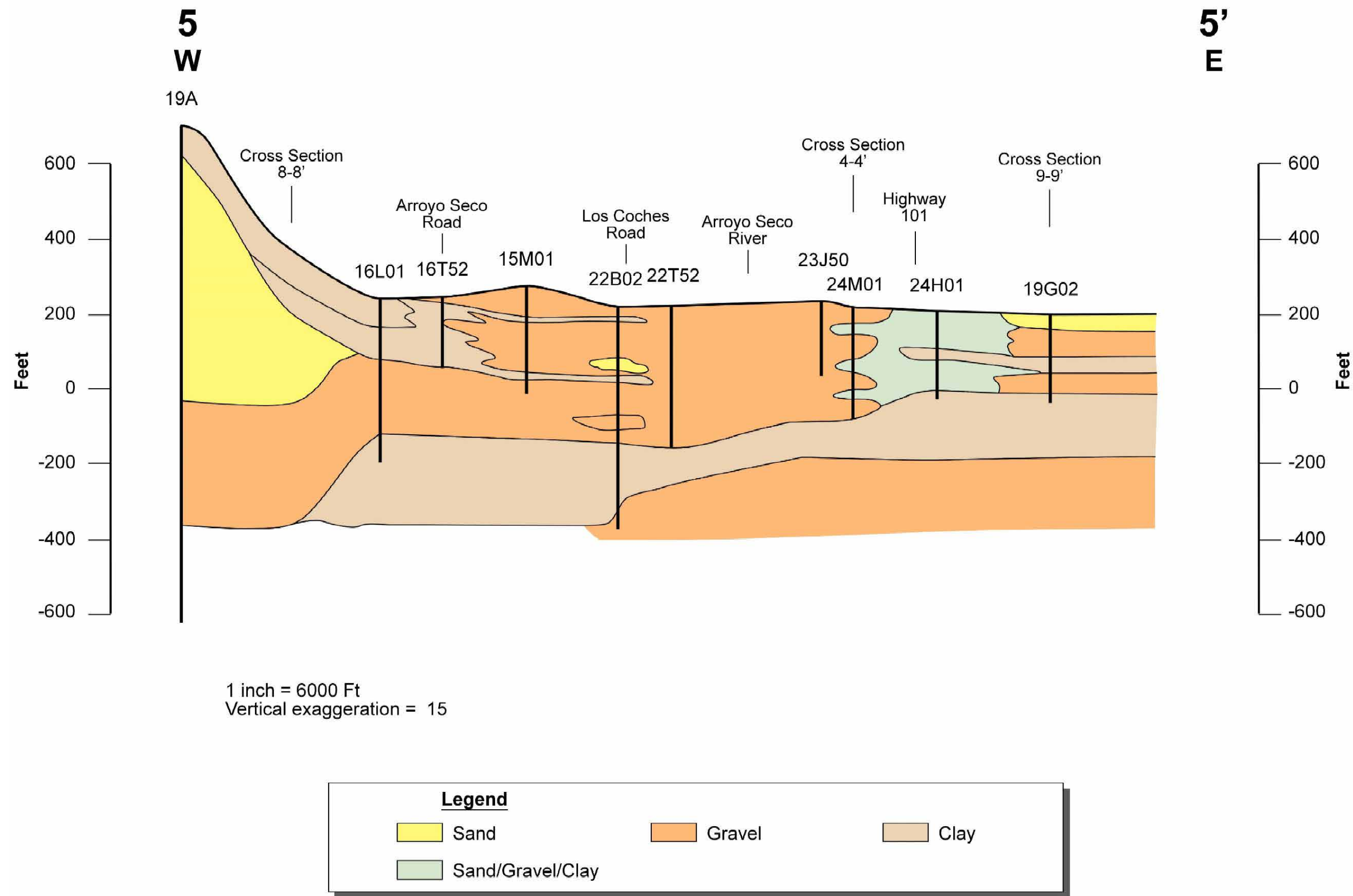
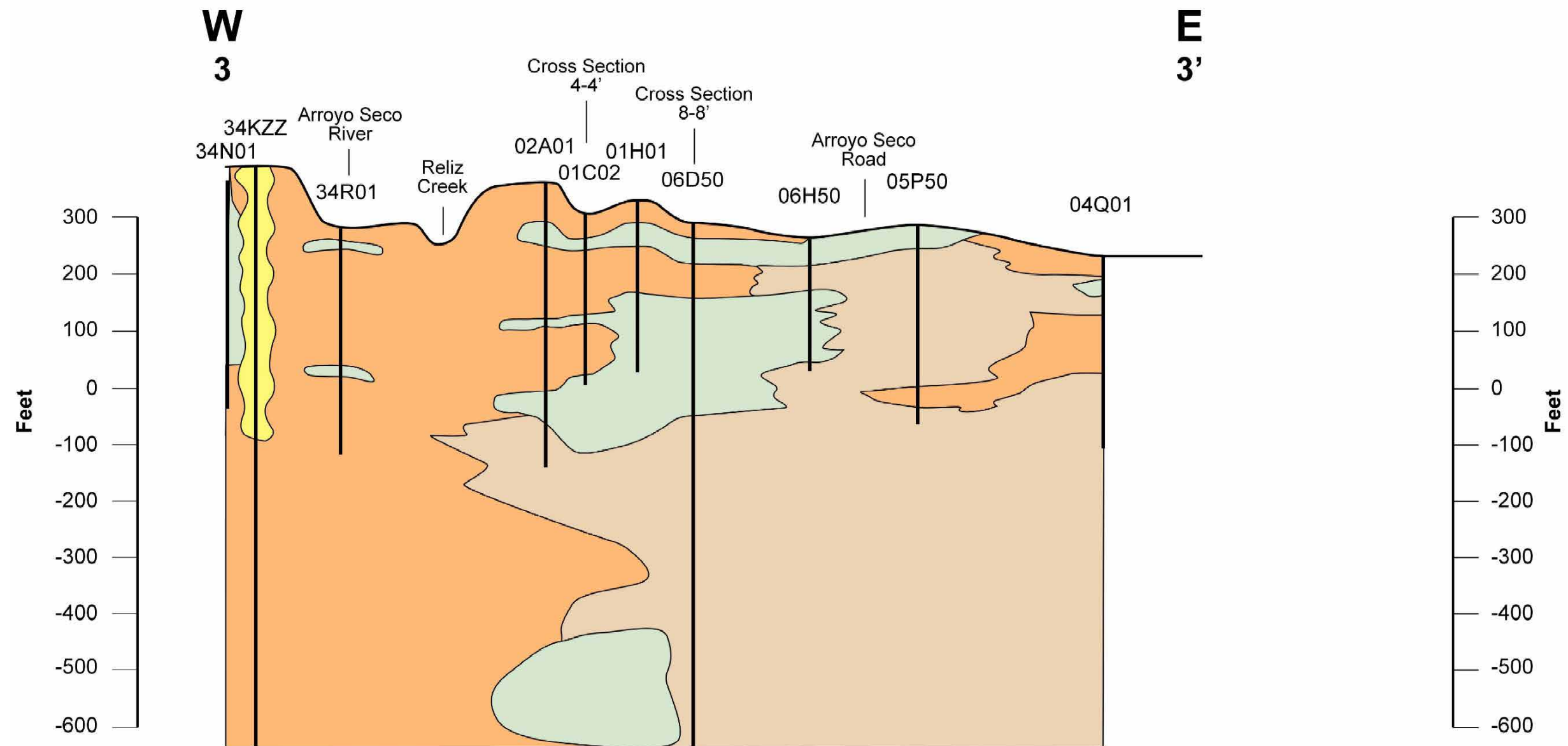


Figure 4-7. Cross Section 5-5'



1 inch = 6000 Ft
Vertical exaggeration = 20

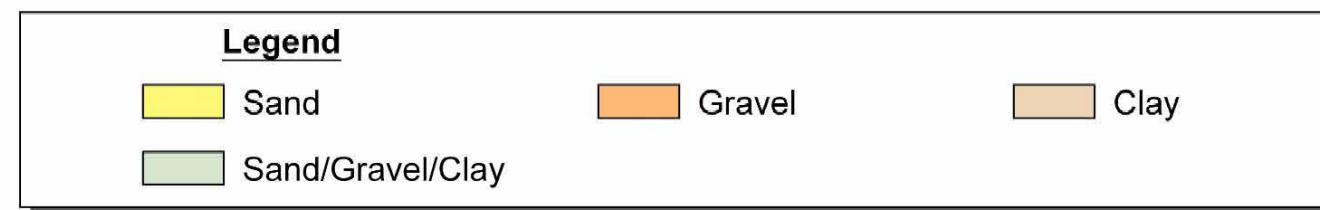


Figure 4-8. Cross Section 3-3'

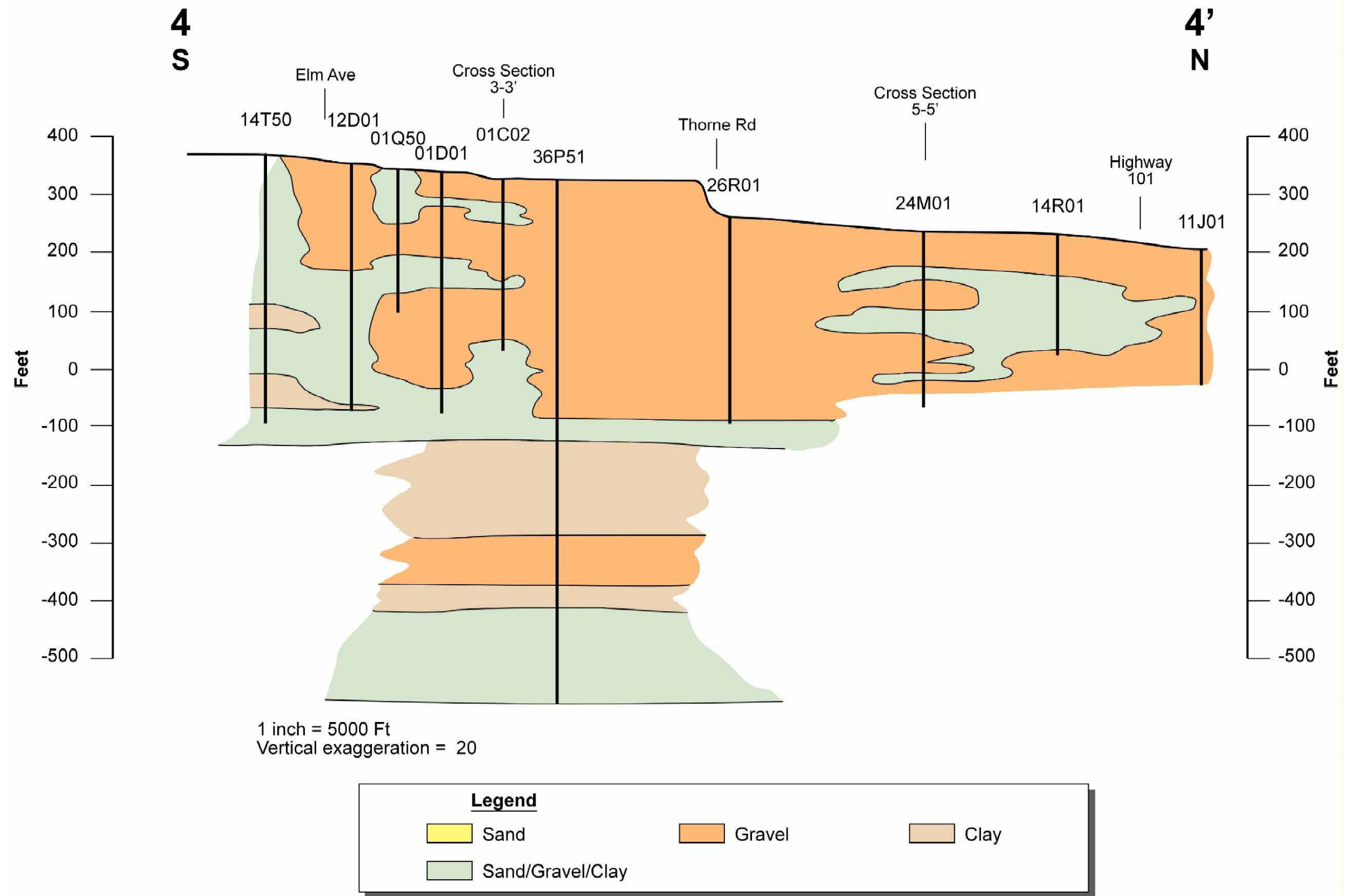


Figure 4-9. Cross Section 4-4'

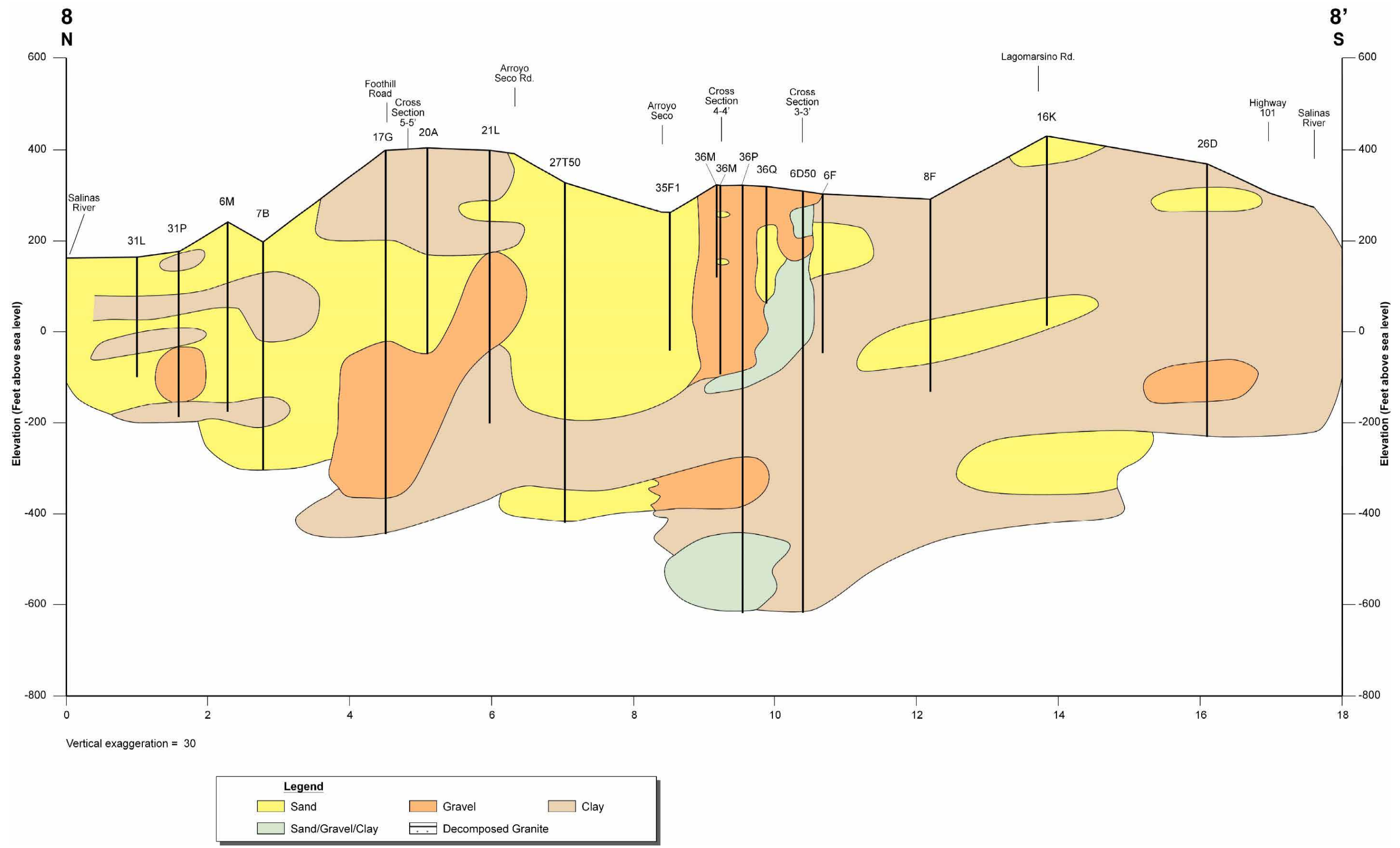


Figure 4-10. Cross Section 8-8'

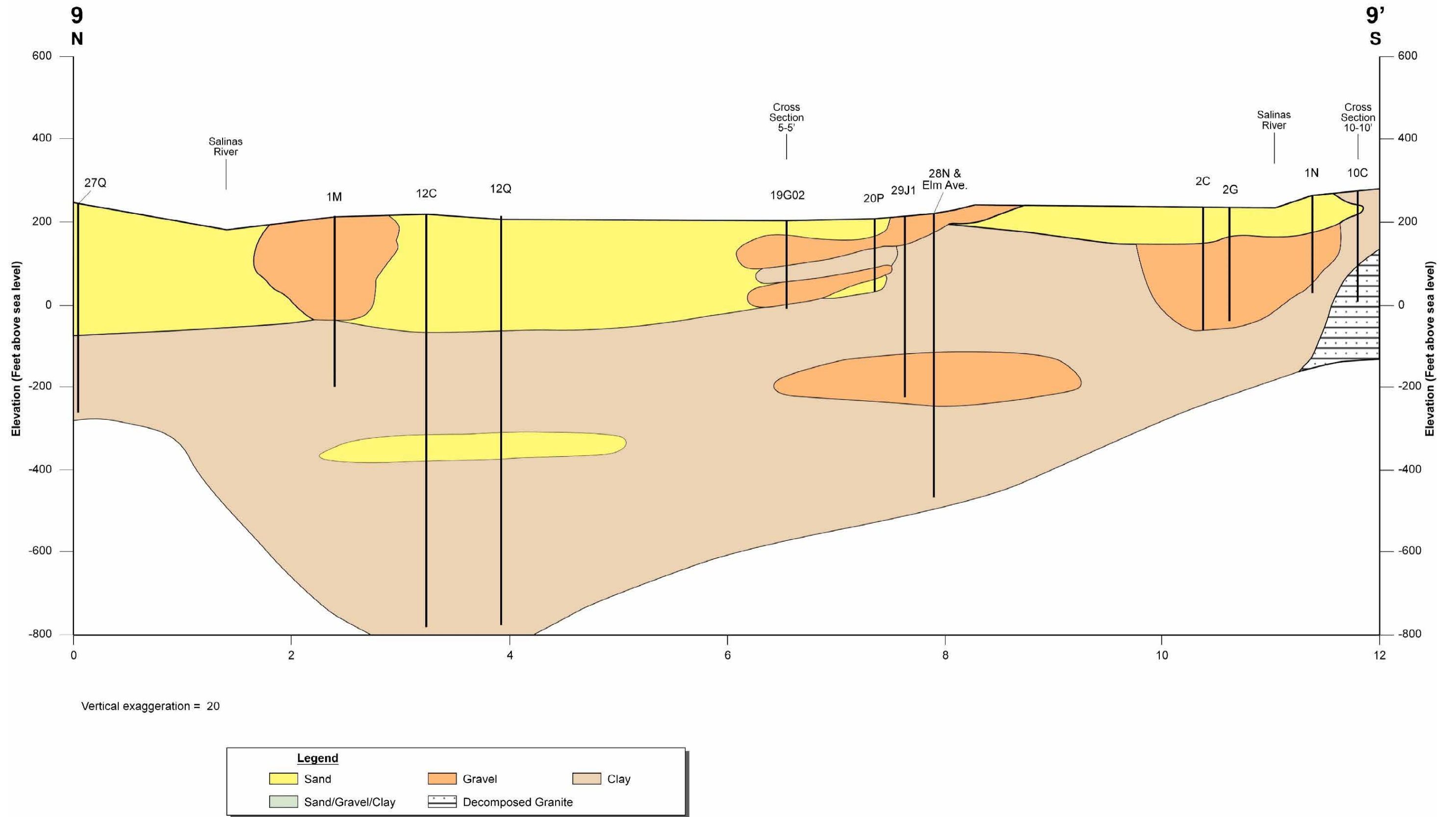


Figure 4-11. Cross Section 9-9'

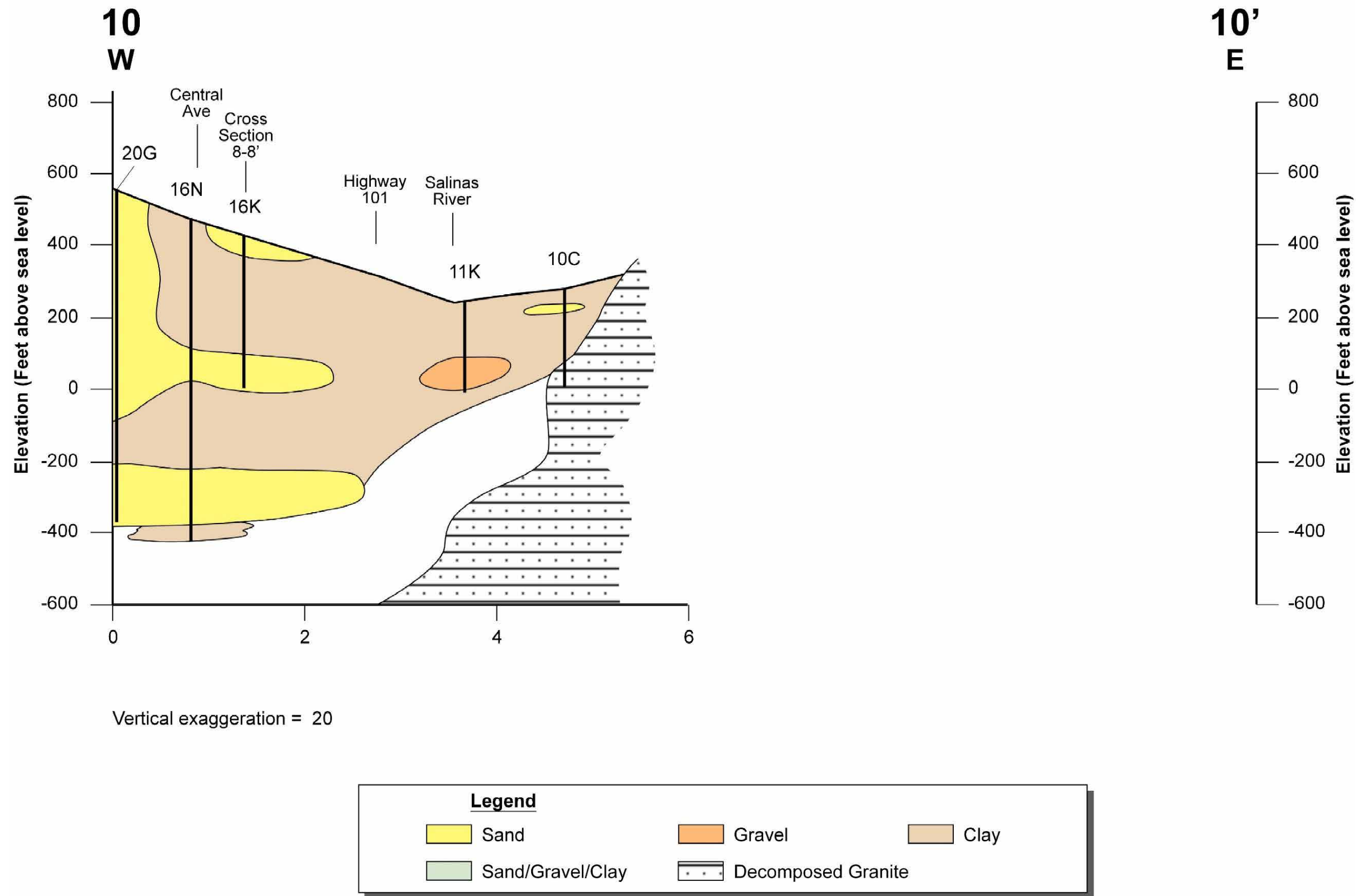


Figure 4-12. Cross Section 10-10'

4.4.2 Aquifer Properties

Aquifer properties define how groundwater is stored and how groundwater moves in the subsurface. This information is needed to understand current groundwater conditions, to predict future groundwater conditions, and to assess strategies for maintaining sustainability.

The values and distribution of aquifer properties in the Forebay Subbasin have not been well characterized and documented. The relatively sparse amount of measured aquifer properties throughout the Subbasin, particularly the differences between the Arroyo Seco Cone and the rest of the Subbasin, is considered a data gap that will be addressed during implementation of the GSP.

Aquifer properties have been estimated during calibration of regional numerical groundwater flow models for the Salinas Valley Groundwater Basin. Aquifer property calibration has been completed for numerous published modeling studies including studies by Durbin (1974); Yates (1988); WRIME (2003); and the Salinas Valley Integrated Hydrologic Model (SVIHM) that is used to develop this GSP.

There are 2 general types of aquifer properties relevant to groundwater management:

- **Aquifer storage properties:** these properties control the relationship between the volume of groundwater stored in the aquifer and the water elevation measured in the aquifer.
- **Groundwater transmission properties:** these properties control the relationship between hydraulic gradients and the rate of groundwater flow.

4.4.2.1 Aquifer Storage Properties

The aquifer properties that characterize the relation between groundwater elevation and amount of water stored in an aquifer are specific yield for unconfined aquifers and specific storage for confined aquifers. Storativity, or storage coefficient, is equal to specific storage multiplied by the aquifer saturated thickness for confined aquifers. Both specific yield and specific storage are measured in units of cubic feet of water per cubic feet of aquifer material. These ratios are often expressed as a percentage.

- **Specific yield**, or drainable porosity, is the amount of water that drains from pores when an unconfined aquifer is dewatered. Often, specific yield values range from 8% to 20%. Estimated specific yield values compiled by DWR for the adjacent 180/400-Foot Aquifer Subbasin range from 6% to 16% (DWR, 2004b). There are no estimated specific yield values published for the Forebay Aquifer. The Arroyo Seco Cone has an estimated specific yield, of 17% (Staal, Gardner, & Dunne, 1994).

- **Specific storage** values are in units of 1/L and often on the order of 5×10^{-4} to 1×10^{-5} for alluvial deposits. There are no estimated specific storage values published for the Forebay Aquifer as this aquifer is generally unconfined.

Detailed aquifer property values specific to the Subbasin were not available at the time of this GSP development. This is a data gap that will be filled during implementation.

4.4.2.2 Groundwater Transmission Properties

Hydraulic conductivity measures the ability of an aquifer to transmit water. Hydraulic conductivity is expressed in units of length per unit time, such as feet per day. Materials with higher hydraulic conductivities, such as sands and gravels, transmit groundwater more readily than units with lower hydraulic conductivities, such as clay. Transmissivity is equal to the hydraulic conductivity multiplied by the aquifer saturated thickness. Few estimates of either hydraulic conductivity or transmissivity exist for the Subbasin.

Transmissivities were estimated for the Arroyo Seco Cone in the Hydrogeologic Investigation, Arroyo Seco Cone by Staal, Gardner, and Dunne Inc. (1994). Transmissivities ranged from 76,000 gallons per day per foot (gpd/ft) to 572,300 gpd/ft. These are relatively high transmissivities, suggesting wells in the Arroyo Seco Cone will produce substantial amounts of water with limited drawdown. However, these estimates are based on application of an equation with estimated data, and not rigorous field tests and data.

Specific capacity of a well is sometimes used as a surrogate for estimating aquifer transmissivity. The specific capacity of a well is the ratio between the well pumping rate in gallons per minute (gpm), and the drawdown in the well during pumping measured in feet. Specific capacity is moderately well correlated, and approximately proportional to, aquifer transmissivity.

Although no published specific capacity data are available for the Subbasin, Durbin, *et al.* (1978) reported relatively high specific capacities of between 30 and 70 gpm/ft. for sediments in the adjoining 180/400-Foot Aquifer Subbasin. Because of the sediment continuity between subbasins, these estimated values are likely similar to values expected in the Forebay Subbasin.

4.4.3 Primary Aquifer Uses

The primary uses of groundwater from this single aquifer include domestic, irrigation, and municipal water supply uses (DWR, 2004a).

4.4.4 Natural Recharge Areas

Natural recharge areas allow rainfall, local runoff, and streamflow to replenish aquifers by percolating through the subsurface. Identifying areas of potentially significant natural recharge can inform water budgets and help planners promote good groundwater management by

incorporating recharge areas into land use plans. This section only identifies areas of natural recharge; quantitative information about all natural and anthropogenic recharge is provided in Chapter 6. There is no known anthropogenic recharge in this Subbasin.

Natural groundwater recharge occurs through the following processes:

- Recharge of surface water from the streams originating in the Gabilan Range and the Sierra de Salinas
- Recharge of surface water from the Salinas River and Arroyo Seco River
- Deep percolation of infiltrating precipitation
- Subsurface inflow from the adjacent Subbasins

Recharge of surface water and deep percolation of precipitation are both surficial sources of natural groundwater recharge. An area's capacity for surficial groundwater recharge is dependent on a combination of factors, including steepness of grade, soil surface conditions such as paving or compaction, and ability of soil to transmit water past the root zone. To assist agricultural communities in California assess groundwater recharge potential, a consortium of researchers at University of California, Davis developed a Soil Agricultural Groundwater Banking Index (SAGBI) and generated maps of recharge potential in agricultural areas of California (O'Geen, *et al.*, 2015). Figure 4-13 presents the SAGBI index map for the Forebay Subbasin. This map ranks soil suitability for groundwater recharge based on 5 major factors including: deep percolation, root zone residence time, topography, chemical limitations, and soil surface condition. Areas with excellent recharge properties are shown in green. Areas with poor recharge properties are shown in red. Not all land is classified, but this map provides helpful guidance on where natural recharge likely occurs.

Areas with the highest potential for recharge are along the Salinas River, tributary streams, and much of the Arroyo Seco Cone. Most soils in the Subbasin are classified as moderately good to good for recharge potential. Although Figure 4-13 shows some areas of good recharge potential, the relationship between surficial soils and subsurface units must be clearly understood when siting potential artificial recharge facilities. An earlier report detailed an investigation into potential recharge sites in the Arroyo Seco Cone and described the disconnect between conducive soils found at the surface and nonconductive soils below which could impede deep percolation (Staal, Gardner, and Dunne Inc., 1994). This disconnect results not only from the interbedded sediment structure of alluvial fans, but also how fines are deposited further from the head of fans and the interfingering nature of the alluvial and fluvial deposits. This demonstrates the limited utility of recharge potential maps that are solely based on surficial soil properties. This map should not be used exclusively to identify recharge areas that will directly benefit the aquifer in the Forebay Subbasin. Rather, it should be used in conjunction with additional research and investigation tools.

Subsurface recharge is estimated to be 31,000 AF (DWR, 2004a). This includes groundwater inflow to the MCWRA Arroyo Seco subarea (Brown and Caldwell, 2015). The magnitude of tributary recharge solely along Arroyo Seco, but not limited to the Subbasin, is estimated to be between 40,000 and 60,000 AF/yr. (MCWRA, 2006).

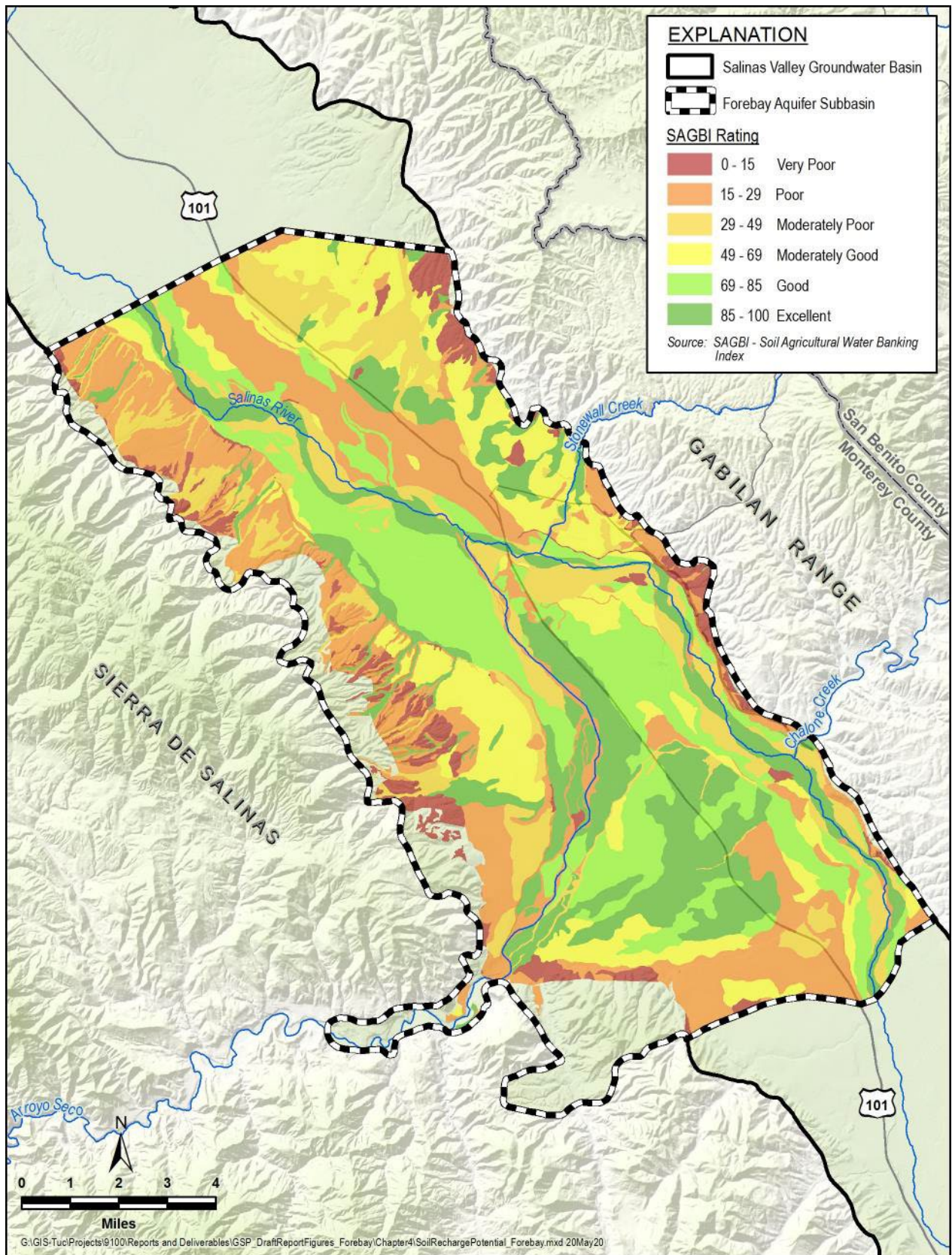


Figure 4-13. SAGBI Soils Map for the Forebay Aquifer Subbasin

4.4.5 Natural Discharge Areas

Natural discharge areas are areas where groundwater naturally leaves aquifers through flow to adjoining basins or percolation to the ground surface. Identifying areas of potentially significant natural discharge can inform water budgets and help locate important environmental uses of groundwater. Quantitative information about all natural and anthropogenic discharge is provided in Chapter 6.

Natural groundwater discharge areas within the Subbasin include wetlands and other surface water bodies that receive groundwater discharge and evapotranspiration (ET) by vegetation types commonly associated with the sub-surface presence of groundwater. There are no springs and seeps in the Subbasin as identified in the National Hydrology Dataset (NHD). Natural groundwater discharge to streams – primarily, the Salinas River and its tributaries – has not been mapped to date.

4.4.5.1 Potential Interconnected Surface Water

Figure 4-14 shows locations of interconnected surface water, in the Forebay Subbasin evaluated on a monthly basis over the entire SVIHM model period from 1967 to 2017. This analysis also excludes the period from June to September for the Salinas River assuming that the majority of flow in the river during these months is from conservation releases from the reservoirs. The blue cells indicate areas where surface water is connected to groundwater for more than 50% of the number of months in the model period and are designated as areas of interconnected surface water. The clear cells represent areas that have interconnection less than 50% of the model period and require further evaluation to determine whether the sustainable management criteria, discussed in Chapter 8, apply. The gray cells show locations of canals, drains, or connectors and were excluded from the analysis. These ISW locations are based on simulated results from the preliminary SVIHM, which is calibrated to measured groundwater levels and streamflows. Although seepage along the ISW reaches is based on assumed channel and aquifer parameters as model inputs, the preliminary SVIHM is the best available tool to estimate ISW locations. The model construction and uncertainty are described in Chapter 6 of this GSP. This map does not show the extent of interconnection which is estimated in Chapter 5. Interconnection between surface water and groundwater can vary both in time and space. A seasonal analysis is included in Appendix 4A. Figure 4-14 is based on provisional version of the SVIHM1 and is subject to change.

¹ These data (model and/or model results) are preliminary or provisional and are subject to revision. This model and model results are being provided to meet the need for timely best science. The model has not received final approval by the U.S. Geological Survey (USGS). No warranty, expressed or implied, is made by the USGS or the U.S. Government as to the functionality of the model and related material nor shall the fact of release constitute any such warranty. The model is provided on the condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from the authorized or unauthorized use of the model.

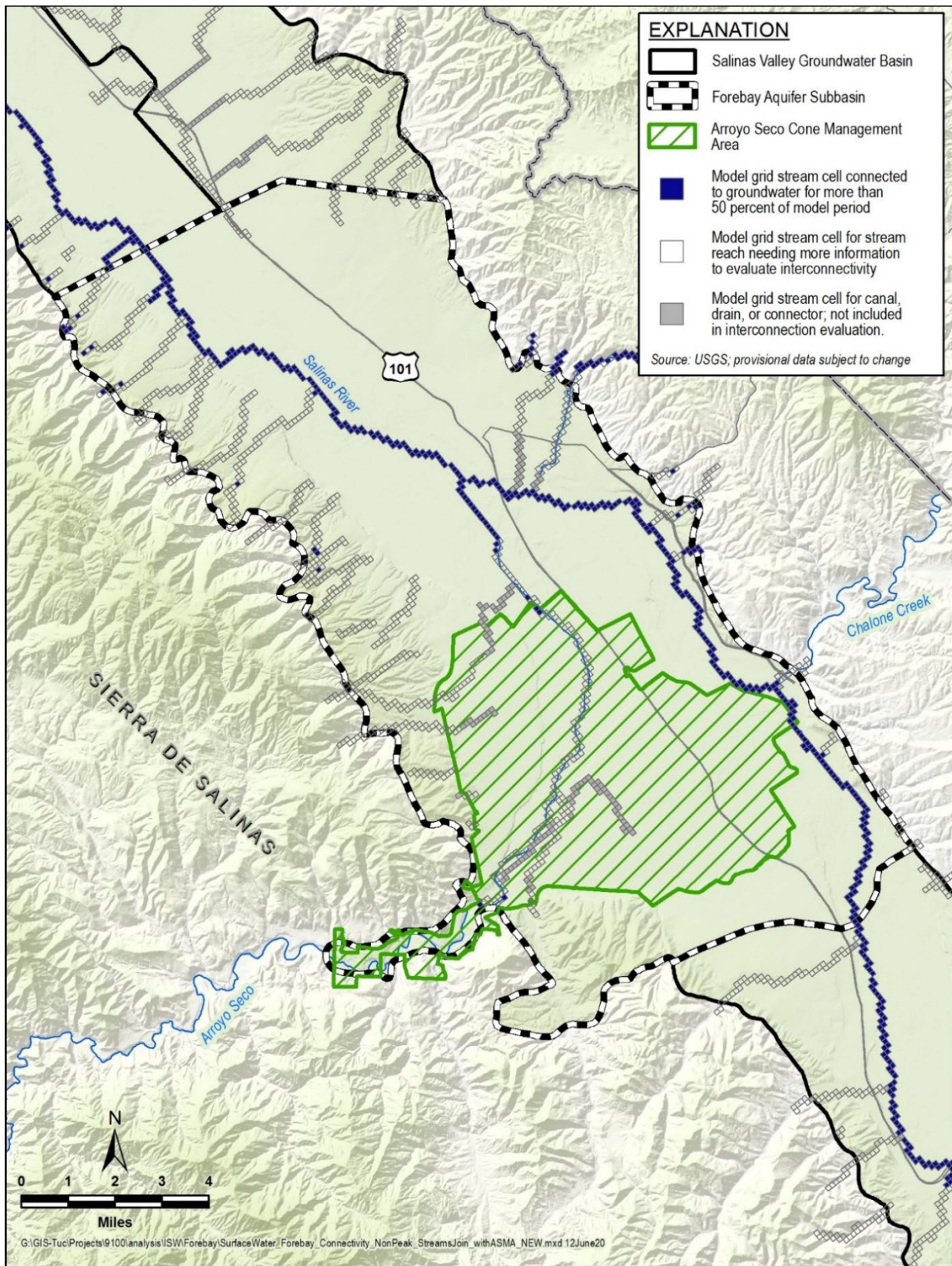


Figure 4-14. Locations of Interconnected Surface Water

4.4.5.2 Groundwater Dependent Ecosystems

Groundwater dependent ecosystems (GDEs) refer to ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface. Two main types of ecosystems are commonly associated with groundwater: wetlands associated with the surface expression of groundwater and vegetation that typically draws water from a shallow water table (phreatophytes).

GDEs may provide critical habitat for threatened or endangered species. Areas designated as critical habitat for threatened or endangered species contain the physical or biological features that are essential to the conservation of these species, and may need special management or protection (USFWS, 2017). A list of threatened and endangered species that might rely on groundwater dependent ecosystems (GDEs) in the Subbasin was compiled using information from the U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Wildlife (CDFW), and The Nature Conservancy (TNC). Several steps were taken to determine which threatened and endangered species were likely found in the Subbasin and of those, which were likely to rely on GDE habitat. A list of threatened and endangered species for Monterey County was downloaded from the USFWS website and cross-referenced to species identified in the CDFW California Natural Diversity Database. The threatened and endangered species for Monterey County was further cross-referenced with the TNC Critical Species LookBook to identify which species are likely to depend on groundwater, as indicated in Table 4-1.

Ten threatened and endangered species, including the Southern California Steelhead and the California Red-legged Frog, were identified as likely to rely directly on groundwater in Monterey County, several of which may be found in the Subbasin. Ten species were identified as likely to rely indirectly on groundwater, and the remaining species are unknown with respect to whether they directly rely on GDEs or groundwater. All species listed have the potential for groundwater dependence. There are 8 species that appear in both the federal and state list for threatened or endangered species.

Table 4-1. Federal and State Listed Threatened and Endangered Species, and Respective Groundwater Dependence for Monterey County

Groundwater Dependence	Common Name	Federal Status	State Status
Direct	California black rail	-	Threatened
	California red-legged frog	Threatened	-
	California Ridgway's rail	Endangered	Endangered
	longfin smelt	-	Threatened
	Santa Cruz long-toed salamander	Endangered	Endangered
	steelhead - central California coast DPS	Threatened	-
	steelhead - south-central California coast DPS	Threatened	-
	Tidewater Goby	Endangered	-
	tricolored blackbird	-	Threatened
Direct and Indirect	arroyo toad	Endangered	-
Indirect	bald eagle	-	Endangered
	bank swallow	-	Threatened
	Belding's savannah sparrow	-	Endangered
	California condor	Endangered	Endangered
	California least tern	Endangered	Endangered
	least Bell's vireo	Endangered	Endangered
	southwestern willow flycatcher	Endangered	Endangered
	Swainson's hawk	-	Threatened
	willow flycatcher	-	Endangered
Unknown	Bay checkerspot butterfly	Threatened	-
	California tiger salamander	Threatened	Threatened
	foothill yellow-legged frog	-	Endangered
	San Joaquin kit fox	Endangered	Threatened
	short-tailed albatross	Endangered	-
	Smith's blue butterfly	Endangered	-
	vernal pool fairy shrimp	Threatened	-

The areas in the Forebay Subbasin where GDEs may be found are mainly along the Salinas River where shallow alluvium is present, and in canyons and washes. The shallow alluvium along the Salinas River may be saturated, but more investigation is needed to determine whether a continuous saturated zone connects to the principal aquifer. This area will require more analysis into the near surface stratigraphy to determine the connection of the principal aquifer to surface water.

Figure 4-15 shows the distribution of potential GDEs within the Subbasin based on the Natural Communities Commonly Associated with Groundwater (NCCAG) Dataset (DWR, 2020b). The NCCAG dataset maps vegetation, wetlands, springs, and seeps in California that are commonly

associated with groundwater. These include: 1) wetland features commonly associated with the surface expression of groundwater under natural, unmodified conditions; and 2) phreatophytes. This map does not account for the depth to groundwater or level of interconnection between surface water and groundwater. Actual rooting depth data are limited and will depend on the plant species and site-specific conditions, and availability to other water sources.

The NCCAG dataset and the additional shallow groundwater analysis are not a determination of GDEs by DWR or SVBGSA, but rather represent the best available data to provide a starting point for this GSP, as well as to direct monitoring, fill data gaps, guide implementation, and support other field activities initiated or partnered by the SVBGSA. Field data are needed to ascertain the degree to which identified ecosystems are groundwater dependent, rather than sustained by soil moisture.

Additional resources that contributed to an initial mapping of GDE locations are the CDFW Vegetation Classification and Mapping program (VegCAMP), the USFWS National Wetlands Inventory, and the USFWS online mapping tool for listed species critical habitat, as described in the methodology for the NCCAG development which is publicly accessible on the NC dataset website: <https://gis.water.ca.gov/app/NCDatasetViewer/>.

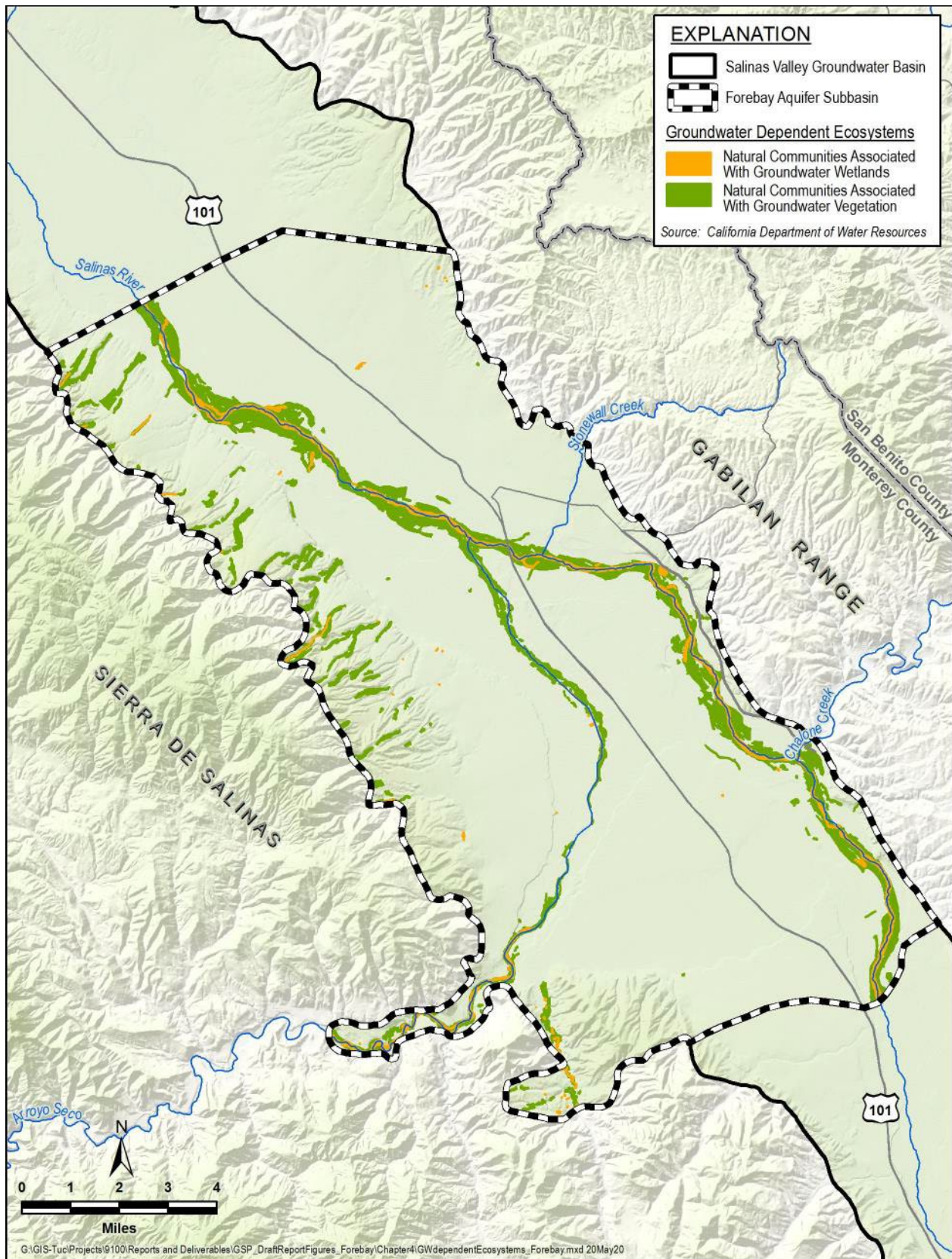


Figure 4-15. Potential Groundwater Dependent Ecosystems using NCCAG dataset

4.5 Surface Water Bodies

The primary surface water body in the Subbasin is the Salinas River. This river runs through the entire length of the Subbasin and is fed by local tributaries (Figure 4-16). The largest and most important tributary is the Arroyo Seco (Figure 4-16). The Arroyo Seco is a tributary with a 275 square-mile drainage area that has no dams and is characterized by both very high flood flows and extended dry periods.

Two reservoirs constructed to control flooding and to increase recharge from Salinas River are located outside of the Subbasin, but are important controls on the rate and timing of Salinas River flows in the Subbasin:

- Nacimiento Reservoir, in San Luis Obispo County, was constructed in 1957 and has a storage capacity of 377,900 acre-feet (MCWRA, 2015).
- San Antonio Reservoir, in Monterey County, was constructed in 1967 and has a storage capacity of 335,000 acre-feet (MCWRA, 2015).

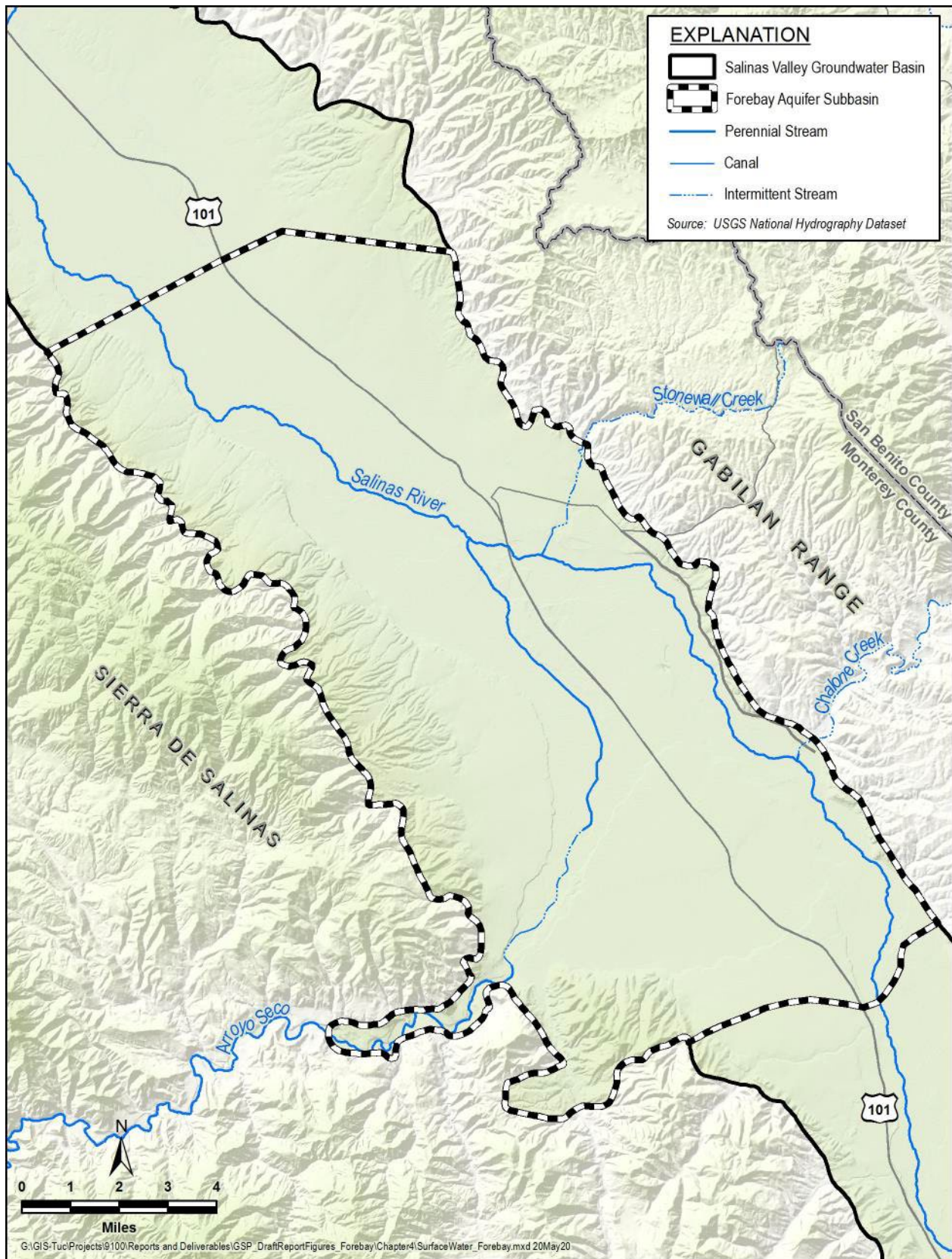


Figure 4-16. Surface Water Bodies in the Forebay Subbasin

4.5.1 Watersheds

Figure 4-16 shows several watersheds that contribute small tributary streams to the Salinas River in the Forebay Subbasin. From the boundary with the Upper Valley Subbasin to the Eastside and 180/400-Foot Aquifer Subbasin, the HUC12 watersheds within the Forebay Subbasin are as follows:

- Agua Grande Canyon-Salinas River
- Reliz Creek
- Vaqueros Creek
- Sweetwater Creek-Arroyo Seco
- Lower Chalone Creek
- Shirttail Gulch-Salinas River
- Stonewall Creek
- Paraiso Springs-Arroyo Seco
- Lasher Canyon-Salinas River
- McCoy Creek-Salinas River
- Limekiln Creek-Salinas River
- Johnson Creek

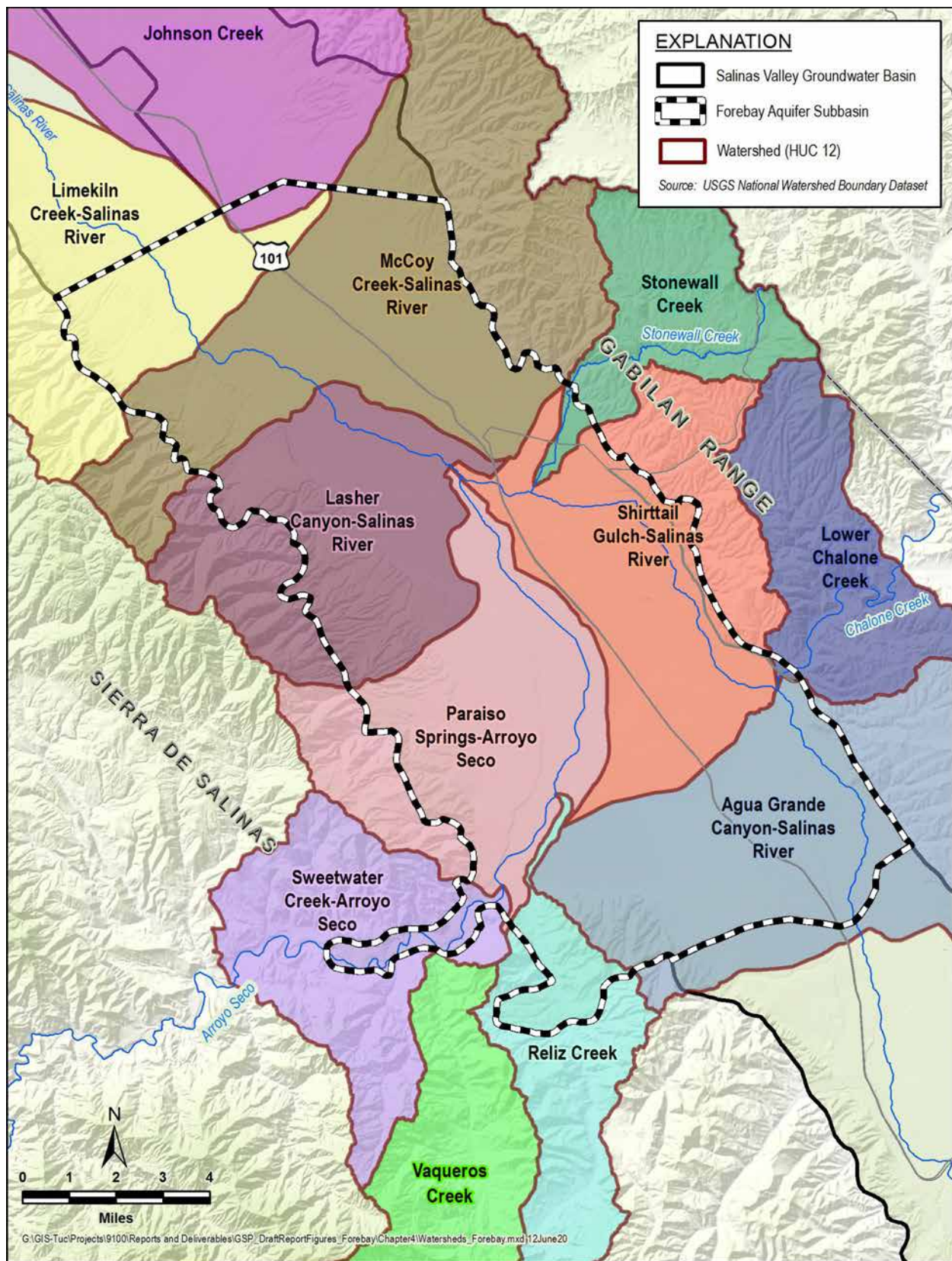


Figure 4-17. HUC12 Watersheds within the Forebay Aquifer Subbasin

4.5.2 Imported Water Supplies

There is no water imported into the Forebay Subbasin.

4.6 Water Quality

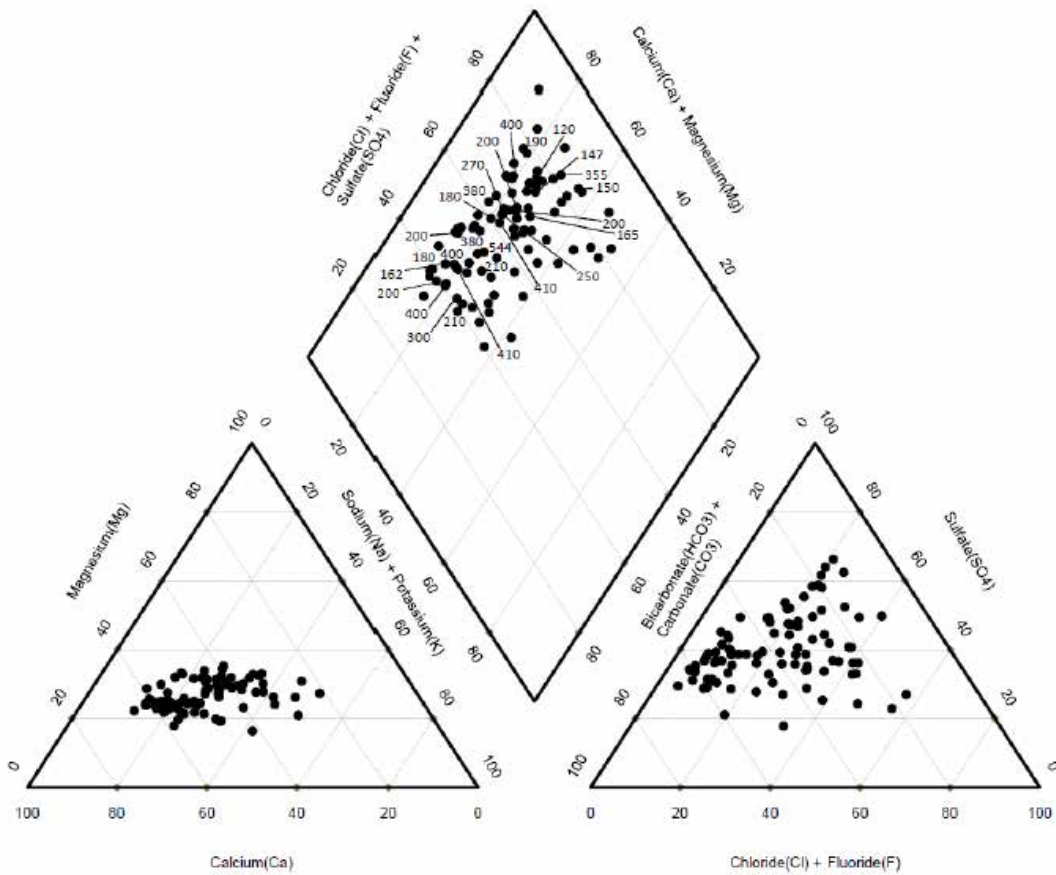
Natural groundwater quality can determine how much treatment may be needed prior to being used for municipal uses, or how the water may impact crop production. This chapter presents a general discussion of the natural groundwater quality in the Subbasin, focusing on general minerals, and is based on data from previous reports. Discussion of the distribution and concentrations of specific constituents of concern (COC) is presented in Chapter 5.

4.6.1 General Mineral Chemistry

The major ion chemistry of the Salinas Valley Groundwater Basin groundwater is summarized on the Distribution of Groundwater Nitrate Concentrations, Salinas Valley, California report, prepared for the Central Coast Groundwater Coalition (CCGC) (HydroFocus, 2014). This report was a response to the CCRWQCB requirement for monitoring elevated nitrate concentrations near drinking water supply wells. The report included the results of extensive groundwater quality sampling and thus provided a good characterization of the Subbasin's general mineral water quality.

General water chemistry provides a baseline of understanding of the water by showing major ions that are dissolved in the groundwater. The major ions that are dissolved can inform users if the water is more alkaline or more acidic. In many areas with more alkaline water, which has more dissolved cations such as calcium, magnesium, and sodium, users report their water as being 'hard.'

Figure 4-18 presents a Piper diagram from the CCGC report that plots major ion data from within and near the Subbasin. The diagram provides a means of representing the proportions of major anions and cations in water samples. The lower left triangle of the piper diagram plots the relative abundance of cations in groundwater samples. The lower right triangle of the piper diagram plots the relative abundance of anions in groundwater samples. The diamond in the middle of the diagram combines the cation and anion abundances in a single plot. Groundwater samples with similar general mineral chemistries will group together on these diagrams. The data plotted on Figure 4-18 show that most groundwater samples are of a similar type and plot in a single cluster. The samples are generally of a magnesium bicarbonate type, which is a more alkaline type of water. However, there are outlier samples that are higher in sodium and potassium than the other samples and are most noticeable in the dots that plot in the middle and right portions of the cation triangle. Piper diagrams do not provide spatial information about groundwater samples, and therefore it is difficult to illustrate the source of the sodium and/or potassium in the outlier samples.



Note: Well depths indicated when available.

Figure 17. Piper Plot of Forebay Subbasin Wells Sampled by the CCGC

Figure 4-18. Piper Diagram of Forebay Aquifer Subbasin Representing Major Anions and Cations in Water Samples

(from CCGC, 2015)

4.6.2 Seawater intrusion

There is no recorded seawater intrusion in this Subbasin. The Forebay Subbasin is more than 30 miles from the coastline and is not affected by seawater intrusion. Furthermore, the groundwater elevations in the Forebay Subbasin remain above sea level, maintaining a groundwater gradient towards the coast.

4.7 Data Gaps and Uncertainty of the HCM

Data gaps of the Forebay Subbasin HCM include:

- Very few available measurements of aquifer properties such as hydraulic conductivity and specific yield in the Subbasin, particularly to highlight the differences between the Arroyo Seco Cone and the rest of the Forebay Subbasin.
- The hydrostratigraphy, vertical and horizontal extents, connectivity, and potential recharge areas of the sediments which comprise the Deep Aquifers are poorly known.
- Areas of Salinas River recharge and discharge have not been mapped.

These data gaps have led to some minor uncertainties in how the principal aquifer functions, and the SVBGSA will minimize these uncertainties by filling data gaps. As described in Chapter 7, the GSP will include ongoing data collection and monitoring that will allow continued refinement and quantification of the groundwater system. Chapter 10 includes activities to address the identified data gaps and improve the HCM.

5 GROUNDWATER CONDITIONS

This chapter describes the current and historical groundwater conditions in the Forebay Subbasin in accordance with the GSP Regulations §354.16. In this GSP, current conditions are any conditions occurring after January 1, 2015. 2019 was chosen as the representative current year where possible. By implication, historical conditions are any conditions occurring prior to January 1, 2015. The chapter focuses on information required by the GSP Regulations and information that is important for developing an effective plan to maintain sustainability. This chapter provides a description of current and historical groundwater conditions at a scale and level of detail appropriate for meeting the GSP sustainability requirements under SGMA. As described in Chapter 4, the Forebay Subbasin contains the ASCMA. This chapter does not separate the ASCMA from the greater Forebay Subbasin. Instead, groundwater conditions are discussed for the entire Subbasin to reflect the single sustainability goal for the Subbasin.

This chapter is organized to align the groundwater conditions descriptions with the 5 sustainability indicators relevant to this Subbasin, including:

1. Chronic lowering of groundwater levels
2. Changes in groundwater storage
3. Subsidence
4. Groundwater quality
5. Depletion of ISW

5.1 Groundwater Elevations

5.1.1 Data Sources

The assessment of groundwater elevation conditions is largely based on data collected by MCWRA from 1944 through the present. MCWRA's monitoring programs are described in Chapter 3.

5.1.2 Groundwater Elevation Contours and Horizontal Groundwater Gradients

Groundwater elevation data are analyzed and presented with 3 sets of graphics:

Maps of groundwater elevation contours show the geographic distribution of groundwater elevations at a specific time. These contours represent the elevation of the groundwater in feet, using the NAVD88. The contour interval is 10 feet, meaning each blue line represents an area where groundwater elevations are either 10 feet higher or 10 feet lower than the next blue line (Figure 5-1 through Figure 5-4). Hydrographs of individual wells show the variations in groundwater elevations at individual wells over an extended period of time (Figure 5-5). Vertical

hydraulic gradients in a single location assess the potential for vertical groundwater flow direction, as discussed in Section 5.1.4.

MCWRA annually produces groundwater elevation contour maps for the Salinas Valley Groundwater Basin using data from their annual fall measurement program that takes place from mid-November to December. MCWRA uses fall groundwater elevations because these measurements are taken after the end of the irrigation season and before seasonal recharge from winter precipitation increases groundwater levels. The fall measurements represent seasonal low conditions in the Subbasin in this GSP. MCWRA does not produce groundwater elevation contour maps in the spring. Therefore, new maps of spring groundwater levels were developed for this GSP. Spring groundwater elevation maps were developed from data collected between January and March for 2019 and 1995. The period from January to March usually reflects seasonal high groundwater levels in the Salinas Valley Groundwater Basin (MCWRA, 2015). The MCWRA Quarterly Salinas Valley Water Conditions report demonstrates that in 2019, the seasonal high groundwater elevations occurred in February (MCWRA, 2019a). In 1995, data collected in March were more representative of seasonal high groundwater elevations.

The following 8 maps present the Current (2019) and Historical (1995) groundwater elevation contours derived from MCWRA data.

Table 5-1. Figures Showing Current and Historical Groundwater Elevation Contours

Figure #	Year	Season
Figure 5-1	Current (2019)	Spring
Figure 5-2	Current (2019)	Fall
Figure 5-3	Historical (1995)	Spring
Figure 5-4	Historical (1995)	Fall

The groundwater elevation contours only cover the portions of the Subbasin monitored by MCWRA and do not always extend to Subbasin margins. Contours are reflective of the groundwater elevations for the entire Basin Fill Aquifer as described in the HCM in Chapter 4.

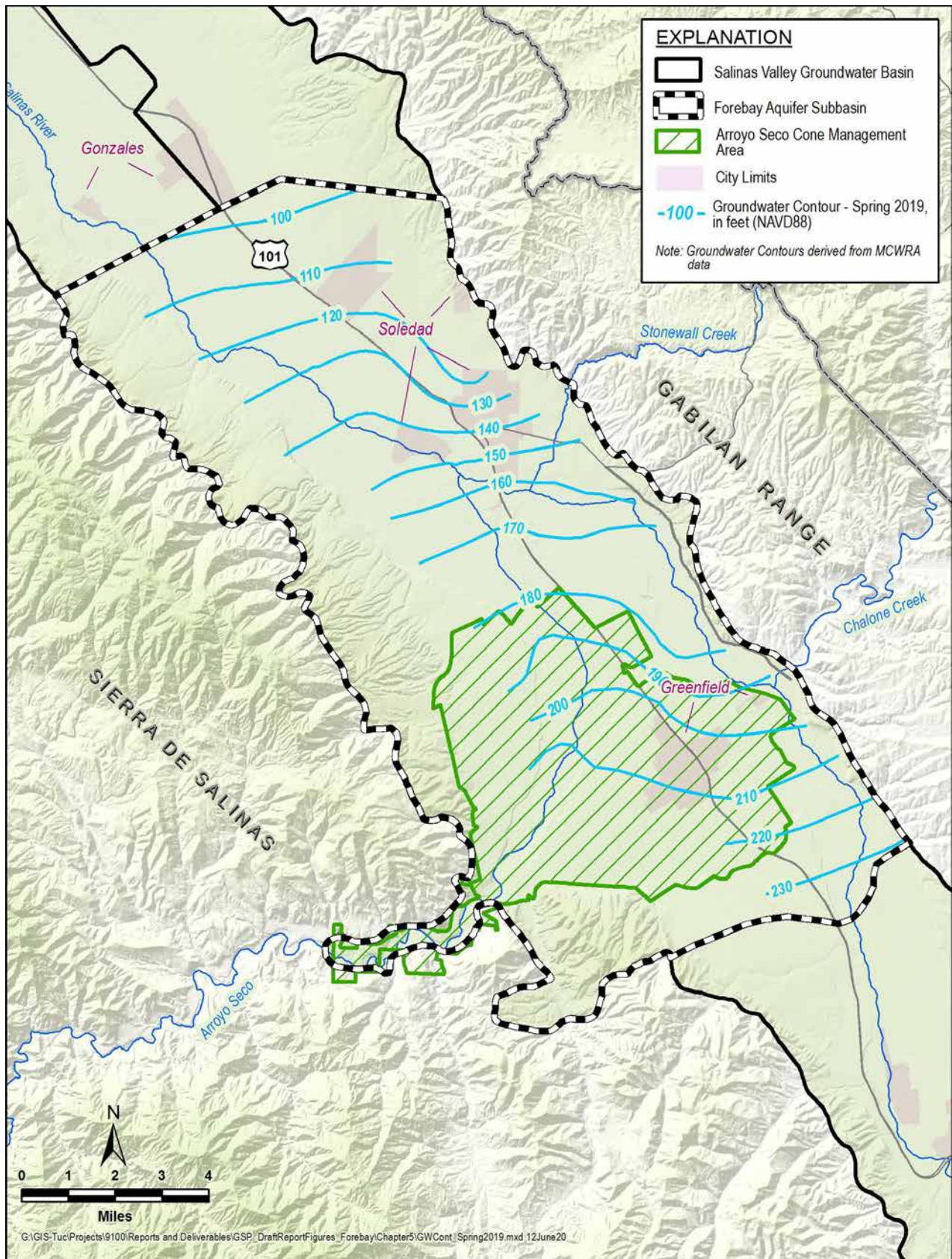


Figure 5-1. Spring 2019 Groundwater Elevation Contours

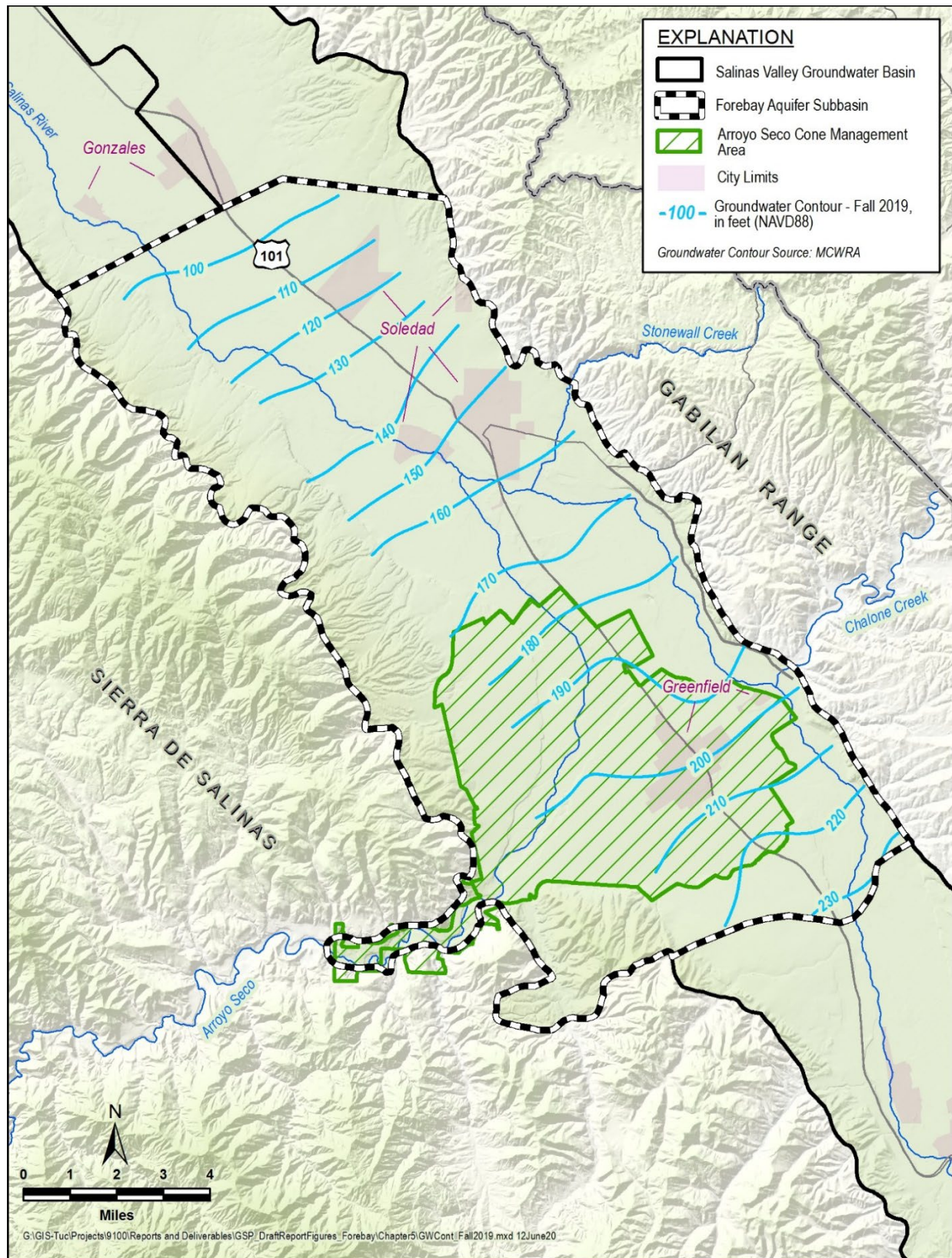


Figure 5-2. Fall 2019 Groundwater Elevation Contours

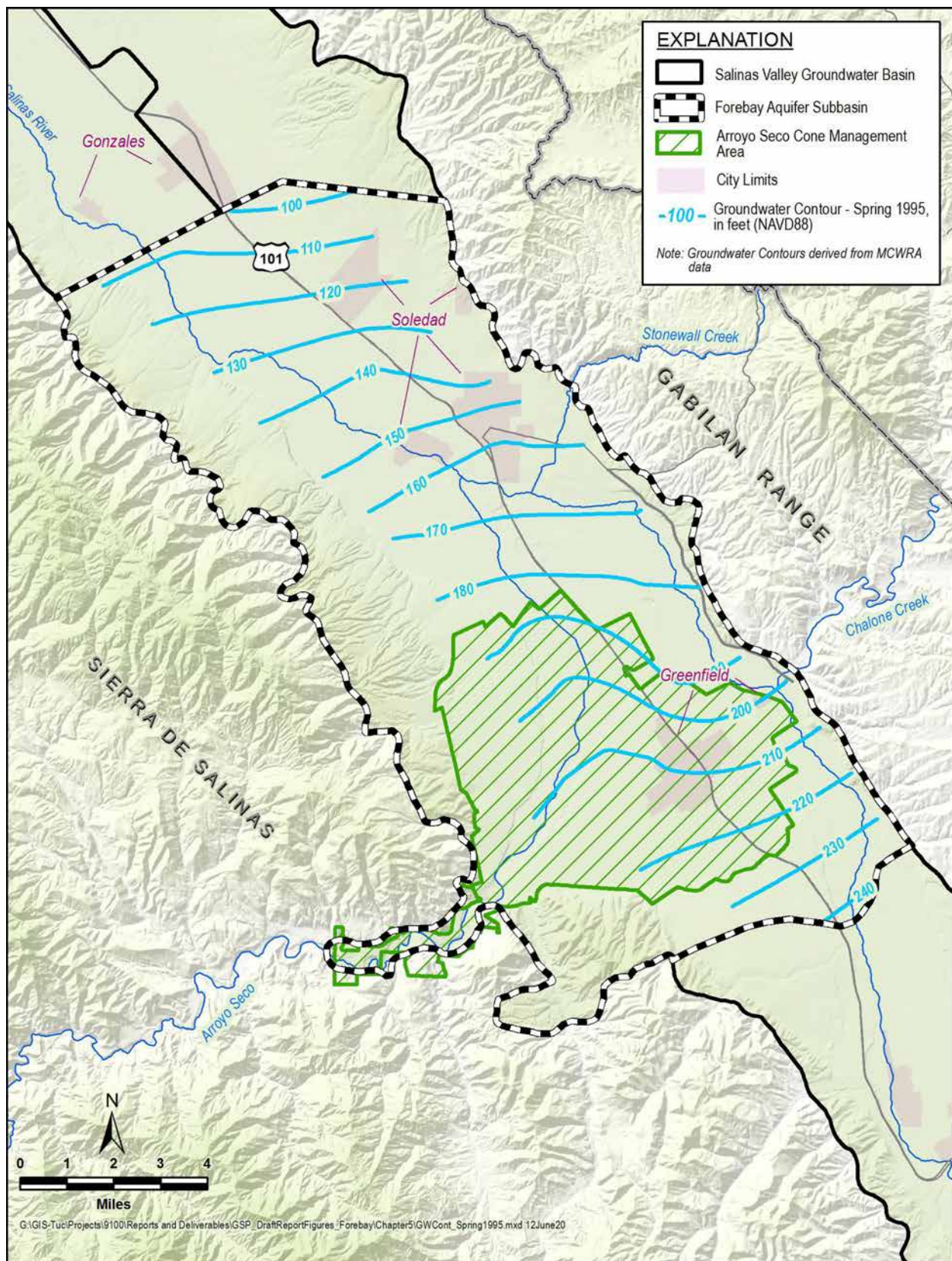


Figure 5-3. Spring 1995 Groundwater Elevation Contours

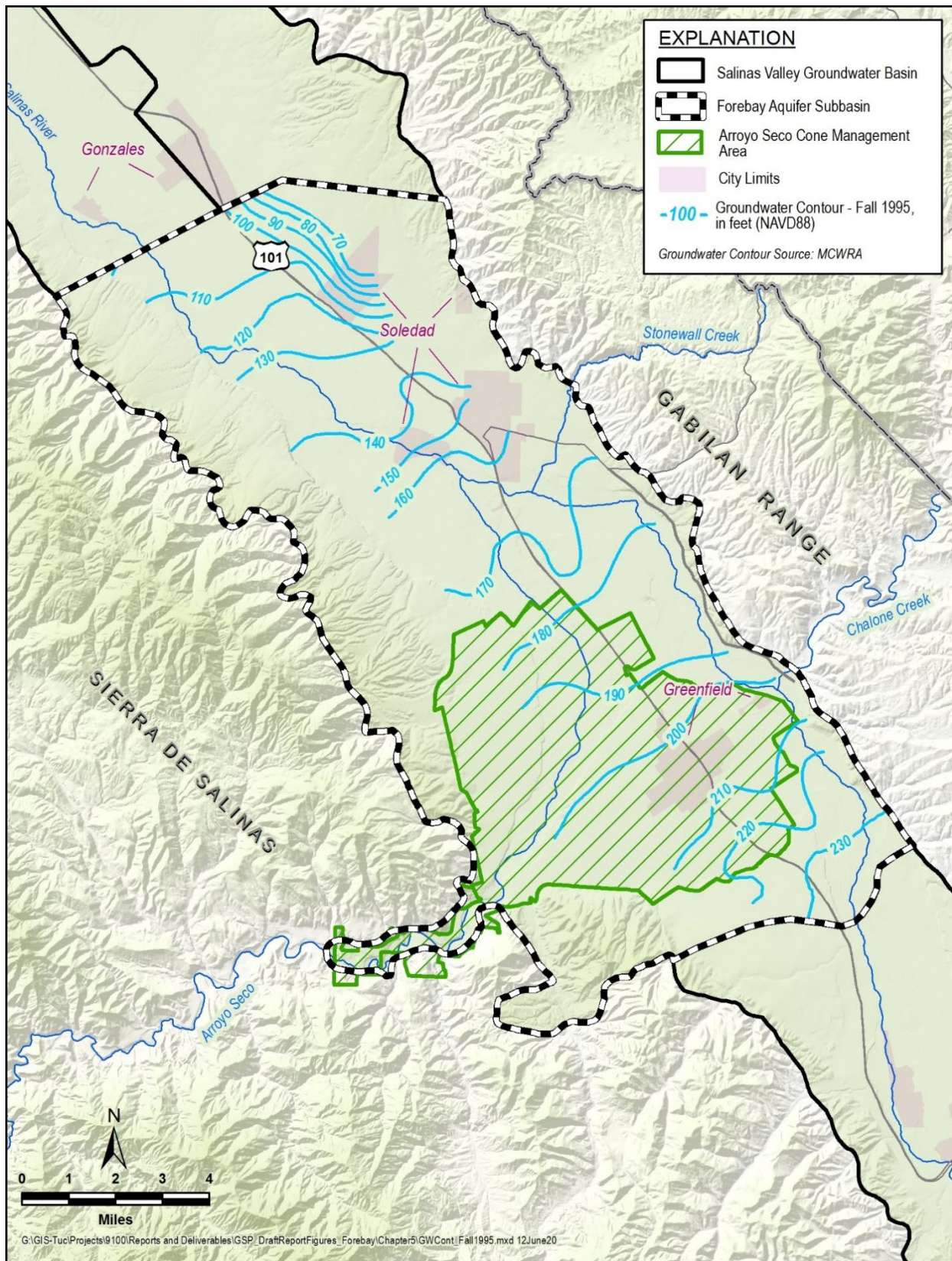


Figure 5-4. Fall 1995 Basin Fill Groundwater Elevation Contours

Groundwater in the Forebay Subbasin generally flows from south-southeast to north-northwest. The lowest groundwater elevations in the Subbasin occur along the boundary with the 180/400-Foot Aquifer and Eastside Subbasins near Gonzales. The minimum groundwater elevations are approximately 100 feet NAVD88 during both the spring and fall 2019 measurements. The hydraulic gradient across the Basin Fill Aquifer was approximately 0.0011 feet/foot, or 6 feet/mile during the spring 2019. Groundwater elevations in the Subbasin generally increase toward the boundary with the Upper Valley Subbasin, with groundwater elevations greater than 230 feet NAVD88 at the Subbasin boundary in the spring 2019. Under the historical conditions of 1995, a similar flow pattern to that of current conditions was present in the Forebay Subbasin. Examples of historical groundwater elevation changes at specific wells are presented in Section 6.3.

The groundwater elevation contours reflect conditions in the single Basin Fill Aquifer. If individual aquifers are delineated in the future, separate groundwater contour maps will be developed for each aquifer.

5.1.3 Hydrographs

Representative temporal trends in groundwater elevations can be assessed with hydrographs, which plot changes in groundwater elevations over time. Groundwater elevation data from wells within the Subbasin are available from monitoring conducted and reported by MCWRA.

Figure 5-5 depicts the locations and hydrographs of example monitoring wells in the Subbasin. Larger versions of the hydrographs for these wells, as well as all representative monitoring wells, are included in Appendix 5A. The locations of all the representative monitoring wells are shown on Figure 5-6. Chapter 7 provides more information specific to the wells and the monitoring system.

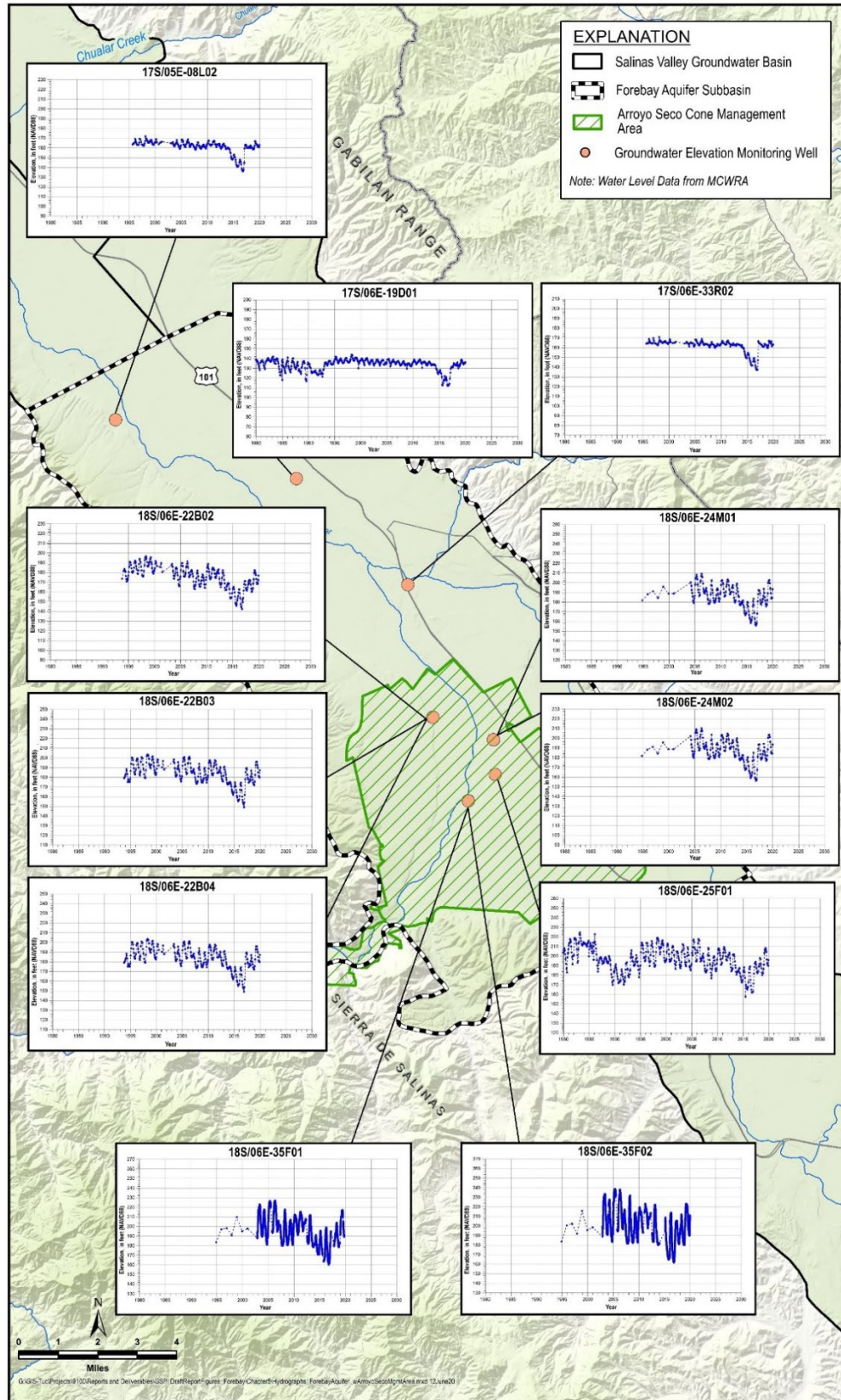


Figure 5-5. Map of Example Hydrographs

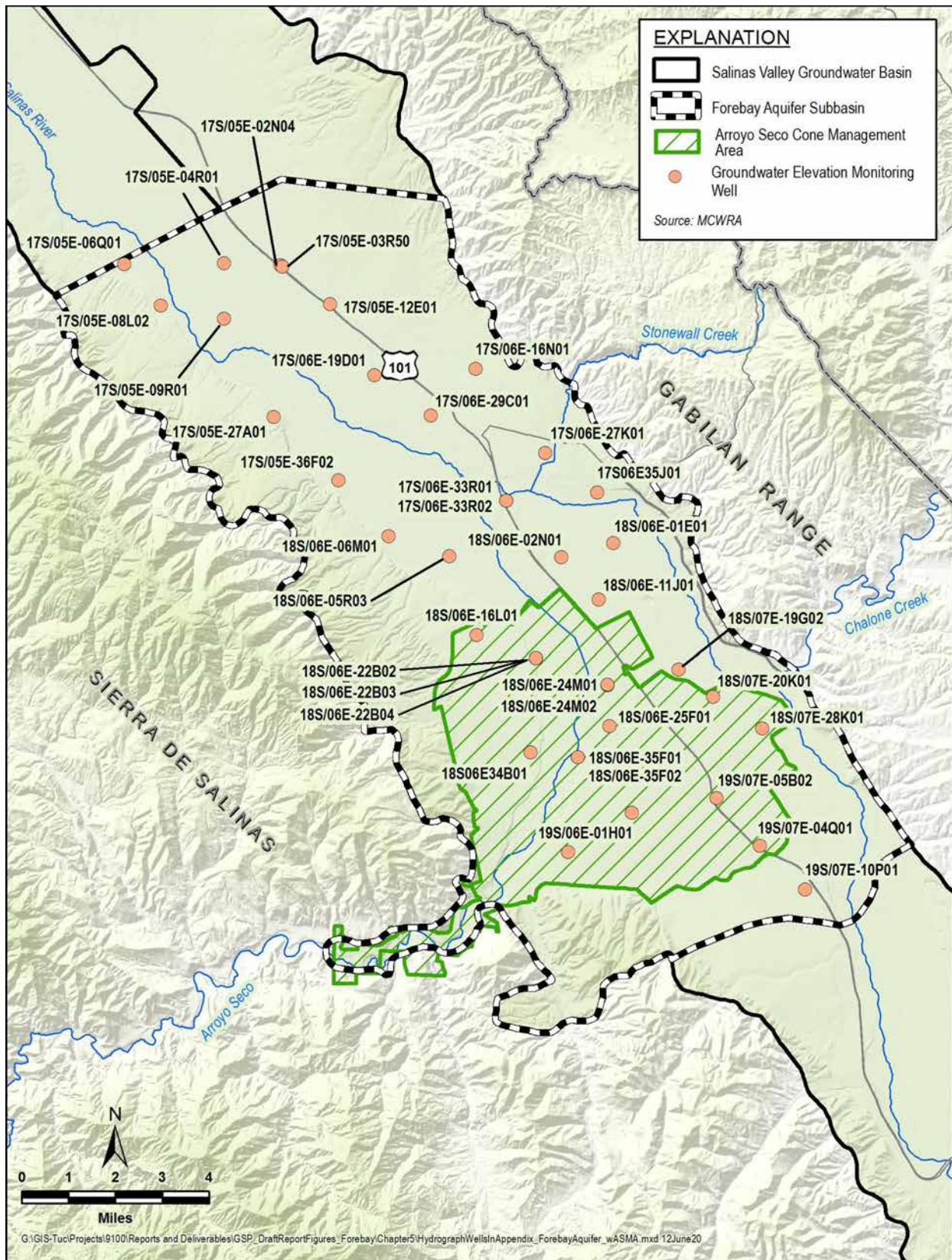


Figure 5-6. Locations of Representative Monitoring Wells with Hydrographs Included in Appendix 5A

Figure 5-8. Figure 5-7 presents a graph of cumulative groundwater elevation change for the Forebay Subbasin. The graph was initially developed by MCWRA and is based on averaged change in fall groundwater elevations for designated wells in the Forebay Subarea each year. The Forebay subarea overlaps the Forebay Subbasin, as well as small portions of the 180/400-Foot Aquifer and the Eastside Subbasins, as shown on Figure 5-8. The figure was adapted to reflect the cumulative change in groundwater elevations specific to the Forebay Subbasin.

Fall measurements occur at the end of the irrigation season and before groundwater levels increase due to seasonal recharge by winter rains. These measurements record annual changes in storage reflective of groundwater recharge and withdrawals in the Subbasin. The cumulative groundwater elevation change plot is therefore an estimated average hydrograph for wells in the Subbasin. Although this plot does not reflect the groundwater elevation change at any specific location, it provides a general illustration of how the average groundwater elevation in the Subbasin changes in response to climatic cycles, groundwater extraction, and water-resources management at the subbasin scale.

The cumulative elevation change graph and the specific hydrographs presented in Appendix 5A show that groundwater elevations in the Subbasin have been relatively constant in part of the Subbasin near the Salinas River, but show a slight declining trend since the late 1990s in other parts of the Subbasin.

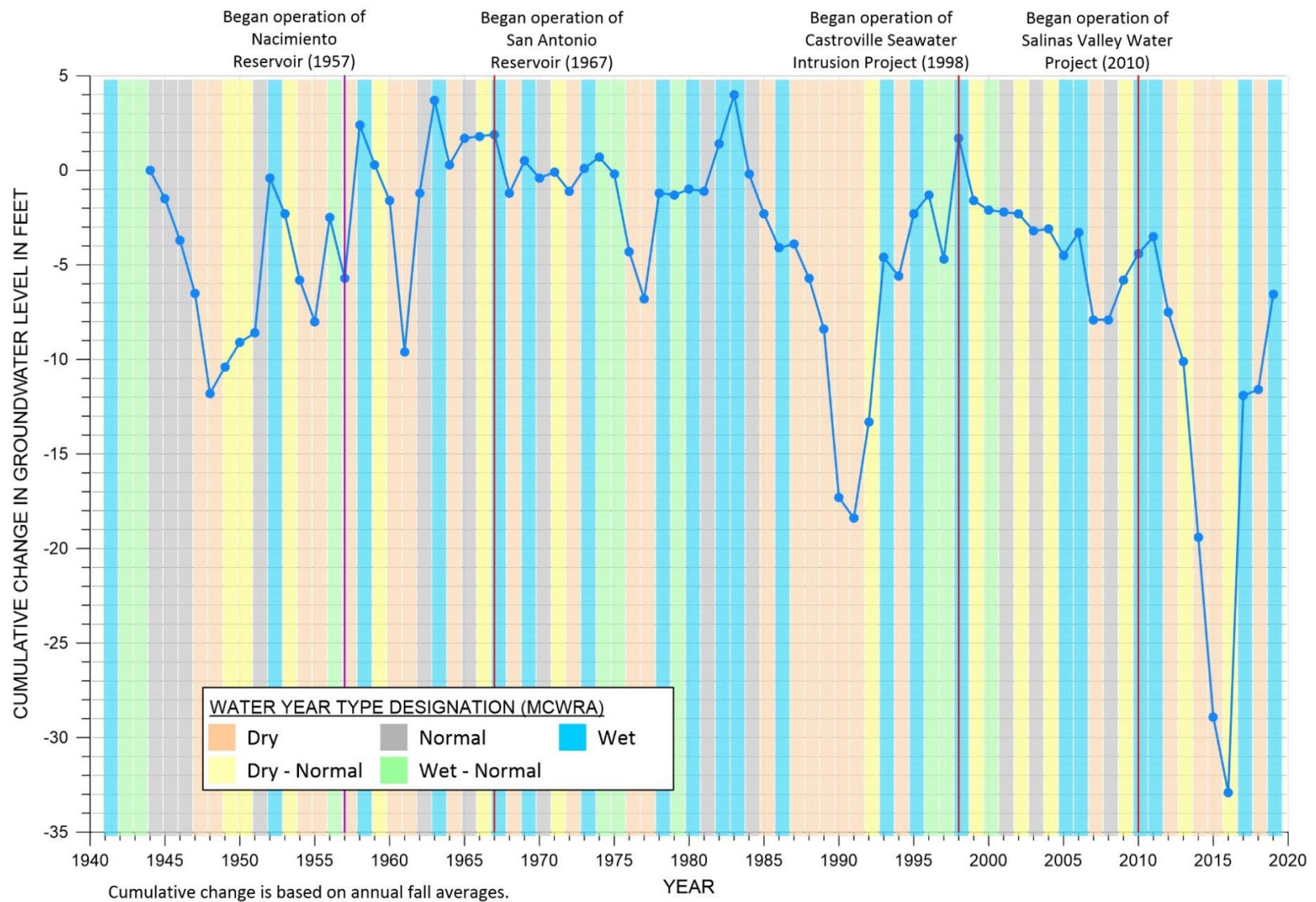


Figure 5-7. Cumulative Groundwater Elevation Change Graph for the Forebay Subbasin
(adapted from MCWRA, 2018a, personal communication)

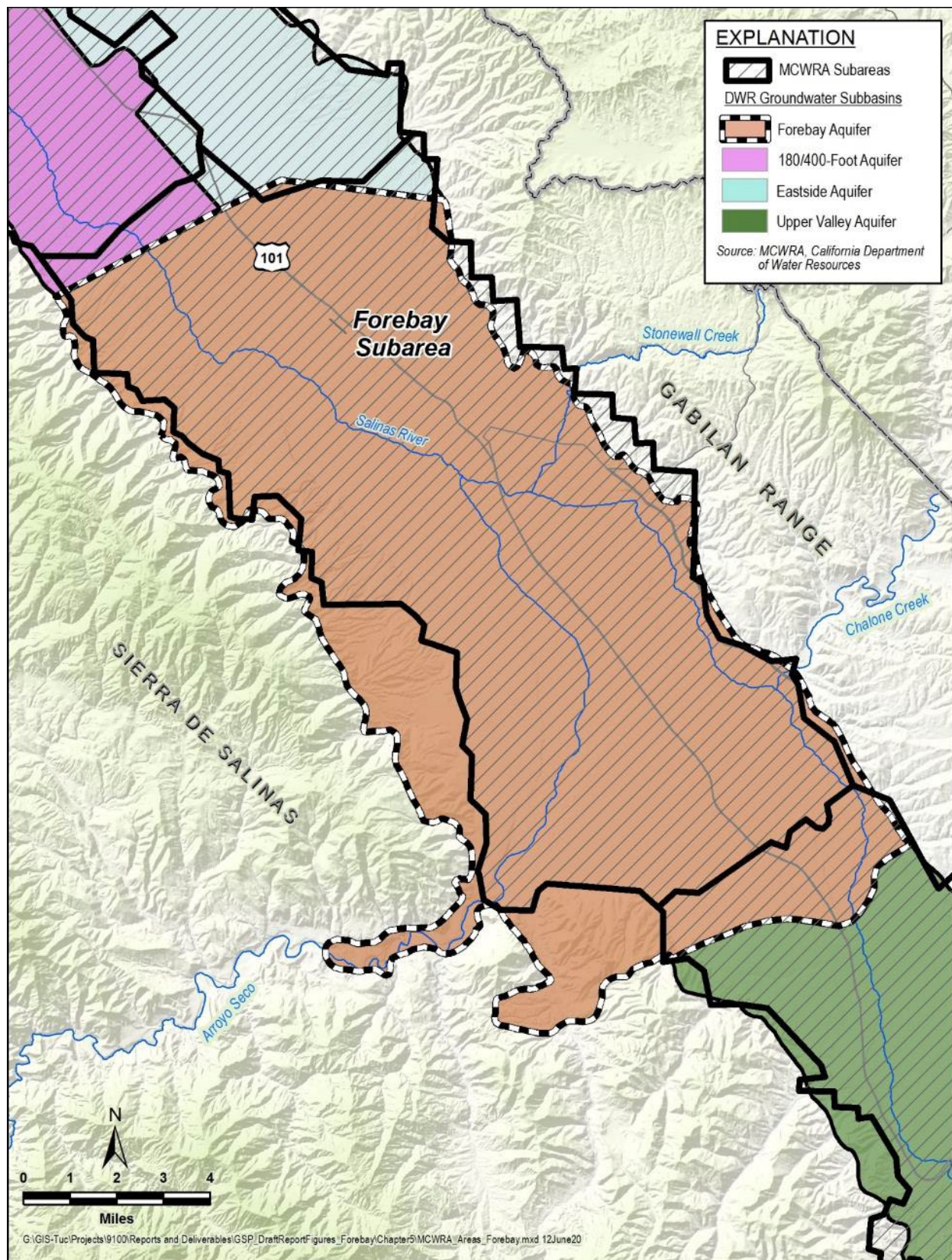


Figure 5-8. MCWRA Management Subareas

5.1.4 Vertical Groundwater Gradients

As discussed in Chapter 4, the Forebay Subbasin has a single principal aquifer—the Basin Fill Aquifer. It is lithologically similar to the 400-Foot and Deep Aquifers in the neighboring 180/400-Foot Aquifer Subbasin. However, the presence and continuity of the aquitard that separates these aquifers in the 180/400-Foot Subbasin is largely unknown in the Forebay Subbasin. Figure 5-9 shows groundwater elevations at 3 well pairs in the Subbasin. The well pairs consist of 2 adjacent wells with different well depths, one shallow and the other deep. The northernmost well pair consists of a shallow well (17S/05E-02N04) and a deep well that is potentially tapping into the deeper sediments of the Basin Fill Aquifer (17S/05E-03R50). The similarity in groundwater elevations suggests that these 2 wells are hydraulically connected. The middle well pair consists of wells that are likely in the Basin Fill Aquifer which is reflected in the similar trends in groundwater elevations of the shallow well (17S/06E-33R02) and deep well (17S/06E-33R01). The southernmost well pair is within the ASCMA. The vertical extent of the Arroyo Seco Cone is unknown, as its relationship with the deepest sediments in the subbasin. For this well pair groundwater elevations in the shallow well (18S/06E-35F02) are generally the same as the groundwater elevations in the deep well (18S/06E-35F01). The noticeably similar trends in groundwater elevations at the 2 depths suggests that these wells are also hydraulically connected despite the difference in depths.

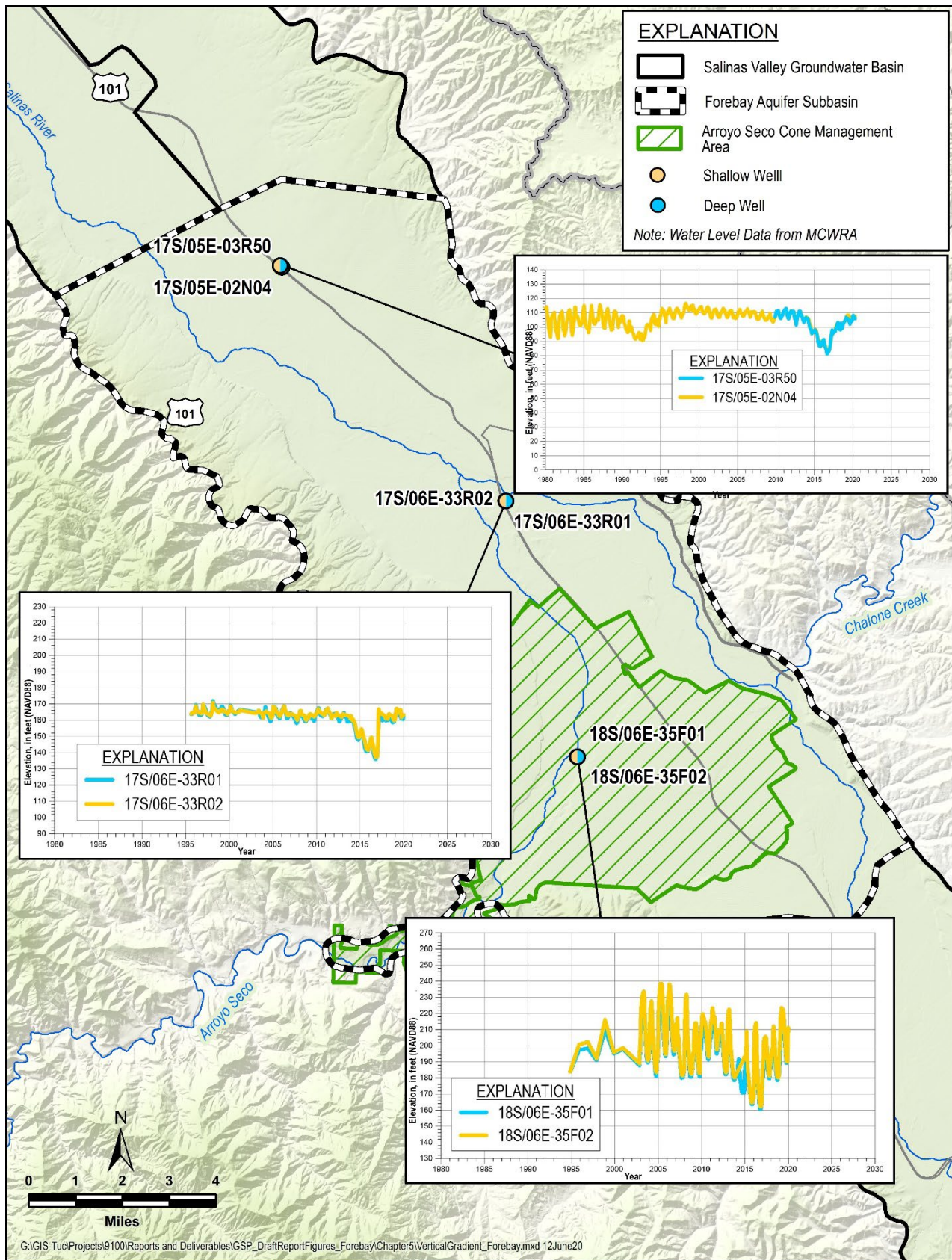


Figure 5-9. Vertical Gradients

5.2 Change in Groundwater Storage

5.2.1 Data Sources

Change in storage is developed based on MCWRA's fall groundwater elevation measurements. This includes historical groundwater elevation measurements used to develop the cumulative change in groundwater elevation graph (Figure 5-7) that is used to estimate cumulative change in groundwater storage over time. Groundwater elevation measurements are also used to create fall groundwater elevation contour maps; MCWRA's fall 1995 and fall 2019 contour maps are used to determine the spatial distribution of storage change. Fall groundwater elevation contour maps were used rather than spring contour maps to retain consistency with the cumulative change in the groundwater elevation graph.

5.2.2 Change in Groundwater Storage

Change in groundwater storage is derived from change in groundwater elevations in the Subbasin in 2 ways: (1) using the cumulative subbasin-wide average change in groundwater elevations and (2) subtracting the fall 1995 from the and fall 2019 groundwater elevation maps. Both approaches rely on observed groundwater elevation changes that provide a measure of the gain and loss of groundwater in storage each year. The change in storage is calculated by multiplying a change in groundwater elevation by a storage coefficient. Storage coefficients depend on the hydraulic properties of the aquifer materials and are commonly measured through long-term pumping tests or laboratory tests. The storage coefficient for the Forebay Subbasin was estimated at 0.12 based on the State of the Basin Report (Brown and Caldwell, 2015). The area of the Forebay Subbasin is approximately 94,000 acres.

Both approaches for calculating the change in storage using groundwater elevation changes are based on the following relationship:

$$\Delta S = \Delta WL \times A \times SC$$

Where: ΔS = Annual change in storage volume in the Subbasin (AF/yr)

ΔWL = Annual change in average groundwater elevation in the Subbasin (ft/yr)

A = Land area of Subbasin (acres)

SC = Storage coefficient (ft³/ft³)

Figure 5-10 shows estimated cumulative change in groundwater storage in the Forebay Subbasin from 1944 through 2019. This graph is based on the cumulative change in groundwater elevation data (Figure 5-7). The magnitudes of the groundwater storage changes are calculated by

multiplying the annual groundwater elevation change by the storage coefficient and size of the Subbasin.

Figure 5-11 shows that the Forebay Subbasin has experienced a long-term decline in groundwater storage due to lowering groundwater elevations. The average annual storage loss due to lowering groundwater elevation in the Forebay Subbasin between 1944 and 2019 is approximately 970 AF/yr, most of which occurred after the mid-1980s. Groundwater elevations have fluctuated over this time period. The change in storage calculation is a reflection of groundwater elevations in the start and end years, which captures the chronic lowering of groundwater levels in the Subbasin. Figure 5-10 also shows the annual change in storage and annual groundwater extractions. Figure 5-11 shows the estimated change in groundwater storage calculated by subtracting the fall 2019 and fall 1995 groundwater elevation maps (Figure 5-2 and Figure 5-4, respectively). The change in groundwater storage map was calculated over an area of about 53,000 acres rather than the total Subbasin area because that is the approximate area of the Subbasin that is contoured. The greatest loss in groundwater storage in the Subbasin occurred adjacent to the city of Soledad and Greenfield. Around Soledad the loss in storage ranged between 0.5 to 1 AF per acre over an area of approximately 11,900 acres (Figure 5-11). Near Greenfield the loss in storage ranged between 0.5 to 1 AF per acre over an area of approximately 6,600 acres (Figure 5-11). This loss in storage is minimal and does not indicate that the Subbasin is unsustainable, especially as groundwater elevations are not in chronic decline and rebound after wet years.

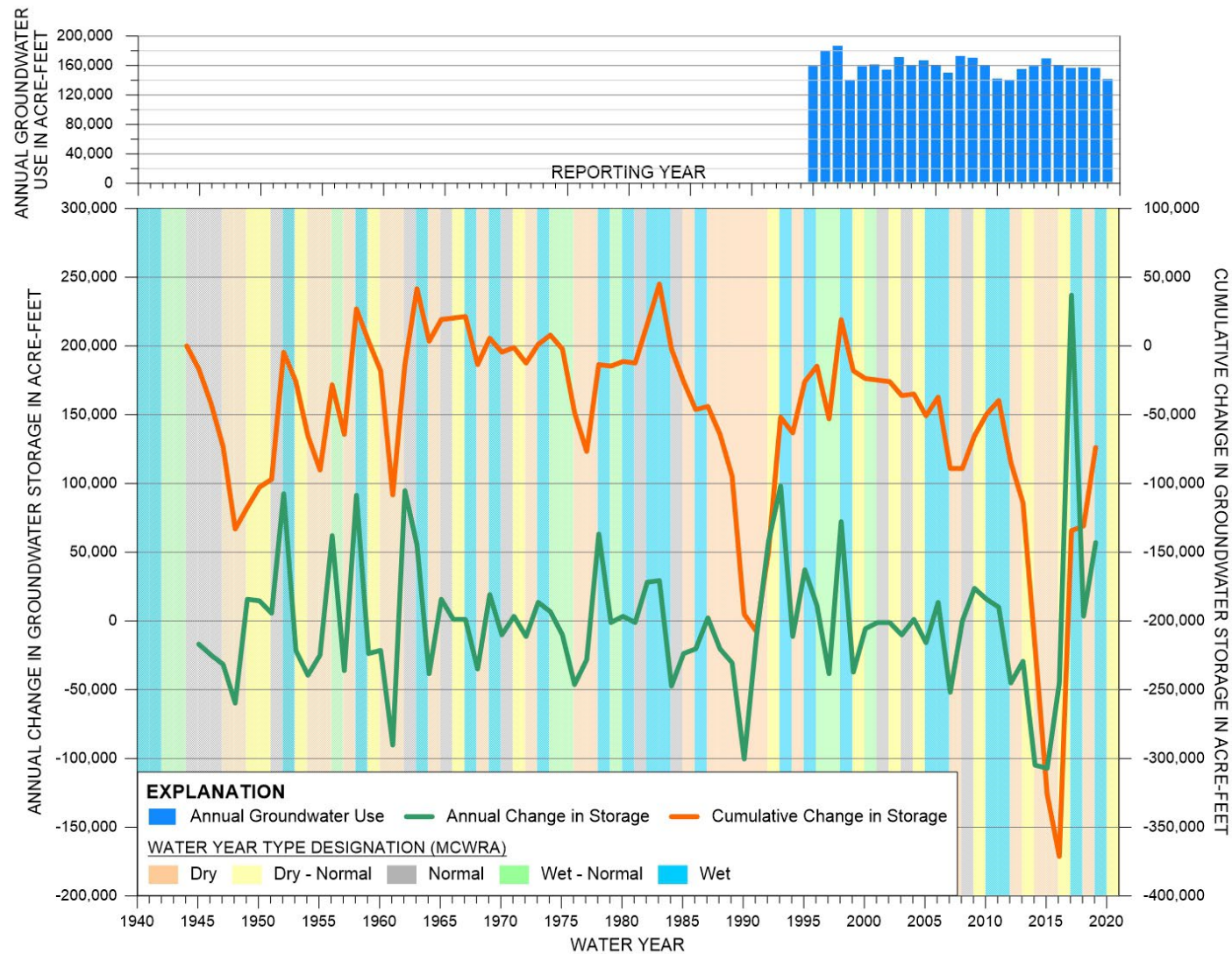


Figure 5-10. Annual and Cumulative Change in Groundwater Storage and Total Groundwater Extraction in the Forebay Subbasin, Based on Groundwater Elevations (Adapted from MCWRA, 2018a, personal communication)

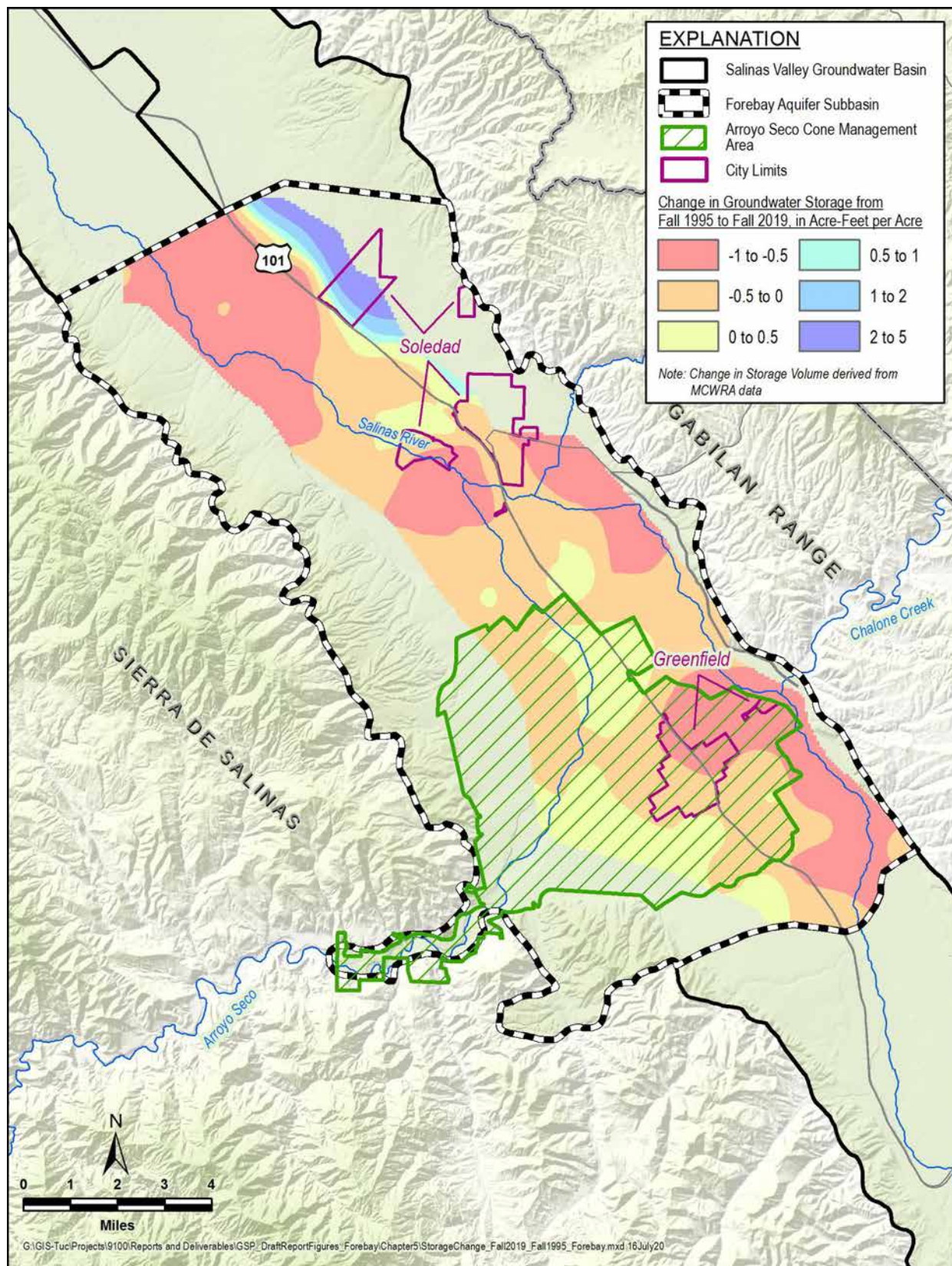


Figure 5-11. Change in Groundwater Storage from Fall 1995 to Fall 2019

5.3 Groundwater Quality Distribution and Trends

The SVBGSA does not have sole regulatory authority over groundwater quality and is not charged with improving groundwater quality in the Salinas Valley Groundwater Basin. Projects and actions implemented by the SVBGSA are not required to improve groundwater quality; however, they must not further degrade groundwater quality.

5.3.1 Data Sources

Groundwater quality samples have been collected and analyzed in the Subbasin for various studies and programs. Groundwater quality samples have also been collected on a regular basis for compliance with regulatory programs. Groundwater quality data for this GSP were collected from:

- The Northern Counties Groundwater Characterization report (CCGC, 2015)
- The USGS's Groundwater Ambient Monitoring and Assessment Program (GAMA) reports (Kulongoski and Belitz, 2005; Burton and Wright, 2018)
- SWRCB's GeoTracker Data Management System (SWRCB, 2020a)
- SWRCB's GAMA Groundwater Information System (SWRCB, 2020b)
- The California DTSC's EnviroStor data management system (DTSC, 2020)

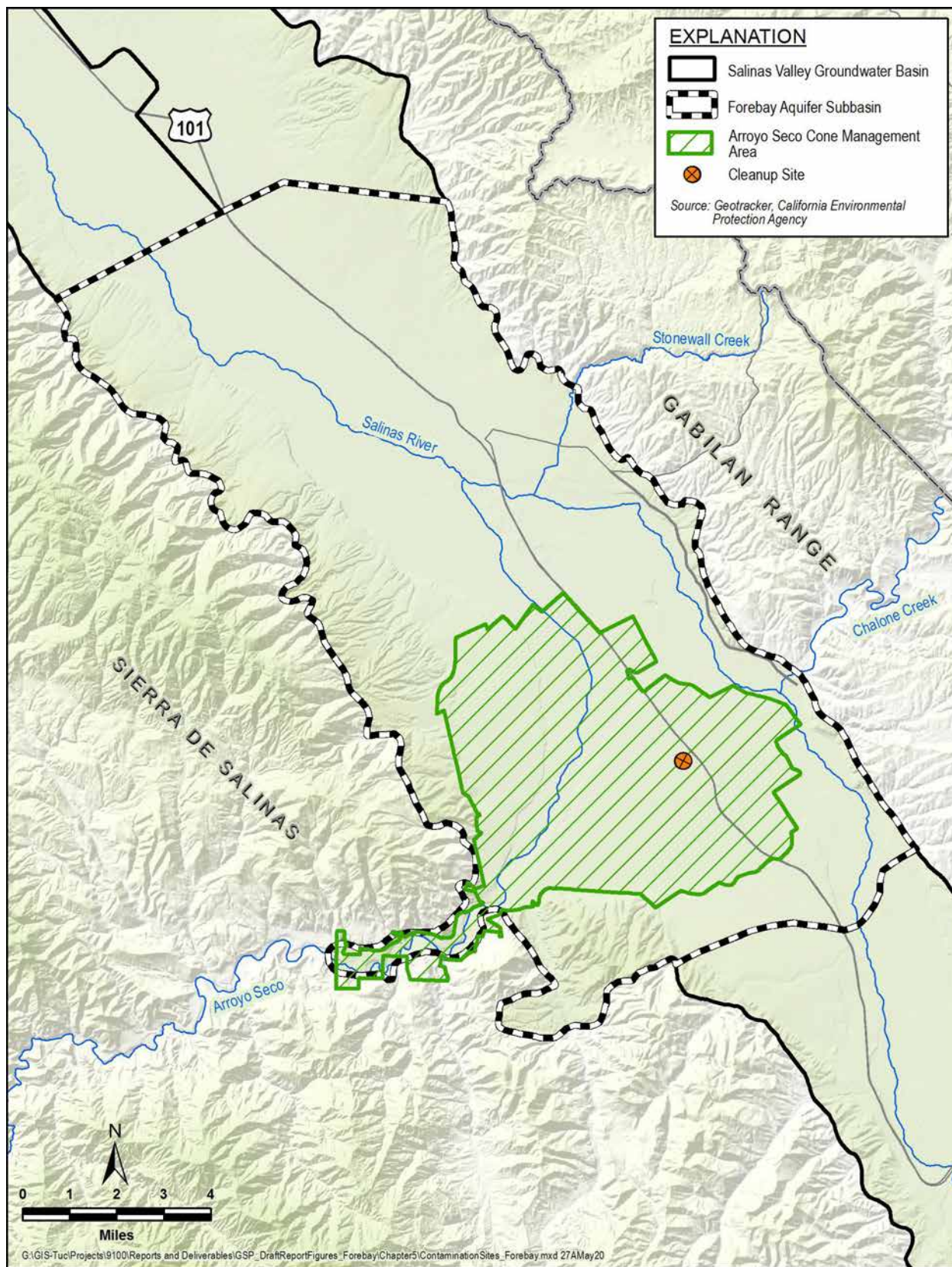
5.3.2 Point Sources of Groundwater Contaminants

Clean-up and monitoring of point source pollutants may be under the responsibility of either the CCRWQCB or the Department of Toxic Substances Control (DTSC). The locations of these clean-up sites are visible in SWRCB's GeoTracker database map, publicly available at: <https://geotracker.waterboards.ca.gov/>. The GeoTracker database is linked to the DTSC's EnviroStor data management system that is used to track clean-up, permitting, and investigation efforts.

Table 5-2 and Figure 5-12 provide a summary and map of the 1 active clean-up site within the Subbasin. They do not include sites that have leaking underground storage tanks, which are not overseen by DTSC or the CCRWQCB.

Table 5-2. Active Cleanup Sites

Site Name	Site Type	Status	Constituents of Concern (COCs)	Address	City
Reconstruction of Mary Chapa and El Camino Real Schools Site	School	Active	Metals, organochlorine pesticides, petroleum, polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons, volatile organics (VOCs)	490 El Camino Real	Greenfield



5.3.3 Distribution and Concentrations of Diffuse or Natural Groundwater Constituents

In addition to the single point source of groundwater contamination described above, the CCRWQCB monitors and regulates activities and discharges that can contribute to non-point pollutants that are released to groundwater over large areas. In the Subbasin, the most prevalent non-point water quality concern is nitrate. The current distribution of nitrate was extensively monitored and evaluated by the CCGC and documented in a report submitted to the CCRWQCB (CCGC, 2015).

Figure 5-13 shows a map of nitrate distribution in the Subbasin prepared by CCGC. The orange and red areas shown on the figure illustrate the portions of the Subbasin where groundwater has nitrate concentrations above the drinking water MCL of 45 mg/L NO₃.

Figure 5-14 shows maps of measured nitrate concentration from 6 decades of monitoring for the entire Salinas Valley Groundwater Basin. These maps, prepared by MCWRA, indicate that elevated nitrate concentrations in groundwater were locally present in the 1960s, but significantly increased in 1970s and 1980s. Extensive distribution of nitrate concentrations above the drinking water MCL, as shown on Figure 5-13, has been present in the Forebay Subbasin for 20 to 30 years.

A May 2018 staff report to the CCRWQCB included a summary of nitrate concentrations throughout the Central Coast Region, including the Salinas Valley Groundwater Basin. The staff report includes data from 2008 to 2018 collected at 2,235 wells in the Salinas Valley Groundwater Basin, during Agricultural Orders 2.0 and 3.0 sampling events. The report states that 66% of on-farm domestic wells in the Forebay Subbasin exceeded the drinking water MCL with a mean concentration of 112.0 mg/L NO₃. In addition, 45% of irrigation supply wells in the Subbasin exceeded this MCL with a mean concentration of 66.0 mg/L NO₃ (CCRWQCB, 2018).

Some COC can be concentrated at various aquifer depths. Nitrate is a surficial constituent derived from such sources as fertilizer, livestock, and septic systems. Because the sources are all near the surface, nitrate is usually highest near ground surface, and decreases with depth. Raising groundwater levels may mobilize additional nitrate. By contrast, arsenic concentrations usually increase with depth, and lowering groundwater levels may mobilize additional arsenic. The distribution and concentrations of COC can be further complicated by location and rate of groundwater pumping. The extent to which pumping affects groundwater quality depends on aquifer properties, distance to contamination, constituent characteristics and transport rate, and the time at which contaminants entered the subsurface. These general relationships have not been analyzed in this Subbasin.

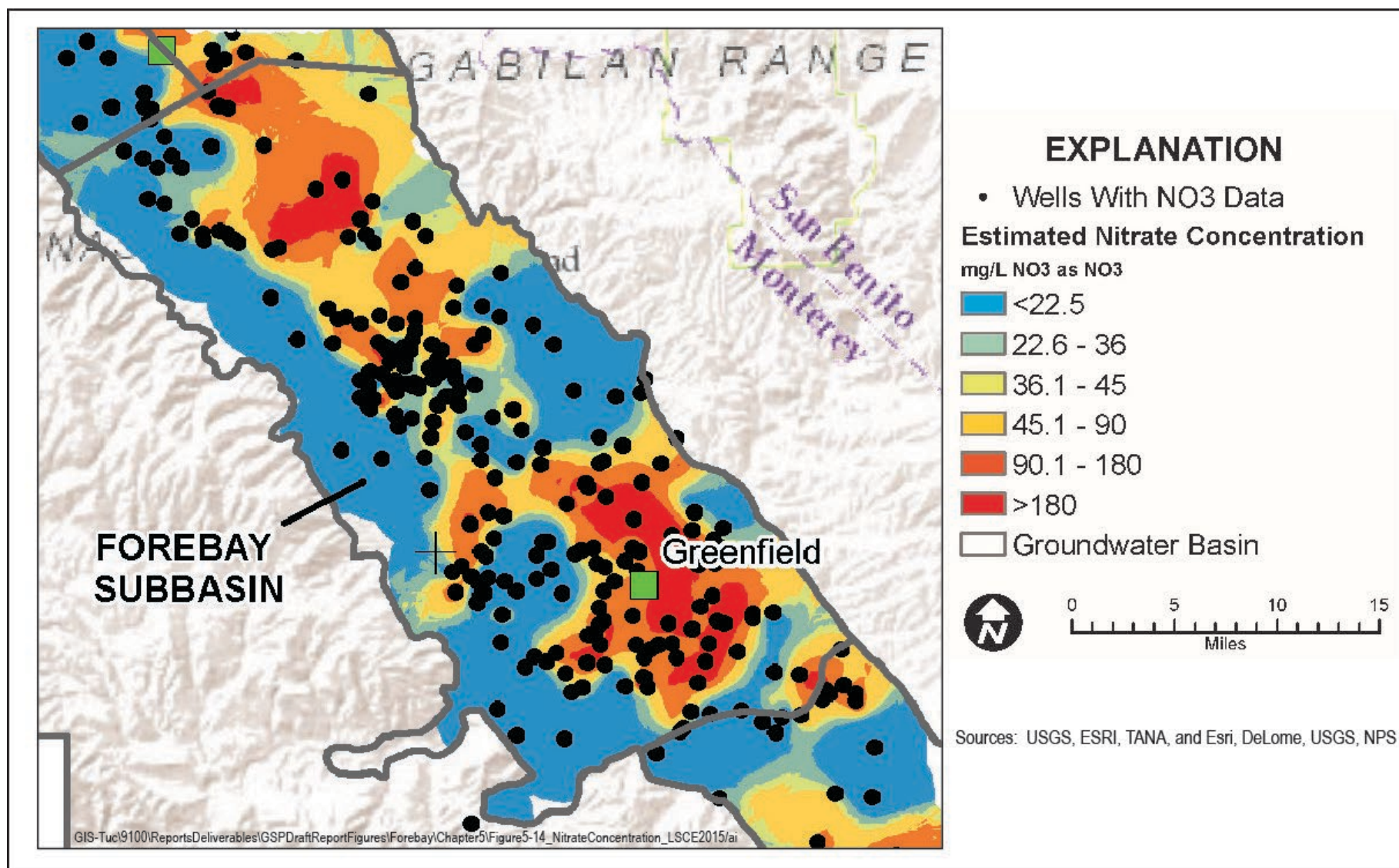


Figure 5-13. Estimated Nitrate Concentrations
(from CCGC, 2015)

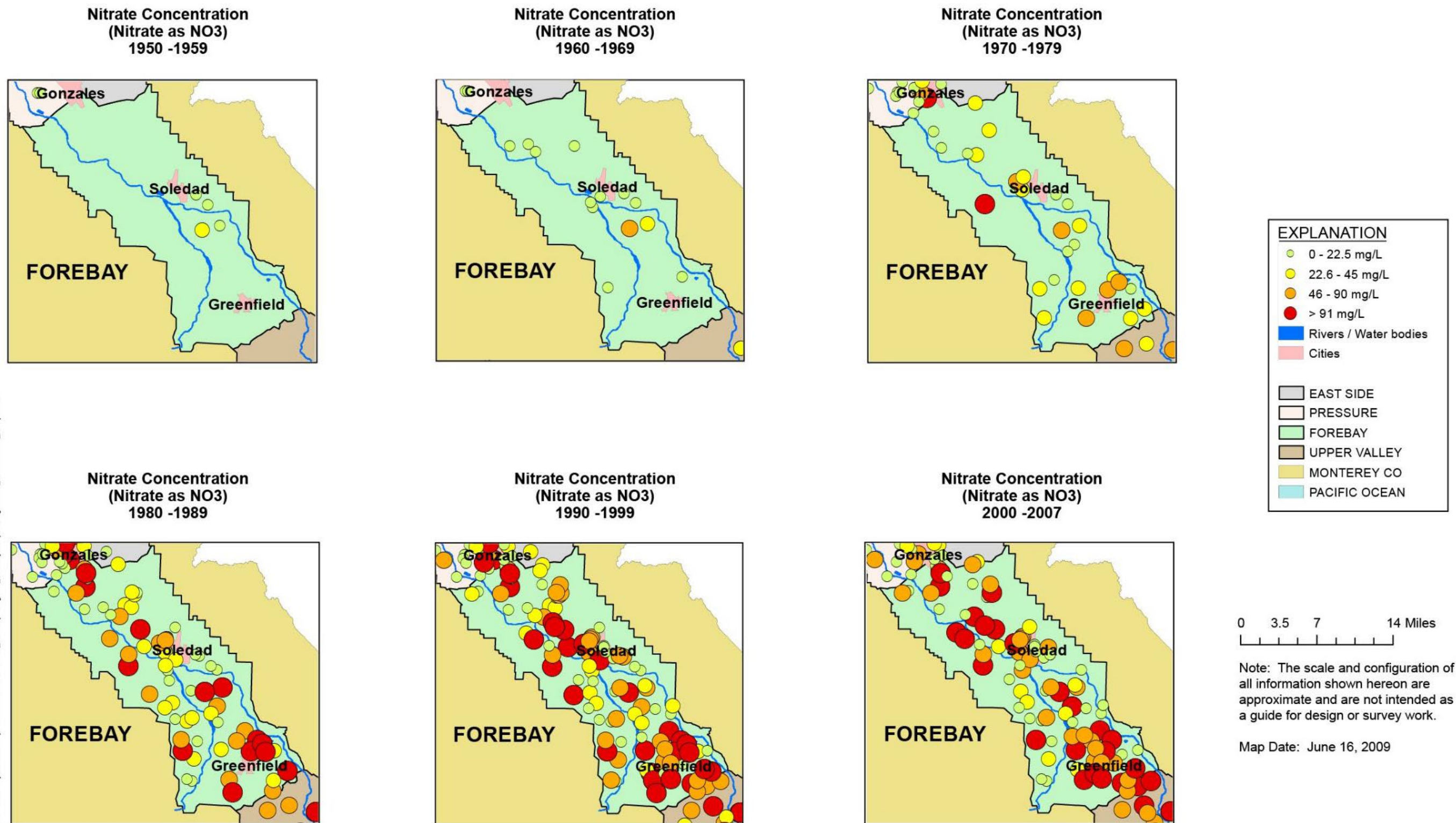


Figure 5-14. Nitrate Concentrations, 1950 to 2007
(modified from MCWRA data)

Additional groundwater quality conditions in the Basin are summarized in 2 USGS water quality studies in the Salinas Valley. The USGS 2005 GAMA study characterized deeper groundwater resources used for public water supply (Kulongoski and Belitz, 2005). The USGS 2018 GAMA study focused on domestic well water quality (Burton and Wright, 2018). The source data used in these 2 studies and additional publicly available water quality data can be accessed through the SWRCB GAMA groundwater information system database at <https://gamagroundwater.waterboards.ca.gov/gama/datadownload>.

The GAMA groundwater information system database includes groundwater quality data for public water system supply wells from the SWRCB DDW, and on-farm domestic wells and irrigation supply wells from CCRWQCB's ILRP. This GSP relies on established thresholds for COC: MCLs and Secondary Maximum Contaminant Levels (SMCLs) established by the State's Title 22 drinking water standards for public water system supply wells and on-farm domestic wells, and COC levels that may lead to reduced crop production for irrigation supply wells, as outlined in the CCRWQCB's Basin Plan (CCRWQCB, 2019).

Table 5-3 reports the COC in the Forebay Subbasin based on GAMA groundwater information system data up to December 31, 2019. The number of wells that exceed the regulatory standard for any given COC is based on the latest sample for each well in the monitoring network. Not all wells have been sampled for all COC. Therefore, the percentage of wells with exceedances is the number of wells that exceed the regulatory standard divided by the total number of wells that have ever been sampled for that COC. Additionally, Table 5-3 does not report all of the constituents that are monitored under Title 22 or the Basin Plan, it only includes the constituents that exceed a regulatory standard. The total list of constituents sampled in the water quality monitoring network are listed in Table 8-6. Maps with the locations of wells that exceeded the regulatory standard for any of the COC listed in Table 5-3 from 2013 to 2019 are provided in Appendix 5B.

Table 5-3. Water Quality Constituents of Concern and Exceedances

Constituent of Concern	Regulatory Exceedance Standard	Standard Units	Number of Wells Sampled for COC	Number of Wells Exceeding Regulatory Standard in Latest Sample	Percentage of Wells with Exceedances
DDW Wells (Data from January 1983 to December 2019)					
1,2,3-Trichloropropane	0.005	UG/L	36	2	6%
Beryllium	4	UG/L	35	1	3%
Chloride	500	MG/L	34	1	3%
Di(2-ethylhexyl) phthalate	4	UG/L	30	1	3%
Dinoseb	7	UG/L	34	3	9%
Iron	300	UG/L	32	6	19%
Lindane	0.2	UG/L	23	1	4%
Manganese	50	UG/L	32	4	13%
Nitrate (as nitrogen)	10	MG/L	42	5	12%
Polychlorinated Biphenyls	0.5	MG/L	19	1	5%
Specific Conductance	1600	UMHOS/CM	36	1	3%
Sulfate	500	MG/L	33	1	3%
Thallium	2	UG/L	35	1	3%
Total Dissolved Solids	1000	MG/L	33	4	12%
Vinyl Chloride	0.5	UG/L	36	4	11%
ILRP On-Farm Domestic Wells (Data from October 2012 to December 2019)					
Manganese	50	UG/L	38	2	5%
Nitrate (as nitrogen)	10	MG/L	251	162	65%
Nitrate + Nitrite (sum as nitrogen)	10	MG/L	111	62	56%
Nitrite	1	MG/L	158	1	1%
Specific Conductance	1600	UMHOS/CM	261	71	27%
Sulfate	500	MG/L	261	34	13%
Total Dissolved Solids	1000	MG/L	231	90	39%
ILRP Irrigation Supply Wells (Data from July 2012 to December 2019)					
Manganese	0.2	MG/L	48	2	4%

5.3.4 Groundwater Quality Summary

Based on the water quality information for the DDW and ILRP wells from GAMA groundwater information system, the following are the COC for drinking water supply wells in the Subbasin and will be included in the GSP monitoring program:

- 1,2 dibromo-3-chloropropane
- 1,2,3-trichloropropane
- beryllium
- chloride
- di(2-ethylhexyl) phthalate
- dinoseb
- iron
- lindane
- manganese
- nitrate (as nitrogen)
- nitrate + nitrite (sum as nitrogen)
- nitrite
- polychlorinated biphenyls
- specific conductance
- sulfate
- thallium
- total dissolved solids (TDS)
- vinyl chloride

The COC for irrigation supply wells that occur in the Subbasin and are known to cause reductions in crop production when irrigation water includes them in concentrations above agricultural water quality objectives include:

- iron
- manganese

The COC for active cleanup site listed in Table 5-2 are not part of the monitoring network described in Chapter 7. However, the status of the constituents at this site will continue to be

monitored by the DTSC or the CCRWQCB. Furthermore, the COC at this site that have a regulatory standard under Title 22 for drinking water wells, or the Basin Plan for irrigation supply wells will be monitored in the DDW and ILRP wells that are part of the monitoring network.

This GSP relies on data from existing monitoring programs to measure changes in groundwater quality. Therefore, the GSA is dependent on the monitoring density and frequency of the DDW and ILRP. The monitoring system is further defined in Chapter 7.

5.4 Subsidence

Land subsidence is the lowering of the ground surface elevation. This is often caused by pumping below thick clay layers. Land subsidence can be elastic or inelastic. Elastic subsidence consists of small lowering and rising of the ground surface that is reversible, while inelastic subsidence is generally irreversible and is the focus of this GSP.

5.4.1 Data Sources

To estimate subsidence, DWR has made Interferometric Synthetic Aperture Radar (InSAR) satellite data available on their SGMA Data Viewer web map: <https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#landsub>. These are the only data used for estimating subsidence in this GSP.

5.4.2 Subsidence Mapping

Figure 5-15 presents a map showing the average annual InSAR subsidence data in the Forebay Subbasin between June 2015 and June 2019 (DWR, 2020c). The yellow area on the map shows measured changes in ground elevation of between -0.1 and 0.1 feet per year. As discussed in Section 8.8.2.1, because of measurement error in this methodology, any measured ground level changes between -0.1 and 0.1 feet per year are not considered subsidence. The white areas on the map are areas with no data available. The map shows that no measurable subsidence has been recorded anywhere in the Subbasin.

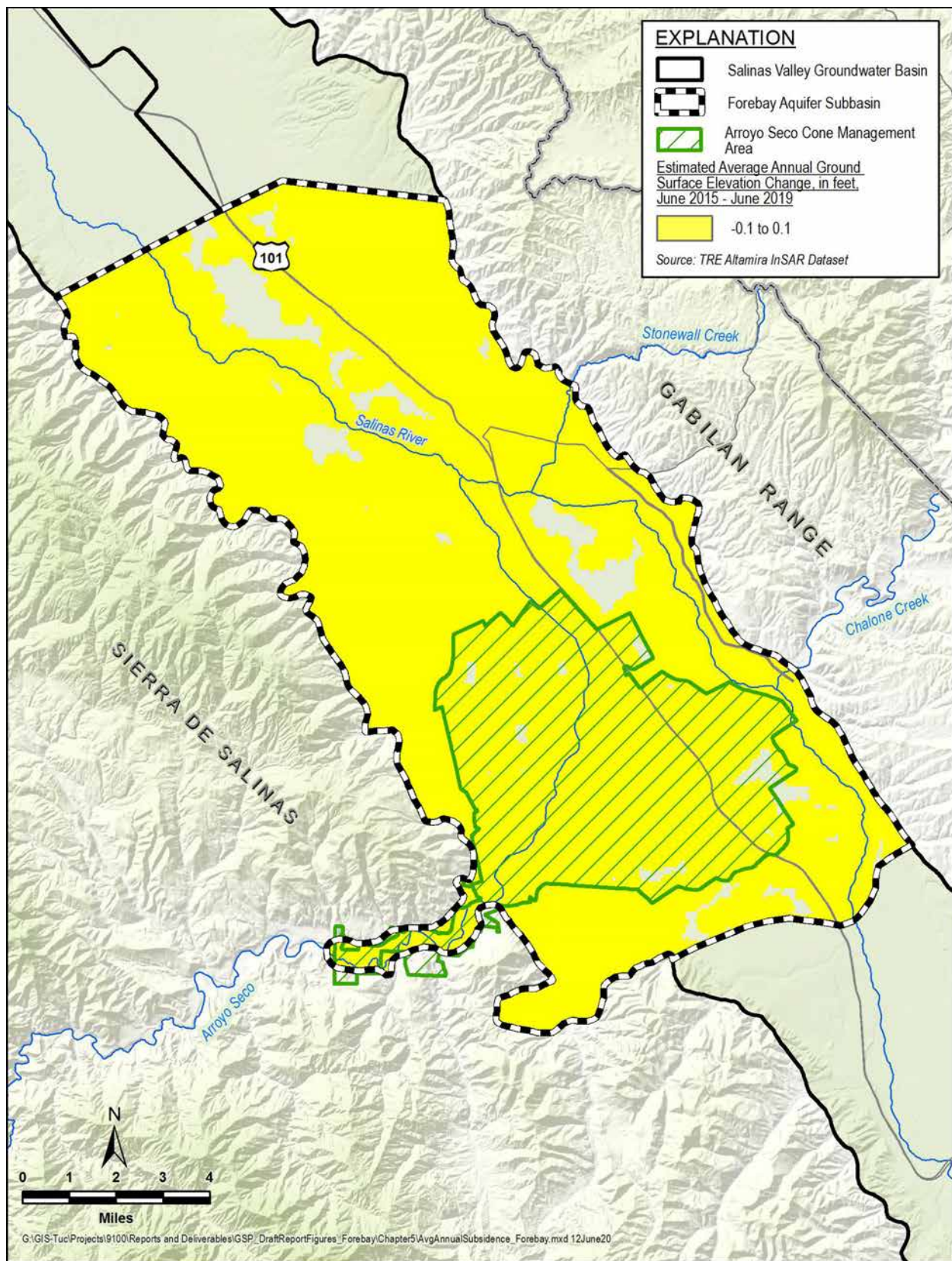


Figure 5-15. Estimated Average Annual InSAR Subsidence in Subbasin

5.5 Interconnected Surface Water

Interconnected surface water is surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completed. If groundwater elevations are higher than the water level in the stream, the stream is said to be a gaining stream because it gains water from the surrounding groundwater. If the groundwater elevation is lower than the water level in the stream, it is termed a losing stream because it loses water to the surrounding groundwater. If the groundwater elevation is below the streambed elevation, the stream and groundwater are considered to be disconnected. SGMA does not require that disconnected stream reaches be analyzed or managed. These concepts are illustrated on Figure 5-16.

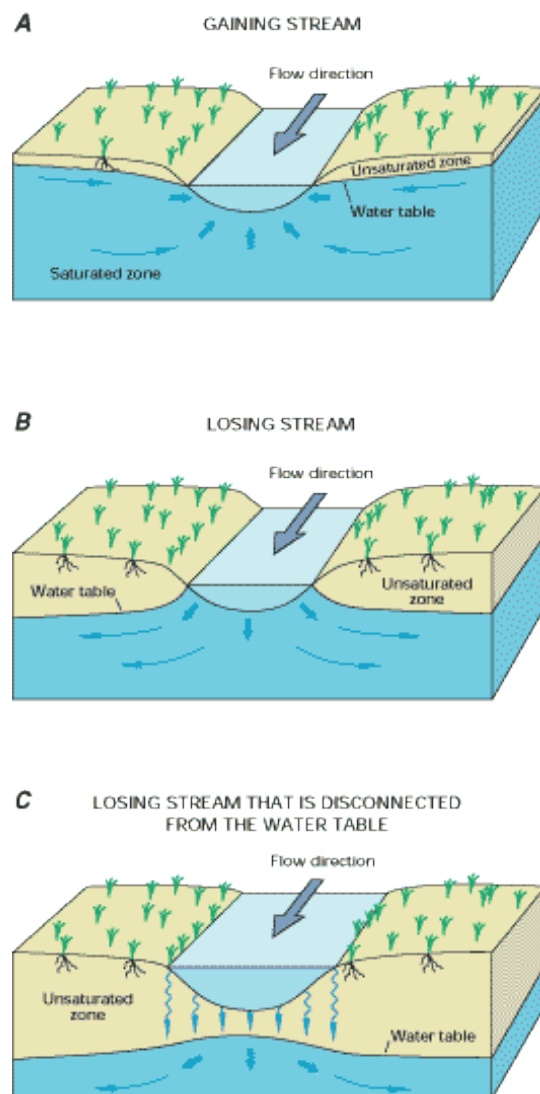


Figure 5-16. Conceptual Representation of Interconnected Surface Water
(Winter, et al., 1999)

5.5.1 Data Sources

The preliminary SVIHM is used to map the potential locations of interconnected surface water (ISW), as described in Chapter 4 and shown in Figure 4-14. There is no data that verifies the location and extent of surface water connection to groundwater, nor the extent to which groundwater extraction depletes surface water. Therefore, this section describes the hydraulic principles that establish the relationship between surface water and groundwater, upon which the current conditions and monitoring network are based.

5.5.2 Evaluation of Surface Water and Groundwater Interconnection

Groundwater extraction can alter flows between surface water and groundwater. Flow changes related to interconnected surface and groundwater could be due to reductions in groundwater discharge to surface water or increases in surface water recharge to groundwater. These 2 changes together constitute the change in the amount of surface water depletion.

Depletion of ISW is estimated by evaluating the change in the modeled stream leakage with and without pumping (i.e., water flowing from the stream into the groundwater system). A model simulation without any groundwater pumping in the model (i.e., SVIHM with no pumping) was compared to the model simulation with groundwater pumping (i.e., SVIHM with pumping). The difference in stream depletion between the 2 models is the depletion caused by the groundwater pumping. This comparison was undertaken for the entire area of the Salinas Valley included in the model and also for the Subbasin. The stream depletion differences are only estimated for the interconnected segments identified in Figure 4-14. The methodology for quantifying stream depletion is described in detail by Barlow and Leake (2012).

This analysis uses the “peak” conservation release period from June to September that reflects when most conservation releases are made, not the full April to October MCWRA conservation release period when releases can be made. Depletion of interconnected sections of the Salinas River is estimated separately for the peak conservation release period of June through September, and the non-peak conservation release period of October through May. Depletion of interconnected sections of other surface water bodies is estimated for the entire year. Table 5-4 shows the estimated annual average depletion of the interconnected surface water along the stream segments shown in Figure 4-14 due to groundwater pumping.

Table 5-4. Average SVIHM Simulated Depletion of Interconnected Surface Waters (AF/yr)

	Peak Conservation Release Period	Non-Peak Conservation Release Period
Salinas River	9,300	20,400
Other Surface Waters	2,100	

Note: provisional data subject to change²

² These data (model and/or model results) are preliminary or provisional and are subject to revision. This model and model results are being provided to meet the need for timely best science. The model has not received final approval by the U.S. Geological Survey (USGS). No warranty, expressed or implied, is made by the USGS or the U.S. Government as to the functionality of the model and related material nor shall the fact of release constitute any such warranty. The model is provided on the condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from the authorized or unauthorized use of the model.”

6 WATER BUDGETS

This chapter summarizes the estimated water budgets for the Forebay Subbasin, including information required by the GSP Regulations and information that is important for developing an effective plan to maintain sustainability. In accordance with the GSP Regulations § 354.18, this water budget provides an accounting and assessment of the total annual volume of surface water and groundwater entering and leaving the basin, including historical, current, and projected water budget conditions, and the change in the volume of groundwater in storage. Water budgets are reported in graphical and tabular formats, where applicable.

Water budgets are developed for the entire Forebay Subbasin and for the ASCMA. The ASCMA water budget is a subset of the Forebay Subbasin water budget. The Forebay Subbasin water budgets are subdivided into 2 sections: (1) historical and current water budgets, and (2) future water budgets. Within each section both a surface water budget and a groundwater budget are presented. Following the Subbasin-wide water budgets, 2 separate sections present the water budgets of the ASCMA.

6.1 Overview of Water Budget Development

The water budgets are presented in 2 subsections: (1) historical and current water budgets, and (2) future water budgets. Within each subsection a surface water budget and groundwater budget are presented.

Historical and current water budgets are developed using a provisional version of the SVIHM, developed by the USGS. The SVIHM is a numerical groundwater-surface water model that was constructed using version 2 of the MODFLOW-OWHM code (Boyce *et al.*, 2020). This code is a version of the USGS groundwater flow code MODFLOW that estimates the agricultural supply and demand, through the Farm Process.

The model area covers the Salinas Valley Groundwater Basin from the Monterey-San Luis Obispo County Line in the south to the Pajaro Basin in the north, including the offshore extent of the major aquifers. The model includes operations of the San Antonio and Nacimiento reservoirs. The SVIHM is supported by 2 sub models: a geologic model known as the Salinas Valley Geologic Model (SVGM) and a watershed model known as the Salinas Valley Watershed Model (SVWM) which uses the Hydrologic Simulation Program – Fortran (HSPF) code. The SVIHM is not yet released by the USGS. Details regarding source data, model construction and calibration, and results for historical and current water budgets will be summarized in more detail once the model and associated documentation are available. Appendix 6A includes an overview of the development and progress of the SVIHM.

The USGS has not yet submitted modeling files or documentation to Salinas Valley stakeholders for review. During the GSP development process, stakeholders who reviewed model output discovered apparent errors or inaccuracies relating to pumping amounts, groundwater storage changes, and simulated Arroyo Seco percolation. Some of the apparent errors are discussed in this chapter, and they are of a magnitude that could potentially affect conclusions or proposed management actions. Although the model was used to estimate some water budget items for this chapter, it needs more review and broader acceptance by stakeholders before it will be suitable for designing and evaluating management actions or projects.

Future water budgets are being developed using an evaluation version of the Salinas Valley Operational Model (SVOM), developed by the USGS and MCWRA. The SVOM is a numerical groundwater-surface water model constructed with the same framework and processes as the SVIHM. However, the SVOM is designed for simulating future scenarios and includes complex surface water operations in the Surface Water Operations module. The SVOM is not yet released by the USGS. Specifics regarding source data, model construction and calibration, and results for future budgets will be summarized in more detail once the model and associated documentation are available. Appendix 6A includes an overview of the SVOM, its development, and inputs.

In accordance with GSP Regulations § 354.18, a complete groundwater budget is developed for each principal aquifer, and for each water budget period. Groundwater in the Forebay Subbasin is pumped from only 1 single principal aquifer.

In addition, the ASGSA provided independent estimates of various historical water budget components. The ASGSA selected water years 1996-2009 as a representative timeframe for developing water budget component estimates. Analysis by ASGSA shows that during this period, average annual Arroyo Seco discharge and precipitation at Greenfield were close to the long-term averages.

ASGSA used 2 linked modeling tools to estimate historical water budget components. A rainfall-runoff-recharge (RRR) model simulated hydrologic processes related to soil moisture budgets on a daily basis for small zones of uniform land use, rainfall, soil type, etc. For agricultural zones, the calculations included estimates of applied water for irrigation. Where the irrigation source is groundwater, those estimates were passed to the FFM18 groundwater flow model as estimates of agricultural groundwater pumping. The RRR model simulated daily hydrology during water years 1949-2015 in 317 recharge zones ranging in size from 1.3 to 3,980 acres.

6.1.1 Water Budget Components

The water budget is an inventory of surface water and groundwater inflows and outflows from the Subbasin. A few components of the water budget can be measured, such as groundwater pumping from a metered wells and streamflow at a gaging station. Other components of the water budget are simulated by the groundwater models, such as recharge from precipitation and

applied irrigation, and change of groundwater in storage. Figure 6-1 presents a general schematic diagram of the hydrologic cycle that is included in the water budget (DWR, 2020d).

The water budgets for the Subbasin are calculated within the following boundaries:

- **Lateral boundaries.** The perimeter of the Forebay Subbasin within the SVIHM is shown on Figure 6-2. The model zone for the ASCMA is also shown on this figure.
- **Bottom.** The base of the groundwater subbasin is described in the HCM and is defined as the base of the usable and productive unconsolidated sediments (Durbin *et al.* 1978). This ranges from 200 feet below ground surface along the Gabilan Range to almost 3,000 feet deep along the Sierra de Salinas. The water budget is not sensitive to the exact definition of this base elevation because the base is defined as a depth below where there is not significant inflow, outflow, or change in storage.
- **Top.** The top of the water budget area is above the ground surface, so that surface water is included in the water budget.

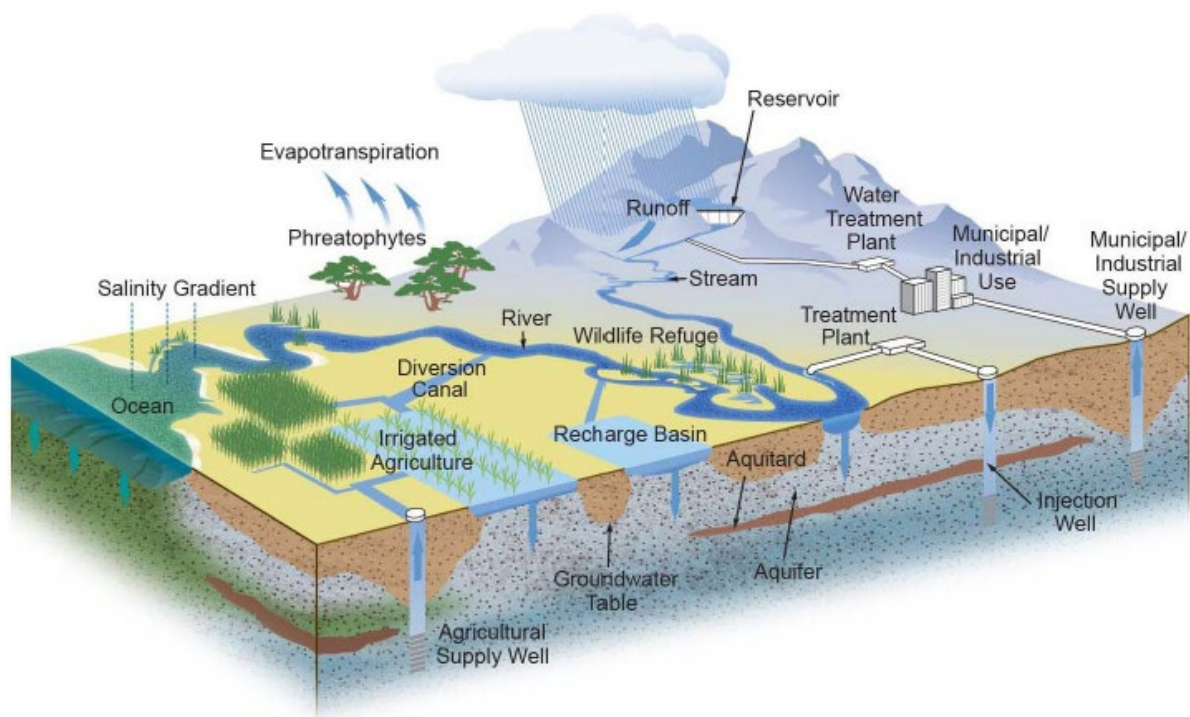


Figure 6-1. Schematic Hydrogeologic Conceptual Model (from DWR, 2020d)

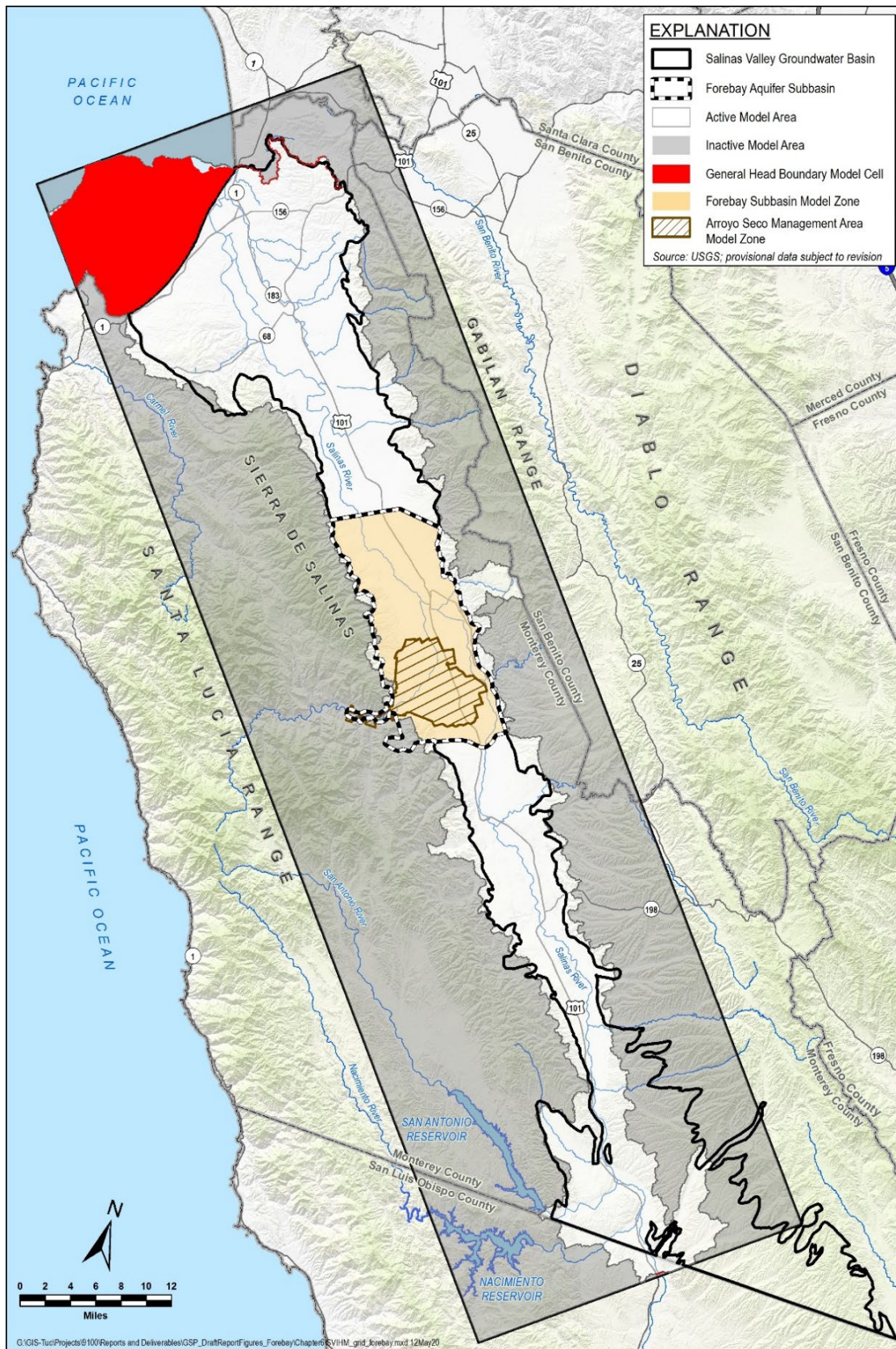


Figure 6-2. Zone and Boundary Conditions for the Salinas Valley Integrated Hydrologic Model

The Forebay Subbasin water budget includes the following components:

Surface Water Budget:

- Inflows
 - Surface water inflows from streams that enter the subbasin, including the Salinas River, Arroyo Seco, Chalone Creek, Stonewall Creek, and other smaller streams that enter the Subbasin. Reservoir operations influence Salinas River inflow; however, reservoir operations are not under the purview of the GSA.
 - Groundwater discharge to streams
- Outflows
 - Surface water outflow to neighboring subbasins along Salinas River and other smaller streams
 - Streambed recharge to groundwater
 - Direct diversions

Groundwater Budget:

- Inflows
 - Deep percolation from precipitation and applied irrigation
 - Streambed recharge to groundwater
 - Subsurface inflows including:
 - Inflow from the Upper Valley Subbasin
 - Inflow from surrounding watershed that are not in other DWR subbasins
- Outflows
 - Crop and riparian ET
 - Groundwater pumping, including both urban and agricultural
 - Groundwater discharge to streams
 - Subsurface outflows including :
 - Outflow to the Eastside Subbasin
 - Outflow to the 180/400-Foot Aquifer Subbasin

The difference between groundwater inflows and outflows is equal to the change of groundwater in storage.

6.1.2 Water Budget Time Frames

Time periods must be specified for each of the 3 required water budgets. The GSP Regulations require water budgets for historical conditions, current conditions, and projected conditions, as follows:

- The historical water budget is intended to evaluate how past land use and water supply availability has affected aquifer conditions and the ability of groundwater users to operate within the sustainable yield. GSP Regulations require that the historical water budget include at least the most recent 10 years of water budget information. DWR's Water Budget BMP document further states that the historical water budget should help develop an understanding of how historical conditions concerning hydrology, water demand, and surface water supply availability or reliability have impacted the ability to operate the basin within the sustainable yield. Accordingly, historical conditions should include the most reliable historical data that are available for GSP development and water budgets calculations.
- The current water budget is intended to allow the GSA and DWR to understand the existing supply, demand, and change in storage under the most recent population, land use, and hydrologic conditions. Current conditions are generally the most recent conditions for which adequate data are available and that represent recent climatic and hydrologic conditions. Current conditions are not well defined by DWR but can include an average over a few recent years with various climatic and hydrologic conditions.
- The projected water budget is intended to quantify the estimated future baseline conditions. The projected water budget estimates the future baseline conditions concerning hydrology, water demand, and surface water supply over a 50-year planning and implementation horizon. It is based on historical trends in hydrologic conditions which are used to project forward 50 years while considering projected climate change and sea level rise if applicable.

Although there is a significant seasonal variation between wet and dry seasons, the GSP does not consider seasonal water budgets for the groundwater budget. All water budgets are developed for complete water years. Selected time periods for the historical and current water budgets are summarized in Table 6-1 and Figure 6-3 and described in Sections 6.1.2.1 and 6.1.2.2.

Table 6-1. Summary of Historical and Current Water Budget Time Periods

Time Period	Proposed Date Range	Water Year Types Represented in Time Period	Rationale
Historical	Water Years 1980 through 2016	Dry: 11 Dry-Normal: 7 Normal: 5 Wet-Normal: 3 Wet: 11	Provides insights on water budget response to a wide range of variations in climate and groundwater use over an extensive period of record. 2017 excluded due to potential limitations of the preliminary SVIHM for that year.
Current	Water Year 2016	Dry-Normal: 1	Best reflection of current land use and water use conditions based on best available data.

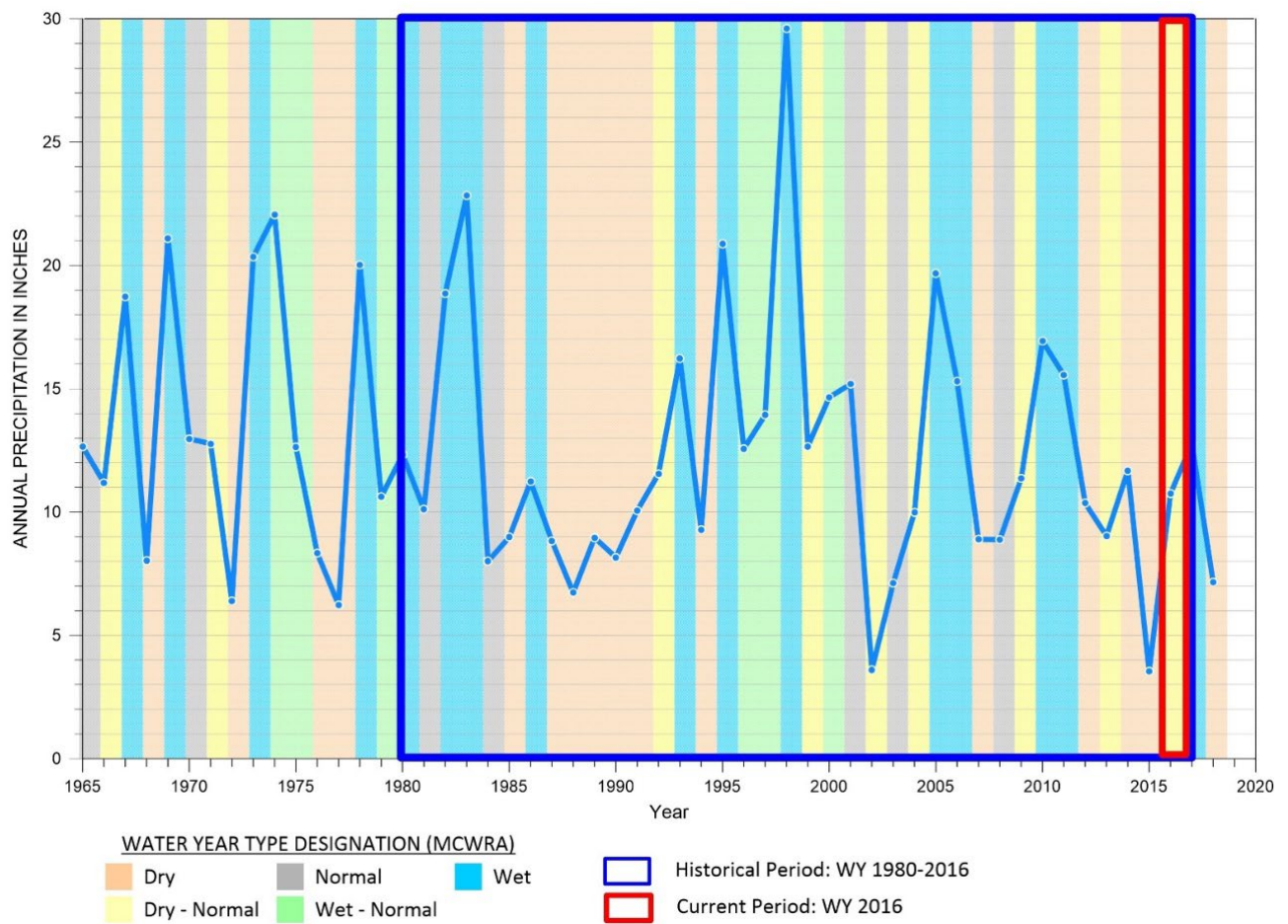


Figure 6-3. Climate and Precipitation for Historical and Current Water Budget Time Periods

6.1.2.1 Historical Water Budget Time Period

GSP Regulations §354.18 require that the historical water budget be based on at least 10 years of data. The water budget is computed using results from the SVIHM numerical model for the period from October 1980 through September 2016. Although the SVIHM simulation covers water years 1967 through 2017, model results for years prior to 1980 and the year 2017 were not used for this water budget due to potential limitations and uncertainties in the provisional SVIHM. Water years 1980 through 2016 comprise a representative time period with both wet and dry periods in the Subbasin (Table 6-1, Figure 6-3).

6.1.2.2 Current Water Budget Time Period

The current water budget time period is also computed using the SVIHM numerical model and is based on water year 2016. Water Year 2016 is classified as dry-normal and is reflective of current and recent patterns of groundwater use and surface water use. Although Water Year 2016 appropriately meets the regulatory requirement for using the “...most recent hydrology, water supply, water demand, and land use information” (23 California Code of Regulations §354.18 (c)(1)), it is noted that water year 2016 was preceded by multiple dry or dry-normal years.

6.1.2.3 Future Projected Water Budgets Time Period

Future projected conditions are based on model simulations using the SVOM numerical flow model, using current reservoir operations rules, projected climate-change scenarios, and estimated sea level rise. The projected water budget represents 47 years of future conditions. Following DWR guidance on implementing climate change factors, the future water budget simulations do not simulate a 47-year projected future, but rather simulate 47 likely hydrologic events that may occur in 2030, and 47 likely hydrologic events that may occur in 2070.

6.2 Overview of Model Assumptions for Water Budget Development

Table 6-2 provides the detailed water budget components and known model assumptions and limitations for each. A few water budget components are directly measured, but most water budget components are either estimated as input to the model or simulated by the model. Both estimated and simulated values in the water budgets are underpinned by certain assumptions. These assumptions can lead to uncertainty in the water budget. However, inputs to the preliminary SVIHM were carefully selected by the USGS and cooperating agencies using best available data, reducing the level of uncertainty.

In addition to the model assumptions, additional uncertainty stems from any model’s imperfect representation of natural condition and level of calibration. The water budgets for the Forebay Subbasin are based on a preliminary version of the SVIHM, with limited documentation of model construction. The model is in internal review at the USGS, and a final version will likely

not be released to the SVBGSA until after the GSP is submitted. Nonetheless, the SVIHM's calibration error is within reasonable bounds. Therefore, the model is the best available tool for estimating water budgets for the GSP.

As GSP implementation proceeds, the SVIHM will be updated and recalibrated with new data to better inform model simulations of historical, current, and projected water budgets. Model assumptions and uncertainty will be described in future updates to this chapter after model documentation is released by the USGS.

Table 6-2. Summary of Water Budget Component Data Source from the Salinas Valley Integrated Hydrologic Model

Water Budget Component	Source of Model Input Data	Limitations
Precipitation	Incorporated in calibrated model as part of land use process	Estimated for missing years
Surface Water Inflows		
Inflow from Streams Entering Basin	Simulated from calibrated model for all creeks	Not all creeks are gauged
Groundwater Discharge to Streams	Simulated from calibrated model	Based on calibration of streamflow to available data from gauged creeks
Overland Runoff	Simulated from calibrated model	Based on land use, precipitation, and soils specified in model
Surface Water Outflows		
Streambed Recharge to Groundwater	Simulated from calibrated model	Based on calibration of streamflow to available data from gauged creeks and groundwater level data from nearby wells
Diversions	Model documentation not available at this time	Based on calibration of streamflow to available data from gauged creeks
Outflow to Streams Leaving Basin	Simulated from calibrated model for all creeks	Not all creeks are gauged
Groundwater Inflows		
Streambed Recharge to Groundwater	Simulated from calibrated model	Based on calibration of streamflow to available data from gauged creeks and groundwater level data from nearby wells
Deep percolation of irrigation water	Simulated from demands based on crop, acreage, temperature, and soil zone processes	No measurements available; based on assumed parameters for crops and soils
Subsurface Inflow from Adjacent basins	Simulated from calibrated model	Limited groundwater calibration data at adjacent subbasin boundaries
Subsurface Inflow from surrounding watershed other than neighboring basins	Simulated from calibrated model	Limited groundwater calibration data at adjacent subbasin boundaries
Groundwater Outflows		
Groundwater Pumping	Reported data for historical municipal and agricultural pumping, and some small water systems. Model documentation not available at this time.	Water budget pumping reported herein is from the SVIHM and might contain errors. Domestic pumping not simulated in model
Groundwater Discharge to Streams	Simulated from calibrated model	Based on calibration of streamflow to available data from gauged creeks and groundwater level data from nearby wells
Subsurface Outflow to Adjacent Basins	Simulated from calibrated model	Limited calibration data at adjacent subbasin boundaries
Riparian ET	Simulated from calibrated model	Based on representative plant group and uniform extinction depth

6.3 Historical and Current Water Budgets

Water budgets for the historical and current periods are presented below. The surface water budgets are presented first, followed by the groundwater budgets. These results are based on the provisional SVIHM and are subject to change in the future. Water budgets will be updated in future GSP updates after the SVIHM is formally released by the USGS.

6.3.1 Historical and Current Surface Water Budget

The surface water budget accounts for the inflows and outflows for the streams within the Subbasin. This includes streamflows of rivers and tributaries entering and exiting the Subbasin, overland runoff to streams, diversions from streams, and stream-aquifer interactions. ET by riparian vegetation along stream channels is estimated by the provisional SVIHM as part of the groundwater system and is accounted for in the groundwater budget.

Figure 6-4 shows the surface water network simulated in the provisional SVIHM. The network includes the Salinas River, Arroyo Seco, and other streams in the Subbasin. For this water budget, boundary inflows and outflows are the sum of all locations that cross the Subbasin boundary.

Figure 6-5. shows the surface water budget for the historical period, which also includes the current period. Table 6-3 shows the average values for components of the surface water budget for the historical and current periods, respectively. Positive values are inflows into the stream system, and negative values are outflows from the stream system. Boundary inflows and outflows dominate the surface water budget in all but the driest years. The flow between surface water and groundwater in the Subbasin is generally net negative, which indicates more seepage from the streams to groundwater, rather than discharge of groundwater to streams.

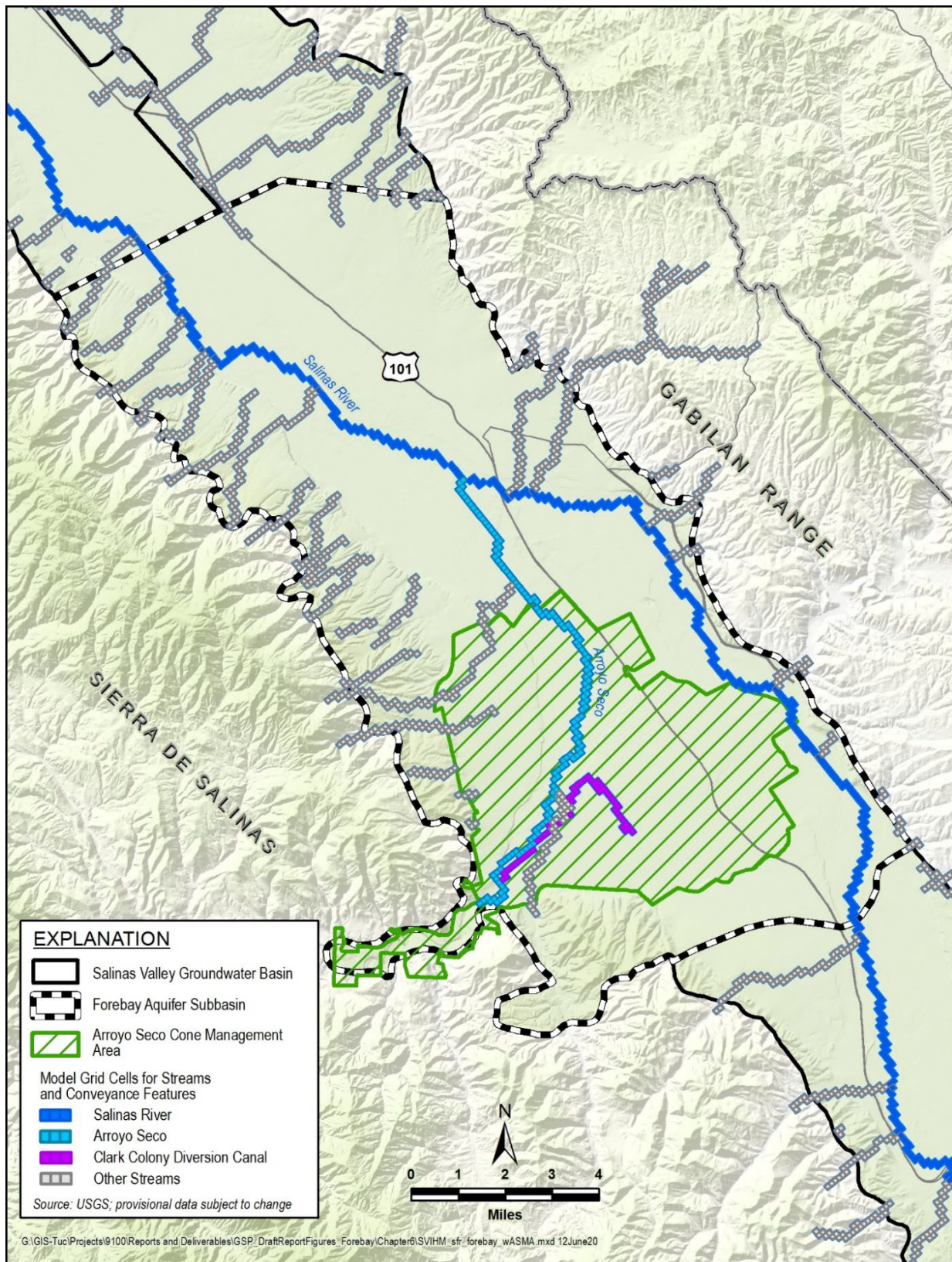


Figure 6-4. Surface Water Network in Forebay Aquifer Subbasin from the Salinas Valley Integrated Hydrologic Model

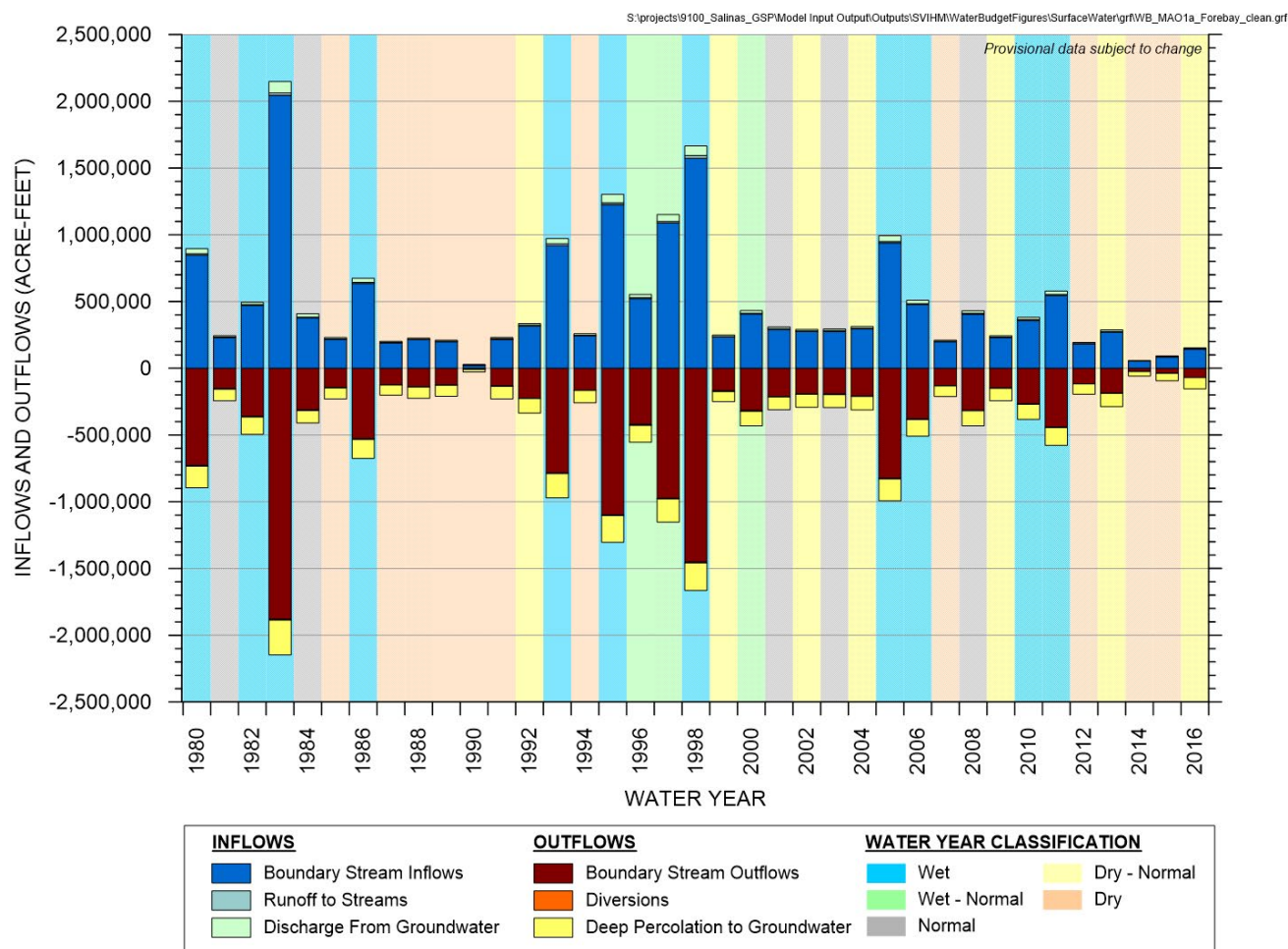


Figure 6-5. Historical and Current Surface Water Budget

Table 6-3. SVIHM Simulated Surface Water Budget Summary (AF/yr)

	Historical Average (WY 1980-2016)	Current (WY 2016)
Overland Runoff to Streams	6,800	5,100
Boundary Stream Inflows	465,200	143,500
Net Flow between Surface Water and Groundwater	-90,300	-77,800
Boundary Stream Outflows	-377,400	-69,500
Diversions from Streams	-4,200	-1,300

Note: provisional data subject to change.

Table 6-4 summarizes the average net flow between surface water and groundwater along selected streams in the Subbasin. Selected streams include the Salinas River, Arroyo Seco, Clark Colony canal, and the sum of all other smaller streams that are primarily along the basin margins. According to provisional results of the SVIHM, most streambed seepage occurs along the Salinas River and Arroyo Seco channels, with relatively minor amounts of seepage from Clark Colony diversions or other streams.

Table 6-4. SVIHM Simulated Net Flow Between Surface Water and Groundwater for Selected Streams (AF/yr)

	Historical Average (WY 1980-2016)	Current (WY 2016)
Salinas River	-71,700	-49,100
Arroyo Seco	-18,400	-20,700
Clark Colony Diversion	0	0
Other Streams	-200	-8,000

Note: provisional data subject to change.

Table 6-6 summarizes the average net flow between surface water and groundwater along the Salinas River for periods of reservoir releases during the water year. June through September (4 months) is when peak conservation releases from the reservoirs occur and the majority of the flow in the river during this period are due to conservation releases. Flows during the non-peak conservation release period of October through May (8 months) are generally not associated with conservation releases; however, conservation releases can be made from April to October. Conservation releases are releases made to supply the basin with groundwater recharge and the SRDF. The estimated historical average rate of flow from surface water to groundwater (seepage along the Salinas River channel) is about 6,000 AF/month during both reservoir release periods. However, the current rate of seepage to groundwater is larger during the non-conservation release period than the conservation release period: 4,900 AF/month and 2,500 AF/month, respectively. It is important to note that these results are provisional and uncertain and are subject to change in future GSP updates after the SVIHM is released by the USGS.

Table 6-5. SVIHM Simulated Net Flow Between Surface Water and Groundwater for Salinas River for Reservoir Release Periods (AF/yr)

Reservoir Release Period	Historical Average (WY 1980-2016)	Current (WY 2016)
Peak Conservation Release Period (June through September)	-23,100	-9,800
Non-Peak Conservation Release Period (October through May)	-48,600	-39,200

Note: provisional data subject to change.

6.3.2 Historical and Current Groundwater Budget

The groundwater budget accounts for the inflows and outflows to and from the Subbasin's aquifers, based on results from the SVIHM. This includes inflows and outflows of groundwater at the Subbasin boundaries, recharge, pumping, ET, and net flow between surface water and groundwater.

SVIHM estimated annual inflows to the groundwater system for the historical and current time periods are shown on Figure 6-6. Table 6-6 provides average groundwater inflows for the historical and current period. Total inflow varies greatly year to year, principally due to variations in streambed seepage. In every year of the historical period except for water year 1990, the largest source of groundwater inflow in the Forebay Subbasin is streambed seepage.

Figure 6-7 shows the SVIHM estimated outflows from the groundwater system for the historical and current time periods. Outflows vary from year to year; however, the annual variation is dampened compared to the inflows. Groundwater pumping, which includes municipal, industrial, and agricultural water, is the largest outflow in the subbasin. Table 6-7 provides annual averages for SVIHM estimated groundwater outflows of the historical and current period. Subsurface outflows and agricultural pumping for the current period are similar to the historical average; however, the decrease in estimated discharge to streams and ET from riparian vegetation suggests that groundwater levels along the streams are lower during the current period than historical average conditions.

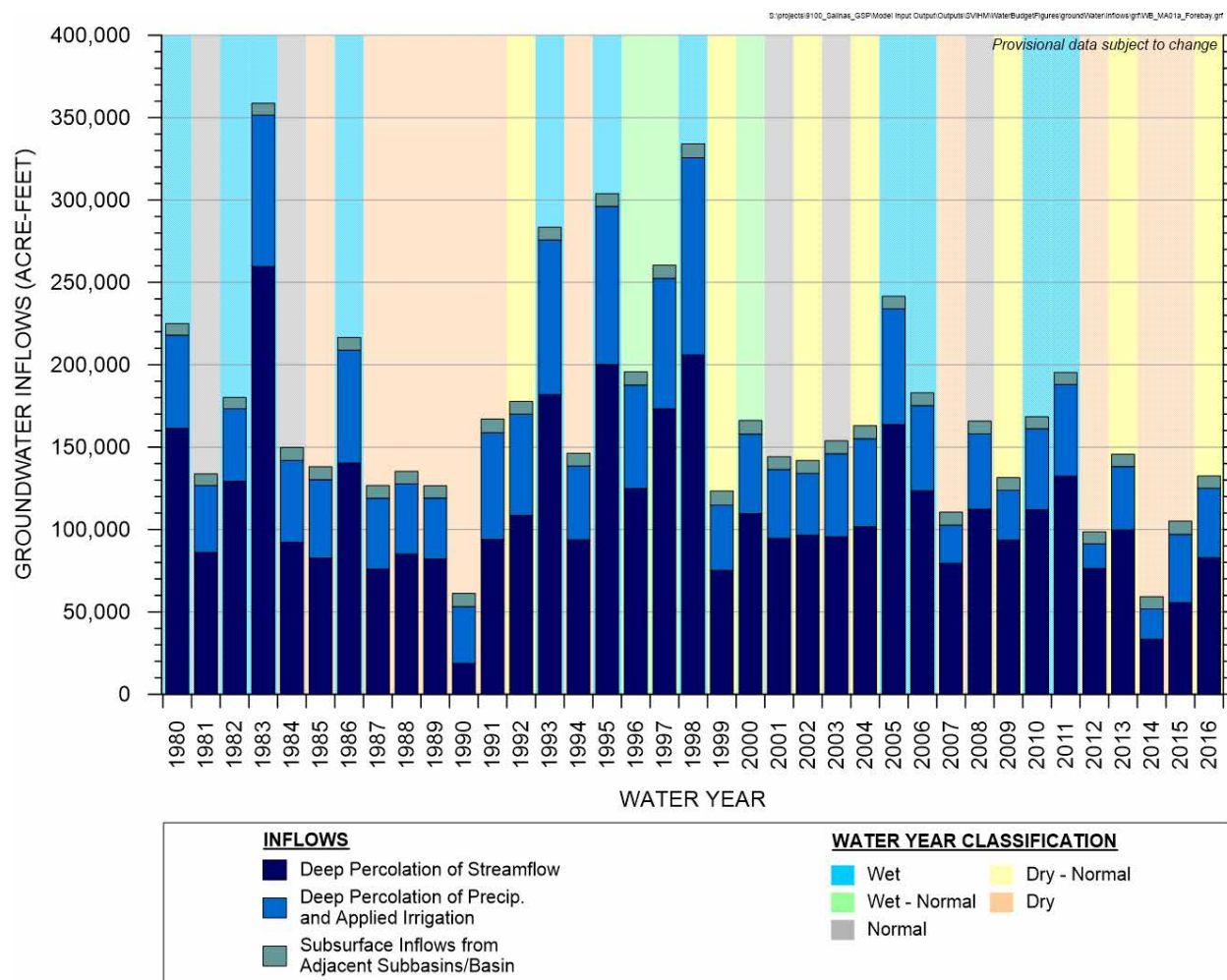


Figure 6-6. SVIHM Simulated Inflows to the Groundwater System

Table 6-6. SVIHM Simulated Groundwater Inflows Summary (AF/yr)

	Historical Average (WY 1980-2016)	Current (WY 2016)
Deep Percolation of Precipitation and Applied Water	52,200	42,200
Deep Percolation of Streamflow	111,700	82,800
Subsurface Inflow from Adjacent Subbasin	7,700	7,600

Note: provisional data subject to change.

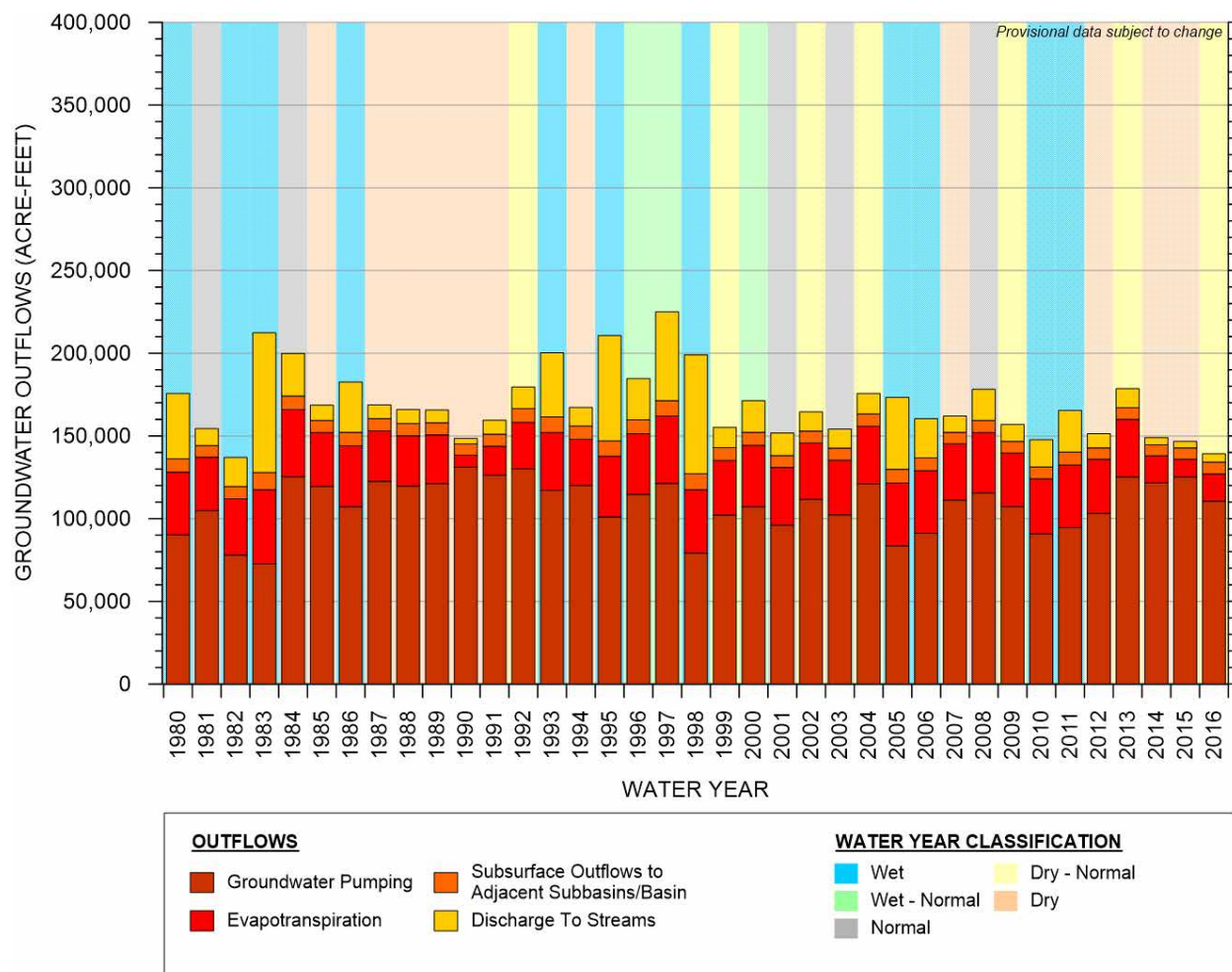


Figure 6-7. SVIHM Simulated Outflows from the Groundwater System

Table 6-7. SVIHM Simulated and Adjusted Groundwater Outflows Summary (AF/yr)

	Simulated Historical Average (WY 1980-2016)	Simulated Current (WY 2016)	Adjusted Historical Average (WY 1980-2016)	Adjusted Current (WY 2016)
Groundwater Pumping	-108,600	-110,700	-167,100	-170,300
Groundwater Evapotranspiration	-32,100	-16,400	-32,100	-16,400
Subsurface Outflow to Adjacent Subbasins/Basin	-7,800	-7,200	-7,800	-7,200
Discharge to Streams	-21,400	-5,100	-21,400	-5,100

Note: Provisional data subject to change.
Adjusted pumping is described below.

ASGSA modeling estimated the annual agricultural applied water in the Forebay Subbasin averaged 149,124 AF/yr during water years 1996-2009. This includes 6,287 AF/yr of surface water delivered by CCWC in the ASCMA. Subtracting this surface water from the 149,124 AF/yr yields 142,837 AF/yr of groundwater pumping for irrigation in the Subbasin.

Comparing SVIHM and ASGSA data to GEMS data reveals that, on average, the preliminary SVIHM estimates only approximately 65% of the pumping reported in the GEMS database for the Subbasin between 1995 and 2016. The ASGSA model estimates of pumping were more accurate than the SVIHM estimates, accounting for approximately 90% of the annual average 158,400 AF/yr of agricultural pumping recorded in the GEMS database between 1996 and 2009.

The GEMS data are likely more representative of historical conditions than the model generated pumping numbers; however, reliable GEMS data are only available since 1995. To accurately estimate groundwater extraction for the full historical period, this 65% ratio was applied to the SVIHM estimated historical pumping shown in Table 6-8, yielding an estimated historical average pumping rate of 167,100 AF/yr. The average 1995-2016 extraction in the GEMS database is 158,400 AF/yr. Pumping values from the SVIHM and GEMS are shown on Table 6-8, along with the adjusted pumping values used for the sustainable yield estimates.

Figure 6-8 and Table 6-8 show SVIHM simulated groundwater pumping by water use sector. These show that more than 90% of pumped groundwater is used for agricultural purposes. Municipal and agricultural pumping are simulated in the SVIHM; however, domestic pumping, including *de minimis* pumping, is not included in the model. The SVIHM does not simulate domestic pumping because it is a relatively small portion of overall groundwater pumping in the larger Salinas Valley Basin. Thus, domestic use from privately owned wells is assumed to be negligible and is not included in the model for the Subbasin. Current municipal and industrial pumping is less than the historical average. Table 6-8 shows this trend in the simulated data and the GEMS data, respectively. The simulated historical average in Table 6-8 is not strictly comparable to the GEMS historical average because the time periods used to calculate the averages are different; however, the ratio between these values is used to adjust simulated pumping to be more consistent with GEMS data.

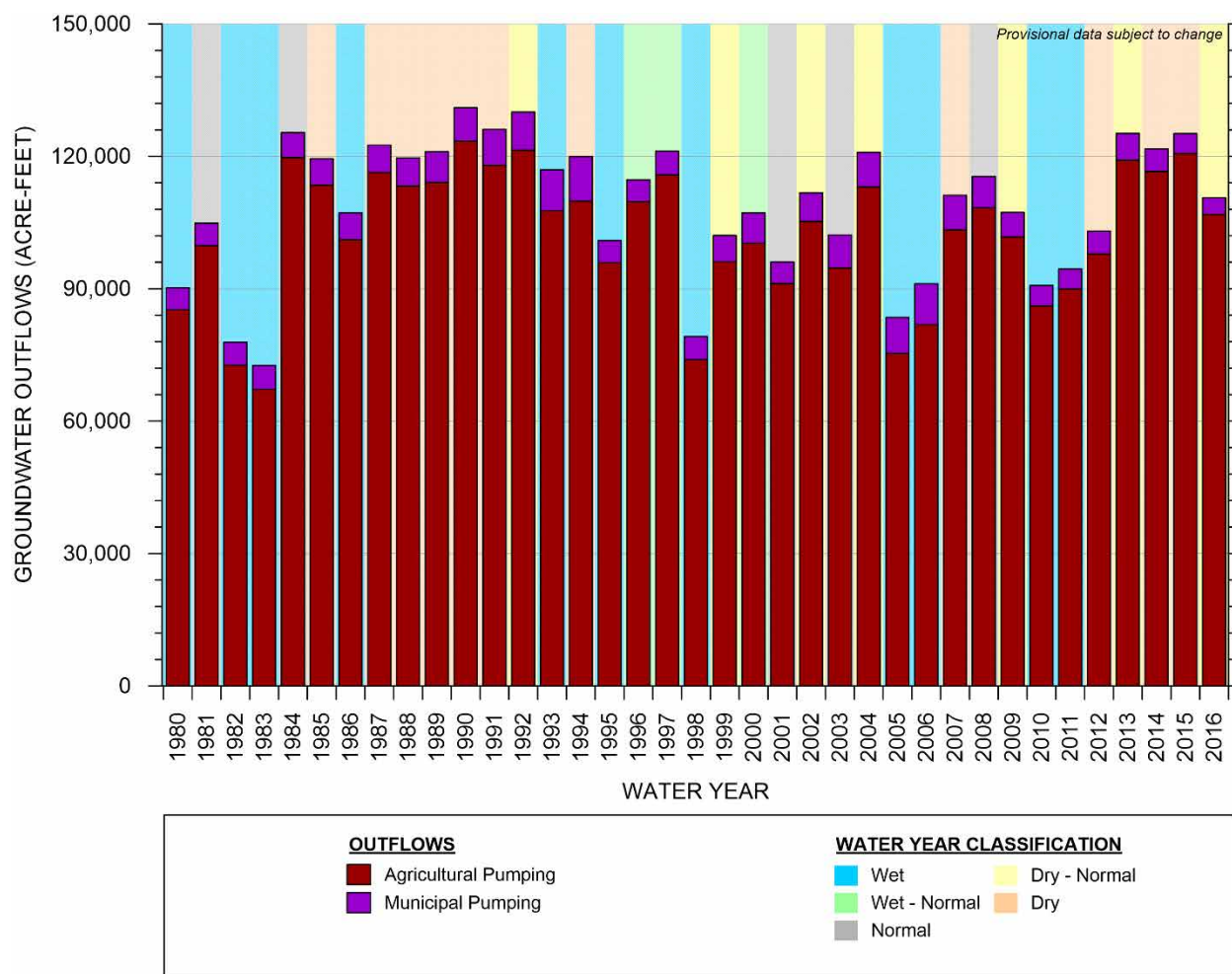


Figure 6-8. SVIHM Simulated Groundwater Pumping by Water Use Sector

Table 6-8. SVIHM Simulated and Adjusted Groundwater Pumping by Water Use Sector (AF/yr)

	Simulated Historical Average (WY 1980-2016)	Simulated Current (WY 2016)	GEMS Historical Average (WY 1995-2016)	GEMS Current (WY 2016)	Adjusted Historical Average (WY 1980-2016)	Adjusted Current (WY 2016)
Municipal and Industrial	-6,300	-3,800	-7,000	-4,900	-9,700	-5,800
Agricultural	-102,300	-106,900	-155,600	-153,500	-157,400	-164,500
Total Pumping	-108,600	-110,700	-162,600	-158,400	-167,100	-170,300

Note: SVIHM data are provisional and subject to change. Adjusted agricultural pumping is based on the ratio between SVIHM and GEMS agricultural pumping, as described in text above.

Figure 6-9 shows SVIHM estimated net subsurface flows entering and exiting the Subbasin by watershed and neighboring subbasins. Table 6-9 shows SVIHM estimated historical mean and current year subsurface flows. Subsurface inflows and outflows in the Subbasin are about equal. The largest source of inflow is from the Upper Valley Subbasin and the largest sink for outflow is the 180/400-Foot Aquifer Subbasin.

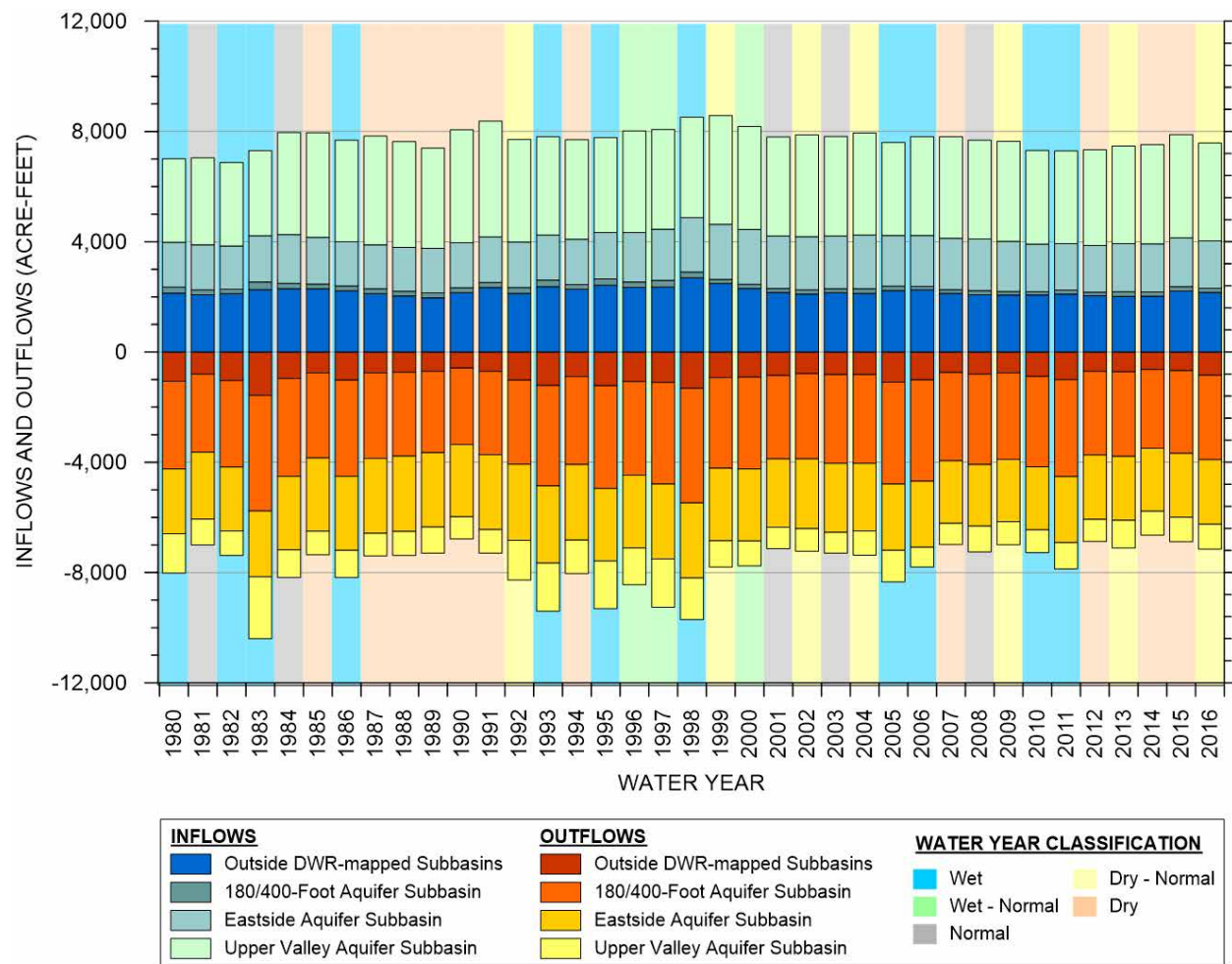


Figure 6-9. SVIHM Simulated Subsurface Inflows and Outflows from Watershed Areas and Neighboring Subbasin

Table 6-9. SVIHM Simulated Net Subbasin Boundary Flows (AF/yr)

	Historical Average (WY 1980-2016)	Current (WY 2016)
Upper Valley Subbasin	2,500	2,600
Eastside Subbasin	-800	-600
180/400-Foot Aquifer Subbasin	-3,100	-2,900
Outside Areas	1,300	1,300

Note: provisional data subject to change

Change in groundwater storage is equal to inflow to storage minus outflows from storage. A negative change in groundwater storage value indicates groundwater storage depletion associated with lower groundwater levels; while a positive value indicates groundwater storage accretion associated with higher groundwater levels. Averaged over the historical period, the preliminary SVIHM estimates that the Forebay Subbasin has a surplus of groundwater of about 1,800 AF/yr; however, simulated change in storage contains significant variability and uncertainty. Figure 6-9 shows considerable variability in change in storage from one year to the next. In water year 2016, outflows exceeded inflows by more than 6,600 AF, while in 1983 inflows exceeded outflows by roughly 147,000 AF. These results are provisional and subject to change in future updates of the GSP after the SVIHM is officially released to the public. ASGSA used the FFM18 model to develop an alternative estimate of storage change. During 1996-2009, the FFM18 model calculated an average annual storage change of -3,729 AF/yr for the entire Forebay Subbasin.

The cumulative simulated change in storage line on Figure 6-10 shows that during the 37-year historical period, the basin was in overdraft during only 3 years, and there is no observable trend indicating a chronic decline in groundwater storage. Therefore, although estimated change in storage from observed groundwater level indicate historical annual overdraft, as described in Section 5.2.2, and the SVIHM estimated historical change in storage indicates annual surplus, the Subbasin is not considered to have been historically in overdraft, and this GSP considers the historical average change in storage to be zero.

6.3.3 Historical and Current Groundwater Budget Summary

The main groundwater inflows into the subbasin are: (1) the percolation of precipitation and applied agricultural irrigation water and (2) streambed recharge. Groundwater pumping is the predominant groundwater outflow. The smaller outflow terms are ET, discharge to streams, and subsurface outflows to adjacent subbasins.

Figure 6-10 shows the entire groundwater water budget from the SVIHM and includes the annual change in groundwater storage. Changes in groundwater storage are strongly correlated with changes in deep percolation of precipitation, applied irrigation water, and streamflow. For example, 1983 and 1998 were comparatively very wet years and represent the greatest increase in deep percolation (recharge) and, correspondingly, the greatest increase in groundwater storage over the historical period. Estimated cumulative groundwater storage increased in response to wet periods and declined in response to dry periods.

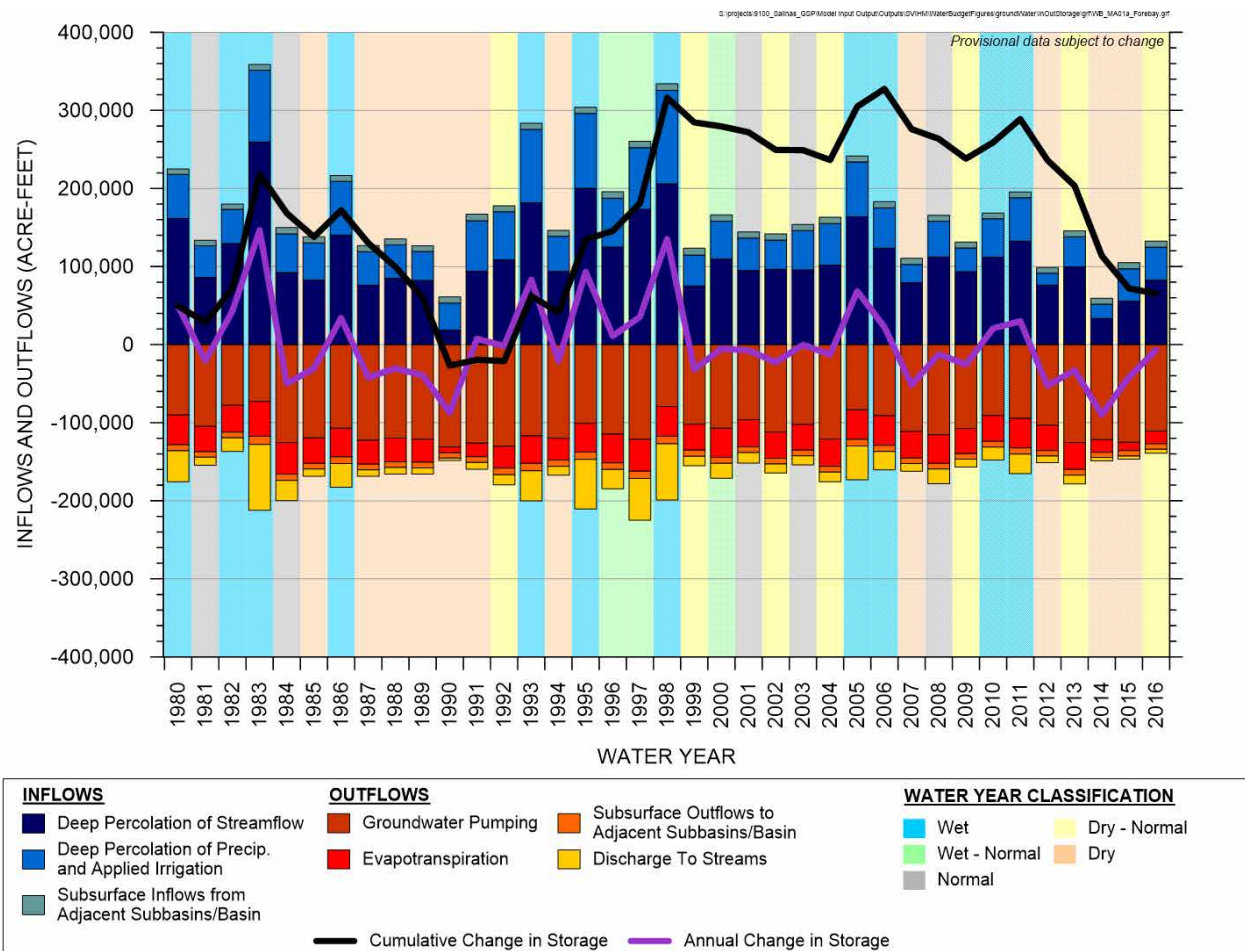


Figure 6-10. SVIHM Simulated Historical and Current Groundwater Budget

The SVIHM estimated the historical annual gain in storage to be 1,800 AF/yr. However, this surplus is no consistent with measured groundwater levels, and this GSP considers the average annual historical change in storage to be zero, as explained above.

A comparison of the historical and current groundwater budgets is shown in Table 6-10. The values in the table are based on the inflows and outflows presented in previous tables. This table is informative in showing the relative magnitude of various water budget components; however, these results are based on a provisional model that might contain errors. The results will be updated in future updates to this GSP after the SVIHM is completed and released by the USGS.

Table 6-10. Summary of Groundwater Budget (AF/yr)

	Historical Average (WY 1980-2016)	Current (WY 2016)
Groundwater Pumping	-167,100	-170,300
Flows to Drains	0	0
Net Stream Exchange (gain from streams)	90,300	77,800
Deep Percolation	52,200	42,200
Net flow to Adjacent Subbasins/Basin	0	400
Groundwater Evapotranspiration	-32,100	-16,400
Net Storage Gain (+) or Loss (-)	0	-6,600

Note: provisional data subject to change. The historical average net storage value is the estimated historical overdraft, as described in Section 6.3.2. Water budget error, as reflected in change in storage, for the historical average period is 33%, which is considered unreasonably large and will be addressed and improved in future updates to the GSP.

6.3.4 Historical and Current Sustainable Yield

The historical and current sustainable yields reflect the amount of Subbasin-wide pumping reduction needed to balance the water budget, resulting in no net decrease in storage. The sustainable yield can be estimated as:

$$\text{Sustainable yield} = \text{pumping} + \text{change in storage}$$

For this sustainable yield discussion and associated computations, groundwater pumping outflows are reported as positive values, which is opposite of how the values are reported in the water budget tables.

Table 6-11 provides estimates of the historical sustainable yield using the GEMS derived historical pumping. The cumulative change in storage line on Figure 6-10 shows that during the 37-year historical period, the basin was in overdraft during only three 3 years, and there is no observable trend indicating a chronic decline in groundwater storage. Therefore, the Subbasin has historically not been in overdraft, and the average change in storage for the calculations in Table 6-11 is set to zero.

Because the Subbasin has not historically been in overdraft, it is impossible to estimate the historical sustainable yield. Therefore, Table 6-11 presents a likely range of sustainable yields. This range represents plus and minus 1 standard deviation around the average GEMS reported pumping between 1995 and 2016. These values are the likely range of the minimum sustainable yield of the subbasin. This GSP adopts the range of likely minimum sustainable yields as the best estimate for the Subbasin.

Table 6-11. Historical Sustainable Yield for the Forebay Aquifer Subbasin Derived from GEMS and Adjusted Change in Storage (AF/yr)

	Low Historical Average (WY 1995-2016)	High Historical Average (WY 1995-2016)
Total Subbasin Pumping	150,900	174,300
Change in Storage	0	0
Estimated Sustainable Yield	150,900	174,300

Note: Pumping is shown as positive value for this computation.

6.4 Projected Water Budgets

Projected water budgets are extracted from the SVOM, which simulates future hydrologic conditions with assumed climate change. Two projected water budgets are presented, 1 incorporating estimated 2030 climate change projections and 1 incorporating estimated 2070 climate change projections.

The climate change projections are based on data provided by DWR (2018). Projected water budgets are useful for showing that sustainability will be maintained for the 20-year implementation period and maintained over the 50-year planning and implementation horizon. The projected water budgets are based on a provisional version of the SVOM and are subject to change. Model information and assumptions summarized in this section of the report are based on provisional documentation on the model. Additional information will be provided in future GSP updates after the model is released by the USGS.

6.4.1 Assumptions Used in Projected Water Budget Development

The assumptions incorporated into the SVOM for the projected water budget simulations include:

- **Land Use:** The land use is assumed to be static, aside from a semi-annual change to represent crop seasonality. The annual pattern is repeated every year in the model. Land use specified in the model by USGS reflects the 2014 land use.
- **No urban growth** is included in this simulation to remain consistent with USGS assumptions. If urban growth is infill, this assumption may result in an underestimate of net pumping increases and an underestimate of the Subbasin's future extraction. If urban growth replaces agricultural irrigation, the impact may be minimal because the urban growth will replace existing agricultural water use.
- **Reservoir Operations:** The reservoir operations reflect MCWRA's current approach to reservoir management, as described in MCWRA's Nacimiento Dam Operation Policy (MCWRA, 2018b).

- **Stream Diversions:** The SVOM explicitly simulates only 2 stream diversions in the Salinas Valley Basin: Clark Colony and the Salinas River Diversion Facility (SRDF). The Clark Colony diversion is located along Arroyo Seco, and diverts stream water to an agricultural area nearby. The SRDF came online in 2010, and diverts water from the Salinas River to the Castroville Seawater Intrusion Project (CSIP) area. Clark Colony diversions are repeated from the historical record to match the water year. SRDF diversions are made throughout the duration of the SVOM whenever reservoir storage and streamflow conditions allow during the months of April through October.
- **Recycled Water Deliveries:** Recycled water has been delivered to the CSIP area since 1998 as irrigation supply. The SVOM includes recycled water deliveries throughout the duration of the model but may not include all sources of recycled water.

6.4.1.1 Future Projected Climate Assumptions

Several modifications were made to the SVOM in accordance with recommendations made by DWR in their *Guidance for Climate Change Data Use During Groundwater Sustainability Plan Development* (2018). Three types of datasets were modified to account for 2030 and 2070 projected climate change: climate data including precipitation and reference ET, streamflow, and sea level.

Climate Data. This GSP uses the climate change datasets provided by DWR for use by GSAs. The climate scenarios were derived by taking the historical interannual variability from 1915 through 2011 and increasing or decreasing the magnitude of events based on projected changes in precipitation and temperature from general circulation models. These datasets of climate projections for 2030 and 2070 conditions were derived from a selection of 20 global climate projections recommended by the Climate Change Technical Advisory Group as the most appropriate projections for California water resources evaluation and planning. Because the DWR climate datasets are only available through December 2011, and the SVOM uses a climate time series through December 2014, monthly change factors for January 2012 to December 2014 are assumed. DWR provided climate datasets for central tendency scenarios, as well as extreme wet and dry scenarios; the future water budgets described herein are based on the DWR central tendency scenarios for 2030 and 2070. Historical data were analyzed from the Salinas Airport precipitation gauge record to identify years from 1968 to 2011 that were most similar to conditions in 2012, 2013 and 2014. As a result, projected climate data from 1981, 2002, and 2004 are applied as the climate inputs for 2012, 2013, and 2014, respectively.

The modified monthly climate data for the entire model period are applied as inputs to the model, which reads precipitation and potential ET data on a monthly basis.

Streamflow. DWR provided monthly change factors for unimpaired streamflow throughout California. For the Salinas Valley and other areas outside of the Central Valley, these change

factors are provided as a single time series for each major watershed. Streamflows along the margins of the Basin are modified by the monthly change factors. As with the climate data, an assumption is required to extend the streamflow change factor time series through December 2014. It is assumed that the similarity in rainfall years at the Salinas Airport rainfall gauge could reasonably be expected to produce similar amounts of streamflow; therefore, the same years (1981, 2002, and 2004) are repeated to represent the 2012, 2013, and 2014 streamflows.

Sea Level. DWR guidance recommends using a single static value of sea level rise for each of the climate change scenarios (DWR, 2018). For the 2030 climate change scenario, the DWR-recommended sea level rise value of 15 centimeters is used. For the 2070 climate change scenario, the DWR-recommended sea level rise value of 45 centimeters is used. The amount of sea level rise is assumed to be static throughout the duration of each of the climate change scenarios.

6.4.2 Projected Surface Water Budget

Average projected surface water budget inflows and outflows for the simulation period with 2030 and 2070 climate change assumptions are quantified in Table 6-12. As with the historical period, the largest components projected surface water budget are boundary outflows and inflows.

Table 6-12. SVOM Simulated Average Surface Water Inflow and Outflow Components for Projected Climate Change Conditions (AF/yr)

Projected Climate Change Timeframe	2030	2070
Overland Runoff to Streams	7,100	7,700
Boundary Inflows	516,100	564,200
Diversions from Streams	-4,000	-4,100
Net Flow between surface water and groundwater	-103,200	-105,700
Boundary Outflows	-416,000	-462,200

Note: provisional data subject to change.

Table 6-13 summarizes the average net flow between surface water and groundwater along the Salinas River and tributaries for simulation period with 2030 and 2070 climate change assumptions for the reservoir release periods previously described. Streambed seepage during the non-peak conservation release period is projected to be about the same as current rates; however, the seepage rate during peak conservation release period is projected to substantially increase as compared to the current rate. It is important to note that these results are provisional and uncertain and are subject to change in future GSP updates after the SVIHM is released by the USGS.

Table 6-13. SVOM Simulated Net Flow Between Surface Water and Groundwater for Reservoir Release Periods for the Projected Climate Change Conditions (AF/yr)

Reservoir Release Period	2030	2070
Peak Conservation Release Period (June through September)	-29,600	-30,400
Non-Peak Conservation Release Period (October through May)	-73,200	-74,900

Note: provisional data subject to change.

6.4.3 Projected Groundwater Budget

Average projected groundwater budget inflows for the simulation period with 2030 and 2070 climate change assumptions are quantified in Table 6-14. In both the 2030 and 2070 simulations, the biggest contributor to groundwater inflows is projected to be deep percolation of streamflow.

Table 6-14. SVOM Simulated Average Groundwater Inflow Components for Projected Climate Change Conditions (AF/yr)

Projected Climate Change Timeframe	2030	2070
Deep Percolation of Streamflow	104,600	107,000
Deep Percolation of Precipitation and Irrigation	53,100	57,500
Underflow from Eastside Subbasin	1,800	2,000
Underflow from Surrounding Watersheds	2,000	2,200
Underflow from 180/400-Foot Aquifer Subbasin	200	200
Underflow from Upper Valley Subbasin	2,800	2,800
Total Inflow	164,500	171,700

Note: provisional data subject to change.

Average SVOM projected groundwater budget outflows for the simulation period with 2030 and 2070 climate change assumptions are quantified in Table 6-15. As in the historical groundwater budget, the largest outflow is pumping. Negative values are shown in Table 6-15 to represent outflows.

Table 6-15. SVOM Simulated and Adjusted Average Groundwater Outflow Components for Projected Climate Change Conditions (AF/yr)

Projected Climate Change Timeframe	2030 (Simulated)	2070 (Simulated)	2030 (Adjusted)	2070 (Adjusted)
Groundwater Pumping	-111,500	-117,800	-171,500	-181,200
Discharge to Streams	-1,400	-1,400	-1,400	-1,400
Groundwater Evapotranspiration	-33,900	-35,100	-33,900	-35,100
Underflow to Eastside Subbasin	-2,400	-2,500	-2,400	-2,500
Underflow to Surrounding Watersheds	-800	-800	-800	-800
Underflow to 180/400-Foot Aquifer Subbasin	-2,600	-2,600	-2,600	-2,600
Underflow to Upper Valley Subbasin	-1,300	-1,500	-1,300	-1,500
Total Outflow	-153,900	-161,700	-213,900	-225,100

Note: provisional data subject to change.

Adjusted pumping is based on the ratio between historical average SVIHM and GEMS agricultural pumping, as described in Section 6.3.2.

As described for the historical water budget, the Subbasin is not considered to be in overdraft. Even though, the SVOM projects 9,900 AF/yr and 9,600 AF/yr gain in storage for 2030 and 2070 respectively, the historical estimated change in storage is used with the adjusted pumping estimates to provide a likely more reasonable estimate for projected sustainable yield. The model includes increased precipitation from climate change; however, it does not account for the frequency and magnitude of storm events. If storm events concentrate precipitation within short periods, more water may run off than infiltrate. More analysis needs to be done with regards to future recharge. Therefore, this projected water budget adopts the historical annual change in storage as the most reasonable estimate, assuming extraction continues. This is reflected in the adjusted average change in storage in Table 6-16, which is set to zero AF/yr.

Combining Table 6-14 and Table 6-15 yields the SVOM simulated net groundwater inflow and outflow data for the future simulation with 2030 and 2070 climate change assumptions. These net flows are shown in Table 6-16. Negative values indicate outflows or depletions of groundwater.

Table 6-16. SVOM Simulated and Adjusted Average Annual Groundwater Budget for Projected Climate Change Conditions (AF/yr)

Projected Climate Change Timeframe	2030 (Simulated)	2070 (Simulated)	2030 (Adjusted)	2070 (Adjusted)
Groundwater Pumping	-111,500	-117,800	-171,500	-181,200
Net Stream Exchange	103,200	105,700	103,200	105,700
Deep Percolation	53,100	57,500	53,100	57,500
Net flow from Eastside Subbasin	-700	-500	-700	-500
Net Flow from Outside Areas	1,200	1,400	1,200	1,400
Net flow from Upper Valley Subbasin	1,400	1,400	1,400	1,400
Net flow from 180/400-Foot Aquifer Subbasin	-2,400	-2,300	-2,400	-2,300
Groundwater Evapotranspiration	-33,900	-35,100	-33,900	-35,100
Net Storage Gain (+) or Loss (-)	9,900	9,600	0	0

Note: provisional data subject to change.

Based on the adjusted change in storage, which is the historical average decline as described in the text, water budget error is 30% for 2030 and 31% for 2070; these error values are unreasonably large and will be addressed and improved in future updates to the GSP.

Adjusted pumping is based on the ratio between historical average SVIHM and GEMS agricultural pumping, as described in Section 6.3.2.

SVOM projected groundwater pumping by water use sector is summarized in Table 6-17. Because the model assumes no urban growth, future municipal pumping was assumed to be equal to current municipal pumping. Future agricultural pumping is then calculated as the total projected pumping minus the current pumping for municipal and industrial use. The 2030 and 2070 model simulations predict that agriculture will account for more than 95% of pumping. Similar to the SVIHM, domestic pumping is not included in the SVOM future projections simulation.

Table 6-17. SVOM Simulated Projected and Adjusted Annual Groundwater Pumping by Water Use Sector (AF/yr)

Water Use Sector	2030 Average (Simulated)	2070 Average (Simulated)	2030 (Adjusted)	2070 (Adjusted)
Agricultural	-107,700	-114,000	-165,700	-175,400
Municipal & Industrial	-3,800	-3,800	-5,800	-5,800
Total Pumping	-111,500	-117,800	-171,500	-181,200

Note: provisional data subject to change.

6.4.4 Projected Sustainable Yield

Projected sustainable yield is the long-term pumping that can be sustained once all undesirable results have been addressed. However, it is not the amount of pumping needed to stop undesirable results before sustainability is reached. The SVBGSA recognizes that, dependent on the success of various proposed management actions and projects, there may be some years when pumping must be held at a lower level to achieve necessary rises in groundwater elevation. The actual amount of allowable pumping from the Subbasin will be adjusted in the future based on the success of management actions and projects.

To retain consistency with the historical sustainable yield, projected sustainable yield can be estimated by summing all the average groundwater extractions and subtracting the average change in storage. This represents the change in pumping that results in no change in storage, assuming no other projects or management actions are implemented. For this sustainable yield discussion and associated computations, groundwater pumping outflows are reported as positive values, which is opposite of how the values are reported in the water budget tables.

Table 6-18. provides estimates of the future sustainable yield using estimated future pumping calculated in Table 6-17. As with the historical sustainable yield, the model estimated change in storage is within the model error, and the average change in storage for the calculations in Table 6-18 is set to zero.

Table 6-18. Projected Sustainable Yields with Pumping Adjusted Based on GEMS Data (AF/yr)

	2030 Projected Sustainable Yield	2070 Projected Sustainable Yield	Historical Sustainable Yield Range
Groundwater Pumping	171,500	181,200	150,900 to 174,300
Change in Storage	0	0	0
Projected Sustainable Yield	171,500	181,200	150,900 to 174,300

Table 6-18 includes the GEMS database estimate of historical sustainable yield for comparison purposes. Although the sustainable yield values provide guidance for maintaining sustainability, simply reducing pumping to within the sustainable yield is not proof of sustainability.

Sustainability must be demonstrated through the SMC. The sustainable yield value will be modified and updated as more data are collected, and more analyses are performed.

6.4.5 Uncertainties in Projected Water Budget Simulations

Models are mathematical representations of physical systems. They have limitations in their ability to represent physical systems exactly and due to limitations in the data inputs used. There is also inherent uncertainty in groundwater flow modeling itself, since mathematical (or numerical) models can only approximate physical systems and have limitations in how they compute data. However, DWR (2018) recognizes that although models are not exact representations of physical systems because mathematical depictions are imperfect, they are powerful tools that can provide useful insights.

There is additional inherent uncertainty involved in projecting water budgets with projected climate change based on the available scenarios and methods. The recommended 2030 and 2070 central tendency scenarios that are used to develop the projected water budgets with the SVIHM provide a dataset that can be interpreted as what might be considered the most likely future conditions; there is an approximately equal likelihood that actual future conditions will be more stressful or less stressful than those described by the recommended scenarios (DWR, 2018).

As stated in DWR (2018):

“Although it is not possible to predict future hydrology and water use with certainty, the models, data, and tools provided [by DWR] are considered current best available science and, when used appropriately should provide GSAs with a reasonable point of reference for future planning.”

6.5 Subbasin Water Supply Reliability

Water is not imported into the Forebay Subbasin from other basins. Uncertainties include future precipitation and land use.

6.6 Historical and Current Water Budgets for Arroyo Seco Cone Management Area

The ASCMA was established to account for the unique hydrogeologic, water quality and water supply characteristics of the Arroyo Seco Cone region that are discussed in Chapter 4. The water budgets for the ASCMA are a subset of the greater Forebay Subbasin water budgets. The water budgets for both the ASCMA and the greater Forebay Subbasin are developed using the identical SVIHM and SVOM models, and identical techniques for refining model results with measured data. Although the water budgets are presented separately, management of the ASCMA and the

greater Forebay Subbasin will be coordinated to meet the sustainability goal of the entire Subbasin.

Water budgets for the historical and current periods for the ASCMA are presented below. The surface water budgets are presented first, followed by the groundwater budgets. These results are based on the provisional SVIHM and are subject to change in the future. Water budgets will be updated in future GSP updates after the SVIHM is formally released by the USGS.

6.6.1 Historical and Current Surface Water Budget for Arroyo Seco Cone Management Area

The surface water budget accounts the inflows and outflows for the streams within the ASCMA. This includes streamflows of rivers and tributaries entering and exiting the ASCMA, overland runoff to streams, diversions from streams, and stream-aquifer interactions. ET by riparian vegetation along stream channels is estimated by the provisional SVIHM as part of the groundwater system and is accounted for in the groundwater budget.

Figure 6-4 shows the surface water network simulated in the provisional SVIHM. The network includes the Salinas River, Arroyo Seco, Clark Colony canal, and other streams within the ASCMA. For this water budget, boundary inflows and outflows are the sum of all locations that cross the ASCMA boundary.

Figure 6-11 shows the surface water budget for the historical period, which also includes the current period. Table 6-19 shows the average surface water budget for the historical and current periods. Positive values are inflows into the stream system, and negative values are outflows from the stream system. The net flow between surface water and groundwater is negative for both the historical and current periods, indicating more stream leakage to groundwater rather than groundwater discharge to streams. Boundary inflows and outflows dominate the surface-water budget in all but the driest years.

Table 6-19. SVIHM Estimated Surface Water Budget Summary for Arroyo Seco Cone Management Area (AF/yr)

	Historical Average (WY 1980-2016)	Current (WY 2016)
Overland Runoff to Streams	800	500
Boundary Stream Inflows	440,000	125,400
Diversions from Streams	-4,200	-1,300
Net Flow between Surface Water and Groundwater	-15,600	-16,500
Boundary Stream Outflows	-420,900	-108,100

Note: provisional data subject to change.

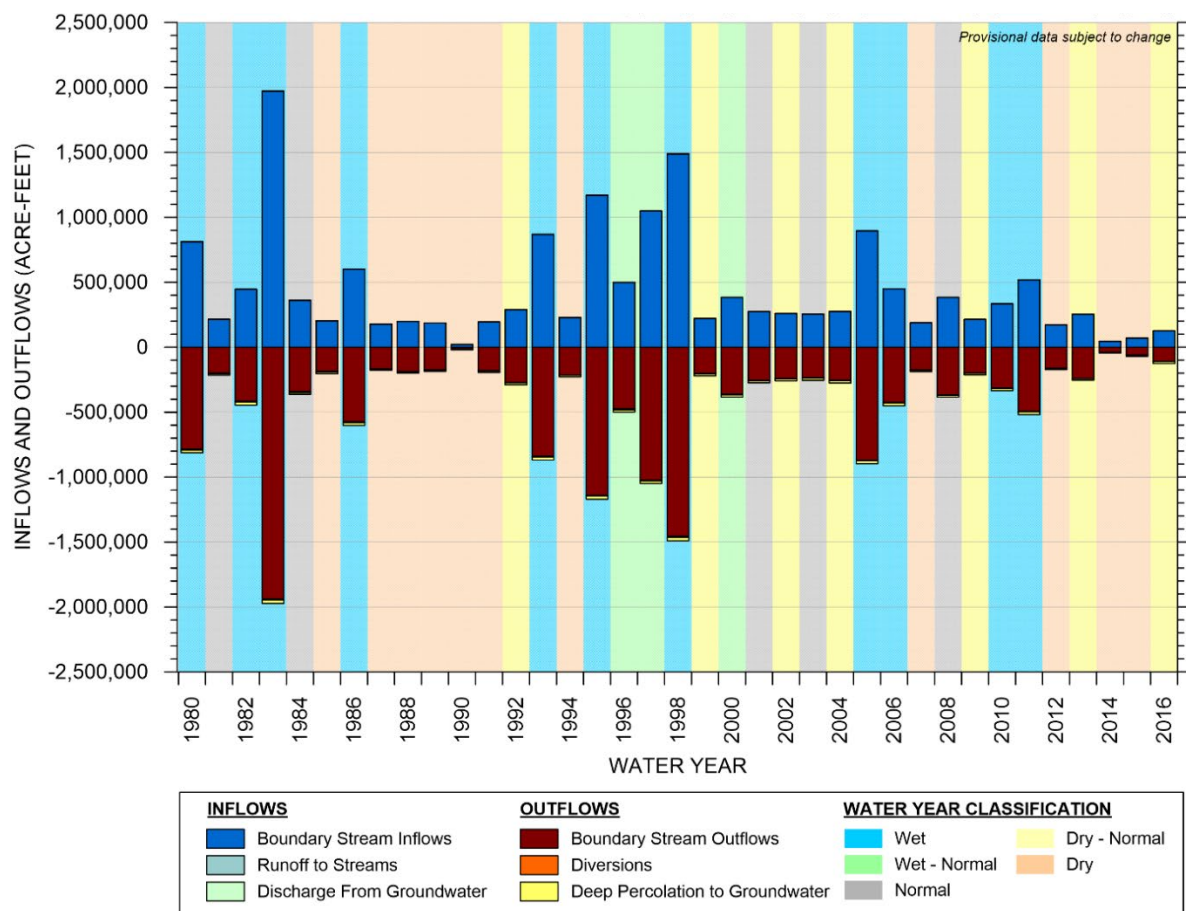


Figure 6-11. SVIHM Estimated Historical and Current Surface Water Budget for Arroyo Seco Cone Management Area

Table 6-20 summarizes the average net flow between surface water and groundwater along Salinas River, Arroyo Seco, Clark Colony canal, and the sum of all other smaller streams. The vast majority of flow between surface water and groundwater occurs along the Arroyo Seco where streamflow quickly percolates down into the coarse-grained streambed. Flow between surface water and groundwater from the Salinas River is small because only a small stretch of the Salinas River intersects the ASCMA.

Table 6-20. SVIHM Estimated Net Flow Between Surface Water and Groundwater by Stream Zone for Arroyo Seco Cone Management Area (AF/yr)

	Historical Average (WY 1980-2016)	Current (WY 2016)
Salinas River	-700	-900
Arroyo Seco	-14,400	-15,300
Clark Colony Diversion	0	0
Other Streams	-500	-300

Note: provisional data subject to change.

The ASGSA used the FFM18 model to develop an independent estimate of percolation from the Arroyo Seco. The FFM18 model simulated an average annual percolation rate of 23,150 AF/yr between 1996 and 2009.

Both the SVIHM and FFM18 models appear to underestimate percolation from the Arroyo Seco into groundwater. A rigorous differential stream gauge analysis conducted by the ASGSA established that the average annual recharge from the Arroyo Seco between 1995 and 2018 was 36,100 AF/yr: more than twice what was estimated by the SVIHM. The same analysis estimated that the annual average Arroyo Seco percolation between 1996 and 2009 was 41,000 AF/yr, compared to the 23,200 AF/yr estimated by the FFM18 model. The Arroyo Seco recharge should be refined in the SVIHM during GSP implementation

6.6.2 Historical and Current Groundwater Budget for Arroyo Seco Cone Management Area

The groundwater budget includes inflows and outflows of groundwater at the ASCMA's boundaries, recharge, pumping, ET, and net flow between surface water and groundwater. Annual inflows to the groundwater system for the historical and current time periods estimated by the SVIHM are shown on Figure 6-12. Inflows vary substantially from year to year. Table 6-21 provides average groundwater inflows for the historical and current period. Generally, each of the 3 inflows contribute roughly equally to the annual total inflow.

Figure 6-13 shows the SVIHM estimated outflows from the groundwater system for the historical and current time periods. Outflows vary from year to year; however, groundwater pumping, including municipal, industrial, and agricultural water, is consistently the largest outflow from the ASCMA. Table 6-22 provides annual averages for groundwater outflows of the historical and current period. Subsurface outflows and agricultural pumping for the current period are similar to the historical average.

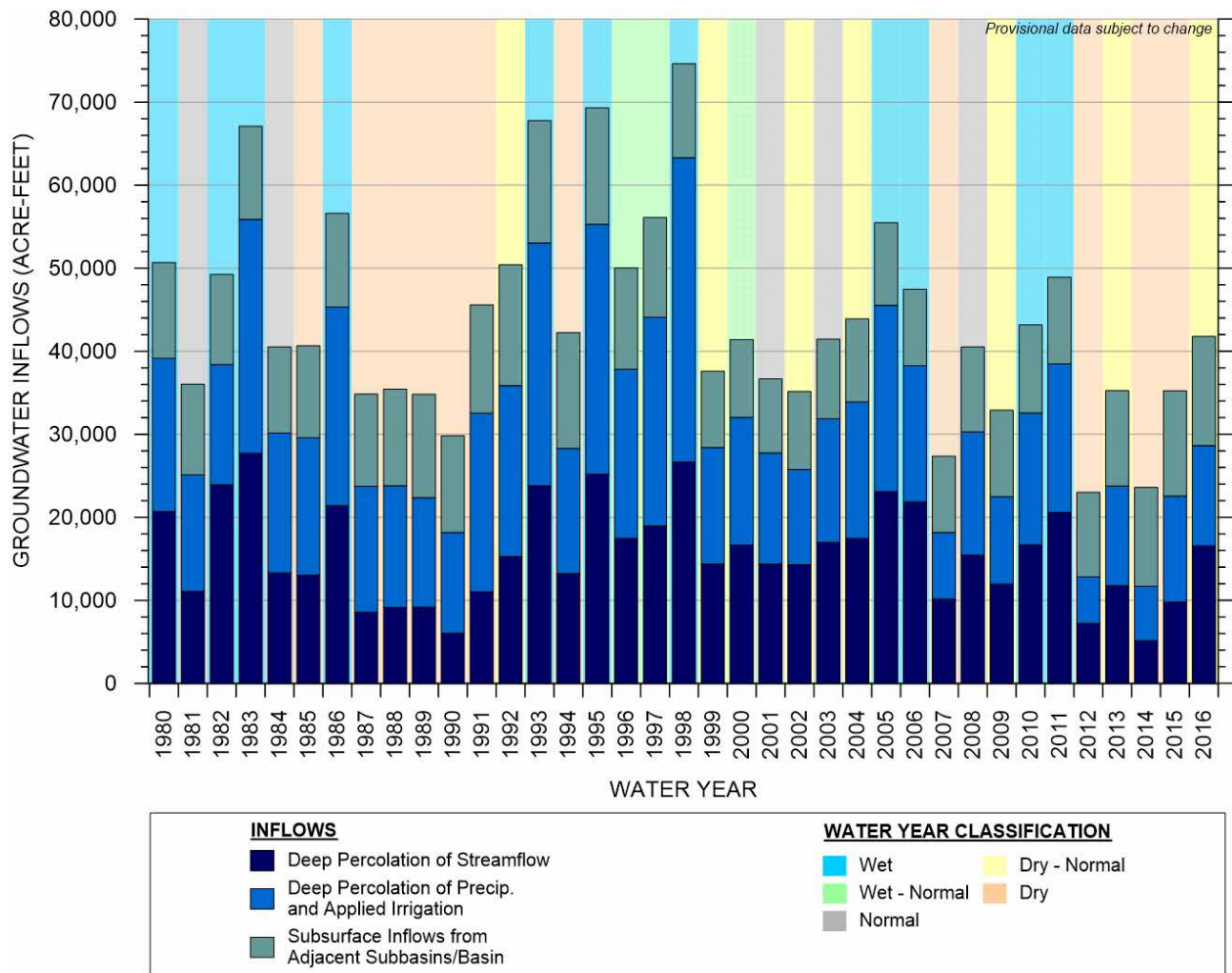


Figure 6-12. SVIHM Estimated Groundwater Inflows to Arroyo Seco Cone Management Area

Table 6-21. SVIHM Simulated Groundwater Inflows Budget Summary in Arroyo Seco Cone Management Area (AF/yr)

	Historical Average (WY 1980-2016)	Current (WY 2016)
Deep Percolation of Streamflow	15,700	16,600
Deep Percolation of Precipitation and Applied Water	16,900	12,100
Subsurface Inflow from Adjacent Subbasins/Basin	11,200	13,100

Note: provisional data subject to change.

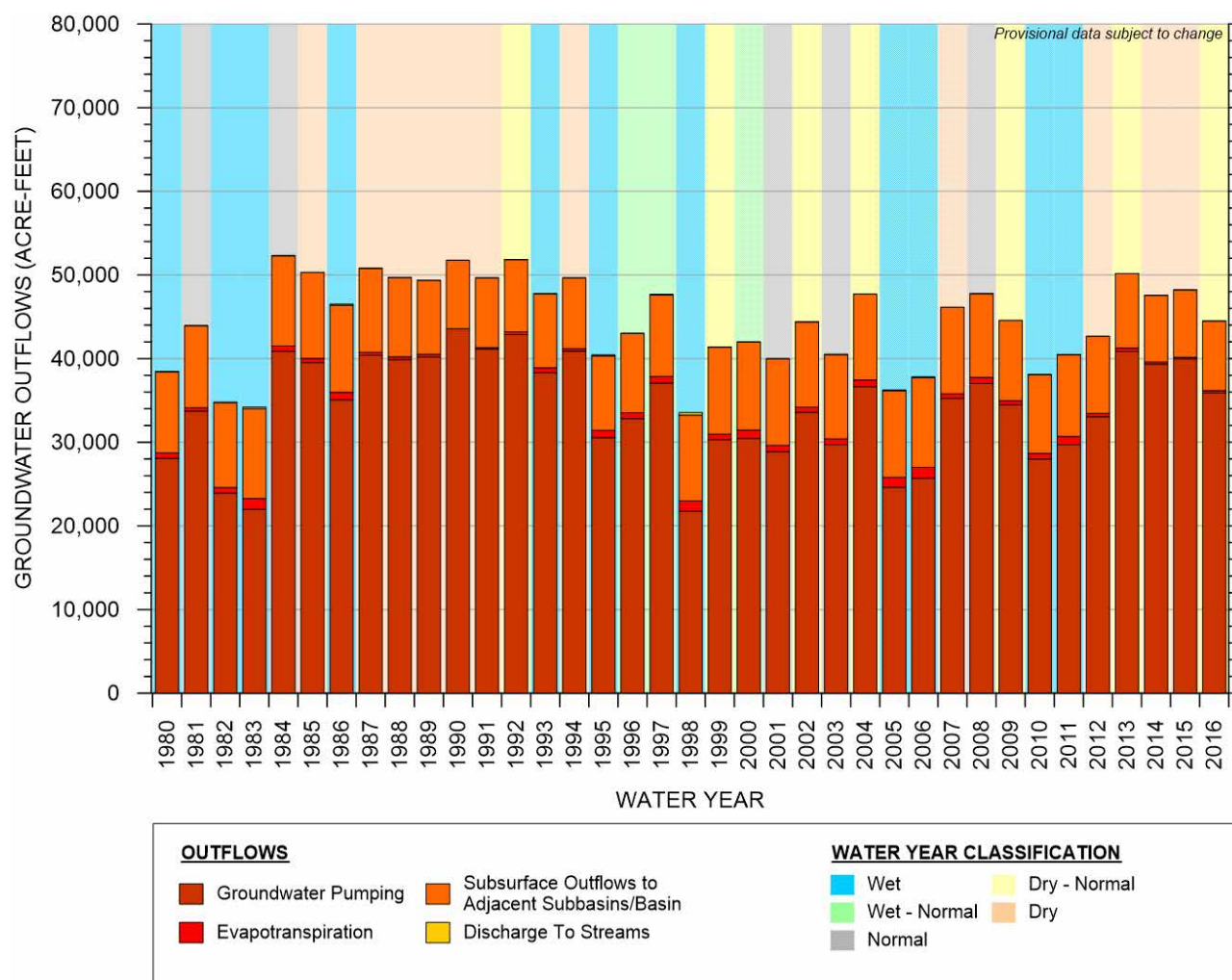


Figure 6-13. SVIHM Estimated Groundwater Outflows from Arroyo Seco Cone Management Area

Table 6-22. SVIHM Simulated and Adjusted Groundwater Outflows Budget Summary in Arroyo Seco Cone Management Area (AF/yr)

	Simulated Historical Average (WY 1980-2016)	Simulated Current (WY 2016)	Adjusted Historical Average (WY 1980-2016)	Adjusted Current (WY 2016)
Groundwater Pumping	-34,200	-35,900	-51,100	-53,500
Groundwater Evapotranspiration	-600	-300	-600	-300
Subsurface Outflow to Forebay	-9,600	-8,300	-9,600	-8,300
Discharge to Streams	-100	0	-100	0

Note: provisional data subject to change.

Adjusted pumping is described below.

ASGSA modeling estimated that 39,087 AF/yr is applied for irrigation in the ASCMA. Of the total applied irrigation, 6,287 AF/yr of surface water was delivered by CCWC. Subtracting this from the 39,087 yields an estimate of 32,800 AF/yr of groundwater pumping for irrigation.

Comparing SVIHM and ASGSA data to GEMS data reveals that, on average, the preliminary SVIHM estimates only approximately 67% of the pumping reported in the GEMS database for the Subbasin between 1995 and 2016.

The ASGSA model estimates of pumping were similar to the SVIHM estimates, accounting for approximately 70% of the annual average 47,000 AF/yr of agricultural pumping in the ASCMA recorded in the GEMS database between 1996 and 2009.

These GEMS data are likely more representative of historical conditions than the model generated pumping numbers, however, reliable GEMS data are only available since 1995. To accurately estimate groundwater extraction for the full historical period, this 67% ratio was applied to the SVIHM estimated historical pumping shown in Table 6-22, yielding an estimated historical average pumping rate of 51,100 AF/yr.

SVIHM estimated groundwater pumping by water use sector is summarized on Figure 6-14 and Table 6-23. These show that more than 90% of pumped groundwater goes toward agricultural use. Domestic pumping, including *de minimis* pumping, from privately owned wells is assumed to be negligible and is not included in the model for the ASCMA.

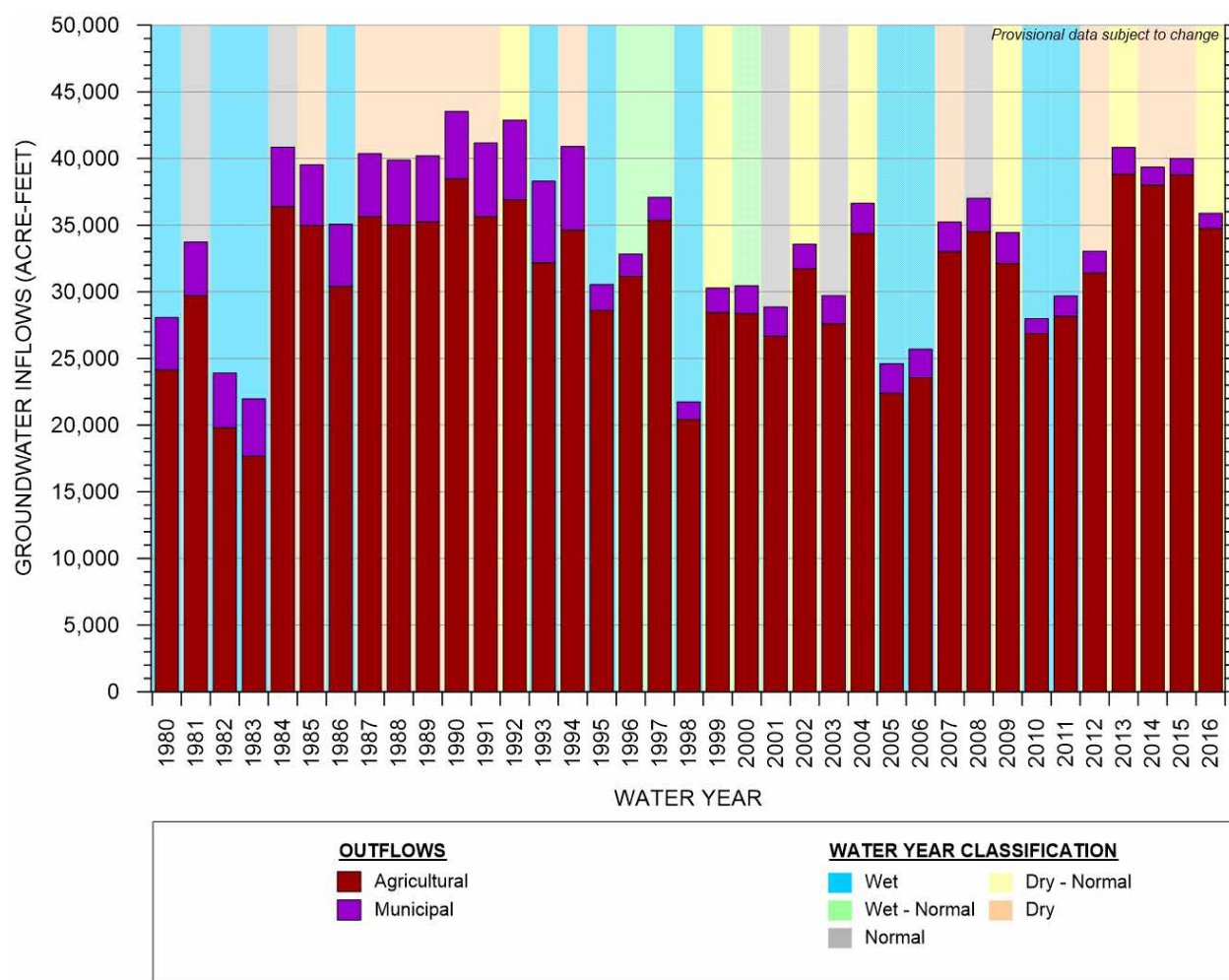


Figure 6-14. SVIHM Estimated Groundwater Pumping by Water Use Sector in Arroyo Seco Cone Management Area

Table 6-23. SVIHM Estimated and Adjusted Groundwater Pumping by Water Use Sector in Arroyo Seco Cone Management Area (AF/yr)

	Simulated Historical Average (WY 1980-2016)	Simulated Current (WY 2016)	GEMS Historical Average (WY 1995-2016)	GEMS Current (WY 2016)	Adjusted Historical Average (WY 1980-2016)	Adjusted Current (WY 2016)
Municipal and Industrial	-3,100	-1,100	-2,200	-1,800	-4,700	-1,600
Agricultural	-31,100	-34,800	-46,500	-45,800	-46,400	-51,900
Total Pumping	-34,200	-35,900	-48,700	-47,600	-51,100	-53,500

Note: provisional data subject to change.

Adjusted pumping is based on the ratio between historical average SVIHM and GEMS agricultural pumping, as described in above in text.

Figure 6-15 shows the SVIHM simulated net subsurface flows entering and exiting the ASCMA from the greater Forebay Subbasin. On average, the ASCMA receives about 1,600 AF more in subsurface inflows per year than it loses to subsurface outflows.

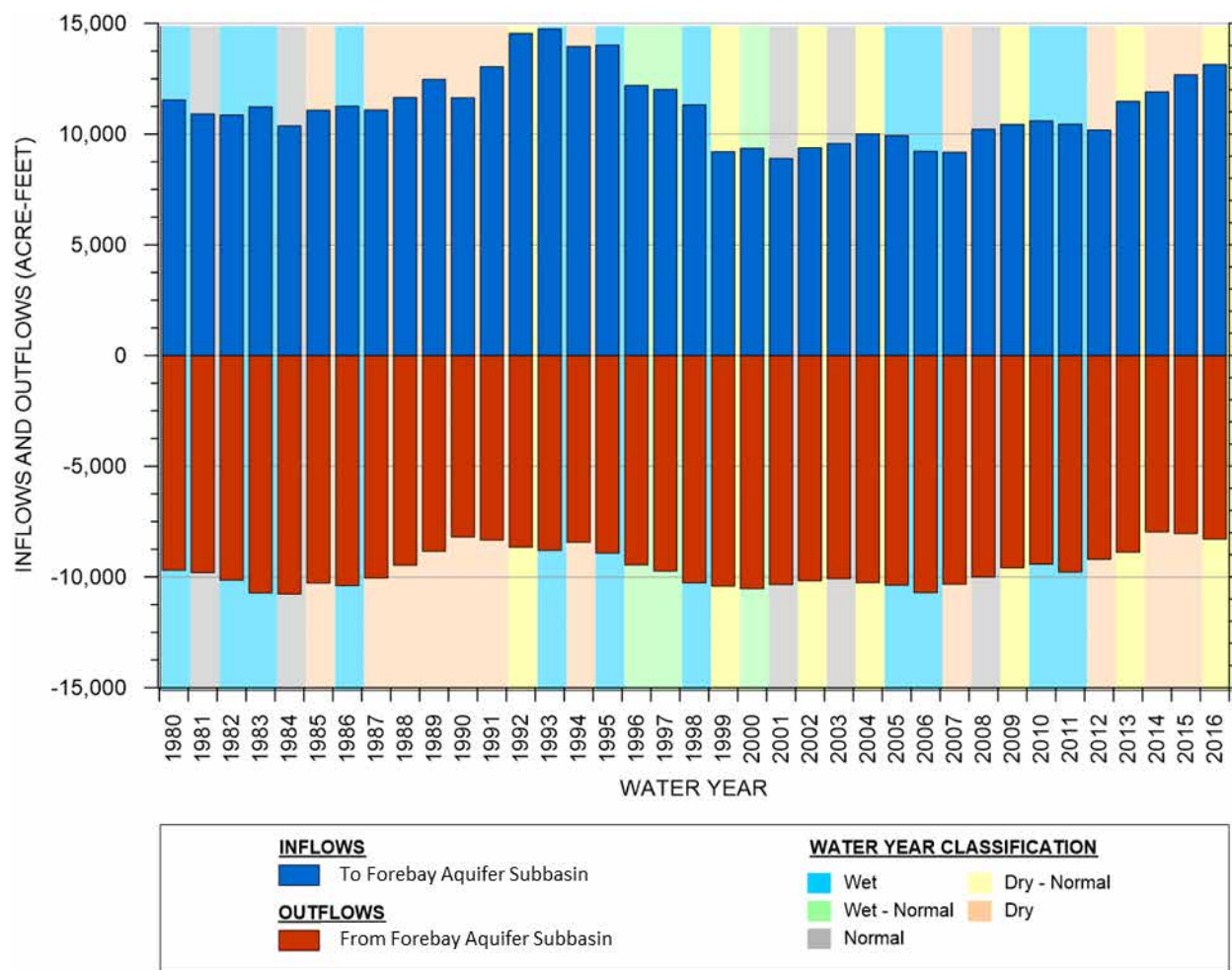


Figure 6-15. SVIHM Simulated Subsurface Inflows and Outflows for Arroyo Seco Cone Management Area

Change in groundwater storage is equal to total inflows to storage (such as deep percolation) minus total outflows from storage (such as pumping). A negative change in groundwater storage value indicates groundwater storage depletion associated with lower groundwater levels; while a positive value indicates groundwater storage accretion associated with higher groundwater levels. Averaged over the historical period, the preliminary SVIHM estimates that the ASCMA loses about 600 AF/yr. However, simulated overdraft contains significant variability and uncertainty. Figure 6-16 shows considerable variability in change in storage from one year to the next. ASGSA used the FFM18 model to develop an alternative estimate of storage change. During 1996-2009, the FFM18 model it calculated an average annual storage change of -1,360 AF/yr for the entire ASCMA.

The cumulative simulated change in storage line on Figure 6-16 shows that during the 37-year historical period, the ASCMA was in overdraft during only 9 years, and there is no observable trend indicating a chronic decline in groundwater storage. Therefore, although the SVIHM estimated historical overdraft of 600 AF/yr, the Subbasin is not considered to have been

historically in overdraft, and this GSP considers the historical average change in storage to be zero.

6.6.3 Historical and Current Groundwater Budget Summary for Arroyo Seco Cone Management Area

Figure 6-16 shows the entire groundwater water budget and includes the annual change in groundwater storage. Changes in groundwater storage are strongly correlated with changes in deep percolation of precipitation, applied irrigation water, and streamflow. For example, 1983 and 1998 were comparatively very wet years and represent the greatest increase in deep percolation (recharge) and, correspondingly, groundwater storage over the historical period. Estimated cumulative groundwater storage increased in response to wet periods and declined in response to dry periods.

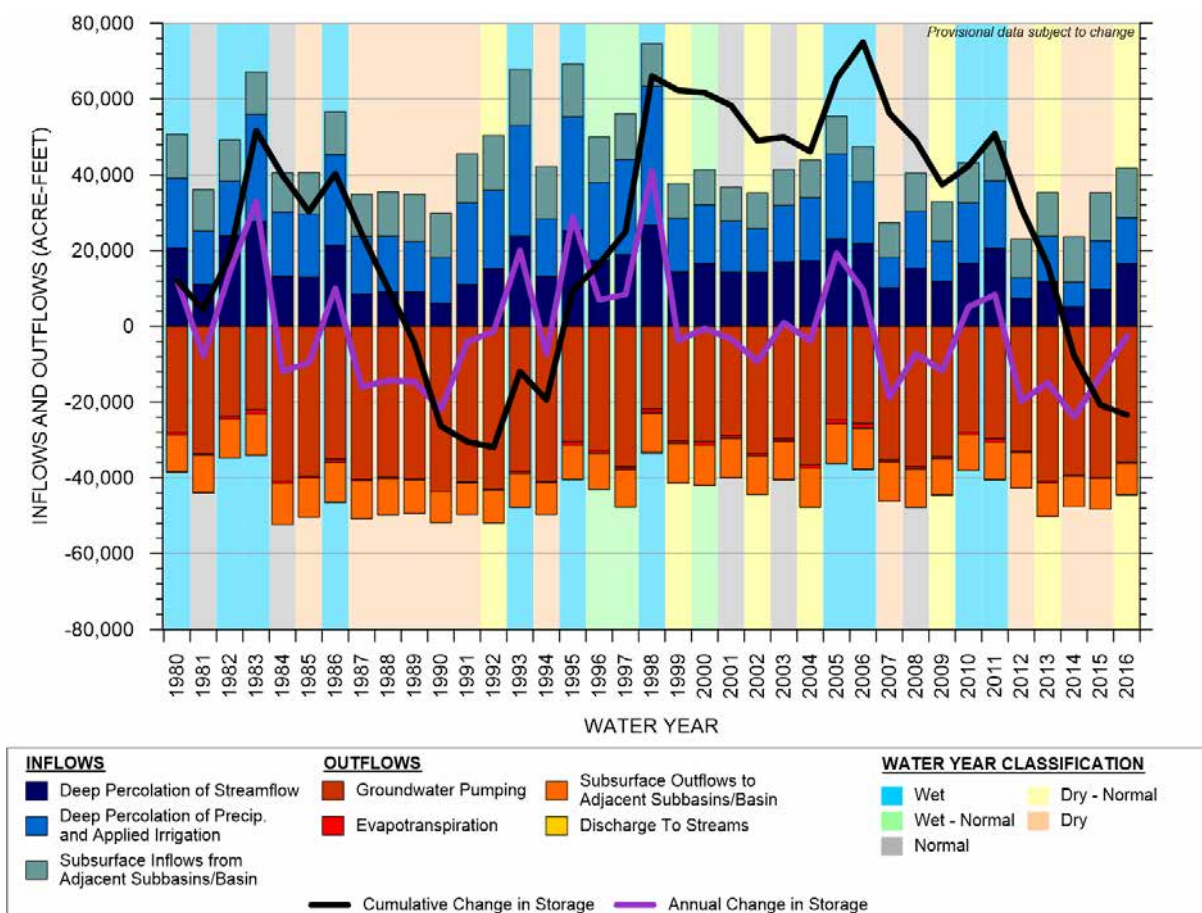


Figure 6-16. SVIHM Estimated Groundwater Budget for Arroyo Seco Cone Management Area

Combining Table 6-21 and Table 6-22 yields the net groundwater inflow and outflow data for the historical period. These net flows are shown in Table 6-24. This table is informative in showing the relative magnitude of various water budget components; however, these results are

based on a provisional model which might contain errors. The results will be updated in future updates to this chapter after the SVIHM is completed and released by the USGS.

Table 6-24. Summary of Groundwater Budget for Arroyo Seco Cone Management Area (AF/yr)

	Historical Average (WY 1980-2016)	Current (WY 2016)
Groundwater Pumping	-51,100	-53,500
Net Stream Exchange	15,600	16,500
Deep Percolation	16,900	12,100
Net flow from Adjacent Subbasins/Basin	1,600	4,800
Groundwater Evapotranspiration	-600	-300
Net Storage Gain (+) or Loss (-)	0	-2,700

Note: provisional data subject to change.

The net storage value is the estimated historical overdraft based on observed groundwater levels, as described in Sections 5.2.2 and 6.3.2.

Water budget error, as reflected in change in storage, for the historical average period is 40%, which is considered unreasonably large and will be addressed and improved in future updates to the GSP.

6.6.4 Historical and Current Sustainable Yield for Arroyo Seco Cone Management Area

For this sustainable yield discussion and associated computations, groundwater pumping outflows are reported as positive values, which is opposite of how the values are reported in the water budget tables.

Table 6-25 provides estimates of the ASCMA historical sustainable yield using the GEMS derived historical pumping. The cumulative change in storage line on Figure 6-16 shows that during the 37-year historical period, the ASCMA was in overdraft during only 9 years, and there is no observable trend indicating a chronic decline in groundwater storage. Therefore, the ASCMA has historically not been in overdraft, and the average change in storage for the calculations in Table 6-25 is set to zero.

Because the ASCMA has not historically been in overdraft, it is impossible to estimate the historical sustainable yield. Therefore, Table 6-25 presents a likely range of sustainable yields. This range represents plus and minus 1 standard deviation around the average GEMS reported pumping between 1995 and 2016. These values are the likely range of the minimum sustainable yield of the subbasin. This GSP adopts the range of likely minimum sustainable yields as the best estimate for the Subbasin.

Table 6-25. Historical Sustainable Yield for the Arroyo Seco Cone Management Area Derived from GEMS and Adjusted Change in Storage (AF/yr)

	Low Historical Average (WY 1995-2016)	High Historical Average (WY 1995-2016)
Total Subbasin Pumping	44,400	53,000
Change in Storage	0	0
Estimated Sustainable Yield	44,400	53,000

6.7 Projected Water Budgets for Arroyo Seco Cone Management Area

Projected water budgets are extracted from the SVOM, which simulates projected hydrologic conditions with climate change simulations. This is the same model used for projected water budgets in Forebay Subbasin.

6.7.1 Assumptions and Overview of Projected Water Budget in Arroyo Seco Cone Management Area

The projected water budget in ASCMA makes the same assumptions and has the same organizational structure as the projected water budget in the greater Forebay Subbasin.

6.7.2 Projected Surface Water Budget for Arroyo Seco Cone Management Area

Average SVOM projected surface water budget inflows and outflows for the future simulation period with 2030 and 2070 climate change assumptions are quantified in Table 6-26. Boundary inflows and outflows and net streamflow seepage are projected to be larger than current rates for both climate change scenarios.

Table 6-26. SVOM Simulated Average Surface Water Inflow and Outflow Components for Projected Climate Change Conditions for the Arroyo Seco Cone Management Area (AF/yr)

Projected Climate Change Timeframe	2030	2070
Overland Runoff to Streams	900	1,000
Boundary Inflows	492,000	537,700
Diversions from Streams	-4,000	-4,100
Net Flow between surface water and groundwater	-23,800	-23,800
Boundary Outflows	-465,100	-510,800

Note: provisional data subject to change.

6.7.3 Projected Groundwater Budget for Arroyo Seco Cone Management Area

Average SVOM projected groundwater budget inflows for the future simulation period with 2030 and 2070 climate change assumptions are quantified in Table 6-27. Inflow is relatively

evenly distributed between the water sources. Based on the comparison of simulated stream leakage and historical measured stream leakage discussed in Section 6.6.1, it is likely that the projected deep percolation of streamflow is underestimated by the SVOM.

Table 6-27. SVOM Simulated Average Groundwater Inflow Components for Projected Climate Change Conditions in Arroyo Seco Cone Management Area (AF/yr)

Projected Climate Change Timeframe	2030	2070
Deep Percolation of Streamflow	23,800	23,800
Deep Percolation of Precipitation and Applied Water	16,800	18,100
Subsurface Inflow	11,200	12,000
Total Inflow	51,800	53,900

Note: provisional data subject to change.

Average SVOM projected groundwater budget outflows for the future simulation period with 2030 and 2070 climate change assumptions are quantified in Table 6-28. The greatest outflow component is groundwater pumping. Projected pumping is summarized below in Section 6.7.4.

Table 6-28. SVOM Simulated and Adjusted Average Groundwater Outflow Components for Projected Climate Change Conditions in Arroyo Seco Cone Management Area (AF/yr)

Projected Climate Change Timeframe	2030 (Simulated)	2070 (Simulated)	2030 (Adjusted)	2070 (Adjusted)
Pumping	-34,900	-37,100	-52,000	-55,300
Discharge to Streams	0	0	0	0
Groundwater Evapotranspiration	-1,500	-1,500	-1,500	-1,500
Subsurface Outflow	-13,400	-13,400	-13,400	-13,400
Total Outflow	-49,800	-52,000	-66,900	-70,200

Note: provisional data subject to change.

Adjusted pumping is based on the ratio between historical average SVIHM and GEMS agricultural pumping, as described in Section 6.6.2.

As described for the historical water budget, the ASCMA is not considered to be in overdraft. Even though, the SVOM projects 1,700 AF/yr and 1,600 AF/yr gain in storage for 2030 and 2070 respectively, the historical estimated change in storage is used with the adjusted pumping estimates to provide a likely more reasonable estimate for projected sustainable yield. Therefore, this projected water budget adopts the historical annual change in storage as the most reasonable estimate, assuming extraction continues. This is reflected in the adjusted average change in storage in Table 6-29, which is set to zero AF/yr.

Combining Table 6-27 and Table 6-28 yields the SVOM projected net groundwater inflow and outflow data for the future simulation with 2030 and 2070 climate change assumptions. These net flows are shown in Table 6-29. Negative values indicate outflows or depletions.

Table 6-29. SVOM Simulated and Adjusted Average Annual Groundwater Budget for Projected Climate Change Conditions in Arroyo Seco Cone Management Area (AF/yr)

Projected Climate Change Timeframe	2030 (Simulated)	2070 (Simulated)	2030 (Adjusted)	2070 (Adjusted)
Groundwater Pumping	-34,900	-37,100	-52,000	-55,300
Net Subsurface Flow	-2,200	-1,500	-2,200	-1,500
Deep Percolation of Precipitation and Applied Water	15,300	16,600	15,300	16,600
Groundwater Evapotranspiration	-1,500	-1,500	-1,500	-1,500
Net Stream Exchange	23,800	23,800	23,800	23,800
Net Storage Gain (+) or Loss (-)	1,700	1,600	0	0

Note: provisional data subject to change.

Based on the adjusted change in storage, which is the historical average decline as described in the text, water budget error is 32% for 2030 and 33% for 2070; these error values are unreasonably large and will be addressed and improved in future updates to the GSP.

Adjusted pumping is based on the ratio between historical average SVIHM and GEMS agricultural pumping, as described in Section 6.6.2.

SVOM projected groundwater pumping by water use sector is summarized in Table 6-30. Because the model assumes no urban growth, future municipal pumping was assumed to be equal to current municipal pumping. Future agricultural pumping is then calculated as total projected pumping minus the current pumping for municipal and industrial use. The 2030 and 2070 model simulations predict that agriculture will account for more than 95% of pumping in the ASCMA.

Table 6-30. Projected SVOM Simulated and Adjusted Annual Groundwater Pumping by Water Use Sector in Arroyo Seco Cone Management Area (AF/yr)

Water Use Sector	2030 (Simulated)	2070 (Simulated)	2030 (Adjusted)	2070 (Adjusted)
Agricultural	-33,800	-36,000	-50,400	-53,700
Urban	-1,100	-1,100	-1,600	-1,600
Total Pumping	-34,900	-37,100	-52,000	-55,300

Note: provisional data subject to change.

Adjusted pumping is based on the ratio between historical average SVIHM and GEMS agricultural pumping, as described in Section 6.6.2.

6.7.4 Projected Sustainable Yield for Arroyo Seco Cone Management Area

Projected sustainable yield is the long-term pumping that can be sustained once all undesirable results have been addressed. However, it is not the amount of pumping needed to stop undesirable results before sustainability is reached. Dependent on the success of various proposed management actions and projects, there may be some years when pumping must be held at a lower level to achieve necessary rises in groundwater elevation. The actual amount of allowable pumping from the Subbasin will be adjusted in the future based on the success of management actions and projects.

To retain consistency with the historical sustainable yield, SVOM projected sustainable yield can be estimated by summing all the average groundwater extractions and subtracting the average change in storage. This represents the change in pumping that results in no change in storage, assuming no other projects or management actions are implemented. Projected sustainable yield estimates are quantified in Table 6-31. For this sustainable yield discussion and associated computations, groundwater pumping outflows are reported as positive values, which is opposite of how the values are reported in the water budget tables. These results indicate that the projected future sustainable yield is larger than the projected future groundwater pumping. The difference between historical pumping and the calculated sustainable yield is within the model's range of error, and therefore the values in Table 6-31 should be used cautiously. The general conclusion from Table 6-31 is that the ASCMA can be managed within its sustainable yield in the future. The sustainable yield value will be updated in future GSP updates as more data are collected and additional analyses are conducted.

Table 6-31 provides estimates of the future sustainable yield using estimated future pumping calculated in Table 6-29. As with the historical sustainable yield, the model estimated change in storage is within the model error, and the average change in storage for the calculations in Table 6-31 is set to zero.

Table 6-31. Projected Sustainable Yields in Arroyo Seco Cone Management Area with Pumping Adjusted Based on GEMS Data (AF/yr)

	2030 Projected Sustainable Yield	2070 Projected Sustainable Yield	Historical Sustainable Yield Range
Groundwater Pumping	52,000	55,300	44,400 to 53,000
Change in Storage	0	0	0
Projected Sustainable Yield	52,000	55,300	44,400 to 53,000

Table 6-31 includes the GEMS database estimate of historical sustainable yield for comparison purposes. Although the sustainable yield values provide guidance for maintaining sustainability, simply reducing pumping to within the sustainable yield is not proof of sustainability. Sustainability must be demonstrated through the SMC. The sustainable yield value will be modified and updated as more data are collected, and more analyses are performed.

6.7.5 Uncertainties in Projected Water Budget Simulations for Arroyo Seco Cone Management Area

As with the greater Forebay Subbasin water budget, there is inherent uncertainty involved in projecting water budgets with projected climate change based on the available scenarios and methods. For a full description, see Section 6.4.5.

6.8 Uncertainties in Water Budget Calculations

The level of accuracy and certainty is highly variable between water budget components. A few water budget components are directly measured, but most water budget components are either estimated inputs to the model or simulated by the model. Additional model uncertainty stems from an imperfect representation of natural condition and is reflected in model calibration error. However, inputs to the models are carefully selected using best available data, the model's calculations represent established science for groundwater flow, and the model calibration error is within acceptable bounds. Therefore, the models are the best available tools for estimating water budgets. The model results are provisional and subject to change in future GSP updates after the models are released by the USGS.

The following list groups water budget components in increasing order of uncertainty:

- Measured: metered municipal, agricultural, and some small water system pumping
- Estimated: domestic pumping, including depth, rate, and location
- Simulated primarily based on climate data: precipitation, ET, irrigation pumping
- Simulated based on calibrated model: all other water budget components

Simulated components based on calibrated model have the most uncertainty because those simulated results encompass uncertainty of other water budget components used in the model in addition to model calibration error.

7 MONITORING NETWORKS

This chapter describes the networks that will monitor the SMC explained further in Chapter 8. This description of the monitoring network has been prepared in accordance with the GSP Regulations § 354.32 *et seq.* to include monitoring objectives, monitoring protocols, and data reporting requirements.

7.1 Introduction

7.1.1 Monitoring Network Objectives

SGMA requires monitoring networks to collect data of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the Subbasin, and to evaluate changing conditions that occur as the Plan is implemented. The monitoring networks are intended to:

- Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds.
- Demonstrate progress toward achieving measurable objectives.
- Monitor impacts to the beneficial uses or users of groundwater.
- Quantify annual changes in water budget components.

7.1.2 Approach to Monitoring Networks

Monitoring networks are developed for each of the 5 sustainability indicators that are relevant to the Subbasin:

6. Chronic lowering of groundwater levels
7. Reduction in groundwater storage
8. Degraded water quality
9. Land subsidence
10. Depletion of ISW

Other monitoring networks, such as groundwater extraction, which are necessary to comply with GSP Regulations are also included in this chapter. Representative Monitoring Sites (RMS) are a subset of the monitoring network and are limited to sites with data that are publicly available and not confidential.

The SVBGSA estimated the density of monitoring sites and the frequency of measurements required to demonstrate short-term, seasonal, and long-term trends. If the required monitoring site density does not currently exist, the SVBGSA will expand monitoring networks during GSP implementation. Filling data gaps and developing more extensive and complete monitoring networks will improve the SVBGSA's ability to demonstrate sustainability and refine the existing conceptual and numerical hydrogeologic models. Chapter 10 provides a plan and schedule for resolving data gaps. The SVBGSA will review the monitoring network in each 5-year assessment, including a determination of uncertainty and whether there are remaining data gaps that could affect the ability of the Plan to achieve the sustainability goal for the Subbasin.

7.1.3 Management Areas

The Forebay Subbasin includes the ASCMA that is designated to be managed by the ASGSA. The remaining area of the Subbasin will be managed by the SVBGSA in accordance with the Forebay Subbasin Groundwater Sustainability Plan Implementation Agreement (Forebay Implementation Agreement, 2021). Both implementation areas will be managed consistent to a single GSP for the entire Subbasin and will consist of the same monitoring network for each sustainability indicator. The quantity and density of monitoring sites in both implementation areas shall be sufficient to evaluate conditions of the Subbasin setting and to establish SMC to reach the sustainability goal of the Subbasin in accordance with GSP Regulation § 354.34 (d).

7.2 Groundwater Level Monitoring Network

The sustainability indicator for chronic lowering of groundwater levels is evaluated by monitoring groundwater elevations in designated monitoring wells. The Regulations require a network of monitoring wells sufficient to demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features.

Figure 7-1 shows 59 wells in the Subbasin monitored by MCWRA for groundwater elevations that are used to develop groundwater elevation contours and have publicly available data on the SVBGSA Web Map.

Of the wells shown on Figure 7-1, 39 are selected for inclusion in the groundwater level monitoring network as RMS wells, and are shown on

Figure 7-2. Criteria for selecting wells as part of the RMS network include:

- RMS wells must have known depths and well completion data.
- RMS wells should have a relatively long period of historical data.

- Hydrographs of RMS wells should be visually representative of the hydrographs from surrounding wells. Appendix 5A includes the hydrograph comparisons used to establish that RMS wells are representative of surrounding wells.
- RMS locations must cover the basin and provide data near basin boundaries.
- RMS should be selected for each aquifer. There is only 1 aquifer in the Forebay Subbasin.
- Data from RMS wells is public data and will be used for groundwater elevation maps and analysis. SVBGSA notified well owner of intent to include well in monitoring network.

The RMS wells in the water level monitoring network are listed in Table 7-1. The need for any additional wells is discussed in Section 7.2.2. Appendix 5A presents well construction information and historical hydrographs for each RMS well.

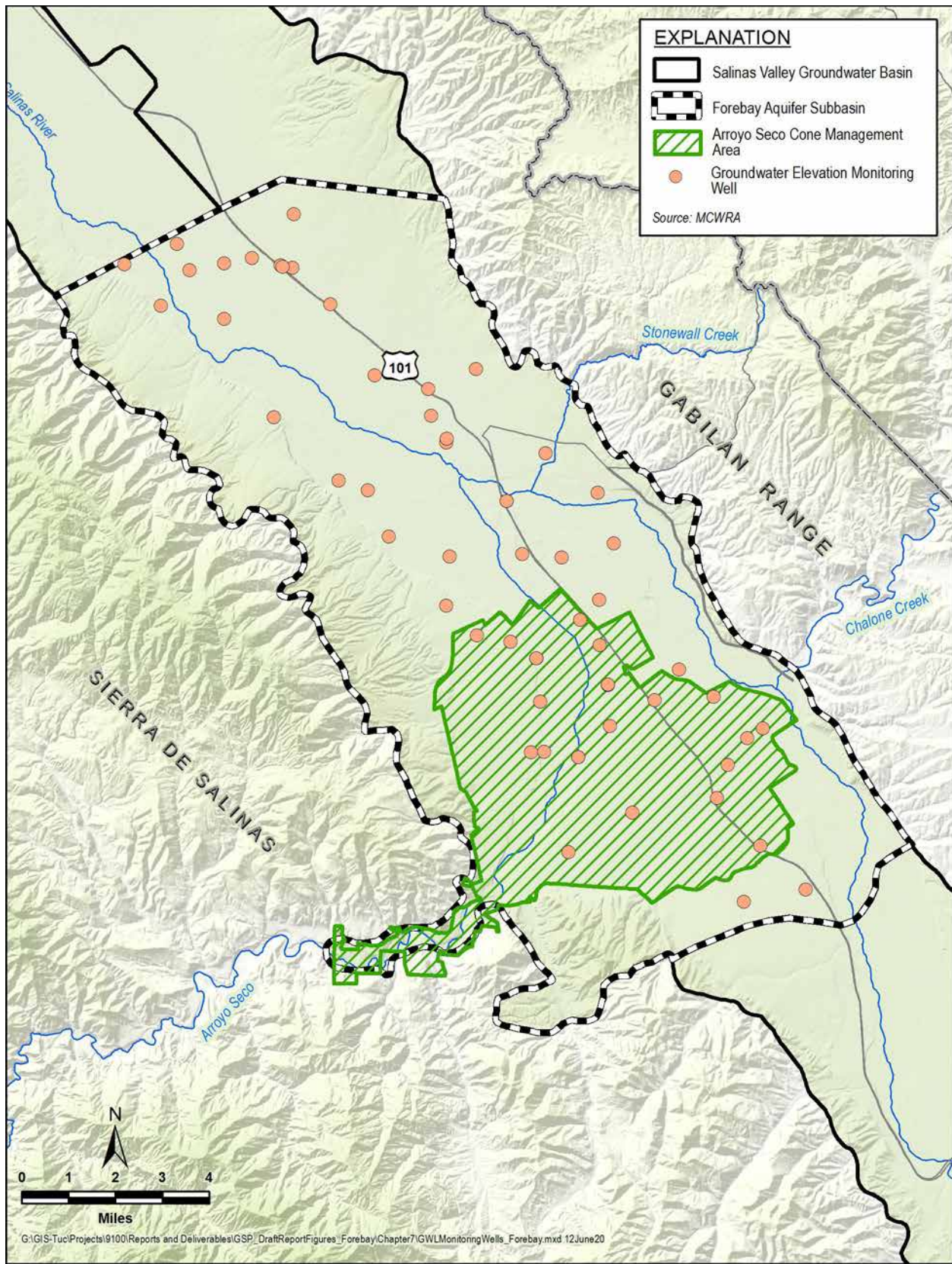


Figure 7-1. Forebay Aquifer Monitoring Network for Groundwater Levels

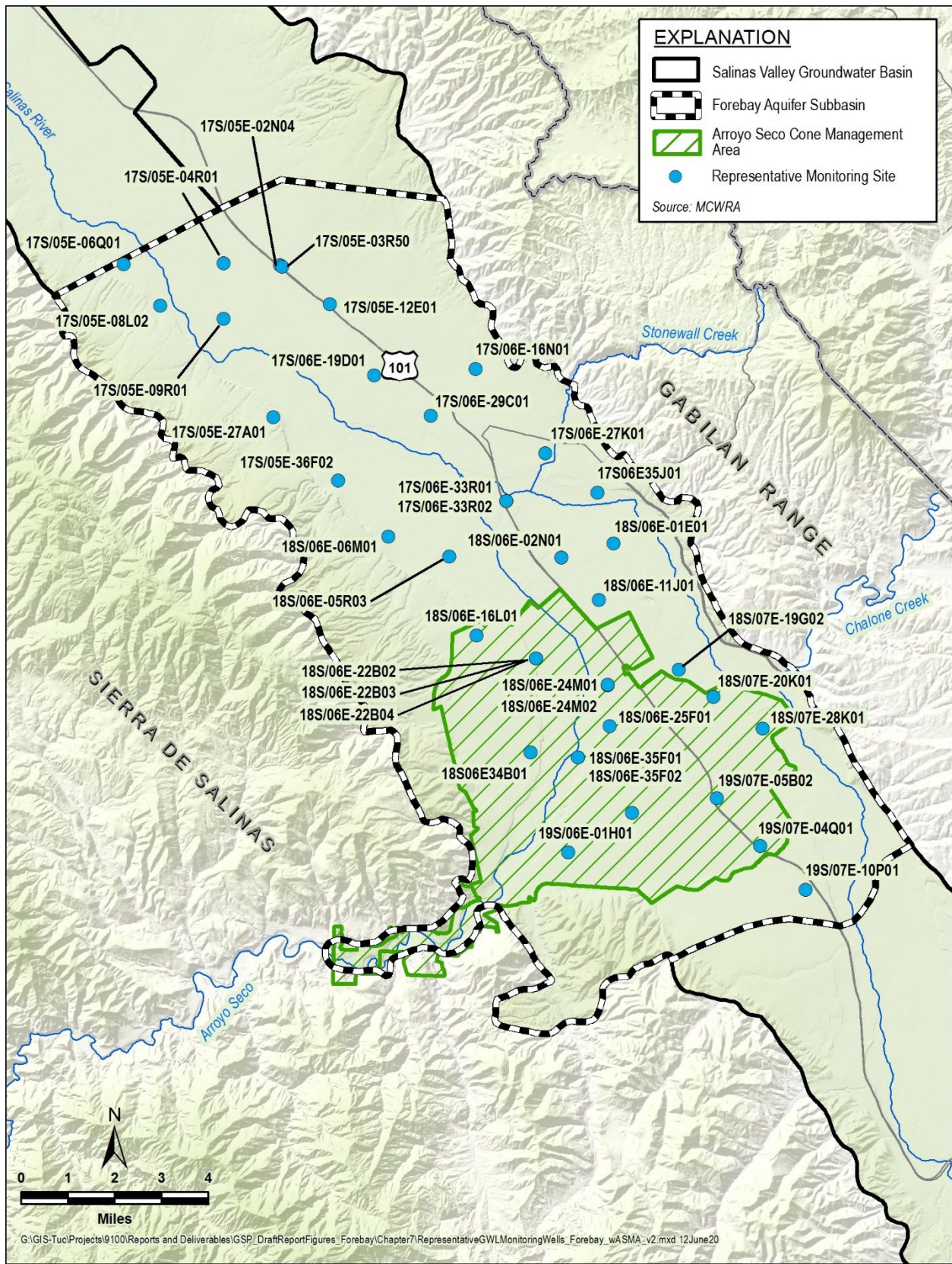


Figure 7-2. Forebay Aquifer Representative Monitoring Network for Groundwater Levels

Table 7-1. Forebay Aquifer Groundwater Level Representative Monitoring Site Network

State Well Number	CASGEM Well Number	Local Well Designation	Well Use	Total Well Depth (ft)	Reference Point (ft, NAVD88)	Latitude (NAD 83)	Longitude (NAD 83)	Period of Record (years)
17S/05E-02N04	N/A	2489	Irrigation	630	165.0	36.47610	-121.40500	60
17S/05E-03R50	N/A	2420	Irrigation	810	165.0	36.47559	-121.40434	10
17S/05E-04R01	N/A	534	Irrigation	442	138.0	36.47621	-121.42677	62
17S/05E-06Q01	N/A	719	Irrigation	170	117.0	36.47510	-121.46499	67
17S/05E-08L02	N/A	22926	Irrigation	830	140.6	36.46259	-121.45070	12
17S/05E-09R01	N/A	513	Irrigation	210	136.1	36.45902	-121.42618	75
17S/05E-12E01	N/A	180	Irrigation	602	171.0	36.46438	-121.38563	58
17S/05E-27A01	N/A	1201	Domestic/Irrigation	265	263.0	36.42894	-121.40611	59
17S/05E-36F02	N/A	914	Irrigation	234	162.0	36.40985	-121.38080	68
17S/06E-16N01	N/A	2310	Irrigation	626	232.4	36.44544	-121.32919	46
17S/06E-19D01	364424N1213682W001	1485	Irrigation	252	170.0	36.44240	-121.36820	88
17S/06E-27K01	N/A	1248	Irrigation	250	240.0	36.41980	-121.30167	70
17S/06E-29C01	N/A	1441	Irrigation	303	178.0	36.43063	-121.34578	59
17S/06E-33R01	364048N1213162W001	VidaDeep21209	Observation	260	194.4	36.40480	-121.31620	24
17S/06E-33R02	364047N1213162W001	VidaShallow21210	Observation	120	194.6	36.40470	-121.31620	24
17S/06E-35J01	N/A	404	Irrigation	144	192.0	36.40803	-121.28131	75
18S/06E-01E01	N/A	1001	Irrigation	218	211.0	36.39234	-121.27469	64
18S/06E-02N01	N/A	1000	Irrigation	274	202.8	36.38769	-121.29443	75
18S/06E-05R03	N/A	1335	Irrigation	279	193.0	36.38715	-121.33755	47
18S/06E-06M01	N/A	1771	Irrigation	350	195.1	36.39280	-121.36102	75
18S/06E-11J01	N/A	788	Irrigation	235	216.0	36.37481	-121.27980	75
18S/06E-16L01	N/A	24	Irrigation	444	304.4	36.36278	-121.32634	59
18S/06E-22B02	363562N1213033W003	LosCochesC18449	Observation	590	224.4	36.35620	-121.30330	61
18S/06E-22B03	363562N1213033W002	LosCochesB21066	Observation	280	225.5	36.35620	-121.30330	17
18S/06E-22B04	363562N1213033W001	LosCochesA21314	Observation	95	224.8	36.35620	-121.30330	17
18S/06E-24M01	363485N1212755W001	HUDB18467	Observation	253	229.6	36.34850	-121.27560	61

State Well Number	CASGEM Well Number	Local Well Designation	Well Use	Total Well Depth (ft)	Reference Point (ft, NAVD88)	Latitude (NAD 83)	Longitude (NAD 83)	Period of Record (years)
18S/06E-24M02	363485N1212756W001	HUDA21067	Observation	130	229.6	36.34850	-121.27560	14
18S/06E-25F01	363359N1212745W001	1495	Irrigation	120	254.5	36.33590	-121.27450	66
18S/06E-34B01	N/A	2308	Irrigation	300	347.1	36.32699	-121.30453	87
18S/06E-35F01	363259N1212863W001	THNB18502	Observation	258	262.6	36.32590	-121.28630	15
18S/06E-35F02	363258N1212864W001	THNA21068	Observation	N/A	262.7	36.32580	-121.28640	66
18S/07E-19G02	N/A	403	Irrigation	265	210.0	36.35373	-121.24851	54
18S/07E-20K01	N/A	1886	Irrigation	200	220.0	36.34565	-121.23498	62
18S/07E-28K01	N/A	1415	Irrigation	120	240.0	36.33610	-121.21584	75
19S/06E-01H01	N/A	333	Irrigation	300	320.0	36.30902	-121.26509	58
19S/06E-11C01	N/A	10004	Irrigation	320	375.3	36.29639	-121.28924	75
19S/07E-04Q01	N/A	1813	Irrigation	342	259.0	36.29969	-121.21579	64
19S/07E-05B02	N/A	10010	Irrigation	420	261.0	36.31416	-121.23271	59
19S/07E-10P01	N/A	10011	Domestic	245	315.0	36.28651	-121.19807	88

7.2.1 Groundwater Level Monitoring Protocols

Chapter 4 of the MCWRA CASGEM monitoring plan includes a description of existing groundwater elevation monitoring procedures (MCWRA, 2015). The CASGEM groundwater elevation monitoring protocols established by MCWRA are adopted by this GSP and are included in Appendix 7A. Groundwater elevation measurements will be collected at least 2 times per year to represent seasonal low and seasonal high groundwater conditions. The monitoring protocols described in Appendix 7A cover multiple monitoring methods for collecting data by hand and by automated pressure transducers. These protocols are consistent with data and reporting standards described in GSP Regulations § 352.4.

7.2.2 Groundwater Level Monitoring Network Data Gaps

Based on the GSP Regulations and BMPs published by DWR on monitoring networks (DWR, 2016b), a visual analysis of the existing monitoring network was performed using professional judgment to evaluate whether there are data gaps in the groundwater level monitoring network.

While there is no definitive requirement on monitoring well density, the BMP cites several studies (Heath, 1976; Sophocleous, 1983; Hopkins and Anderson, 2016) that recommend 0.2 to 10 wells per 100 square miles. The BMP notes that professional judgment should be used to design the monitoring network to account for high-pumping areas, proposed projects, and other subbasin-specific factors.

The Forebay Subbasin encompasses 147 square miles. If the BMP guidance recommendations are applied to the Subbasin, the well network should include between 1 and fifteen wells. The current network includes 39 wells. The number of groundwater elevation monitoring wells in the Subbasin exceeds the range of the BMP guidance. However, visual inspection of the geographic distribution of the well network indicates that there is a data gap along the Arroyo Seco, as shown on Figure 7-3. The data gap area shown on Figure 7-3 will be filled with a new monitoring well, as discussed in Chapter 10. This data gap also applies to the interconnected surface water monitoring network, described in Section 7.6.2, thus a new well in this area will fill the data gap in both networks. The generalized locations for new monitoring wells were based on addressing the criteria listed in the monitoring BMP including:

- Providing adequate data to produce seasonal potentiometric maps
- Providing adequate data to map groundwater depressions and recharge areas
- Providing adequate data to estimate change in groundwater storage
- Demonstrating conditions at Subbasin boundaries

Additionally, groundwater elevation measurements for some of the monitoring wells in the Subbasin occur only once a year. SVBGSA will work with MCWRA to have groundwater levels

collected at least twice a year as outlined in Section 7.2.1. Furthermore, some of the wells in the monitoring network have unknown well construction information and that is a data gap that will be addressed during GSP implementation.

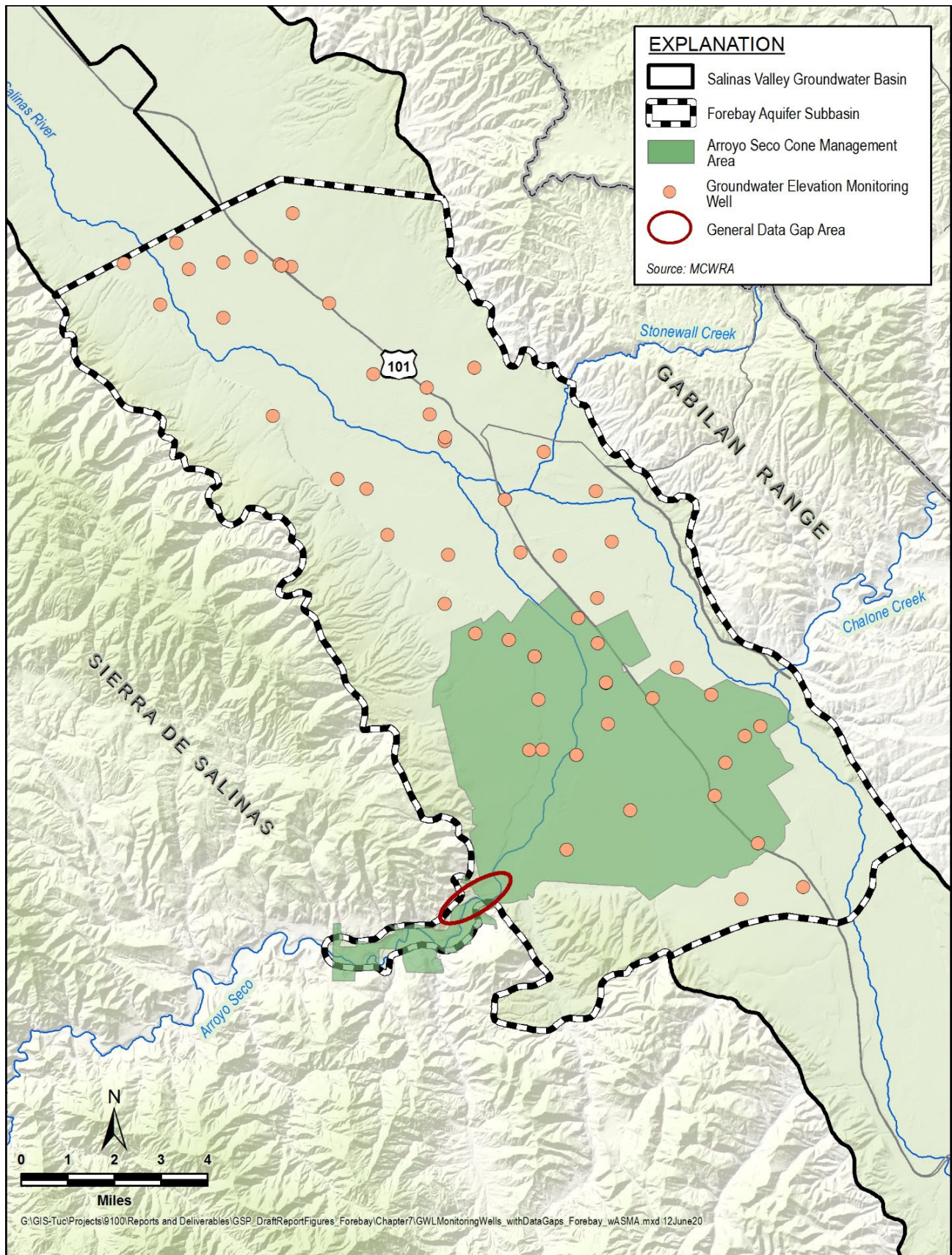


Figure 7-3. Data Gaps in the Groundwater Level Monitoring Network

7.3 Groundwater Storage Monitoring Network

As discussed in Chapter 8, the sustainability indicator for reduction of groundwater storage is measured using groundwater elevations to calculate change in storage. Thus, the groundwater storage monitoring network is the same as the groundwater level monitoring network.

7.4 Groundwater Quality Monitoring Network

The sustainability indicator for degraded water quality is evaluated by adopting the SWRCB, DDW, and CCRWQCB ILRP groundwater quality networks. The water quality monitoring network for the Subbasin is composed of public water system supply wells monitored under DDW, and on-farm domestic wells and irrigation supply wells monitored under ILRP.

As described in Chapter 8, separate minimum thresholds are set for the COC for public water system supply wells, on-farm domestic wells, and irrigation supply wells. Therefore, although there is a single groundwater quality monitoring network, different wells in the network are reviewed for different constituents. COC for drinking water are assessed at public water supply wells and on-farm domestic wells, and COC for crop health are assessed at irrigation supply wells. The COC for the 3 sets of wells are listed in Chapter 5.

The public water system supply wells included in the monitoring network were identified by reviewing data from the SWRCB DDW. The SWRCB collects data for municipal systems; community water systems; non-transient, non-community water systems; and non-community water systems that provide drinking water to at least 15 service connections or serve an average of at least 25 people for at least 60 days a year. The RMS network consists of 45 DDW wells, as shown on Figure 7-4 and listed in Appendix 7B.

All on-farm domestic wells and irrigation supply wells that have been sampled through the CCRWQCB's ILRP are included in the RMS network. Under the existing, Ag Order, 619 ILRP wells, consisting of 323 irrigation supply wells and 296 on-farm domestic wells that are all part of the RMS network. The locations of these wells are shown on Figure 7-5 and listed in Appendix 7B. The SVBGSA assumes that Ag Order 4.0 will have a similar representative geographic distribution of wells within the Subbasin. The agricultural groundwater quality monitoring network will be revisited and revised when the Ag Order 4.0 monitoring network is finalized.

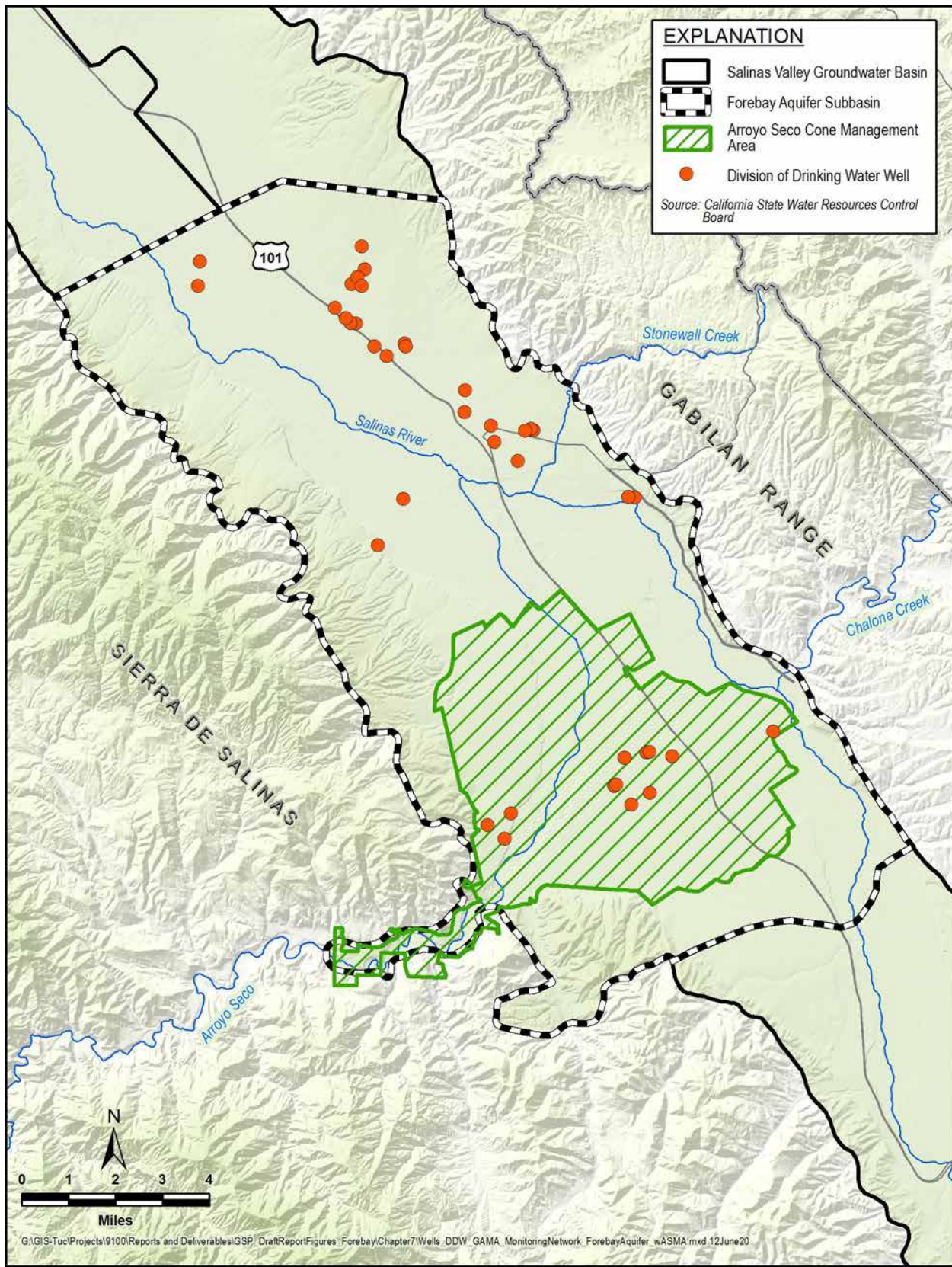


Figure 7-4. DDW Public Water System Supply Wells in the Groundwater Quality Monitoring Network

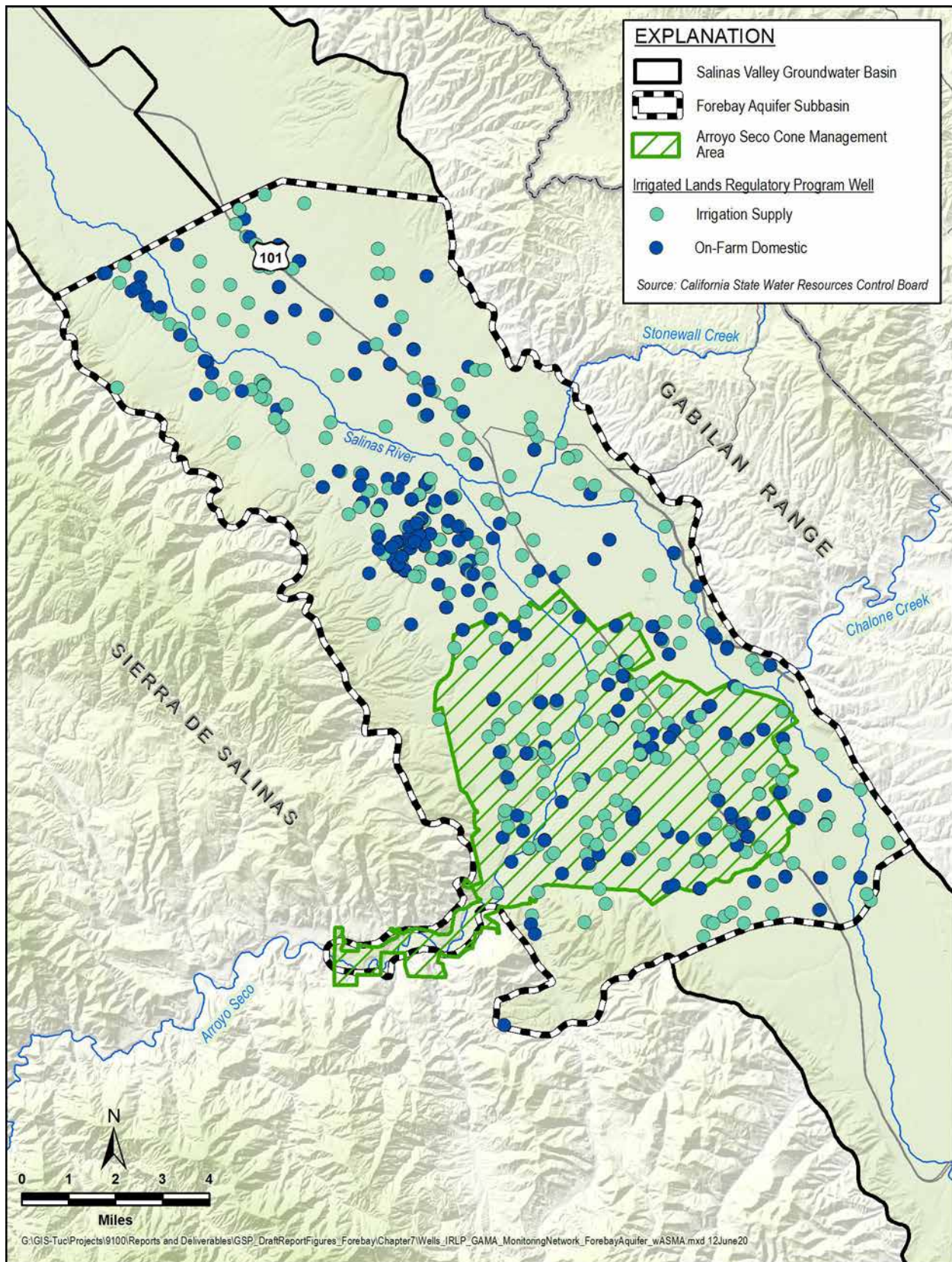


Figure 7-5. ILRP Wells in the Groundwater Quality Monitoring Network

7.4.1 Groundwater Quality Monitoring Protocols

The SVBGSA does not independently sample wells for any COC. Instead, the GSA analyzes water quality data that are collected through the DDW and ILRP. Therefore, the GSA is dependent on the monitoring density and frequency of DDW and ILRP.

Water quality data from public water systems are collected, analyzed, and reported in accordance with protocols that are reviewed and approved by the SWRCB DDW, in accordance with the state and federal Safe Drinking Water Acts. Monitoring protocols may vary by agency.

ILRP data are currently collected under CCRWQCB Ag Order 3.0. ILRP samples are collected under the Tier 1, Tier 2, or Tier 3 monitoring and reporting programs. Under Ag Order 4.0, ILRP data will be collected in 3 phases and each groundwater basin within the Central Coast Region has been assigned to one or more of these phases. The designated phase for each ILRP well is provided in SWRCB's GeoTracker database and is publicly accessible at:

<https://geotracker.waterboards.ca.gov/>. Ag Order 4.0 will take effect in the Subbasin beginning in 2023. Copies of the Ag Orders 3.0 and 4.0 monitoring and reporting programs are included in Appendix 7C and are incorporated into this GSP. These protocols are consistent with data and reporting standards described in GSP Regulations § 352.4.

7.4.2 Groundwater Quality Monitoring Data Gaps

The DDW and ILRP monitoring network provide sufficient spatial and temporal data to determine groundwater quality trends for water quality indicators to address known water quality issues. Additionally, there is adequate spatial coverage in the water quality monitoring network to assess impacts to beneficial uses and users.

7.5 Land Subsidence Monitoring Network

As described in Section 5.4, DWR collects land subsidence data using InSAR satellite data and makes these data available to the GSAs. This subsidence dataset represents the best available science for the Forebay Subbasin and is therefore used as the subsidence monitoring network.

7.5.1 Land Subsidence Monitoring Protocols

Land Subsidence monitoring protocols are the ones used by DWR for InSAR measurements and interpretation. DWR adapted their methods to measure subsidence on hard surfaces only and interpolate between them to minimize the change in land surface elevation captures in soft surfaces that are likely not true subsidence. The cell size of this interpolated surface is 302 feet by 302 feet. If the annual monitoring indicates subsidence is occurring at a rate greater than the minimum thresholds, then additional investigation and monitoring may be warranted. In particular, the GSAs will implement a study to assess if the observed subsidence can be

correlated to groundwater elevations, and whether a reasonable causality can be established. These protocols are consistent with data and reporting standards described in GSP Regulations § 352.4.

7.5.2 Land Subsidence Data Gaps

There are no data gaps associated with the subsidence monitoring network.

7.6 Interconnected Surface Water Monitoring Network

The primary tool for assessing depletion of ISW due to pumping will be shallow monitoring wells adjacent to the Salinas River, the Arroyo Seco, and other streams in the Subbasin. Figure 7-6 shows the existing wells from MCWRA's groundwater monitoring programs that will be added to the ISW monitoring network and the location of a proposed new monitoring well. Existing wells were chosen based on the locations of ISW determined by the preliminary SVIHM, well depth, and proximity to the Salinas River and Arroyo Seco. Furthermore, the wells are also located in vicinity of to a USGS stream gauge or MCWRA River Series measurement site shown on Figure 7-6. This allows for monitoring of groundwater elevations near the rivers in the Subbasin and may provide insight on the relationship between streamflow and groundwater elevations. Additionally, the combined use of groundwater elevation and streamflow data will allow SVBGSA to assess temporal changes in conditions due to variations in stream discharge and regional groundwater extraction, as well as other factors that may be necessary to identify adverse impacts on beneficial uses of the surface water as discussed in Chapter 8. All ISW monitoring wells are RMS. More information on the development of the ISW monitoring network is provided in Appendix 7D.

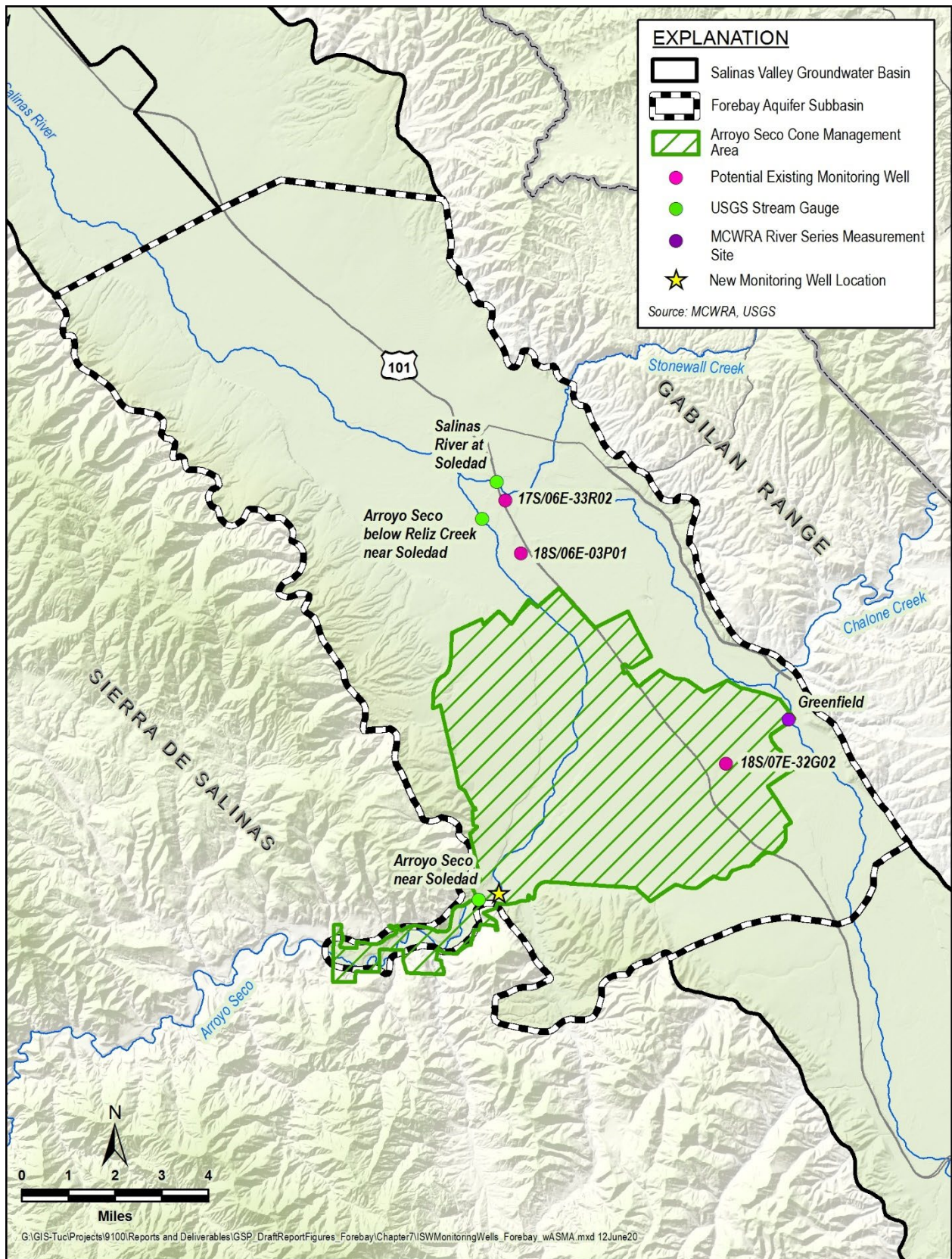


Figure 7-6. Interconnected Surface Water Monitoring Network

7.6.1 Interconnected Surface Water Monitoring Protocols

Monitoring protocols for shallow wells monitoring ISW will be identical to MCWRA's current groundwater elevation monitoring protocols, included in Appendix 7A. These protocols are consistent with data and reporting standards described in GSP Regulations § 352.4. Additionally, each well that is added to the monitoring network will be equipped with a data logger that will allow SVBGSA to access if seasonal pumping is resulting in streamflow depletions.

7.6.2 Interconnected Surface Water Data Gaps

As shown in Figure 7-6, the data gap in the ISW monitoring network will be filled with a new well added along the Arroyo Seco. This well will fill the data gap in this monitoring network and the one in the groundwater elevation monitoring network, as discussed in Chapter 10. The new shallow well will be added to MCWRA's groundwater elevation monitoring program.

7.7 Other Monitoring Networks

SGMA requires that annual reports include annual groundwater extractions and surface water diversions in order to report total water use for the Subbasin; thus, the following monitoring networks are needed in addition to the monitoring networks outlined above for sustainability indicators.

7.7.1 Groundwater Extraction

MCWRA's GEMS will be used to monitor urban and agricultural extraction in the Subbasin. Under Monterey County Ordinance No. 3717, public water systems and agricultural pumpers using wells with an internal discharge pipe greater than 3 inches within Zones 2, 2A, and 2B report extractions annually to GEMS. Extraction is self-reported by well owners or operators. Agricultural wells report their data based on MCWRA's reporting year that runs from November 1 through October 31. Urban and industrial wells report extraction on a calendar year basis. When extraction data is summarized annually, MCWRA combines industrial and urban extractions into a single urban water use. As depicted in Figure 3-3, these zones provide sufficient coverage of the Forebay Subbasin.

SVBGSA will work with MCWRA to obtain the GEMS data through a coordinated reporting program such that wells owners can provide a single annual reporting to fulfill the requirements of both the GSP and the existing County Ordinances No. 3717 and No. 3718.

7.7.1.1 Groundwater Extraction Monitoring Protocols

Groundwater extraction monitoring is accomplished using the GEMS data provided by MCWRA. Existing GEMS protocols are consistent with data and reporting standards described in GSP Regulations §352.4.

7.7.1.2 Groundwater Extraction Monitoring Data Gaps

Accurate assessment of the amount of pumping requires an accurate count of the number of municipal, agricultural, and domestic wells in the GSP area. As proposed in Chapter 9, SVBGSA will undertake well registration during implementation to develop a database of existing and active groundwater wells. This database will draw from the existing MCWRA database, DWR's OSWCR database, and the Monterey County Health Department database of state small and local small water systems. As part of the assessment, the SVBGSA will verify well completion information and location, and whether the well is active, abandoned, or destroyed as is discussed further in Chapter 9.

The accuracy and reliability of groundwater pumping reported through GEMS is constantly being updated. SVBGSA will work with MCWRA to evaluate methods currently in place to assure data reliability. Based on the results of that evaluation, the protocols for monitoring may be revised and a protocol for well meter calibration may be developed. SVBGSA will work with MCWRA to consider the value of developing protocols for flowmeter calibration and other potential enhancements to the GEMS programs that are discussed in Chapter 9.

7.7.2 Salinas River Watershed Diversions

Salinas River watershed monthly diversion data are collected annually in the SWRCB's Electronic Water Rights Information Management System (eWRIMS). eWRIMS is used track information of water rights in the state and is publicly accessible at:

<https://ciwqs.waterboards.ca.gov/ciwqs/ewrims/reportingDiversionsDownloadPublicSetup.do>.

These data include diversions from tributaries of the Salinas River, such as CCWC's diversion from the Arroyo Seco.

As mentioned in Chapter 3, growers and residents have noted that some irrigation is reported both to the SWRCB as Salinas River diversion and to the MCWRA as groundwater pumping. Comparing surface water diversion data to groundwater pumping data is complicated by the fact that diversions and pumping are reported on different schedules. To estimate the quantity that is potentially double counted and reported as both groundwater extraction and surface water diversions, an initial analysis was undertaken by matching unique locations and monthly diversion amounts summed by the GEMS reporting year (November 1 through October 31) to reported annual pumping data as shown in Figure 3-4.

7.7.2.1 Salinas River Watershed Diversions Monitoring Protocols

Salinas River watershed diversion monitoring protocols are those that the SWRCB has established for the collection of water right information. These protocols are consistent with data and reporting standards described in GSP Regulations § 352.4.

7.7.2.2 Salinas River Watershed Diversions Monitoring Data Gaps

These data are lagged by a year because the reporting period does not begin until February of the following year.

7.8 Data Management System and Data Reporting

The SVBGSA has developed a DMS in adherence to GSP Regulations § 352.6 and § 354.40 that is used to store, review, and upload data collected as part of the GSP development and implementation.

The SVBGSA DMS consists of 2 SQL databases. The HydroSQL database stores information about each well and time-series data for water level and extraction. Fields in the HydroSQL database include:

- Subbasin
- Cadastral coordinates
- Planar coordinates
- Well owner
- Well name
- Well status
- Well depth
- Screened interval top and bottom
- Well type
- Water level elevation
- Annual pumping volume

Well owner and annual pumping information will be stored in HydroSQL; however, neither will be publicly accessible due to confidentiality requirements.

Streamflow gauge data from the USGS is stored in the HydroSQL database similarly to the well water level information.

Water quality data are stored in the EnviroSQL database, which is linked to the HydroSQL database for data management purposes. Fields in the EnviroSQL database include:

- Station
- Parameter
- Sample Date
- Detection (detect or non-detect)
- Value
- Unit

The data used to populate the SVBGSA DMS are listed in Table 7-2. Categories marked with an X indicate datasets that were used in populating the DMS, including data that are publicly accessible or that are available to SVBGSA from MCWRA. Some data, such as groundwater extraction is confidential, and cannot be made publicly accessible by SVBGSA unless aggregated. Additional datasets will be added in the future as appropriate, such as recharge or diversion data.

Table 7-2. Datasets Available for Use in Populating the DMS

Data Sets	Data Category					
	Well and Site Information	Well Construction	Water Level	Pumping ¹	Streamflow	Water Quality
DWR (CASGEM)	X	X				
MCWRA	X	X	X	X		
GAMA Groundwater Information System	X					X
USGS Gage Stations					X	

¹ Pumping data not publicly accessible

Data are compiled and reviewed to comply with quality objectives. The review includes the following checks:

- Removing or flagging questionable data being uploaded in the DMS. This includes identifying outliers that may have been introduced during the original data entry process and plotting each well hydrograph to identify and remove anomalous data points.
- Loading into the database and checking for errors and missing data.

In the future, well log information will be entered for selected wells and other information will be added as needed to satisfy the requirements of the GSP Regulations.

The DMS also includes a publicly accessible web-map hosted on the SVBGSA website; accessible at <https://svbgsa.org/gsp-web-map-and-data/>. This web-map gives interested parties access to non-confidential technical information used in the development of the GSP and annual reports and includes public well data and analysis such as water level contour maps and seawater intrusion, as well as various local administrative boundaries. In addition, the web-map has functionalities to graph time series of water levels and search for specific wells in the database. This web-map will be regularly updated as new information is made available to the SVBGSA.

8 SUSTAINABLE MANAGEMENT CRITERIA

This chapter defines the conditions that constitute sustainable groundwater management; and establishes minimum thresholds, measurable objectives, and undesirable results for each sustainability indicator. The minimum thresholds, measurable objectives, and undesirable results detailed in this chapter define the Subbasin's future conditions and commit the GSA to actions that will meet these criteria. This chapter includes adequate data to explain how SMC were developed and how they influence all beneficial uses and users.

The chapter is structured to address all the GSP Regulations regarding SMC. To retain an organized approach, the SMC are grouped by sustainability indicator. The discussion of each sustainability indicator follows a consistent format that contains all the information required by the GSP Regulations, and as further clarified in the SMC BMP (23 California Code of Regulations §354.22 *et seq.*; DWR, 2017).

The Forebay Subbasin includes the ASCMA. The ASCMA is managed by the ASGSA, and the remaining area of the Subbasin managed by the SVBGSA in accordance with the Forebay Subbasin Groundwater Sustainability Plan Implementation Agreement (Forebay Implementation Agreement, 2021). The Management Area was established to account for the unique hydrogeologic, water quality and water supply characteristics of the Arroyo Seco Cone region as described in Chapter 4. Although the ASCMA and the greater Forebay Subbasin are managed by different GSAs, both areas will be managed cooperatively to meet the sustainability goal of the entire Subbasin. The undesirable results for all sustainability indicators are defined consistently throughout the Subbasin.

8.1 Definitions

The SGMA legislation and GSP Regulations contain terms relevant to the SMC. The definitions included in the GSP Regulations are repeated below. Where appropriate, additional explanatory text is added in *italics*. This explanatory text is not part of the official definitions of these terms.

- **Sustainability indicator** refers to any of the effects caused by groundwater conditions occurring throughout the basin that, when significant and unreasonable, cause undesirable results, as described in Water Code Section 10721(x).

The 5 sustainability indicators relevant to this subbasin include chronic lowering of groundwater levels; reduction of groundwater storage; degraded water quality; land subsidence; and depletion of ISW.

- **Significant and Unreasonable**

Significant and unreasonable is not defined in the Regulations. However, the definition of undesirable results states, “Undesirable results occur when significant and

unreasonable effects ... are caused by groundwater conditions....” This GSP adopts the phrase significant and unreasonable to be the qualitative description of undesirable conditions due to inadequate groundwater management. Minimum thresholds are the quantitative measurement of the significant and unreasonable conditions.

- **Minimum threshold** refers to a numeric value for each sustainability indicator used to define undesirable results.

Minimum thresholds are indicators of an unreasonable condition.

- **Measurable objective** refers to a specific, quantifiable goals for the maintenance or improvement of specified groundwater conditions that have been included in an adopted Plan to achieve the sustainability goal for the basin.

Measurable objectives are goals that the GSP is designed to achieve.

- **Interim milestone** refers to a target value representing measurable groundwater conditions, in increments of 5 years, set by an Agency as part of a Plan.

Interim milestones are targets such as groundwater elevations that will be achieved every 5 years to demonstrate progress toward sustainability.

- **Undesirable Result**

Undesirable Result is not defined in the Regulations. However, the description of undesirable result states that it should be a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the subbasin. An example undesirable result is more than 10% of the measured groundwater elevations being lower than the minimum thresholds. Undesirable results should not be confused with significant and unreasonable conditions. Significant and unreasonable conditions are qualitative descriptions of conditions to be avoided; an undesirable result is a quantitative assessment based on minimum thresholds.

8.2 Sustainability Goal

The sustainability goal of the Forebay Subbasin is to manage groundwater resources for long-term community, financial, and environmental benefits to the Subbasin’s residents and businesses. The goal of this GSP is to ensure long-term viable water supplies while maintaining the unique cultural, community, and business aspects of the Subbasin. It is the express goal of this GSP to balance the needs of all water users in the Subbasin.

Several management actions and projects that will allow the SVBGSA to maintain sustainability are included in this GSP and detailed in Chapter 9. It is not necessary to implement all projects and actions listed in this GSP to maintain sustainability. However, some combination of these

may be implemented throughout the planning and implementation horizon to ensure the Subbasin continues to operate within its sustainable yield and meet the sustainability goal. This includes the option of 7 management actions, including the establishment of the Forebay SMC TAC, conservation and agricultural BMPs, improving rural residential water quality within the ASCMA, watershed protection policy for the Arroyo Seco River, land fallowing, and 2 potential management actions that would result in the reoperation of the San Antonio and Nacimiento Reservoirs. The Chapter also includes 2 potential recharge projects that involve multi-benefit stream channel improvements and large recharge basins. Finally, Chapter 9 includes implementation actions that do not directly help meet the SMC, but contribute to GSP implementation through data collection, assistance to groundwater users, and collaboration with partner agencies. This suite of management actions and projects provide sufficient options to maintain sustainability in the Forebay Subbasin throughout GSP implementation. The management actions and projects are designed to maintain sustainability for the next 20 years by one or more of the following means:

- Educating stakeholders and prompting changes in behavior to improve chances of achieving sustainability
- Increasing awareness of groundwater pumping impacts to promote voluntary reductions in groundwater use through improved water use practices or fallowing crop land
- Increasing basin recharge
- Developing new alternative water supplies for use in the Subbasin to offset groundwater pumping

8.3 Maintaining Long-Term Sustainability

The GSP addresses long-term groundwater sustainability. Correspondingly, the SVBGSA intends to develop SMC to avoid undesirable results under future hydrologic conditions. The understanding of future conditions is based on historical precipitation, ET, streamflow, and reasonable anticipated climate change, which have been estimated on the basis of the best available climate science (DWR, 2018). These parameters underpin the estimated future water budget over the planning horizon (see Section 6.4). The average hydrologic conditions include reasonably anticipated wet and dry periods. Groundwater conditions that are the result of extreme climatic conditions and are worse than those anticipated do not constitute an undesirable result. However, SMC may be modified in the future to reflect observed future climate conditions.

The GSA will track hydrologic conditions during GSP implementation. These observed hydrologic conditions will be used to develop a value for average hydrologic conditions, which will be compared to predicted future hydrologic conditions. This information will be used to interpret the Subbasin's performance against SMC. Year-by-year micro-management is not the

intent of this GSP; this GSP is developed to avoid undesirable results with long-term, deliberate groundwater management. For example, groundwater extractions may experience variations caused by reasonably anticipated hydrologic fluctuations. However, under average hydrologic conditions, there will be no chronic depletion of groundwater storage.

Further, since the GSP addresses long-term groundwater sustainability, exceedance of some SMC during an individual year does not constitute an undesirable result. Pursuant to SGMA regulations (California Water Code § 10721(w)(1)), “Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.” Therefore, groundwater levels may temporarily exceed minimum thresholds during prolonged droughts, which could be more extreme than those that have been anticipated based on historical data and anticipated climate change conditions. Such temporary exceedances do not constitute an undesirable result.

The SMC presented in this chapter are developed on the basis of historically observed hydrologic conditions and, in most cases, reasonably anticipated climate change. These SMC may be updated in future drafts to reflect changes in anticipated climate conditions and climate change based upon groundwater modeling results.

8.4 General Process for Establishing Sustainable Management Criteria

The SMC presented in this chapter were developed using publicly available information, feedback gathered during public meetings including Subbasin Committee meetings, hydrogeologic analysis, and meetings with SVBGSA and ASGSA staff and Advisory Committee members. The general process included:

- Presenting to Forebay Subbasin Committee and ASGSA Advisory Committee on the general SMC requirements and implications. These presentations outlined the approach to developing SMC and discussed initial SMC ideas.
- Gathering feedback from discussions with subbasin committee and the ASGSA Advisory Committee on challenges and goals.
- Providing supplemental data to the subbasin committees to guide the approach to setting SMC.
- Polling and receiving feedback from the subbasin committees to establish preferences for establishing SMC.
- Selecting approach and criteria for setting SMC in the subbasin committee.
- Developing joint ASGSA and SVBGSA recommendations for SMC.

- Soliciting feedback on joint approach from the Forebay Subbasin Committee and the ASGSA Advisory Committee.
- Obtaining additional input on SMC from with GSA staff and GSA Board Members.
- Modifying minimum thresholds and measurable objectives based on input from the public, GSA staff, and GSA Board Members, if needed.

8.5 Sustainable Management Criteria Summary

Table 8-1 provides a summary of the SMC for each of the 5 sustainability indicators. Measurable objectives are the goals that reflect the Subbasin’s desired groundwater conditions for each sustainability indicator. These provide operational flexibility above the minimum thresholds. The minimum thresholds are quantitative indicators of the Subbasin’s locally defined significant and unreasonable conditions. The undesirable result is a combination of minimum threshold exceedances that show a significant and unreasonable condition across the Subbasin as a whole. This GSP is designed to not only avoid undesirable results, but to achieve the sustainability goals within 20 years, along with interim milestones every 5 years that show progress. The management actions and projects provide sufficient options for reaching the measurable objectives within 20 years and maintaining those conditions for 30 years for all 5 sustainability indicators. The rationale and background for developing these criteria are described in detail in the following sections. The SMC are identical for the ASCMA and the Greater Forebay Subbasin. The rationale and background for developing these criteria are described in detail in the following sections.

The SMC are individual criteria that will each be met simultaneously, rather than in an integrated manner. For example, the groundwater elevation and interconnected surface water SMC are 2 independent SMC that will be achieved simultaneously. The groundwater elevation SMC do not hinder the interconnected surface water SMC, but also, they do not prevent the degradation of interconnected surface water by themselves. The SMC presented in Table 8-1 are part of the GSA’s 50-year management plan: SGMA allows for 20 years to reach sustainability and requires the Subbasin have no undesirable results for the subsequent 30 years.

Table 8-1. Sustainable Management Criteria Summary

Sustainability Indicator	Measurement	Minimum Threshold	Measurable Objective	Undesirable Result
Chronic lowering of groundwater levels	Measured through groundwater level representative monitoring well network	Minimum thresholds are set to December 2015 groundwater elevations. See Table 8-2 .	Measurable objectives are set to 2015 groundwater elevations plus 75% of the difference between 2015 and 1998 groundwater elevations.	More than 15% of groundwater elevation minimum thresholds are exceeded. Allows 5 exceedances in the Forebay Subbasin.
Reduction in groundwater storage	Measured from groundwater elevation contour maps.	Minimum threshold is set to 267,000 AF below the measurable objective. This reduction is based on the groundwater level minimum thresholds. This number will be refined as additional data are collected and other projects are implemented.	Measurable objective is set to zero when the groundwater elevations are held at the groundwater level measurable objectives. Since the goal is to manage to the measurable objective, additional water in storage is needed until groundwater elevations are at their measurable objectives.	There is an exceedance of the minimum threshold.
Degraded groundwater quality	Groundwater quality data downloaded annually from GeoTracker GAMA groundwater information system.	Minimum thresholds are zero additional exceedances of the regulatory drinking water standard (potable supply wells) or Basin Plan objective (irrigation supply wells) beyond those observed on December 31, 2019 for groundwater quality constituents of concern. Exceedances are only measured in public water system supply wells and ILRP on-farm domestic and irrigation supply wells. See Table 8-5.	Measurable objectives are identical to the minimum threshold.	Future or new minimum thresholds exceedances are caused by a direct result of GSA groundwater management action(s), including projects or management actions and regulation of groundwater extraction.

Sustainability Indicator	Measurement	Minimum Threshold	Measurable Objective	Undesirable Result
Land subsidence	Measured using DWR provided InSAR data.	Minimum threshold is 0.133 feet per year. This is the rate that results in less than 1 foot of cumulative subsidence over a 30-year implementation horizon, plus 0.1 feet per year of estimated land movement to account for InSAR measurement errors.	Measurable objective is 0.1 feet per year. This is a long-term rate of zero feet per year plus 0.1 feet per year of estimated land movement to account for InSAR measurement errors.	There is an exceedance of the minimum threshold for subsidence due to lowered groundwater elevations that surpass historical lows.
Depletion of interconnected surface water (ISW)	Groundwater elevations in shallow wells adjacent to locations of ISW identified using the SVIHM.	Minimum thresholds are established by proxy using shallow groundwater elevations observed in December 2015 near locations of ISW.	Measurable objectives are established by proxy using shallow groundwater elevations near locations of ISW and are set to 75% of the distance between 2015 and 1998 shallow groundwater elevations.	There is an exceedance of the minimum threshold in a shallow groundwater monitoring well used to monitor ISW.

8.6 Chronic Lowering of Groundwater Levels SMC

8.6.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable groundwater elevations in the Subbasin are those that:

- Are at or below the observed groundwater elevations in December 2015. Public and stakeholder input identified these historical groundwater elevations as significant and unreasonable.
- Cause significant financial burden to local agricultural interests.
- Interfere with other sustainability indicators.

These significant and unreasonable conditions were determined based on input collected during ASGSA Advisory Committee meetings, SVBGSA Subbasin Committee meetings, and discussions with GSA staff.

8.6.2 Minimum Thresholds

The minimum thresholds for chronic lowering of groundwater levels are set to December 2015 groundwater elevations.

The minimum threshold values for each well within the groundwater level monitoring network are provided on Table 8-2. The minimum threshold contour map, along with the RMS well locations for the single principal aquifer in the Forebay Subbasin, are shown on Figure 8-1.

Table 8-2. Chronic Lowering of Groundwater Levels Minimum Thresholds and Measurable Objectives

Monitoring Site	Minimum Threshold (feet)	Measurable Objective (feet)
17S/05E-02N04	89.7	108.5
17S/05E-03R50	89.7	111.5*
17S/05E-04R01	82.7	101.8
17S/05E-06Q01	76.7	97.9
17S/05E-08L02	92.5	109.4*
17S/05E-09R01	93.1	112.8*
17S/05E-12E01	95.9*	105.2
17S/05E-27A01	116.9	134.6
17S/05E-36F02	120.9	136.6
17S/06E-16N01	75.3*	109.4
17S/06E-19D01	118.6	135.5
17S/06E-27K01	137.9	156.2
17S/06E-29C01	129.9	144.8
17S/06E-33R01	141.9	160.7
17S/06E-33R02	142.0	159.7
17S/06E-35J01	151.5	171.2
18S/06E-01E01	149.3	174.1
18S/06E-02N01	142.2	164.0
18S/06E-05R03	136.1	154.0
18S/06E-06M01	144.8	162.6
18S/06E-11J01	154.4	177.1
18S/07E-19G02	151.2	175.7
19S/07E-10P01	204.5	227.8
Arroyo Seco Cone Management Area		
18S/06E-16L01	140.4	168.4
18S/06E-22B02	153.2	180.8
18S/06E-22B03	157.2	183.8
18S/06E-22B04	156.2	182.4
18S/06E-24M01	161.9	187.4
18S/06E-24M02	162.0	187.4
18S/06E-25F01	167.9	199.0
18S/06E-34B01	167.2	199.5
18S/06E-35F01	165.9	198.9
18S/06E-35F02	166.5	203.6
18S/07E-20K01	160.6	183.7
18S/07E-28K01	176.0	199.3
19S/06E-01H01	181.3	207.0
19S/06E-11C01	175.6	206.3
19S/07E-04Q01	207.1	223.9
19S/07E-05B02	189.2	210.0

*Groundwater elevation was estimated.

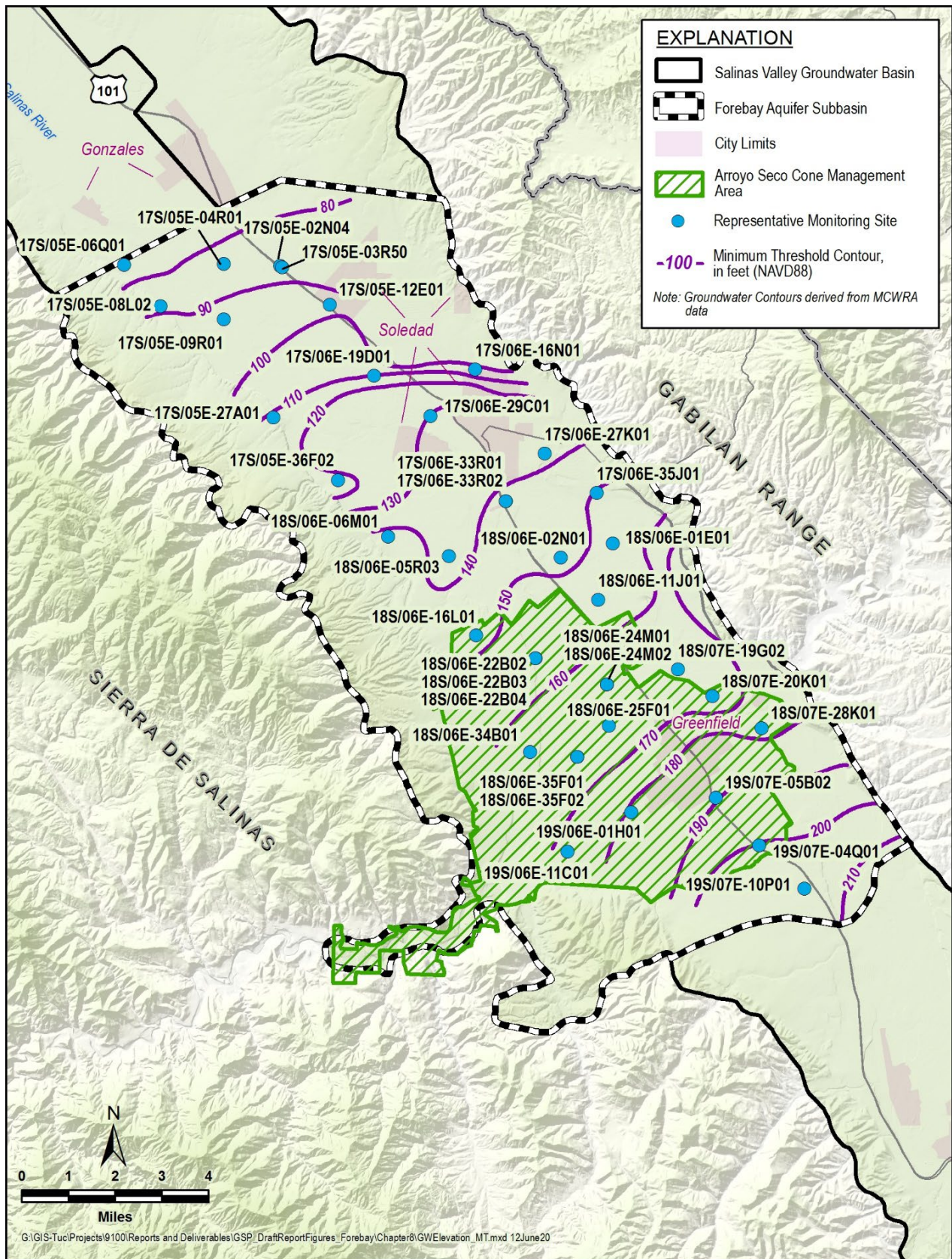


Figure 8-1. Groundwater Level Minimum Threshold Contour Map

8.6.2.1 Information and Methodology Used to Establish Minimum Thresholds and Measurable Objectives

The development of minimum thresholds and measurable objectives followed similar processes and are described concurrently in this section. The information used includes:

- Feedback from discussions with the Subbasin Committee and the ASGSA Advisory Committee on challenges and goals
 - Historical groundwater elevation data and hydrographs from wells monitored by the MCWRA
 - Maps of current and historical groundwater elevation data
 - Analysis of the impact groundwater elevations on domestic wells
1. The general steps for developing minimum thresholds and measurable objectives were:
 2. The ASGSA Advisory Committee and the Subbasin Committee selected approaches and criteria for setting the groundwater level minimum thresholds and measurable objectives.
 3. The ASGSA and SVBGSA consultants reviewed and compared information from the various committee recommendations, tentatively agreeing on December 2015 as the minimum threshold.
 4. The ASGSA reviewed hydrographs and estimated that groundwater elevations have historically been held approximately 75% of the way up from December 1995 elevations to the relatively high elevations recorded in 1998. This was tentatively chosen as the measurable objective.
 5. SVBGSA reviewed the cumulative change in groundwater levels from all years, shown on Figure 8-2, to verify if the minimum threshold and measurable objective were realistic criteria for the Subbasin. The minimum threshold listed above is about 4 feet above the lowest groundwater levels experienced by the Subbasin and is therefore a reasonable criterion. The measurable objective chosen falls within the representative climatic cycle shown on Figure 8-2 meaning that it is an achievable goal under reasonably expected climatic conditions.
 6. SVBGSA verified the minimum threshold and measurable objective with the Subbasin Committee Stakeholders.
 7. SVBGSA and ASGSA plotted the appropriate minimum thresholds and measurable objectives on the respective monitoring well hydrographs. Each hydrograph was visually inspected to check if the minimum threshold and measurable objective was reasonable. If an RMS did not have measurements from the minimum threshold or measurable objective years, the SMC were interpolated from the groundwater elevation contours. The RMS location was intersected with groundwater elevation contour maps to estimate the

minimum thresholds and measurable objectives. The interpolated minimum thresholds and measurable objectives are indicated by an asterisk in Table 8-2. Additionally, if December measurements were unavailable November measurements were used.

Hydrographs with well completion information showing minimum thresholds for each RMS are included in Appendix 8A.

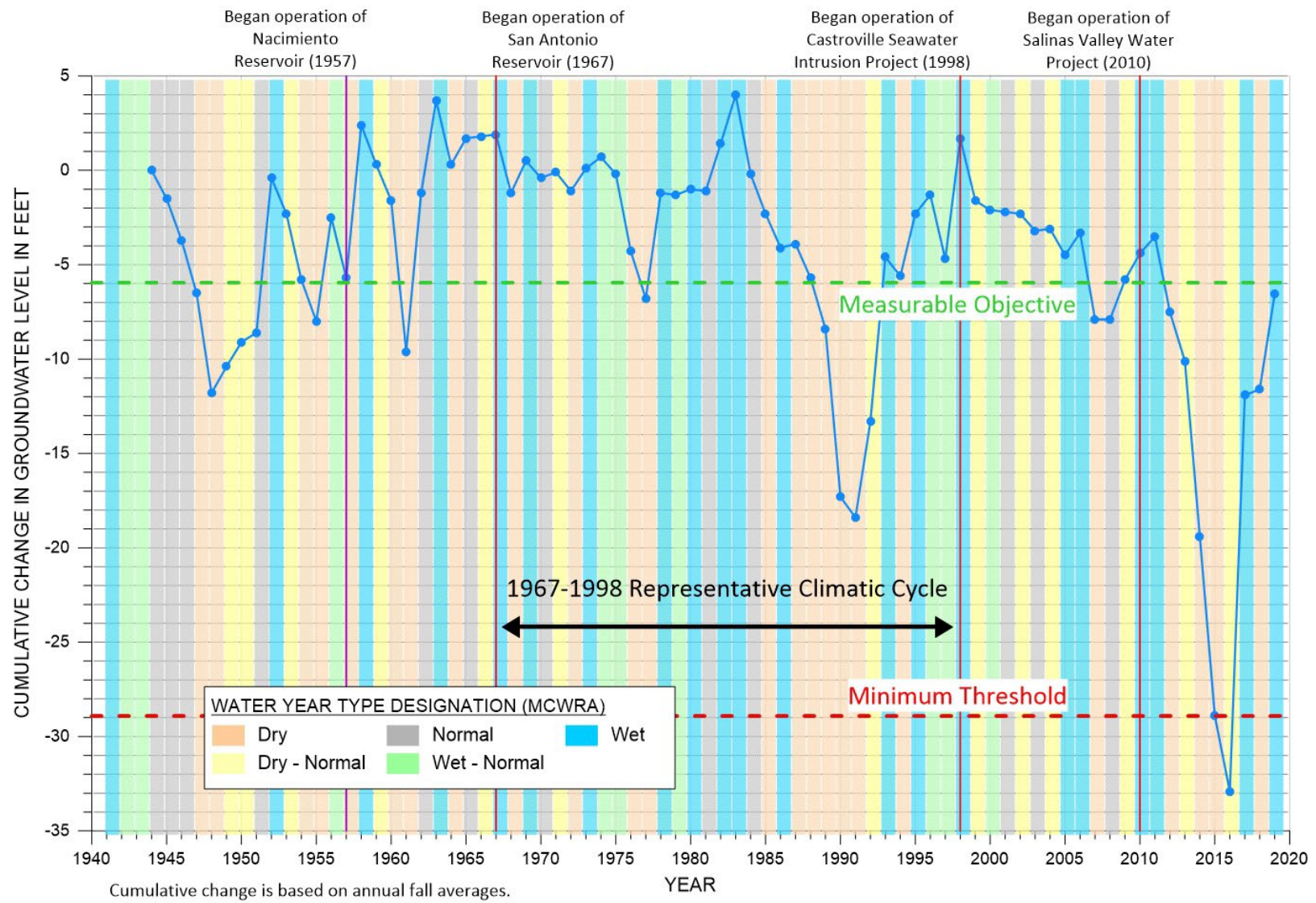


Figure 8-2. Cumulative Groundwater Elevation Change Hydrograph with Selected Minimum Threshold and Measureable Objective for the Forebay Aquifer Subbasin

8.6.2.2 Minimum Thresholds Impact on Domestic Wells

To address the human right to water, minimum thresholds for groundwater levels are compared to the range of domestic well depths in the Subbasin using DWR's OSWCR database. This check was done to assure that the minimum thresholds maintain operability in a reasonable percentage of domestic wells. The proposed minimum thresholds for groundwater levels do not necessarily protect all domestic wells because it is impractical to manage a groundwater basin in a manner that fully protects the shallowest wells. The average computed depth of domestic wells in the Subbasin is 281 feet using the Public Land Survey System sections data in the OSWCR database.

While this approach is reasonable, there are some adjustments that had to be made to improve the accuracy of the analysis. These include:

- Only wells that had accurate locations were included, since some wells in the OSWCR database are not accurately located, it could lead to inaccurate estimations of depth to water in the wells.
- The depth to water is derived from a smoothly interpolated groundwater elevation contour map. Errors in the map may result in errors in groundwater elevation at the selected domestic wells.

Given the limitations listed above, the analysis only included 8 domestic wells out of the total 154 domestic wells in the OSWCR database. In the Forebay Subbasin, 100% of all domestic wells will have at least 25 feet of water in them as long as groundwater elevations remain above minimum thresholds; and 100% of all domestic wells will have at least 25 feet of water in them when measurable objectives are achieved. These percentages were considered reasonable despite the limitations of this analysis. Since data for the analysis is limited, further assessment may be done when more data becomes available.

8.6.2.3 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

The SVBGSA compared minimum thresholds between RMS to understand the relationship between RMSs (i.e., describe why or how a water level minimum threshold set at a particular RMS is similar to or different from water level thresholds in nearby RMS). The minimum thresholds are unique at every well, but when combined represent a reasonable and potentially realistic groundwater elevation map. Because the underlying groundwater elevation map is a reasonably achievable condition, the individual minimum thresholds at RMSs do not conflict with each other.

Groundwater level minimum thresholds can influence other sustainability indicators. SVBGSA reviewed the groundwater level minimum thresholds' relationship with each of the other

sustainability indicators' minimum thresholds to ensure a groundwater level minimum threshold would not trigger an undesirable result for any of the other sustainability indicators. The groundwater level minimum thresholds are selected to avoid undesirable results for other sustainability indicators.

- **Reduction in groundwater storage.** The chronic lowering of groundwater levels' minimum thresholds is identical to the groundwater storage minimum thresholds. Thus, the groundwater level minimum thresholds will not result in an undesirable loss of groundwater storage.
- **Degraded water quality.** The chronic lowering of groundwater levels minimum could affect groundwater quality through 2 processes:
 1. Changes in groundwater elevation could change groundwater gradients, which could cause poor quality groundwater to flow toward production and domestic wells that would not have otherwise been impacted. These groundwater gradients, however, are only dependent on differences between groundwater elevations, not on the groundwater elevations themselves. Therefore, the minimum threshold groundwater levels do not directly lead to a significant and unreasonable degradation of groundwater quality in production and domestic wells.
 2. Decreasing groundwater elevations can mobilize COC that are concentrated at depth, such as arsenic. The groundwater level minimum thresholds are near or above historical lows. Therefore, any depth dependent constituents have previously been mobilized by historical groundwater levels. Maintaining groundwater elevations above the minimum thresholds assures that no new depth dependent COC are mobilized and are therefore protective of beneficial uses and users.
- **Land subsidence.** The chronic lowering of groundwater levels' minimum thresholds is set at or above recent low groundwater elevations. Thus, avoiding the dewatering and compaction of clay-rich sediments that causes subsidence in response to lowering groundwater elevations.
- **Depletion of ISW.** The chronic lowering of groundwater levels' minimum thresholds is identical to the ISW minimum thresholds. Therefore, the groundwater level minimum thresholds will not result in a significant or unreasonable depletion of ISW including GDEs.

8.6.2.4 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The Forebay Subbasin has 3 neighboring subbasins within the Salinas Valley Groundwater Basin:

- The Eastside Subbasin to the northeast

- The Upper Valley Subbasin to the south
- The 180/400-Foot Aquifer Subbasin to the northwest

The SVBGSA is either the exclusive GSA or is one of the coordinating GSAs for the adjacent Subbasins. Because the SVBGSA covers all these subbasins, the SVBGSA is coordinating the development of the minimum thresholds and measurable objectives for all these subbasins. The 180/400-Foot Aquifer Subbasin submitted a GSP in 2020 and the Eastside and Upper Valley Subbasins are in the process of GSP development for submittal in January 2022. Minimum thresholds for the Forebay Subbasin will be reviewed relative to information developed for the neighboring subbasins' GSPs to ensure that these minimum thresholds will not prevent the neighboring subbasins from achieving or maintaining sustainability.

8.6.2.5 Effects on Beneficial Users and Land Uses

The groundwater level minimum thresholds may have several effects on beneficial users and land uses in the Subbasin.

Agricultural land uses and users. The groundwater level minimum thresholds prevent continued lowering of groundwater elevations in the Subbasin. This may have the effect of limiting the amount of groundwater pumping in the Subbasin. Limiting the amount of groundwater pumping may limit the amount and type of crops that can be grown in the Subbasin. The groundwater level minimum thresholds could therefore limit expansion of the Subbasin's agricultural economy. This could have various effects on beneficial users and land uses:

- Agricultural land currently under irrigation may become more valuable as bringing new lands into irrigation becomes more difficult and expensive.
- Agricultural land not currently under irrigation may become less valuable because it may be too difficult and expensive to irrigate.

Urban land uses and users. The groundwater level minimum thresholds may limit the amount of groundwater pumping in the Subbasin. This may limit urban growth or result in urban areas obtaining alternative sources of water. This may result in higher water costs for public drinking water system users.

Domestic land uses and users. The groundwater level minimum thresholds are intended to protect most domestic wells. Therefore, the minimum thresholds will likely have an overall beneficial effect on existing domestic land uses by protecting the ability to pump from domestic wells. However, extremely shallow domestic wells may become dry, requiring owners to drill deeper wells. Additionally, the groundwater level minimum thresholds may limit the number of new domestic wells that can be drilled to limit future declines in groundwater elevations caused by more domestic pumping.

Ecological land uses and users. The groundwater level minimum thresholds may limit the amount of groundwater pumping in the Subbasin and may limit both urban and agricultural growth. This may benefit ecological land uses and users by curtailing the conversion of native vegetation to agricultural or domestic uses, and by reducing pressure on existing ecological land caused by declining groundwater elevations.

8.6.2.6 Relevant Federal, State, or Local Standards

No federal, state, or local standards exist for chronic lowering of groundwater levels.

8.6.2.7 Method for Quantitative Measurement of Minimum Thresholds

Groundwater level minimum thresholds will be directly measured from the representative monitoring well network. The groundwater elevation monitoring will be conducted according to the monitoring plan outlined in Chapter 7. Furthermore, the groundwater elevation monitoring will meet the requirements of the technical and reporting standards included in the GSP Regulations.

As noted in Chapter 7, the current groundwater level monitoring network in the Subbasin across aquifers includes 39 wells. Data gaps were identified in Chapter 7 and will be resolved during implementation of this GSP.

8.6.3 Measurable Objectives

The measurable objectives for chronic lowering of groundwater levels represent target groundwater elevations that are higher than the minimum thresholds. These measurable objectives provide operational flexibility to ensure that the Subbasin can be managed sustainably over a reasonable range of hydrologic variability.

The measurable objectives for the chronic lowering of groundwater levels are set to 2015 groundwater elevations plus 75% of the difference between 2015 and 1998 groundwater elevations.

These measurable objectives are summarized in Table 8-2. The measurable objectives are also shown on the hydrographs for each RMS in Appendix 8A.

8.6.3.1 Methodology for Setting Measurable Objectives

Groundwater levels minimum thresholds are set to 2015 elevations, and 1998 groundwater elevations were considered the highest reasonable groundwater elevation. To provide adequate operational flexibility during droughts and to mimic historical hydrograph patterns, the measurable objective was set 75% of the way up from 2015 groundwater elevations rather than halfway between 2015 and 1998 groundwater elevations. The measurable objective contour

maps along with the representative monitoring network wells are shown on Figure 8-3 for the Forebay Subbasin.

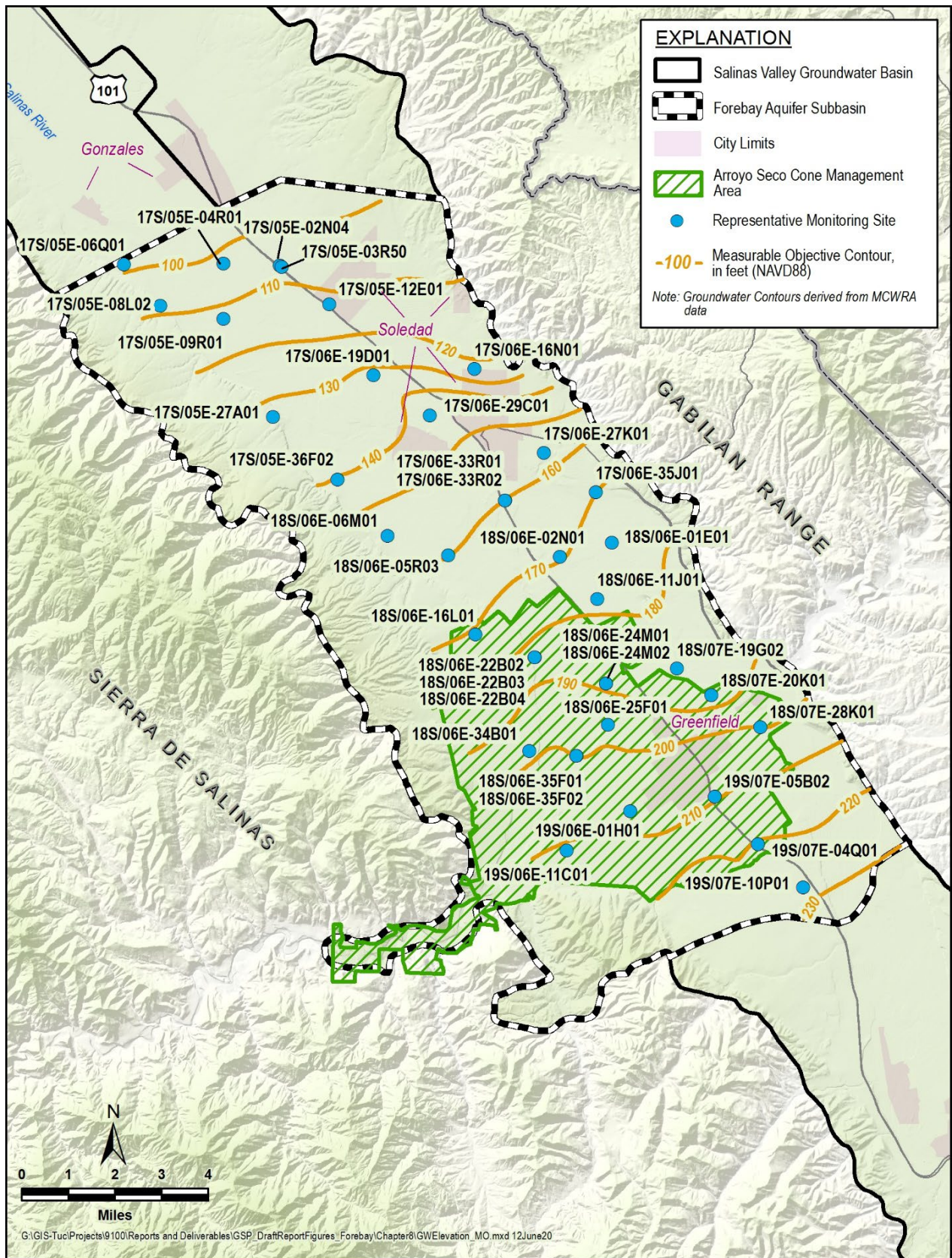


Figure 8-3. Groundwater Level Measurable Objective Contour Map

8.6.3.2 Interim Milestones

Interim milestones for groundwater levels are shown in Table 8-3. These are only initial estimates of interim milestones. Interim milestones for groundwater levels will be modified as better data, analyses, and project designs become available.

Table 8-3. Chronic Lowering of Groundwater Levels Interim Milestones

Monitoring Site	Current Groundwater Elevation (feet)	Interim Milestone at Year 2027 (feet)	Interim Milestone at Year 2032 (feet)	Interim Milestone at Year 2037 (feet)	Measurable Objective (feet) (goal to reach at 2042)
17S/05E-02N04	106.3	106.8	107.4	107.9	108.5
17S/05E-03R50	107.4	108.4	109.5	110.5	111.5*
17S/05E-04R01	101.9	101.9	101.8	101.8	101.8
17S/05E-06Q01	98.1	98.0	98.0	97.9	97.9
17S/05E-08L02	112.6	111.8	111.0	110.2	109.4*
17S/05E-09R01	112.6	112.6	112.7	112.7	112.8*
17S/05E-12E01	105.7	105.6	105.5	105.3	105.2
17S/05E-27A01	135.3	135.1	135.0	134.8	134.6
17S/05E-36F02	137.9	137.6	137.2	136.9	136.6
17S/06E-16N01	96.8	99.9	103.1	106.2	109.4
17S/06E-19D01	136.3	136.1	135.9	135.7	135.5
17S/06E-27K01	159.0	158.3	157.6	156.9	156.2
17S/06E-29C01	147.8	147.0	146.3	145.5	144.8
17S/06E-33R01	163.2	162.6	161.9	161.3	160.7
17S/06E-33R02	163.3	162.4	161.5	160.6	159.7
17S/06E-35J01	174.3	173.5	172.7	171.9	171.2
18S/06E-01E01	172.7	173.0	173.4	173.7	174.1
18S/06E-02N01	167.4	166.5	165.7	164.8	164.0
18S/06E-05R03	156.7	156.0	155.3	154.6	154.0
18S/06E-06M01	163.5	163.3	163.0	162.8	162.6
18S/06E-11J01	182.4	181.1	179.8	178.4	177.1
18S/07E-19G02	175.2	175.3	175.5	175.6	175.7
19S/07E-10P01	229.1	228.8	228.4	228.1	227.8

Monitoring Site	Current Groundwater Elevation (feet)	Interim Milestone at Year 2027 (feet)	Interim Milestone at Year 2032 (feet)	Interim Milestone at Year 2037 (feet)	Measurable Objective (feet) (goal to reach at 2042)
Arroyo Seco Cone Management Area					
18S/06E-16L01	167.7	167.9	168.0	168.2	168.4
18S/06E-22B02	176.9	177.9	178.9	179.8	180.8
18S/06E-22B03	187.2	186.4	185.5	184.7	183.8
18S/06E-22B04	183.5	183.2	183.0	182.7	182.4
18S/06E-24M01	193.3	191.8	190.4	188.9	187.4
18S/06E-24M02	193.5	192.0	190.4	188.9	187.4
18S/06E-25F01	195.8	196.6	197.4	198.2	199.0
18S/06E-34B01	192.5	194.2	196.0	197.7	199.5
18S/06E-35F01	189.2	191.6	194.1	196.5	198.9
18S/06E-35F02	203.2	203.3	203.4	203.5	203.6
18S/07E-20K01	187.0	186.2	185.4	184.5	183.7
18S/07E-28K01	202.7	201.8	201.0	200.1	199.3
19S/06E-01H01	203.4	204.3	205.2	206.1	207.0
19S/06E-11C01	204.0	204.6	205.1	205.7	206.3
19S/07E-04Q01	224.6	224.4	224.3	224.1	223.9
19S/07E-05B02	210.2	210.1	210.1	210.0	210.0

*Groundwater elevations was estimated.

8.6.4 Undesirable Results

8.6.4.1 Criteria for Defining Chronic Lowering of Groundwater Levels Undesirable Results

The chronic lowering of groundwater level undesirable result is a quantitative combination of groundwater level minimum threshold exceedances. The undesirable result is:

More than 15% of the groundwater elevation minimum thresholds are exceeded.

Since the GSP addresses long-term groundwater sustainability, exceedances of groundwater levels minimum thresholds during a drought do not constitute an undesirable result. Pursuant to SGMA Regulations (California Water Code § 10721(w)(1)), “Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.” Therefore, groundwater levels may temporarily exceed minimum thresholds during droughts, and do not constitute an undesirable result, as long as groundwater levels rebound.

Undesirable results provide flexibility in defining sustainability. Increasing the percentage of allowed minimum threshold exceedances provides more flexibility but may lead to significant and unreasonable conditions for some beneficial users. Reducing the percentage of allowed minimum threshold exceedances ensures strict adherence to minimum thresholds but reduces flexibility due to unanticipated hydrologic conditions. The undesirable result was set at 15% to balance the interests of beneficial users with the practical aspects of groundwater management under uncertainty.

The 15% limit on minimum threshold exceedances in the undesirable result allows for 5 exceedances in the 39 existing representative monitoring wells. This was considered a reasonable number of exceedances given the hydrogeologic uncertainty of aquifer characteristics of the Subbasin. As the monitoring system grows, additional exceedances will be allowed. One additional exceedance will be allowed for approximately every 7 new monitoring wells.

8.6.4.2 Potential Causes of Undesirable Results

An undesirable result for chronic lowering of groundwater levels does not currently exist, since groundwater elevations in all 39 existing representative monitoring wells in the Subbasin were above the minimum threshold in the December 2019 groundwater elevation measurements. Conditions that may lead to an undesirable result include the following:

- **Localized pumping clusters.** Even if regional pumping is maintained within the sustainable yield, clusters of high-capacity wells may cause excessive localized drawdowns that lead to undesirable results.
- **Expansion of *de minimis* pumping.** Individual *de minimis* pumpers do not have a significant impact on groundwater elevations. However, many *de minimis* pumpers are often clustered in specific residential areas. Pumping by these *de minimis* users is not regulated under this GSP. Adding additional domestic *de minimis* pumpers in these areas may result in excessive localized drawdowns and undesirable results.
- **Departure from the GSP's climatic assumptions, including extensive, unanticipated drought.** Minimum thresholds were established based on historical groundwater elevations and reasonable estimates of future climatic conditions and groundwater elevations. Departure from the GSP's climatic assumptions or extensive, unanticipated droughts may lead to excessively low groundwater elevations and undesirable results.

8.6.4.3 Effects on Beneficial Users and Land Uses

The primary detrimental effect on beneficial users from allowing multiple exceedances occurs if more than 1 exceedance take place in a small geographic area. Allowing 15% exceedances is reasonable if the exceedances are spread out across the Subbasin, and as long as any 1 well does not regularly exceed its minimum threshold. If the exceedances are clustered in a small area, it

will indicate that significant and unreasonable effects are being borne by a localized group of landowners.

8.7 Reduction in Groundwater Storage SMC

8.7.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable conditions in groundwater storage in the Subbasin are those that:

- Lead to chronic, long-term reduction in groundwater storage, or
- Interfere with other sustainability indicators

These significant and unreasonable conditions were determined based on input collected during ASGSA Advisory Committee meetings, SVBGSA Subbasin Committee meetings, and discussions with GSA staff.

8.7.2 Minimum Thresholds

The minimum threshold for reduction in groundwater storage is 267,000 acre-feet below the measurable objective. This reduction is based on the groundwater level minimum thresholds. This number will be refined as additional data are collected and other projects are implemented.

Although not the metric for establishing change in groundwater storage, the GSAs are committed to pumping at or less than the Subbasin's long-term sustainable yield. SGMA allows 20 years to reach sustainability.

8.7.2.1 Information and Methodology Used to Establish Minimum Thresholds

The groundwater storage minimum threshold relies on the groundwater elevation minimum thresholds, for which the methodology used to establish minimum thresholds is detailed in Section 8.6.2.1. The GSP Regulations § 354.36 (b) states that: "Groundwater elevations may be used as a proxy for monitoring other sustainability indicators if the Agency demonstrates the following: (1) Significant correlation exists between groundwater elevations and the sustainability indicators for which groundwater elevation measurements serve as a proxy." The Subbasin-specific data analysis to establish the proxy relationship between groundwater storage and groundwater elevations is discussed below.

The general relationship between groundwater storage and groundwater elevations is described in greater detail in Chapter 4, Section 4.4.2. The minimum threshold groundwater elevation contours, shown on Figure 8-1, were used to estimate the amount of groundwater in storage

when groundwater elevations are held at the minimum threshold levels. The estimated elevation of the bottom of the aquifer in Chapter 4 (Figure 4-4) was subtracted from the minimum threshold groundwater elevation maps to estimate the total aquifer volume at these groundwater elevations. The aquifer volume was multiplied by an estimated specific yield of 0.12 to estimate the total amount of water in storage at the minimum threshold (Brown and Caldwell, 2015).

Figure 8-4 compares the Subbasin's cumulative change in storage, plotted on the black line, with the average annual change in groundwater elevation, plotted on the blue line. The groundwater elevation change data are derived from the groundwater elevation network; the cumulative change in groundwater storage is derived from the SVIHM. Although the data come from 2 sources, the data generally show similar patterns between 1980 and 2016. The decrease in storage modeled by the SVIHM from 1983 to 1998 is not exactly reflected in the change in groundwater elevations, because the modeled storage is dependent on the simulated groundwater elevations in the SVIHM. However, from 1998 to 2016, the cumulative change in storage and change in groundwater elevations seem to be more closely related as verified in Figure 8-5.

Figure 8-5 shows a scatter plot of cumulative change in storage and average change in groundwater elevation. The blue data points show data for the entire model period from 1980 to 2016 and the orange data points show data from 1998 to 2016. Although, the data for the entire model period demonstrate a weak correlation ($R^2=0.2350$), a more significant positive correlation exists between groundwater elevations and the amount of groundwater in storage between 1998 and 2016 ($R^2=0.8834$). The correlation for the 1998 to 2016 period is sufficient to show that groundwater elevations are an adequate proxy for groundwater storage.

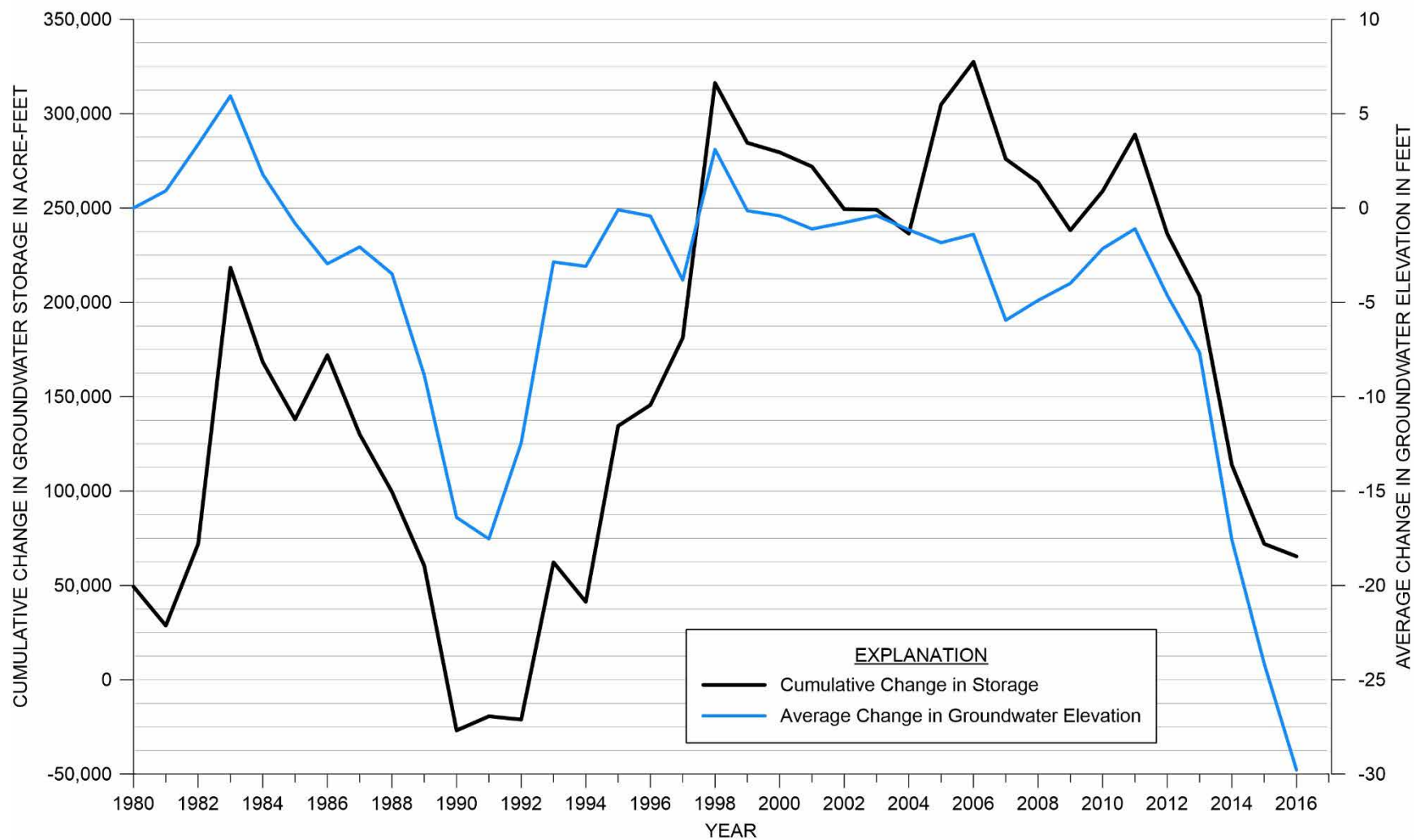


Figure 8-4. Cumulative Change in Storage and Average Change in Groundwater Elevation in the Forebay Aquifer Subbasin

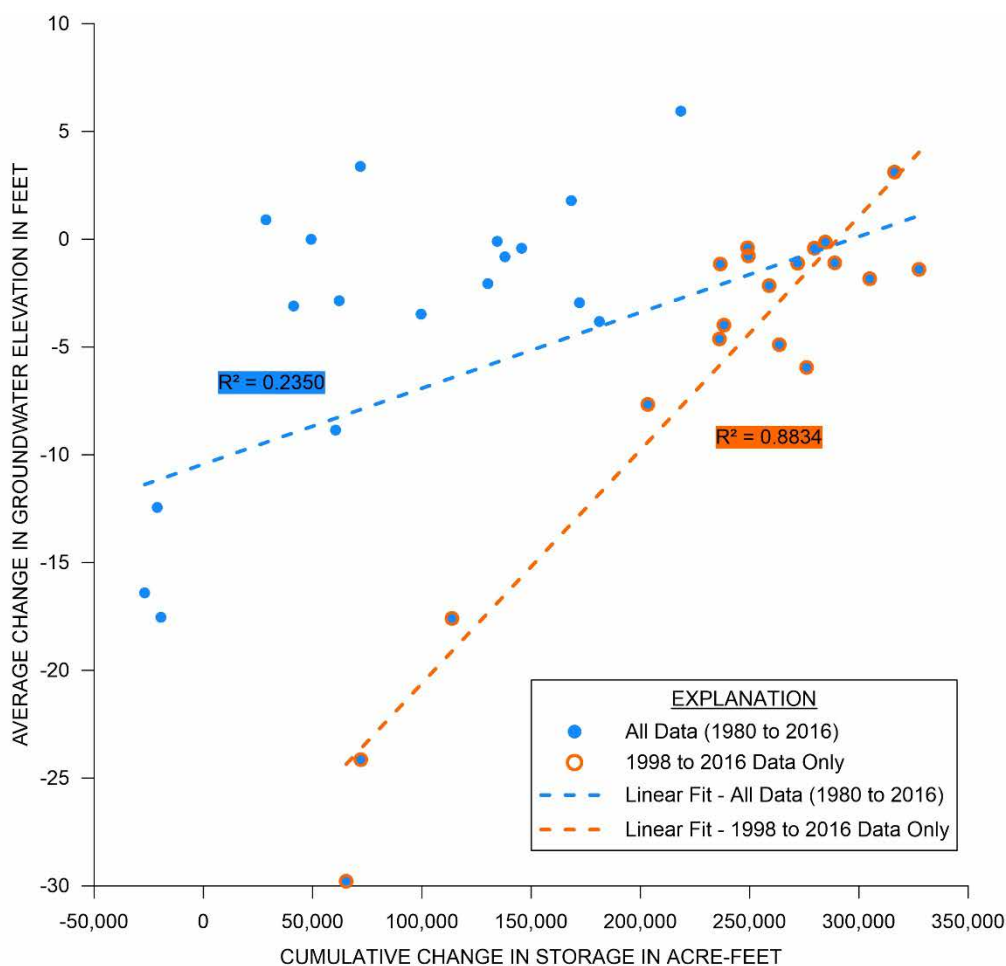


Figure 8-5. Correlation Between Cumulative Change in Storage and Average Change in Groundwater Elevation

8.7.2.2 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

The minimum threshold for reduction in groundwater storage is a single value for the entire Subbasin. Therefore, the concept of potential conflict between minimum thresholds at different locations is not applicable.

The reduction in groundwater storage minimum threshold could influence other sustainability indicators. The reduction in groundwater storage minimum threshold is selected to avoid undesirable results for other sustainability indicators, as outlined below.

- Chronic lowering of groundwater levels.** The reduction in storage minimum threshold is calculated from the groundwater level minimum thresholds. Therefore, the minimum threshold for reduction in groundwater storage is consistent with, and will not result in, a significant or unreasonable impact on groundwater elevations.

- **Degraded water quality.** The reduction in storage minimum threshold is established to maintain groundwater elevations above historical lows. The change in storage minimum threshold will not directly lead to any additional degradation of groundwater quality.
- **Land subsidence.** The reduction in storage minimum threshold is established to maintain groundwater elevations above historical lows. Therefore, the change in storage minimum threshold will not induce any additional dewatering of clay-rich sediments; and will not induce additional subsidence.
- **Depletion of ISW.** The reduction in storage minimum threshold is established to maintain groundwater elevations above historical lows. Therefore, the change in storage minimum threshold will not induce additional depletion of ISW.

8.7.2.3 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The Forebay Subbasin has 3 neighboring subbasins within the Salinas Valley Groundwater Basin:

- The Eastside Subbasin to the northeast
- The Upper Valley Subbasin to the south
- The 180/400-Foot Aquifer Subbasin to the northwest

The SVBGSA is either the exclusive GSA or is one of the coordinating GSAs for the adjacent Subbasins. Because the SVBGSA covers all these subbasins, the SVBGSA is coordinating the development of the minimum thresholds and measurable objectives for all these subbasins. The 180/400-Foot Aquifer Subbasin submitted a GSP in 2020 and the Eastside and Upper Valley Subbasins are in the process of GSP development for submittal in January 2022. Minimum thresholds for the Forebay Subbasin will be reviewed relative to information developed for the neighboring subbasins' GSPs to ensure that these minimum thresholds will not prevent the neighboring subbasins from achieving or maintaining sustainability.

8.7.2.4 Effect on Beneficial Uses and Users

The reduction in groundwater storage minimum thresholds might limit the amount of groundwater pumping in the Subbasin. Limiting pumping may impact the beneficial uses and users of the Subbasin.

Agricultural land uses and users. Limiting the amount of groundwater pumping may limit agricultural production or restrict options for crops that can be grown in the Subbasin by reducing the amount of available water. Agricultural lands that are currently not irrigated may be particularly impacted because the additional groundwater pumping needed to irrigate these lands could remove groundwater from storage until it is below minimum thresholds

Urban land uses and users. Limiting the amount of groundwater pumping may increase the cost of water for municipal users in the Subbasin because municipalities may need to find other, more expensive water sources.

Domestic land uses and users. The change in storage minimum thresholds are based on groundwater level minimum thresholds that protect most domestic wells. Therefore, the minimum thresholds will likely have an overall beneficial effect on existing domestic land uses by protecting the ability to pump from domestic wells.

Ecological land uses and users. Limiting the amount of pumping may generally benefit the environmental groundwater uses. Maintaining historical amounts of groundwater in the Subbasin maintains groundwater supplies for environmental purposes at levels similar to historical levels.

8.7.2.5 Relation to State, Federal, or Local Standards

No federal, state, or local standards exist for reductions in groundwater storage.

8.7.2.6 Method for Quantitative Measurement of Minimum Threshold

The amount of groundwater in storage will be calculated by calculating the change between groundwater elevation contour maps. The change in storage estimates will also be checked every 5 years when the SVIHM model is updated.

8.7.3 Measurable Objectives

The measurable objective for reduction in groundwater storage measurable objective is 0 when the groundwater elevations are held at the groundwater level measurable objectives.

Since the goal is to manage to the measurable objective, additional water in storage is needed until groundwater elevations are at their measurable objectives.

8.7.3.1 Methodology for Setting Measurable Objectives

The measurable objective groundwater elevation contours, shown on Figure 8-2, were used to estimate the amount of groundwater in storage when groundwater elevations are held at the measurable objective levels. The estimated elevation of the bottom of the aquifer in Chapter 4 (Figure 4-4) was subtracted from the measurable objective groundwater elevation maps to estimate the total aquifer volume at these groundwater elevations. The aquifer volume was multiplied by an estimated specific yield of 0.12 to estimate the total amount of water in storage at the measurable objective (Brown and Caldwell, 2015).

8.7.3.2 Interim Milestones

The reduction in storage interim milestones is shown in Table 8-4 for each of the 5-year intervals, consistent with the minimum threshold and the measurable objective. At current 2019 groundwater elevations, the groundwater in storage is about 780 AF below the measurable objective, to reach the measurable objective a gain of 260 AF in groundwater storage needs to occur every 5 years until 2042.

Table 8-4. Reduction in Groundwater Storage Interim Milestones

	At Current Conditions	At Interim Milestone Year 2027	At Interim Milestone Year 2032	At Interim Milestone Year 2037	At Measurable Objective Year 2042
Gain in Storage needed to Reach Measurable Objective (AF)	780	260	260	260	0

8.7.4 Undesirable Results

8.7.4.1 Criteria for Defining Reduction in Groundwater Storage Undesirable Results

The reduction in groundwater storage undesirable result is:

There is an exceedance of the minimum threshold.

Since the GSP addresses long-term groundwater sustainability, exceedances of groundwater storage minimum thresholds during a drought do not constitute an undesirable result. Pursuant to SGMA Regulations (California Water Code § 10721(w)(1)), “Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.” Therefore, groundwater storage may temporarily exceed minimum thresholds during droughts, and do not constitute an undesirable result, as long as groundwater levels rebound.

8.7.4.2 Potential Causes of Undesirable Results

Conditions that may lead to an undesirable result for the reduction in groundwater storage sustainability indicator include the following:

- **Expansion of agricultural or municipal pumping.** Additional agricultural or municipal pumping may result in lowered groundwater elevations that reduce groundwater storage to an undesirable result.

- **Expansion of *de minimis* pumping.** Pumping by *de minimis* users is not regulated under this GSP. Adding domestic *de minimis* pumpers in the Subbasin may result in low groundwater levels that reduce the groundwater storage below to an undesirable result.
- **Departure from the GSP's climatic assumptions, including extensive, unanticipated drought.** The undesirable result is established based on reasonable anticipated future climatic conditions and groundwater elevations. Departure from the GSP's climatic assumptions or extensive, unanticipated droughts may lead to excessively low groundwater recharge and unanticipated high pumping rates that could reduce groundwater in storage to an undesirable result.

8.7.4.3 Effects on Beneficial Users and Land Use

The practical effect of the reduction in groundwater storage undesirable result is no chronic, long-term net change in groundwater storage. Therefore, beneficial uses and users will have access to a similar amount of water in storage that currently exists, and the undesirable result will not have an additional negative effect on the beneficial users and uses of groundwater.

8.8 Degraded Water Quality SMC

8.8.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable changes in groundwater quality in the Subbasin are increases in a COC caused by a direct result of a GSA groundwater management action that either:

- Result in groundwater concentrations in a potable water supply well above an established MCL or SMCL, or
- Lead to significantly reduced crop production.

These significant and unreasonable conditions were determined based on input collected during ASGSA Advisory Committee meetings, SVBGSA Subbasin Committee meetings, and discussions with GSA staff.

8.8.2 Minimum Thresholds

The minimum thresholds for degraded water quality are zero additional exceedances of the regulatory drinking water standards (potable supply wells) or Basin Plan objectives (irrigation supply wells) beyond those observed on December 31, 2019, for groundwater quality constituents of concern.

The minimum thresholds for DDW public water system supply wells and ILRP on-farm domestic wells reflect California's Title 22 drinking water standards. The minimum thresholds

for irrigation supply wells are based on the water quality objectives listed in the Water Quality Basin Plan for the Central Coastal Basin (CCRWQCB, 2019). The minimum threshold values for the COC for all 3 sets of wells are provided in Table 8-5 and are based on data up to December 31, 2019. Full discussion of these current conditions is included in Chapter 5. Because the minimum thresholds reflect no additional exceedances, the minimum thresholds are set to the number of existing exceedances. Surpassing the number of existing exceedances for any of the listed constituents will lead to an undesirable result. Not all wells in the monitoring network are sampled for every COC.

Table 8-5. Degradation of Groundwater Quality Minimum Thresholds and Measurable Objectives

Constituent of Concern (COC)	Minimum Threshold/ Measurable Objective – Number of Wells Exceeding Regulatory Standard from latest sample (August 1986 to December 2019)
DDW Wells	
1,2 Dibromo-3-chloropropane	3
1,2,3-Trichloropropane	2
Beryllium	1
Chloride	1
Di(2-ethylhexyl) phthalate	1
Dinoseb	3
Iron	6
Lindane	1
Manganese	4
Nitrate (as nitrogen)	5
Polychlorinated Biphenyls	1
Specific Conductance	1
Sulfate	1
Thallium	1
Total Dissolved Solids	4
Vinyl Chloride	4
ILRP On-Farm Domestic Wells	
Iron	8
Manganese	2
Nitrate (as nitrogen)	162
Nitrate + Nitrite (sum as nitrogen)	62
Nitrite	1
Specific Conductance	71
Sulfate	34
Total Dissolved Solids	90
ILRP Irrigation Supply Wells	
Iron	1
Manganese	2

8.8.2.1 Information and Methodology Used to Establish Water Quality Minimum Thresholds and Measurable Objectives

As noted in the GSP Regulations, minimum thresholds are based on a degradation of groundwater quality, not an improvement of groundwater quality (23 CCR §354.28 (c)(4)). Therefore, this GSP is designed to avoid taking any action that may inadvertently move groundwater constituents already in the Subbasin in such a way that the constituents have a significant and unreasonable impact that would not otherwise occur. COC must meet 2 criteria:

3. They must have an established level of concern such as an MCL or SMCL, or a level known to affect crop production.
4. They must have been found in the Subbasin at levels above the level of concern.

Based on the review of groundwater quality in Chapter 5, the COC that may affect drinking water supply wells include those for DDW and ILRP on-farm domestic wells listed in Table 8-5. The COC that are known to cause reductions in crop production are those for ILRP irrigation supply wells listed in Table 8-5.

As discussed in Chapter 7, 3 existing water quality monitoring networks were reviewed and used for developing SMC:

- Public water system supply wells are regulated by the SWRCB DDW.
- On-farm domestic wells monitored as part of CCRWQCB ILRP. This dataset was obtained from the SWRCB through the GAMA groundwater information system. The ILRP data were separated into 2 data sets, 1 for on-farm domestic wells and the other for irrigation supply wells (discussed below) for purposes of developing initial draft minimum thresholds and measurable objectives for each type of well. The monitoring well network for the ILRP will change when the monitoring network for Ag Order 4.0 is finalized. At that time, the new ILRP on-farm domestic monitoring network will be incorporated into this GSP, replacing the current network, for water quality monitoring.
- Irrigation supply wells monitored as part of ILRP. As mentioned above, this dataset was obtained from the SWRCB through the GAMA groundwater information system. Like the on-farm domestic well dataset, the IRLP irrigation supply monitoring network will change when Ag Order 4.0 is finalized.

Each of these well networks are monitored for a different set of water quality parameters. Furthermore, some groundwater quality impacts are detrimental to only certain networks. For example, high nitrates are detrimental to public water system supply wells and on-farm domestic wells but are not detrimental to irrigation supply wells. The constituents monitored in each well network are indicated by an X in Table 8-6. An X does not necessarily indicate that the constituents have been found above the regulatory standard in that monitoring network.

Table 8-6. Summary of Constituents Monitored in Each Well Network

Constituent	Public Water System Supply	On-Farm Domestic ¹	Irrigation Supply
Boron	X	X	X
Chloride	X	X	X
Iron	X	X	X
Manganese	X	X	X
Nitrite	X	X	X
Nitrate (as nitrogen)	X	X	X
Nitrate + Nitrite (sum as nitrogen)		X	X
Specific Conductance	X	X	X
Sulfate	X	X	X
Total Dissolved Solids	X	X	X
Silver	X		
Aluminum	X		
Alachlor	X		
Arsenic	X		
Atrazine	X		
Barium	X		
Beryllium	X		
Lindane	X		
Di(2-ethylhexyl) phthalate	X		
Bentazon	X		
Benzene	X		
Benzo(a)Pyrene	X		
Toluene	X		
Cadmium	X		
Chlordane	X		
Chlorobenzene	X		
Cyanide	X		
Chromium	X		
Carbofuran	X		
Carbon Tetrachloride	X		
Copper	X		
Dalapon	X		
1,2 Dibromo-3-chloropropane	X		
1,1-Dichloroethane	X		
1,2-Dichloroethane	X		
1,2-Dichlorobenzene	X		
1,4-Dichlorobenzene	X		
1,1-Dichloroethylene	X		
cis-1,2-Dichloroethylene	X		
trans-1,2-Dichloroethylene	X		
Dichloromethane (a.k.a. methylene chloride)	X		
1,2-Dichloropropane	X		

Constituent	Public Water System Supply	On-Farm Domestic ¹	Irrigation Supply
Dinoseb	X		
Diquat	X		
Di(2-ethylhexyl) adipate	X		
Ethylbenzene	X		
Endrin	X		
Fluoride	X		
Trichlorofluoromethane	X		
1,1,2-Trichloro-1,2,2-Trifluoroethane	X		
Foaming Agents (MBAS)	X		
Glyphosate	X		
Hexachlorocyclopentadiene	X		
Hexachlorobenzene	X		
Heptachlor	X		
Mercury	X		
Molinate	X		
Methyl-tert-butyl ether (MTBE)	X		
Methoxychlor	X		
Nickel	X		
Oxamyl	X		
1,1,2,2-Tetrachloroethane	X		
Perchlorate	X		
Polychlorinated Biphenyls	X		
Tetrachloroethene	X		
Pentachlorophenol	X		
Picloram	X		
Antimony	X		
Selenium	X		
2,4,5-TP (Silvex)	X		
Simazine	X		
Styrene	X		
1,1,1-Trichloroethane	X		
1,1,2-Trichloroethane	X		
1,2,4-Trichlorobenzene	X		
Trichloroethene	X		
1,2,3-Trichloropropane	X		
Thiobencarb	X		
Thallium	X		
Toxaphene	X		
Vinyl Chloride	X		
Xylenes	X		
Zinc	X		

¹Basin plan states domestic wells are monitored for Title 22 constituents; however, GAMA groundwater information system only provides data for the constituents listed above.

8.8.2.2 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

Preventing degradation of groundwater quality may affect other sustainability indicators or may limit activities needed to achieve minimum thresholds for other sustainability indicators as described below:

- **Chronic lowering of groundwater levels.** The degradation of groundwater quality minimum thresholds could influence groundwater level minimum thresholds by limiting the types of water that can be used for recharge to maintain or raise groundwater elevations. Water used for recharge cannot exceed any groundwater quality standards.
- **Reduction in groundwater storage.** The degradation of groundwater quality minimum thresholds do not promote lower groundwater elevations. Therefore, the groundwater quality minimum thresholds will not result in an exceedance of the groundwater storage minimum threshold.
- **Land subsidence.** The degradation of groundwater quality minimum thresholds do not promote additional pumping that could cause subsidence. Therefore, the groundwater quality minimum thresholds will not result in an exceedance of the subsidence minimum threshold.
- **Depletion of ISW.** The degradation of groundwater quality minimum thresholds do not promote additional pumping or lower groundwater elevations adjacent to ISW. Therefore, the groundwater quality minimum thresholds will not result in a significant or unreasonable depletion of ISW.

8.8.2.3 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The anticipated effect of the degraded groundwater quality minimum thresholds on each of the neighboring subbasins is addressed below.

The Forebay Subbasin has 3 neighboring subbasins within the Salinas Valley Groundwater Basin:

- The Eastside Subbasin to the northeast
- The Upper Valley Subbasin to the south
- The 180/400-Foot Aquifer Subbasin to the northwest

The SVBGSA is either the exclusive GSA or is one of the coordinating GSAs for the adjacent Subbasins. Because the SVBGSA covers all these subbasins, the SVBGSA is coordinating the development of the minimum thresholds and measurable objectives for all these subbasins. The 180/400-Foot Aquifer Subbasin submitted a GSP in 2020 and the Eastside and Upper Valley Subbasins are in the process of GSP development for submittal in January 2022. Minimum

thresholds for the Forebay Subbasin will be reviewed relative to information developed for the neighboring subbasins' GSPs to ensure that these minimum thresholds will not prevent the neighboring subbasins from achieving sustainability.

8.8.2.4 Effect on Beneficial Uses and Users

Agricultural land uses and users. The groundwater quality minimum thresholds generally provide positive benefits to the Subbasin's agricultural water users. Preventing any GSA actions that would result in additional agricultural supply wells exceeding levels that could reduce crop production ensures that a supply of usable groundwater will exist for beneficial agricultural use.

Urban land uses and users. The groundwater quality minimum thresholds generally provide positive benefits to the Subbasin's urban water users. Preventing any GSA actions that would result in COC in additional drinking water supply wells exceeding MCLs or SMCLs ensures adequate groundwater quality for public water system supplies.

Domestic land uses and users. The groundwater quality minimum thresholds generally provide positive benefits to the Subbasin's domestic water users. Preventing any GSA actions that would result in COC in additional drinking water supply wells exceeding MCLs or SMCLs ensures adequate groundwater quality for on-farm domestic supplies.

Ecological land uses and users. Although the groundwater quality minimum thresholds do not directly benefit ecological uses, it can be inferred that the degradation of groundwater quality minimum thresholds provide generally positive benefits to the Subbasin's ecological water uses. Preventing any GSA actions that would result in COC migrating will prevent unwanted contaminants from impacting ecological groundwater uses.

8.8.2.5 Relation to State, Federal, or Local Standards

The groundwater quality minimum thresholds specifically incorporate state and federal standards for drinking water and Basin Plan objectives.

8.8.2.6 Method for Quantitative Measurement of Minimum Thresholds

Degradation of groundwater quality minimum thresholds will be directly measured from existing public water system supply wells, on-farm domestic wells, and irrigation supply wells. Groundwater quality will be measured with SWRCB GAMA groundwater information system data submitted through existing monitoring programs—DDW and ILRP—as discussed in Chapter 7.

- Exceedances of MCLs and SMCLs in public water system supply wells will be monitored with annual water quality data submitted to the DDW.

- Exceedances of MCLs and SMCLs in on-farm domestic wells will be monitored with ILRP data.

Initially, the review of drinking water MCLs, SMCLs, and water quality objectives that maintain adequate crop production will be centered around the COC identified above. If during review of the water quality data additional constituents appear to exceed any of the regulatory standards, these additional constituents will be added to the list of COC for the Subbasin.

8.8.3 Measurable Objectives

The measurable objectives for degradation of groundwater quality represent target groundwater quality distributions in the Subbasin. SGMA does not mandate the improvement of groundwater quality. Therefore, the measurable objectives are based on no groundwater quality degradation, and are identical to the minimum thresholds, as defined in Table 8-5.

The measurable objectives for degraded water quality are zero additional exceedances of the regulatory drinking water standards (potable supply wells) or Basin Plan objectives (irrigation supply wells) beyond those observed on December 31, 2019, for groundwater quality constituents of concern.

8.8.3.1 Methodology for Setting Measurable Objectives

As described above, measurable objectives are set to be identical to the minimum thresholds and therefore follow the same method as detailed in Section 8.8.2.1.

8.8.3.2 Interim Milestones

There is no anticipated degradation of groundwater quality during GSP implementation that results from the implementation of projects and actions as described in Chapter 9. Therefore, the expected interim milestones are identical to current conditions.

8.8.4 Undesirable Results

8.8.4.1 Criteria for Defining Undesirable Results

The degradation of groundwater quality becomes an undesirable result when a quantitative combination of groundwater quality minimum thresholds is exceeded. For the Subbasin, the exceedance of minimum thresholds is unacceptable as a direct result of GSP implementation. Some groundwater quality changes are expected to occur independent of SGMA activities; because these changes are not related to SGMA activities, nor GSA management, they do not constitute an undesirable result. Additionally, SGMA states that GSAs are not responsible for addressing water quality degradation that was present before January 1, 2015 (California Water Code § 10727.2(b)(4)). Therefore, the degradation of groundwater quality reaches an undesirable result when:

Future or new minimum thresholds exceedances are caused by a direct result of GSA groundwater management action(s), including projects or management actions and regulation of groundwater extraction.

The groundwater level SMC is designed and intended to help protect groundwater quality. Setting the groundwater level minimum thresholds at or above historical lows assures that no new depth dependent constituents of water quality concern are mobilized. The GSAs may pursue projects or management actions to ensure that groundwater levels do not fall below groundwater level minimum thresholds.

This undesirable result recognizes there is an existing regulatory framework in the form of the California Porter Cologne Act and the federal Clean Water Act that addresses water quality management; and considers existing federal, state, and local groundwater quality standards, which were used in the development of minimum thresholds in the GSP. SVBGSA is not responsible for enforcing drinking water requirements or for remediating violations of those requirements that were caused by others (Moran and Belin, 2019). The existing regulatory regime does not require nor obligate the SVBGSA nor ASGSA to take any affirmative actions to manage or control existing groundwater quality. However, SVBGSA and ASGSA are committed to monitoring and disclosing changes in groundwater quality and ensuring its groundwater management actions do not cause drinking water or irrigation water to be unusable.

SVBGSA and ASGS will work closely with the Central Coast Regional Water Quality Control Board and other entities that have regulatory authority over water quality. SVBGSA will lead the Water Quality Coordination Group, as described in Chapter 9, which includes meeting annually with these partner agencies to review the status of water quality data and discuss any action needed to address water quality degradation.

If the GSA has not implemented any groundwater management actions in the Subbasin, including projects, management actions, or pumping management, no such management actions constitute an undesirable result. If minimum thresholds are exceeded after the GSA has implemented actions in the Subbasin, the GSA will review groundwater quality and groundwater gradients in and around the project areas to assess if the exceedance resulted from GSA actions to address sustainability indicators or was independent of GSA activities. Both the implementation of actions and assessment of exceedances will occur throughout the GSP timeframe of 50 years as required by SGMA. The general approach to assess if a minimum threshold exceedance is due to GSA action will include:

- If no projects, management actions, or other GSP implementation actions have been initiated in a subbasin, or near the groundwater quality impact, then the impact was not caused by any GSA action.

- Many projects will likely include a new monitoring network. If data from the project-specific monitoring network do not show groundwater quality impacts, this will suggest that the impact was not caused by any GSA actions.
- If a GSA undertakes a project that changes groundwater gradients, moves existing constituents, or results in the exceedance of minimum thresholds, SVBGSA will undertake a more rigorous technical study to assess local, historical groundwater quality distributions, and the impact of the GSA activity on that distribution.

For SGMA compliance, undesirable results for groundwater quality are not caused by (1) lack of action; (2) GSA required reductions in pumping; (3) exceedances in groundwater quality minimum thresholds that occur, if there are fewer exceedances than if there had been a lack of management; (4) exceedances in groundwater quality minimum thresholds that would have occurred independent of projects or management actions implemented by the GSA; (5) past harm.

8.8.4.2 Potential Causes of Undesirable Results

Conditions that may lead to an undesirable result include the following:

- **Required Changes to Subbasin Pumping.** If the location and rates of groundwater pumping change as a result of projects implemented under the GSP, these changes could alter hydraulic gradients and associated flow directions, and cause movement of one of the COC toward a supply well at concentrations that exceed relevant standards.
- **Groundwater Recharge.** Active recharge of imported water or captured runoff could modify groundwater gradients and move one of the COC toward a supply well in concentrations that exceed relevant limits.
- **Recharge of Poor-Quality Water.** Recharging the Subbasin with water that exceeds an MCL, SMCL, or level that reduces crop production will lead to an undesirable result.

8.8.4.3 Effects on Beneficial Users and Land Use

The undesirable result for degradation of groundwater quality is avoiding groundwater degradation caused by a direct result of a GSA groundwater management action. Therefore, the undesirable result will not impact the use of groundwater and will not have a negative effect on the beneficial users and uses of groundwater. This undesirable result does not apply to groundwater quality changes that occur due to other causes.

8.9 Land Subsidence SMC

8.9.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable subsidence in the Subbasin is defined as follows:

- Any inelastic land subsidence that impacts infrastructure and is caused by lowering of groundwater elevations occurring in the Subbasin or
- Any inelastic subsidence that causes an increase of flood risk.

These significant and unreasonable conditions were determined based on input collected during ASGSA Advisory Committee meetings, SVBGSA Subbasin Committee meetings, and discussions with GSA staff.

Subsidence can be elastic or inelastic. Inelastic subsidence is generally irreversible. Elastic subsidence is the small, reversible lowering and rising of the ground surface. This SMC only concerns inelastic subsidence.

8.9.2 Minimum Thresholds

The minimum threshold for land subsidence is 0.133 feet per year. This is the rate that results in less than 1 foot of cumulative subsidence over a 30-year implementation horizon, plus 0.1 feet per year of estimated land movement to account for InSAR measurement errors.

8.9.2.1 Information Used and Methodology for Establishing Subsidence Minimum Thresholds

Significant and unreasonable impacts from subsidence include loss of canal and drainage ditch capacity due to overflowing, increased flooding extent and duration near stream channels, reduced gradients in sewers, storm drains and other gravity flow pipelines, degradation of leveling in laser-leveled fields, and damage to well casings due to compaction of clay layers adjacent to the casing. Example standards for flooding and drainage include:

- Ground floor elevations are recommended or required to be at least 1 foot above the Base Flood Elevation in some jurisdictions (see for example Federal Emergency Management Agency [no date]; City of Temecula [no date]).
- The minimum freeboard along roadside ditches is often required to be 1 foot above the maximum anticipated water level (see for example City of Morgan Hill [no date]).

Therefore, any more than 1 foot of cumulative subsidence over the implementation horizon was considered significant and unreasonable because of the potential impact on infrastructure.

The InSAR data provided by DWR are subject to measurement error. DWR stated that, on a statewide level, for the total vertical displacement measurements between June 2015 and June 2019, the errors are as follows (DWR, 2019, personal communication):

1. The error between InSAR data and continuous GPS data is 16 mm (0.052 feet) with a 95% confidence level.

2. The measurement accuracy when converting from the raw InSAR data to the maps provided by DWR is 0.048 feet with 95% confidence level.

By adding errors 1 and 2, the combined error is 0.1 foot. While this is not a robust statistical analysis, it does provide an estimate of the potential error in the InSAR maps provided by DWR.

Additionally, the InSAR data provided by DWR reflects both elastic and inelastic subsidence. While it is difficult to compensate for elastic subsidence, visual inspection of monthly changes in ground elevations suggest that elastic subsidence is largely seasonal. To minimize the influence of elastic subsidence on the assessment of long-term, permanent subsidence, changes in ground level will only be measured annually from June of one year to June of the following year.

8.9.2.2 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

The subsidence minimum threshold has little or no impact on other minimum thresholds, as described below.

- **Chronic lowering of groundwater levels.** The land subsidence minimum threshold will not decrease groundwater elevations and therefore will not result in significant or unreasonable groundwater elevations.
- **Reduction in groundwater storage.** The land subsidence minimum threshold will not change the amount of pumping and therefore will not result in a significant or unreasonable change in groundwater storage.
- **Degraded water quality.** The land subsidence minimum threshold does not promote decreasing groundwater elevations that lead to exceedance of groundwater quality minimum thresholds and therefore will not result in significant or unreasonable degradation of water quality.
- **Depletion of ISW.** The land subsidence minimum threshold does not promote additional pumping or lower groundwater elevations adjacent to ISW. Therefore, the subsidence minimum threshold will not result in a significant or unreasonable depletion of ISW.

8.9.2.3 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The Forebay Subbasin has 3 neighboring subbasins within the Salinas Valley Groundwater Basin:

- The Eastside Subbasin to the northeast
- The Upper Valley Subbasin to the south
- The 180/400-Foot Aquifer Subbasin to the northwest

The SVBGSA is either the exclusive GSA or is one of the coordinating GSAs for the adjacent Subbasins. Because the SVBGSA covers all these subbasins, the SVBGSA is coordinating the development of the minimum thresholds and measurable objectives for all these subbasins. The 180/400-Foot Aquifer Subbasin submitted a GSP in 2020 and the Eastside and Upper Valley Subbasins are in the process of GSP development for submittal in January 2022. Minimum thresholds for the Forebay Subbasin will be reviewed relative to information developed for the neighboring subbasins' GSPs to ensure that these minimum thresholds will not prevent the neighboring subbasins from achieving or maintaining sustainability.

8.9.2.4 Effects on Beneficial Uses and Users

The subsidence minimum threshold is set to prevent any long-term inelastic subsidence. Available data indicate that there is currently no long-term subsidence occurring in the Subbasin, and therefore the minimum threshold has no impact on current pumping rates. The subsidence minimum threshold does not impact infrastructure and does not require any additional reductions in pumping, and there is no negative impact on any beneficial user. Increased pumping, however, could initiate subsidence and require pumping restrictions.

8.9.2.5 Relation to State, Federal, or Local Standards

There are no federal, state, or local regulations related to subsidence.

8.9.2.6 Method for Quantitative Measurement of Minimum Threshold

The minimum threshold will be assessed using DWR-supplied InSAR data.

8.9.3 Measurable Objectives

The measurable objective for ground surface subsidence represents a target annual subsidence rate in the Subbasin.

The measurable objective for land subsidence is 0.1 foot per year. This is a long-term rate of zero feet per year plus 0.1 foot per year of estimated land movement to account for InSAR measurement errors.

8.9.3.1 Methodology for Setting Measurable Objectives

The measurable objective will be assessed using DWR-supplied InSAR data.

8.9.3.2 Interim Milestones

The subsidence measurable objective is set at current conditions of no long-term subsidence. There is no change between current conditions and sustainable conditions. Therefore, the interim

milestones are identical to current conditions of zero long-term subsidence, and annual measurements of no more than 0.1 foot of subsidence per year.

8.9.4 Undesirable Results

8.9.4.1 Criteria for Defining Undesirable Results

By regulation, the ground surface subsidence undesirable result is a quantitative combination of subsidence minimum threshold exceedances. No rate of subsidence that results in greater than 1 foot of cumulative subsidence, and that is directly caused by lowered groundwater elevations, is acceptable. Therefore, the land subsidence undesirable result is:

There is an exceedance of the minimum threshold for land subsidence due to lowered groundwater elevations that surpass historical lows.

Should potential subsidence be observed, the SVBGSA and ASGSA will first assess whether the subsidence may be due to elastic subsidence. If the subsidence is not elastic, the GSAs will undertake a program to assess whether the subsidence is caused by lowered groundwater elevations. The first step in the assessment will be to check if groundwater elevations have dropped below historical lows. If groundwater elevations remain above historical lows, the GSAs shall assume that any observed subsidence was not caused by lowered groundwater levels. If groundwater levels have dropped below historical lows, the GSAs will attempt to correlate the observed subsidence with measured groundwater elevations. Additionally, if the Subbasin experiences subsidence in multiple consecutive years that are due to InSAR measurement error, the GSAs will confirm if the error is not actually net long-term subsidence.

8.9.4.2 Potential Causes of Undesirable Results

Conditions that may lead to an undesirable result include a shift in pumping locations. A significant increase in the amount of pumping in an area that is susceptible to subsidence could trigger subsidence that has not been observed before.

8.9.4.3 Effects on Beneficial Users and Land Use

The undesirable result for subsidence allows for no more than 1 foot of cumulative subsidence in the Subbasin. This has limited to no impact on infrastructure. Therefore, there is no negative effect on any beneficial uses and users.

8.10 Depletion of Interconnected Surface Water SMC

Areas with ISW occur where shallow groundwater may be connected to the surface water system. This SMC applies only to locations of ISW, as shown on Figure 4-14.

The SVIHM is used to identify the locations of ISW and to develop an estimate of the quantity and timing of stream depletions due to pumping during current and historical groundwater conditions. Shallow groundwater and surface water levels simulated by the SVIHM are used to identify the location of interconnection and evaluate the frequency with which different stream reaches are connected with groundwater in the underlying aquifer. The magnitude of stream depletions in relation to shallow groundwater elevations in interconnected reaches are evaluated in Chapter 5.

8.10.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable depletion of ISW in the Subbasin is defined as:

- Depletions from groundwater extraction that would result in a significant and unreasonable impact on other beneficial uses and users such as riparian water rights holders, appropriative surface water rights holders, ecological surface water users, and recreational surface water uses.
- Depletion from groundwater extraction more than observed in December 2015, as measured by shallow groundwater elevations near locations of interconnected surface water. While a documented determination of whether past depletions was significant is not available, staying above December 2015 depletions was determined to be a reasonable balance for all the beneficial uses and users.

These significant and unreasonable conditions were determined based on input collected during ASGSA Advisory Committee meetings, SVBGSA Subbasin Committee meetings, and discussions with GSA staff. There is currently no data that determines what level of depletion from groundwater extraction has a significant adverse effect on steelhead trout or other beneficial use or user of ISW. Should there be a determination regarding what level of depletion from groundwater extraction is significant, SVBGSA will take that into consideration as it reviews how it locally defines significant and unreasonable conditions for the SMC in the 5-Year Update.

8.10.2 Minimum Thresholds

The minimum thresholds are established to maintain consistency with the chronic lowering of groundwater elevation and reduction in groundwater storage minimum thresholds, which are also established based on groundwater elevations.

The minimum thresholds for depletion of interconnected surface water are established by proxy using shallow groundwater elevations observed in December 2015 near locations of interconnected surface water.

No minimum thresholds are established for times when flow in a river is due to conservation releases from a reservoir. One purpose for these conservation releases is to recharge the Salinas Valley groundwater basin. Therefore, depletion of conservation releases is a desired outcome, and the minimum thresholds and measurable objectives do not apply to these flows.

The locations of ISW identified with the SVIHM are based on best available data but contain uncertainty, which is discussed in Chapters 4, 5, and 6. Additional stream and groundwater level data are needed to reduce uncertainty, verify with observed conditions, and track changes over time. The shallow groundwater monitoring wells, USGS stream gauges, and MCWRA River Series measurement sites will be used to supplement the analysis of locations of connectivity provided by the SVIHM. These monitoring points will also become part of the ISW monitoring network that is discussed in Chapter 7. Data from the ISW monitoring network will be used to monitor and evaluate the interconnection through time.

As discussed in Chapter 7, a monitoring network for ISW composed of shallow groundwater monitoring wells is in the process of development. Existing shallow wells will be added to the monitoring network where possible and will be supplemented with new shallow wells if needed. The monitoring network is dependent on the location and magnitude of stream reaches determined by the SVIHM. Once the monitoring network is fully established, SMC will be determined using the wells' groundwater elevations during the minimum threshold and measurable objective years, or interpolated values from the groundwater elevation contour maps for wells that do not have shallow groundwater elevation measurements for those years.

8.10.2.1 Information Used and Methodology for Establishing Depletion of Interconnected Surface Water Minimum Thresholds and Measurable Objectives

8.10.2.1.1 Establishing Groundwater Elevations as Proxies

The GSP Regulations § 354.28(d) states that: “an Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence.”

The evaluation of ISW in the Salinas Valley Groundwater Basin is based on an approach recommended by the Environmental Defense Fund (EDF, 2018) that uses groundwater elevations as surrogates for streamflow depletion rates caused by groundwater use. Basic hydraulic principles state that groundwater flow is proportional to the difference between groundwater elevations at different locations along a flow path. Using this basic principle, groundwater flow to a stream, or conversely seepage from a stream to the underlying aquifer, is proportional to the difference between water elevation in the stream and groundwater elevations at locations away from the stream. Assuming the elevation in the stream is relatively stable, changes in interconnectivity between the stream and the underlying aquifer is determined by changes in groundwater levels in the aquifer. Thus, the change in hydraulic gradient between

stream elevation and surrounding groundwater elevations is representative of change in interconnection between surface water and groundwater. Monitoring the hydraulic gradient in the aquifer adjacent to the stream monitors the interconnectivity between stream and aquifer. Therefore, the gradient can be monitored by measuring and evaluating groundwater elevations at selected shallow monitoring wells near streams. No existing estimations of the quantity and timing of depletions of ISW exist, nor data available to make estimations, so the hydraulic principles provide the best available information.

8.10.2.1.2 Review of Beneficial Uses and Users of Surface Water

The various beneficial uses and users of surface waters were addressed when setting the ISW depletion minimum thresholds. The classes of beneficial uses and users that were reviewed include riparian rights holders, appropriative rights holders, ecological surface water users, and recreational surface water users. This is not a formal analysis of public trust doctrine, but it is a reasonable review of all uses and users in an attempt to balance all interests. This is not an assessment about what constitutes a reasonable beneficial use under Article X, Section 2 of the California Constitution. The minimum thresholds for depletion of ISW are developed using the definition of significant and unreasonable conditions described above, public information about critical habitat, locations of ISW derived from the SVIHM, and public information about water rights described below.

Riparian water rights holders and Pre-1914 water rights holders. Table 8-7 provides a summary of water diversions reported to the SWRCB by riparian water rights holders and pre-1914 water rights holders on the Salinas River and its tributaries within the Subbasin. The diversion data were obtained from queries of the SWRCB eWRIMS water rights management system and represent water diversions self-reported by water-rights holders with points of diversion located within the Subbasin boundaries. Riparian rights holders are not differentiated from pre-1914 rights holders in the eWRIMS query results, and therefore diversions by riparian rights holders are lumped with the pre-1914 right diversions by Clark Colony. The reported surface water diversions are not a determination of water rights and may not include all pre 1914 water rights. Some of the diversions shown in Table 8-7 are also reported to MCWRA as groundwater pumping.

The SVBGSA is not aware of any current water rights litigation or water rights enforcement acts along the Salinas River in the Subbasin. Furthermore, to the extent that groundwater pumping depletes surface water flows, these depletions, and the potential surface water limitations, would be injurious only if the surface water right holders held rights senior to the groundwater pumpers. Lack of enforcement complaints suggest that historical depletions have not resulted in substantial and unreasonable impact.

Table 8-7. Reported Annual Surface Water Diversions in the Forebay Aquifer Subbasin

Diversions (Acre-Feet)	2011	2012	2013	2014	2015	2016	2017	2018	2019
Appropriation per Permit	84,270	33,708	0	0	0	0	0	0	0
Statement of Diversion and Use including Clark Colony and Reported Riparian Diversions	17,692	30,782	9,914	9,929	16,624	12,358	16,440	13,032	12,327
Total	101,962	64,490	9,914	9,929	16,624	12,358	16,440	13,032	12,327

Appropriative water rights holders. The one permitted appropriative water right holder in the Forebay Subbasin, shown in Table 8-7, is MCWRA. The reported surface water diversion is not a determination of water rights. In addition to this one diversion, MCWRA releases water from upstream appropriative diversions, the Nacimiento Reservoir and San Antonio Reservoir, which flows through the Subbasin. MCWRA has not filed any action noting illegal use of these appropriated waters. Therefore, current levels of depletion are assumed to not infringe on their appropriative water right from the reservoir releases.

The SVBGSA is not aware of any current water rights litigation or water rights enforcement acts along the Salinas River in the Subbasin. Therefore, SVBGSA assumes that the current level of depletion has not injured any appropriative water rights holders in the Subbasin.

Ecological surface water users. Review of MCWRA's Nacimiento Dam Operation Policy (MCWRA, 2018b) and MCWRA's water rights indicates MCWRA operates the Dam in a manner that meets downstream demands and considers ecological surface water users. Since the reservoir operations consider ecological surface water users and reflect reasonable existing surface water depletion rates, this GSP infers that stream depletion from existing groundwater pumping is not unreasonable. If further river management guidelines are developed to protect ecological surface water users, the SMC in this GSP will be revisited.

Recreational surface water users. No recreational activities such as boating regularly occur on surface water bodies in the Subbasin.

As shown by the analysis above, the current rate of surface water depletion is not having an unreasonable impact on the various surface water uses and users in the Subbasin. Therefore, the minimum thresholds are set based on 2015 groundwater elevations.

8.10.2.2 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

The minimum thresholds for depletion of ISW are set to December 2015 groundwater elevations in the shallow monitoring wells within the Subbasin. The minimum thresholds all reference the same historical year and have existed simultaneously in the past. Therefore, no conflict exists between minimum thresholds measured at various locations within the Subbasin.

The depletion of ISW minimum thresholds could influence other sustainability indicators as follows:

- **Chronic lowering of groundwater levels.** The depletion of ISW minimum thresholds is identical to the groundwater level minimum thresholds. Therefore, the ISW minimum thresholds will not result in chronic lowering of groundwater elevations.
- **Reduction in groundwater storage.** The depletion of ISW minimum threshold is identical to the groundwater elevation minimum thresholds. The change in groundwater storage minimum threshold require groundwater elevations be held at the minimum thresholds set for the chronic lowering of groundwater indicator. Thus, the ISW minimum threshold is therefore consistent with the change in groundwater storage minimum threshold.
- **Degraded water quality.** The depletion of ISW minimum thresholds does not promote decreasing groundwater elevations that lead to exceedance of groundwater quality minimum thresholds. Therefore, groundwater quality will not be affected by the ISW minimum thresholds.
- **Land subsidence.** The depletion of ISW minimum thresholds does not promote additional pumping that could cause subsidence. Therefore, subsidence will not be affected by the ISW minimum thresholds.

8.10.2.3 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The Forebay Subbasin has 3 neighboring subbasins within the Salinas Valley Groundwater Basin:

- The Eastside Subbasin to the northeast
- The Upper Valley Subbasin to the south
- The 180/400-Foot Aquifer Subbasin to the northwest

The SVBGSA is either the exclusive GSA or is one of the coordinating GSAs for the adjacent Subbasins. Because the SVBGSA covers all these subbasins, the SVBGSA is coordinating the development of the minimum thresholds and measurable objectives for all these subbasins. The 180/400-Foot Aquifer Subbasin submitted a GSP in 2020 and the Eastside and Upper Valley

Subbasins are in the process of GSP development for submittal in January 2022. Minimum thresholds for the Forebay Subbasin will be reviewed relative to information developed for the neighboring subbasins' GSPs to ensure that these minimum thresholds will not prevent the neighboring subbasins from achieving or maintaining sustainability.

8.10.2.4 Effect on Beneficial Uses and Users

Table 3-9 of the *Salinas River Long-Term Management Plan* (MCWRA, 2019b) includes a list of 18 different designated beneficial uses on certain reaches of the river. In general, the major beneficial uses on the Salinas River are:

- Surface water diversions for agricultural, urban/industrial, and domestic supply
- Groundwater pumping from recharged surface water
- Freshwater habitat
- Rare, threatened, or endangered species, such as the Steelhead Trout

The depletion of ISW minimum thresholds may have varied effects on beneficial users and land uses in the Subbasin.

Agricultural land uses and users. The depletion of ISW minimum thresholds prevents lowering of groundwater elevations adjacent to certain parts of streams and rivers beyond historical lows. While the measurable objectives are higher, this leaves flexibility for needed groundwater extraction during droughts or periods of low reservoir releases. If the minimum thresholds were higher than these historical levels, it might affect the quantity and type of crops that can be grown in the land adjacent to streams and the ability of crops to withstand droughts.

Urban land uses and users. The depletion of ISW minimum thresholds prevents lowering of groundwater elevations adjacent to certain parts of streams and rivers beyond historical lows. While the measurable objective is higher, this leaves flexibility for needed groundwater extraction during droughts or periods of low reservoir releases. If the minimum thresholds were higher than these historical levels, it may limit the amount of urban pumping near rivers and streams, which could limit urban growth in these areas to historical levels. Also, if pumping is limited beyond historical levels, municipalities may have to obtain alternative sources of water to achieve urban growth goals. If this occurs, this may result in higher water costs for municipal water users.

Domestic land uses and users. The depletion of ISW minimum thresholds protects existing domestic land users and uses near locations of interconnected surface water from groundwater elevation declines below historical lows by maintaining shallow groundwater elevations near streams and protecting the operability of relatively shallow domestic wells.

Ecological land uses and users. The depletion of ISW minimum thresholds addresses ecological uses and users by preventing depletion of interconnected surface water from groundwater pumping beyond what was historically experienced. Additionally, by setting future groundwater levels at or above recent lows, there should be less impact to ecological users than has been seen to date.

8.10.2.5 Relation to State, Federal, or Local Standards

There are no explicit federal, state, or local standards for depletion of ISW. However, both state and federal provisions call for the protection and restoration of conditions necessary for endangered and threatened species.

8.10.2.6 Method for Quantitative Measurement of Minimum Threshold

The SVIHM is used to preliminarily identify areas of ISW and will help determine when any flow in a river is primarily due to conservation releases from Nacimiento and San Antonio reservoirs. Groundwater elevations measured in shallow wells adjacent to these areas of ISW will serve as the primary approach for monitoring depletion of ISW. As discussed in Chapter 7, an existing shallow well will be added, or a new shallow well will be installed to monitor groundwater elevations adjacent to surface water bodies during GSP implementation.

The new shallow monitoring well installed pursuant to the GSP will not have data from 2015. A minimum threshold for that well will be estimated by either correlation with nearby deeper wells with water-level records that include 2015, or from groundwater model results.

8.10.3 Measurable Objectives

The measurable objectives for depletion of ISW target groundwater elevations that are higher than the minimum thresholds. The measurable objectives are established to maintain consistency with the chronic lowering of groundwater elevation and reduction in groundwater storage minimum thresholds, which are also established based on groundwater elevations.

The measurable objectives for depletion of interconnected surface water are established by proxy using shallow groundwater elevations near locations of interconnected surface water and are set to 75% of the distance between 2015 and 1998 shallow groundwater elevations.

8.10.3.1 Methodology for Setting Measurable Objectives

The 2015 groundwater elevations are the minimum thresholds, and 1998 groundwater levels were considered the highest reasonable groundwater elevation. To provide adequate operational flexibility during droughts and to mimic historical hydrograph patterns, the measurable objective was set 75% of the way up from 2015 groundwater elevations.

8.10.3.2 Interim Milestones

The interim milestones leading to the depletion of ISW measurable objectives will be added when the monitoring network is established.

8.10.4 Undesirable Results

8.10.4.1 Criteria for Defining Undesirable Results

By regulation, the depletion of ISW undesirable result is a quantitative combination of minimum threshold exceedances. The undesirable result for depletion of ISW is:

There is an exceedance of the minimum threshold in a shallow groundwater monitoring well used to monitor interconnected surface water.

Streamflow depletion in the Subbasin is complicated by many factors, such as reservoir releases, recharge of the aquifer from streamflow, losses to vegetation, and ET. The ISW SMC applies to depletion of ISW from groundwater use. For SGMA compliance purposes, the default assumption is that any depletions of surface water beyond the level of depletion that occurred prior to December 2015, as evidenced by reduction in groundwater levels, represent depletions that are significant and unreasonable. Any additional depletions of surface water flows caused by groundwater conditions in excess of conditions as they were in December 2015 would likely be an undesirable result that must be addressed under SGMA. There is currently no biological opinion or habitat conservation plan that indicates additional protection is needed for species protected under the Endangered Species Act; however, if it is determined that additional protection is needed and streamflow loss is due to groundwater extraction not surface water flows, SVBGSA will adapt as necessary to adhere to environmental laws.

8.10.4.2 Potential Causes of Undesirable Results

Conditions that may lead to an undesirable result for the depletion of ISW include the following:

- **Localized pumping increases.** Even if the Subbasin is adequately managed at the Subbasin scale, increases in localized pumping near ISW bodies could unreasonably increase surface water depletion.
- **Expansion of riparian water rights.** Riparian water rights holders often pump from wells adjacent to the Salinas River. Pumping by these riparian water rights holder users is not regulated under this GSP. Additional riparian pumpers near interconnected reaches of rivers and streams may result in excessive localized surface water depletion.
- **Changes in Nacimiento and San Antonio Reservoir Releases.** Since the Salinas River is dependent on reservoir releases for sustained flows, releases at low levels could cause

undesirable results. The ability to avoid undesirable results for interconnected surface waters is partially dependent on reservoir releases.

- **Departure from the GSP's climatic assumptions, including extensive, unanticipated drought.** Minimum thresholds were established based on anticipated future climatic conditions. Departure from the GSP's climatic assumptions or extensive, unanticipated droughts may lead to excessively low groundwater elevations that increase surface water depletion rates.

8.10.4.3 Effects on Beneficial Users and Land Use

The depletion of ISW undesirable result is to have no net increase in surface water depletion due to groundwater use beyond December 2015 levels, as determined by shallow groundwater elevations. The effects of undesirable results on beneficial users and land use are the same as the effects of minimum thresholds on beneficial uses and users, as described in Section 8.10.2.4.

SVBGSA will work with National Marine Fisheries Service and MCWRA to further evaluate the effects of the ISW measurable objectives, minimum thresholds, and undesirable results on surface water flows and beneficial users.

9 MANAGEMENT ACTIONS AND PROJECTS

9.1 Introduction

This chapter describes the management actions and projects that will allow the Subbasin to maintain sustainability in accordance with §354.42 and §354.44 of the GSP Regulations should they be needed. The set of management actions and projects provide sufficient options for maintaining sustainability throughout the planning horizon. Implementation of management actions and projects will only be initiated in the Forebay Subbasin after the benefits and impacts of the actions have been analyzed with a publicly available groundwater model that has technical acceptance. As stated in Chapter 6, the model used for developing this GSPs groundwater budgets should be improved before it can be used for analyzing management actions in the Subbasin.

While management actions may be applicable in the subbasin as a whole, management actions will be implemented for the ASCMA by the ASGSA, and the SVBGSA will implement management actions in the rest of the Forebay Subbasin. Special implementation of one management action, A3 – Improve Rural Residential Water Quality is identified to be implemented in the ASCMA and not the entire subbasin. The nature of how management actions and projects are described in this chapter may be implemented to different degrees or in different manners in the ASCMA and remaining Subbasin, however the intent is to work in coordination across the Subbasin.

All management actions and projects will be implemented in accordance with the Implementation Agreement executed by the SVBGSA and the ASGSA. The Implementation Agreement defines that the ASGSA shall implement in the ASCMA and the SVBGSA shall implement in the balance of the Forebay subbasin. The Agreement details establishment of a Coordination Committee to provide a forum for the Parties to discuss the implementation of management actions and projects. The Committee makes recommendations to each GSA's Board of Directors.

This chapter includes a description of proposed projects and proposed groundwater management actions. In this GSP, projects are activities supporting groundwater sustainability that require infrastructure or physical change to the environment. Projects include green infrastructure projects that achieve benefits through alteration of vegetation or soils, such as removal of invasive species and floodplain restoration. The term groundwater management actions generally refer to activities that support groundwater sustainability without infrastructure.

The management actions and projects included in this GSP are designed to achieve a number of outcomes including:

- Maintaining groundwater sustainability through 2042 by continuing to meet Subbasin-specific SMC
- Providing equity between who benefits from projects and who pays for projects
- Providing incentives to keep groundwater pumping within the sustainable yield

The management actions and projects included in this chapter outline a framework for maintaining sustainability, however, many details must be negotiated before any of the management actions and projects can be implemented. Costs will be additional to current operational costs of SVBGSA and funding needed for monitoring and reporting.

This GSP is developed as part of an integrated effort by the SVBGSA to achieve and maintain groundwater sustainability in all 6 subbasins of the Salinas Valley under its authority. Therefore, the projects and actions included in this GSP are part of a larger set of integrated projects and actions for the entire Valley, all of which account for the uncertainty associated with the basin setting. However, because much of the Subbasin and the ASCMA is fundamentally reliant on the Arroyo Seco River for groundwater recharge and is currently sustainable, the principal management action related to the Salinas River and the Salinas Valley groundwater basin in the ASCMA is to work with the SVBGSA and the MCWRA to evaluate potential reoperation scenarios to ensure the continued sustainability of the Forebay and eastern part of the ASCMA. The 2 GSAs will actively participate in management actions and implementation actions as they are prioritized and implemented, as necessary. The GSAs will consult on management actions and projects as agreed to in the Implementation Agreement between the SVBGSA and ASGSA.

The management actions and projects are based on existing infrastructure, including the reservoirs and their spillways. The reservoirs are currently operated according to the Nacimiento Dam Operations Policy (MCWRA, 2018b), which reflects the Salinas Valley Water Project. The Nacimiento Spillway has an elevation of 787.75 feet msl, with an inflatable gate that can temporarily raise the spillway gate to 800 feet msl to accommodate flood flows. If current infrastructure is operated differently, such as required reductions if deferred maintenance is not completed or changes resulting from the planned HCP, or if other projects are implemented within the Valley that affect groundwater conditions, SVBGSA intends to work with its partner, the ASGSA, to consider the effect of any such changes in meeting sustainability goals in the ASCMA and Forebay Subbasin and will act in furtherance of reaching such goals.

Discussions and decisions regarding specific management actions and projects will continue throughout GSP implementation, conducted in accordance with the Implementation Agreement, and be part of the adaptive management of the Subbasin. Members of the ASGSA and SVBGSA and stakeholders in the Subbasin should view these management actions and projects as a starting point for more detailed discussions. Where appropriate, details that must be agreed upon are identified for each project or management action.

As a means to compare projects, this chapter estimates the cost per AF of water. The cost per AF is the amortized cost of the project divided by the annual yield. It is not the cost of water for irrigation or the domestic cost of drinking water for households on water systems. It is included to help compare projects; however, more refined cost analyses and future special benefit analyses will be completed if projects are needed during GSP implementation.

The specific design for implementing management actions and projects will provide landowners and public entities flexibility in how they manage water and how the Subbasin maintains groundwater sustainability. Not all management actions and projects need to be implemented. Forebay and ASCMA stakeholders will work collaboratively with the SVBGSA and the ASGSA as detailed in the Implementation Agreement to determine which management actions and projects to implement in order to maintain sustainability of the Forebay Subbasin and ASCMA and will pursue adaptive management if conditions change.

9.2 General Process for Developing Management Actions and Projects

9.2.1 Process for Developing Management Actions and Projects

The general process for developing the management actions and projects presented in this chapter included a combination of reviewing publicly available information, gathering feedback during public meetings including Subbasin Committee meetings, conducting hydrogeologic analysis, consulting with SVBGSA and ASGSA staff, and meeting with Advisory Committee and Board members.

The 4 management actions included in the draft Arroyo Seco GSP were also reviewed and discussed with the Coordination Committee and 3 management actions have been included in the Forebay GSP. One management action, Salinity Management Studies, was agreed to not be included in the GSP and one management action, Improve Rural Residential Water Quality, will be implemented specifically in the ASCMA.

Building off the previously identified projects, SVBGSA undertook an iterative process at the subbasin level to develop the management actions and projects in this GSP. An overview of the purpose and types of management actions and projects was presented to the Subbasin Committee, and initial ideas were solicited. Subbasin Committee members completed a survey for feedback and further solicitation of ideas. After these ideas were gathered, a list of potential management actions and projects was presented to the Subbasin Committee and discussed. Potential management actions and projects were also discussed in terms of meeting the SMC outlined in Chapter 8.

9.2.2 Cost assumptions used in developing projects

Assumptions used to develop projects and cost estimates are provided in Appendix 9A.

Assumptions and issues for each project need to be carefully reviewed and revised during the pre-design phase of each project. Project designs, and therefore costs, could change considerably as more information is gathered.

The cost estimates included for each SVBGSA project are order of magnitude estimates. These estimates were made with little to no detailed engineering data. The expected accuracy range for such an estimate is within +50% or –30%. The cost estimates are based on perceptions of current conditions at the project location and reflect professional opinions of costs at this time and are subject to change as project designs mature.

For infrastructure projects, capital costs include major infrastructure components, such as pipelines, pump stations, customer connections, turnouts, injection wells, recharge basins, and storage tanks. Capital costs also include 30% contingency for plumbing appurtenances, 15% increase for general conditions, 15% for contractor overhead and profit, and 9.25% for sales tax. Engineering, legal, administrative, and project contingencies was assumed as 30% of the total construction cost and included within the capital cost. For capital projects, land acquisition at \$45,000/acre was also included within capital costs.

Annual operations and maintenance (O&M) fees include the costs to operate and maintain new project infrastructure. O&M costs also include any pumping costs associated with new infrastructure. O&M costs do not include O&M or pumping costs associated with existing infrastructure, because these are assumed to be part of water purchase costs. Water purchase costs are assumed to include repayment of loans for existing infrastructure; however, these purchase costs will need to be negotiated. The terms of such a negotiation could vary widely.

Capital costs were annualized over 25 years and added with annual O&M costs and water purchase costs to determine an annualized \$/AF cost for each project.

9.3 Overview of Management Actions and Projects

This GSP is part of an integrated plan for managing groundwater in all 6 subbasins of the Salinas Valley that are managed by the SVBGSA. This GSP includes focuses on the management actions and projects that directly help the Forebay Subbasin, inclusive of the ASCMA, maintain sustainability, but also includes projects that could be implemented if needed and multi-subbasin projects outside the Subbasin that could benefit the Subbasin.

The appropriate actions for Subbasin and the ASCMA, given its sustainable status and lack of groundwater elevation or storage declines, are management actions generally focused on mitigating drought conditions and consisting of policies or feasibility/planning studies. Consequently, management of groundwater extractions is not currently needed as a management action for the Subbasin or the ASCMA. Current levels of groundwater extraction—or more specifically, consumptive use of groundwater in the Subbasin and the ASCMA—appear to be sustainable based on 2020 groundwater conditions. As stated previously, contingent actions, in coordination with recommendations from the Forebay SMC TAC (described as Management Action A1), may include groundwater demand management, but those actions are currently not considered management actions needed to be implemented at the time of this GSP.

The following are the major types of management actions and projects that can be developed to supplement the Forebay Subbasin's groundwater supplies:

- Direct recharge through recharge basins or injection/dry wells
- Indirect recharge through decreased ET
- Reoperation of reservoir releases to achieve greater or more regular recharge
- Demand management

The management actions and projects for this GSP are listed in Table 9-1.

Table 9-1. Management Actions and Projects

Project/ Management Action #	Name	Description	Project Benefits	Quantification of Project Benefits	Cost
A – MANAGEMENT ACTIONS					
A1	Forebay SMC Technical Advisory Committee (TAC)	Establish TAC to review groundwater conditions and provide advice on management actions and projects	Potential for increased groundwater elevations, increased groundwater storage, decreased groundwater extraction, protection of water quality	Dependent on specific recommendations implemented	Staffing costs plus \$10,000 per year
A2	Conservation and Agricultural BMPs	Promote agricultural BMPs and support use of ET data as an irrigation management tool for growers	Better tools assist growers to use water more efficiently; decreased groundwater extraction	Unable to quantify benefits until specific BMPs are identified and promoted	Approximately \$100,000 for 4 workshops, grant writing, and demonstration trials. Cost could be reduced if shared between subbasins.
A3	Improve Rural Residential Water Quality in ASCMA	Educate rural residents about common groundwater quality issues and options for obtaining safe and aesthetic potable water in their homes	Improve rural domestic water quality by supplying bottled water, installing reverse osmosis units, and/or extending public water supply systems	To be determined	\$3,000 for outreach and education. Program does not include cost for bottled water, reverse osmosis units
A4	Watershed Protection Policy for Arroyo Seco River	Establish a Watershed Protection Policy for protecting the Arroyo Seco River watershed	Ensure continued recharge from Arroyo Seco River and habitat for threatened fish	Protection of the Arroyo Seco River watershed maintains sustainable conditions in the ASCMA	Costs would be staff time only to prepare policy resolutions for the ASGSA and SVBGSA Board of Directors
A5	Fallowing, Fallow Bank, and Agricultural Land Retirement	Includes voluntary fallowing, a fallow bank whereby anybody fallowing land could draw against the bank to offset lost profit from fallowing, and retirement of agricultural land	Decreased groundwater extraction for irrigated agriculture	Dependent on program participation	\$430-\$1,270/AF if land is fallowed \$830-\$2,070/AF if land is retired

Project/ Management Action #	Name	Description	Project Benefits	Quantification of Project Benefits	Cost
A6	MCWRA Drought Reoperation	Support the existing Drought Technical Advisory Committee (D-TAC) when it develops plans for how to manage reservoir releases during drought conditions	Additional regular winter reservoir releases; drought resilience	Unable to quantify benefits since drought operations have yet to be triggered	No additional costs since already formed.
A7	Reservoir Reoperation	Collaborate with MCWRA to evaluate potential reoperation scenarios	Additional regular annual reservoir releases; drought resilience	Unable to quantify benefits until feasibility study completed	Approximately \$400,000 - \$500,000
B –PROJECTS					
B1	Multi-benefit Stream Channel Improvements	Prune native vegetation and remove non-native vegetation, manage sediment, and enhance floodplains for recharge. Includes 3 components: Stream Maintenance Program Invasive Species Eradication Floodplain Enhancement and Recharge	Groundwater recharge, flood risk reduction, returns streams to a natural state of dynamic equilibrium	<p>Component 1: Multi-subbasin benefits not quantified</p> <p>Component 2: Multi-subbasin benefits of 2,790 to 20,880 AF/yr. of increased recharge</p> <p>Component 3: Forebay benefits of 400 AF/yr. from 4 recharge basins</p>	<p><u>Component 1</u> Multi-subbasin Cost: \$150,000 for annual administration and \$95,000 for occasional certification; \$780,000 for the first year of treatment on 650 acres, and \$455,000 for annual retreatment of all acres</p> <p><u>Component 2</u> Multi-subbasin Average Cost: \$16,500,000 Unit Cost: \$60 to \$600/AF</p> <p><u>Component 3</u> Forebay Cost: \$4,464,000 Unit Cost: \$930/AF</p>
B2	Managed Aquifer Recharge with Overland Flow	Construct basins for managed aquifer recharge of overland flow before it reaches streams	Groundwater recharge, less stormwater and erosion, more regular surface temperature	400 AF/yr. in increased recharge	Capital Cost: \$4,128,000 Unit Cost: \$870/AF
C - IMPLEMENTATION ACTIONS					
C1	Well Registration	Register all production wells, including domestic wells	Better informed decisions, more management options	N/A – Implementation Action	Not estimated at this time

Project/ Management Action #	Name	Description	Project Benefits	Quantification of Project Benefits	Cost
C - IMPLEMENTATION ACTIONS					
C2	GEMS Expansion and Enhancement	Update current GEMS program by collecting groundwater extraction data from wells in areas not currently covered by GEMS and improving data collection	Better informed decisions	N/A – Implementation Action	Not estimated at this time
C3	Dry Well Notification System	Develop a system for well owners to notify the GSA if their wells go dry. Refer those owners to resources to assess and improve their water supplies. Form a working group if concerning patterns emerge.	Support affected well owners with analysis of groundwater elevation decline	N/A – Implementation Action	Not estimated at this time
C4	Water Quality Coordination Group	Form a working group for agencies and organizations to collaborate on addressing water quality concerns	Improve water quality	N/A – Implementation Action	Not estimated at this time
C5	Land Use Jurisdiction Coordination Program	Review land use plans and efforts to coordinate with land use planning agencies to assess activities that potentially create risks to groundwater quality or quantity.	Better aligned land use and water use planning	N/A – Implementation Action	Not estimated at this time

9.4 Management Actions to Maintain Sustainability

Management actions that could be used to maintain sustainability were the most reliable, feasible, cost-effective, and acceptable to stakeholders. Descriptions of these project and management actions are included below and are not in order of priority. Generalized costs are also included for planning purposes and to show the general level of effort necessary to undertake actions. Components of these management actions may change based on future analyses. Therefore, each of the management actions described in this GSP should be treated as a generalized action representative of a range of potential project configurations. Management actions and projects are to be implemented consistent with the Implementation Agreement between the ASGSA and the SVBGSA and through the subbasin with the exception of Management Action A3, Improve Rural Residential Water Quality, will be implemented only in the ASCMA.

9.4.1 Management Action A1: Forebay Sustainable Management Criteria Technical Advisory Committee

This management action establishes the Forebay SMC TAC to give valuable science-based information and advice to the Subbasin Implementation Committee to manage groundwater resources sustainably. This is a technical-based committee that may include outside experts. The TAC will be open to all interested stakeholders but will be limited in meeting attendance to third party experts with expertise in fields such as hydrology, hydrogeology, hydrological modeling, civil engineering, or fisheries biology. As a prerequisite to participating in the TAC, an interested stakeholder must retain and pay for an expert to serve on the TAC on his/her behalf. Government agencies may utilize in-house staff for purposes of TAC participation. The SMC TAC will include the entire Subbasin, and the ASCMA will be represented on the TAC.

The SMC TAC will be established during the first 2 years of GSP implementation. SVBGSA will work with the Subbasin Committee to determine membership, which will include professional and scientific experts. The SMC TAC will initially meet to develop guiding principles, triggers, and the decision-making process. The triggers are groundwater condition levels that trigger the need for management actions or projects according to the SMC. Over the course of GSP implementation, the SMC TAC will also review the data required for decision making to ensure needed data is being collected to monitor the 5 SMC potentially present in the Forebay Subbasin. TAC members will work with the Forebay Subbasin Committee to develop recommendations to correct negative trends in groundwater conditions and continue to meet the measurable objectives.

After the meetings associated with its establishment, the SMC TAC will convene annually in April, and subsequently as needed, to:

- Review the Forebay Subbasin Annual Report and whether conditions trigger the need for projects or management actions to continue to maintain sustainability.
- Recommend implementation of specific management actions and projects to the Subbasin Committee for approval by the appropriate Board for final implementation. SVBGSA and ASGSA will consult on management actions and projects as agreed to in the Implementation Agreement between the SVBGSA and ASGSA.
- Review data and make recommendations on data acquisition and analysis needed.

The SMC TAC will make recommendations to the Forebay Subbasin Committee on management actions and projects. These could include:

- Recharge projects, such as stream channel improvements or managed aquifer recharge (MAR) of overland flow.
- Demand management, such as voluntary or mandatory pumping restrictions depending on spatial and temporal conditions, voluntary fallowing, or other demand management strategies.
- Management actions and projects that mitigate groundwater quality degradation from GSA actions.

In addition, the SMC TAC may analyze how non-SVBGSA projects will affect maintaining sustainability, in the Forebay, primarily regarding projects that modify reservoir operations at Nacimiento and San Antonio; in the future there may be other projects that need to be analyzed upstream or downstream on the Salinas River outside of the Forebay boundaries.

This management action relies on monitoring data that covers the entire Subbasin. Therefore, the GEMS Expansion and Enhancement management action and other monitoring tasks identified in Chapter 10 are critical to collect the data the SMC TAC needs for decision making.

The MCWRA D-TAC, described in Management Action A6, convenes, and develops a schedule for releases from the Nacimiento and San Antonio reservoirs during drought periods. The D-TAC and SMC TAC are unique but complimentary, as the D-TAC's recommendation of reservoir releases affect stream flow and therefore groundwater recharge, and the SMC TAC advises on groundwater status.

Through this approach, the Subbasin will be able to react in real time with hydrological situations derived from additional data, provided by a robust SVBGSA monitoring program that includes other local agencies that interface with the Forebay.

9.4.1.1 Relevant Measurable Objectives

The measurable objectives benefiting from the SMC TAC management action include:

- **Groundwater levels.** This measurable objective will benefit from actions the TAC recommends to maintain groundwater elevations at or above the measurable objectives.
- **Groundwater storage.** This measurable objective will benefit from actions the TAC recommends to maintain groundwater storage at or above the measurable objectives.
- **Groundwater quality.** This measurable objective will benefit from actions the TAC recommends to maintain groundwater quality at or above the measurable objectives.
- **Land subsidence.** This measurable objective will benefit from actions the TAC recommends to prevent any potential land subsidence from occurring based on groundwater conditions.
- **Interconnected Surface Water.** This measurable objective will benefit from actions the TAC recommends to maintain shallow groundwater elevations at or above the measurable objectives near areas of interconnected surface water.

9.4.1.2 Expected Benefits and Evaluation of Benefits

The primary benefits for this management action are that there will be a stakeholder-accepted, science-based process to assess the Annual Report and recommend actions as needed to maintain sustainability. Management actions and recharge projects will increase groundwater elevations and storage. Demand management actions will reduce groundwater extraction. Groundwater quality projects will mitigate groundwater quality degradation from GSA action. The specific management actions and projects implemented will determine whether the groundwater benefits expected are related to groundwater elevations, groundwater storage, groundwater quality, land subsidence, and/or interconnected surface water. Because future conditions are unknown and the actions recommended and taken depend on those conditions, it is difficult to quantify the expected benefits at this time.

In addition to helping the Subbasin meet SMC measurable objectives, the SMC TAC provides a process to assist the Subbasin Committee in responding to drought impacts to groundwater.

Benefits will be measured using the monitoring networks described in Chapter 7. Groundwater elevations will be measured with a network of wells that is monitored by MCWRA. Groundwater storage will be monitored based on groundwater elevation changes. Land subsidence will be measured using InSAR data provided by the DWR. When data gaps are filled, interconnected surface waters will be measured through shallow groundwater wells and river flow.

9.4.1.3 Circumstances for Implementation

The SMC TAC can be established at any time. Subbasin stakeholders plan to establish it within the first 2 years of GSP implementation. After it is established, the TAC will meet annually in April and subsequently if needed.

9.4.1.4 Permitting and Regulatory Process

The GSA Board of Directors will need to authorize the establishment of the SMC TAC. If the Forebay Subbasin Committee recommends pumping restrictions, the development and implementation of pumping restrictions is a regulatory activity and would be embodied in a GSA regulation. The regulation could be established to provide for automatic implementation upon existence of specific criteria or to require the vote of the Board to implement.

9.4.1.5 Legal Authority

The California Water Code §10725.4 allows GSAs to pursue investigations to determine the need for groundwater management and to implement groundwater sustainability plans. In addition, the California Water Code §10726.4(a)(2) provides GSAs the authorities to control groundwater extractions by regulating, limiting, or suspending extractions from individual groundwater wells or extractions from groundwater wells in the aggregate.

9.4.1.6 Implementation Schedule

The SMC TAC will be established within the first 2 years of GSP implementation, as shown on Figure 9-1. After it is established, it will convene at least annually.

Task Description	Year 1	Year 2	Annually
Establish TAC (membership, guiding principles, and decision-making process)			
Convene annually and meet additionally as needed			

Figure 9-1. Implementation Schedule for SMC TAC

9.4.1.7 Estimated Cost

The costs of convening and supporting the SMC TAC will be staff time and any additional analyses requested by the TAC. Development of the Annual Report occurs independent of the TAC and therefore does not incur any additional costs. The cost for SVBGSA technical support to the SMC TAC is estimated at \$10,000/year, variable based on the number of meetings and additional analyses needed.

9.4.1.8 Public noticing

As part of the approval of the establishment of the SMC TAC, it will go through a public notice process to ensure that all groundwater users and other stakeholders have ample opportunity to comment on it. The general steps in the public notice process will include the following:

- GSA staff will bring an assessment of the need for the TAC to the SVBGSA Board in a publicly noticed meeting. This assessment will include:
 - A description of the undesirable result(s) that may occur if action is not taken
 - A description of the proposed management action
 - An estimated cost and schedule for the proposed management action
 - Any alternatives to the proposed management action
- The SVBGSA Board will notify stakeholders in the area of the proposed TAC and allow at least 30 days for public response.
- After the 30-day public response period, the SVBGSA Board will vote whether to establish the TAC and notify the public if approved via an announcement on the SVBGSA website and mailing lists.

In addition to the process detailed above, all projects will follow the public noticing requirements per CEQA or NEPA.

9.4.2 Management Action A2: Conservation and Agricultural BMPs

This would be a program to incentivize and/or assist with conservation and agricultural BMPs to reduce groundwater pumping. It may also improve groundwater quality. SVBGSA acknowledges that BMPs are being developed as part of Ag Order 4.0 and will work to complement and not replicate those efforts. Potential practices that will be part of a program include:

- **EVAPOTRANSPIRATION DATA**
ET data indicate crops' theoretical water needs as determined by crop type and weather conditions. Some ET data sets are 100% automated, relying on satellite imagery and weather stations to provide affordable data for large areas of land. Other ET data sets are generated automatically, but then subjected to expert verification, resulting in higher quality data at higher cost. The incorporation of ET data with soil moisture sensors, soil nutrient data, and flow meter data can help inform more efficient irrigation practices. The GSA could support the development and utilization of these tools through securing funding or coordinating with existing local agricultural extension specialists who conduct research and provide technical assistance to growers.

- **EDUCATION AND OUTREACH**

SVBGSA will support existing local agricultural extension specialists with their education and outreach on BMPs that would increase water conservation and decrease pumping. Efforts will promote irrigation practices to reduce water use. Efforts could also include supporting practices to increase water retention such as compost application and use of cover crops. These BMPs could also support compliance with Ag Order regulations applicable to groundwater. Effective implementation of BMPs will require buy-in from growers. SVBGSA will work with local agricultural extension specialists and growers to understand preferred BMPs and those that could yield the greatest water savings. SVBGSA could partner with existing organizations or technical assistance providers to help growers identify which BMPs they could pursue and analyze the potential savings from their implementation. Technical workshops and professional referrals can be utilized with partners to accomplish outreach effectively and efficiently with growers.

9.4.2.1 Relevant Measurable Objectives

The measurable objectives benefiting from outreach and education include:

- **Groundwater elevation measurable objective.** This measurable objective will benefit from BMPs that promote less pumping or greater recharge that result in higher groundwater levels.
- **Groundwater storage measurable objective.** Reducing pumping or adding water to the principal aquifer will ultimately have the effect of increasing groundwater in storage.
- **Land subsidence measurable objective.** This measurable objective will benefit from BMPs that reduce the pumping stress on the local aquifer and thereby reduce any potential for subsidence.

9.4.2.2 Expected Benefits and Evaluation of Benefits

The primary benefit of implementing this management action is to provide the latest technologies and opportunities to modify agricultural practices that would allow farmers to reduce pumping needs but realize the same crop yields. This program could also be a mechanism for grant opportunities, funded through the SVBGSA to identify pilot programs and other innovative technological advancements that could provide an overall groundwater basin benefit.

Improving ET data allows for improved modeling and sets more accurate expectations for climate change impacts on crops. This in turn is translated into expected water demand for the crops. With more accurate data and information, pumpers can work with the SVBGSA to improve water extractions and potentially keep more water in the ground. This would result in protected groundwater elevations and storage. Furthermore, education and outreach activities can

help inform farmers about cutting-edge technology that would help maximize irrigation efficiency. This would also improve groundwater elevations and storage. Benefits cannot be quantified until specific BMPs are identified and promoted.

Benefits will be measured using the monitoring networks described in Chapter 7. Groundwater levels will be measured with a network of wells that is monitored by MCWRA. Land subsidence will be measured using InSAR data provided by DWR.

9.4.2.3 Circumstances for Implementation

The circumstance for implementation is for willing farmers to participate in an education and outreach program and to work with the SVBGSA to identify opportunities. No other triggers are necessary or required.

9.4.2.4 Permitting and Regulatory Process

No permitting or regulatory processes are necessary for an education and outreach program.

9.4.2.5 Implementation Schedule

If selected, the option for an outreach and education program could begin immediately. This program will be ongoing.

9.4.2.6 Legal Authority

No legal authority is needed to promote outreach and education.

9.4.2.7 Estimated Cost

The Conservation and Agricultural BMP activities would be conducted as an ongoing program funded annually. This would cost approximately \$100,000 to promote opportunities for education seminars, grant writing tasks, demonstration projects, and other activities focused on BMPs in the agricultural industry.

9.4.2.8 Public Noticing

The SVBGSA will endeavor to have the broadest possible public noticing of educational and outreach activities to inform stakeholders, interested parties, landowners, and agricultural interests of conservation and agricultural BMPs.

9.4.3 Management Action A3: Improve Rural Residential Water Quality in Arroyo Seco Cone Management Area

Rural residents in the ASCMA supplied by on-site domestic wells are more likely to have poor-quality water because the quality is rarely tested, unregulated, and usually from relatively shallow groundwater that typically has lower-quality water. Strategies for mitigating this situation include:

- Buying bottled water for drinking.
- Installing point-of-use under-counter reverse osmosis units at the kitchen sink to provide drinking water.
- Extending public water supply systems to serve nearby rural residences.

In recent years, the City of Greenfield has extended water service to some nearby rural residences, and its Water Master Plan includes expansion of the municipal service area to new development around the perimeter of the existing urban area (Wallace Group, 2016). Such action could be continued by the City of Greenfield within the ASCMA.

This management action consists of educating rural residents about common groundwater quality issues and options for obtaining safe and aesthetic potable water in their homes. ASGSA will compile information about home water quality treatment options and make it available to local residents via their websites. If funding allows, this management action could include workshop or direct outreach to residential residents conducted by the City of Greenfield or ASGSA.

9.4.3.1 Relevant Measurable Objectives

This management action does not affect the groundwater quality measurable objective; however, it assists beneficial users affected by poor groundwater quality.

9.4.3.2 Expected Benefits and Evaluation of Benefits

The strategies that will be included in this management actions' educational activities improve potable water quality at rural residences. The dissolved minerals removed by reverse osmosis units are returned to the groundwater basin via the septic system, resulting in no net change in groundwater quality.

9.4.3.3 Circumstances for Implementation

Rural homeowners may purchase bottled drinking water or install a reverse osmosis unit at any time. Many reverse osmosis units are readily available at home improvement stores and online. The City of Greenfield's Water Master Plan already intends to expand the distribution system.

9.4.3.4 Permitting and Regulatory Process

Individuals implementing residential recharge projects are responsible for any required permitting. Due to the small-scale and decentralized nature of these projects, it is not anticipated that these projects are of a magnitude capable of having a demonstrable impact on the environment that would require a CEQA review process.

9.4.3.5 Legal Authority

No legal authority is required to make non-binding recommendations such as this management action would undertake. The ASGSA or SVBGSA could be the sponsor of such a project if funding were secured for the effort. The Coordination Committee of the ASGSA and SVBGSA would convene to consider such implementation actions.

9.4.3.6 Implementation Schedule

If selected, this management action will include approximately 1 year of compiling information on home water quality treatment actions and making it available to residents online. The timing of bottled water purchases or installation of a reverse unit is up to the rural resident. The City of Greenfield Water Master Plan includes a schedule for expanding the municipal potable water supply distribution system.

9.4.3.7 Estimated Cost

Costs for public education and outreach could range in the amount of \$3,000. Water quality conditions could be documented from existing data sources. Under-counter reverse osmosis units typically cost several hundred dollars. Handy homeowners can do their own installation. Otherwise, a plumber can do the installation in 1 to 2 hours, at prevailing rates. Bottled water is ubiquitously available in local markets at a range of prices.

9.4.3.8 Public Noticing

As part of the approval of the program, it will go through a public notice process to ensure that all groundwater users and other stakeholders have ample opportunity to comment on it. The general steps in the public notice process will include the following:

- SVBGSA and ASGSA staff will bring an assessment of the need for the project/management action to the SVBGSA and ASGSA Boards in a publicly noticed meeting. The project could be generated from quarterly discussions of the Coordination Committee of the ASGSA and SVBGSA. The assessment will include:
 - A description of the undesirable result(s) that may occur if action is not taken
 - A description of the proposed project

- An estimated cost and schedule for the proposed project
- Any alternatives to the proposed project
- The SVBGSA Board will notify stakeholders in the area of the proposed project/management action and allow at least 30 days for public response.

After the 30-day public response period, the SVBGSA Board will vote whether to approve the implementation of the management action and notify the public if approved via an announcement on the SVBGSA website and mailing lists.

9.4.4 Management Action A4: Watershed Protection Policy for Arroyo Seco River

The Forebay Subbasin GSP establishes a Watershed Protection Policy for protecting the Arroyo Seco River watershed due to its habitat values and for its recharge of the Forebay Subbasin. The alluvial fan of the Arroyo Seco River is a cone-shaped geomorphic feature consisting of coarse sediments that promote abundant river recharge with good water quality. The Arroyo Seco River contains no dams and is the largest unregulated tributary to the Salinas Valley. Its value as an unregulated water source to the Forebay Subbasin is well documented. It is understood that while watershed protection is not under the purview of groundwater sustainability agencies, watershed health is a critical asset that groundwater agencies value, and in the case of the Arroyo Seco River, protecting its natural habitats and river system functions are essential to the long-term sustainability of the ASCMA.

This management action would benefit the measurable objectives for water levels, water quality and interconnected surface water. Groundwater users in the ASCMA receive significant water supply and quality benefits from the unregulated flow regime of the Arroyo Seco. The Arroyo Seco River supplied more groundwater recharge to the ASCMA during the 2012-2016 drought than did the regulated Salinas River.

The proposed Watershed Protection Policy for the Arroyo Seco River will include the following findings and actions, which will be further detailed as part of the Forebay Subbasin GSP implementation.

- a. This Watershed Protection Policy recognizes the unique hydrogeology of the Arroyo Seco alluvial fan and its role in groundwater recharge within the basin.
- b. The Arroyo Seco River is further recognized as a Class 1 Recovery stream for the threatened South-Central Coast Steelhead.
- c. Watershed protection actions associated with this policy will include assessment of all local, state, and federal actions proposed for the Arroyo Seco and Salinas watersheds and response by the SVBGSA and the ASGSA on watershed protection

and prohibitions on any such proposed actions, including construction of a dam, which may harm the unique hydrogeology and habitat of the river system.

- d. The SVBGSA and the ASGSA shall prepare letters and reports as needed to demonstrate the unique hydrogeological features of the ASCMA of the Forebay Subbasin if any proposed project or program threatens this unique resource.

A formal Watershed Protection Policy will be jointly developed by the SVBGSA and ASGSA during the first 5 years of GSP implementation. The policy will be adopted by the Boards of Directors of both GSAs.

9.4.4.1 Relevant Measurable Objectives

The measurable objectives benefiting from watershed protection include:

- **Groundwater elevation measurable objective.** The Arroyo Seco River provides groundwater recharge that sustains groundwater levels. Protecting the Arroyo Seco River and its watershed should help prevent lowering of groundwater elevations.
- **Groundwater storage measurable objective.** The Arroyo Seco River provides groundwater recharge. Protecting the Arroyo Seco River and its watershed should increase the amount of groundwater in storage.
- **ISW measurable objective.** The Arroyo Seco River provides groundwater recharge from the River. Protecting the Arroyo Seco River and its watershed should help prevent lowering of groundwater elevations near locations of interconnected surface water.

9.4.4.2 Expected Benefits and Evaluation of Benefits

This management action would benefit the measurable objectives for water levels, water quality and interconnected surface water. Groundwater users in the ASCMA receive significant water supply and quality benefits from the unregulated flow regime of the Arroyo Seco. It supplied more groundwater recharge to the ASCMA during the 2012-2016 drought than did the regulated Salinas River. The salinity of Arroyo Seco water is also low, and recharge from the Arroyo Seco River has created a region of high-quality groundwater that covers most of the ASCMA. In addition, there are very significant environmental benefits to maintaining the Arroyo Seco River in its natural state. The Arroyo Seco River is recognized as a Class 1 Recovery stream for threatened South-Central Coast Steelhead. It is the largest unregulated tributary to the Salinas River and is relatively close to the coast. As a result, it has the greatest potential for sustaining steelhead populations in the Salinas River watershed.

9.4.4.3 Circumstances for Implementation

The ASGSA Board may pass this policy at any time. No prior conditions need to occur prior to implementing this action.

9.4.4.4 Permitting and Regulatory Process

This management action does not require any additional permitting and regulatory processes.

9.4.4.5 Legal Authority

This management action consists of advocacy in the context of public proceedings. No special authority is required.

9.4.4.6 Implementation Schedule

When initiated, this management action would be implemented as needed on an ongoing basis. The level of activity would likely be sporadic. If an HCP process gets underway, it would be reasonable to assume that it might last 3 years.

9.4.4.7 Estimated Cost

This management action will be undertaken by SVBGSA and ASGSA staff, and therefore does not have any additional cost associated with it.

9.4.4.8 Public Noticing

As part of the approval of this policy, it will go through a public notice process to ensure that all groundwater users and other stakeholders have ample opportunity to comment on it. The general steps in the public notice process will include the following:

- GSA staff will bring an assessment of the need for the project/management action to the SVBGSA and ASGSA Boards in publicly noticed meetings. This assessment will include:
 - A description of the undesirable result(s) that may occur if action is not taken
 - A description of the proposed policy
 - An estimated cost and schedule for the proposed policy
 - Any alternatives to the proposed policy
- The SVBGSA Board will notify stakeholders in the area of the proposed policy and allow at least 30 days for public response.

- After the 30-day public response period, the SVBGSA Board will vote whether to approve the policy and notify the public if approved via an announcement on the SVBGSA website and mailing lists.

In addition to the process detailed above, all projects will follow the public noticing requirements per CEQA or NEPA.

9.4.5 Management Action A5: Fallowing, Fallow Bank, and Agricultural Land Retirement

To reduce groundwater extraction temporarily or permanently, this management action includes 3 actions that could be implemented on an as-needed basis to reduce irrigated land. These actions provide options for voluntary fallowing and land retirement that can be targeted to specific locations that have declining groundwater elevations or recharge potential, such as floodplains. Water quality and access to drink water wells will also be considered when deciding where to incentivize fallowing or land retirement. Greater analysis of the incentive to growers and funding for these actions needs to be undertaken. The following could be included under an overarching program, even if implemented independently:

- **Rotational fallowing:** Participating growers fallow some percentage of land or fallow on a rotating basis. This could be modified to include partial fallowing, such as growing fewer crops per year instead of completely fallowing land.
- **Fallow bank:** Growers could contribute to a fallow bank whereby anybody fallowing land could draw against the bank to offset the lost income from fallowing. This could be combined with other fallowing plans. The specific design of a fallow bank will be developed during GSP implementation, including options such as exempting growers from rotational fallowing if they contribute a certain amount of money to the fallow bank.
- **Agricultural land retirement:** SVBGSA could develop a system for voluntary agricultural land retirement or pay to retire agricultural land, effectively reducing the amount of groundwater used in the Subbasin. The benefit from this program depends on identifying willing participants.

9.4.5.1 Relevant Measurable Objectives

The measurable objectives benefiting from reduced groundwater extraction include:

- **Groundwater elevation measurable objective.** Depending on the location of fallowing or land retirement, this measurable objective will benefit from decreased pumping that will result in higher groundwater levels.

- **Groundwater storage measurable objective.** Depending on the location of fallowing or land retirement, reducing pumping from the principal aquifer will ultimately have the effect of increasing groundwater in storage.
- **Land subsidence measurable objective.** Depending on the location of fallowing or land retirement, this measurable objective will benefit from pumping allowances and controls that reduce the pumping stress on the local aquifer and thereby reduce any potential for subsidence.

9.4.5.2 Expected Benefits and Evaluation of Benefits

The primary benefits expected for this management action is reduced Subbasin pumping. This management action is costed for saving 1,000 AF/yr.; however, it could be scaled to any size. The less water that is extracted from the principal aquifer, the more water is in storage. Depending on the location of fallowing and land retirement, benefits may include halting the decline of or raising groundwater elevations and avoiding any potential subsidence in specific areas. Because it is unknown how many landowners will willingly enter the land retirement program, it is difficult to quantify the expected benefits at this time.

Benefits will be measured using the monitoring networks described in Chapter 7. Groundwater elevations will be measured with a network of wells that is monitored by MCWRA. A direct correlation between agricultural land retirement and changes in groundwater elevations is likely not possible because this is only one among many management actions and projects that may be implemented in the Subbasin. Groundwater storage will be monitored using groundwater pumping measurements and estimates. Land subsidence will be measured using InSAR data provided by DWR.

9.4.5.3 Circumstances for Implementation

Agricultural land retirement relies on willing participants, be it for participation or land sale. No other triggers are necessary or required. The circumstance for implementation is for SVBGSA to identify the need for the management action and identify willing participants and secure their participation.

9.4.5.4 Permitting and Regulatory Process

While no permitting or regulatory processes are necessary for buying land or securing agreements with landowners for fallowing or land retirement, the SVBGSA will secure and record as appropriate, the necessary agreements or deed restrictions to implement the management action.

9.4.5.5 Legal Authority

California Water Code §10726.2 provides GSAs the authority to purchase, among other things, land, water rights, and privileges.

9.4.5.6 Implementation Schedule

Fallowing and land retirement will be developed when conditions warrant implementation. If selected, the process and GSA incentives for fallowing and/or land retirement will be developed over 2 years. The development of a fallow bank may take additional time. Although the program will be ongoing, it is reliant on willing participants and may be implemented intermittently or on an as-needed basis.

9.4.5.7 Estimated Cost

The cost for voluntary fallowing and land retirement depends on extent of fallowing and land retirement. These cost estimates are based on average rent and land value, and they do not capture the additional economic benefits associated with agriculture. The average cost of land and rent was derived from a source that had county-specific estimates. It is understandable that even within a county the cost of land acquisition is highly variable; however, this was the best available information on the average cost of land.

The costs of fallowing land sufficient to reach 1,000 AF/yr. water conserved are shown in Table 9-2, which could be scaled to the amount desired. Fallowed land would be planted with cover crops to maintain soil quality. Vegetables are the most common crop type in the Forebay Subbasin (MCWRA, 2019c). Since vegetables in the Forebay use 3.3 AF/acre/yr. (MCWRA, 2019c) and cover crops use only 0.3 AF/acre/yr. (RCDSCC, 2018), each acre of vegetables fallowed would save 3 AF/yr. Therefore, conserving 1,000 AF/yr. would require fallowing about 333 acres of vegetables. The average rent between the low and high estimates is \$2,250/acre, which would result in a unit cost of \$750/AF water conserved when fallowing.

Table 9-2. Estimated Cost of Fallowing and Agricultural Land Retirement

Annual Fallowing	Low Estimate	High Estimate	Description
Annual rent (cost/acre)	\$1,000	\$3,500	Rent for row crops in Monterey County (ASFMRA, 2020)
Annual cover crop cost per acre	\$300	\$300	Cost for cover crops in nearby Pajaro Valley (Highland Economics, 2017)
Annual rent plus annual cover crop cost per acre	\$1,300	\$3,800	
Acres fallowed annually to conserve 1,000 AF/yr.	333 acres	333 acres	Based on vegetable water use in the Forebay (MCWRA, 2019c) and cover crop water usage (RCDSCC, 2018)
Annual cost to conserve 1,000 AF/yr. through fallowing	\$432,900	\$1,265,400	
Unit cost/AF water conserved	\$430	\$1,270	
Agricultural Land Retirement	Low Estimate	High Estimate	Description
Land value per acre	\$27,500	\$75,000	Cost per acre row crops in Monterey County (ASFMRA, 2020)
Unit cost/AF water conserved	\$830	\$2,070	Using cover crop value as annual O&M, 6% interest, and annualized over 25 years

9.4.5.8 Public Noticing

All appropriate documentation for any agricultural land retirement achieved through a land sale, agreement or deed restriction will be recorded with the County of Monterey Assessor – Clerk – Recorder’s Office. All agricultural land retirement by any means through the GSA will be recorded and publicly accessible.

9.4.6 Management Action A6: MCWRA Drought Reoperation

MCWRA formed a Drought Operations Technical Advisory Committee (D-TAC) to provide, when drought triggers occur, technical input and advice regarding the operations of Nacimiento and San Antonio Reservoirs. The D-TAC developed Standards and Guiding Principles to be used in the development of a proposed reservoir release schedule triggered under specific, seasonally defined conditions. This management action would inform in decisions on reservoir operation and flow releases during a drought.

The proposed reservoir release operations schedule triggered under specific, seasonally defined conditions of drought will be developed based on the best available scientific knowledge, data, and understanding of the environmental biology, hydrology, and hydrogeology of the Salinas Valley; under the technical expertise of the members of the D-TAC. If adopted, the proposed reservoir release schedule will be implemented based on specific tools and templates made available to the D-TAC. These are discussed further in the Implementation Procedures. The proposed reservoir release schedule will acknowledge, address, and balance the water needs of various stakeholders for limited resources during a drought.

The D-TAC will use a MCWRA provided template when developing the release schedule. The specific actions will also be described in a narrative form to expound upon the actions taken for each month shown in the release schedule. Reservoir releases will be made under direction of the MCWRA Board of Directors or Board of Supervisors through the adoption of a reservoir release schedule or dry winter release priorities, to be executed by MCWRA staff. Appendix 9B outlines the D-TAC Standards, Guiding Principles, and Implementation Procedures. The recommendations of the D-TAC may change with the development and adoption of a HCP, but the D-TAC Standards, Guiding Principles, and Implementation procedures will remain in place unless modified by an HCP.

Summary Actions

The Standards and Guiding Principles Document and any recommended release schedule prepared by the D-TAC will first be received by the Reservoir Operations Advisory Committee. The Reservoir Operations Advisory Committee will meet to discuss recommended release schedules and will solicit information, data, and public comment regarding appropriate MCWRA operations during droughts. Following receipt of public input regarding on the recommended release schedule, the Reservoir Operations Advisory Committee will then prepare a written recommendation regarding reservoir operations which will be transmitted to the MCWRA Board of Directors for consideration and action. Any interested party that dissents from the Reservoir Operations Committee's recommendation may submit separate written comments to the MCWRA Board of Directors. The MCWRA Board of Directors will determine, in accordance with applicable law, whether MCWRA will implement a recommended release schedule, provided the MCWRA General Manager may, in his sole discretion, refer the question of whether MCWRA should implement a release schedule to the MCWRA Board of Supervisors for final determination. In the event the MCWRA General Manager elects not to refer the question of implementation of a recommended release schedule to the MCWRA Board of Supervisors, the decision of the MCWRA Board of Directors regarding such questions shall constitute final agency action for all purposes. The MCWRA Board of Directors (or MCWRA Board of Supervisors, if applicable) will retain full discretion and authority to accept or reject, in whole or in part, the written recommendations of the Reservoir Operations Advisory Committee.

9.4.6.1 Relevant Measurable Objectives

The measurable objectives benefiting from outreach and education include:

- **Groundwater elevation measurable objective.** Releasing additional water from the reservoirs even during droughts should help ensure annual groundwater recharge in the Forebay, which will help prevent lowering of groundwater elevations.

- **Groundwater storage measurable objective.** Releasing additional water from the reservoirs even during droughts should help ensure annual groundwater recharge in the Forebay, which will increase the amount of groundwater in storage.
- **Land subsidence measurable objective.** Increasing both groundwater elevations and groundwater storage will have the added benefit of preventing any potential land subsidence. Although subsidence is not a concern in this Subbasin, adding water in the subsurface will keep pore spaces saturated with positive pressure and inhibit land surface collapse associated with groundwater depletion.

9.4.6.2 Expected Benefits and Evaluation of Benefits

The D-TAC will help develop a release schedule aimed at mitigating negative effects from droughts, including from surface water flows and groundwater recharge. The proposed reservoir release schedule will be based on scientific data and will acknowledge, address, and balance the water needs of various stakeholders for limited resources during a drought. The proposed reservoir release schedule will maintain geographic equity, avoid adverse impacts to Valley-wide agricultural operations, and avoid, to the extent possible, consecutive years where only minimum releases are made from the reservoirs. Annual reservoir releases will help recharge the aquifer in the Forebay, which will help prevent declines in groundwater elevations and storage during drought periods. Subsequently, although subsidence is not likely in this Subbasin, this will help reduce the risk of subsidence and prevent water quality degradation.

This GSP is unable to quantify the benefits at this time because the D-TAC decisions will be different each time it convenes. Drought conditions have not been triggered to cause the D-TAC to convene.

If and when the D-TAC convenes, benefits will be measured using the monitoring networks described in Chapter 7. Groundwater levels will be measured with a network of wells that is monitored by MCWRA. Land subsidence will be measured using InSAR data provided by DWR.

9.4.6.3 Circumstances for Implementation

The D-TAC is already established. Its convening will occur when conditions trigger it on an annual basis.

9.4.6.4 Permitting and Regulatory Process

This management action follows the ongoing permitting and regulatory process used by MCWRA for reservoir operations.

9.4.6.5 Implementation Schedule

The D-TAC is already established. Its convening will occur when conditions trigger it on an annual basis.

Annually, the D-TAC will meet any time a “drought trigger” occurs to develop a recommended release schedule for Nacimiento and San Antonio Reservoirs. MCWRA presents the annual reservoir release schedule update at the October meeting of the MCWRA Reservoir Operations Advisory Committee. If the December 1 forecasted combined reservoir storage volume is below 220,000 AF and the San Antonio Reservoir forecasted storage is below 82,000 AF, the D-TAC release schedule process will begin. MCWRA will schedule a D-TAC meeting to occur no earlier than February 15 and the D-TAC will meet as needed through March 31. The release schedule will be developed for April through December of the current year. If significant inflow occurs during this period, then modifications to the release schedule will be made through existing MCWRA protocols. Provided that neither of the aforementioned threshold storage volumes has been exceeded by inflow as of February 15, the D-TAC will develop a recommended release schedule consistent with its Standards and Guiding Principles. The D-TAC’s Standards and Guiding Principles and any subsequent release schedule will be presented to the MCWRA Board of Directors and/or Board of Supervisors for consideration and decision.

9.4.6.6 Legal Authority

MCWRA, who owns and operates the reservoirs, is implementing the D-TAC. Since MCWRA is a member of the SVBGSA, it benefits one of the SVBGSA members. The SVBGSA will participate in and work in cooperation with MCWRA on the Drought TAC. No additional legal authority is needed.

9.4.6.7 Estimated Cost

This management action is already underway. MCWRA is already funding costs associated with facilitation of the D-TAC. SVBGSA costs include staff participation in the Drought TAC.

9.4.6.8 Public Noticing

As this management action is already underway, MCWRA has already completed initial public noticing. Public noticing will occur for the October Reservoir Operations meeting that activates the D-TAC, and when the reservoir release schedule developed by the D-TAC goes to Reservoir Operations and/or the Board of Directors for consideration.

9.4.7 Management Action A7: Reservoir Reoperation

This management action consists of SVBGSA and ASGSA collaborating with MCWRA and other interested parties to evaluate potential reoperation scenarios to ensure the sustainability of the Forebay and eastern part of the ASCMA and to prevent undesirable results, while also operating within the existing committed purposes of existing infrastructure, such as the Salinas Valley Water Project. This management action is reliant on a new source of dedicated funding. Groundwater conditions in the ASCMA are currently sustainable; however, it should be noted some areas near the Salinas River within the ASCMA have the potential for undesirable results associated with water-level declines during multi-year drought periods. This management action is focused on reoperation of the Nacimiento and San Antonio Reservoirs that would prevent the curtailment of reservoir releases in consecutive year droughts.

This management action includes a feasibility study by working with MCWRA on existing models or developing new ones to simulate reservoir operations and groundwater-surface water interactions along the Salinas River. This management action would take under consideration the other beneficial users dependent on reservoir flows, such as steelhead trout and users in other subbasins.

This management action could be paired with potential capital projects that are within the sustainability horizon of the GSP. Both projects referenced below rely on infrastructure owned and operated by MCWRA and implementing either would require a cooperative effort between SVBGSA and MCWRA. These projects include:

- 1) **ILT and Spillway Modification** - The proposed Interlake Tunnel project consists of design, permitting, construction, and maintenance of a tunnel for diversion of water from the Nacimiento Reservoir to the San Antonio Reservoir. The San Antonio and Nacimiento Reservoirs have storage capacities of 335,000 and 377,900 AF, respectively; however, the Nacimiento River watershed produces nearly 3 times the average annual flow of the San Antonio River watershed. Consequently, more available storage capacity must be maintained in Nacimiento Reservoir to prevent downstream flooding during storm events than must be maintained in San Antonio Reservoir. Initial modeling shows the proposed Interlake Tunnel project would divert 49,400 AF/yr. of flood control water on average from Nacimiento Reservoir to San Antonio Reservoir, or 47,800 AF/yr. with the spillway modification (MCWRA, 2020). This would increase the total volume of water in storage by 39,000 AF/yr., or 54,300 AF/yr. with the spillway modification. The reservoir operating rules for this modeling reflect the current Nacimiento Dam Operations Policy (MCWRA, 2018b), and therefore reflect changes due to the project as compared to current reservoir operations, not considering any potential reductions in reservoir capacity that may be required if deferred maintenance does not occur. This project is intended to primarily increase water available for conservation releases to the

Salinas River between April and October. Any additional conservation releases would be diverted at the SRDF for irrigation within the CSIP area. Without the spillway modification, model results show the additional conservation releases would result in approximately 30,500 AF/yr. of additional groundwater recharge from the Salinas River in the basin over the entire modeled hydrologic period. With the spillway modification, there would be approximately 32,000 AF/yr. of additional groundwater recharge (MCWRA, 2020).

- 2) **Seasonal Release with Aquifer Storage and Recovery or Direct Delivery** - This project entails modifying reservoir releases for the MCWRA's Conservation Program and SRDF diversions to store at least a portion of these releases during alternate seasons in the 180-Foot and 400-Foot Aquifers. This seasonal storage would reduce or eliminate the need for Conservation Program dry season releases and initial modeling shows it would increase annual carryover in the reservoirs, allowing for more consistent alternate seasonal releases. This alternate season release water would be diverted at the SRDF, treated, and recharged through Aquifer Storage and Recovery (ASR) injection wells into an unimpaired part of the aquifer in the winter/spring and later extracted during peak irrigation season demands for use through the CSIP system. ASR is a critical component of this project because it enables summer releases for CSIP to be shifted to winter/spring releases; however, a benefits assessment will be done to assess differing levels of special benefits. As an alternative to direct injection for groundwater recharge, seasonal reservoir releases could be used for direct delivery for municipal supply within the Basin. Under direct delivery use, this water would act as in-lieu recharge by reducing the need for pumping from municipal wells, resulting in less groundwater demand when water is directly delivered. This project would require additional infrastructure.

This GSP is primarily concerned with project benefits that maintain groundwater sustainability. However, ancillary benefits and relative costs must also be addressed and carefully evaluated. These projects will affect the entire Salinas Valley, and the analyses of these projects must consider the impact on all subbasins. This GSP includes reservoir reoperation as a management action to help maintain groundwater sustainability along the Salinas River, including some portion that augments groundwater in the Forebay Subbasin. This management action will likely be subject to new flow restrictions and reservoir operations resulting from the planned HCP, and subject to any biological opinion or incidental take permit issued by NMFS, or other regulations issued by applicable regulatory agencies.

9.4.7.1 Relevant Measurable Objectives

Should reservoir reoperation move forward, the intended Forebay Subbasin GSP measurable objectives benefiting include:

- **Groundwater elevation measurable objective.** Releasing additional water from the reservoirs even during droughts should help ensure annual groundwater recharge in the Forebay and ASCMA, which will help prevent lowering of groundwater elevations.
- **Groundwater storage measurable objective.** Releasing additional water from the reservoirs even during droughts should help ensure annual groundwater recharge in the Forebay and ASCMA, which will increase the amount of groundwater in storage.
- **Land subsidence measurable objective.** Increasing both groundwater elevations and groundwater storage will have the added benefit of preventing any potential land subsidence. Although subsidence is not a concern in this Subbasin, adding water in the subsurface will keep pore spaces saturated with positive pressure and inhibit land surface collapse associated with groundwater depletion.
- **ISW measurable objective.** Continuing to release some water from the reservoirs even during droughts should benefit ISW by maintaining groundwater elevations at or above historical lows.

9.4.7.2 Expected Benefits and Evaluation of Benefits

Benefits that may arise from this management action would be the development of additional reservoir reoperation analysis. Wells in the vicinity of the Salinas River may be projected to experience sustained elevations depending on modeling results. The effort may produce additional management alternatives to be applied during drought conditions. Modeling outputs could be publicly reviewed with partner agency Boards of Directors.

Should reservoir reoperation move forward, intended expected benefits for the Forebay include more consistent annual releases, including during dry years. However, these intended expected benefits for the Forebay will need to be balanced with the needs of other affected subbasins.

Benefits will be measured using the monitoring networks described in Chapter 7. Groundwater elevations and groundwater storage will be measured with a network of wells that is monitored by MCWRA. Land subsidence will be measured using InSAR data provided by the Department of Water Resources. When data gaps are filled, ISW will be measured through shallow groundwater wells and river flow.

9.4.7.3 Circumstances for Implementation

In order for this management action to move ahead MCWRA, SVBGSA, and ASGSA would need to agree to coordinate on such an analysis and SVBGSA would lead the effort to source associated funding for the effort. The Coordination Committee could also review the management action and refer a recommendation to the ASGSA and SVBGSA Boards. Ultimately MCWRA would determine whether such an effort would be pursued under their role as owner and operator of the reservoirs.

9.4.7.4 Permitting and Regulatory Process

The initial phases of this management action include a feasibility study, which do not require permitting or meeting regulatory requirements. This will include an evaluation of the permitting and regulatory steps needed for potential reoperation.

Implementing the ultimate reoperation scenario will require coordination with permits from National Marine Fisheries Service, the SWRCB, or other agencies that have authority over Salinas River flows.

9.4.7.5 Implementation Schedule

The feasibility study associated with this management action will be conducted within the first 5 years of the Forebay GSP implementation.

9.4.7.6 Legal Authority

No legal authority is required to undertake the feasibility study. MCWRA, SVBGSA, National Marine Fisheries Service, and other project partners will participate in the study. Implementing the ultimate reoperation scenario will be under the authority of MCWRA.

9.4.7.7 Estimated Cost

This management action is estimated to cost approximately \$400,000 - \$500,000.

9.4.7.8 Public Noticing

The work associated with this effort would be under the purview of MCWRA. SVBGSA would utilize publicly noticed meetings of the SVBGSA Board of Directors, Advisory Committee, Integrated Implementation Committee, and Subbasin Committees to update the public on such analysis and outcomes from model efforts.

9.5 Project Options Over 50-Year Planning Horizon

Projects are not currently needed to maintain sustainability. However, changes in future conditions over the next 50 years, such as changes in land use, groundwater extraction, reservoir releases, weather, or groundwater recharge could affect the sustainability of the Subbasin. If monitoring data shows the Subbasin is no longer sustainable according to the 5 relevant sustainability indicators, and management actions are not sufficient, SVBGSA and Subbasin stakeholders may consider implementing a project(s). Descriptions of potential projects that could contribute to the sustainability of the Forebay Subbasin are included below and are not in order of priority. If a project is implemented by another agency, SVBGSA could work with that agency to support a design and implementation plan that considers groundwater sustainability.

Generalized costs are included for planning purposes and to show the general level of effort necessary to undertake each project, regardless of project sponsor. If any project is pursued, the distribution of costs and special benefits will be determined through additional analysis, either by SVBGSA or the lead project sponsor. The inclusion of projects in the GSP does not obligate the SVBGSA to participate in paying for projects; however, SVBGSA must be strategic in its efforts to track and support projects that could impact groundwater conditions. The design of these projects may change based on future analyses. Therefore, each of the projects described in this GSP should be treated as a generalized project representative of a range of potential configurations and associated costs

9.5.1 Project B1: Multi-benefit stream channel improvements

Over the past half a century, the Salinas River has been impacted by the construction of the San Antonio and Nacimiento Dams and flood control levees intended to move water away from agricultural fields. These have changed natural river geomorphology, resulting in sediment build up and vegetation encroachment on the historically dynamic channels of the River. This alteration of natural floodplains and geomorphology has increased flood risk, decreased direct groundwater recharge, and contributed to increased ET through vegetation build-up. Targeted, geomorphically informed stream maintenance and floodplain enhancement can improve stream function both morphologically and biologically.

This program takes a 3-pronged approach to stream channel improvements. First, it addresses vegetation growth and geomorphic conditions in the river channel by removing perennial native and non-native vegetation in designated maintenance channels (and removing *Arundo donax* (arundo) and *Tamarix sp.* (tamarisk) throughout the river corridor). Second, the program reduces the height of sediment bars that have been identified to meet criteria for impeding flow. Third, it enhances floodplains to increase groundwater recharge.

This 3-pronged approach increases flow by removing dense native and non-native vegetation, provides vegetation free channel bottom areas for infiltration, stabilizes stream banks and earthen levees by reducing downstream velocities, and reduces flood risk. This program's activities also benefit native species throughout the river ecosystem. By improving geomorphological function through vegetation and sediment removal activities, the coordinated efforts allow native species to reestablish in areas where invasive species have become dominant. River maintenance activities enhance groundwater recharge efforts through the streambed by providing additional open channel bed for infiltration, and floodplain enhancement can further recharge potential of high flows. Infiltration through the streambed accounts for a significant portion of the groundwater budget, and invasive species such as arundo, which can take up to 4 times as much water as native riparian species thereby negatively impacting both river flows as well as infiltration in to the subsurface through the streambed (Cal-IPC, 2011).

Surface water flows, and notably flood flows, can be impacted by the density of vegetation and whether the vegetation is comprised of native or non-native species. Native riparian species allow for dynamic action that scours the riverbed and resorts sediment in a manner that encourages natural infiltration and conveyance of flood waters in the broader active flood terraces in the river. This wider use of the floodplain by flood waters slows velocities and distributes flood waters over a broader spatial area of the riverbed.

Stream channel vegetation removes water from the river through ET. Water loss through ET from invasive species such as arundo can take up between 3.1 and 23.2 AF/yr. per acre, whereas ET from native vegetation can take up to 4 AF/yr. per acre (Melton and Hang, 2021; Cal-IPC, 2011). This illustrates the difference in water consumption between vegetation types and how these water consumptions can have major impacts on water in the river (Cal-IPC, 2011). The Salinas River is characterized by a braided channel in some areas of the floodplain and a confined channel in other areas. Plants can take root in channel locations that adversely impact the flow of water, resulting in either a channelized river or in creating directional velocities that can cause localized damages including levee failure. Poorly functioning sedimentation can also negatively impact water flow in drought and flood conditions, as well as impeded proper infiltration to the subsurface. Geomorphological processes are important to managing a natural riverbed and floodplain to enhance recharge, groundwater levels, and groundwater storage.

This program is not meant to restore the Salinas River to historical conditions, but rather to enhance geomorphological function through targeted maintenance sites for flood risk reduction and floodplain enhancement for increased recharge. The MCWRA has developed a science-based approach to river management that recognizes the value of critical habitat, environmental resources, cost to landowners, and coordination among stakeholders (MCWRA, 2016). A key feature of this modified management approach is providing protection for critical habitats and water quality (MCWRA, 2016). One of the important functions of a river is to provide habitat for native species. In a poorly functioning river, invasive species have more opportunities to crowd out native species and in turn, further degrade the river conditions. Therefore, this program will result in flood risk reduction, increased recharge, and a multitude of benefits that address critical functions of the Salinas River.

This program includes 4 main types of tasks: vegetation maintenance, non-native vegetation removal, sediment management, and floodplain enhancement and recharge.

- **Vegetation Maintenance** – Vegetation, both native and non-native, will be removed within designated maintenance areas using a scraper, mower, bulldozer, excavator, truck, or similar equipment to remove the vegetation above the ground and finishing by ripping roots to further mobilize the channel bottom. Vegetation maintenance includes pruning up to 25% of canopy cover and removing dead mass. Maintenance activities will not include disturbance of emergent wetland vegetation that provides suitable habitat for

threatened California red-legged frogs or for the endangered tidewater gobies. In instances where native vegetation needs to be removed for site-specific conditions or tie-ins, these impacts can be compensated with replanting and revegetation in other areas as a form of mitigation offset for stream channel maintenance. Native trees will be planted during the rainy season to enhance their rate of success.

- **Non-Native Vegetation Removal** – Non-native vegetation removal primarily focuses on the arundo present in the region but may include tamarisk shrubs as well. Arundo is a grass that was introduced to the Americas in the 1800s for construction material and for erosion control purposes (Cal-IPC, 2011). In 2011, the California Invasive Plant Council determined that the Salinas Watershed had the second largest invasion with approximately 1500 infested acres. While arundo thrives near water, such as wetlands and rivers, it grows in many habitats and soil types. It requires a substantial amount of water, previously estimated making it one of the thirstier plants in a given region and outpacing the water demands of native vegetation. To manage this invasive species, arundo biomass is typically sprayed, sometimes mowed or hand cut if needed, and then treated with multiple applications of herbicide over several years. Permits allow arundo removal in the entire riparian corridor, including along the low-flow channel.
- **Sediment Management** – Sediment management includes channel bed grading and sediment removal. Sediment grading and removal may occur exclusively, or after vegetation maintenance activities described above. Sediment removal and grading activities help reestablish proper gradients to allow for improved drainage downstream, encourage preferential flow into and through secondary channels, and minimize resistance to flow (until dunes form) (MCWRA, 2016). Sediment removal will follow best practices to protect native species while producing maximum benefit for flood reduction and groundwater recharge.
- **Floodplain Enhancement and Recharge** – Floodplain enhancement restores areas along the River, creeks, and floodplains to slow and sink high flows and encourage groundwater recharge. Restored floodplain and riparian habitat can slow down the velocity of the River and creeks and encourage greater infiltration. Due to agricultural and urban encroachment, streams have become more highly channelized, and flow has increased in velocity, particularly during storm events. This flow has resulted in greater erosion and loss of functional floodplains.

Program Components

This multi-benefit stream channel improvements program is implemented through various program components. These build off existing programs and permits to undertake the 4 main types of tasks. During GSP implementation, these components may be modified as needed to most efficiently accomplish the program goals.

Component 1: Stream Maintenance Program

The first component continues the Salinas River Stream Maintenance Program (SMP), which maintains the river corridor to reduce flood risk and minimize bank and levee erosion, while maintaining and improving ecological conditions for fish and wildlife consistent with other priorities for the Salinas River (MCWRA, 2016). It is a coordinated SMP that includes MCWRA, the Resource Conservation District of Monterey County (RCDMC), and the Salinas River Management Unit Association currently representing approximately 50 landowner members along the river corridor. Project benefits include increased water availability, flood risk reduction, reduced velocities during high flows to lessen bank and levee erosion, and enhanced infiltration by managing vegetation and sediment throughout the river and its tributaries.

The SMP occurs along the area of the Salinas River in Monterey County. The 92-miles of the river in Monterey County is broken into 7 River Management Units from San Ardo in the south to Highway 1 in the north. The management activities are focused on the secondary channels of the Salinas River located outside of the primary low flow channel and are preferentially aligned with low-lying undeveloped areas that are active during times of higher flow (MCWRA, 2016). The SMP includes 3 main activities as part of stream maintenance: vegetation maintenance, non-native vegetation removal, and sediment management.

Component 2: Invasive Species Eradication

The second Component supports and/or undertakes removal of arundo and tamarisk done by the Resource Conservation District of Monterey County (RCDMC). RCDMC is the lead agency on an estimated 15 to 20-year effort to fully eradicate arundo from the Salinas River Watershed, working in a complementary manner with the SMP. This project focuses on removal of woody invasive species such as arundo, tamarisk, and tree tobacco (*Nicotiana glauca*) along the Salinas River, as well as retreatments needed to keep it from coming back. It includes 3 distinct phases: initial treatment, re-treatment, and ongoing monitoring and maintenance treatments. As of April 2021, estimated arundo under treatment was 850 acres. Original mapped acreage had expanded by 20%, leaving 900 arundo acres remaining to be treated. The initial treatment phase includes mechanical and/or chemical treatment in all areas of the river that have yet to be treated. The re-treatment phase includes re-treatment of the approximately 850 acres that have already had an initial treatment and re-treatment of the remaining 900 acres done in stages, with each area treated over a 3-to-5-year period following initial treatment. The final phase is the ongoing monitoring and maintenance treatment phase. This phase requires monitoring for regrowth of the invasive species or new invasive species and chemical treatment every 3 to 5 years.

Component 3: Floodplain Enhancement and Recharge

The third component complements the first 2 by enhancing and restoring floodplains to enable high flows to be slowed and directed toward areas where it can infiltrate into the ground. For this

component, SVBGSA will partner with the Integrated Regional Water Management (IRWM) Group, Central Coast Wetlands Group, and other organizations that are already undertaking creek and floodplain restoration efforts and encourage inclusion of features that would enhance recharge.

Restored floodplain and riparian habitat along creeks can slow down the velocity of creeks and encourage greater infiltration. Due to agricultural and urban encroachment, streams have become more highly channelized, and flow has increased in velocity, particularly during storm events. This flow has resulted in greater erosion and loss of functional floodplains.

9.5.1.1 Relevant Measurable Objectives

Relevant measurable objectives benefiting from this project include:

- **Groundwater elevation measurable objective.** Removing the invasive species, better managing streams, and directing high flows into restored floodplains will facilitate more water infiltrating and percolating into the subsurface to raise groundwater elevations. This has the effect of adding water to the principal aquifer. Adding water to the principal aquifer will ultimately increase groundwater elevations or decrease their decline.
- **Groundwater storage measurable objective.** Adding water to the principal aquifer will ultimately have the effect of increasing groundwater in storage.
- **Land subsidence measurable objective.** Increasing both groundwater elevations and groundwater storage will have the added benefit of preventing any potential land subsidence. Maintaining and adding water in the subsurface will keep pore spaces saturated with positive pressure and inhibit land surface collapse associated with groundwater depletion.
- **Interconnected surface water measurable objective.** By removing vegetation pathways for ET, less interconnected groundwater and less surface water will be depleted, leaving more water available in the river for flows as well as for connection to the principal aquifer.

9.5.1.2 Expected Benefits and Evaluation of Benefits

The groundwater-related expected benefits are increased groundwater elevations in the vicinity of the river channel due to increased infiltration and percolation to the principal aquifers, increased groundwater in storage, better water quality, decreased depletion of interconnected surface water, and protection against any potential land subsidence due to groundwater extractions. In addition, the project provides habitat restoration, increased connectivity for wildlife, and flood risk reduction.

Increased storage of flood waters can increase groundwater elevations in the vicinity of the Salinas River. This typically will be seen as groundwater mounding subparallel to the river corridor. However, as more water infiltrates into the subsurface, more water will flow laterally, thereby expanding the zone of influence from the river outward and raise groundwater elevations laterally. Additionally, water stored underground is not subject to ET in the same way water stored above ground is. With annual removal of arundo, ET will decrease over time, allowing for more water to remain in the system. Arundo removal is coupled with identified native species removal where native species have encroached in high flow channels where they may not typically grow; however, there is significant uncertainty in the recharge benefits, as arundo and many native species draw both surface and groundwater.

Removal of arundo on 900 acres along the Salinas River will decrease ET by 2,790 to 20,880 AF/yr. throughout the Salinas Valley. This will enhance recharge from the Salinas River within the Forebay Subbasin and leave more water in the River to get down to the CSIP, where surface water is used in lieu of groundwater to help address seawater intrusion and declining groundwater elevations. With this reduction of non-productive water consumption, less water can be released from the reservoirs to get the same amount of water downstream, which increases the Valley's sustainable yield and drought resilience. It also results in indirect recharge as removal reduces groundwater use by the plants.

Component 3 of this project includes various floodplain enhancement features and restoration activities. Preliminary project scoping includes the development of 4 recharge basins within the Forebay Subbasin, each with a recharge capacity of about 100 AF/yr. However, greater analysis is needed to determine the exact number, size, and type of features. The combined benefit of the 4 recharge basins is expected to be 400 AF/yr. in increased recharge.

This program will also enhance stream flow by returning patterns of flow to a more natural state. Arundo infestation decreases the natural channel migration and complexity of sandy-bottomed streams by confining the channel to an armored, single stem with faster flowing water, which then becomes susceptible to erosion and incision. A narrowing channel with reduced capacity also heightens flood risk. Removing arundo will allow greater normalization of natural geomorphic processes and sediment transport by de-armoring low-flow channel banks and adjacent floodplain areas to enable channel migration and braiding.

Stream channel improvements will provide many additional ecosystem benefits, including:

Habitat restoration: This project will help restore riparian habitat. Results from 4 years of plant community monitoring of arundo sites initially treated in 2016 show that diversity and abundance of native plants have increased over this time period and this trend is expected to continue. Field biologists conducting pre-activity surveys have also observed increased wildlife activity post-arundo removal.

Increased connectivity for wildlife: Within the Central Coast region there are several mountain ranges, coastal areas, valley floors, and upland habitats that need to be connected to allow for the wildlife movement necessary for gene flow and healthy populations (Thorne *et al.*, 2002). The Salinas River riparian area is an important linkage for wildlife movement between upland habitat via tributaries. Removal of dense arundo stands will reduce physical impediments to movement for wildlife species such as mountain lion, bobcat, deer, and American badger. RCDMC has documented this through wildlife camera monitoring, which has shown increased detections of large mammals such as deer, bobcat, and coyote after arundo removal. This project will promote habitat use and movement of wildlife by increasing availability of food and nesting resources.

Flood risk reduction: Stream maintenance has the societal benefit of reducing flood risk to neighboring lands, which are mostly agricultural fields. Arundo's dense structure creates increased surface roughness, thus backing up water and causing flooding during high flow events. When agricultural fields are flooded with river water, farmers lose crops and thus considerable income, and must leave their fields fallow for months after flooding due to food safety concerns. Flooding can also damage levees which then have to be repaired and bring weed seeds and propagules (including arundo) into fields which then have to be controlled.

Enhanced Conveyance and Infrastructure Protection: The work conducted in the SMP improves conveyance of storm, flood, and nuisance waters by keeping water in the stream channel and flowing freely rather than being blocked by the invasive species. The SMP protects city infrastructure by keeping water more in the channel rather than blocked and rerouted by arundo, which reduces the cost of infrastructure repairs to nearby cities.

Project benefits will be measured using the monitoring networks described in Chapter 7. Groundwater elevations will be measured with a network of wells that is monitored by MCWRA. Land subsidence will be measured using InSAR data provided by DWR. When data gaps are filled, interconnected surface waters will be measured through shallow groundwater wells and river flow.

The expected benefits to groundwater in the Forebay Subbasin will be defined through further investigation.

9.5.1.3 Circumstances for Implementation

The SMP and invasive species eradication are ongoing projects with MCWRA, the RCDMC, and the Salinas River Management Unit Association. Program administration is provided by the RCDMC and the Salinas River Management Unit Association. Landowners currently pay for all maintenance activities in the maintenance channels and for associated biological monitoring and reporting. SVBGSA could support the program, become an administrative partner in the program with other program partners, or fund maintenance and monitoring activities.

Floodplain enhancement will be implemented if additional water is required to maintain sustainability. A number of agreements and rights must be secured before individual projects are implemented. Primarily, a more formal cost/special benefit analysis must be completed to determine how many site options are preferable. Water diversion rights may need to be secured to divert stormwater, which may take a significant number of years.

9.5.1.4 Permitting and Regulatory Process

For Components 1 and 2, the permitting process has already been initiated by MCWRA and RCDMC and permits are in place until 2025 for the program. Invasive species eradication will be continued under existing permitting. All participants in the SMP must enter into an agreement with MCWRA and comply with all terms, conditions, and requirements of the permits and Program Guidelines.

Component 3 may require a California Environmental Quality Act (CEQA) environmental review process and may require an Environmental Impact Report (EIR) or a Mitigated Negative Declaration (the review could also result in a Negative Declaration or Notice of Exemption). Additionally, permits from a variety of state and federal agencies may be necessary, and any project that coordinates with federal facilities or agencies may require National Environmental Policy Act (NEPA) documentation.

Permits for all 3 components are detailed below.

Component 1 Permits:

- ***U.S. Army Corps of Engineers (USACE)***- The Department of the Army Regional General Permit (RGP) 20 for the Salinas River Stream Maintenance Program, Corps File No. 22309S, was executed on September 28, 2016, by the USACE. The RGP is authorized under § 404 of the Clean Water Act (33 U.S.C. § 1344) through November 15, 2021. The National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) concurred with the USACE determination that the project was not likely to adversely affect the following federally endangered or threatened species: the San Joaquin kit fox (*Vulpes macrotis mutica*), the California tiger salamander (*Ambystoma californiense*), the Monterey spineflower (*Chorizanthe pungens* var. *pungens*), the yellow-billed cuckoo (*Coccyzus americanus*), or the South-Central California Coast (S-CCC) steelhead (*Oncorhynchus mykiss*). The USFWS issued a Biological Opinion on August 22, 2016, for the federally endangered least Bell's vireo (*Vireo bellii pusillus*) and tidewater goby (*Eucyclogobius newberryi*) and its critical habitat and the federally threatened California red-legged frog (*Rana draytonii*).
- ***NMFS*** – The RCDMC also has a letter of concurrence in which NMFS supports USACE's decision that the SMP "is not likely to adversely affect species listed as

threatened or endangered or critical habitats designated under the Endangered Species Act.”

- ***State of California Regional Water Quality Control Board*** - The Clean Water Act § 401 Water Quality Certification for Discharge of Dredged and/or Fill Materials, Certification No. 32716WQ02, was approved on August 31, 2016, and is set to expire on November 30, 2025. The Central Coast Water Board staff will assess the implementation and effectiveness of the SMP after 5 years and consider modifications to this Certification for the second 5 years of the permit term.
- ***California Department of Fish & Wildlife*** - The SMP is authorized under a Routine Maintenance Agreement (RMA) 1600-2016-0016-R4, approved October 14, 2016, and held by the RCDMC. The RMA was amended and restated on June 16, 2017, and subsequently amended on April 10, 2018. The RMA covers all impacts under the program from the original date of approval through December 31, 2026.
- ***California Natural Resources Agency*** – An EIR was completed in compliance with the California Environmental Quality Act (CEQA).

Component 2 Permits:

- ***California Department of Fish & Wildlife*** – The invasive species eradication is authorized under a Routine Maintenance Agreement (RMA) 1600-2012-0154-R4, approved April 11, 2014, and held by the RCDMC. The RMA was amended on September 30, 2014. It covers all impacts under the program from the original date of approval through April 10, 2026.
- ***Environmental Protection Agency (EPA)*** – National Pollutant Discharge Elimination System (NPDES) permit CAG990005 allows the Salinas River Arundo Control Program to apply pesticides to waterways.
- In addition, the Salinas River Arundo Control Program filed a CEQA Mitigated Negative Declaration, received a technical assistance letter from NMFS, completed a U.S. Fish and Wildlife Service No Take Request, and received a technical assistance letter from U.S. Fish and Wildlife Service.

Component 3 Permits that may be required for floodplain enhancement include:

- ***USACE*** – A Regional General Permit may be required if there are impacts to wetlands or connections to waters of the United States.
- ***California Department of Fish and Wildlife*** – A Standard Agreement is required if the project could impact a species of concern.

- **EPA Region 9** – National Environmental Policy Act (NEPA) documentation must be submitted for any project that coordinates with federal facilities or agencies. Additional permits may be required if there is an outlet or connection to waters of the United States.
- **NMFS** – A project may require authorization for incidental take, or another protected resources permit or authorization from NMFS.
- **California Natural Resources Agency** – Projects of a magnitude capable of having a demonstrable impact on the environment will require a California Environmental Quality Act (CEQA) environmental review process. Projects will require either an EIR, Negative Declaration, or a Mitigated Negative Declaration.

9.5.1.5 Implementation Schedule

If selected, the components of this program may be implemented on different schedules. The annual implementation schedule for Component 1 is outlined on Figure 9-2. About 40 new acres could be added to the program each year, taking about 10 years to add the remaining acres if selected for full implementation. Annual maintenance needs to be continued indefinitely. For Component 2, up to 100 of the remaining 900 acres of uncontrolled arundo could begin treatment each year, as shown on Figure 9-3. Component 3 is contingent on the first 2 components but could be initiated shortly after Component 2. This schedule is shown on Figure 9-4.

Task Description	Dec 1	Mar 31	Sep 1	Nov 30
Phase I – Annual RMU report, Work Plan, and noticing				
Phase II – Pre-maintenance surveys				
Phase III – Maintenance activities				

Figure 9-2. Annual Implementation Schedule for Stream Maintenance

Task Description	Year												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Treat and retreat first 100 acres													
Treat and retreat second 100 acres													
Treat and retreat third 100 acres													
Treat and retreat fourth 100 acres													
Treat and retreat fifth 100 acres													
Treat and retreat sixth 100 acres													
Treat and retreat seventh 100 acres													
Treat and retreat eighth 100 acres													
Treat and retreat ninth 100 acres													

Figure 9-3. Implementation Schedule for Invasive Species Eradication

Task Description	Year				
	1	2	3	4	5
Studies/Preliminary Engineering Analysis					
Agreements/Right of Way					
CEQA					
Permitting					
Design					
Bid/Construct					

Figure 9-4. Implementation Schedule for Floodplain Enhancement and Recharge

9.5.1.6 Legal Authority

MCWRA has legal authority over the Component 1 SMP for program administration and permitting. Private landowners and local cities who conduct maintenance in the permitted work areas must agree to permit conditions and execute an agreement annually with each agency. Private landowners and local cities currently pay for all maintenance activities including heavy equipment work and biological monitoring and reporting.

For Component 2 invasive species removal, the RCDMC has legal authority for program administration and permitting. The RCDMC obtains Landowner Access Agreements with property owners or managers (tenants) to allow them to do the work or to allow the RCDMC to oversee landowner-conducted work.

For floodplain restoration activities, the SVBGSA has the right to divert and store water once it has access to the appropriate water rights. Pursuant to California Water Code §10726.2 (b), the SVBGSA has the right to acquire and hold real property, and to divert and store water once it has acquired any necessary real property or appropriative water rights.

9.5.1.7 Estimated Cost

Component 1 program permits have been completed and are operational through 2026. Renewal of the 401 Certification with the Central Coast Regional Water Control Board will include a cost of \$95,000 in the timeframe of 2024 to 2026. The annual administrative cost of Component 1 of this program is approximately \$150,000. This cost does not include stream maintenance activities, required biological monitoring, and reporting, which are currently paid by program participants. These costs vary from year to year based on number of participants and work site conditions. This program could cover the costs of stream maintenance activities, biological monitoring, and/or reporting in order to reach higher participation rates from landowners and therefore increased project benefit. The cost for the vegetation management is approximately \$1,200/acre for the first year and \$700/acre for annual maintenance thereafter. This does not include the cost of sediment management, which can be costly. The cost estimate for stream maintenance activities, required biological monitoring, and reporting is included in Table 9-3,

which may continue to be paid by participants, be funded by the GSA, or be funded through a different source. So far 254 acres have received their first year of vegetation management.

Table 9-3. Cost Estimate of Vegetation Management

	Acres	First year of vegetation management (\$1,200/acre)	Subsequent years of vegetation management (\$700/acre)
Upper Valley	250	\$300,000	\$175,000
Forebay	263	\$315,600	\$184,100
180/400-Foot Aquifer Subbasin	137	\$164,400	\$95,900
Subtotal	650	\$780,000	\$455,000

For Component 2, the estimated capital cost is estimated at between \$14,536,943 and \$18,898,026. Annual O&M costs are anticipated to be approximately \$165,200. The indirect projected yield for the invasive species eradication project is estimated at between 3.1 AF/yr. and 23.2 AF/yr. per acre of invasive species removed. With the range of costs and range of project benefits, the amortized cost of water for this project is estimated to range between \$60/AF and \$600/AF. See Appendix 9A for cost estimate.

Component 3 includes the construction of 4 recharge basins, each with an expected benefit of 100 AF/yr. and a capital cost of \$1,116,000 each, for a total of \$4,464,000. Spread over 25 years and assuming a 6% discount rate, the annualized cost is \$93,300 per recharge basin, including annual maintenance. The unit cost is \$930/AF. These costs were estimated assuming that only 1 recharge basin would be built, but there may be economies of scale that lower the cost if more are built. These costs are approximate; exact costs will depend on site specifics.

9.5.1.8 Public Noticing

Component 1 implementation and permitting requires annual notification of potential program participants and this notification is announced via direct mail to program participants as well as announced on MCWRA website. Program related annual reporting as required and is published on the MCWRA website.

Component 2 public noticing practices and requirements of the existing RCDMC invasive species eradication programs will be continued as part of this project. This includes reaching out to specific landowners and tenants in areas of potential work and completing annual permit reports that are posted to the RCDMC website.

Component 3 public noticing will be conducted prior to any project initiates construction to ensure that all groundwater users and other stakeholders have ample opportunity to comment on projects before they are built. The general steps in the public notice process will include the following:

- SVBGSA staff will bring an assessment of the need for the project to the SVBGSA Board in a publicly noticed meeting. This assessment will include:
 - A description of the undesirable result(s) that may occur if action is not taken
 - A description of the proposed project
 - An estimated cost and schedule for the proposed project
 - Any alternatives to the proposed project
- The SVBGSA Board will notify stakeholders in the area of the proposed project and allow at least 30 days for public response.
- After the 30-day public response period, the SVBGSA Board will vote whether to approve design and construction of the project and notify the public if approved via an announcement on the SVBGSA website and mailing lists.

In addition to the process detailed above, all projects will follow the public noticing requirements per CEQA or NEPA.

9.5.2 Project B2: Managed Aquifer Recharge of Overland Flow

This program incentivizes development of groundwater recharge basins that recharge overland flow and stormwater runoff from the Coastal Ranges before they reach streams and the Salinas River. This program is structured similar to the program instituted in Pajaro Valley, whereby agricultural landowners dedicate a portion of their land to recharge ponds and direct overland flood flows into the ponds. This could include some type of incentive for recharge basins would be situated to collect runoff before it enters a local stream and allowed to infiltrate. It could also be combined with Project B1 and include multi-benefit projects along the floodway to increase floodplain capacity, since floodplains generally have high recharge.

This program will require additional analysis on actual available runoff from each of the watersheds. It assumes that the stormwater is not being diverted upstream; however, many of the mountain ranges have diversion operations already occurring upstream in the watershed. Rain gauges and studies will be required to determine the true estimate of water available from each subwatershed.

Four recharge basins are included in this cost estimate, each with a recharge capacity of about 100 AF/yr. Their locations will be chosen based on site availability and suitability. The most suitable sites have clean soil and high recharge potential. Soil tests will guide site selection so that contaminants do not leach into groundwater and contaminate drinking water. Aquifer recharge potential is highest where there are areas of highly permeable soils, good connection to

underlying aquifers, and topography that directs surface runoff toward retention/catchment areas. The SVBGSA will investigate where recharge ponds would yield the greatest amount of groundwater recharge, combining data on soil permeability, stratigraphy, and land use to map areas of high potential recharge.

The program will reach out to landowners to increase awareness of the benefits of recharge basins and work with local stakeholders to identify lands with high recharge capacity. It could also work with interested landowners to identify sites, undertake potential site analyses with cone penetration tests (push tests), and design recharge basins. This program will involve monitoring water quality and could potentially improve stormwater quality and reduce stormwater volume which is regulated under the ILRP. Water recharged will comply with regulatory standards. The project could potentially include development of a permit coordination program for recharge projects. The program could also work with various organizations and government agencies to connect existing incentivization programs and funding to landowners interested in collaborative recharge projects that require land and access.

9.5.2.1 Relevant Measurable Objectives

Relevant measurable objectives benefiting from this project include:

- **Groundwater elevation measurable objective.** By routing stormwater and runoff from streams into recharge facilities and restored floodplains, there will be more water added to the principal aquifer. This water will be slowed down and allowed to infiltrate, which has the effect of addition water to the aquifer. Adding water into the principal aquifer will raise groundwater elevations over time.
- **Groundwater storage measurable objective.** Furthermore, adding water to the principal aquifer will ultimately have the effect of increasing groundwater in storage. Groundwater storage is also calculated from measured groundwater elevations. By raising groundwater elevations, the calculation of change in storage will be positive.
- **Land subsidence measurable objectives.** Increasing both groundwater elevations and groundwater storage will have the added benefit of preventing any potential land subsidence. Maintaining and adding water in the subsurface will keep pore spaces saturated with positive pressure and inhibit land surface collapse associated with groundwater depletion.

9.5.2.2 Expected Benefits and Evaluation of Benefits

This project will increase sustainable yield and groundwater elevations through enhanced infiltration of runoff. Runoff occurs when the rate of rainfall exceeds the soil infiltration rate. This runoff then flows over the land surface before accumulating into washes and streams as measurable stream flow. In the initial phases of overland flow, this water often infiltrates into the

soils, which enhances soil moisture, and facilitates recharge to the aquifer. The benefits to increased soil moisture go beyond increased opportunity for recharge. Enhanced soil moisture contributes to erosion protection as well as near-surface temperature regulating processes (Rivas, 2006; Mittelbach *et al.*, 2011). Four recharge basins are planned for this project with a combined benefit of about 400 AF/yr. in increased recharge.

Project benefits will be measured using the monitoring networks described in Chapter 7. Groundwater elevations will be measured with a network of wells that is monitored by MCWRA. Projects may include monitoring wells if they are not close enough to the existing monitoring network for the impacts to be measured. Various volumetric measurement methods may be installed along with either recharge basins or dry wells to assist in calculating increases to groundwater storage. Land subsidence will be measured using InSAR data provided by DWR.

9.5.2.3 Circumstances for Implementation

If selected, the overland flow MAR project will be implemented if stakeholders determine it is necessary to maintain sustainability. A number of agreements and rights must be secured before the project is implemented. Primarily, a more formal cost/special benefit analysis must be completed to determine if the on-farm modifications will provide quantifiable benefits to the principal aquifer. Recharge basins installed as part of this project could be directly funded by the SVBGSA or grant funding, or SVBGSA could develop an incentive program. Funding must be approved by the SVBGSA Board of Directors.

9.5.2.4 Permitting and Regulatory Process

Projects described in this section may require a California Environmental Quality Act (CEQA) environmental review process and may require an EIR or a Mitigated Negative Declaration (the review could also result in a Negative Declaration or Notice of Exemption). Additionally, permits from a variety of state and federal agencies may be necessary, and any project that coordinates with federal facilities or agencies may require National Environmental Policy Act (NEPA) documentation.

In addition, permits from the following government organizations that may be required for overland flow MAR projects include:

- **USACE** – A Regional General Permit may be required if there are impacts to wetlands or connections to waters of the United States.
- **California Department of Fish and Wildlife** – A Standard Agreement is required if the project could impact a species of concern.
- **EPA Region 9** – National Environmental Policy Act (NEPA) documentation must be submitted for any project that coordinates with federal facilities or agencies. Additional permits may be required if there is an outlet or connection to waters of the United States.

- **NMFS** – A project may require authorization for incidental take, or another protected resources permit or authorization from NMFS.
- **State Water Board Stormwater Pollution Prevention Plan (SWPPP)** – A General Permit to Discharge Stormwater may be required depending on how stormwater is rerouted.
- **California Department of Transportation (Caltrans)** – An Encroachment Permit is required if any state highway will be obstructed.
- **Monterey County** – A Use Permit may be required. A Grading Permit is required if 100 cubic yards or more of soil materials are imported, moved, or exported. An Encroachment Permit is required if objects will be placed in, on, under, or over any County highway.

9.5.2.5 Implementation Schedule

If selected, a proposed implementation schedule for this project is presented on Figure 9-5. The schedule will depend on whether programmatic permitting can be obtained or whether each individual project needs its own feasibility, permitting, and design.

Task Description	Year				
	1	2	3	4	5
Studies/Preliminary Engineering Analysis					
Agreements/Right of Way					
CEQA					
Permitting					
Design					
Bid/Construct					

Figure 9-5. Implementation Schedule for Overland Flow MAR

9.5.2.6 Legal Authority

Pursuant to California Water Code §10726.2 (a) and (b), the SVBGSA has the right to acquire and hold real property, and to divert and store water once it has acquired any necessary real property or appropriative water rights. Some right in real property (whether fee title, easement, license, leasehold or other) may be required to implement a recharge project. A permit to appropriate water may not be needed to infiltrate overland flow if constructed on a parcel without a USGS blue line stream. If a blue line stream crosses the parcel, SVBGSA will evaluate whether a permit is needed. SVBGSA recognizes that this process takes several years to complete. If a permit is needed, SVBGSA will pursue a SWRCB 5-year temporary permit under the Streamlined Permit Process while it applies for the diversion permit.

9.5.2.7 Estimated Cost

This project proposes the construction of 4 recharge basins, each with an expected benefit of 100 AF/yr. and a capital cost of \$1,032,000 for a total of \$4,128,000. Spread over 25 years and assuming a 6% discount rate, the annualized cost is \$86,700 per recharge basin, including annual maintenance. The unit cost is \$870/AF. These costs were estimated assuming that only 1 recharge basin would be built, but there may be economies of scale that lower the cost if more are built. These costs are approximate; exact costs will depend on site specifics.

9.5.2.8 Public Noticing

Before construction is initiated on any project as part of GSP implementation, it will go through a public notice process to ensure that all groundwater users and other stakeholders have ample opportunity to comment on projects before they are built. The general steps in the public notice process will include the following:

- GSA staff will bring an assessment of the need for the project to the SVBGSA Board in a publicly noticed meeting. This assessment will include:
 - A description of the undesirable result(s) that may occur if action is not taken
 - A description of the proposed project
 - An estimated cost and schedule for the proposed project
 - Any alternatives to the proposed project
- The SVBGSA Board will notify stakeholders in the area of the proposed project and allow at least 30 days for public response.

- After the 30-day public response period, the SVBGSA Board will vote whether to approve design and construction of the project and notify the public if approved via an announcement on the SVBGSA website and mailing lists.

In addition to the process detailed above, all projects will follow the public noticing requirements per CEQA or NEPA.

9.6 Implementation Actions

Implementation actions include actions that contribute to groundwater management and GSP implementation but do not directly help the Subbasin maintain sustainability. Included here for the Forebay Subbasin are well registration, GEMS expansion and enhancement, the dry well notification system, Water Quality Coordination Group, and Land Use Jurisdiction Coordination Program.

9.6.1 Implementation Action C1: Well Registration

All groundwater production wells, including wells used by de minimis pumpers, will be required to be registered with the SVBGSA. Well registration is intended to establish a relatively accurate count of all the active wells in the Subbasin. This implementation action will help gain a better understanding of the wells in active use, versus those that have been decommissioned. Well registration will collect information on active wells, such as type of well meter, depth of well, and screen interval depth. Well metering is intended to improve estimates of the amount of groundwater extracted from the Subbasin. A GSA may not require de minimis users (as defined) to meter or otherwise report annual extraction data. Other public agencies such as the County of MCWRA may have such authority. The details of the well registration program, and how it integrates with existing ordinances and requirements, will be developed during the first 2 years of GSP implementation.

9.6.2 Implementation Action C2: GEMS Expansion and Enhancement

SGMA requires Groundwater Sustainability Agencies to manage groundwater extractions within a basin's sustainable yield. Accurate extraction data is fundamental to this management. The MCWRA GEMS collects groundwater extraction data from certain areas in the Salinas Valley. The system was enacted in 1993 under Ordinance 3663 and was later modified by Ordinances 3717 and 3718. The MCWRA provides the SVBGSA annual GEMS data that can be used for groundwater management.

Most of the Forebay Subbasin's estimated groundwater extraction data is derived from MCWRA's GEMS Program, which is only implemented in Zones 2, 2A, and 2B. There are limited data on groundwater extraction within the Forebay Subbasin outside of MCWRA Zones 2, 2A and 2B.

SVBGSA will work with MCWRA to expand the existing GEMS Program to cover the entire Forebay Subbasin, which would capture all wells that have at least a 3-inch internal diameter discharge pipe. Program revisions will consider and not contradict related state regulations. Alternatively, SVBGSA could implement a new groundwater extraction reporting program that collects data outside of MCWRA Zones 2, 2A, and 2B. The groundwater extraction information will be used to report total annual extractions in the Subbasin and assess progress on the groundwater storage SMC as described in Chapter 8. Additional improvements to the existing MCWRA groundwater extraction reporting system may include some subset of the following:

- Developing a comprehensive database of extraction wells
- Expanding reporting requirements to all areas of the Salinas Valley Groundwater Basin
- Including all wells with a 2-inch discharge or greater
- Requiring automatically reporting flow meters
- Comparing flow meter data to remote sensing data to identify potential errors and irrigation inefficiencies.

9.6.3 Implementation Action C3: Dry Well Notification System

The GSA could develop or support the development of a program to assist well owners (domestic or state small and local small water systems) whose wells go dry due to declining groundwater elevations. The program could include a notification system whereby well owners can notify the GSA or relevant partner agency if their well goes dry, such as the Household Water Supply Shortage System (DWR, 2021). The information collected through this portal is intended to inform state and local agencies on drought impacts on household water supplies. It could also include referral to assistance with short-term supply solutions, technical assistance to assess why it went dry, and/or long-term supply solutions. For example, the GSA could set up a trigger system whereby it would convene a working group to assess the groundwater situation if the number of wells that go dry in a specific area cross a specified threshold. A smaller area trigger system would initiate action independent of monitoring related to the groundwater level SMC. The GSA could also support public outreach and education.

9.6.4 Implementation Action C4: Water Quality Coordination Group

The Water Quality Coordination Group will include the CCRWQCB, local agencies and organizations, water providers, domestic well owners, technical experts, and other stakeholders. The purpose of the Coordination Group is to coordinate amongst and between agencies that regulate water quality directly and the GSAs, which has an indirect role to monitor water quality and ensure its management does not cause undesirable water quality results.

Numerous agencies at the local and state levels are involved in various aspects of water quality. The SWRCB and RWQCBs are the principal state agencies with primary responsibility for the coordination and control of water quality for the health, safety, and welfare of the people of the state pursuant to the Porter-Cologne Water Quality Control Act 1969 (California Water Code Division 7 Section 13001). There are many efforts to address water quality by the SWRCB. For example, at the State level, the Department of Drinking Water's Safe and Affordable Funding for Equity and Resilience (SAFER) program is designed to meet the goal of safe drinking water for all Californians. In addition, at the local level, the County of Monterey Health Department Drinking Water Protection Service is designed to regulate and monitor water systems and tests water quality for new building permits for systems with over 2 connections.

The locally based GSAs established pursuant to SGMA are required to develop and implement GSPs to avoid undesirable results (including an undesirable result related to water quality) and mitigate overdraft in the groundwater basin within 20 years. SVBGSA and ASGSA will coordinate with the appropriate water quality regulatory programs and agencies in the Subbasin to understand and develop a process for determining when groundwater management and extraction are resulting in degraded water quality in the Subbasin.

Both the State and Monterey County have committed to a Human Right to Safe Drinking Water. SGMA outlines a specific role for GSAs related to beneficial users of groundwater including drinking water, which is to manage groundwater according to the 6 sustainability indicators. The Coordination Group will help define the unique role for the GSAs, not related to specific sustainability metrics. Under this implementation action, the GSAs will play a convening role by developing and coordinating a Water Quality Coordination Group.

The Coordination Group will review water quality data, identify data gaps, and coordinate agency communication. The Coordination Group will convene at least annually to share groundwater quality conditions, as assessed for the GSP Annual Reports, and assesses whether groundwater management actions are resulting in unsustainable conditions. The goal of the Coordination Group will include documenting agencies' actions that address water quality concerns including outlining each agency's responsibilities. An annual update to the GSAs' BODs will be provided regarding Coordination Group efforts and convenings.

This Coordination Group will also serve to collaborate with agencies on local regulation that could affect groundwater contamination, such as county or city groundwater requirements that relate to regulation of septic systems, well drilling, capping and destruction, wellhead protection and storage and/or leaking of hazardous materials.

9.6.5 Implementation Action C5: Land Use Jurisdiction Coordination Program

The Land Use Jurisdiction Coordination Program outlines how the SVBGSA and ASGSA review land use plans and efforts to coordinate with land use planning agencies to assess

activities that potentially create risks to groundwater quality or quantity. The goal is to ensure that GSAs and Land Use Jurisdiction efforts are aligned. Examples of these activities include the application of the B-8 Zoning district by the County of Monterey in areas with water supply, water quality and other constraints on development, and the consideration of recharge potential for new developments. While the SVBGSA does not have land use authority, and the Land Use Jurisdictions retain all such authority, the Coordination Program also describes how local agencies should consider adopted GSPs when revising or adopting policies, such as adopting and amending general plans and approving land use entitlements, regulations, or criteria, or when issuing orders or determinations, where pertinent. The Coordination Program will be developed immediately upon implementation of this GSP.

9.7 Other Groundwater Management Activities

Although not specifically funded or managed by this GSP, a number of associated groundwater management activities will be promoted and encouraged by the GSAs as part of general good groundwater management practices. If any particular action is scoped further and shown to significantly improve groundwater conditions, SVBGSA may consider implementing it as a management action or project under this GSP.

9.7.1 Continue Urban and Rural Residential Conservation

Existing water conservation measures should be continued, and new water conservation measures promoted for residential users. Conservation measures may include the use of low flow toilet fixtures, or laundry-to-landscape greywater reuse systems. Conservation projects can reduce demand for groundwater pumping, thereby acting as in-lieu recharge.

9.7.2 Promote Stormwater Capture

Stormwater and dry weather runoff capture projects, including Low Impact Development (LID) standards for new or retrofitted construction, should be prioritized and implemented. The Storm Water Resource Plan outlines an implementation strategy to ensure valuable, high-priority projects with multiple benefits (Hunt *et al.*, 2019). While not easily quantified and therefore not included as projects in this document, stormwater capture projects may be worthwhile and benefit the basin.

9.7.3 Watershed Protection and Management

Watershed restoration and management can reduce stormwater runoff and improve stormwater recharge into the groundwater basin. While not easily quantified and therefore not included as projects in this document, watershed management activities may be worthwhile and benefit the basin.

9.7.4 Support Reuse and Recharge of Wastewater

Wastewater collection and treatment provides opportunities to use and reuse water in various ways. Each wastewater treatment facility has unique infrastructure with different plans for expansion or upgrades. Potential upgrades could result in greater reliability, improved water quality, the ability to reuse treated wastewater or increase water reuse yields, or increased recharge to groundwater. These upgrades may directly or indirectly affect groundwater conditions.

9.8 Mitigation of Overdraft

The Forebay Subbasin has not historically been in overdraft. Based on the water budget components, the historical sustainable yield of the Subbasin is between 150,900 and 174,300 AF/yr., as summarized in Table 6-14. From 1980 to 2016, the Subbasin was in overdraft during only 3 years. Therefore, the calculation of the mitigation of overdraft is not needed at this time. However, these results are provisional and uncertain and are subject to change in future GSP updates after the SVIHM is released by the USGS. Because all model results in the GSP are provisional, any modeling outputs included in this GSP are only approximates and the use as a basis to implement a management action or project is limited. Given that the Subbasin's extraction is currently close to the sustainable yield, this chapter includes a robust set of potential management actions and projects that could be undertaken if needed. The management actions and projects selected will ensure that lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels or storage during other periods.

10 GROUNDWATER SUSTAINABILITY PLAN IMPLEMENTATION

This chapter describes how the GSP for the Forebay Subbasin will be implemented. The intent is that the SVBGSA and ASGSA will coordinate during implementation of the GSP. In accordance with the Implementation Agreement, the ASGSA will implement the GSP within the ASCMA and the SVBGSA will implement the GSP within the remainder of the Forebay Subbasin. The chapter serves as a road map for addressing all of the activities needed for GSP implementation between 2022 and 2042 but focuses on the activities between 2022 and 2027.

Implementing this GSP will require the following formative activities, each of which is detailed in a subsequent subsection:

- Data, monitoring, and reporting
 - Annual monitoring and reporting
 - Updating the Data Management System
 - Improving monitoring networks
 - Addressing identified data gaps in the HCM
- Continuing communication and stakeholder engagement
- Refining and implementing management actions and projects
- Adapting management with the 5-year Update
- Developing a funding strategy

The implementation plan in this chapter is based on the best available data used to understand groundwater conditions in the Subbasin and the current assessment of management actions and projects described in Chapter 9. As described in Chapter 9, there is currently no need to implement management actions or projects in the Forebay Subbasin or ASCMA. Monitoring and expansion of the data network will be a focus for the Subbasin. Implementation of management actions and projects will only be initiated in the Forebay Subbasin after the benefits and impacts of the actions have been analyzed with a publicly available groundwater model that has technical acceptance. As stated in Chapter 6, the model used for developing this GSPs groundwater budgets should be improved before it can be used for analyzing management actions in the Subbasin.

This plan takes into consideration the defined management actions of the ASGSA within the ASCMA. The Subbasin's conditions and the details of the projects and actions will likely evolve over time based on future data collection, model development, and input from Subbasin stakeholders.

10.1 Data, Monitoring, and Reporting

Beginning in the first year of GSP implementation, SGMA requires submittal of annual monitoring data and development of an annual report. This annual process tracks groundwater conditions with respect to the SMC established in Chapter 8. The SVBGSA will hire consultant(s), form agreements with agencies, and/or hire staff to implement the monitoring and reporting functions.

Monitoring of the 5 sustainability indicators will begin upon adoption of the GSP. ASGSA and SVBGSA will coordinate on monitoring data collection and reporting. Most of the monitoring networks described in Chapter 7 rely on existing monitoring programs. Only interconnected surface water needs the establishment of a new monitoring network in the ASCMA. Data from the monitoring programs will be maintained in the Data Management System and evaluated annually to ensure progress is being made toward sustainability or to identify exceedances of minimum thresholds. SVBGSA and ASGSA, will assess monitoring data to prepare annual reports and guide decisions on management actions and projects in the subbasin and ASCMA.

10.1.1 Annual Monitoring and Reporting

SGMA requires completion of annual reports to document Subbasin conditions relative to the SMC presented in Chapter 8. Starting on April 1, 2022, SVBGSA will submit annual reports for the Forebay Subbasin to DWR and make them publicly available. Draft reports will be provided to SVBGSA and ASGSA staff for information and to receive comments. The purpose of the reports is to provide monitoring, groundwater extraction, and total water use data to DWR, compare monitoring data to the SMC, and adaptively manage actions and projects implemented to achieve sustainability.

The monitoring of the 5 sustainability indicators relevant to the Subbasin are described below. Chapter 7 outlines the data collected through the monitoring programs that will be used to complete annual reports. Where possible, SVBGSA will leverage data collection and analysis completed by MCWRA to avoid duplication of efforts.

10.1.1.1 Groundwater Levels

For groundwater level monitoring, SVBGSA relies on MCWRA's collection of groundwater elevation data and analyzes it to meet SGMA requirements. MCWRA collects groundwater elevation monitoring data under the statewide CASGEM program and their annual, monthly, and August groundwater elevation monitoring programs. The CASGEM system will be replaced by the SGMA groundwater level monitoring program after GSP submission. The new monitoring system will include the 11 existing CASGEM wells and at least 28 additional wells that are already part of MCWRA's monitoring programs. Groundwater monitoring will continue to be conducted by MCWRA, and they will make these data available to the SVBGSA. The GSA will

use MCWRA's annual fall contour maps and develop additional spring contour maps using groundwater elevation data collected from the groundwater level monitoring network and adjacent subbasins. Although not always the lowest groundwater elevations, fall groundwater elevations are taken at the end of the irrigation season before winter rains begin to recharge the aquifer and raise groundwater levels. Thus, fall measurements represent annual change in storage due to recharge and pumping. The GSA will also prepare summary tables and figures, compare the data to SMC, and annually upload the data for DWR and to the Data Management System.

10.1.1.2 Groundwater Quality

For groundwater quality, SVBGSA relies on state monitoring systems and analyzes it to meet SGMA requirements. SWRCB compiles groundwater quality monitoring data for DDW and ILRP wells in their GAMA groundwater information system. The GSA will annually download these data, analyze exceedances for the COC, prepare summary tables, compare the data to SMC, and upload them to the Data Management System.

10.1.1.3 Land Subsidence

For land subsidence, SVBGSA relies on data provided by the State and analyzes it to meet SGMA requirements. DWR provides InSAR data that SVBGSA will use to assess land subsidence. InSAR data will be downloaded annually and are provided through DWR's SGMA Data Viewer, if available, and used to create annual change in subsidence maps to compare to SMC in the annual report.

10.1.1.4 Interconnected Surface Water

No entity currently monitors ISW. As described in Chapter 7, the monitoring network for interconnected surface water is in the process of development. Shallow groundwater elevations will be used as proxies for depletion rates; thus, shallow wells near the areas of interconnected surface water are needed. Monitoring wells will be located near USGS stream gauges and MCWRA's Salinas River Series measurement sites to evaluate groundwater gradient and effects of groundwater levels on surface water depletion. This will also help determine the extent of interconnection. The ISW monitoring wells will be incorporated into MCWRA's existing monitoring network and MCWRA will make these data available to SVBGSA and ASGSA. Water level measurements will be made at least once a year at each ISW monitoring site during MCWRA's annual fall groundwater monitoring event that occurs from mid-November to December. The SVBGSA in coordination with ASGSA will annually prepare summary tables and figures and compare the data to SMC.

10.1.1.5 Groundwater Extraction

SVBGSA relies on MCWRA's collection of groundwater extraction data and analyzes it to meet SGMA requirements. Through the GEMS, MCWRA collects groundwater pumping data for agricultural supply wells and public groundwater system wells that have discharge pipes larger than 3 inches within MCWRA Zones 2, 2A, and 2B. SVBGSA will work with MCWRA to update and enhance this program, as detailed in Section 10.1.3.1. The GSA will annually use these data to prepare summary tables and figures and compare the data to SMC. These data will be shared with ASGSA via the Coordination Committee. Due to the GEMS reporting period and submittal deadlines defined by Monterey County Ordinance No. 3717 and 3718, groundwater extraction reported in the annual reports will be lagged by 1 year.

10.1.2 Updating the Data Management System

The SVBGSA has developed a Data Management System that is used to store, review, and upload data collected from the monitoring programs outlined above, as described in Chapter 7. A web application reporting these data is available on the SVBGSA's website for stakeholders to view the data. The Data Management System will be updated as new information is collected for annual reports, developed as part of GSP implementation, and provided by stakeholders.

10.1.3 Improving Monitoring Networks

As discussed in Chapter 7, the existing groundwater quality, and subsidence monitoring networks already provide sufficient spatial coverage and do not need to be improved.

10.1.3.1 Groundwater Levels

The current groundwater level monitoring network has adequate coverage of the greater Forebay Subbasin. However, there is a data gap within the ASCMA along the Arroyo Seco that will be filled with a new monitoring well as described in Section 10.1.3.2. Additionally, some of the wells in the groundwater level monitoring network are only sampled annually. Thus, SVBGSA will work with MCWRA to update monitoring protocols for these well to be sampled at least twice a year as is required by SGMA. Moreover, for wells in the monitoring network that lack well construction information, SVBGSA will try to address that data gap.

10.1.3.2 Interconnected Surface Water

Depletion of interconnected surface water will be monitored through shallow wells adjacent to locations of interconnected surface water. The SVBGSA identified 3 existing wells adjacent to the Salinas River that will be added to the ISW monitoring network. These existing wells have been deemed adequate based on their shallow groundwater elevations but still require preliminary inspection. SVBGSA will notify well owners prior to incorporating their wells into

the monitoring network. Despite these 3 existing shallow wells, there is a data gap where the Arroyo Seco enters the Subbasin where SVBGSA plans to install a new shallow well along the Arroyo Seco. The new shallow well will be added to MCWRA's monitoring program. All existing shallow wells are already part of MCWRA's groundwater elevation monitoring programs.

10.1.3.3 Groundwater Extraction

Accurate extraction data is necessary to meet the SGMA requirement of reporting annual groundwater extractions. The current GEMS area that includes Zones 2, 2A, and 2B provide sufficient coverage of the Forebay Subbasin (Figure 3-3), but SVBGSA and MCWRA will work together to potentially improve the existing GEMS Program as outlined in Chapter 9.

10.1.4 Addressing Identified Data Gaps in the Hydrogeologic Conceptual Model

Chapter 4 identified a few key data gaps related to the HCM. Filling these data gaps would allow the SVBGSA to improve the HCM and thus, the characterization of the Subbasin and the principal aquifer. The data gaps are related to aquifer properties for the Subbasin and the Salinas Valley, and lithologic and hydrostratigraphic data for deeper portions of the aquifer.

To fill these key data gaps and meet GSP Regulations § 354.14, during early GSP implementation SVBGSA will implement:

- **Aquifer properties assessment.** The values and distribution of aquifer properties throughout the entire Subbasin have not been well characterized and documented. There are very few measured aquifer parameters in the Salinas Valley Groundwater Basin overall. Aquifer properties are important to understanding groundwater flow directions and magnitude within the aquifer, and particularly for the Forebay Aquifer they can help delineate the differences between the Arroyo Seco Cone and the greater Forebay Subbasin. This informs the model with better data, which in turn leads to better model predictions. With better understanding of the aquifer and potential future conditions, SVBGSA, ASGSA and stakeholders will be better equipped to guide the management of water resources throughout the entire Subbasin. To develop better estimates of aquifer properties, the SVBGSA, in coordination with ASGSA, will identify up to 3 wells that are representative of the Forebay Aquifer for aquifer testing. Each well test will last a minimum of 8 hours and will be followed by a minimum 4-hour monitored recovery period. Wells for testing will be identified using the following criteria:
 - Wells are owned by willing well owners
 - Wells have known well completion information
 - Wellheads are completed such that water elevations in wells can be monitored with data loggers

- Wells are equipped with accurate flow meters
 - Wells have area for discharge of test water
 - Preferred wells will have nearby wells that can be monitored during the test.
- **Lithologic and hydrostratigraphic data collection for the Basin Fill Aquifer.** Previous investigations have been inconclusive about the potential extension of the Deep Aquifers in the Forebay Subbasin. Whether the Deep Aquifers sediments exist in the Forebay Subbasin, and whether an aquitard exists that separates these deeper sediments into a definable aquifer, are data gaps identified for this GSP. These data gaps can be filled during the drilling and installation of new monitoring wells by SVBGSA as well as with supplemental data from the Deep Aquifers Study led by SVBGSA. Lithologic data such as sediment composition and formation designation, as well as hydrologic data such as groundwater elevations and depth-specific water chemistry can be collected during drilling activities. Additionally, more hydrologic data can be collected during well development and well testing. These data will improve the understanding of the aquifer properties and potential groundwater-surface water relationships. Filling these data gaps will not only help characterize and map the lateral and vertical extent of the principal Basin Fill Aquifer and the sediments which comprise the deeper portions of the aquifer with greater resolution, but also the associated aquifer characteristics for improved understanding of groundwater flow. These data will inform SVBGSA, ASGSA and stakeholders for future development location decisions, injection, or recharge project locations, as well as overall groundwater management directions to continue to use the aquifer sustainably under all climatic and future development conditions. Many stakeholders have discussed the importance of data for their decisions throughout the GSP development process; acquiring these data will improve all future GSP updates and subsequent implementation activities.

10.2 Communication and Engagement

The SVBGSA will routinely report information to the public about GSP implementation and progress towards sustainability and the need to use groundwater efficiently. The SVBGSA website will be maintained as a communication tool for posting data, reports, and meeting information. This website features a link to an interactive mapping function for viewing Salinas Valley Groundwater Basin-wide data that were used during GSP development.

- **GSP Implementation – Data, Monitoring, and Reporting.** During GSP implementation, SVBGSA, in coordination with ASGSA, will engage in technical collaboration with partner agencies and stakeholders on data collection and analysis. Correspondingly, it will report out on findings to stakeholders through a variety of engagement strategies and pathways, including but not limited to:

- Annual report presentations the Subbasin Committee, Forebay SMC TAC, Advisory Committee and Board of Directors
- FAQs
- Online communications, including SVBGSA website and Facebook page and direct emails
- Mailings to most-impacted water users and residents
- Media coverage
- Talks and presentations to interested stakeholders, agencies, and groups

This collaboration and outreach will be done on an annual basis as data are analyzed for the annual report. Additional outreach will occur more frequently depending on the data collection and analysis undertaken and its relevance for projects, management actions, and other implementation activities.

- **GSP Implementation – Management Actions and Projects.** SVBGSA and ASGSA will engage in outreach, communication, and engagement as part of its efforts to maintain sustainability through undertaking management actions and projects as described in the Implementation Agreement between the 2 agencies. This will include engagement of stakeholders and other decision-making processes, such as the Forebay Subbasin Committee, the Integrated Implementation Committee, the SVBGSA and ASGSA Advisory Committees, and the SVBGSA and ASGSA Board of Directors. It will also involve outreach to interested and potentially affected stakeholders through engagement strategies such as:
 - Annual Report presentations to Subbasin Committees, Advisory Committees and Board of Directors
 - FAQs
 - Online communications
 - Mailings to most-impacted water users and residents
 - Co-promotional opportunities with partner entities
 - Talks and presentations to interested stakeholders, agencies, and groups
- **Engagement in Governance and Partnerships.** In addition to Subbasin-specific processes, SVBGSA and ASGSA will continue to pursue multiple means of engagement in governance and partnerships that directly or indirectly affect the Forebay Subbasin. ASGSA and

SVBGSA have signed an Implementation Agreement that outlines processes that the 2 GSAs will undertake for the Forebay Subbasin GSP and the ASCMA. These include:

- Valley-wide – The Integrated Implementation Committee will consolidate the needs of all Salinas Valley subbasins and create an integrated approach to groundwater management throughout the Salinas Valley.
 - Coordination between SVBGSA and ASGSA – SVBGSA and ASGSA will jointly manage the Forebay Subbasin via the Implementation Agreement and specifically the Coordination Committee of the 2 agencies. In close collaboration with MCWRA, SVBGSA and ASGSA will also work with other local, state, and federal agencies, to meet the Forebay Subbasin sustainability goals as detailed in this GSP. This includes working with the CCRWQCB, Monterey County Health Department, and other agencies on water quality, and the National Marine Fisheries Services on protection of steelhead trout.
- **General Outreach on Groundwater.** SVBGSA and ASGSA will further pursue outreach in order to ensure stakeholders and interested or affected users are aware of SVBGSA and ASGSA efforts, as well as promote broader awareness of groundwater conditions and management. It will do this through means such as:
 - Offer public informational sessions and subject-matter workshops and if possible, provide online access via Facebook Live or via Zoom
 - SVBGSA Web Map
 - FAQs
 - Online communications
 - Media coverage
 - Promote/Celebrate National Groundwater Week
 - Educational materials available through mailers or at public events
- **URCs.** SVBGSA and ASGSA acknowledge that URCs have little or no representation in water management and have often been disproportionately less represented in public policy decision making. SVBGSA will engage more constructively with URCs, including activities such as to:
 - Conduct workshops with specific partners on the importance of water and groundwater sustainability
 - Identify URCs concerns and needs for engagement, as well as URCs specific engagement strategies

- Plan listening sessions around GSA milestones
- Coordinate with partner organizations to develop a “resource hub” where people can go for support
- Identify community allies in groundwater engagement work and bring down barriers for participation
- Consider particular URCs impacts during routine GSA proceedings
- Convene a partnership group on domestic water, including URCs with partner entities

10.3 Road Map for Refining and Implementing Management Actions and Projects

The management actions and projects identified in Chapter 9 are sufficient for maintaining sustainability in the Forebay Subbasin over the 50-year planning horizon. They will be integrated with projects for the other Salinas Valley subbasins as appropriate during GSP implementation. The management actions and projects described in this GSP have been identified as beneficial for the Forebay Subbasin. The impacts of management actions and projects on other subbasins will be analyzed and taken into consideration as part of the project selection process. Prior to implementation, they will be evaluated in the context of this Subbasin and the entire Valley. In addition, to consider the human right to water, SVBGSA will assess the potential impacts of management actions and projects on water quality in nearby domestic wells and other wells supplying drinking water systems, and it will establish additional monitoring as necessary to monitor for groundwater quality impacts. The SVBGSA Board of Directors will approve management actions and projects that are selected to move forward. The SVBGSA-ASGSA Coordination Committee will play an important role of annually reviewing management actions and projects and making recommendations to the Boards of Directors of SVBGSA and ASGSA. These projects assume continued operation of current infrastructure by parties such as MCWRA. If conditions change, such as other projects being undertaken that are outside of this GSP, SVBGSA, and ASGSA will adapt approaches to maintaining sustainability, including the management actions and projects considered.

Management actions and projects are not needed to maintain sustainability at this time, so do not need to be implemented immediately. Rather, they will move forward only if conditions warrant it, ASGSA or SVBGSA decide to pursue them, or if the Forebay Subbasin can leverage projects or management actions initiated by other subbasins.

This section outlines a road map to refining and implementing management actions and projects. It organizes the key steps SVBGSA and ASGSA will undertake with respect to Forebay management actions and projects and the contingency of certain actions. The Coordination

Committee will review this roadmap annually as will the ASGSA and SVBGSA Boards of Directors.

1. Implementation Actions

Data collection and analysis are critical for the implementation of all GSPs. Even though MCWRA has collected information across most of the Forebay Subbasin, strengthening data collection is still important to better understand the necessity of management actions and projects. Along with the expansion of monitoring networks, including updating and enhancing GEMS to improve the collection of extraction data, SVBGSA will register wells to gain more information on active wells, especially *de minimis* users. In addition, it will begin standing up the Dry Well Notification System within the first 2 years of GSP implementation, which will assist well owners whose access could be jeopardized if groundwater elevations decline. SVBGSA plans to undertake the development of these actions within the first 2 years after GSP submittal, and fully implement them through years 3 and 4 through actively reaching out to well owners, visiting and checking wells, and inputting data.

The Water Quality Coordination Group and Land Use Jurisdiction Coordination Program are also a critical implementation action to coordinate with other agencies that have responsibilities affecting water quality and access. After undertaking preliminary planning work, SVBGSA plans to establish these efforts in the first 2 years after implementation.

2. Forebay SMC TAC

Subbasin stakeholders plan to establish the SMC TAC within the first 2 years of GSP implementation. The Forebay SMC TAC will include the entire Subbasin, including the ASCMA. SVBGSA and ASGSA will work with the Subbasin Committee to determine the criteria for professional and scientific experts that will serve on the SMC TAC. After it is established, the SMC TAC will establish guiding principles, triggers, and the decision-making process. The SMC TAC will convene annually in April, and subsequently as needed, to review the annual report and whether conditions trigger the need for management actions and projects, recommend implementation of specific management actions and projects, and review data.

3. Management Actions

The Forebay Subbasin Planning Committee voiced preference for pursuing management actions before projects. The D-TAC is already established. The SMC TAC will be established within the first 2 years of GSP implementation. Improving rural residential water quality and the watershed protection policy for the Arroyo Seco River could occur at any time the GSAs decide to move forward with them. Conservation and agricultural BMPs and fallowing, fallow bank, and agricultural land retirement will move forward if conditions warrant it.

The evaluation of potential reoperation of the Nacimiento and San Antonio Reservoirs will occur within the first 5 years of GSP implementation. MCWRA owns and operates the reservoirs. SVBGSA will continue and deepen conversations with MCWRA regarding reservoir reoperation, including potential projects, and their impact on groundwater conditions. The SVBGSA needs to establish a funding mechanism for the feasibility study to occur.

4. Multi-benefit Stream Channel Improvements

SVBGSA will begin supporting multi-benefit stream channel improvements immediately after GSP implementation. The initial steps that need to be undertaken to further the existing programs include working with MCWRA, the RCDMC, and the Salinas River Management Unit Association on outreach to landowners, extension of permits, and the establishment of funding mechanism. Current Stream Maintenance Program permits are in place until 2025. The permitting process includes development of work plans, noticing, and pre-maintenance surveys. After undertaking maintenance activities, biological monitoring and reporting must be completed. During GSP implementation, SVBGSA will evaluate the extent to which funding the maintenance activities themselves could increase participation.

5. Projects

The remaining project, overland flow MAR, may be pursued if it is determined that it is needed in the Forebay or if the Forebay can leverage similar efforts in other subbasins.

The implementation of all management actions and projects will be a dynamic, adaptive process. Refinement of the projects and actions will occur simultaneously with adjustment of the funding mechanism that supports the projects and actions. A start-up budget that covers required actions such as data, monitoring, and reporting initial funds for selecting and scoping management actions and projects that would need to occur prior to financing a project. Management actions and projects will be approved by the Board of Directors and will be implemented in a coordinated manner if they affect multiple subbasins.

10.4 Five-Year Update

SGMA requires the development of 5-year GSP assessment reports, starting in 2027. The 5-year update will assess whether the GSA is achieving the sustainability goal in the Subbasin. The assessment will include a description of significant new information that has been made available since GSP submittal, whether any new information warrants changes to any aspect of the plan, and how the GSP will be adapted accordingly.

The 5-year update will include updating the SVIHM and SVOM with newly collected data and updating model scenarios to reflect both the additional data and refinements in project design or assumptions. It will also include a reevaluation of climate change to ensure assumptions in the GSP are still valid.

SVBGSA and ASGSA will engage stakeholders in the development of the 5-year update. In contrast to the annual reports, which share monitoring data and progress related to the SMC, the 5-year update will involve a more systemic reevaluation of the SMC minimum thresholds and measurable results, as well as report on progress meeting the interim milestones.

10.5 Start-up Budget and Funding Strategy

10.5.1 SVBGSA Operational Fee

SVBGSA established a valley-wide Operational Fee to fund the typical annual operational costs of its regulatory program authorized by SGMA, including regulatory activities of management groundwater to sustainability (such as GSP development), day-to-day administrative operations costs, and prudent reserves. The Operational Fee funds GSA operational costs, and therefore covers any tasks undertaken by staff, such as planning, technical review, partnership development, communication, stakeholder engagement, and support for the selection, development and implementation of management actions and projects. The fee is a regulatory fee with the purpose of ensuring that ground water use is managed sustainably so that adequate supplies remain for all users. The Operational Fee is also used as local cost share for grants.

Per the Implementation Agreement executed by ASGSA and SVBGSA the SVBGSA will provide a portion of the Operational Fee collected by the SVBGSA in the ASCMA to the ASGSA to complete operational actions. Annually during the first quarter of the calendar year, the Coordination Committee will identify budgetary needs of both the SVBGSA and ASGSA for their respective activities in implementing the Forebay GSP.

The Operational Fee is based on the 2018 Regulatory Fee Study (Hansford Economic Consulting, 2019) commissioned by SVBGSA. The SVBGSA has the authority to charge fees, as set forth in the California Water Code §10730, 10730.1, and 10730.2. The Operational Fee is a regulatory fee authorized under California Water Code Section 10730 and is exempt from voter approval, as it is not a tax pursuant to California Constitution Article XIII C (Proposition 26, Section 1(e)(3)). As the fee must be proportional and related to the benefits of the program, this study analyzed options and proposed a regulatory fee structure whereby agricultural beneficiaries are responsible for 90% of the cost and all other beneficiaries are responsible for 10% of the cost. The SVBGSA Board of Directors approved this fee in March 2019.

The Forebay Subbasin urban and agricultural groundwater are charged the Operational Fee by domestic connection or irrigated acreage by land use code. The Operational Fee funds valley-wide activities, including initial GSP development; however, individual subbasins need additional funding for meeting future requirements, GSP implementation, and management actions and projects.

10.5.2 Forebay Subbasin Start-up Budget

Table 10-1 summarizes the conceptual planning-level costs for the initial 5 years of GSP implementation for the Forebay Subbasin. This table does not include the Valley-wide costs for routine administrative operations and other Valley-wide costs funded through the SVBGSA operational fee outlined in 10.5.1. The Subbasin specific costs, shown in Table 10-1, include data collection and analysis beyond tasks already undertaken by other agencies. These tasks could be undertaken by staff, consultants, or partner agencies. The costs comprise of annual analysis and reporting of sustainability conditions; improvements to the monitoring networks, including installation of up to 1 new monitor well; and supplemental hydrogeologic investigations to address data gaps.

The start-up budget includes implementation actions envisioned to occur within the first 5 years of GSP implementation. It does not include funding for development or implementation of management actions and projects; however, does include some funding for refinement and selection of management actions and projects. When management actions and projects move forward with implementation, they will require additional funding for project feasibility and design studies, environmental permitting, and landowner outreach. Should the ASGSA desire to implement a project set forth in the Forebay GSP with the ASCMA, the SVBGSA will cooperate with the ASGSA on the implementation of any necessary funding mechanism.

These are initial estimates of costs and will likely change as more data become available.

These costs are independent of fees currently collected by MCWRA; SVBGSA will aim to not duplicate fees already being collected by MCWRA.

For components of this GSP being developed in coordination with other GSPs in the Salinas Valley, the establishment costs are split between subbasins, and initial implementation costs are estimated based on the direct costs to the Forebay Subbasin. These are initial estimates; however, the final cost and division between subbasins will be reviewed and revised as necessary prior to implementation and per approval of the SVBGSA Board.

Table 10-1. Forebay Aquifer Subbasin Specific Estimated Planning-Level Costs for First 5 Years of Implementation

Activity	Estimated Annual Cost	Total Cost for 5 years or Lump Sum	Assumptions
Required Compliance Activities: Data, Monitoring, and Reporting		\$583,000	
Annual Monitoring and Reporting	\$50,000	\$250,000	
Updating the Data Management System	\$3,000	\$15,000	Valley-wide cost split equally between subbasins; includes hosting fee and updating information
Improving Monitoring Networks		\$92,000	(No GWL monitoring wells needed)
Development of GEMS expansion ordinance		\$7,000	Valley-wide cost split equally between subbasins; includes hosting fee and updating information
Implementation of GEMS expansion		\$50,000	Estimate for implementation in the Forebay
Install up to 1 shallow wells for monitoring ISW		\$15,000	
Additional groundwater level monitoring	\$4,000	\$20,000	
Addressing Identified Data Gaps in the HCM – Aquifer Properties Assessments		\$16,000	For 3 aquifer properties tests
Coordination with MCWRA		\$10,000	Setting up a shared system; MCWRA time
Required 5-year Update		\$200,000	
SVIHM and SVOM update (gathering data, getting it into model)		\$9,000	
Reevaluate climate change		\$2,000	Valley-wide cost split equally between subbasins; includes evaluating extent to which previous estimates of climate change are still valid
Update model scenarios		\$14,000	
Stakeholder engagement		\$50,000	
Analysis and report-writing		\$125,000	
Refine and Implement Management Actions and Projects		\$50,000	Depends on management actions and projects pursued; Could be grant or project match
Engineering feasibility studies and project design			
Permitting and environmental review			
Cost-benefit analyses			
Total		\$633,000	

10.5.3 Funding for Management Actions and Projects

The start-up budget does not include funding for specific management actions and projects. Management actions and projects implemented by other agencies and organizations that contribute to groundwater sustainability will follow the funding strategies developed by those respective agencies and organizations. For projects funded by SVBGSA or funding SVBGSA raises to contribute to the implementation of projects, SVBGSA will evaluate the most appropriate funding mechanisms and engage stakeholders and the Board of Directors in this analysis. These include:

- **Grant funding.** SVBGSA will pursue grants to the extent possible to fund management actions and projects.
- **Contributions from local jurisdictions, partner agencies, organizations, and companies.** Where appropriate, SVBGSA will work with partners to solicit contributions to jointly implement a project or management action.
- **Benefit assessment (Proposition 218 vote).** For projects with considerable capital cost or that benefit multiple subbasins, SVBGSA will consider holding a 218 vote to levy an assessment based upon the special benefits conferred from a specific project. Before doing so, SVBGSA will undertake an analysis to identify the special benefit of the conferred project, the cost of the benefit, the zone of benefit, and method of calculating the assessments to be levied. This requires a public hearing and is subject to a majority protest.
- **Fees.** Fees may be collected for a variety of purposes, such as funding a regulatory program or providing a product or service. Fees are not subject to a vote or protest proceeding, but they cannot exceed the cost of running the program or providing the product or service. Some regulatory programs need to be implemented via ordinance.
- **Fines and penalties.** With the establishment of an ordinance, SVBGSA has the authority to impose fines and penalties, such as may be associated with a regulatory program. Imposition of a fine or penalty must provide due process, usually a hearing after notice/citation and before assessment of the fine or penalty, and funds must be put back into the program.
- **Special taxes.** SVBGSA has the authority to levy a special tax for a specific purpose, such as a parcel tax or some sales tax components. This requires a two-thirds vote of the electorate.

SVBGSA acknowledges that the costs associated with management actions and projects will need to be funded through mechanisms such as these. It will work with funding agencies and local partners to do so. Although a water charges framework and water marketing are potential funding mechanisms, the Forebay Subbasin Planning Committee agreed they are not their preferred funding mechanisms.

10.6 Implementation Schedule and Adaptive Management

The SVBGSA oversees all or part of 6 subbasins in the Salinas Valley Groundwater Basin. Implementing the Forebay Subbasin GSP must be integrated with the implementation of the 5 other GSPs in the Salinas Valley. The implementation schedule reflects the significant integration and coordination needed to implement all 6 GSPs in a unified manner.

A general schedule showing the major tasks and estimated timeline during the first 5 years of GSP implementation is provided on Figure 10-1.

The general implementation schedule for management actions and projects focuses on implementation actions and the SMC TAC within the first 2 to 3 years. The D-TAC has already been created. Other management actions could be pursued at any point that groundwater conditions warrant them or at any point Subbasin stakeholders and the SVBGSA decide is appropriate. Projects will be considered for the Forebay Subbasin if conditions warrant it. Management actions and projects will be revisited and adjusted as needed throughout GSP implementation. Implementation of this GSP will rely on best available science and will be continually updated as new data and analyses are available.

SVBGSA will adaptively manage groundwater and the implementation of the GSP. The work of SVBGSA and stakeholders to complete this GSP provides a solid base to guide groundwater management; however, certain conditions may provide the need to adapt and change management as envisioned in this plan. For example, if existing conditions change, such as a prolonged drought that affects groundwater conditions, or additional funding for specific projects becomes available, SVBGSA may adapt its management strategy. If that occurs, SVBGSA will work through an open and transparent process with stakeholders, partner agencies, and DWR to ensure it continues to meet regulatory requirements and reaches sustainability.



Figure 10-1. General Schedule of 5-Year Start-Up Plan

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