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Eastern Management Area Groundwater Sustainability Agency

Santa Ynez River Valley Groundwater Basin – Eastern Management Area Groundwater Sustainability Plan

~~September 8, 2021~~

January 2022

Santa Ynez River Valley Groundwater Basin
Eastern Management Area
Groundwater Sustainability Agency

Prepared by:

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Prepared for:
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GSI Water Solutions, Inc., is pleased to submit this Groundwater Sustainability Plan (GSP) prepared in accordance with California Code of Regulations, Title 23. Water, Division 2. Department of Water Resources, Chapter 1.5. Groundwater Management, Subchapter 2. Groundwater Sustainability Plans.

The GSP was prepared by the following authors:

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Contents

Tables

Figures

Appendices

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Abbreviations and Acronyms

µg/L	microgram per liter
ADF	average daily flow
Administrative Agreement	Intra-Basin Administrative Agreement for Implementation
AEM	airborne electromagnetic
AF	acre-feet
AFY	acre-feet per year
ANA	Above Narrows Account
AMI	automated meter infrastructure
ASR	aquifer storage and recovery
AW	applied water
Basin	Santa Ynez River Valley Groundwater Basin
BCM	Basin Characterization Model
bgs	below ground surface
BMP	best management practice
BNA	Below Narrows Account
BPA	base pumping allocation
CAG	Citizens Advisory Group
CASGEM	California Statewide Groundwater Elevation Monitoring
Casino	Chumash Casino Resort
CCR	California Code of Regulations
CCWA	Central Coast Water Authority
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CGPS	Continuous Global Positioning System
City	City of Solvang
CMA	Santa Ynez River Valley Groundwater Basin – Central Management Area
COGG	California Oil, Gas, and Groundwater
Committee	EMA GSA Committee
County	Santa Barbara County
DCR	Delivery Capability Report
DDW	Division of Drinking Water
DMS	data management system
DPS	Distinct Population Segment
DRINC	Drinking Water Information Clearinghouse
DSW-MAR	distributed storm water managed aquifer recharge
DWR	California Department of Water Resources
EMA	Santa Ynez River Valley Groundwater Basin – Eastern Management Area

Ep	pan evaporation
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ET	evapotranspiration
ETAW	evapotranspiration of applied water
ETc	crop evapotranspiration
ETo	reference evapotranspiration
EVT	Existing Vegetation Type
GAMA	Groundwater Ambient Monitoring and Assessment
GCP	(Santa Ynez) Groundwater Communication Portal
GDE	groundwater dependent ecosystem
GEC	groundwater extraction credit
gpcd	gallons per capita per day
gpm	gallons per minute
Groundwater Report	2019 Santa Barbara County Groundwater Basins Status Report
GSA	Groundwater Sustainability Agency
GSI	GSI Water Solutions, Inc.
GSP	Groundwater Sustainability Plan
GWMP	Groundwater Management Plan
HCM	hydrogeologic conceptual model
HTO	Heal the Ocean
HUC	Hydrologic Unit Codes
ID No. 1	Santa Ynez River Water Conservation District, Improvement District No. 1
ILRP	Irrigated Lands Regulatory Program
InSAR	Interferometric Synthetic Aperture Radar
IRWM	Integrated Regional Water Management
JPL	Jet Propulsion Laboratory
LOCSD	Los Olivos Community Service District
LUST	leaking underground storage tank
M&I	municipal and industrial
MA	management area
MAR	managed aquifer recharge
MBAS	methylene blue active substances
MCL	maximum contaminant level
mg/L	milligrams per liter
MGD	million gallons per day
mm	milliliter
MO	measurable objective
MOA	memorandum of agreement
MOU	memorandum of understanding

MT	minimum threshold
MTBE	methyl tert-butyl ether
NASA	National Aeronautics and Space Administration
NAVD 88	North American Vertical Datum of 1988
NCCAG	Natural Communities Commonly Associated with Groundwater
NHD	National Hydrography Dataset
NMFS	National Marine Fisheries Service
NWIS	National Water Information System
OWTS	onsite wastewater treatment system
PCE	tetrachloroethylene
pCi/L	picocuries per liter
Plan	Groundwater Sustainability Plan
PMA	project or management action
QA/QC	quality assurance and quality control
RMS	representative monitoring site
RP	reference point
RWQCB	Regional Water Quality Control Board
SACV	San Antonio Creek Valley Groundwater Basin
SCH	State Clearinghouse
SGMA	Sustainable Groundwater Management Act
SMC	sustainable management criterion
SMCL	secondary maximum contaminant level
Stetson	Stetson Engineers
SWP	State Water Project
SWRCB	Stare Water Resources Control Board
SYCSD	Santa Ynez Community Services District
SYR	Santa Ynez River
SYRHM	Santa Ynez River Hydrologic Model
SYRWCD	Santa Ynez River Water Conservation District
TDS	total dissolved solids
TEM	transient electromagnetic
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
tTEM	towed transient electromagnetic
UC	University of California
UNAVCO	University NAVSTAR Consortium
USBR	U.S. Bureau of Reclamation
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UWCD	United Water Conservation District

UWMP	Urban Water Management Plan
VIC	variable infiltration capacity
Water Agency	Santa Barbara County Water Agency
WMA	Santa Ynez River Valley Groundwater Basin – Western Management Area
WQ Basin Plan	Water Quality Control Plan for the Central Coastal Basin
WQO	water quality objective
WRP	water reclamation plant
WWTF	wastewater treatment facility
WWTP	wastewater treatment plant
WY	water year

Definitions

California Water Code

Sec. 10721

Unless the context otherwise requires, the following definitions govern the construction of this part:

(a) Adjudication action means an action filed in the superior or federal district court to determine the rights to extract groundwater from a basin or store water within a basin, including, but not limited to, actions to quiet title respecting rights to extract or store groundwater or an action brought to impose a physical solution on a basin.

(b) Basin means a groundwater basin or subbasin identified and defined in Bulletin 118 or as modified pursuant to Chapter 3 (commencing with Section 10722).

(c) Bulletin 118 means the department's report entitled California's Groundwater: Bulletin 118 updated in 2003, as it may be subsequently updated or revised in accordance with Section 12924.

(d) Coordination agreement means a legal agreement adopted between two or more groundwater sustainability agencies that provides the basis for coordinating multiple agencies or groundwater sustainability plans within a basin pursuant to this part.

(e) De minimis extractor means a person who extracts, for domestic purposes, two acre- feet or less per year.

(f) Governing body means the legislative body of a groundwater sustainability agency.

(g) Groundwater means water beneath the surface of the earth within the zone below the water table in which the soil is completely saturated with water, but does not include water that flows in known and definite channels.

(h) Groundwater extraction facility means a device or method for extracting groundwater from within a basin.

(i) Groundwater recharge or recharge means the augmentation of groundwater, by natural or artificial means.

(j) Groundwater sustainability agency means one or more local agencies that implement the provisions of this part. For purposes of imposing fees pursuant to Chapter 8 (commencing with Section 10730) or taking action to enforce a groundwater sustainability plan, groundwater sustainability agency also means each local agency comprising the groundwater sustainability agency if the plan authorizes separate agency action.

(k) Groundwater sustainability plan or plan means a plan of a groundwater sustainability agency proposed or adopted pursuant to this part.

(l) Groundwater sustainability program means a coordinated and ongoing activity undertaken to benefit a basin, pursuant to a groundwater sustainability plan.

(m) In-lieu use means the use of surface water by persons that could otherwise extract groundwater in order to leave groundwater in the basin.

(n) Local agency means a local public agency that has water supply, water management, or land use responsibilities within a groundwater basin.

(o) Operator means a person operating a groundwater extraction facility. The owner of a groundwater extraction facility shall be conclusively presumed to be the operator unless a satisfactory showing is made to the governing body of the groundwater sustainability agency that the groundwater extraction facility actually is operated by some other person.

(p) Owner means a person owning a groundwater extraction facility or an interest in a groundwater extraction facility other than a lien to secure the payment of a debt or other obligation.

(q) Personal information has the same meaning as defined in Section 1798.3 of the Civil Code.

(r) Planning and implementation horizon means a 50-year time period over which a groundwater sustainability agency determines that plans and measures will be implemented in a basin to ensure that the basin is operated within its sustainable yield.

(s) Public water system has the same meaning as defined in Section 116275 of the Health and Safety Code.

(t) Recharge area means the area that supplies water to an aquifer in a groundwater basin.

(u) Sustainability goal means the existence and implementation of one or more groundwater sustainability plans that achieve sustainable groundwater management by identifying and causing the implementation of measures targeted to ensure that the applicable basin is operated within its sustainable yield.

(v) Sustainable groundwater management means the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results.

(w) Sustainable yield means the maximum quantity of water, calculated over a base period representative of long-term conditions in the basin and including any temporary surplus that can be withdrawn annually from a groundwater supply without causing an undesirable result.

(x) Undesirable result means one or more of the following effects caused by groundwater conditions occurring throughout the basin:

(1) Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. 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.

(2) Significant and unreasonable reduction of groundwater storage.

(3) Significant and unreasonable seawater intrusion.

(4) Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies.

(5) Significant and unreasonable land subsidence that substantially interferes with surface land uses.

(6) Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water.

(y) Water budget means an accounting of the total groundwater and surface water entering and leaving a basin including the changes in the amount of water stored.

(z) Watermaster means a watermaster appointed by a court or pursuant to other law.

(aa) Water year means the period from October 1 through the following September 30, inclusive.

(ab) Wellhead protection area means the surface and subsurface area surrounding a water well or well field that supplies a public water system through which contaminants are reasonably likely to migrate toward the water well or well field.

Official California Code of Regulations (CCR)

Title 23. Waters

Division 2. Department of Water Resources

Chapter 1.5. Groundwater Management

Subchapter 2. Groundwater Sustainability Plans

Article 2. Definitions

23 CCR § 351

§ 351. Definitions.

The definitions in the Sustainable Groundwater Management Act, Bulletin 118, and Subchapter 1 of this Chapter, shall apply to these regulations. In the event of conflicting definitions, the definitions in the Act govern the meanings in this Subchapter. In addition, the following terms used in this Subchapter have the following meanings:

(a) "Agency" refers to a groundwater sustainability agency as defined in the Act.

(b) "Agricultural water management plan" refers to a plan adopted pursuant to the Agricultural Water Management Planning Act as described in Part 2.8 of Division 6 of the Water Code, commencing with Section 10800 et seq.

(c) "Alternative" refers to an alternative to a Plan described in Water Code Section 10733.6.

(d) "Annual report" refers to the report required by Water Code Section 10728.

(e) "Baseline" or "baseline conditions" refer to historic information used to project future conditions for hydrology, water demand, and availability of surface water and to evaluate potential sustainable management practices of a basin.

(f) "Basin" means a groundwater basin or subbasin identified and defined in Bulletin 118 or as modified pursuant to Water Code 10722 et seq.

(g) "Basin setting" refers to the information about the physical setting, characteristics, and current conditions of the basin as described by the Agency in the hydrogeologic conceptual model, the groundwater conditions, and the water budget, pursuant to Subarticle 2 of Article 5.

(h) "Best available science" refers to the use of sufficient and credible information and data, specific to the decision being made and the time frame available for making that decision, that is consistent with scientific and engineering professional standards of practice.

(i) "Best management practice" refers to a practice, or combination of practices, that are designed to achieve sustainable groundwater management and have been determined to be technologically and economically effective, practicable, and based on best available science.

(j) "Board" refers to the State Water Resources Control Board.

(k) "CASGEM" refers to the California Statewide Groundwater Elevation Monitoring Program developed by the Department pursuant to Water Code Section 10920 et seq., or as amended.

(l) "Data gap" refers to a lack of information that significantly affects the understanding of the basin setting or evaluation of the efficacy of Plan implementation, and could limit the ability to assess whether a basin is being sustainably managed.

(m) "Groundwater dependent ecosystem" refers to ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface.

(n) "Groundwater flow" refers to the volume and direction of groundwater movement into, out of, or throughout a basin.

(o) "Interconnected surface water" refers to 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 completely depleted.

(p) "Interested parties" refers to persons and entities on the list of interested persons established by the Agency pursuant to Water Code Section 10723.4.

(q) "Interim milestone" refers to a target value representing measurable groundwater conditions, in increments of five years, set by an Agency as part of a Plan.

(r) "Management area" refers to an area within a basin for which the Plan may identify different minimum thresholds, measurable objectives, monitoring, or projects and management actions based on differences in water use sector, water source type, geology, aquifer characteristics, or other factors.

(s) "Measurable objectives" refer to 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.

(t) "Minimum threshold" refers to a numeric value for each sustainability indicator used to define undesirable results.

(u) "NAD83" refers to the North American Datum of 1983 computed by the National Geodetic Survey, or as modified.

(v) "NAVD88" refers to the North American Vertical Datum of 1988 computed by the National Geodetic Survey, or as modified.

(w) "Plain language" means language that the intended audience can readily understand and use because that language is concise, well-organized, uses simple vocabulary, avoids excessive acronyms and technical language, and follows other best practices of plain language writing.

(x) “Plan” refers to a groundwater sustainability plan as defined in the Act.

(y) “Plan implementation” refers to an Agency's exercise of the powers and authorities described in the Act, which commences after an Agency adopts and submits a Plan or Alternative to the Department and begins exercising such powers and authorities.

(z) “Plan manager” is an employee or authorized representative of an Agency, or Agencies, appointed through a coordination agreement or other agreement, who has been delegated management authority for submitting the Plan and serving as the point of contact between the Agency and the Department.

(aa) “Principal aquifers” refer to aquifers or aquifer systems that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems.

(ab) “Reference point” refers to a permanent, stationary and readily identifiable mark or point on a well, such as the top of casing, from which groundwater level measurements are taken, or other monitoring site.

(ac) “Representative monitoring” refers to a monitoring site within a broader network of sites that typifies one or more conditions within the basin or an area of the basin.

(ad) “Seasonal high” refers to the highest annual static groundwater elevation that is typically measured in the Spring and associated with stable aquifer conditions following a period of lowest annual groundwater demand.

(ae) “Seasonal low” refers to the lowest annual static groundwater elevation that is typically measured in the Summer or Fall, and associated with a period of stable aquifer conditions following a period of highest annual groundwater demand.

(af) “Seawater intrusion” refers to the advancement of seawater into a groundwater supply that results in degradation of water quality in the basin, and includes seawater from any source.

(ag) “Statutory deadline” refers to the date by which an Agency must be managing a basin pursuant to an adopted Plan, as described in Water Code Sections 10720.7 or 10722.4.

(ah) “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).

(ai) “Uncertainty” refers to a lack of understanding of the basin setting that significantly affects an Agency's ability to develop sustainable management criteria and appropriate projects and management actions in a Plan, or to evaluate the efficacy of Plan implementation, and therefore may limit the ability to assess whether a basin is being sustainably managed.

(aj) “Urban water management plan” refers to a plan adopted pursuant to the Urban Water Management Planning Act as described in Part 2.6 of Division 6 of the Water Code, commencing with Section 10610 et seq.

(ak) “Water source type” represents the source from which water is derived to meet the applied beneficial uses, including groundwater, recycled water, reused water, and surface water sources identified as Central Valley Project, the State Water Project, the Colorado River Project, local supplies, and local imported supplies.

(al) "Water use sector" refers to categories of water demand based on the general land uses to which the water is applied, including urban, industrial, agricultural, managed wetlands, managed recharge, and native vegetation.

(am) "Water year" refers to the period from October 1 through the following September 30, inclusive, as defined in the Act.

(an) "Water year type" refers to the classification provided by the Department to assess the amount of annual precipitation in a basin.

Executive Summary [§354.4(a)]

ES-1 ES-1 Introduction

The Sustainable Groundwater Management Act (SGMA), effective as of January of 2015, created a new statewide framework for managing California's groundwater at the local level. SGMA empowers local agencies to form groundwater sustainability agencies (GSAs) tasked with developing groundwater sustainability plans (GSPs), such as this document. A GSP is a detailed road map for maintaining or bringing a designated groundwater basin into a sustainable condition within the next 20 years. When a basin is managed sustainably, groundwater conditions are maintained in a manner that avoids undesirable results caused by groundwater conditions occurring throughout the basin, such as chronic lowering of groundwater levels, or significant and unreasonable depletion of supply, reduction of groundwater storage, degraded water quality, land subsidence, or depletions of interconnected surface waters.

In his signing statement, Governor Brown emphasized that "groundwater management in California is best accomplished locally." The Santa Ynez River Valley Groundwater Basin (Basin) is divided into three management areas: the Western Management Area (WMA), the Central Management Area (CMA), and the Eastern Management Area (EMA), each with its own GSA and GSP. In 2017, the Santa Ynez River Water Conservation District (SYRWCD), Santa Barbara County Water Agency, the City of Solvang, and the SYRWCD, Improvement District No. 1 (ID No. 1) signed a Memorandum of Agreement (MOA) to form the EMA GSA. This GSP describes the pathway to groundwater sustainability for the EMA.

This GSP describes the EMA physical setting, quantifies; presents historical, present, and future water budgets,; develops quantifiable management objectives that account for the interests of the EMA's beneficial groundwater uses and users,; and identifies a group of projects and management actions that will allow the EMA to maintain or achieve sustainability within 20 years of plan adoption. This document also includes the list of references and technical studies, documentation of the stakeholder engagement process used in the development of this plan, and several supporting appendices. The EMA GSA has taken many steps, starting with stakeholder engagement, to complete the GSP in accordance with the requirements of SGMA and related SGMA regulations.

The EMA GSA has provided multiple venues for stakeholder engagement to encourage interested parties and the public to provide input based on their perspectives and priorities and to enable the GSA to provide updates to the public in a timely manner. The GSA created a Citizen Advisory Group (CAG) representing a variety of water user groups in the EMA to capture perspectives of all stakeholders throughout the development of the GSP. Numerous presentations and workshops were given to inform EMA groundwater users and the public about the plan and plan elements, and to solicit input. In addition, many of the key GSP sections were posted on the EMA website for public review. Numerous other meetings, educational flyers, mailers, and postings to social media were done to provide outreach in accordance with the *Communication and Engagement Plan* (see Appendix B). Comments were received through email, letters, and posts to the EMA groundwater communications portal. Each of these comments have been responded to and the locations where the comments are addressed in the GSP (if changes were warranted) are recorded in the response to comment log in Appendix J.

This plan considers the sources and uses of water in the EMA and the changes that might occur due to population growth, potential expansion of irrigated agriculture, and changes in rainfall, streamflow, and evapotranspiration due to climate change. This plan also considers groundwater dependent ecosystems, or (GDEs,), which are habitats in which plants and animals relyecological communities or species that depend on groundwater for survivalemerging from aquifers or on groundwater occurring near the ground surface.

The EMA GSA establishedestablishes sustainable management criteria (SMCs) to avoid significant and unreasonable conditions caused by groundwater use that could lead to undesirable results for a number offive sustainability indicators listed in SGMA. As indicated above, the sustainability indicators include (1) chronic lowering of groundwater levels, indicating a significant and unreasonable depletion of supply, (2) significant and unreasonable reduction of groundwater storage, (3) degraded water quality, (4) land subsidence, and (5) depletion of interconnected surface water. Basin stakeholders helped to define the sustainability goal, what constitutes undesirable results, and appropriate SMCs for each sustainability indicator. SGMA also requires that GSAs identify GDEs and assess the effects of changing groundwater levels on GDEs. The GSP includes a robust groundwater monitoring program and defines projects and management actions that have been developed to maintain long-term groundwater sustainability.

The organization of this plan is as follows:

- **Section 1 – Introduction to Plan Contents:** An introduction to the GSP, including a description of its purpose and a brief description of the EMA.
- **Section 2 – Administrative Information:** Includes the following:
  - Information on the EMA GSA as an organization and a brief description of the agencies participating in the GSA, including information on the legal authority of the GSA to plan and coordinate groundwater sustainability for the EMA.
  - An overview description of the EMA, including land use and agencies with jurisdiction, a description of the existing groundwater management plans and regulatory programs, any programs for conjunctive use, and urban land use programs that might have an effect on, or be affected by, this GSP.
  - The EMA GSA's communicationscommunication and engagement planning and implementation, public feedback and stakeholder comments on the plan, how feedback was incorporated into the GSP, and responses to comments received *(Note: comments and responses to comments will be included in the final draft of the GSP, once all public comments have been received)*
- **Section 3 – Basin Setting:** Includes the following:
  - An explanation of the hydrogeologic conceptual model developed for the EMA that includes descriptions of the regional hydrology and geology, principal aquifers and aquitards, and a description of the data gaps in the current model.
  - A detailed description of the groundwater conditions, including groundwater elevations and changes in storage, groundwater quality for drinking water and agricultural irrigation and trends over time, an evaluation of land subsidence, locations where surface water and groundwater are interconnected, and the identification and distribution of groundwater-dependent ecosystems.
  - A presentation of the historical, current, and projected future water budgets for the EMA; how the water budgets were developed; an estimate of sustainable yield for the EMA; and the effects of climate change using the California Department of Water Resources (DWR) climate change assumptions.
- **Section 4 – Monitoring Networks:** A detailed description of the monitoring objectives and monitoring in the EMA for groundwater levels, storage, water quality, land subsidence, interconnected surface water, representative monitoring sites, and a description of the data management and reporting system.
- **Section 5 – Sustainable Management Criteria:** Defines the sustainability goal for the EMA; describes the process through which the SMCs were established; describes significant and unreasonable effects that could lead to undesirable results as a result of groundwater use;conditions occurring throughout the

EMA describes and defines SMCs regarding chronic lowering of groundwater levels, significant and unreasonable reduction in groundwater storage, seawater intrusion, degraded groundwater quality, land subsidence, and depletion of interconnected surface water; (including quantity and timing of surface water depletion); and describes the minimum thresholds, measurable objectives, and interim milestones to avoid undesirable results.

- **Section 6 – Projects and Management Actions:** Provides a grouping and description of each project and management action that may be developed and implemented by the EMA GSA to avoid undesirable results and ensure sustainability within 20 years of GSP adoption.
- **Section 7 – Groundwater Sustainability Plan Implementation:** Describes the implementation sequence for projects and management actions, overall schedule, estimated implementation costs, and sources of funding.

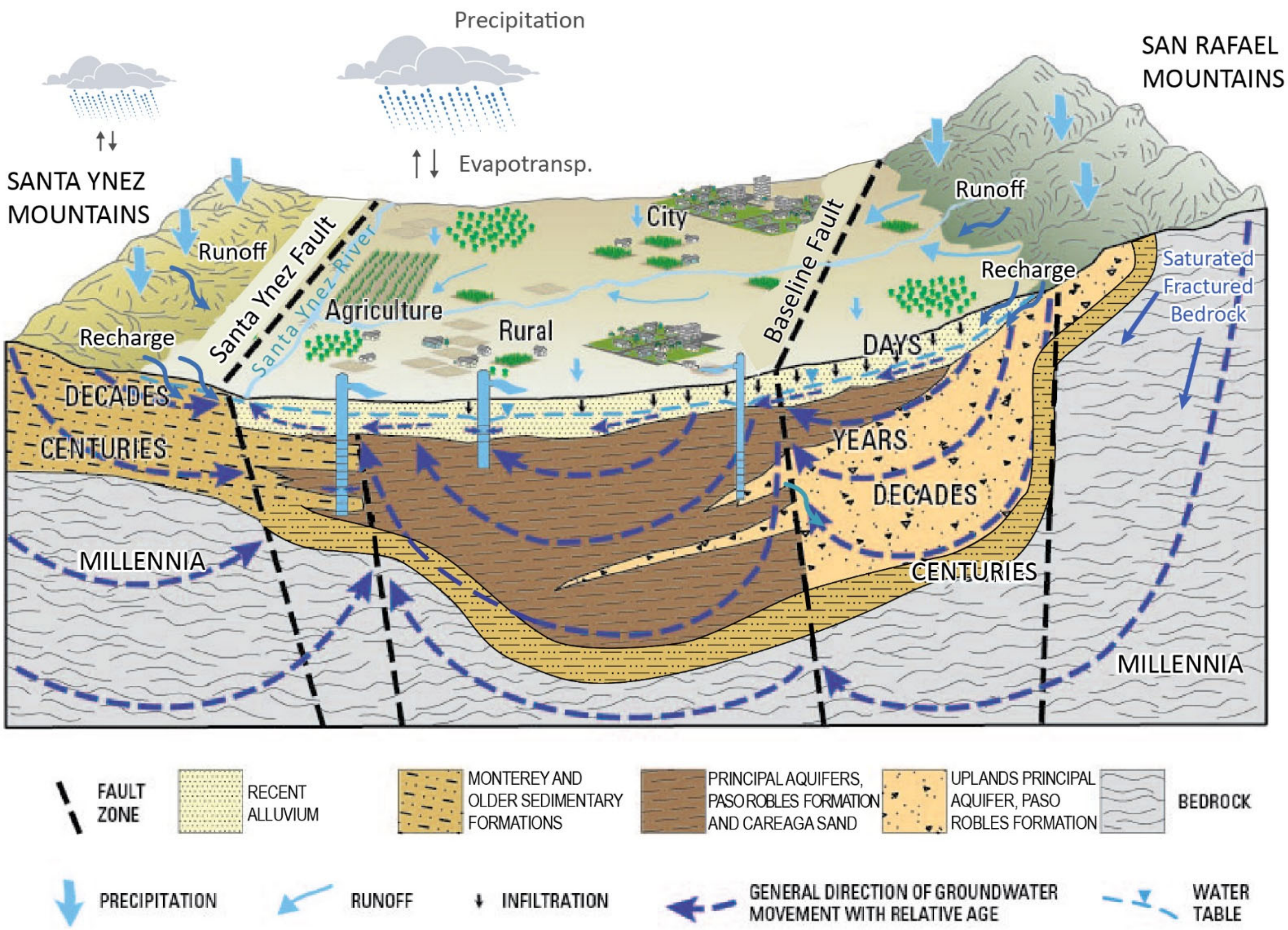
Summaries of the key technical sections of this GSP are presented below.

ES-2 ES-2 Basin Setting (GSP Section 3)

Section 3 of the GSP describes the physical setting and characteristics of the EMA, including the basin boundaries, geologic formations and structures, and principal aquifer units. The hydrogeologic conceptual model describes how the groundwater system works and is based on the available body of data and prior studies of the Basin's geology, hydrology, and water quality. In this GSP, the hydrogeologic conceptual model provides a framework for subsequent sections of the basin setting, including groundwater conditions and water budgets. Together these sections provide the basis for understanding the groundwater resources in the EMA and support the GSA's efforts to achieve groundwater sustainability in the EMA and the Basin by 2042. This plan will be updated as required to maintain this goal.

ES-2.1 ES-2.1 Hydrogeologic Conceptual Model and Principal Aquifers

Figure ES-1 is a diagram generally depicting the hydrogeologic system of the EMA, including its topographic setting, underlying geologic system, principal aquifers, generalized recharge and discharge areas for the aquifers, and water inflows and outflows. Two principal aquifers have been identified in the EMA: the Paso Robles Formation and the Careaga Sand. Water present within the Santa Ynez River Alluvium is considered surface water byunder the regulatory jurisdiction of the State Water Resources Control Board (SWRCB) and is not managed by the GSAsunder SGMA. Therefore, and according to definitions set forth by SGMA and the



SGMA regulations, the Santa Ynez River Alluvium is not classified in this GSP as a principal aquifer. (see Appendix K).

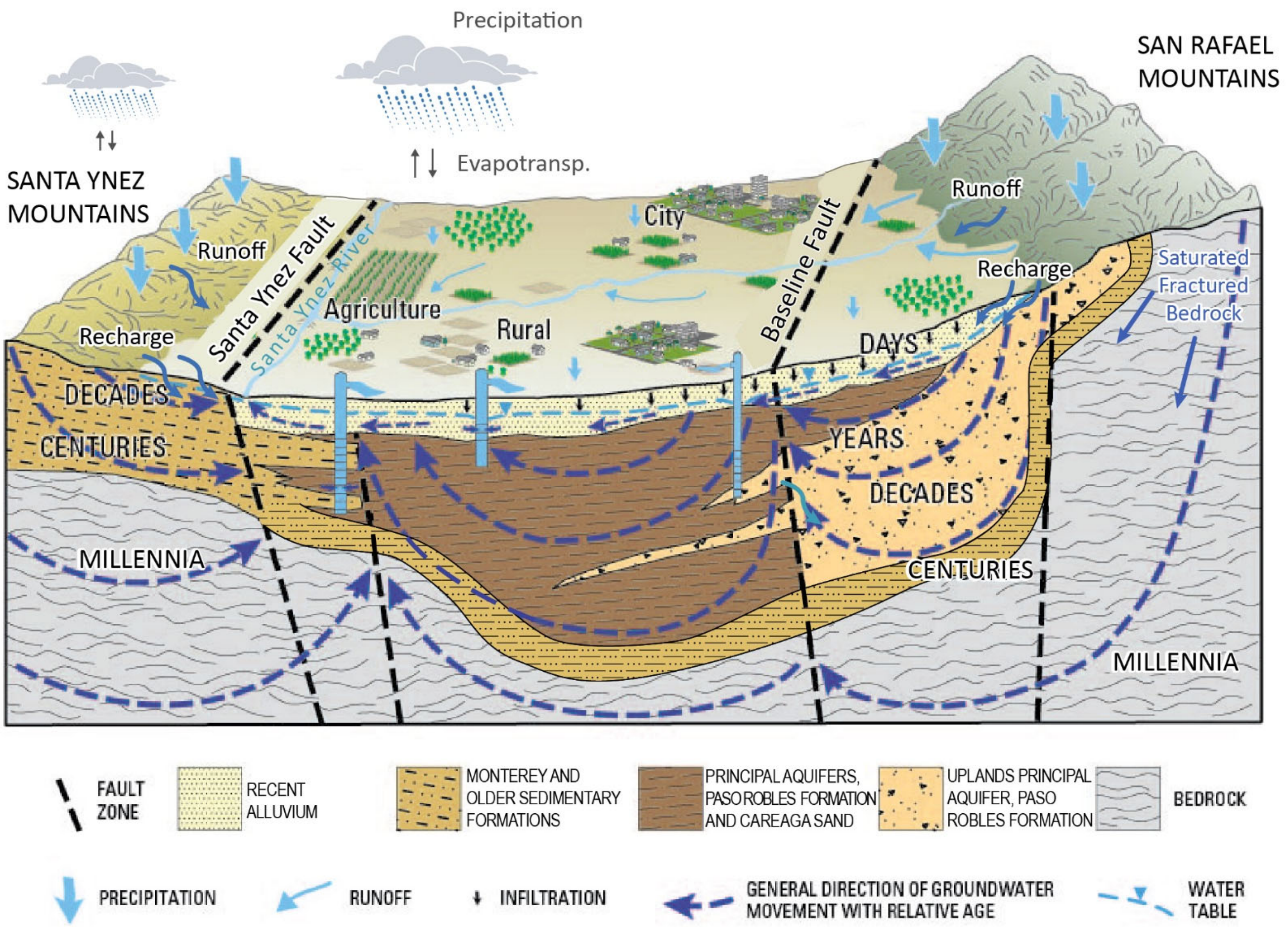


Figure ES-1. Hydrogeologic Conceptual Model and Principal Aquifers

The Paso Robles Formation makes upcontains the majority of the groundwater in storage in the EMA. This aquifer is present in the Santa Ynez Uplands area of the EMA, extending from the ground surface to approximately 3,500 feet below ground surface, with an average thickness of about 1,500 feet. Deeper portions of the Paso Robles Formation are thought to contain poor quality groundwater. The Paso Robles Formation is made of relatively thin sand and gravel layers interbedded with thicker layers of silt and clay. The upper portion of the Paso Robles formation tends to contain more coarse-grained materials and produces groundwater at higher flow rates than the more fine-grained lower portion.

The Careaga Sand lies below the Paso Robles Formation in the Santa Ynez Uplands and below the Santa Ynez River gravels near the City of Solvang. In the Santa Ynez Uplands, the Careaga Sand is typically about 800 feet thick on average and varies between 200 and 900 feet. Generally, the Careaga Sand is less permeable than the Paso Robles Formation. Wells drawing water from the Careaga Sand typically provide less water than wells screened in the Paso Robles Formation. Because the material in this aquifer is relatively uniform and fine, wells completed in the Careaga Sand often have sanding problems.

ES-2.2 ES-2.2 Recharge and Discharge in the EMA

Within the Santa Ynez Uplands area of the EMA, sources of groundwater recharge include percolation of precipitation, infiltration into and through streambeds, urban and agricultural return flows, septic system return flows (leachate), and water system distribution losses. Within the shallow alluvial sand and gravel beds of tributaries in the Santa Ynez Uplands, portions of the ephemeral streams contribute to groundwater recharge into the underlying Paso Robles Formation. Where the Careaga Sand is exposed at ground surface in the Purisima Hills and along Alamo Pintado Creek, a considerable amount of water from precipitation and streamflow can recharge this aquifer. Groundwater recharge to principal aquifers also occurs from mountain front recharge. Mountain front recharge includes (1) direct recharge from the underlying bedrock along the San Rafael Mountains to the north and east and from the Santa Ynez Mountains to the south and (2) runoff from the mountains that subsequently percolates into the ground.

Natural groundwater discharge areas in the EMA include springs and seeps, groundwater discharge to surface water, and evapotranspiration by plants whose roots tap into groundwater in the alluvium along creeks and streams. Groundwater discharge as subsurface outflow from the Santa Ynez Uplands portion of the EMA to the adjoining Central Management Area (CMA) is relatively small. Much of the groundwater flow exits the uplands as surface water flow leaving the tributaries just upstream of the confluence with the Santa Ynez River. Very small quantities of groundwater flow may occur through fractures in the bedrock in the Ballard Canyon area. Surface water also discharges from the EMA as underflow from the Santa Ynez River Alluvium that crosses into the CMA every year.

ES-2.3 ES-2.3 Groundwater Conditions

Groundwater wells completed in the Paso Robles Formation have water levels that have been relatively stable over long periods except during drought periods. Water levels in the Paso Robles Formation show a strong correlation with climatic conditions. Some wells show water elevation decreases of more than 100 feet during prolonged drought cycles, but most wells appear to fully recover within a few years when the drought conditions end. Changes in water levels are also related to groundwater pumping. The Paso Robles Formation is the most productive and most widely pumped aquifer in the EMA. During periods of drought, water levels decline in response to a combination of increased pumping and decreased recharge. Seasonal fluctuations in water levels in the Paso Robles Formation appear to be relatively small (less than 30 feet).

Wells completed in the Careaga Sand also show long-term stability of water levels since the mid-1960s, with minimal change in water level elevation. Water levels in some wells show muted correlation with climatic conditions, exhibiting minor decreases during drought conditions and rising water levels during wet periods. One reason for the stable water levels in the Careaga Sand is that there is much less groundwater pumping compared to the Paso Robles Formation. Wells completed in the Careaga Sand typically have relatively low yields compared to the yields of the Paso Robles Formation. The volume of water extracted from the Careaga Sand is likely a small portion of the total available storage, which may explain why water levels do not show significant decline due to drought conditions.

Groundwater in the EMA is generally suitable for use as potable water and for agriculture. While there are some wells that currently have constituent concentrations that exceed Basin Water Quality Objectives set by the Regional Water Quality Control Board, it is possible that some of these exceedances are a result of natural conditions and not caused by land use or other anthropogenic activities. Elevated boron concentrations are naturally occurring in many central coast basins, and elevated total dissolved solids (TDS), chloride, and sodium are often associated with rocks of marine origin that are present in the EMA. EMA agricultural stakeholders have not indicated that these concentrations are impacting agricultural production or drinking water quality.

ES-2.4 ES-2.4 Interconnected Groundwater and Surface Water

The Santa Ynez River is the primary surface water drainage feature in the EMA, flowing from east to west. The EMA also includes both perennial and intermittent creeks that flow into the Santa Ynez River or into Cachuma Reservoir (Lake Cachuma). The surface water system of the Santa Ynez River, including underflow within the Santa Ynez Alluvium, is subject to the regulatory jurisdiction of the SWRCB and its base flow is not managed by the EMA GSA under the GSP as part of the SGMA (refer to Appendix K for additional discussion of the distinction between groundwater and the surface water system because groundwater in the EMA uplands does not interconnectaccordance with the river except where upland groundwater discharges to tributaries that then flow into the river.SGMA).

Tributaries to the Santa Ynez River on the north side of the EMA cut through the uplands and provide recharge to the Paso Robles Formation. On the southern ends of theThis percolating groundwater is not interconnected with surface water and is completely disconnected from the underlying regional groundwater table within the principal aquifers. Within these portions of the tributaries, the regional groundwater table is significantly lower than the elevation of the tributaries and there is no continuous saturated zone between the surface and water table, except in the lower ends of Alamo Pintado and Zanja de Cota Creeks. At the southern ends of these tributaries, groundwater present in the tributary alluvium encounters relatively impermeable bedrock adjacent to and beneath the Santa Ynez River, which forces the groundwater to discharge to surface water at these locations. This is most evident on the far southern ends of Alamo Pintado and Zanja de Cota Creeks at the confluence with the Santa Ynez River.

ES-2.5 ES-2.5 Groundwater Dependent Ecosystems (GDEs)

GDEs are defined under SGMA as “ecological communities of species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface.” GDE types include terrestrial vegetation that is supported by shallow groundwater that discharges to seeps, springs, wetlands, streams, and estuaries. Figure ES-2 shows the locations of potential GDEs in the EMA, as identified through screening methods developed by The Nature Conservancy and from local data on the spatial and temporal variations in the water table depth below ground surface. Biological surveys have not been completed in preparation of this GSP, but the presence of these potential GDEs will be verified during GSP implementation.

Several palustrine and riverine wetland features, three mapped springs, and five types of vegetation communities are present within the EMA. The five vegetation types are the following:

- Coast Live Oak
- Valley Oak
- Riparian Mixed Hardwoods
- Riversidean Alluvial Scrub
- Willow

The potential GDEs are further categorized based on their proximity to, and association with, the regional confined principal aquifers in the EMA. Category A GDEs are associated with the principal aquifers and may be affected by groundwater management activities, while Category B GDEs show a hydrogeologic separation from the principal aquifers and are unlikely to be affected by groundwater management activities. Category A GDEs are concentrated in the southwestern portion of the EMA in the areas surrounding the lower, generally perennial reaches of Alamo Pintado and Zanja de Cota Creeks. Category B GDEs are located in the northern and eastern portion of the EMA. The Category A potential GDEs are considered in the development of sustainable management criteria (Section 5) and in projects and management actions (Section 6).

Figure ES-2. Categorized Potential Groundwater Dependent Ecosystems

ES-2.6 The EMA GSA is fully supportive of the comprehensive and ongoing efforts, dating back to the 1990s, to develop and implement surface flow and non-flow measures in the mainstem lower Santa Ynez River and certain tributaries for the protection of public trust resources, including but not limited to steelhead and its critical habitat within the Santa Ynez River. The member agencies of the EMA GSA remain actively involved with numerous federal, state, and local entities in proceedings before the SWRCB and in the current re-consultation process under the federal Endangered Species Act to protect steelhead and its critical habitat in the lower Santa Ynez River. Notably, however, steelhead and other species residing in the Santa Ynez River depend on surface and underflow components of the surface water system and are not groundwater dependent based on the analyses set forth in this GSP.

ES-2.6 Water Budget Development

A water budget defines the sources and uses of water in a groundwater basin and how they have changed over time. The water budget in this GSP is an inventory and accounting of total surface water and groundwater inflows (recharge) and outflows (discharge) from the EMA, including the following:

Surface Water Inflows (Santa Ynez River):

- Streamflow and subsurface inflow into the Santa Ynez River Alluvium from both the upstream Santa Ynez River and Santa Ynez Uplands tributaries
- Runoff of precipitation into streams and rivers or diversion structures that enter the EMA from the surrounding watershed
- Irrigation return flow to the Santa Ynez River Alluvium
- Return flows from septic systems
- Imported surface water (e.g., from the State Water Project)

Surface Water Outflows (Santa Ynez River):

- Streamflow exiting the EMA through the Santa Ynez River and Zaca Creek
- Subsurface flow through the Santa Ynez River Alluvium downstream towards the Central Management Area
- Pumping from river wells completed in the Santa Ynez River Alluvium
- Evapotranspiration by plants

Groundwater Inflows:

- Recharge from precipitation
- Percolation of tributary flows to groundwater
- Subsurface groundwater inflow, including mountain front recharge
- IrrigationAgricultural irrigation return flow (water not consumed by crops/landscaping)
- Percolation of treated wastewater
- Septic tank return flows
- Urban irrigation return flow (including water distribution system leakage and water from imported sources)

Groundwater Outflows:

- Groundwater pumping

- Evapotranspiration by crops and phreatophyte plants
- Subsurface groundwater outflows to adjoining groundwater systems
- Groundwater discharge to surface water

The historical and current water budget analysis was developed in a tabular accounting format by water year using various publicly available data sets. The projected water budget analysis was developed in part using the EMA numerical groundwater flow model. The groundwater inflow and outflow components of the water budget are related to the principal aquifers, (the Paso Robles Formation and the Careaga Sand,) in the Santa Ynez Uplands portion of the EMA. The difference between inflows to and outflows from the groundwater system in the Santa Ynez Uplands is equal to the change of groundwater in storage.

The estimated inflow and outflow components as well as the estimated sustainable yield are presented in this GSP. SGMA requires that, within 20 years, basins avoid significant and unreasonable effects that could lead to undesirable results as a result of groundwater use.conditions occurring throughout the EMA. Undesirable results include chronic lowering of groundwater levels over time that leads toindicating a significant and unreasonable depletion of supply. This can occur when the average annual amount of groundwater extraction exceeds the long-term average annual supply of water to the basin. It is normal for groundwater basins to experience increases and decreases in storage in response to the normal dry and wet hydrologic cycles.

The water budget for the historical period of 1982 through 2018 indicates that total groundwater outflow exceeded the total inflow in the EMA by an average of 1,830 AFY, as shown in Figure ES-3.

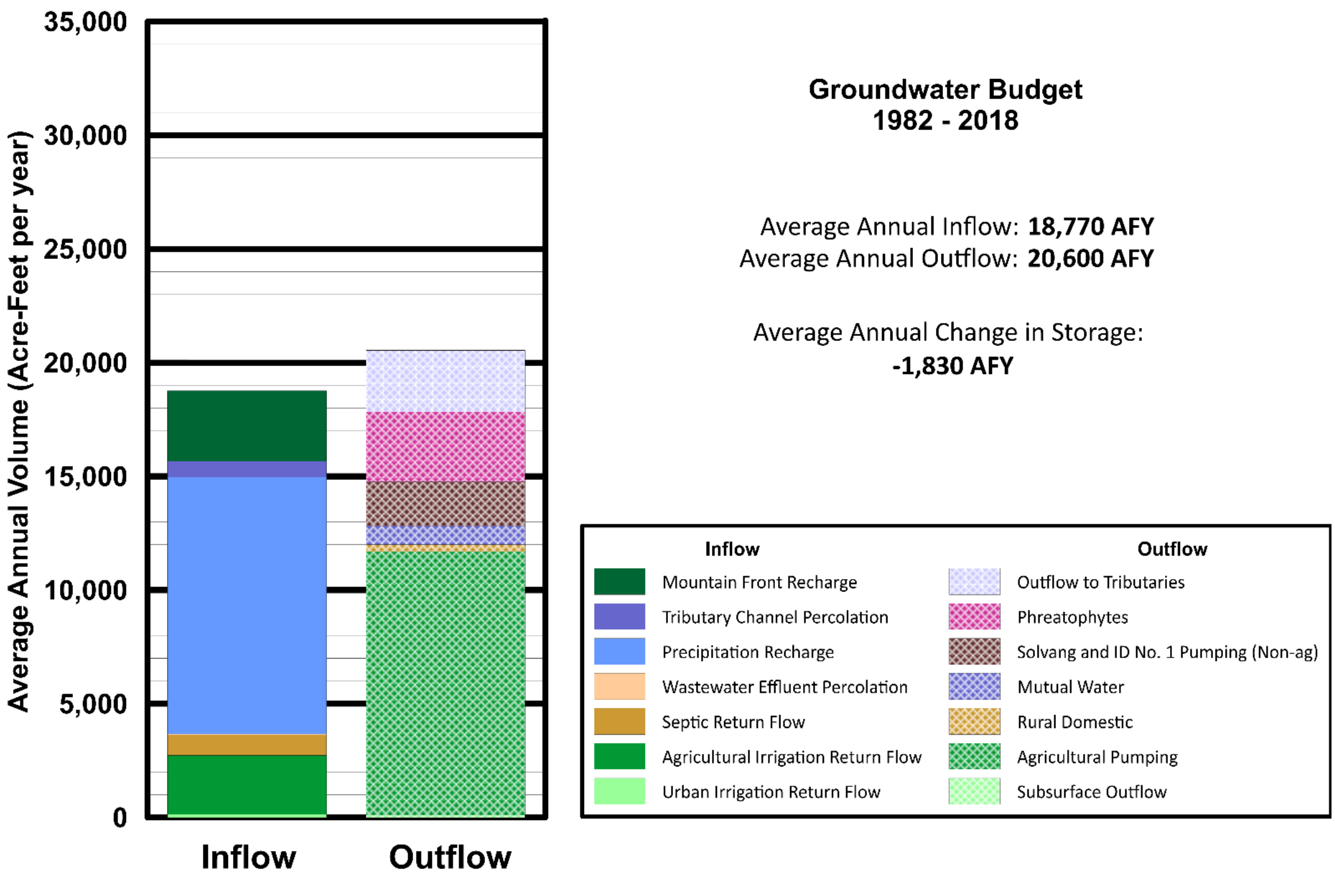


Figure ES-3. Average Groundwater Budget Volumes, Historical Period (1982 through 2018)

The sustainable yield in the EMA was estimated by adding the average change of groundwater in storage (negative 1,830 AFY) to the estimated total average amount of groundwater pumping (14,700 AFY) for the historical period. This results in a sustainable yield of about 12,870 AFY. This estimated value reflects historical climatic and hydrologic conditions and provides insight into the average amount of groundwater pumping that can be sustained in the EMA without causing undesirable results as defined by SGMA. The sustainable yield is not a fixed constant value but can fluctuate over time as the groundwater inflows and outflows change; thus, the calculated sustainable yield within the EMA can be estimated and likely modified during a future update of the GSP, depending on the representativeness of the long-term hydrologic conditions present at that time or availability of improved estimates of the water budget components.

ES-2.7 ES-2.7 Projected Water Budget

The projected water budget is used to assess how future land use, pumping, and climate conditions affect the EMA. Based on the conditions documented in the historical water budget, the inflow and outflow from the EMA were estimated throughout the GSP implementation period through 2042 as well as for 50 total years after this GSP is submitted, through 2072. Historical climate values were projected forward into the future, and modified by projected climate change impacts on streamflow, recharge, evapotranspiration, and precipitation. The subsurface groundwater inflow and outflow components were projected using anticipated future land uses, population growth, and related pumping volumes.

The DWR-provided climate change data are based on the California Water Commission's Water Storage Investment Program climate change analysis results, which used global climate models and radiative forcing scenarios recommended for hydrologic studies in California by the Climate Change Technical Advisory Group. Climate data from the recommended General Circulation Model models and scenarios have also been downscaled and aggregated to generate an ensemble time series of change factors that describe the projected average change in precipitation and evapotranspiration (ET) values for climate conditions that are expected to prevail at midcentury and late century, centered around 2030 and 2070, respectively.

Within the entire Basin, and therefore the EMA, streamflow is projected to increase slightly on average, by 0.5 percent in 2030 and 3.8 percent in 2070, based on the average DWR climate change factors and other factors in the variable infiltration capacity analyses for the Basin. The projected changes to streamflow resulting from the climate change factors have been applied to the flow that will occur through the tributaries that flow through the Santa Ynez Uplands and ultimately into the Santa Ynez River. Crops require more water to sustain growth in a warmer climate, and this increased water requirement is characterized in climate models using the rate of ET. Under 2030 conditions, the EMA is projected to experience average annual ET increases of 3.8 percent relative to the historical period. Under 2070 conditions, annual ET is projected to increase by 8 percent relative to the historical period. The seasonal timing of precipitation in the EMA is projected to change. Sharp decreases in early fall and late spring precipitation accompanied by increases in winter and early summer precipitation are projected to occur. Under 2030 conditions, the largest monthly changes would occur in May with projected decreases of 14 percent, while increases of approximately 9 percent and 10 percent are projected in March and August, respectively. Under 2070 conditions, decreases of up to 31 percent are projected in May while the largest increases are projected to occur in September (25 percent) and January (17 percent). TheOn average, the EMA is projected to experience minimal changes in total annual precipitation, although, the drought that has continued since before 2012 is concerning to Basin stakeholders.

Groundwater outflows from the Santa Ynez Uplands are projected to exceed inflows in the future in the absence of GSA management actions. During the historical period, production from wells in the Santa Ynez Uplands served increasing demands for areas that did not have access to surface water supply. In the future, it is assumed surface water supplies, including imported water sources, will not be sufficient to meet new demand from agricultural, municipal, and industrial uses, and therefore increased demand would be supplied by local groundwater.

The combined effects of these changes in supply and demand are that total groundwater pumping in the EMA may increase by approximately 1.1 percent, from 14,760 AFY under historical conditions to 14,920 AFY under 2042 conditions, and to 14,840 AFY by 2072, unless measures are implemented to increase supply or reduce demand. The water budget calculations indicate that the current deficit (outflows exceeding inflows) could increase to an average of 2,060 AFY in 2042 and further to 2,270 AFY in 2072. This analysis demonstrates that, if demand for groundwater increases in the future, projects and management actions may be needed to address the current and projected deficit (overdraft) anticipated to remain in 2042, the year that DWR requires the Basin to be balanced and sustainable without undesirable results.

The projected water budget for year 2042 conditions is presented in Figure ES-4, which breaks out the inflow and outflow components of the water budget.

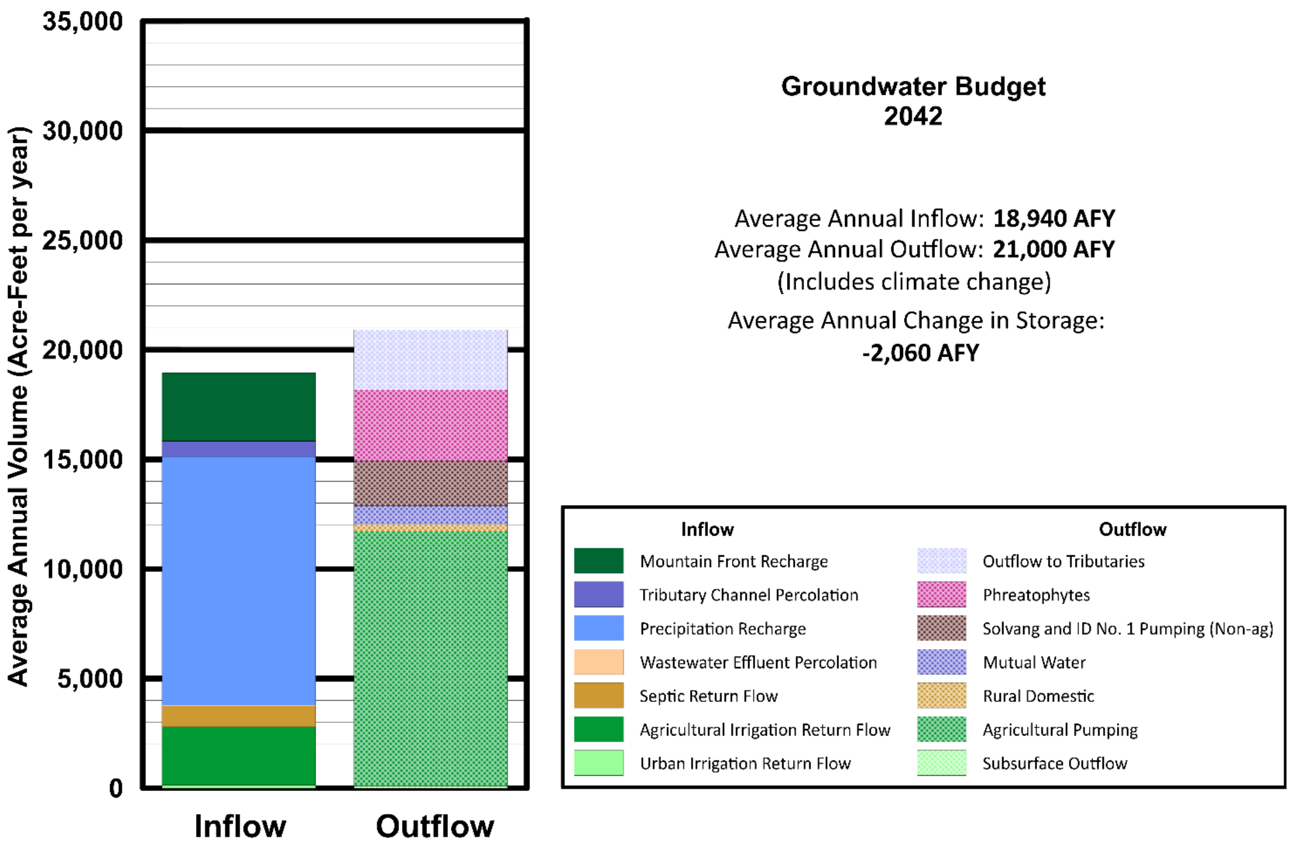


Figure ES-4. Projected Groundwater Budget, 2042

ES-3 ~~ES-3~~ Monitoring Networks (GSP Section 4)

This section of the GSP describes existing monitoring networks and improvements to the monitoring networks that ~~will be~~are being developed for implementation of the EMA GSP. The monitoring networks presented in this section are largely based on existing monitoring sites. During the 20-year GSP implementation period, it ~~may~~will be necessary to expand the existing monitoring networks and, if existing wells are unavailable, identify or install more monitoring sites to fully demonstrate sustainability and improve the groundwater flow model.

The groundwater level monitoring network section of this GSP is largely based on historical groundwater data compiled by the U.S. Geological Survey National Water Information System program, the California Statewide Groundwater Elevation Monitoring program, and semi-annual groundwater monitoring conducted by Santa Barbara County. The groundwater quality monitoring network section of this GSP is largely based on historical groundwater data compiled by the USGS Groundwater Ambient Monitoring and Assessment Program. The subsidence monitoring program will rely on existing Interferometric Synthetic Aperture Radar (InSAR) and University NAVSTAR Consortium (UNAVCO) satellite monitoring information, which may be supplemented with surveyed benchmarks if the satellite data suggest that subsidence is occurring as a result of groundwater pumping. Depletion of interconnected surface water and potential significant and unreasonable adverse impacts to GDEs will be monitored in new piezometers that will be installed in two tributaries where groundwater is interconnected with surface water. Data gaps have been identified in the monitoring programs that will be addressed during GSP implementation.

ES-3.1 ~~ES-3.1~~ Monitoring Plan for Water Levels, Change in Storage, Water Quality

The GSP monitoring network is composed of aquifer-specific wells that are screened in one of the two principal aquifers in the EMA (the Paso Robles Formation or the Careaga Sand). A total of 24 representative wells—defined in the SGMA regulations as monitoring sites that are representative of groundwater conditions in each of the principal aquifers—make up the groundwater level monitoring network in the EMA. Representative wells are spatially distributed to provide information across most of the EMA, have a reasonably long record of data so that trends can be determined, and have hydrograph signatures that are representative of groundwater levels in wells in the surrounding area. Additionally, there are 13 wells in the EMA that are monitored by Santa Barbara County that do not meet the criteria of representative wells, totaling 37 wells that are currently monitored in the EMA. The monitoring network will enable the collection of data to assess sustainability indicators, evaluate the effectiveness of management actions and projects that are designed to achieve sustainability, and evaluate adherence to minimum thresholds and measurable objectives for each applicable sustainability indicator.

The representative wells network consists of 24 wells (15 wells in the Paso Robles Formation and 9 wells in the Careaga Sand) that will be used to monitor groundwater levels and storage. Ten wells are production wells used for agricultural irrigation, seven wells are domestic drinking water wells, and seven wells are municipal drinking water wells. While not ideal for use as monitoring wells because they are production wells, these wells are currently included as representative wells because of their locations in the EMA, available well construction information, and long periods of record. The groundwater level monitoring network will be used to create groundwater elevation contour maps and calculate change of groundwater in storage for each principal aquifer.

The geographic distribution of this selection of representative wells allows for the collection of data to evaluate groundwater gradients and flow directions over time as well as the annual change in storage. Furthermore, the monitoring frequency of the wells will allow for the monitoring of seasonal highs and lows. Because wells were chosen with the existing lengths of historical data records in mind, future groundwater data will be comparable to the historical data. This coverage accounts for the ability to use each site for monitoring multiple sustainability indicators.

The groundwater quality monitoring network includes a total of 61 wells. This includes 26 municipal and public water system wells that were identified by reviewing data available from the SWRCB Division of Drinking Water, 25 agricultural supply wells, and 10 domestic supply wells included in the groundwater quality monitoring network. These wells were identified by reviewing data available from the SWRCB Irrigated Lands Regulatory Program (ILRP). In the future, wells that are sampled as part of the ILRP will be used to assess groundwater quality at agricultural and domestic wells.

ES-3.2 ES-3.2 Monitoring Plan for Land Subsidence

Locally defined significant and unreasonable conditions for land subsidence are (1) land subsidence rates exceeding rates estimated by using InSAR (satellite-based land surface elevation monitoring) data processed by TRE ALTAMIRA, Inc. for the period from June 13, 2015, through September 19, 2019, and by the National Aeronautics and Space Administration for the period between spring of 2015 and summer of 2017; and (2) land subsidence that causes significant and unreasonable damage to or substantially interferes with groundwater supply, land uses, infrastructure, and property interests. Total measured negative change in land surface elevation in the EMA based on these sources has been less than 0.06 foot (ft), or 0.015 ft per year. Recorded subsidence could be due to tectonic activity, groundwater extraction, oil and gas extraction, or a combination of the three. This is considered a minor rate of land surface elevation change and is relatively insignificant and not a major concern for the EMA GSA. The EMA GSA will continue to monitor annual land surface elevation change using InSAR and UNAVCO satellite systems.

ES-3.3 ES-3.3 Monitoring Plan for Interconnected Surface Water and GDEs

Avoiding significant and unreasonable adverse impacts on beneficial uses of interconnected surface water present in the EMA is the focus of the depletion of interconnected surface sustainability indicator. To avoid significant and unreasonable adverse impacts to high-priority GDEs, groundwater levels will be used as a proxy for monitoring interconnected surface water because installation of surface water gauging stations is not considered feasible due to access and channel configuration limitations. Shallow monitoring wells, or piezometers, are planned to be installed and monitored within the areas identified near the confluence of both Alamo Pintado and Zanja de Cota Creeks with the Santa Ynez River (see Figure 4-4). Monitoring of groundwater levels will be conducted to assess whether there is potential for a long-term depletion of interconnected surface water and undesirable results. caused by groundwater extraction. Groundwater levels measured below the maximum rooting depth of GDEs—along with observed significant and unreasonable loss of habitat relative to conditions existing when SGMA was enacted—would be considered an undesirable result.

ES-4 ES-4 Sustainable Management Criteria (SMCs) (GSP Section 5)

Section 5 defines the criteria by which sustainability will be evaluated, defines conditions that constitute sustainable groundwater management, and discusses the process by which the EMA GSA will characterize undesirable results and establish minimum thresholds and measurable objectives for each sustainability indicator in the EMA. Section 5 presents the data and methods used to develop SMCs and demonstrates how these criteria influence beneficial uses and users. The SMCs are considered initial criteria and will be reevaluated and potentially modified in the future as new data become available.

Sustainability indicators are the effects caused by groundwater conditions occurring throughout the EMA that, when significant, unreasonable, and caused by groundwater useconditions occurring throughout the EMA, become undesirable results. Undesirable results are one or more of the following effects:

- Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon
- Significant and unreasonable reduction in groundwater storage
- Significant and unreasonable degraded groundwater quality
- Significant and unreasonable land subsidence that substantially interferes with surface land uses
- Depletion of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water.

A wide variety of information was used to define minimum thresholds and measurable objectives for each sustainability indicator, which are measured at representative wells. Minimum thresholds and measurable objectives are generally defined as follows:

- **Minimum Threshold** – A minimum threshold is the numeric value for each sustainability indicator that is used to define undesirable results. For example, a particular groundwater level might be a minimum threshold if lower groundwater levels would result in a significant and unreasonable reduction of groundwater in storage or depletion of supply.
- **Measurable Objective** – Measurable objectives are specific, quantifiable goals or targets that reflect the EMA's desired groundwater conditions and allow the EMA GSA to achieve the sustainability goal within 20 years.

ES-4.1 ~~ES-4.1~~ Sustainability Goal

Because each of the groundwater management areas together encompass the entire Basin, a single sustainability goal has been adopted for the entire Santa Ynez River Valley Groundwater Basin as follows:

> In accordance with the Sustainable Groundwater Management Act (SGMA), the sustainability goal for the Santa Ynez River Valley Groundwater Basin (Basin) is to sustainably manage the groundwater resources in the Western, Central, and Eastern Management Areas to ensure that the Basin is operated within its sustainable yield for the protection of reasonable and beneficial uses and users of groundwater. The absence of undesirable results, as defined by SGMA and the Groundwater Sustainability Plans (GSPs), will indicate that the sustainability goal has been achieved. Sustainable groundwater management as implemented through the GSPs is designed to ensure that:
>
> 1. Long-term groundwater elevations are adequate to support existing and future reasonable and beneficial uses throughout the Basin,
> 2. A sufficient volume of groundwater storage remains available during drought conditions and recovers during wet conditions,
> 3. Groundwater production, and projects and management actions undertaken through SGMA, do not degrade water quality conditions in order to support ongoing reasonable and beneficial uses of groundwater for agricultural, municipal, domestic, industrial, and environmental purposes.
>
> Groundwater resources will be managed through projects and management actions implemented under the GSPs by the respective Groundwater Sustainability Agencies (GSAs). Management of the Basin will be supported by monitoring groundwater levels, groundwater in storage, groundwater quality, land surface elevations, and interconnected surface water~~, and seawater intrusion~~. The GSAs will adaptively manage any projects and management actions to ensure that the GSPs are effective and undesirable results are avoided.

The EMA GSP includes a monitoring program (see Section 4) that addresses each of the applicable sustainability indicators. If, based on the results of the monitoring program, minimum thresholds are exceeded such that undesirable effects are present or imminent, the GSA will identify management actions and projects that will be implemented to avoid an undesirable result (see Section 6). Other projects and management actions may be implemented immediately upon GSP adoption, without a specific nexus to undesirable results, to achieve the sustainability goal, address data gaps, and collect important data regarding basin conditions that are necessary for effective management of the EMA.

ES-4.2 ~~ES-4.2~~ Qualitative Objectives for Meeting Sustainability Goals

Qualitative objectives are designed to help stakeholders understand the overall purpose for sustainably managing groundwater resources (e.g., avoid chronic lowering of groundwater levels) and reflect the local economic, social, and environmental values within the EMA. A qualitative objective is often compared to a mission statement. The qualitative objectives for the EMA are the following:

- **Avoid Chronic Lowering of Groundwater Levels**
  - Maintain groundwater levels that continue to support current and ongoing beneficial uses and users of groundwater use in the EMA.
- **Avoid Significant and Unreasonable Reduction of Groundwater Storage**
  - Maintain sufficient groundwater volumes in storage to sustain current and ongoing beneficial uses and users of groundwater which maintains access to groundwater supplies, including during prolonged drought conditions while avoiding permanent degradation of GDEs resulting from groundwater ~~pumping~~conditions occurring throughout the EMA.
- **Avoid Significant and Unreasonable Degraded Groundwater Quality**
  - Maintain groundwater access to suitable water quality for all beneficial uses to ensure sustainability of groundwater drinking water supplies for all beneficial uses.
  - Evaluate changes in groundwater quality resulting from groundwater ~~pumping~~conditions occurring throughout the EMA.
- **Avoid Significant and Unreasonable Land Subsidence that Substantially Interferes with Surface Land Uses**
  - Reduce or prevent land subsidence that causes significant and unreasonable effects to groundwater supply, current land uses, and water supply infrastructure, and property interests.
- **Avoid Significant and Unreasonable Depletion of Interconnected Surface Water**
  - Avoid depletions of interconnected surface water that have significant and unreasonable adverse impacts to beneficial uses of the surface water, including GDEs, caused by groundwater ~~pumping~~conditions occurring throughout the EMA.
  - Maintain sufficient groundwater levels to maintain areas of interconnected surface water existing as of January 2015 when SGMA became effective.

ES-4.3 ~~ES-4.3~~ General Process for Establishing Sustainable Management Criteria

This section presents the process that was used to develop the SMCs for the EMA, including input obtained from EMA stakeholders, the criteria used to define undesirable results, and the information used to establish minimum thresholds and measurable objectives.

ES-4.3.1 ES-4.3.1 Obtain Public Input

The public input process was developed in conjunction with the GSA member agencies and included engagement with local stakeholders, the public at large, and interested parties on GSP issues. This included the formation of the Citizen's Advisory Group (CAG), whose members were selected by the GSA Committee because they represent the various beneficial uses and users of groundwater in the EMA. The SMCs and beneficial uses presented in this section were developed using a combination of information from public input, public meetings, written comments submitted to the GSA, hydrogeologic analysis, and meetings with CAG members.

ES-4.3.2 ES-4.3.2 Define Undesirable Results

Defining what is considered undesirable is one of the first steps in the SMC development process. The qualitative objectives for meeting sustainability goals are presented as ways of avoiding undesirable results for each of the sustainability indicators. The absence of undesirable results defines sustainability. The following are the general criteria used to define undesirable results in the EMA:

- There must be significant and unreasonable effects caused by groundwater conditions occurring throughout the ~~Basin~~EMA.
- A minimum threshold is exceeded in a specified number of representative wells over a prescribed period such that there is a depletion of supply.
- Impacts to beneficial uses, including to GDEs, are likely to occur.

These criteria may be refined periodically during the 20-year GSP implementation period based on monitoring data and analysis.

ES-4.4 ES-4.4 Summary of Sustainable Management Criteria

Table ES-1 summarizes the SMCs for the six groundwater sustainability indicators. The table describes the type(s) of potential undesirable results associated with each sustainability indicator, the minimum thresholds, and measurable objectives for each indicator. Detailed discussions of the SMCs for each groundwater sustainability indicator are provided in Sections 5.5 through 5.10 of this GSP.

Table ES-1. Summary of Sustainable Management Criteria

Potential Undesirable Results	Minimum Threshold	Measurable Objective	Other Notes
Chronic Lowering of Groundwater Levels			
Groundwater levels in the Paso Robles Formation or Careaga Sand aquifers remain below minimum thresholds after 2 consecutive years of average and above-average precipitation in 50 percent of representative wells. ~~Agricultural~~Existing agricultural, municipal, and domestic wells are unable to produce ~~historic average quantities~~the estimated sustainable yield of the EMA due to chronic decline in groundwater levels caused by groundwater conditions occurring throughout the EMA.	Paso Robles Formation wells: 15 feet below spring 2018 levels. Careaga Sand wells: 12 feet below spring 2018 levels.	Average groundwater levels measured at each representative monitoring site prior to the recent drought beginning in Water Year 2012.	Extended drought or high rates of pumping (exceeding the long-term rate of recharge) could lead to significant and unreasonable effects on groundwater levels.
Significant and Unreasonable Reduction of Groundwater in Storage			
Same as for chronic lowering of groundwater levels.	Same as for chronic lowering of groundwater levels.	Same as for chronic lowering of groundwater levels.	Same as for chronic lowering of groundwater levels.
Seawater Intrusion			
Not applicable (EMA is an inland basin)	N/A	N/A	N/A
Significant and Unreasonable Degraded Groundwater Quality			
Concentrations of regulated contaminants in untreated groundwater pumped from private domestic wells, agricultural wells, or municipal wells exceed regulatory thresholds as a result of ~~pumping~~groundwater conditions occurring throughout the EMA or GSA activities. Groundwater ~~pumping~~conditions occurring throughout the EMA or GSA activities cause concentrations of total dissolved solids (TDS), chloride, sulfate, boron, sodium, or nitrate to increase and exceed Basin Water Quality Objectives (WQOs) and is greater than concentrations in January 2015.	Concentrations of TDS, chloride, sulfate, boron, sodium, and nitrate are equal to or greater than WQOs in 50 percent of representative wells or are equal to concentrations in January 2015.	Do not make contamination issues worse; maintain groundwater quality equal to or below regulatory standards for contaminants, or equal to or below concentrations in January 2015. Maintain groundwater quality related to salts and nutrients equal to or below WQOs, or equal to or below concentrations in January 2015.	Minimum thresholds are not established for contaminants because state regulatory agencies have the responsibility and authority to regulate and direct actions that address contamination.
Significant and Unreasonable Land Subsidence that Substantially Interferes with Surface Land Uses			
Significant and unreasonable subsidence caused by groundwater ~~extraction~~conditions occurring throughout the EMA exceeds the minimum threshold *and* causes damage to structures and infrastructure and substantially interferes with surface land uses.	The rate of subsidence does not exceed 0.08 ft (1 inch) per year for 3 consecutive years.	Maintenance of current conditions as measured at the 95 percent confidence range of InSAR data, 0.053 ft per year.	Based on InSAR-measured subsidence and UNAVCO CGPS stations.
Depletion of Interconnected Surface Water that has Significant and Unreasonable Adverse Impacts to Beneficial Uses of Surface Water			
Permanent loss or significant and unreasonable adverse impacts to existing native riparian or aquatic habitat in the Category A (high-priority) GDE area due to lowered groundwater levels caused by ~~pumping.~~groundwater use.	Groundwater levels measured at the piezometers proposed to be installed in the GDE areas of Alamo Pintado and Zanja de Cota Creeks are 15 ft below the streambed.	Groundwater levels measured at 5 ft below the streambed (using the same piezometers as for the minimum threshold).	Avoiding impacts to GDEs will also avoid depletion of surface water that discharges to the Santa Ynez River. The areas near the confluence of Alamo Pintado and Zanja de Cota Creeks with the Santa Ynez River are the only locations identified in the EMA where groundwater from a principal aquifer is interconnected with surface water.

Notes

CGPS = Continuous Global Positioning System~~GDE = groundwater-dependent ecosystem~~

GDE = groundwater-dependent ecosystem

TDS = total dissolved solids

UNAVCO = University NAVSTAR Consortium

WQO = Water Quality Objective

Appendix I of this GSP presents a well location map and hydrographs showing the minimum threshold levels for each representative well that will be used to monitor for chronic lowering of groundwater levels and depletion of storage. The locations of GDEs near the confluence of Alamo Pintado and Zanja de Cota Creeks with the Santa Ynez River and the proposed interconnected surface water monitoring network are shown in Figure 4-4.

Interim milestones show how the GSA would move from current conditions to meeting the measurable objectives in the 20-year GSP implementation horizon. While no significant and unreasonable effect has been observed in the EMA as a result of lowering of groundwater levels to date, interim milestones are being proposed for lowering of groundwater levels and change in groundwater storage to ensure that the GSA is on track for eliminating the storage deficit going forward. The GSA intends to move forward with selected projects and management actions (see GSP Section 6) very early after GSP submittal to ensure that groundwater levels recover when normal or above normal rainfall conditions return. No interim milestones are proposed for degraded groundwater quality, land subsidence, or depletion of interconnected surface water, because no significant or unreasonable effects have been observed in the EMA associated with these sustainability indicators.

ES-5 ES-5 Management Actions and Projects (GSP Section 6)

Section 6 of the GSP describes the management actions that will be developed and implemented in the EMA to attain and maintain sustainability in accordance with SGMA regulations. Management actions are activities that support groundwater sustainability through policy and regulations without infrastructure. These actions are intended to optimize groundwater use to avoid undesirable results, consistent with SGMA regulations. Many are also intended to help improve the understanding of the EMA, enhance the monitoring program, enhance improved water use practices, and improve information upon which the GSA may make decisions. Projects are defined as activities supporting groundwater sustainability that require infrastructure.

The potential management actions described in this section include the following:

- Address data gaps
- Groundwater pumping fee program
- Well registration and well meter installation programs
- Water use efficiency programs
- Groundwater Base Pumping Allocation program
- Groundwater Extraction Credit marketing and trading program
- Voluntary agricultural crop fallowing and crop conversion programs

The identified management actions and potential future projects are categorized into three groups, with the management actions in Group 1 to be initiated within 1 year of GSP adoption by the GSA. The Group 2 management actions and Group 3 projects may be considered for implementation in the future as conditions dictate and the effectiveness of the other management actions are assessed. Group 1 management actions are focused primarily on filling identified data gaps, developing funding for GSA operations and future EMA monitoring, registering and metering wells, and developing new and expanding existing water use efficiency programs for implementation within the EMA. The Group 2 management actions and Group 3 projects may not be necessary if the implementation of Group 1 management actions results in conditions in the EMA that are trending toward meeting the EMA GSA sustainability goals and measurable objectives.

The projects and management actions included in this section should be considered a list of options that will be refined during GSP implementation. Stakeholders will be provided an opportunity to participate in the public process before projects and actions are undertaken. The effect of the management actions will be reviewed periodically, and additional Group 2 management actions and Group 3 projects may be considered and implemented as necessary to avoid undesirable results. A graphical depiction of the implementation sequence is presented in Figure ES-5.

Management actions included in the GSP are summarized below and are described in more detail in Sections 6.3 through 6.10.

ES-5.1 ES-5.1 Group 1 Management Action 1 – Address Data Gaps

Data gaps have been identified that require additional information because they are important for management of the EMA in the future. The following management actions will help fill these data gaps:

- Expanding Monitoring Well Network in the EMA to Increase Spatial Coverage and Well Density
- Performing Video Surveys in Representative Wells That Do Not Have Adequate Well Construction Records
- Installing Shallow Piezometers in Alamo Pintado Creek and Zanja de Cota Creek Identified GDE Areas
- Reviewing/Updating Water Usage Factors and Crop Acreages and Update Water Budget
- Surveying and Investigating Additional Potential GDEs in the EMA

ES-5.1.1 ES-5.1.1 Expand Monitoring Well Network in the EMA to Increase Spatial Coverage and Well Density

The areas where additional monitoring well data is needed are depicted in Figure 4-2. The data gap areas in both the Paso Robles Formation and the Careaga Sand units (the northwestern and north central portions of the uplands from Los Olivos to the northern boundary of the EMA, including the northern reaches of Zaca Creek and Alamo Pintado Creek) are locations where additional monitoring wells would improve the understanding of basin conditions. The proposed strategy for adding monitoring wells to the monitoring network will be to first incorporate existing wells to the extent possible. If an existing well in a particular area cannot be identified or permission to use data from an existing well cannot be secured to fill a data gap, then a new monitoring well may be considered.

ES-5.1.2 ES-5.1.2 Perform Video Surveys in Representative Wells That Currently Do Not Have Adequate Construction Records to Confirm Well Construction

Several of the representative wells that are planned to be included in the GSP monitoring well network do not have adequate documentation about their depths, geologic formations intersected, casing characteristics, screened intervals, pump settings, and/or well construction details. To address this data gap, the EMA GSA will perform video logging to ascertain well construction details, and the location of well production zones. Concurrent with the video surveys, EMA GSA representatives will interview each well owner regarding the well maintenance history, operational issues or events, surface issues that may affect the well, and water quality within the well.

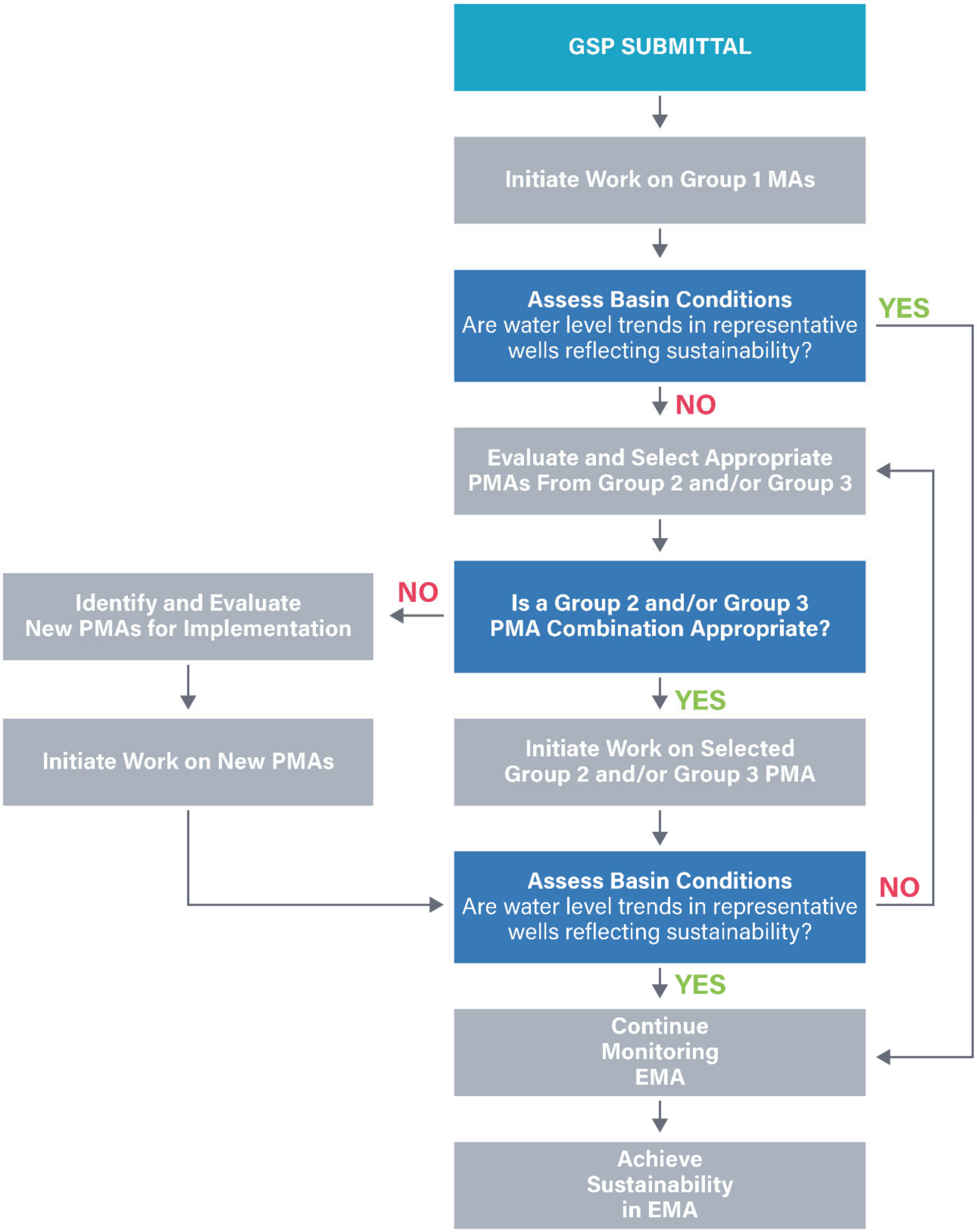


Figure ES-5. Adaptive Implementation Strategy for Projects and Management Actions

ES-5.1.3 ES-5.1.3 Install Shallow Piezometers in Alamo Pintado Creek and Zanja de Cota Creek Identified GDE Areas

To avoid undesirable results to GDEs and interconnected surface water discharging to the Santa Ynez River from the tributaries, construction of two shallow piezometers, are proposed within the GDE areas identified near the confluence of Alamo Pintado and Zanja de Cota Creeks with the Santa Ynez River (see Figure 4-4). The two proposed shallow piezometers will provide valuable data that will allow an enhanced understanding of the interconnected surface water system in high priority GDE areas and provide the basis for future refinements in the EMA hydrogeologic conceptual model.

ES-5.1.4 ES-5.1.4 Review/Update Water Usage Factors and Crop Acreages and Update Water Budget

While the accuracy of the DWR and SYRWCD data for irrigated crops for the recent years is relatively high, uncertainty remains regarding the estimates of water use on the irrigated lands within the EMA. To address this uncertainty, the EMA GSA plans to review and update water usage factors and crop acreages, which will be incorporated into future refinements in the EMA water budget.

ES-5.1.5 ES-5.1.5 Survey and Investigate Potential GDEs in the EMA

No biological or habitat surveys have been completed to verify the existence of potential GDEs in preparation of this GSP. A preliminary evaluation indicates there is insufficient data available to confirm the existence of the full nature and extent of Category A (high-priority) potential GDEs. To address this uncertainty, the recommended next step is to conduct field surveys to document and characterize the Category A potential GDEs. The findings from the proposed field surveys could be incorporated into future refinements in the EMA hydrogeologic conceptual model and SMCs.

ES-5.2 ES-5.2 Group 1 Management Action 2 – Groundwater Pumping Fee Program

As part of the GSP implementation process, the EMA GSA will explore various financing options to cover its operational costs and to generate funding for the ongoing EMA monitoring program and the implementation of Group 1 management actions and potential future Group 2 management actions and Group 3 projects. Based on the results of these efforts, the EMA GSA may adopt a management action to levy groundwater pumping fees to generate funding for the EMA GSA. The initial financing evaluation will be focused on program design, policy and regulatory development, compliance with the California Environmental Quality Act, and stakeholder outreach. The EMA GSA will identify and evaluate the most effective and equitable fee structure for the EMA.

ES-5.3 ES-5.3 Group 1 Management Action 3 – Well Registration and Well Meter Installation Programs

Well registration is intended to establish an accurate count of all the active wells in the EMA. Well metering is intended to improve estimates of the amount of groundwater extracted from the EMA. The EMA GSA will require that all groundwater production wells, including wells used by de minimis pumpers, be registered with the EMA GSA. The GSA may also develop and implement reporting protocols applicable to de minimis pumpers to ensure their production is reflected in the total amount of pumping in the EMA and to address circumstances where de minimis pumpers are or may be exceeding the de minimum thresholds. The EMA GSA will require all non-de minimis groundwater pumpers to report extractions at an interval to be determined by the EMA GSA using an approved method to estimate production. Guidelines and a regulatory framework will be developed to implement this program, which may also include a system for reporting and accounting for water conservation initiatives, voluntary irrigated land fallowing (temporary and permanent), stormwater capture projects, or other activities that individual pumpers may elect to implement.

ES-5.4 Group 1 Management Action 4 – Water Use Efficiency Programs

Urban, rural, and agricultural water use efficiency has been practiced in the EMA for more than two decades and has been effective in significantly reducing water use within the region outside of the EMA. Existing programs promote responsible design of landscapes and appropriate choices of appliances, irrigation equipment, and other water-using devices to enhance the efficient use of water. The water use efficiency management actions—to be developed for implementation by municipal, agricultural, and rural domestic pumpers—will promote expansion and supplementation of the water use efficiency programs that currently exist. These programs will also be aligned with the requirements of water conservation mandates that been put in place by the State of California. Two types of water use efficiency programs are proposed:

- **Urban and Domestic Water Use Efficiency Programs:** Initiatives that promote increasing water use efficiency by achieving reductions in the amount of water used for municipal, commercial, industrial, landscape irrigation, rural domestic, and aesthetic purposes. These programs can include incentives, public education, technical support, and other efficiency-enhancing programs.
- **Agricultural Water Use Efficiency Programs:** Initiatives that promote increasing water use and irrigation efficiency and achieving reductions in the amount of water used for agricultural irrigation. These programs can include incentives, public education, technical support, training, implementation of BMPs, and other efficiency-enhancing programs.

ES-5.5 ~~ES-5.4~~ Group 2 Management Action 5 – Groundwater Base Pumping Allocation

If Group 1 management actions do not avoid chronic groundwater level declines and reduction of groundwater in storage over the next 20-year period and beyond, the EMA GSA may seek to develop and implement a regulatory program to allocate a volume of groundwater to be pumped by users annually from the EMA. This program is referred to herein as the base pumping allocation (BPA) program. The amount of pumping reduction (if needed in the future) is uncertain and will depend on several factors including climate conditions, the effectiveness and timeliness of voluntary actions by pumpers, and the success of other planned and potential projects and management actions. The groundwater BPA Program would require various analyses and steps, including but not limited to:

- Establishing a methodology for determining baseline pumping considering:
  - Sustainable yield of the EMA
  - Groundwater level trends
  - Historical groundwater production
  - Land uses and corresponding water use requirements
  - Compliance with the California Environmental Quality Act
- Establishing a methodology to consider, among other factors determine groundwater, water rights and evaluation of anticipated benefits from other relevant actions individual pumpers take
- An implementation timeline
- Approving a formal regulation to enact the program

A baseline pumping allocation schedule could be implemented and adjusted over time, as needed, and according to relevant factors, to meet groundwater extraction targets in the EMA (consistent with the sustainable yield). Analyses would be updated periodically as new data are developed.

ES-5.6 ES-5.5 Group 2 Management Action 6 – Groundwater Extraction Credit (GEC) Marketing and Trading Program

As previously described, the EMA GSA may, as needed, develop and implement a Groundwater BPA Program that would assign pumping allocations in the EMA annually and, if necessary, impose a schedule on the pumping allocations over time to bring total pumping in the EMA within its sustainable yield within 20 years of GSP adoption. In conjunction with a Groundwater BPA Program, the EMA GSA may also pursue the development and implementation of a Groundwater Extraction Credit (GEC) Marketing and Trading Program to provide increased flexibility to groundwater producers in using their pumping allocations. The program could enable voluntary transfers of allocations between parties, on a temporary or permanent basis, through an exchange of GECs. Among other potential benefits, a GEC Marketing and Trading Program could assist existing groundwater users or new groundwater users in acquiring needed groundwater supplies from other pumpers, in the form of GECs, to support economic activities in the EMA, encourage and incentivize water conservation, enable temporary and permanent fallowing of agricultural lands, and facilitate a control of pumping allocations as needed during the 20-year GSP implementation period. As part of a GEC Marketing and Trading Program, the EMA GSA may consider a policy to define groundwater extraction carryover provisions from year to year and/or to allow multi-year pumping averages.

ES-5.7 ES-5.6 Group 2 Management Action 7 – Voluntary Agricultural Crop Fallowing and Crop Conversion Programs

The EMA GSA has identified voluntary agricultural crop fallowing and crop conversion as a potential management action that may be considered if Group 1 management actions are not proving effective in achieving sustainability in the EMA within 20 years of GSP adoption. As deemed necessary during the GSP implementation period, the EMA GSA may develop programs that would permit voluntary fallowing and land use conversions on a temporary or permanent basis as a means of reducing total water production in the EMA. As with the Groundwater BPA and GEC Marketing and Trading Programs discussed above, an important consideration in developing a voluntary fallowing and crop conversion program would be to include protections of water rights for producers who choose to fallow or carry out their land use conversions. As part of this management action, the EMA GSA would develop an EMA-wide accounting system that tracks landowners who decide to voluntarily fallow or convert their land and reduce groundwater pumping or otherwise refrain from using groundwater.

ES-5.8 ES-5.7 Group 3 Projects

Although the EMA GSA has no near-term plans to initiate construction of any specific projects for the purposes of achieving groundwater sustainability, the EMA GSA and/or other local agencies may be interested in proceeding with the study, planning, preliminary design/engineering, and permitting phases for several projects that were identified for potential future consideration. A description of the projects that the EMA GSA identified for future consideration and associated summary information are presented in Sections 6.10.1 through 6.10.10.

The projects that the EMA GSA identified for future consideration include:

- Distributed Storm Water Managed Aquifer Recharge (DSW-MAR) Basins (In-Channel and Off-Stream Basins)
- City of Solvang / Santa Ynez Community Services District WWTF Recycled Water and Reuse In Lieu of Groundwater Pumping or Indirect Potable Reuse
- Los Olivos Community Services District WWTF Recycled Water and Reuse In Lieu of Groundwater Pumping or Indirect Potable Reuse
- Santa Ynez Band of Chumash Indians WWTF Recycled Water and Reuse In Lieu of Groundwater Pumping or Indirect Potable Reuse
- GSA to become a Funding Partner to the Santa Barbara County Precipitation Enhancement Program
- Conjunctive Use – Managed Aquifer Recharge (MAR) Projects Using Imported (State Water Project [SWP] and Santa Ynez River [SYR]) Water
- In Lieu Recharge Projects to Deliver Unused and Surplus Imported Water to Offset Groundwater Extractions
- Aquifer Storage and Recovery Projects

ES-6 ES-6 Groundwater Sustainability Plan Implementation (GSP Section 7)

Section 7 provides a conceptual road map for efforts to implement the GSP after adoption and discusses implementation effects in accordance with SGMA regulations. This implementation plan is based on the current understanding of the EMA's conditions and anticipated administrative considerations that affect the management actions described in Section 6. Projects and management actions will address data gaps and reduce uncertainty, improve understanding of basin conditions and how they may change over time, and create opportunities to promote conservation and optimize water use in the EMA.

The EMA GSA plans to continually monitor and assess groundwater levels relative to SMCs, and under conditions where minimum thresholds are projected to be reached, the EMA GSA will perform assessments to determine whether the trends are related to groundwater pumping, drought conditions, or other factors. If groundwater level data are trending toward reaching minimum thresholds as a direct consequence of groundwater pumping in the EMA, then the EMA GSA may consider the implementation of Group 2 management actions and Group 3 projects. Conceptual planning-level cost estimates for implementing each management action are presented in Table 7-1, and potential funding sources are described in Section 7.7.

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SECTION 1: Introduction to Plan Contents [Article 5 §354]

§ 354 Introduction to Plan Contents. This Article describes the required contents of Plans submitted to the Department for evaluation, including administrative information, a description of the basin setting, sustainable management criteria, description of the monitoring network, and projects and management actions.

This section describes the purpose of this Groundwater Sustainability Plan (GSP), the Santa Ynez River Valley Groundwater Basin (Basin) – Eastern Management Area (EMA), and how this GSP is organized.

1.1 Purpose of the Groundwater Sustainability Plan

In 2014, the State of California enacted the Sustainable Groundwater Management Act (SGMA). This law requires groundwater basins in California that are designated as medium or high priority be managed sustainably. Satisfying the requirements of SGMA generally requires four basic activities:

1. Forming one or multiple Groundwater Sustainability Agency(s) (GSAs) to fully cover a basin
2. Developing one or multiple GSPs that fully cover the basin
3. Implementing the GSP and managing to achieve quantifiable objectives
4. Regular reporting to the California Department of Water Resources (DWR)

This document fulfills the GSP requirement for the EMA GSA. This GSP describes the EMA, develops quantifiable management objectives that account for the interests of the EMA's beneficial groundwater uses and users, and identifies a group of projects and management actions that will allow the EMA to achieve sustainability within 20 years of plan adoption.

This GSP was developed specifically to comply with SGMA's statutory and regulatory requirements. As such, the GSP uses the terminology set forth in these requirements (see California Water Code § 10721 and 23 California Code of Regulations § 351), which may be different from the terminology used in other contexts (e.g., past reports or studies, past analyses, judicial rules, or findings).

1.2 Description of the Santa Ynez River Valley Groundwater Basin – Eastern Management Area

The Basin is identified by DWR in Bulletin 118 as Basin No. 3-015 (DWR, 2016). The Basin is located in central Santa Barbara County in the Central Coastal region of California. For the purposes of groundwater management and SGMA compliance, the Notice of Decision to Become a GSA, dated May 1, 2017, describes the organization of SGMA compliance for the Basin with the creation of three management areas: the Western Management Area, the Central Management Area, and the EMA (see Appendix A).

The EMA is within the Basin, as presented on Figure 1-1. The total area of the EMA is about 130 square miles. The land surface elevation ranges from 480 feet at the mouth of Alamo Pintado Creek south of Solvang to about 2,390 feet in the foothills of the San Rafael Mountains on the northeast side of the EMA. The San Rafael Range continues beyond the boundaries of the EMA, reaching elevations of 4,000 to 6,000 feet above mean sea level (LaFreniere and French, 1968). The EMA boundary delineates the northeast portion of the groundwater basin; however, the watershed includes a larger area that contributes surface water to the EMA.

Figure 1-1. Santa Ynez River Valley Groundwater Basin

1.3 How this GSP is Organized

This GSP has been planned and developed collaboratively by the member agencies making up the EMA GSA. The organization of this plan is as follows:

- **Section 1 – Introduction to Plan Contents:** An introduction to the GSP, including a description of its purpose and a brief description of the EMA.
- **Section 2 – Administrative Information:** Includes the following:
  - Information on the EMA GSA as an organization and a brief description of the agencies participating in the GSA, including information on the legal authority of the GSA to plan and coordinate groundwater sustainability for the EMA.
  - An overview description of the EMA, including land use and agencies with jurisdiction, a description of the existing groundwater management plans and regulatory programs, any programs for conjunctive use, and urban land use programs that might have an effect on, or be affected by, this GSP.
  - The EMA GSA's ~~communications~~communication and engagement planning and implementation, public feedback and stakeholder comments on the plan, how feedback was incorporated into the GSP, and responses to comments received
- **Section 3 – Basin Setting:** Includes the following:
  - An explanation of the hydrogeologic conceptual model developed for the EMA that includes descriptions of the regional hydrology and geology, principal aquifers and aquitards, and a description of the data gaps in the current model.
  - A detailed description of the groundwater conditions, including groundwater elevations and changes in storage, groundwater quality for drinking water and agricultural irrigation and trends over time, ~~any issues related to~~an evaluation of land subsidence, locations where surface water and groundwater are interconnected, and the identification and distribution of groundwater-dependent ecosystems.
  - A presentation of the historical, current, and projected future water budgets for the EMA; how the water budgets were developed; an estimate of sustainable yield for the EMA; and the effects of climate change using the California Department of Water Resources (DWR) climate change assumptions.
- **Section 4 – Monitoring Networks:** A detailed description of the monitoring objectives and monitoring in the EMA for groundwater levels, storage, water quality, land subsidence, interconnected surface water, ~~as well as~~ representative monitoring sites, and a description of the data management and reporting system.
- **Section 5 – Sustainable Management Criteria:** Defines the sustainability goal for the EMA~~,~~; describes the process through which ~~sustainable management criteria (~~the SMCs~~)~~ were established; describes significant and unreasonable effects that could lead to undesirable results as a result of groundwater ~~use;~~conditions occurring throughout the EMA describes and defines SMCs regarding chronic lowering of groundwater levels, significant and unreasonable reduction in groundwater storage, ~~seawater intrusion,~~ degraded groundwater quality, land subsidence, and depletion of interconnected surface water~~;~~ (including quantity and timing of surface water depletion); and describes the minimum thresholds, measurable objectives, and interim milestones to avoid undesirable results.
- **Section 6 – Projects and Management Actions:** Provides a grouping~~,~~ and description of each project and management action that may be developed and implemented by the EMA GSA to avoid undesirable results and ensure sustainability within 20 years of GSP adoption.

- **Section 7 – Groundwater Sustainability Plan Implementation:** Describes the implementation sequence for projects and management actions, overall schedule, estimated implementation costs, and sources of funding.

1.4 References

DWR. 2018. Bulletin 118 Basin Boundary Description 3-015, Santa Ynez River Valley. Prepared by the California Department of Water Resources (DWR). Available at https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Bulletin-118/Files/2016-Basin-Boundary-Descriptions/3_015_SantaYnezRiverValley.pdf. (Accessed July 26, 2021.)

LaFreniere, G.F., and J.J. French. 1968. Ground-Water Resources of the Santa Ynez Upland Ground-Water Basin, Santa Barbara County, California. Prepared by G.F. LaFreniere and J.J. French in cooperation with the Santa Barbara County Water Agency for the U. S. Geological Survey.

SECTION 2: Administrative Information [Article 5, SubArticle 1]

§ 354.2 Introduction to Administrative Information. This Subarticle describes information in the Plan relating to administrative and other general information about the Agency that has adopted the Plan and the area covered by the Plan.

2.1 Agency Information [§ 354.6]

On May 23, 2016, eight agencies, including the Santa Ynez River Water Conservation District (SYRWCD); Santa Barbara County Water Agency (Water Agency); the City of Solvang; and the SYRWCD, Improvement District No. 1 (ID No. 1); along with the Cities of Buellton and Lompoc and the Vandenberg Village and Mission Hills Community Services Districts, entered into a memorandum of understanding (2016 MOU).[1] The 2016 MOU outlined a structure for implementing Sustainable Groundwater Management Act (SGMA) in the Santa Ynez River Valley Groundwater Basin (Basin); the formation of three Groundwater Sustainability Agencies (GSAs) for the Western Management Area (WMA), Central Management Area (CMA), and Eastern Management Area (EMA); and the development of a separate Groundwater Sustainability Plan (GSP) for each GSA.

On April 27, 2017, the SYRWCD, the Water Agency, the City of Solvang, and ID No. 1 entered into a memorandum of agreement (2017 MOA)[2] providing for the formation of the EMA GSA, the development of this GSP, the implementation of a hydrogeologic study, and the establishment of a GSA Committee for the EMA. The 2017 MOA also outlines the powers of the GSA and establishes how each signing party bears the costs of the outlined efforts. The 2017 MOA is described in further detail in Section 2.1.2.3 and is presented in Appendix A.

On February 26, 2020, the eight parties to the 2016 MOU entered into an Intra-Basin Administrative Agreement (Administrative Agreement)[3] to coordinate implementation of the SGMA among the three GSAs in the Basin (see Appendix A). This agreement provides a framework for ongoing cooperation to ensure that the three GSPs are developed and implemented using the same data and methodologies for key assumptions (e.g., groundwater elevation data, water budget, etc.) and that components of the three GSPs needed to achieve the sustainability goal for the Basin are based on a consistent understanding of the Basin setting. The agreement further outlines how the GSAs will coordinate distribution of California Department of Water Resources (DWR) grant funds, as well as cost sharing for joint services.

AAdditionally, a Coordination Agreement is being draftedhas been prepared and entered into between the parties to address GSAs in accordance with SGMA requirements. It will be A copy of the Agreement is included with the Final GSP that is submitted to DWR.

[1] Memorandum of Understanding for Implementation of the Sustainable Groundwater Management Act in the Santa Ynez Valley Groundwater Basin (see Appendix A).
[2] Memorandum of Agreement for Formation of a Groundwater Sustainability Agency for the Eastern Management Area in the Santa Ynez River Valley Groundwater Basin Under the Sustainable Groundwater Management Act (see Appendix A).
[3] Intra-Basin Administrative Agreement for Implementation of the Sustainable Groundwater Management Act in the Santa Ynez River Valley Groundwater Basin (see Appendix A).

2.1.1 Name and Mailing Address

§ 354.6 Agency Information. When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information:

(a) The name and mailing address of the Agency.

The following contact information is provided for the EMA GSA pursuant to California Water Code § 10723.8:

Santa Ynez River Valley Groundwater Basin Eastern Management Area GSA
Mailing Address: P.O. Box 719
Physical Address (no mail delivery): 3669 Sagunto Street, Suite 101 Santa Ynez, CA 93460

2.1.2 Organization and Management Structure

§ 354.6 Agency Information. When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information:

(b) The organization and management structure of the Agency, identifying persons with management authority for implementation of the Plan.

2.1.2.1 Agencies Participating in the GSA

The organization and management structures of each of the four member agencies in the EMA are described below.

Santa Ynez River Water Conservation District

The SYRWCD was formed in 1939 for the primary purpose of protecting water rights on the lower Santa Ynez River. The SYRWCD extends over approximately 180,000 acres in central Santa Barbara County (County). Water production within the SYRWCD is used for domestic, municipal, industrial, and agricultural purposes.

Under the Water Conservation District Law of 1931, the SYRWCD has collected a groundwater charge since 1979 to supplement ad valorem property taxes (on land only) to fund its operations. The groundwater charge is based on self-reported production from owners' wells in the SYRWCD. There are currently six groundwater charge zones in the SYRWCD. There is a differential charge for agricultural water, special irrigation water (such as parks, golf courses), and other (non-agricultural, non-special) water uses. Water code dictates that other water rates may be no less than three times the agricultural rates.

The principal enabling act for formation of SYRWCD is California Water Code § 74000 et seq. SYRWCD is governed by a five-member board of directors. Directors are elected by the registered voters in SYRWCD boundaries to staggered 4-year terms; there is no limit to how many terms a board member may serve. The board meets quarterly to discuss regular business, and as needed to discuss special agenda items. The board is the legislative body of the district that determines the policies by which SYRWCD operates. SYRWCD's staff include a general manager, a groundwater program manager, and a district administrator. Staff also fill the roles of board secretary and treasurer. The board is also supported and advised by its own legal counsel. SYRWCD is the point of contact with DWR for the EMA GSA, according to California Code of Regulations (CCR) Title 23, § 357.4.

Santa Barbara County Water Agency

The Water Agency was established by the state legislature in 1945 to control and conserve storm, flood, and other surface waters for beneficial use and to enter into contracts for water supply. The Water Agency was originally empowered under California Water Code § 30000 et seq. The Water Agency is part of the Santa Barbara County Public Works Department and is responsible for the following:

- Preparing investigations and reports on the County's water requirements, groundwater conditions, efficient use of water, and other water supply related technical studies.
- Managing County-wide programs, including the Integrated Regional Water Management (IRWM) Program, Regional Water Efficiency Program, and winter cloud seeding program.
- Providing technical assistance to other County departments, water districts, and the public concerning water availability.
- Administering certain provisions of the Cachuma Project and the Twitchell Dam Project contracts with the U.S. Bureau of Reclamation (USBR).
- Participating in GSAs.

City of Solvang

The City of Solvang was incorporated on May 1, 1985. Its City Council includes a mayor, mayor pro tempore, and three council members. The mayor and one council member each serve a 2-year term and all other council members serve 4-year terms. The City Council meets the second and fourth Mondays of each month. The City of Solvang Municipal Code[4] includes regulations on Water and Sewer, Zoning, Subdivisions, and Stormwater.

Santa Ynez River Water Conservation District, Improvement District No. 1

ID No. 1 was formed on July 7, 1959, under the Water Conservation Law of 1931, Division 21, § 74000 et seq. of the California Water Code as an Improvement District within the SYRWCD, for the purposes of furnishing water to its customers within its boundaries. ID No. 1's operations are governed by rules and regulations for water service for ID No. 1. The most recent version of the Rules and Regulations was adopted by the Board on March 20, 2018.

2.1.2.2 Memorandum of Agreement for GSP Development

The four member agencies participating in the EMA GSA entered into an MOA in April 2017. The 2017 MOA forms a GSA for the EMA and facilitates a cooperative and ongoing working relationship between the parties to develop a GSP for the EMA. The GSP developed under this MOA will be considered for adoption by the EMA GSA and the adopted GSP subsequently will be submitted to DWR for approval. The GSA may decide to enter into a new agreement to coordinate GSP implementation at that time. A copy of the 2017 MOA is included in Appendix A.

[4] The City of Solvang Municipal Code is available here: http://qcode.us/codes/solvang/. (Accessed March 22, 2021.)

The 2017 MOA establishes the EMA GSA Committee (Committee), consisting of one representative and one alternate from each of the four member agencies. The representative is an elected official while the alternate is either an elected official or staff, as appointed by the governing body of the member agency. The 2017 MOA outlines voting within the Committee and the Committee's powers and responsibilities. The Committee conducts activities related to GSP development and SGMA implementation, including but not limited to the following:

- Developing a SGMA-compliant GSP.
- Reviewing and participating in the selection of consultants related to GSA efforts.
- Developing annual budgets and additional funding needs.
- Developing a stakeholder engagement plan.
- Coordinating with the other two GSAs in the Basin.

The full list of activities the Committee is authorized to undertake is included in the 2017 MOA (see Appendix A).

2.1.2.3 Administrative Agreement and Coordination Agreement

As described in Section 2.1, eight parties in the Basin entered into the Administrative Agreement in 2020, which provides context for the three GSAs in the Basin to work together to prepare three GSPs for the Basin (see Appendix A). The Administrative Agreement describes the division of DWR grant funding for GSP development among the three GSAs and cost sharing, when appropriate, for basin-wide activities. Importantly, the Administrative Agreement also requires the three GSAs to prepare a Coordination Agreement in accordance with SGMA and the SGMA regulations to ensure that the three GSPs are developed and implemented using the same data and methodologies for key assumptions (e.g., groundwater elevation and extraction data, surface water supply, total water use, change in groundwater storage, water budget, and sustainable yield). A Coordination Agreement ~~is being developed~~has been prepared and entered into among the three GSAs and ~~will be adopted by each GSA and included as part of each of~~has been submitted with the three GSPs for the Basin ~~being submitted~~ to DWR.

2.1.3 Plan Manager and Contact Information

§ 354.6 Agency Information. When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information:

(c) The name and contact information, including the phone number, mailing address and electronic mail address, of the plan manager.

The address and telephone number for the EMA GSP plan manager is listed below:

Bill Buelow, GSA Coordinator
Santa Ynez River Valley Groundwater Basin
Eastern Management Area GSA
P.O. Box 719
3669 Sagunto Street, Suite 101
Santa Ynez, CA 93460

Phone: 805-693-1156
e-mail: bbuelow@syrwcd.com

2.1.4 Legal Authority

§ 354.6 Agency Information. When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information:

(d) The legal authority of the Agency, with specific reference to citations setting forth the duties, powers, and responsibilities of the Agency, demonstrating that the Agency has the legal authority to implement the Plan.

As part of its creation, the 2017 MOA for the GSA Committee granted it authority to have all powers that a GSA is authorized to exercise as provided by SGMA, including, but not limited to, developing a GSP and imposing fees to fund GSA and GSP activities.

In accordance with California Water Code § 10720.5 (b) "Nothing in this part, or in any groundwater management plan adopted pursuant to this, part determines or alters surface water rights or groundwater rights under common law or any provision of law that determines or grants surface water rights." Accordingly, this GSP does not determine or alter such surface water or groundwater rights.

Figure 2-1 shows the extent of the GSP plan area for the EMA, which is the Santa Ynez Uplands Area, along with the jurisdictional boundary of each of the four member agencies of the EMA GSA. The entire plan area is covered by the four agencies; no portion of the EMA is covered by an exclusive agency.[5] No authority is needed from any other GSA or agency to implement this GSP.

2.1.5 Cost and Funding of Plan Implementation

§ 354.6 Agency Information. When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information:

(e) An estimate of the cost of implementing the Plan and a general description of how the Agency plans to meet those costs.

Costs and options for funding the EMA GSP are presented in Section 7.

[5] The Santa Ynez Band of Chumash Indians has sovereignty over the Santa Ynez Reservation but is not a member agency of the GSA implementing this GSP.

2.2 Description of Plan Area [§ 354.8]

This GSP covers the entire EMA, which lies in the eastern portion of the Basin, in north Santa Barbara County. As presented on Figure 2-1, the EMA portion of the Basin is bounded on the north and east by the San Rafael Mountains and on the northwest by the adjacent San Antonio Creek Valley Groundwater Basin. The southern boundary of the EMA to the south is adjacent to the Santa Ynez Mountains. The southwest portion of the EMA is adjacent to the CMA and beyond to the rest of the Basin (DWR, 2018). Average precipitation within the EMA varies from a maximum of about 24 inches per year in the higher elevations to a minimum of about 15 inches per year in the southern and central areas (Santa Barbara County, 2012).

The EMA includes the City of Solvang; the unincorporated townships of Santa Ynez, Los Olivos, and Ballard; properties of the Santa Ynez Band of Mission Indians; and remaining unincorporated areas extending throughout the EMA (see Figure 2-2). The unincorporated areas consist of ranchettes (occupying parcels that are 5 to 20 acres in size) and larger agricultural parcels. The City of Solvang and ID No.1 provide retail water service to their respective service areas. Additionally, water is produced from private wells for domestic and agricultural uses both inside and outside of the retail water service areas. The SYRWCD covers approximately 33 percent of the EMA area in two non-contiguous areas, one in the southwestern portion of the EMA and the other around Cachuma Reservoir (Lake Cachuma). The City of Solvang and ID No. 1 are entirely within the SYRWCD boundary. The remainder of the EMA outside of the SYRWCD, the City of Solvang, and ID No.1 boundaries is under the jurisdiction of the Water Agency, as described by SGMA. Estimates of pumping within the EMA vary widely over time and are largely unknown outside of the SYRWCD boundary. Estimates of pumping in these areas have been made using crop type, acreage, and crop water use factors. Changes in pumping volumes are attributed to changes in agricultural practices and residential development.

The Santa Ynez River drains the entire Santa Ynez watershed as it flows through its southern end. From its origins in the Los Padres National Forest to the east near Divide Peak and the Ventura County border, the river enters three man-made reservoirs, including Jameson Lake, Gibraltar Reservoir, and Lake Cachuma. Two tributaries from the Santa Ynez Uplands Area, Santa Cruz Creek and Cachuma Creek, feed Lake Cachuma, the largest of the three reservoirs. The Bradbury Dam impounds Lake Cachuma; downstream, the Santa Ynez River flows west through the EMA. Within the EMA, the Santa Ynez River is joined by several tributaries, including Santa Agueda Creek, Zanja de Cota Creek, and Alamo Pintado Creek. Highway 154 is the most significant east-west highway in the EMA; Highway 246 also runs east-west across western third of the EMA.

Figure 2-1. Area Covered by GSP

Figure 2-2. Federal, State, and Tribal Jurisdictional Areas

2.2.1 Summary of Jurisdictional Areas and Other Features

2.2.1.1 Adjudicated Areas, Other GSA, And Alternative Plans

§ 354.8 Description of Plan Area. Each Plan shall include a description of the geographic areas covered, including the following information:

(a) One or more maps of the basin that depict the following, as applicable:

(1) The area covered by the Plan, delineating areas managed by the Agency as an exclusive Agency and any areas for which the Agency is not an exclusive Agency, and the name and location of any adjacent basins.

(2) Adjudicated areas, other Agencies within the basin, and areas covered by an Alternative.

(3) Jurisdictional boundaries of federal or state land (including the identity of the agency with jurisdiction over that land), tribal land, cities, counties, agencies with water management responsibilities, and areas covered by relevant general plans.

(4) Existing land use designations and the identification of water use sector and water source type.

(5) The density of wells per square mile, by dasymetric or similar mapping techniques, showing the general distribution of agricultural, industrial, and domestic water supply wells in the basin, including de minimis extractors, and the location and extent of communities dependent upon groundwater, utilizing data provided by the Department, as specified in Section 353.2, or the best available information.

(b) A written description of the Plan area, including a summary of the jurisdictional areas and other features depicted on the map.

As of the date that this GSP was completed and submitted to DWR for evaluation, no part of the Basin nor any surrounding basin has been identified in SGMA (California Water Code § 10720.8) as an adjudicated area and no part of the Basin nor any surrounding basin has been the subject of a comprehensive adjudication as described in Code of Civil Procedure § 830 et seq. Two other GSAs exist within the Basin (i.e., WMA and CMA). No alternative plans have been submitted for any part of the Basin nor for any surrounding basin. Consequently, no map is included in the GSP for adjudicated areas or alternative plans.

2.2.1.2 Other Jurisdictional Areas

In addition to the four member agencies of the EMA GSA, there are several federal, state, tribal, and local agencies that have some degree of water management authority in the EMA. Each agency or organization is discussed below. A map of the jurisdictional extent of the federal, state, and tribal agencies within the EMA is shown on Figure 2-2. A map showing the jurisdictional extent of city and local jurisdictions within the EMA is shown on Figure 2-3.

Figure 2-3. City and Local Jurisdictional Areas

2.2.1.3 Federal Agencies

Federal agencies with land holdings in the EMA include the National Forest Service, the Bureau of Land Management, and the USBR. A portion of the Los Padres National Forest covers a small area near the northern boundary of the EMA. The Bureau of Land Management manages one small parcel near Happy Canyon Road that partially overlies the EMA. The USBR manages the area in and around Lake Cachuma.

2.2.1.4 Tribal Land

The one Native American tribe in Santa Barbara County is the Santa Ynez Band of Chumash Indians. The Tribe has three recognized tribal land areas in the EMA. The Santa Ynez Reservation of the Santa Ynez Band of Chumash Indians' boundaries are within the boundary of the EMA, and the Tribal Chairman indicated early in the SGMA process that the Tribe looks forward to collaborating with the GSA.[6] Currently, the Chumash tribal government is participating in the SGMA process for the EMA GSA through its representative on the Citizens Advisory Group (CAG).

2.2.1.5 State Agencies

The Santa Ynez Mission State Park is the only state-owned parcel within the EMA, as shown on Figure 2-2. The State Water Resources Control Board has jurisdiction over the Santa Ynez River and the associated river underflow.

2.2.1.6 County Agencies

The County of Santa Barbara is responsible for comprehensive long-term planning in the county through a County of Santa Barbara Comprehensive Plan.[7] Details on the Comprehensive Plan are available in Section 2.2.3. In addition, the Water Agency overlies the EMA and is a local agency as defined in California Water Code § 10721(n). The Water Agency represents the areas outside of the SYRWCD, City of Solvang, and ID No. 1 jurisdictional areas within the EMA (see Figure 2-1).

2.2.1.7 City and Local Agencies

The City of Solvang (City) lies on the west side of the EMA. The City has water management authority over its incorporated area and manages a number of parks and recreational sites. The City water and sewer regulations include a conservation program that sets forth conservation benchmarks and penalties. The City operates a wastewater treatment plant (WWTP) that can treat up to 1.5 million gallons per day. The WWTP receives and treats wastewater from the City as well as the Santa Ynez Community Services District (SYCSD). The City's stormwater code outlines the provisions for protecting water quality.

In addition to collecting and treating wastewater from the City, the SYCSD serves the eastern portion of the town of Santa Ynez and maintains the Chumash wastewater treatment and collection system. The SYCSD is responsible for sewer collections and streetlights. The SYCSD also does contract operations for wastewater collection and treatment.

The Los Olivos Community Service District was formed in 2018 for the purpose of developing the facilities necessary to collect, treat, and dispose of sewage, wastewater, recycled water, and stormwater in the unincorporated community of Los Olivos.

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[6] See Appendix E of the ~~*Final Draft Communications &*~~*Communication and Engagement Plan for Santa Ynez EMA GSP Development* (~~GSI and GEI, 2020~~Appendix B of this GSP).
[7] Available at https://www.countyofsb.org/plndev/policy/comprehensiveplan/comprehensiveplan.sbc. (Accessed March 24, 2021.)

SYRWCD was established as a special district by the Santa Barbara County Board of Supervisors in 1939. Its mission is to protect water rights and conserve and augment water supplies within the district. Its six groundwater charge zones are presented in Figure 2-4.

ID No. 1 was formed on July 7, 1959, under the Water Conservation Law of 1931, Division 21, § 74000 et seq. of the California Water Code as an Improvement District within the SYRWCD, for the purposes of furnishing water to its customers within its boundaries (see Figure 2-4). ID No. 1's operations are governed by rules and regulations for water service for ID No. 1. The most recent version of the Rules and Regulations was adopted by the Board on March 20, 2018.

2.2.1.8 Land Use

Land uses in the Santa Barbara County Comprehensive Plan are designated by the Santa Barbara County Board of Supervisors. Land uses throughout the ~~county~~County include the following:

- Agriculture
- Mineral Resource Industry
- Oil/Petroleum Resource Industry
- Mineral Resource Area
- Utility-Scale Solar Photovoltaic Facility
- Waste Disposal Facility
- Incorporated City
- Unincorporated Urban Area
- Vandenberg Space Force Base[8]
- Los Padres National Forest

According to land use data prepared by Land IQ, LLC, and provided to DWR, the primary land uses in the EMA are agriculture, urban areas, and undeveloped land. Current EMA land uses in the EMA are summarized by category in Table 2-1 and shown on Figure 2-5. They do not include the Vandenberg Space Force Base and Utility-Scale Solar Photovoltaic Facility noted above. The urban land use category is provided by DWR based on data compiled by Land IQ, LLC, from 2018 (DWR, 2021). The balance of the approximately 84,400 acres in the EMA is classified as native vegetation and could include dry farmed land. In 2019 the Santa Barbara County Board of Supervisors limited outdoor cannabis cultivation in the unincorporated areas of the County outside the Carpinteria Agricultural Overlay District to no more than 1,575 acres (Santa Barbara County Code § 50-7) and added a required special land use permit.

[8] Vandenberg Space Force Base was formerly called the Vandenberg Air Force Base until a renaming ceremony in May 2021 (Associated Press, 2021). The Base is not included in the EMA.

Figure 2-4. Santa Ynez River Water Conservation District Zones

Figure 2-5. Existing Land Use Designations

Table 2-~~2.~~1. Land Use Summary in 2018

Land Use Category	Acres
Agriculture by Crop Type	
Deciduous Fruit and Nuts	317
Field Crops	1,590
Ornamentals	3
Pasture	1,294
Truck, Nursery, and Berry Crops	872
Vineyards	3,253
Total Agriculture	**7,330**
Urban	**4,359**
Native Vegetation / Idle	**84,711**
Total	**96,400**

The City of Solvang, which occupies 2.2 square miles in the EMA, includes the following zoning designations within its boundaries (City of Solvang, 2016):

- Eight Residential Categories, including Mobile Home Park
- Commercial Retail / General /Tourist Related
- Light Industry
- Professional ~~-Office~~– Offices
- Recreational
- Agricultural
- Resource Management

2.2.1.9 Water Use Sector

Water demands in the EMA are organized into the six water use sectors identified in the GSP emergency regulations.[9] These are:

- **Urban.** Urban water use is assigned to non-agricultural water uses in the City and other census-designated places. Domestic use outside of census-designated places is not considered urban use.
- **Industrial.** There is limited industrial use in the EMA. DWR does not have any records of wells in the EMA that are categorized as being for industrial use. Most industrial use is associated with agriculture and is accounted for in the agricultural water use sector.
- **Agricultural.** This is the largest water use sector in the EMA.
- **Managed wetlands.** There are no managed wetlands in the EMA.
- **Managed recharge.** There is no managed recharge in the EMA.

[9] Section 3, Basin Setting, includes water budgets that categorize water uses with different categories, primarily (1) agricultural; (2) "other" water, which includes municipal, industrial, small public water systems, and domestic use; and (3) "special" irrigation water, which refers to urban landscape and golf course irrigation.

- **Native vegetation.** This is the largest water use sector in the EMA by land area. This sector, required by the regulations, includes rural residential areas. Native vegetation is the term used in the regulations for all other unmanaged and non-irrigated land use sectors.

Figure 2-6 shows the distribution of the water use sectors in the EMA.

2.2.1.10 Water Source Type

Water source types in the EMA include groundwater, surface water, and water imported from outside the EMA. Groundwater supplies about 85 percent of the water demand within the EMA, and communities dependent on groundwater are presented in Figure 2-7 (refer to the water budget presented in Section 3.3). Water is imported into the EMA from the Cachuma Project and from the State Water Project (SWP).

Groundwater pumped by the City and ID No. 1 is delivered to ~~its~~their customers within ~~its~~their respective ~~jurisdictional~~ boundaries in the southwestern portion of the EMA. Private agricultural and domestic users also pump groundwater from the Santa Ynez Uplands. The bulk of water used to irrigate crops in the EMA is sourced by pumping groundwater from the Santa Ynez Uplands and surface water from the Santa Ynez River underflow.

ID No. 1 imports water into the EMA via the Cachuma Project and the SWP. ID No. 1 does not receive its Cachuma Project water directly; instead, in addition to its own entitlement of SWP supplies, it also receives an amount of SWP water through an Exchange Agreement with the South Coast members of the Cachuma Project, whereby ID No.1 provides its Cachuma Project water to the South Coast in exchange for an equivalent amount of SWP water from the South Coast agencies. ID No.1 also produces water from the Santa Ynez River ~~under~~underflow pursuant to licenses issued by the State Water Resources Control Board for use in the Santa Ynez Uplands.

As a member agency of the Central Coast Water Authority (CCWA), ID No. 1 has a Table A allocation of 2,000 acre-feet per year (AFY) and a 200-acre-foot drought buffer of imported SWP water. Of that amount, 1,500 AFY are contractually committed for use by the City of Solvang. The drought buffer effectively increases the amount of water to be delivered in the event that overall deliveries are reduced by a given percentage.

Figure 2-6. Water Use Sector and Water Source Type

Figure 2-7. Communities Dependent on Groundwater

2.2.1.11 Existing Well Types, Numbers, and Density

An exact total count of existing and active wells in the EMA is not yet known. Preliminary data on well types, well depth data, and well distribution data were retrieved from DWR's Well Completion Report Map Application.[10] Well information is also available from SYRWCD and public databases, which supplement the DWR well data. Wells in the public databases may have been long since destroyed or abandoned and some well records are located in more than one database. Due to multiple well-naming conventions, it is possible that some wells exist in multiple sources. The databases, and number of wells in each, include the following:

- DWR Well Completion Reports: 583 wells within and surrounding EMA
- ID No. 1: 14 groundwater wells in the ~~entire~~ EMA
- USBR: 13 monitoring wells within Santa Ynez River
- City of Solvang: 10 wells
- Mutual water companies: ~~several~~various groundwater wells in Santa Ynez Uplands

DWR categorizes wells in its mapping application as either domestic, production, or public supply. These categories are based on the well use information submitted with well logs to DWR. Many of the wells categorized on well logs as production wells are used for agriculture. Most of the wells in the EMA are also used in part for domestic purposes.

The density of wells in the EMA by their types of use are presented on Figure 2-8 through Figure 2-10. The data used to develop these maps are from DWR-provided data and well locations for the City of Solvang and ID No. 1. These maps should be considered representative, but not definitive, of well distributions.

2.2.2 Water Resources Monitoring and Management Programs ~~[§~~

~~**§354.8 Description of Plan Area. Each Plan shall include a description of the geographic areas covered, including the following information:**~~

~~**(c) Identification of existing water resource monitoring and management programs, and description of any such programs the Agency plans to incorporate in its monitoring network or in development of its Plan. The Agency may coordinate with existing water resource monitoring and management programs to incorporate and adopt that program as part of the Plan.**~~

~~**(d) A description of how existing water resource monitoring or management programs may limit operational flexibility in the basin, and how the Plan has been developed to adapt to those limits.**~~

[§ 354.8(c) and (d)]

2.2.2.1 Groundwater Level Monitoring

In 2009, the California legislature passed Senate Bill X7-6, the California Statewide Groundwater Elevation Monitoring (CASGEM) Program, mandating that local agencies track seasonal and long-term trends in

[10] Available at https://www.arcgis.com/apps/webappviewer/index.html?id=181078580a214c0986e2da28f8623b37. (Accessed March 24, 2021.)

groundwater elevations in all state-designated groundwater basins. The Water Agency is the designated monitoring entity for the Basin.

Figure 2-8. Well Density By Section (Domestic Wells)

Figure 2-9. Well Density By Section (Irrigation Wells)

Figure 2-10. Well Density By Section (Public Wells)

In a cooperative program with the U.S. Geological Survey (USGS) National Water Information System (NWIS), the Water Agency monitors more than 300 groundwater wells annually throughout the County, including in the EMA. Figure 2-11 shows wells with publicly available groundwater elevation data in the EMA. Currently, groundwater level measurements are taken once in the spring and sometimes also in the fall. The monitoring is performed in a network of wells that have been volunteered for this purpose. The network has changed over time as access to wells has been lost or new wells have been added. The cooperative program, in place for several decades, provides vital data for tracking groundwater trends and conducting groundwater studies. The data are published in a triennial report prepared by the Water Agency. Many of the functions of the CASGEM Program will be replaced or subsumed under the GSAs.

The City of Solvang, ID No.1, USBR, and several mutual water companies also provide groundwater well elevation data. A summary of the groundwater level data compiled for use in this GSP is presented in Table 3-5.

2.2.2.2 Groundwater Quality Monitoring

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

- The City of Solvang and ID No. 1 use data from sampled supply wells for their annual water quality reports to comply with their water supply permits and California Safe Drinking Water Act requirements and reports to DWR and their customers.
- The USGS collects water quality data on a routine basis under the Groundwater Ambient Monitoring and Assessment (GAMA) program and the NWIS. These data are stored in Stare Water Resources Control Board's (SWRCB's) GeoTracker GAMA Program database.
- Multiple sites monitor groundwater quality as part of investigation or compliance monitoring programs through the Central Coast Regional Water Quality Control Board (RWQCB).[11]
- Water Agency monitors water quality in conjunction with water level measurements collected for the CASGEM Program.

Section 3.2 provides a summary of groundwater quality for drinking water and agricultural purposes.

Figure 2-12 shows the location of wells in the GAMA GeoTracker database.

[11] In 2016, the Central Coast RWQCB adopted Resolution No. R3-2017-0004, Adopting the Human Right to Water as a Core Value and Directing Its Implementation in Central Coast Water Board Programs and Activities. The Resolution and the Workplan for Implementing the Human Right to Water (Central Coast RWQCB, 2017a) includes development of region-wide geographic information system maps to identify areas where public and domestic drinking water wells are impacted by common pollutants and the identification of areas where domestic wells users are vulnerable to contamination.

Figure 2-11. Wells with Publicly Available Groundwater Elevation Data

Figure 2-12. Wells with Publicly Available Groundwater Quality Data

2.2.2.3 Surface Water Monitoring

Stream gauges have historically been maintained and monitored by the USGS. Data are stored electronically in NWIS files and are retrievable from the USGS Water Resources site. USBR maintains data on water releases from Bradbury Dam. The periods with monthly streamflow data sets from stream gauging stations within and surrounding the EMA are presented on Table 3-1. The locations of these gauging stations, with the exception of the upstream stations along the Santa Ynez River, are presented on Figure 2-13. The locations of the point of delivery of imported water from northern California through the SWP via the CCWA pipeline is also presented on Figure 2-13.

2.2.2.4 Climate Monitoring

Climate data are measured at two meteorological monitoring stations in the EMA portion of the Basin as well as six additional stations surrounding the EMA. Data from these stations were obtained from Santa Barbara County. Station information is provided in Table 2-2 and station locations are shown on Figure 2-14. Figure 2-14 displays the long-term precipitation record at the Santa Ynez Fire Station #32.

Table 2-~~3.~~2. Meteorological Monitoring Stations Used for Historical Period Selection

Station No.	Station Name	Beginning of Record	Location	Elevation (feet)	Period Average Precipitation (inches)
218	Santa Ynez Fire Station	1951	Within EMA	600	15.7
393	Solvang	1965	Within EMA	485	18.3
196	Los Olivos - Foxen Canyon	1995	Within EMA	1,040	16.0
419	Midland School	1958 [1]	Within EMA	1,180	16.4
290	Happy Canyon	1994 [2]	Within EMA	1,690	15.6
233	Buellton Fire Station	1955	Surrounding	360	17.2
421	Figueroa Mountain	1961	Surrounding	3,200	21.3
332	Cachuma	1953	Adjacent EMA	800	19.7
204	Los Alamos Fire Station	1910	San Antonio Basin	580	15.3
230	Gibraltar Reservoir	1920	Upstream	1,500	26.2
232	Jameson Dam	1926	Upstream	2,230	28.7

Notes

[1] Data from the Midland School is discontinuous, missing entire water years: 1964, 1969, 1977 through 1993, and 2002 through 2011. This data includes 34 of the 61 years between water years 1958 and 2018.

[2] Data from Happy Canyon is discontinuous, missing water years 1998 through 2001.

EMA = Eastern Management Area

California Irrigation Management Information Center Station 64 measures several climatic factors that allow a calculation of daily reference evapotranspiration (ET) for the area. This site is located in an alfalfa field and is significantly affected by the changing conditions mandated by alfalfa agriculture. A summary of average monthly precipitation, temperature, and reference evapotranspiration (ETo) for the EMA is presented on Table 2-3.

Table 2-3. Average Monthly Climate Summary, Station 64 in EMA

Month	Average Precipitation (inches)[1]	Average ETo (inches)[2]	Average Daily Temperature (°F)[3]
January	3.3	1.9	~~48.8~~49
February	3.4	2.4	50~~.4~~
March	2.9	3.8	53~~.2~~
April	1.0	5.0	~~55.9~~56
May	0.9	6.0	59~~.1~~
June	0.4	6.4	~~62.7~~63
July	0.3	6.6	66~~.0~~
August	0.3	6.2	~~65.9~~66
September	0.1	4.8	54~~.1~~
October	0.7	3.7	59~~.4~~
November	0.7	2.3	52~~.3~~
December	2.4	1.7	47~~.0~~
Monthly Average	**1.4**	**4.2**	**57~~.1~~**
Average Calendar Year[4]	**16.6**	**50.6**	**57~~.1~~**

Notes

Data sources: DWR CIMIS https://cimis.water.ca.gov/Stations.aspx

[1] Average of monthly precipitation at CIMIS Station 64 for water years 1988 through 2020.

[2] Average of monthly evapotranspiration at CIMIS Santa Ynez Station 64 for water years 1988 through 2020.

[3] Average daily temperature at CIMIS Santa Ynez Station 64 for water years 1988 through 2020.

[4] Average Calendar Year is not the sum of monthly averages, but rather a historical annual average over the period of record.

°F = degrees Fahrenheit~~CIMIS = California Irrigation Management Information Center~~

CIMIS = California Irrigation Management Information Center

EMA = Eastern Management Area

ETo = reference evapotranspiration

Figure 2-13. Surface Water Features

Figure 2-14. Meteorological Monitoring Stations

2.2.2.5 Existing ~~Groundwater~~Water Management Plans

Existing ~~groundwater~~water management plans within the EMA area include the Central Coast Water Authority's Urban Water Management Plan (UWMP), the Water Quality Control Plan for the Central Coast Basin, and the Santa Barbara County IRWM Plan. In addition, the Santa Barbara County Groundwater Basins Status Report provides monitoring data and further information about groundwater resources in the region. These water management plans were developed prior to SGMA and while they have goals that differ from the sustainability goal provided in this GSP, they will not limit operational flexibility in the EMA with regard to sustainable groundwater management. The sustainability goal presented in Section 5 was developed collaboratively for the Basin and adopted by all three GSAs in the context of both SGMA and the existing water management plan framework. The GSP and implementation plan presented in Section 7 will adapt to conditions based on the results of the monitoring program to avoid undesirable results (see Section 4). This approach is consistent with the CCWA UWMP and IRWM Plan.

Central Coast Water Authority Urban Water Management Plan

The UWMP Act requires urban water suppliers to compare the total projected demand for water supply with the amount of water supply that is available over the next 20 years, in 5-year increments. The CCWA[12] was formed for the sole purpose of designing, constructing, and operating the facilities needed to bring SWP water to the agencies that contract to receive that water. CCWA is considered an urban water supplier because SWRCB Division of Drinking Water (DDW) classifies it as a public water system. Both ID No. 1 and the City of Solvang provide retail water service within the EMA, but they are not large enough to be required to prepare an UWMP.

The CCWA's 2020 Update to its UWMP (CCWA, 2021) describes the roles and responsibilities of CCWA, available water supplies, water demands, water reliability, and mitigation programs performed in droughts to secure additional water. The UWMP 2020 Update provides the following:

- A projection of future SWP water demand and assesses SWP supply reliability through 2040 for CCWA participants.
- An update on the negotiations to extend the termination dates of SWP contracts for participating CCWA agencies beyond the 2040 termination date into 2085.
- A discussion of future possible water sources.

The discussion of future water sources includes water transfers (such as the Cachuma Project in the EMA), groundwater banking, desalination, and recycled water and local groundwater. Future water projects include the following:

- **Delta Conveyance Project**—An infrastructure project that would allow for greater flexibility in balancing the needs of the Delta estuary with the reliability of water supplies and help in reducing the risk of long outages from Delta levee failures.
- **Suspended Table A Reacquisition**—In the 1980s, 12,214 square feet of SWP Table A water was suspended by DWR and the Santa Barbara County Flood Control and Water ~~Agency.~~Conservation District. CCWA and the Santa Barbara County Flood Control and Water ~~Agency has~~Conservation District have the option of reacquiring this suspended water through payment of past costs plus interest.

[12] The CCWA member agencies are the Cities of Buellton, Guadalupe, Santa Barbara, and Santa Maria; Carpinteria Valley Water District; Goleta Water District; Montecito Water District; and ID No. 1 in which the City of Solvang is located. Participating entities with no voting rights include Golden State Water Company, Vandenberg Space Force Base, La Cumbre Mutual Water Company, Morehart Land Company, and the Raytheon Systems Company.

- **Long-Term Exchange between San Luis Obispo Flood Control Water Conservation District and CCWA**—An exchange of SWP Table A water for water treated at the CCWA Coastal Branch that could benefit CCWA participants. CCWA and the San Luis Obispo Flood Control Water Conservation District are exploring potential exchange concepts for mutual benefit.
- **CCWA Water Management Strategies Study**—CCWA is developing a management strategies study for maximizing the utility of State Water Project water supplies and integrating it with local supplies. Potential water management measures may include transfers, exchanges, and banking.

Water Quality Control Plan for the Central Coastal Basin – Planning Elements

The *Water Quality Control Plan for the Central Coastal Basin* (WQ Basin Plan) (RWQCB et al., 2017) provides management strategies to ensure that surface water and groundwater in the Central Coast Region are managed to provide the highest possible quality. The WQ Basin Plan includes the following elements:

- The water quality standards that must be maintained for all the water uses in the region
- An implementation plan that describes the programs, projections, and other actions necessary to achieve the water quality standards
- The existing plans and policies of the SWRCB and the RWQCB that protect water quality
- A description of the monitoring and surveillance programs to support ensuring management of surface and groundwater

The WQ Basin Plan includes recommended actions, requirements, and management principles, including salt source control, to ensure high-quality surface water and groundwater for all beneficial uses. The present and potential future beneficial uses for inland waters listed in the WQ Basin Plan include surface water and groundwater as municipal supply (water for community, military, or individual water supplies); agricultural purposes; groundwater recharge; recreational water contact and non-contact; sport fishing; warm freshwater habitat; wildlife habitat; rare, threatened or endangered species; and spawning, reproduction, and/or early development of fish.

The WQ Basin Plan also describes the existing regulatory monitoring and assessment of point sources of pollution and a program to control nonpoint sources of pollution; the GAMA program to assess groundwater quality; the Central Coast Ambient Monitoring Program; and the available state, federal, and regional assessments of water quality (see Section 2.2.2.6 for more on the water quality measures outlined in the WQ Basin Plan).

Santa Barbara County Integrated Regional Water Management Plan

The Santa Barbara County IRWM Plan (Dudek, 2019), updated in 2019, provides guidance for integrating water management across the region. The IRWM Plan was updated through a 2-year process that included a broad array of stakeholders and objectives, priorities, and resource management strategies which were revisited to respond to the changing conditions in the region, including increasing vulnerabilities from climate change, and in response to new state-mandated requirements, including SGMA regulations.

The IRWM Plan integrated 34 selected water management strategies and considered and included an additional eight strategies for the region. The strategies included in the IRWM Plan have or will have a role in protecting the region’s water supply reliability, water quality, ecosystems, groundwater, and flood management objectives. The integration of these strategies resulted in a list of action items (projects, programs, and studies) needed to implement the IRWM Plan over the 25-year planning horizon.

Based on several datasets, no disadvantaged communities were identified within the EMA (refer to the IRWM Plan [Dudek, 2019]; 2020 California Air Resources Board and 2018 California Climate Investments

Priority Populations online maps[13]; and DWR's DAC mapping data from 2018 at the places and tract scales[14]).

Santa Barbara County Groundwater Basins Status Report

The 2019 Santa Barbara County Groundwater Basins Status Report (Groundwater Report) (Santa Barbara County, 2019) describes the conditions of groundwater and status of groundwater basins in Santa Barbara County since the publication of the 2011 Santa Barbara County Groundwater Report. The 2019 Groundwater Report provides data and information from state and federal monitoring for water quantity and quality in the wake of the local drought emergency that lasted from 2014 to 2019. Specifically, for each basin in the county, the report discusses basin characteristics and status, provides groundwater levels and hydrographs for selected wells, and describes developments in supplemental supplies and basin management plans.

2.2.2.6 Existing Groundwater Regulatory Programs

Well owners located within the service area of SYRWCD are required to register their wells and report the quantity of water pumped on a semi-annual basis. Groundwater production in the EMA that occurs outside of the SYRWCD boundaries is not reported. Groundwater use within the EMA is also subject to the Agricultural Order, Title 22 Drinking Water Program, and Water Quality Control Plan described below.

Agricultural Order

In 2017 the Central Coast RWQCB issued Agricultural Order No. R3-2017-0002, a Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands (Agricultural Order) (RWQCB, 2017). The permit requires that growers implement practices to reduce nitrate leaching into groundwater and improve surface receiving water quality. Specific requirements for individual growers are structured into three tiers based on the relative risk their operations pose to water quality. Growers must enroll, pay fees, and meet various monitoring and reporting requirements according to the tier to which they are assigned. All growers are required to implement groundwater monitoring, either individually or as part of a cooperative regional monitoring program. Growers electing to implement individual monitoring (i.e., not participating in the regional monitoring program) are required to test all on-farm domestic wells and the primary irrigation supply well for nitrate or nitrate plus nitrite, and general minerals, including, but not limited to, total dissolved solids, sodium, chloride, and sulfate.

The Central Coast RWQCB is currently developing Agricultural Order No. R3-2021-0040 (RWQCB, 2021). The updated Agricultural Order has more frequent groundwater monitoring requirements than Agricultural Order No. R3-2017-0002. Beginning in 2022, all growers must conduct annual sampling of all on-farm domestic drinking water supply wells and the primary irrigation well between March 1 and May 31. Growers must report monitoring results by July 31 each year. Additionally, groundwater trend monitoring is required under the updated Agricultural Order. All growers are required to implement groundwater trend monitoring work plans either individually or as part of a cooperative regional monitoring program. Work plans for groundwater trend monitoring must be submitted by a date dependent on the phase area. The work plan due date is September 1, 2027, in the EMA.

[13] Available at https://webmaps.arb.ca.gov/PriorityPopulations/. (Accessed December 6, 2021.)
[14] Available at https://gis.water.ca.gov/app/dacs/. Mapped DACs data included Places (2018) and Tracts (2018). (Accessed December 6, 2021.)

Title 22 Drinking Water Program

The 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 through pipes or other constructed conveyances 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 less than 15 residential service connections, and industrial and irrigation wells are not regulated by the DDW.

The County of Santa Barbara has primacy and regulates state small water systems as defined in Chapter 34B Domestic Water Systems (Ordinance No. 12-4843) (Santa Barbara County, 2012). The DDW enforces the monitoring requirements established in Title 22 of the CCR for public water system wells, and all the data collected must be reported to the DDW. Title 22 also designates the regulatory limits (known as maximum contaminant levels) for various waterborne contaminants, including volatile organic compounds, non-volatile synthetic organic compounds, inorganic chemicals, radionuclides, disinfection byproducts, general physical constituents, and other parameters.

Water Rights Releases

Surface water releases from Lake Cachuma to the lower Santa Ynez River are made in accordance with water rights orders and decisions issued by the SWRCB to replenish the downstream alluvial ~~basins~~areas within the EMA and other downstream reaches, and to protect public trust resources. Water rights releases for users downstream of Lake Cachuma are set forth in SWRCB Decision D886, and SWRCB Orders WR 73-37, WR 89-18, and WR 2019-0148. These releases are based on the establishment of two accounts, and accrual of credits (storing water) in Lake Cachuma for the areas above and below the Lompoc Narrows. Releases from the Above Narrows Account (ANA) are made at Bradbury Dam at the direction of SYRWCD for the benefit of downstream water users between the dam and the Lompoc Narrows. Releases from the Below Narrows Account (BNA) are conveyed to the Narrows for the benefit of water users in the Lompoc Plain subarea at the direction of SYRWCD. ANA releases are made to replenish the alluvial ~~basin in the~~ areas above the Lompoc Narrows and combined releases of ANA and BNA are made to replenish the various downstream areas of the Santa Ynez River Alluvium and Lompoc Plain, respectively.

Water Quality Control Plan for the Central Coastal Basin – Water Quality Requirements

The pollution control actions required by, and best management practices recommended by, the SWRCB, the RWQCB, and other agencies with authority over water quality are described in the WQ Basin Plan (RWQCB et al., 2017). The WQ Basin Plan includes all the EMA and also extends beyond its boundaries. The plans and policies of the SWRCB for managing water quality are listed in Section 5 and included as appendices to the WQ Basin Plan. Key policies in the WQ Basin Plan that affect the management of surface water and groundwater in the EMA include the State Policy for Water Quality Control, Sources of Drinking Water Policy, and the Nonpoint Source Management Plan. Discharge prohibitions outlined in the WQ Basin Plan include regulations for groundwater, salt discharge, and other discharge requirements. Best management practices recommended in the WQ Basin Plan include source controls that prevent a discharge or threatened discharge and treatment controls that remove pollutants from a discharge before it reaches surface water or groundwater. The WQ Basin Plan also lists the thresholds for Total Maximum Daily Loads (TMDLs) for waterbodies covered by the plan; none of the waterbodies with concentrations exceeding TMDLs are in the EMA.

2.2.2.7 Conjunctive Use Programs

§ 354.8 Description of Plan Area. Each Plan shall include a description of the geographic areas covered, including the following information:

(e) A description of conjunctive use programs in the basin.

Some water users within the EMA use surface water and underflow from the Santa Ynez River conjunctively with groundwater. Native surface water flows enter the EMA from precipitation runoff within the watershed and Santa Ynez River inflow to the EMA, regulated as releases from Lake Cachuma at the Bradbury Dam, operated by the USBR (see Section 2.2.2.6). Additional surface water is available as SWP water imported by ID No.1 pursuant to its entitlement as a CCWA member agency and via an Exchange Agreement with the South Coast members of the Cachuma Project. Details on water sources and historical, current, and projected water budgets are available in Section 3.

2.2.3 Land Use and General Plans

§ 354.8 Description of Plan Area. Each Plan shall include a description of the geographic areas covered, including the following information:

(f) A plain language description of the land use elements or topic categories of applicable general plans that includes the following:

(1) A summary of general plans and other land use plans governing the basin.

(2) A general description of how implementation of existing land use plans may change water demands within the basin or affect the ability of the Agency to achieve sustainable groundwater management over the planning and implementation horizon, and how the Plan addresses those potential effects.

(3) A general description of how implementation of the Plan may affect the water supply assumptions of relevant land use plans over the planning and implementation horizon.

2.2.3.1 Land Use and General Plans Summary [§ 354.8(f)(1),(f)(2), and (f)(3)]

Land use planning authority in the EMA is the responsibility of the Santa Barbara County and the City of Solvang. The Santa Barbara County Comprehensive Plan includes the following elements that have a bearing on water quantity or quality:

- A land use element that outlines the distribution of real estate, open space and agricultural land, mineral resources, recreational facilities, schools, and waste facilities

- A conservation element[15] that addresses the conservation, development, and use of natural resources including water, forests, soils, rivers, and mineral deposits
- Community and specific plans for municipalities and more urban areas to provide goals, policies, and standards to guide community development
- An open space element that details plans and measures for preserving open space for natural resources, outdoor recreation, public health and safety, and agriculture.

2.2.3.2 Santa Barbara County Integrated Regional Water Management Plan and Plan Update

The Santa Barbara County IRWM Program began in 2005 following the passage of Proposition 50, The Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002. Chapter 8 of Proposition 50 authorized the legislature to appropriate funding for IRWM planning, the intent of which was to encourage agencies to develop plans using regional water management strategies for water resources and to develop projects using these IRWM strategies to protect communities from drought, protect and improve water quality, and improve local water security by reducing dependence on imported water. The first Santa Barbara County IRWM Plan was adopted in 2007. The region updated the IRWM Plan in 2019 to address adaptation to climate change, provide incentives for collaboration in managing water resources and setting regional priorities for water infrastructure, and improving regional water self-reliance.

2.2.3.3 How Land Use Plans May Change Water Demands and Sustainable Groundwater Management

The Santa Barbara County Comprehensive Plan includes goals, principles, and policies aligned with sustainable groundwater management. In particular, the Groundwater Resources Section of the plan's Conservation Element outlines four major goals that are compatible with sustainable management objectives under SGMA. These goals are:

- Goal 1: To ensure adequate quality and quantity of groundwater for present and future County residents, and to eliminate prolonged overdraft of any groundwater basins.
- Goal 2: To improve existing groundwater quality, where feasible, and to preclude further permanent or long-term degradation in groundwater quality.
- Goal 3: To coordinate County land use planning decisions and water resources planning and supply availability.
- Goal 4: To maintain accurate and current information on groundwater conditions throughout the County.

As a county-wide document, the Comprehensive Plan does not make specific policy recommendations for the EMA. Nonetheless, the overarching policies and strategies in the plan promote water conservation, coordinated decision making around land use and water resources, groundwater recharge, and prevention of prolonged overdraft, all of which are consistent with the sustainable groundwater management objectives of this GSP. Future land use patterns described in the Comprehensive Plan's Land Use Element were considered in the projected water budget forecast in Section 3.3 of the GSP.

The City of Solvang's General Plan is being updated and includes a Conservation/Open Space Element ~~which~~that identifies current water supply resources, including groundwater, as well as projected future demands and options for meeting those demands. The Conservation/Open Space Element promotes the protection of groundwater resources and lays out policies and actions supporting sustainability, such as

[15] Various studies indicate slight to moderate levels of overdraft in several groundwater basins within the County and substantial overdraft in one basin (Santa Barbara County, 2012). The goals and policies in the Santa Barbara County Comprehensive Plan, Conservation Element, Groundwater Resources Section were developed to protect local groundwater.

protecting important groundwater recharge areas through open space designation and prohibiting land uses in recharge areas that could adversely affect groundwater. Information from the Conservation/Open Space Element and the plan's Land Use Element was considered in the projected water budget forecast in Section 3.3 of the GSP.

2.2.3.4 How Sustainable Groundwater Management May Affect Water Supply Assumptions

As described above, the sustainable groundwater management focus of the GSP is well-aligned with the Santa Barbara County Comprehensive Plan's goals and policies in support of prudent management of groundwater resources and protection from overdraft. The Comprehensive Plan's policies regarding coordination of land use planning with water resources planning may present opportunities to include groundwater sustainability data in decision making. The Groundwater Resources Section of the Conservation Element includes estimates of safe yield, overdraft, storage, and other parameters related to water supply, and it notes that additional studies and updates are anticipated to refine the estimates. The data collected during the development and implementation of the GSP may therefore be used to refine water supply assumptions and support sustainability. While the City of Solvang's General Plan does not provide an in-depth discussion of sustainable groundwater management, the plan is undergoing a comprehensive update that may provide opportunities to incorporate new data and sustainability objectives as part of its water supply assumptions. The update to the General Plan is anticipated to be completed by May 2022.

2.2.3.5 Impact of Land Use Plans Outside of Basin on Sustainable Groundwater Management

The Santa Barbara County Comprehensive Plan described previously applies throughout the County and is not specific to the EMA. Implementation of the Comprehensive Plan is anticipated to be complementary to implementation of the GSP and achievement of a sustainable groundwater management. The EMA GSA is not aware of any other land use plans outside the EMA that would limit progress toward sustainability or prevent sustainable management.

2.2.4 Process for Well Permitting

§ 354.8 Description of Plan Area. Each Plan shall include a description of the geographic areas covered, including the following information:

(f) A plain language description of the land use elements or topic categories of applicable general plans that includes the following:

(4) A summary of the process for permitting new or replacement wells in the basin, including adopted standards in local well ordinances, zoning codes, and policies contained in adopted land use plans.

The Santa Barbara County Public Health Department's Environmental Health Services Division requires a Water Well Permit for all new and replacement wells and for modifications to wells such as deepening, replacement or repairs. A permit application and map must be submitted describing the proposed location, construction, and intended use of the well. An Environmental Health Services representative reviews the application and conducts a site inspection before issuance of a permit can occur. Standards for well construction are set forth in Santa Barbara County Code § 34A-12. Once the well construction or replacement is completed, the property owner or well driller must provide a copy of the completed well log to Environmental Health Services. In addition, new wells drilled inside the service area boundaries of SYRWCD are required to be registered with and report groundwater pumping to the SYRWCD.

~~2.2.4.11.1.1.1 Impact of Land Use Plans Outside of Basin on Sustainable Groundwater Management~~

> ~~**§354.8 Description of Plan Area. Each Plan shall include a description of the geographic areas covered, including the following information:**~~
>
> ~~**(f) A plain language description of the land use elements or topic categories of applicable general plans that includes the following:**~~
>
> ~~**(5) To the extent known, the Agency may include information regarding the implementation of land use plans outside the basin that could affect the ability of the Agency to achieve sustainable groundwater management.**~~

~~The Santa Barbara County Comprehensive Plan described previously applies throughout the County and is not specific to the EMA. Implementation of the Comprehensive Plan is anticipated to be complementary to implementation of the GSP and achievement of sustainable groundwater management. The GSA is not aware of any other land use plans outside the EMA that would limit progress toward sustainability or prevent sustainable management.~~

2.2.5 Additional Plan Elements

> **§ 354.8 Description of Plan Area. Each Plan shall include a description of the geographic areas covered, including the following information:**
>
> **(g) A description of any of the additional Plan elements included in Water Code Section 10727.4 that the Agency determines to be appropriate.**

Additional Plan elements from California Water Code § 10727.4 are shown in Table 2-4 below along with a description of how they are addressed in the GSP, coordinated with other entities, or are not applicable to the EMA.

Table 2-4. Plan Elements from California Water Code Section 10727.4

Element	Location
(a) Control of saline water intrusion	Not applicable
(b) Wellhead protection areas and recharge areas	To be coordinated with Santa Barbara County
(c) Migration of contaminated groundwater	Section 3, Basin Setting and Section 4, Monitoring Plan
(d) A well abandonment and well destruction program	To be coordinated with Santa Barbara County
(e) Replenishment of groundwater extractions	Section 6, Projects and Management Actions
(f) Activities implementing, opportunities for, and removing impediments to, conjunctive use or underground storage	Section 6, Projects and Management Actions
(g) Well construction policies	To be coordinated with Santa Barbara County

Element	Location
(h) Measures addressing groundwater contamination cleanup, groundwater recharge, in-lieu use, diversions to storage, conservation, water recycling, conveyance, and extraction projects	Section 6, Projects and Management Actions
(i) Efficient water management practices, as defined in Section 10902, for the delivery of water and water conservation methods to improve the efficiency of water use	To be coordinated with SYRWCD and other entities as applicable
(j) Efforts to develop relationships with state and federal regulatory agencies	Section 6, Projects and Management Actions
(k) Processes to 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	To be coordinated with Santa Barbara County and City of Solvang
(l) Impacts on groundwater dependent ecosystems	Section 3, Basin Setting and Section 3.2.6, Groundwater Dependent Ecosystems

2.3 Notice and Communication [§ 354.10]

2.3.1 Beneficial Uses and Users

§ 354.10 Notice and Communication. Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:

(a) A description of the beneficial uses and users of groundwater in the basin, including the land uses and property interests potentially affected by the use of groundwater in the basin, the types of parties representing those interests, and the nature of consultation with those parties.

In accordance with § 10723.2 of SGMA, the following parties were contacted to determine how best to consider and protect their interests during the formation of the GSA and throughout implementation of the GSP. Land uses and property interests potentially affected by the use of groundwater in the EMA, and the parties representing those interests, include but are not limited to the following:

- **Holders of overlying groundwater rights, including agricultural users and domestic water well owners:** ~~The SYRWCD, the City of Solvang, and ID No. 1 are GSA members.~~ Domestic water well owners and agricultural users are members of the EMA CAG.
- **Municipal well operators:** The City of Solvang and ID No. 1 are municipal well operators and members of the GSA. Residents living in the service areas of the City of Solvang and ID No. 1 are members of the CAG.
- **Santa Ynez River Water Conservation District ID No. 1:** ID No. 1 is a member of the GSA and pumps groundwater for municipal, agricultural, commercial, and domestic uses.

- **Public water systems:** Representatives from several mutual water companies in the EMA are members of the EMA CAG.
- **Local land use planning agencies:** The City of Solvang and Santa Barbara County are members of the EMA GSA. Both entities have planning authority in the EMA. Both agencies were provided notice of the intention to adopt the GSP on August 6, 2021, by the EMA GSA.
- **Environmental users of groundwater:** The California Department of Fish and Wildlife (CDFW) and the National Marine Fisheries Service (NMFS) have been involved in the EMA SGMA process regarding environmental uses of groundwater. Environmental users of groundwater were invited to apply to participate on the EMA CAG.
- **Surface water users:** The City of Solvang and ID No. 1 divert water from the alluvial underflow of the Santa Ynez River. The City of Solvang discharges wastewater to the alluvial underflow of the Santa Ynez River. CDFW and NMFS have been involved regarding environmental uses of the Santa Ynez River. The SYRWCD manages water rights releases for the benefit of downstream users of surface water. Surface water users are members of the EMA CAG.
- **California Native American Tribes:** The Santa Ynez Band of Chumash Indians is a federally recognized tribe that maintains a reservation within the EMA and will work with the EMA GSA. A representative of the Chumash Tribe is a member of the EMA CAG.
- **Disadvantaged communities:** No disadvantaged communities have been identified within the EMA. Focused efforts have been made to ensure that ~~disadvantaged communities~~ all users within the EMA are informed of the GSP development process and are invited to participate. ~~Residents of disadvantaged communities were invited to apply to participate on the EMA CAG.~~
- **Entities listed in SGMA § 10927 that are monitoring groundwater elevations in all or part of the EMA managed by the GSA:** The City of Solvang and ID No. 1 monitor their respective wells, and the Water Agency is the CASGEM agency within the EMA. All three entities are members of the EMA GSA.

The EMA GSA developed a *Communication and Engagement Plan for Santa Ynez EMA GSP Development* (see Appendix ~~J~~B) to guide stakeholder engagement and ensure that all beneficial uses and users of groundwater remained informed about the GSP development process and had opportunities to participate and represent their interests. Participation from a variety of stakeholders helps the EMA GSA make decisions that consider varying needs and interests in the EMA.

The EMA GSA created the EMA CAG, which is comprised of a variety of the stakeholders and water user groups. Members of this group provide meaningful insight, support, and expertise from a variety of viewpoints for the EMA GSA to consider. Although strictly advisory and not a voting participant of the EMA GSA, the EMA CAG represents a number of social, business, agricultural, domestic, cultural, and economic backgrounds to bring the widest possible perspective. Potential EMA CAG members were identified through outreach to the interested party list and a press release to local newspapers. The group is comprised of seven members representing interests of the following stakeholder groups:

- Domestic well owners
- Agricultural well owners
- Vineyard and wine industry
- Riparian water diverters
- Mutual water companies
- Santa Ynez Band of Chumash Indians
- At large citizens

EMA CAG applicants were screened by an Ad-Hoc committee of the EMA GSA consisting of elected representatives and member agency staff. The selected representatives must reflect the interests of their group and be able to effectively communicate the group's opinions and feedback. The qualifications of all candidates were reviewed prior to the EMA GSA selection of the EMA CAG.

The members of the EMA CAG were responsible for reviewing drafts of the various sections of the GSP, providing feedback on those drafts, reviewing and providing feedback on draft newsletters created for stakeholder outreach, reviewing presentations that were delivered during workshops and Committee meetings, and soliciting input from their respective stakeholders as the GSP was being developed. Staff members from the EMA GSA member agencies facilitated the CAG meetings; prepared agendas for the meetings; compiled questions, comments, and responses to comments made in the meetings; prepared supporting materials; prepared press releases; and maintained the Basin's SGMA website with dedicated GSA pages.

2.3.2 Public Meetings

§ 354.10 Notice and Communication. Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:

(b) A list of public meetings at which the Plan was discussed or considered by the Agency.

The EMA GSA Committee first met in January 2019 and has held quarterly regular meetings thereafter, with additional special meetings, as needed. Regular and special meetings are open to the public and involve discussions of the GSP. Opportunities for public comment are provided at all meetings, and meetings are also an opportunity for stakeholders to stay informed about what is happening with the GSA and the GSP process. Meetings were held remotely via teleconference call and video feed due to COVID-19 protocols. In-person meetings, when conducted, took place in the Solvang City Council Chambers after the first initial meetings held in the Santa Ynez Community Services District Conference Room. Advance notice of meetings has been, and will continue to be, posted on the Basin's SGMA website (santaynezwater.org). All agendas and meeting minutes from past meetings are available on the Basin's SGMA website. The EMA CAG consists of appointed members representing a variety of groundwater uses and users in the EMA. The EMA CAG provides input to the GSA related to elements of the GSP, and its meetings are open to the public and noticed in accordance with the Brown Act.[16] Below is a list of public meetings of the EMA GSA Committee and the CAG where the GSP was discussed.

EMA GSA Committee meetings:

- 2019: January 24, April 25, July 25, and October 24
- 2020: February 27, May 21, August 27, November 19, and December 10
- 2021: January 21, February 25, March 25, April 15, April 29, May 13, ~~,~~ May 27, ~~and~~July 22, August 26, October 21, October 28, November 18, and December 9

EMA CAG meetings:

- 2019: September 5 and September 30
- 2020: January 9 and June 2
- 2021: February 17, May 11, ~~and~~ July 7, Sept. 30, and October 11

[16] The Ralph M. Brown Act (Government Code §§ 54950-54963) is intended to provide public access to meetings of California local government agencies. Agencies subject to the requirements of the Brown Act must provide public notice of their meetings, post agendas of the subjects to be discussed, and provide public access to those meetings. More information is available at https://firstamendmentcoalition.org/facs-brown-act-primer/

2.3.3 Public Comments

§ 354.10 Notice and Communication. Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:

(c) Comments regarding the Plan received by the Agency and a summary of any responses by the Agency.

Public comments received and a summary of responses to public comments are provided in Appendix J. In addition to the response to comments, many revisions were made to the GSP incorporating responses to the comments received "that raise credible technical or policy issues with the Plan." (§ 355.4(b)(10))

2.3.4 Communication

2.3.4.1 Decision-Making Process

§ 354.10 Notice and Communication. Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:

(d) A communication section of the Plan that includes the following:

(1) An explanation of the Agency's decision-making process.

The GSA's decision-making process is described in the 2017 MOA for the formation of the GSA which became effective April 27, 2017. The GSA Committee is comprised of one elected official representative and an alternate from each of the four member agencies that make up the GSA: SYRWCD, City of Solvang, Water Agency, and ID No. 1. Voting in the EMA GSA Committee is weighted. The Water Agency has five votes, SYRWCD has three votes, ID No. 1 has two votes, and the City of Solvang has one vote. A quorum to hold a meeting requires a simple majority (three of the four GSA member agencies), and meetings are subject to the Brown Act, which includes public notice and comment requirements. All proposed actions or resolutions must be passed by a simple majority of the voting membership. Actions to enter into a Joint Powers Agency agreement and to adopt or approve the GSP must pass by a 70 percent vote (at least eight votes) with the concurrence of each GSA member's governing body.

2.3.4.2 Public Engagement

§ 354.10 Notice and Communication. Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:

(d) A communication section of the Plan that includes the following:

(2) Identification of opportunities for public engagement and a discussion of how public input and response will be used.

(3) A description of how the Agency encourages the active involvement of diverse social, cultural, and economic elements of the population within the basin.

The *Communication and Engagement Plan* describes multiple venues and tools for stakeholder engagement to support interested parties in providing input on their priorities and values and to provide updates to the public in a timely manner. The EMA GSA is committed to conducting an open process that includes active discussions with all interested parties throughout the development of the GSP.

A list of interested parties has been compiled and is updated and revised regularly. The ~~EMA~~EMA's interested parties list is maintained on the online Santa Ynez Groundwater Communication Portal (GCP), which is also used by the two other GSAs in the Basin. The GCP notifies interested parties electronically of upcoming meetings related to development of the GSP and sends e-mails about upcoming surveys and public comment periods. More than 35 notification e-mails were sent through this source over the course of GSP preparation. The GCP contains a database showing meeting dates, times, and locations, along with related documents, such as meeting agendas, minutes, and matters considered by the GSA. During public comment periods, interested parties can review documents and submit comments using a form on the GCP. Public comments are reviewed and addressed in revisions to ~~draft~~ GSP elements and sections.

In addition to the online GCP, EMA GSA Committee meetings are held regularly to provide updates and information about the GSP and to receive public feedback. As described above, all EMA GSA Committee meetings are subject to Brown Act requirements. The EMA CAG provides an additional level of public input on various issues related to the development of the GSP. As requested by the EMA GSA Committee, the EMA CAG ~~provides~~provided feedback on elements or sections of the GSP (and ~~will provide input~~ on the final draft of the GSP) to ensure the inclusion of perspectives representing different categories of groundwater uses and users in the EMA. Public input gathered at these meetings has helped shape development of the GSP and fostered discussion of stakeholder concerns and ideas for collaborative involvement in future GSP implementation activities.

More than 23 public workshops were held during the development of the GSP to inform stakeholders of key elements of the GSP and to solicit input on how sustainability criteria should be set, what constitutes undesirable results, and what projects and management actions should be employed as needed or desired to maintain sustainability in the EMA. Media outreach included preparation of three press releases in the Santa Barbara News Press, Santa Ynez Valley Star, and Noozhawk, a digital news source.

Substantial effort was put into maintaining the Basin's SGMA website (santaynezwater.org) with GSA-specific webpages that provided a calendar of events and public comment periods for each GSA, GSA and CAG meeting agendas, minutes, supporting materials presented at each meeting, and workshop slides. The Basin's SGMA website has recorded over 5,000 webpage views per month.

The EMA GSA used focused methods to enhance the accessibility of the GSP development process to a diverse range of social, cultural, and economic elements of the population within the EMA. Section 10723.2(h) of SGMA provides that California Native American tribes are among the beneficial users of groundwater that must be considered by the EMA GSA in preparing the GSP. The Santa Ynez Band of Chumash Indians have a reservation within the EMA, and the Tribal Chairman indicated early in the process of developing the GSP that the Tribe looks forward to collaborating with the GSA. The EMA GSA remains in contact with and welcomes participation from the Santa Ynez Band of Chumash Indians in GSP development, and the Tribal Government has a representative on the EMA CAG.

Specific efforts were also made to reach out to disadvantaged communities during GSP development, including the use of culturally appropriate language, education, and framing of sustainable groundwater management issues. However, recent data indicates that there are no disadvantaged communities present within the EMA, although there are disadvantaged communities within other management areas in the Basin. The GSA created quarterly newsletters in English and Spanish for the general public for the entire Basin, which were distributed by member agencies in utility bills and through newsletters from the County's District Supervisors. These newsletters are included in Appendix B. Translation services ~~are~~were offered for different languages as needed in compliance with the Dymally-Alatorre Bilingual Services Act. Interested parties were notified of each meeting through the GCP and through the newsletters from the County's District Supervisors.

2.3.4.3 Progress Updates

§ 354.10 Notice and Communication. Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:

(d) A communication section of the Plan that includes the following:

(4) The method the Agency shall follow to inform the public about progress implementing the Plan, including the status of projects and actions.

The EMA GSA has kept the public informed throughout the development of the GSP using the GCP and other means discussed herein and will continue to use this web-based tool during GSP implementation along with the Basin's SGMA website that has GSA-specific pages. E-mails will be sent to interested parties to report on the progress made in implementing projects and actions. Direct mailings will also be sent to stakeholders who have requested direct mailings and provided a mailing address. EMA GSA Committee meetings will continue to be held to present information and invite the public to comment. Materials presented in EMA GSA Committee meetings to update the public on progress will also be made available to local agencies to use in communications with their own constituents, and they will be encouraged to share these materials. Annual reports will be prepared describing monitoring results and progress toward implementing the GSP and meeting sustainability goals. GSP updates must be submitted to DWR every 5 years, and stakeholders will be asked to review and comment on the updates.

The *Communication and Engagement Plan* for the GSP is presented in Appendix B. A description of the public process that was used to establish the SMCs is presented in Section 5.3.1. The methods the EMA GSA will follow to inform the public about progress towards implementing the GSP is included in Section 7. The annual report will also provide an update that informs the public about progress toward implementing the plan.

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SECTION 3: **Basin Setting** [Article 5, Subarticle 2]

§ 354.12 Introduction to Basin Setting. This Subarticle describes the information about the physical setting and characteristics of the basin and current conditions of the basin that shall be part of each Plan, including the identification of data gaps and levels of uncertainty, which comprise the basin setting that serves as the basis for defining and assessing reasonable sustainable management criteria and projects and management actions. Information provided pursuant to this Subarticle shall be prepared by or under the direction of a professional geologist or professional engineer.

This section describes the physical setting and characteristics of the Santa Ynez River Valley Groundwater Basin (Basin) Eastern Management Area (EMA), including the basin boundaries, geologic formations and structures, and principal aquifer units. An accurate understanding of the Basin is central to sustainable management of the groundwater resource for all the beneficial uses within the EMA, including agricultural, municipal, domestic, and environmental uses.

This section is principally based upon a body of published literature, consisting primarily of the following:

- Geologic and hydrogeologic investigations
- Annual groundwater planning reports, which have been prepared for a large portion of the EMA for more than 40 years
- Basin-specific geologic and hydrogeologic data

The compiled literature, reports, and data that contribute to this report constitute the best available information relevant to the EMA. This Basin Setting section of the Santa Ynez River Valley Groundwater Basin – Eastern Management Area Groundwater Sustainability Plan (GSP) provides a foundation for sustainable groundwater management, and, to that end, will be updated as warranted to maintain this goal.

3.1 Hydrogeologic Conceptual Model [§ 354.14]

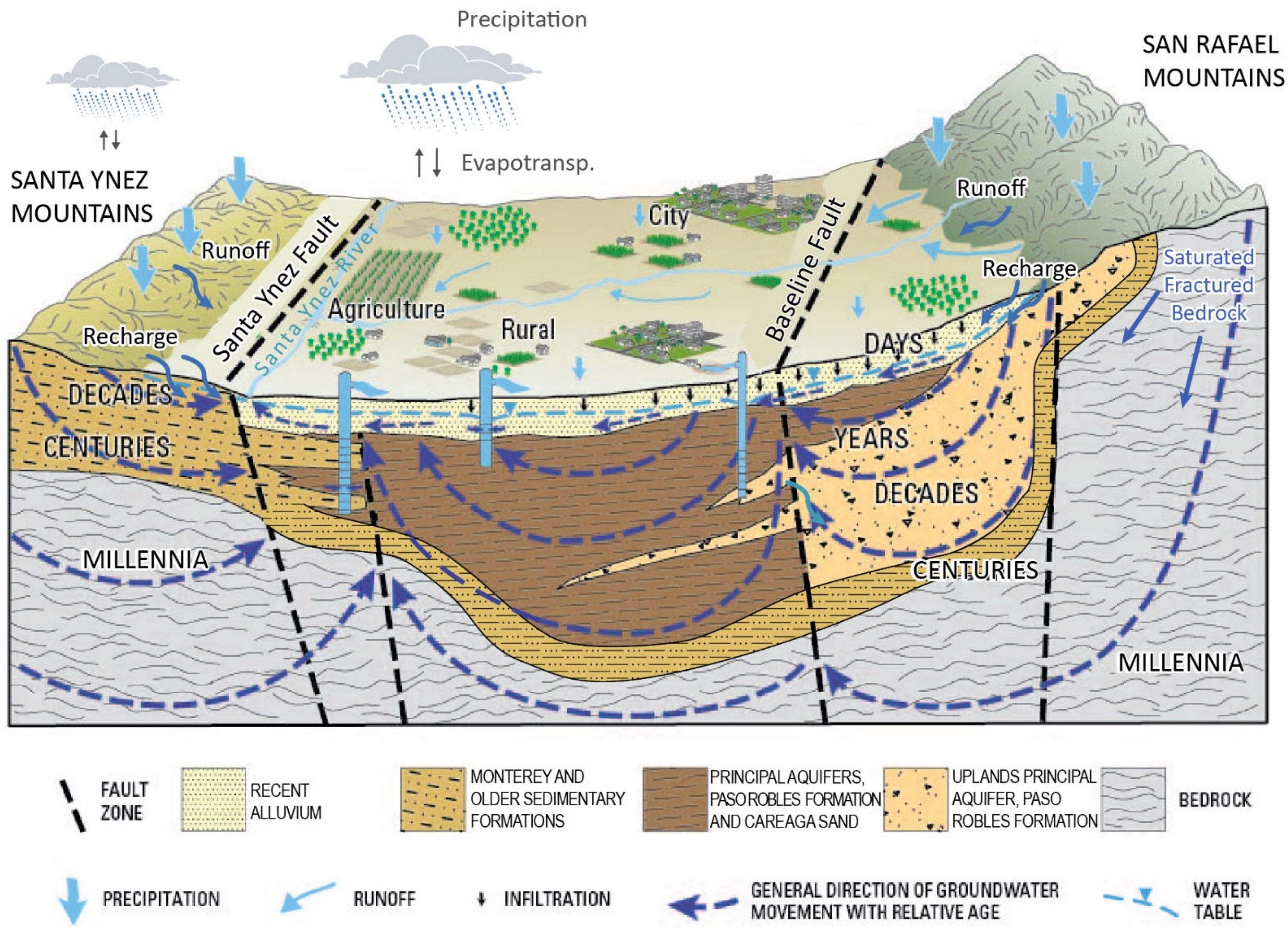
§ 354.14 Hydrogeological Conceptual Model

(a) Each Plan shall include a descriptive hydrogeologic conceptual model of the basin based on technical studies and qualified maps that characterizes the physical components and interaction of the surface water and groundwater systems in the basin.

This section describes the hydrogeologic conceptual model (HCM) for the EMA and, to some degree, the entire Basin. The HCM is a simple narrative description with diagrams of the hydrogeologic system of the EMA. As depicted in Figure 3-1Figure 3-1, the EMA HCM area encompasses the entire landscape and underlying geology from the mountains rimming the Basin (the San Rafael Mountains to the north and east and the Santa Ynez Mountains to the south) down to the Santa Ynez River that drains water from the valley. The HCM and its various components are presented below, including the following:

- Topographic setting

- Surface hydrology and its interactions with groundwater
- Underlying geologic system and principal aquifers
- Generalized recharge and discharge areas for the aquifers
- Principal flow directions
- Water inflows and outflows



Source: Nishikawa, 2013, Hydrologic and Geochemical Characterization of the Santa Rosa Plain Watershed, Sonoma County, California

Important details related to each of these components of the HCM, relevant groundwater water quality and primary beneficial uses of the groundwater, and a discussion of identified data gaps and aspects of uncertainty associated with these elements are presented in the following subsections.

This HCM provides a framework for subsequent sections of the basin setting, including groundwater conditions (Section 3.2) and water budgets (Section 3.3). Together these sections provide the basis for a solid understanding of the groundwater resources in the EMA and support water managers' efforts to achieve groundwater sustainability in the EMA and the Basin by 2042.

3.1.1 Regional Hydrology

3.1.1.1 Topography and Watershed Boundary

§ 354.14 Hydrogeological Conceptual Model.

(d) Physical characteristics of the basin shall be represented on one or more maps that depict the following:

(1) Topographic information derived from the U.S. Geological Survey or another reliable source.

The Basin is located within the Santa Ynez River watershed in Santa Barbara County on California's central coast. The entire Basin is about 50 miles long and varies in width from about 4 to 7 miles, as presented on Figure 1-1. The Basin covers 319 square miles (204,000 acres) within the entire Bulletin 118 Basin Boundary, of which the easternmost 150 square miles make up the EMA, including the Santa Ynez Uplands and Santa Ynez River areas. The Santa Ynez Uplands area includes the groundwater system that is under the jurisdiction of the Sustainable Groundwater Management Act (SGMA). The Santa Ynez River area, including the river and associated underflow constitutes a surface water system, is managed under the jurisdiction of the California State Water Resources Control Board (SWRCB) and is not within the purview of SGMA.

The Basin is divided into three management areas (MAs): the Western Management Area (WMA), the EMA, and the Central Management Area (CMA). Due to the unique geology and hydrogeology in each area, these three areas are managed as individual management areas with respect to SGMA.

Extending north of the Santa Ynez Uplands and rising to 4,000 to 6,000 feet above sea level, the EMA watershed includes Figueroa Mountain (LaFreniere and French, 1968) and the Santa Ynez Mountains. The EMA is bounded on the north and east by impermeable rocks of the San Rafael Mountains and on the northwest by the adjacent San Antonio Creek Valley Groundwater Basin (San Antonio Groundwater Basin). The entire Basin is bounded on the south by the Santa Ynez Mountains (DWR, 2016; Figures 1-1 and 3-1).

As is discussed throughout this section, the EMA portion of the California Department of Water Resources (DWR) Bulletin 118 boundary comprises two main areas: the Santa Ynez Uplands and the Santa Ynez River areas. To the north and east, the Santa Ynez Uplands are surrounded by the San Rafael Mountains, which contribute surface water flow and groundwater recharge to the Santa Ynez Uplands. Several tributaries and their sub-watersheds flow from the San Rafael Mountains to the Santa Ynez River. They include Santa Cruz Creek and Cachuma Creek, which flow into Lake Cachuma (Cachuma Reservoir). Several other creeks that flow into the Santa Ynez River directly downstream of Lake Cachuma's Bradbury Dam include Happy Canyon, Santa Agueda Creek, Zanja de Cota Creek, Alamo Pintado Creek, Adobe Canyon and Ballard Canyon. Zaca Creek exits the EMA and flows through the CMA into the Santa Ynez River.

The southern portion of the DWR's Bulletin 118 basin boundary along the Santa Ynez River is bounded by the Santa Ynez Mountains to the south. Surface water flows into this area are principally from the upstream Santa Ynez River, which drains approximately 900 square miles, and include flow from the Santa Ynez

Mountains through the following tributaries into the Santa Ynez River: Hilton, San Lucas, Calabazal, Quiota and Alisal Creeks. The locations of the contributing creeks are shown on Figure 3-1.[17]

The Santa Ynez Uplands covers a majority of the EMA, including the northern 130 square miles (87 percent) of the 150 square miles of the EMA. The Santa Ynez Uplands is characterized by the following:

- It is wholly within the EMA.
- It includes the towns of Santa Ynez, Ballard, and Los Olivos.
- It includes areas both within the Santa Ynez River Water Conservation District (SYRWCD) referred to as Zone E; shown on Figure 2-4 and extending to the north to the San Rafael Mountains and to the east to areas north of Lake Cachuma (Stetson, 2021).
- Its principal aquifers are separated from the topographically lower Santa Ynez River and associated Alluvium to the south by a ridge of low permeability rocks (e.g., Monterey Formation), except in areas where tributaries to the Santa Ynez River (e.g., Alamo Pintado Creek) cut through. These low permeability rocks underlie the river and Santa Ynez River Alluvium.
- Its land-surface elevation ranges from a low of 480 feet above sea level in the southern portion along Alamo Pintado Creek near the City of Solvang to a high of about 2,390 feet above sea level in the foothills in the north and northeast of the area.

The Santa Ynez River Alluvium—managed as surface water by the SWRCB and not subject to management by the Groundwater Sustainability Agencies (GSAs) under SGMA—underlies the Santa Ynez River. The Santa Ynez Alluvium extends outside of the EMA, both upstream and downstream, for a total length of 36 miles between the upstream Bradbury Dam (to the east) through the CMA and WMA to the Lompoc Plain to the west, passing the Cities of Solvang, Buellton, and Lompoc (Santa Barbara County, 2012). In the EMA, the land-surface elevation within the Santa Ynez River Alluvium ranges from a low of 350 feet near the City of Solvang, to a high of 600 feet near the base of Bradbury Dam (Santa Barbara County, 2012).

Between the Santa Ynez Uplands and Santa Ynez River areas lies an area of relatively limited groundwater production (referred to in SYRWCD annual reports as Zone C [see Figure 2-4]) that serves as a catch-all area for all other portions of SYRWCD (Stetson, 2021). Groundwater production in this area is limited due to the relatively shallow and discontinuous aquifers and bedrock.

As is discussed more thoroughly in Section 3.3, Water Budgets, both surface water flow and groundwater recharge derive from water that enters the Basin around the edges from the underlying bedrock on the mountain slopes. This is commonly referred to as mountain front recharge. This recharge component occurs both from the north from the San Rafael Mountains, which contribute groundwater recharge to the Santa Ynez Uplands, and from the south from the Santa Ynez Mountains, which contribute recharge to the Santa Ynez River area both above and belowground. Mountain front recharge from the Santa Ynez Mountains flows directly into streams and then into the Santa Ynez River.

[17] The subareas referred to in this GSP generally follow the conventions used for management by SYRWCD, such that the Santa Ynez River area includes most of SYRWCD's Zone A, as well as other areas within the Santa Ynez River Alluvium upstream to the Bradbury Dam. The Santa Ynez River area constitutes a surface water system, which is managed under the jurisdiction of the SWRCB and is not within the purview of SGMA. These general areas are summarized in annual reports prepared by SYRWCD.

Figure 3-1. Topographic Map

3.1.1.2 Soil Types

§ 354.14 Hydrogeological Conceptual Model.

(d) Physical characteristics of the basin shall be represented on one or more maps that depict the following:

(3) Soil characteristics as described by the appropriate Natural Resources Conservation Service soil survey or other applicable studies.

Soil types have been mapped and presented by the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service Soil Survey Geographic Database (USDA, 2020; Figure 3-2Figure 3-2). The saturated hydraulic conductivity of the surficial soils is a good indicator of surficial soil infiltration potential, and thus potential for recharging underlying groundwater resources. The soil hydrologic grouping is an assessment of soil infiltration rates that are determined by the water transmitting properties of the soil, which includes hydraulic conductivity and percentage of clays in the soil relative to sands. These groups are defined as the following:

- **Group A – High Infiltration Rate:** Water is transmitted freely through the soil; soils typically have less than 10 percent clay and more than 90 percent sand or gravel.
- **Group B – Moderate Infiltration Rate:** Water transmission through the soil is unimpeded; soils typically have between 10 and 20 percent clay and between 50 and 90 percent sand.
- **Group C – Slow Infiltration Rate:** Water transmission through the soil is somewhat restricted; soils typically have between 20 and 40 percent clay and less than 50 percent sand.
- **Group D – Very Slow Infiltration Rate:** Water movement through the soil is restricted or very restricted; soils typically have greater than 40 percent clay, less than 50 percent sand.

The hydrologic groups generally correlate with the hydraulic conductivity of underlying geologic units, with lower soil hydraulic conductivity zones correlating to areas underlain by clayey portions of the Paso Robles Formation. The higher soil hydraulic conductivity zones generally correspond to areas underlain by Alluvium underlying the Santa Ynez River, unsaturated Older Alluvium, and areas of coarser sediments within the Paso Robles Formation.

Soils with the highest infiltration rate in Group A mainly consist of deep, well-drained to excessively drained sands or gravelly sands, characterized by low runoff potential even when thoroughly wet. These high infiltration soils are present in three general areas:

- **Vicinity of Los Olivos and Solvang**
- **Along Santa Agueda and Alamo Pintado Creeks**, as well as along the **Tributary Alluvium of Santa Cruz Creek** north of Lake Cachuma
- **Along the Santa Ynez River**

Figure 3-2. Hydrologic Soil Groups

The soils in Group B have a moderate infiltration rate when thoroughly wet and are moderately deep and well-drained. These have moderately fine to moderately coarse texture. These soils are located within the following:

- **Tributary Alluvium of Zaca Creek** north of Highway 101
- **Santa Ynez Uplands** north of Santa Ynez
- **Zanja de Cota Creek and a majority of SYRWCD's Zone C area**, adjacent to the Santa Ynez River area

The slow and very slow infiltration rate soils in Groups C and D, respectively, make up the remainder of the EMA, occurring primarily in the Older Alluvium that blankets the area and found in areas of the Santa Ynez Uplands. These soils have slow to very slow infiltration rates when thoroughly saturated. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture.

3.1.1.3 Surface Water Bodies

§ 354.14 Hydrogeological Conceptual Model

(d) Physical characteristics of the basin shall be represented on one or more maps that depict the following:

(5) Surface water bodies that are significant to the management of the basin.

The most significant natural surface water feature in the Basin, the Santa Ynez River, flows west over approximately 90 miles, from its headwaters in the San Rafael and Santa Ynez Mountains, to the Pacific Ocean, draining approximately 900 square miles (Figure 2-13). The headwaters originate at an elevation of about 4,000 feet above sea level near the eastern boundary of Santa Barbara County, where there is an average annual precipitation of up to 49 inches per year.[18]

The Santa Ynez River enters three human-made reservoirs upstream of the WMA and the CMA: Jameson Reservoir is the farthest upstream, then Gibraltar Reservoir, and finally Lake Cachuma (Figure 2-13). The reservoirs were built for municipal water supply. Both Jameson and Gibraltar Reservoirs have storage capacities of approximately 5,000 acre-feet each. Lake Cachuma is much larger with a total storage capacity of as much as 195,578 acre-feet (at an elevation of 753 feet above sea level). Although reservoir releases flow into the Santa Ynez River, the reservoirs are also managed to divert water out of the Santa Ynez River watershed through a system of tunnels through the Santa Ynez Mountains for use by the cities located on the Santa Barbara County south coast (i.e., City of Goleta and Cities of Santa Barbara, Montecito and Carpinteria).

The largest of the three reservoirs is Lake Cachuma, which is approximately 5 miles long and up to 1 mile wide, which is fed by the upper Santa Ynez River and two major tributaries from the Santa Ynez Uplands to the north, which are Santa Cruz Creek and Cachuma Creek. Below the Bradbury Dam, which impounds Lake Cachuma, the Santa Ynez River flows west into and through the EMA. In the EMA downstream of Bradbury Dam, the Santa Ynez River is joined by several tributaries—including Santa Agueda Creek, Zanja de Cota

[18] PRISM Climate Group. 2014. *Average Annual Precipitation 1981–2010*.

Creek, and Alamo Pintado Creek—as the river flows past the communities of Solvang and Santa Ynez, as shown on Figure 3-1Figure 3-1.

Downstream of Bradbury Dam, the Santa Ynez River continues flowing west and is primarily intermittent throughout the Basin, carrying mainly flood flows from tributary watershed land downstream of Bradbury Dam with occasional spills and releases of water from Lake Cachuma. During summer months, water is released from Lake Cachuma to meet downstream water rights.

Downstream Water Rights Releases

The EMA is recharged in part by downstream water rights releases from Lake Cachuma, as ordered by SYRWCD. Rules governing water rights releases for users downstream of Lake Cachuma are set forth in the SWRCB Order of 1973 (WR 73-37), as amended in 1989 (WR 89-18) and most recently in 2019 (WR 2019-0148) (SWRCB, 2019). These releases are based on the establishment of two accounts and accrual of credits (storing water) in Lake Cachuma for the Above and Below Narrows areas. Releases from the Above Narrows Account are made at Bradbury Dam for the benefit of downstream water users between the dam and the Lompoc Narrows. Releases from the Below Narrows Account are conveyed to Lompoc Narrows for the benefit of water users in the Lompoc Plain subarea. The SYRWCD designates the riparian flow subarea as Zone A, which is referred to as the Santa Ynez River Area on Figure 3-1Figure 3-1.

Historically, the primary uses of Lake Cachuma water have been for people and agriculture. Water rights releases from Bradbury Dam are made for the benefit of downstream users of water along the Santa Ynez River in a manner that balances the flood flow capture capacity within the reservoir and the reliable downstream supply of water for aquatic and riparian needs and human demands along the river. The 2019 water rights decision includes provisions to protect endangered Southern California steelhead in the Santa Ynez River. Within the EMA, the Santa Ynez River flows west of Highway 154, past the communities of Solvang and Santa Ynez, as presented on Figure 3-1Figure 3-1.

3.1.2 Streamflow Monitoring

Within the EMA, the Santa Ynez River is currently gauged and recorded just upstream of the EMA where it flows under Highway 154 at the San Lucas Bridge. Flow of the Santa Ynez River within the EMA has been actively gauged near Solvang from 1928 until the present. Streamflow is also measured along Alamo Pintado Creek, at a location approximately 2.5 miles upstream of its confluence with the Santa Ynez River.

Streamflow data from the historical and existing streamflow gauges, along with Lake Cachuma storage data, have been obtained from the U.S. Geological Survey (USGS). Data documenting water releases from Bradbury Dam were compiled from the U.S. Bureau of Reclamation (USBR) sources.

The periods with monthly streamflow data sets from stream gauging stations within and surrounding the EMA are presented on Table 3-1Table 3-1. The locations of these gauging stations, with the exception of the upstream stations along the Santa Ynez River, are presented on Figure 2-13.

Table 3-1. Summary of Streamflow Gauging Stations

Station Name	Elevation (feet)	Location	Beginning of Record	End of Record	Station No.
Jameson Reservoir	2,240	Upstream	1970	2013	11121010
Santa Ynez River Below Gibraltar Reservoir	1,229	Upstream	1988	Active	11123000
Gibraltar Dam Release Weir	1,229	Upstream	2007	Active	11122010
Santa Ynez River Above Gibraltar Dam Storage	1,399 (varies)	Upstream	1988	Active	11122000
Santa Ynez River Below Los Laurels Canyon	788	Upstream	1947	Active	11123500
Santa Cruz Creek	783	Upstream	1941	Active	11124500
Hilton Canyon Below Bradbury Dam	653	Upstream	2002	2016	11125605
Hilton Canyon Creek	740	Upstream	2016	Active	11125600
Santa Ynez River near Santa Ynez (stage)	558	Upstream	1928	2009 (Currently stage only)	11126000
Santa Ynez River at Highway 154 (Water Quality)	520	Upstream	2007	Active	11126400
Alamo Pintado Creek	540	Within EMA	1970	Active	11128250
Zaca Creek Near Buellton	471	Downstream	1963	Active	11129800
Santa Ynez River at Solvang	350	Within EMA[1]	1928	Active	11128500

Note

[1] This is within the DWR Bulletin 118 boundaries for the Basin in the Santa Ynez River area, not managed under the purview of SGMA.

3.1.2.1 Sources and Point of Delivery of Imported Water

§ 354.14 Hydrogeological Conceptual Model.

(d) Physical characteristics of the basin shall be represented on one or more maps that depict the following:

(6) The source and point of delivery for imported water supplies.

In addition to local surface water and groundwater sources, supplemental water is imported into the EMA. While groundwater supplies a majority of the water demand within the EMA, surface water is available to the EMA via local sources (the Cachuma Project and Cachuma releases that convey water through the Santa Ynez River Alluvium), and from an imported source: California State Water Project (SWP) water through the Coastal Branch of the SWP (Santa Barbara County, 2012).[19] Pumping from the Santa Ynez River Alluvium is managed as surface water by the SWRCB and is not subject to management by the GSAs under SGMA.

State Water Project

Imported SWP water is delivered to portions of the EMA through the Central Coast Water Authority (CCWA) pipeline, which has been operating since 1997. Water is delivered at turnouts to specific water distribution systems, as well as to Lake Cachuma. Within the Basin, the receiving entities are Vandenberg Space Force Base,[20] the City of Buellton, the City of Solvang, and the Santa Ynez River Water Conservation District, Improvement District No. 1 (ID No. 1). CCWA water can also be mixed in with the water from water rights releases at Lake Cachuma.

In 1997 and 1998, CCWA was formed to finance, construct, manage, and operate Santa Barbara County's 42-mile extension of the SWP water pipeline, the State-owned water facilities in Santa Barbara and San Luis Obispo Counties, and a regional water treatment plant (Santa Barbara County, 2012). Beginning in 1998, ID No. 1 began receiving water from the SWP through the new pipeline. The location of the pipeline and turnouts in the City of Solvang and ID No. 1 are presented on Figure 2-13.

ID No. 1 holds an SWP allocation of 2,000 acre-feet per year (AFY) and a 200-AFY as a drought buffer. A total of 1,500 AFY are contractually committed for use by the City of Solvang. The drought buffer effectively increases the amount of water that can be delivered in the event that the agency's full allocation of SWP water is not delivered in a given year.

The imported water, both within ID No. 1 and the City of Solvang, is used by agricultural, municipal, domestic, and industrial customers. Approximately 95 percent of these water uses occur on land overlying the Santa Ynez Upland area; however, it is not possible at this time to determine exactly where the imported water is used in the ID No. 1 system. This is because, in the ID No. 1 water distribution system, the imported water is mixed with other native water in the Basin, including upland groundwater and river alluvium well water.

3.1.3 Regional Geology

§ 354.14 Hydrogeological Conceptual Model.

(b) The hydrogeologic conceptual model shall be summarized in a written description that includes the following:

(1) The regional geologic and structural setting of the basin including the immediate surrounding area, as necessary for geologic consistency.

(d) Physical characteristics of the basin shall be represented on one or more maps that depict the following:

(2) Surficial geology derived from a qualified map including the locations of cross-sections required by this Section.

This section describes the geologic formations and structure in the EMA portion of the Basin. These descriptions are summarized from published reports from the USGS (Upson and Thomasson,1951 and LaFreniere and French, 1968) and reports by consultants and federal, state, and local agencies. The surficial geology and geologic structures are mapped and described by Dibblee (1950, 1980, 1987a, 1987b, 1988a, 1988b, 1991, 1993a, and 1993b), as presented on Figure 3-3Figure 3-3.

3.1.3.1 Regional Geologic and Structural Setting

The Basin is located at the extreme southern end of the Coast Ranges geomorphic province, as defined by the California Geological Survey (2002). The Santa Ynez Fault Zone, which is located near the southern boundary of the Basin, is the southern boundary of the Coast Ranges, which extend more than 500 miles to the north up the California Coast to the Oregon border. The Coast Ranges are northwest-trending mountain ranges and valleys that follow the trend of the San Andreas Fault. The Coast Ranges are composed of thick Mesozoic and Cenozoic sedimentary rocks. The northern and southern extents of the Coast Ranges are separated by a depression in which the San Francisco Bay lies.

The Transverse Ranges south of the Basin is an east-west trending series of steep mountain ranges and valleys. Contrary to the north-south trending in the Coast Ranges, the structure of the Transverse Ranges is oblique to the normal northwest trend of coastal California, hence the name "Transverse." This province extends offshore to include the San Miguel, Santa Rosa, and Santa Cruz islands. Intense north-south compression is squeezing the Transverse Ranges, causing this to be one of the most rapidly rising regions on Earth (California Geological Survey, 2002).

Within the Coast Ranges, the Basin consists of a westward-trending, linear, structural depression between rugged mountain ranges and hills. The Basin is open to the Pacific Ocean on its west end. The main structural features of the Basin are a series of related synclines and anticlines (i.e., folding of the rocks),

[19] Both the Cachuma Project and the SWP water source provisions are described in detail in Section 3.3.2.1.3.
[20] Vandenberg Space Force Base was formerly called the Vandenberg Air Force Base until a renaming ceremony in May 2021 (Associated Press, 2021).

which represent folded formations in the lowland between the Santa Ynez Mountains on the south and the faulted San Rafael Mountains on the north (Figure 3-3Figure 3-3).

Within the EMA, several faults bound the EMA and cross it, as shown on Figure 3-3Figure 3-3. The San Rafael Mountains to the north of the EMA were uplifted along the Little Pine Fault Zone, which trends northwest and has a displacement of several thousand feet (Upson and Thomasson, 1951).

Several additional faults exist within the EMA. The Santa Ynez River Fault Zone crosses below the Santa Ynez River area. Likewise, the Baseline Fault and the associated Los Alamos Fault and Casmalia Fault Zone cross the Santa Ynez Uplands area of the Basin in a southeast to northwest trend (Figure 3-3). These faults do not exhibit vertical offset of adjacent materials and are not believed to be barriers to groundwater flow but are likely semi-permeable because of the interbedded (and layered) nature of the underlying Paso Robles Formation (Hoffman, 1996).

The Tertiary-age older consolidated sedimentary formations surrounding and underlying the EMA include the Monterey Formation and the Vaqueros Formation. These units outcrop at the surface on the southern and northern edges of the EMA and underlie the water-bearing formations or aquifers. The water-bearing formations (aquifers) are discussed further below and in Section 3.1.4..

Monterey Formation (Bedrock below Principal Aquifers)

The Miocene-age Monterey Formation (Tm/Tml on Figure 3-3Figure 3-3) consists of interbedded argillaceous and siliceous shale, sandstone, siltstone, and diatomite. The Monterey Formation outcrops in the highlands surrounding the EMA, defines the base of the Basin, and lies stratigraphically below the Paso Robles Formation at the western edge of the EMA. Regionally, the unit thickness of the Monterey Formation is up to as much as 3,500 feet and is often highly deformed. The Monterey Formation is a source for oil in the Zaca Oil Field northwest of Los Olivos.

Groundwater produced from the Monterey Formation often has high concentrations of hydrogen sulfide, total organic carbon, and manganese. The locations of oil and gas exploration wells drilled in the EMA are presented on Figure 3-4. Oil and gas exploration has been important to the understanding of the geology of the region, including the EMA. The oil and gas wells identified on Figure 3-4Figure 3-4 help identify the depth and extent of the geologic formations that surround and underlie the EMA. Water wells completed in the Monterey Formation are occasionally productive if a sufficient thickness of highly deformed and brittle siliceous shale is encountered. More often, however, the Monterey shale produces groundwater to wells in very low quantities.

Other Bedrock Formations (Bedrock below Principal Aquifers)

The bedrock below and surrounding the Basin consists of a variety of non-water-bearing rocks of Tertiary, Cretaceous, and Jurassic ages. These are older impermeable rocks below and surrounding the Basin, separated by and faults including the Little Pine Fault Zone to the north and Santa Ynez River Fault Zone to the south. These rocks include the Monterey Formation; Sisquoc Formation; Sandstone of Hurricane Deck (also known as the Temblor Sandstone); Vaqueros Sandstone; Sespe Formation; Espada Formation; and the Diabase, Serpentinite and the Franciscan Assemblage (Figure 3-3Figure 3-3). Few water wells are completed within these formations, which are all outside of the Basin.

Characteristic of the Coast Range, the oldest of these rocks represent ophiolites, which consist of very old igneous and metamorphic rocks from the Jurassic and Cretaceous ages. These rocks formed at great depth and were scraped off the ocean floor when it subducted (dived below) rocks on the land.

Figure 3-3. Geologic Map

Figure 3-4. Oil and Gas Wells

3.1.3.2 Surficial Geology

The Basin is a wedge-shaped, northwest-trending trough filled with sediments that have been folded and faulted by dynamic regional tectonics. The Basin is bounded by faults on the north and east along the base of the San Rafael Mountains and to the south near the Santa Ynez River by older low-permeability rocks. The boundary to the northwest is defined as the shared border with the San Antonio Groundwater Basin, which is a topographic watershed divide west of Zaca Creek Canyon, but not necessarily a geologic barrier to groundwater flow. The understanding of flow in this area is discussed further in Section 3.2.

The surficial geology and major fault systems within and surrounding the Basin are presented as Figure 3-3~~Figure 3-3~~. In the lowland between the Santa Ynez Mountains and the San Rafael Mountains, the non-water-bearing rocks that underlie the Basin are folded in response to regional tectonic forces. This folding determined the areas where the unconsolidated water-bearing sediments could accumulate to form the aquifers within the Basin. Several synclines and anticlines exist throughout the complexly folded bedrock units within the EMA. The Santa Ynez River flows on top of a relatively younger alluvium that overlies the much older Monterey Formation, which was uplifted closer to the surface, due to faulting and folding in this portion of the Basin.

As shown on Figure 3-3~~Figure 3-3~~, the Basin is filled with an unconsolidated to weakly consolidated Tertiary-aged marine sandstone deposit, referred to as the Careaga Sand (~~Tca and~~ Tcag) and non-marine Pliocene- and Pleistocene-aged sand, gravel, silt, and clay deposits that comprise the Paso Robles Formation (QTp). In this report, the authors have combined the use of the two members of the Careaga Sand (Cebada and Graciosa members) to reflect how this material is managed in the EMA. The water-bearing formations of the Careaga Sand and the Paso Robles Formation together extend to a depth of more than 1,500 feet below ground surface (bgs) in the EMA with a maximum thickness up to 3,500 feet in the deepest part of the EMA. Overlying these formations are the Quaternary-aged Older Alluvium (Qoa), which is considered a derivative of the Paso Robles Formation, and is therefore composed of materials that are very similar to the Paso Robles Formation to a depth of as thick as 150 feet in places. Because of this similarity, this Older Alluvium is managed as part of the Paso Robles Formation

The Tributary Alluvium (Qa) in the Santa Ynez Uplands is comprised of similar alluvial materials as those of the Santa Ynez River Alluvium (Qg) in the Santa Ynez River area. These two materials are together referred to as Younger Alluvium in the CMA and WMA.

3.1.3.3 Geologic Cross Sections

§ 354.14 Hydrogeological Conceptual Model

(c) The hydrogeologic conceptual model shall be represented graphically by at least two scaled cross-sections that display the information required by this section and are sufficient to depict major stratigraphic and structural features in the basin.

Several geologic cross sections were created to depict the complex geology throughout the EMA. The locations of the cross sections are shown on Figure 3-5~~Figure 3-5~~ and the geologic cross sections are provided as Figures 3-6 through 3-14. Beneath the geology exposed on the land surface, are a series of sedimentary and bedrock geologic formations. The uppermost units below the surface are the recent and older alluvium and the Paso Robles Formation and Careaga Sand, which represent the principal aquifers. Underlying the principal aquifer, Tertiary-age and older consolidated sedimentary formations surrounding and underlying the EMA include the Monterey Formation and the Vaqueros Formation. These units outcrop at the surface on the southern and northern edges of the EMA and underlie the water-bearing formations or aquifers.

Figure 3-5. Geologic Cross Section Location Map

The geologic cross sections were created with the three-dimensional (3D) geologic modeling tool Leapfrog®. The 3D model has been used to characterize and illustrate the geologic and hydrogeologic setting that will be used to and support the decision-making process regarding sustainable groundwater management criteria. The 3D model was created for this GSP based on the best-available data from a variety of local, regional, and state-wide sources of geologic and hydrogeologic data, as presented on Table 3-2Table 3-2. Details of how the geologic framework model was prepared are presented in Appendix C.

Table 3-2. Summary of Data Used for Geologic Model

Data Type	Source	Coverage	Period of Record
Borehole Lithology (including oil and gas well geophysical logs)	DWR, ID No. 1, SYRWCD, Solvang, California Geologic Energy Management Division, USGS	131 boreholes within or adjacent to EMA	Current
Well Screen Intervals	DWR, ID No. 1, SYRWCD, Cities, USGS NWIS	279 wells within EMA	Current
Digital Elevation Model (DEM) 10-meter resolution	National Elevation Dataset (NED), USGS EROS Data Center	Entire model domain	Current
Surficial Geology	Dibblee (1950, 1980, 1987a, 1987b, 1988a, 1988b, 1991, 1993a, 1993b, and 1995)	Entire EMA	
Geologic Cross Sections	Dibblee (4 Sections: 1988a, 1993a, 1993b, 1995), Fugro (1 Section: 2007), Hopkins (4 Sections: 2003), USGS (3 Sections: Upson and Thomasson, 1951, LaFreniere and French, 1968)	Within and surrounding EMA	
Water Level Data[1]	USGS NWIS (includes CASGEM and Santa Barbara County data), USBR, City of Solvang, ID No. 1	Wells within and surrounding EMA	1905 to present

Notes

[1] Water level data and associated groundwater contour maps have not yet been incorporated into the model.

DWR = California Department of Water Resources
EMA = Eastern Management Area
EROS = Earth Resources Observation and Science
NWIS = National Water Information System
SYRWCD = Santa Ynez River Water Conservation District
USBR = U.S. Bureau of Reclamation
USGS = U.S. Geological Survey

The 3D geologic model represents the most complete understanding of the local geologic setting and distribution of principal aquifers and aquitards. The 3D geologic model also provided input data for the numerical groundwater flow model presented in Section 3.3 below. The 3D geological model will be updated as warranted as the understanding of the EMA changes. Geophysical characterization is underway within the EMA, the results of which will be used to update the 3D geologic model, numerical groundwater model, and geologic cross sections.

As shown in the cross sections, non-water-bearing rocks surround and underlie the EMA and include the Sisquoc and Monterey Formations. These formations are also evident at the surface in the southern portion of the EMA, north of the Santa Ynez River. These older bedrock units have generally low permeability, contain poor quality groundwater, and do not yield substantial quantities of water to wells.

Water-bearing geologic formations shown on Figure 3-3Figure 3-3 and the geologic cross sections include the Paso Robles Formation, Careaga Sand, Santa Ynez River Alluvium, and Tributary Alluvium. The geologic cross sections show the relationships between the darker-colored non-water-bearing geologic units of the Sisquoc and Monterey Formations, and the lighter-colored water-bearing geologic formations.

The configurations of the geologic formations, aquifers, and aquitards are presented on the geologic cross sections. The lateral extent and physical properties of the principal aquifers and aquitards are presented in Section 3.1.4.3.1.4.

Figure 3-6. Cross Section A

Figure 3-7. Cross Section B

Figure 3-8. Cross Section C

Figure 3-9. Cross Section D

Figure 3-10. Cross Section E

Figure 3-11. Cross Section F

Figure 3-12. Cross Section G

Figure 3-13. Cross Section H

Figure 3-14. Cross Section I

3.1.4 Principal Aquifers and Aquitards

The following sections describe the principal aquifers in the EMA portion of the Basin,[21] including physical properties, hydrogeologic characteristics, structural features within and bounding the EMA, the water quality within the EMA, and the primary beneficial uses of groundwater.

§ 354.14 Hydrogeological Conceptual Model.

(b) The hydrogeologic conceptual model shall be summarized in a written description that includes the following:

(4) Principal aquifers and aquitards, including the following information:

(A) Formation names, if defined.

3.1.4.1 Principal Aquifers

Aquifers are commonly named based upon the presence of water-bearing sand and gravel deposits grouped together into similar zones. Aquifers can be vertically or horizontally separated by fine-grained layers (called aquitards) that can impede the movement of groundwater between aquifers. Two principal aquifers have been identified in the EMA, as presented in Table 3-3Table 3-3: the Paso Robles Formation and the Careaga Sand. The Paso Robles Formation and Older Alluvium have similar hydrogeologic characteristics, are managed as a single unit, and have been combined into a single principal aquifer for the purposes of this GSP.

Table 3-3. Principal Aquifers in the Basin

Principal Aquifer	Formation Names	Map Symbol
Paso Robles Formation	Paso Robles Formation	QTp
	Older Alluvium	Qoa
Careaga Sand	Careaga Sand	Tca and Tcag

Note

Pumping from the Santa Ynez River Alluvium is managed as surface water by the SWRCB and is not subject to management by the GSAs under SGMA.

Water present within the Santa Ynez River Alluvium is considered surface water bysubject to the jurisdiction of the SWRCB, and, thus, is not managed by the GSAs. Therefore under SGMA. In accordance with definitions set forth by SGMA and the SGMA regulations, the Santa Ynez River Alluvium is not classified in this GSP as a principal groundwater aquifer. Appendix K contains a memorandum that presents additional hydrogeological, jurisdictional, and historical bases for defining water in the Santa Ynez River Alluvium as underflow of the Santa Ynez River and not "groundwater" for purposes of SGMA. The hydraulic continuity of

[21] The Basin boundary as defined by DWR Bulletin 118 (Bulletin 118 boundary) (DWR, 2018a) is shown on Figure 3-4Figure 3-4. The Bulletin 118 boundary does not everywhere include the full lateral extent of basin sediments. The Bulletin 118 boundary also includes older, relatively impermeable non-basin geologic units in places. The discrepancies between the Bulletin 118 boundary and the surficial geology may be corrected in a future Basin Boundary Modification Request.

this underflow with the surface flow of the Santa Ynez River is such that diversion from the underflow constitutes diversion from the surface water system. This finding is also consistent with the practice of the SWRCB and numerous SWRCB decisions (refer to Appendix K for additional discussion).

The main criterion for defining the water-bearing geologic formations in the EMA as principal aquifers is based on the SGMA definition of a principal aquifer: "aquifers or aquifer systems that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems." "Groundwater" is defined by SGMA as "water beneath the surface of the earth within the zone below the water table in which the soil is completely saturated with water, but does not include water that flows in known and definite channels." Principal aquifers must exhibit both sufficient permeability and storage potential for the movement and storage of groundwater such that wells can reliably produce groundwater in sufficient quantities on a long-term basis. Another criterion is that the groundwater produced from the geologic formation must have generally acceptable quality. Groundwater of a conductivity of 3,000 micromhos/centimeter is considered as the maximum limit for basin groundwater quality that is suitable for serving beneficial uses in similar groundwater basins (DWR, 1979).

Application of these two criteria, along with the historical understanding and ongoing management of the aquifer system, supports the designation of the EMA sediments to the two principal aquifers, the Paso Robles Formation and the Careaga Sand. Descriptions of these two aquifers are presented in Section 3.1.4.3 below.below. Alluvium present within tributaries to the Santa Ynez River are not considered principal aquifers because they do not meet the above definitions; stakeholders living in these areas indicate that shallow wells frequently go dry in the summer and do not reliably supply water to meet beneficial uses.

3.1.4.2 Basin Boundary (Vertical and Lateral Extent of Basin) [§ 354.14(b)(2),(b)(3)]

§ 354.14 Hydrogeological Conceptual Model

(b) The hydrogeologic conceptual model shall be summarized in a written description that includes the following:

(2) Lateral basin boundaries, including major geologic features that significantly affect groundwater flow.

(3) The definable bottom of the basin.

While the watershed that drains surface water into the EMA encompasses a much larger area, DWR's Bulletin 118 defines the groundwater basin within the EMA as shown on Figure 3-1Figure 3-1 (DWR Bulletin 118 Basin 3-015; DWR, 2018a).

The Santa Ynez Uplands is separated from the Santa Ynez River area to the south by a ridge of impermeable bedrock. The Santa Ynez River Alluvium extends outside of the EMA, both upstream and downstream of the City of Solvang and the EMA boundary, for a total length of 36 miles between the upstream Bradbury Dam (to the east) to the Lompoc Plain to the west, passing the cities of Buellton and Lompoc (Santa Barbara County, 2012).

The Basin's bottom elevation within the EMA is shown on Figure 3-15Figure 3-15. In the Santa Ynez Uplands, the bottom of the Basin is the base of the water-bearing formations and includes the Paso Robles Formation and/or Careaga Sand. Together, the base of these water-bearing formations is an irregular surface formed as the result of folding, faulting, and erosion. The depth of these materials extends to a maximum depth of approximately 3,500 feet in some areas.

Figure 3-15. Basin Bottom

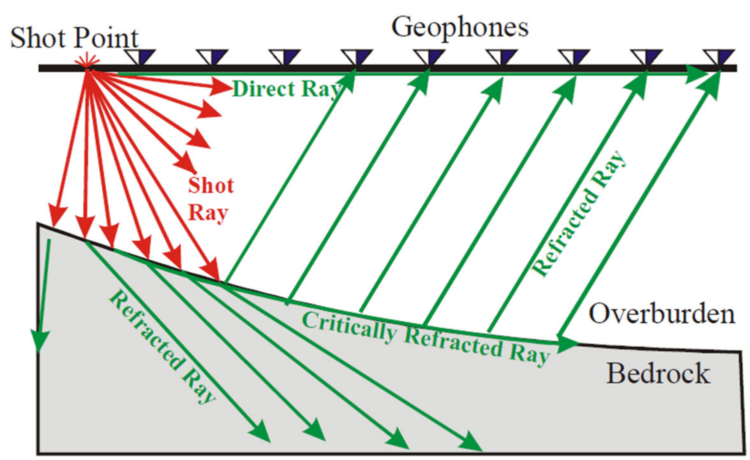
The top of the Monterey Shale bedrock is considered the base of the groundwater basin. While some of the bedrock units underlying the water-bearing materials may produce limited quantities of water, the water is generally of poor quality, especially within the Monterey Shale, and of limited volume and therefore, in accordance with SGMA, is not considered part of the Basin for the purposes of this GSP.

Basin Boundary Refinements - Geophysical Investigation

A series of geophysical surveys were conducted to provide additional information about water bearing deposits within the EMA including the nature of the boundary between the EMA and CMA, the nature of the connection between several of the north-south trending tributaries (e.g., Alamo Pintado Creek) within the Santa Ynez Uplands and the Santa Ynez River Alluvium, and to improve the understanding of the subsurface conditions in the Santa Ynez Uplands (Figure 3-16Figure 3-16). These geophysical surveys included a variety of both land-based and aerial methods. The land-based methods included seismic refraction and transient electromagnetic (TEM) surveys that were conducted in September 2020. An airborne electromagnetic (AEM) survey using a tTEM called SkyTEM is an electromagnetic survey conducted using a helicopter in November 2020. The results of the TEM and SkyTEM surveys were not available at the time of this GSP preparation and will be presented in the 5-year update.

Seismic Refraction Survey

As discussed in Section 3.1.3.2 above,above, geologic maps of the EMA show a bedrock ridge in the southwestern portion of the Basin. The bedrock ridge is believed to constrain groundwater flow between the Santa Ynez Uplands to the north and the Santa Ynez River Alluvium to the south (Hoffman, 1996). Groundwater in portions of the Santa Ynez Uplands may contribute some quantity of recharge to the Tributary Alluvium, which subsequently contributes to recharge to the Santa Ynez River Alluvium underflow and the rest of the Basin downstream of the EMA. This is not well defined. The groundwater discharging from the Santa Ynez Uplands also may flow through notches in the bedrock, which have been scoured out by erosive flows within ancient tributaries of the Santa Ynez River. These notches associated with the major tributaries to the Santa Ynez River have been filled to a limited depth with alluvium, the depth and extent of which are the subject of geophysical exploration conducted in support of this GSP. The areas where the geophysical investigations were conducted are presented on Figure 3-16Figure 3-16.



The diagram to the right presents an example of the seismic refraction method (HGI, 2020). Seismic energy provided by a source (shot) located on the surface radiates out from the shot point, either traveling directly through the upper layer (direct arrivals), or traveling down to, and then laterally along, higher-velocity layers (refracted arrivals) before returning to the surface. The refracted energy is detected on the surface using a linear array (or spread) of geophones spaced at regular intervals. Beyond a certain distance from the shot point, the refracted signal is observed as a first-arrival signal at the geophones (arriving before the direct arrival). Observation of the travel times of the direct and refracted signals provides information on the depth profile of the refractor for determining depth to bedrock and bedrock structure.

The results of the seismic refraction survey suggest that the depth to bedrock varies between approximately 35 and 200 feet bgs along the survey transects (Figure 3-16Figure 3-16). A picture of one of these seismic refraction survey lines along Meadowlark Road is shown to the right. Generally, the depth to bedrock tends to decrease with proximity to the mapped bedrock highs—which helps confirm the presence of a flow-restricting bedrock ridge. The bedrock lows correspond to areas that are filled with alluvium and transmit groundwater through the notches. Some of the cross sections show significant undulations in the interpreted bedrock surface, which could indicate a degree of scouring by ancient tributaries, and thus a permeable conduit for groundwater to flow through. Although there are uncertainties concerning lithological interpretations, the cross sections provide important details about the geometries of permeable and impermeable sediments, which are essential to quantifying the amount of groundwater flowing out of the Santa Ynez Uplands.

tTEM Survey

The other ground-based geophysical survey consisted of a towed transient electromagnetic system (tTEM) system, employed to provide data that could refine the geometry, layering, and estimated hydraulic properties of the shallow subsurface materials (0 to 250 feet). The tTEM equipment is designed for detailed 3D geophysical and geological mapping of the shallow subsurface (0 to 250 feet) in a fast and cost-efficient way. The tTEM survey was conducted to characterize the geometry of the major tributaries where they join the Santa Ynez River and the interaction of groundwater and surface water in the Santa Ynez River channel. The results of the tTEM survey support the interpretation that there are no substantial subsurface channels in the underlying bedrock that convey subsurface outflow from the tributaries directly to the Santa Ynez River. The report presenting these results will be available separately from this GSP when complete.

AEM Survey

The AEM (also referred to as SkyTEM) survey conducted within the EMA was designed to provide information about the geology, locations of faults and folds, thickness of principal aquifers, and geologic controls on groundwater movement in the Santa Ynez Uplands portions of the EMA. In addition, the AEM survey was designed to interpret the hydraulic connection between the EMA and CMA as well as between the shared border between the EMA and the San Antonio Groundwater Basin. The SkyTEM flight lines presented on Figure 3-16Figure 3-16 were selected to maximize the understanding of the geologic materials to a depth of about 1,000 feet below ground in areas where well log data are not available. Generally, these areas included the western portion of the Basin adjacent to the border with the San Antonio Groundwater Basin, the northern portion of the Basin, and the eastern portion of the Basin, generally north of Lake Cachuma.

The flight lines avoided inhabited buildings and areas of possible interference with the geophysical methods, including large metallic structures, fences, power lines, and grape trellises. The AEM flight plans were spaced approximately 800 feet apart and totaled more than approximately 600 miles of total flight lines. The flights were flown in a northeast-to-southwest direction. Two individual flight lines extended from the northern portion of the EMA in the Santa Ynez Uplands to the southern end of the EMA near the Santa Ynez River, in a location that was also surveyed by tTEM methods.

The hydrologic conceptual model presented in this GSP was updated based on the tTEM and AEM survey results. The results of updated geometry of the groundwater basin were imported into the 3D geological model of the EMA (in Leapfrog) and informed the development of the geologic cross sections and, ultimately, the calibrated groundwater flow model. The results of the tTEM and AEM surveys were generally incorporated directly into the geologic model for the EMA, which:

- Verified the substantial degree of folding of the principal aquifers as presented in the HCM (which was based on geologic mapping as well as lithologic descriptions from water wells and downhole geophysical surveys from oil and gas wells).
- Verified the presence of a known fault in the surveyed area.
- Confirmed the interpretation included in the numerical modeling calibration that there are differences in characteristics between the upper and lower portions of the Paso Robles Formation.

A report presenting the results of the AEM survey will be available separately from this GSP.

Figure 3-16. Areas of Geophysical Investigation

3.1.4.3 Physical Properties of Aquifers and Aquitards

§ 354.14 Hydrogeological Conceptual Model

(b) The hydrogeologic conceptual model shall be summarized in a written description that includes the following:

(4) Principal aquifers and aquitards, including the following information:

(B) Physical properties of aquifers and aquitards, including the vertical and lateral extent, hydraulic conductivity, and storativity, which may be based on existing technical studies or other best available information.

The following section presents a description of the physical properties of each principal aquifer. These descriptions are based on technical studies and geologic interpretation compiled from the best available data. The locations of these aquifers are presented on Figure 3-3Figure 3-3. The physical properties of each of the principal aquifers are summarized in Table 3-4Table 3-4.

No significant confining aquitard units are known to exist within the EMA, although locally confined conditions may be observed in wells completed in the Paso Robles Formation, due to the known heterogeneity in this aquifer, which includes clayey layers and gravel lenses of significant areal extent.

The hydraulic properties of wells completed in the principal aquifers were estimated based on published values (Upson and Thomasson, 1951; LaFreniere and French, 1968; Hoffman, 1996; Hopkins, 2003) and pumping test analyses for wells compiled for creation of this GSP. These data were supported by data included in well completion reports reviewed by GSI Water Solutions, Inc. (GSI). These best available data provide a basis for estimating aquifer properties for the principal aquifers. Aquifer testing data were compiled for wells completed within the Paso Robles Formation and Careaga Sand. These hydraulic properties are employed as inputs for the numerical groundwater flow model, whose development and results are presented in Section 3.3. The estimated aquifer properties presented in Table 3-4Table 3-4 and in the paragraphs below for the two principal aquifer and the Tributary Alluvium include usage of the following aquifer characteristics:

- **Hydraulic conductivity:** the rate of flow of water in gallons per day through a cross section of one square foot under a unit hydraulic gradient (feet per day).
- **Transmissivity:** the rate at which water is transmitted through a unit width of an aquifer under a unit hydraulic gradient (square feet per day).
- **Storativity:** the volume of water an aquifer releases from or takes into storage per unit surface area of the aquifer per unit change in head. Also commonly referred to as the storage coefficient, storativity is the sum of the confined storage coefficient (specific storage times saturated thickness) and the specific yield (unitless).
- **Specific Capacity:** the rate of discharge of a water well per unit of water level drawdown (gallons per minute per foot of drawdown).
- **Flow:** the rate at which water is discharged from a water well during operation (gallons per minute).

Data sources include pumping tests compiled from the County of Santa Barbara Environmental Health Services for water purveyors and mutual water companies, including the following:

- Oak Trail Estates
- Midland School
- Santa Ynez Rancho Estates
- Rancho Ynecita
- Woodstock Ranch
- Walking M Ranches
- Alisal Ranch Golf Course
- Meadowlark Ranches
- City of Solvang
- ID No. 1

These data and reports (some of which include interpretation of the data) were reviewed to estimate hydraulic properties, principally, hydraulic conductivity and well production characteristics. The type of aquifer testing conducted varied between shorter-term step-rate tests and longer-term constant-rate tests conducted for up to 24 hours. The distribution of these wells in the Basin was generally sufficient to represent the variability of aquifer hydraulic properties throughout the EMA.

Table 3-4. Physical Properties of Each Principal Aquifer

Principal Aquifer	Principal Location (Lateral Extent)	Vertical Extent (feet)	Hydraulic Conductivity (feet / day)	Storativity (unitless)		Porosity
				Sc	Sy	(Vol/Vol)
Paso Robles Formation (includes Older Alluvium)	Santa Ynez Uplands, outcropping across approximately 70 percent of EMA, except for along the river, tributary channels, and older alluvial terraces within 1 to 2 miles of river	0 to 3,500 Av. Thickness: 1,500 bgs	0.2 to 96 Average:18	1.0 x 10-2	Paso Robles: 0.04	Paso Robles: 0.15
	Draped atop Paso Robles Formation from terraces near river up to 1 to 2 miles upslope from river	Surface to 150 Av. Thickness: 60 bgs	70 to 280 Average: 136	6.0 x 10-4	Older Alluvium: 0.1	Older Alluvium: 0.2
Careaga Sand	Deeply buried beneath Santa Ynez Uplands, rising to near-surface, near and beneath City of Solvang	Below Paso Robles Formation and Santa Ynez River Alluvium 200 to 900 Av. Thickness: 800 bgs	0.8 to 20 Average: 7.5	8.0 x 10-4	0.05	0.12

Notes

Av. = average

bgs = below ground surface

Sc = specific yield

Sy = storage coefficient

Vol = volume

The following sections provide information about both principal aquifers, including descriptions of the vertical and lateral extent of each, its hydraulic conductivity and storativity, as well as the general production capacity of wells completed in each aquifer.

Paso Robles Formation

The Paso Robles Formation (QTp on Figure 3-3Figure 3-3) makes upcontains the majority of the groundwater in storage within the EMA. The Paso Robles Formation extends laterally throughout Santa Barbara and San Luis Obispo counties. Locally, this aquifer is present in the Santa Ynez Uplands area of the EMA, extending from the ground surface to a maximum depth of approximately 3,500 feet bgs and forms an extensive and heterogeneous aquifer where saturated.

The Paso Robles Formation is a Plio-Pleistocene-aged, predominantly non-marine terrestrial unit made of relatively thin, often discontinuous sand and gravel layers interbedded with thicker layers of silt and clay. These layers are often described on drillers logs as "shale gravel." The formation was deposited in alluvial fan, floodplain, and lake depositional environments derived from materials from the surrounding the San Rafael and Santa Ynez Mountains. Seashells are reported in some well logs near the base of the Paso Robles Formation, suggesting a near-shore marine depositional environment. The formation is unconsolidated and poorly sorted. The sand and gravel beds within the unit have a high percentage of Monterey shale gravel fragments and generally have moderately lower permeability compared to the shallow, unconsolidated alluvial sand and gravel beds. Typically, the formation is sufficiently thick such that water wells completed in the Paso Robles Formation produce up to several hundreds of gallons per minute.

For the purpose of groundwater management, the Paso Robles Formation is considered a single unit. However, considerable variability is known to exist within the formation throughout the EMA and indeed the entire Basin. Whereas the upper part consists of relatively coarse-grained materials typical of alluvial fan deposits, the lower part of the complexly folded Paso Robles Formation is finer-grained. The coarser-grained upper portions of the Paso Robles Formation yield groundwater to wells at higher flow rates than the underlying portions. Deeper portions of the Paso Robles Formation are thought to contain poor quality groundwater.

Results of aquifer tests for 20 wells completed in the Paso Robles Formation throughout the EMA indicate that the hydraulic conductivity of the Paso Robles Formation varies between 1 foot and 100 feet per day. Based on these aquifer tests, as well as published reports, the upper part of the formation was assigned a hydraulic conductivity for use in this report and the numerical groundwater model of 10 feet per day and the lower part was assigned a value of 20 feet per day (Upson and Thomasson, 1951). The estimated range of hydraulic conductivity of between approximately 0.2 and 96 feet per day reflects the heterogeneity of the aquifer hydraulic properties of these materials in the EMA. The storativity ranges from 0.01 for confined storage with a specific yield of around 0.04. The pumping rates for wells completed in this formation can range between less than 100 gallons per minute (gpm) to as much as 1,500 gpm, depending largely on length of the aquifer perforated by individual wells.

Because of the similarity of the materials, the Older Alluvium is proposed to be managed in conjunction (as part of) the Paso Robles Formation. These Older Alluvium deposits (Qoa on Figure 3-3Figure 3-3)—also referred to as Terrace Deposits—are located throughout the southern portion of the Santa Ynez Uplands (Figure 3-3Figure 3-3). These deposits are terraces of dissected older alluvial sands and gravels overlying the Paso Robles Formation to a maximum depth of 150 feet. This formation is very similar to, and made up of the same materials as, the Paso Robles Formation it overlies, and therefore it is difficult to distinguish the Older Alluvium from the Paso Robles Formation. The Older Alluvium are not considered a reliable aquifer per se, because of their shallow depth and tendency to be dewatered during drought conditions (Hoffman, 1996). Several wells are completed in both the Older Alluvium and Paso Robles Formation materials.

Because of the similarity of these materials, these will be managed together as one aquifer, referred to as the Paso Robles Formation.

Careaga Sand

The Careaga Sand (Tcag and Tca on Figure 3-3Figure 3-3) is present at the surface in flanks of Purisima Hills and San Rafael Mountains. In the subsurface, this sand is present below the Paso Robles Formation in the Santa Ynez Uplands and below the Santa Ynez River gravels near the City of Solvang. In the Santa Ynez Uplands, the Careaga Sand is approximately 800 feet thick on average and varies between 200 and 900 feet (refer to the geologic cross sections in Section 3.1.2.3).

The Careaga Sand consists of fine-grained to medium-grained, uniform, massive, marine sand with some gravel and limestone. Some of the Careaga Sand contains fossils in areas west of the EMA. Where the Careaga Sand is exposed at ground surface in the Purisima Hills and along Alamo Pintado Creek, a considerable amount of water from precipitation and streamflow can recharge this unit. Two members of the Careaga Sand include the upper Graciosa member (Tcag), which is relatively coarse, and the lower Cebada member (Tca), which is relatively fine-grained. These members are managed as a single aquifer within the EMA.

Generally, the Careaga Sand is less permeable than the overlying Paso Robles Formation; wells completed in the Careaga Sand typically provide relatively less water than wells in the Paso Robles Formation. Based on published values, the hydraulic conductivity of the Careaga Sand is approximately 10 feet per day (Upson and Thomasson, 1951), which is similar to the lower end of the range of hydraulic conductivities for the Paso Robles Formation. Pumping test data from a total of six wells completed in the Careaga Sand indicated that hydraulic conductivity ranges between approximately 2 feet and 20 feet per day. Aquifer tests for wells completed in the Careaga Sand ranged between 12 and 325 gpm. Because of the limited lateral extent of the aquifer relative the Paso Robles Formation within the Santa Ynez Uplands and the greater depth to this formation outside of the western portion of the Santa Ynez Uplands, fewer wells are completed in the Careaga Sand than in the overlying Paso Robles Formation. Wells completed within the Careaga Sand often have sanding problems, especially for wells completed in the lower Cebada member, because of the uniform fine nature of the material.

The storativity of the Careaga Sand is made up of a confined storage of approximately 0.008 and a specific yield of 0.05 (both of which are unitless).

3.1.4.4 Groundwater Flow Barriers

§ 354.14 Hydrogeological Conceptual Model.

(b) The hydrogeologic conceptual model shall be summarized in a written description that includes the following:

(C) Structural properties of the basin that restrict groundwater flow within the principal aquifers, including information regarding stratigraphic changes, truncation of units or other features.

The EMA portion of the Basin is well-bounded by bedrock below the two principal aquifers, which contain and control the storage and movement of groundwater. Several faults are located within the water-bearing materials in the EMA. The Santa Ynez River Fault Zone crosses below the Santa Ynez River area. Likewise, the Baseline Fault and associated Los Alamos Fault and Casmalia Fault Zone, presented on Figure 3-3Figure 3-3, cross the Santa Ynez Uplands area in a general southeast to northwest trend. While these faults may have vertical offset of as much as 120 feet (for the Baseline Fault just west of Santa Agueda Creek; USGS, 1981), these faults are not believed to be barriers to groundwater flow. Instead, they are likely semi-permeable because of the interbedded (layered) nature of the underlying Paso Robles Formation (Hoffman, 1996).

The total volume of groundwater that discharges as subsurface outflow from the higher-elevation Santa Ynez Uplands into the lower-lying Santa Ynez River along the southern border is relatively small (LaFreniere and French, 1968) due to the presence of impermeable bedrock. Limited groundwater flow appears to occur in gaps between bedrock outcrops, as confirmed by the results of the seismic refraction and tTEM geophysical surveys. Within the tributaries to the Santa Ynez River, the Tributary Alluvium has limited saturated thickness (e.g., 0 feet to 60 feet), thus restricting groundwater flow significantly (Hoffman, 1996), and see the summary of the recent geophysical survey (Section 3.1.3.2~~.1)~~).

Fine-grained zones are present within the Paso Robles Formation; however, these zones are generally not laterally continuous and do not represent regional groundwater flow barriers.

The sediments of the Paso Robles Formation are heterogenous and have undergone a high degree of tectonic deformation. Consequently, the vertical heterogeneity in the water-bearing properties of the Paso Robles are the result of alternating coarse-grained beds and fine-grained beds. These fine-grained zones act as local confining beds and are likely the cause of the localized artesian conditions that were historically reported in some wells screened within the Paso Robles Formation in Happy Canyon and along Alamo Pintado Creek (LaFreniere and French, 1968~~) (Figure 3-23).~~).

The Careaga Sand consists of fine- to medium-grained sand with some silt and abundant pebbles. Driller logs from wells drilled into this unit do not indicate the presence of confining beds that may create barriers to flow in the Careaga Sand.

3.1.4.5 Groundwater Recharge and Discharge Areas

§ 354.14 Hydrogeological Conceptual Model.

(d) Physical characteristics of the basin shall be represented on one or more maps that depict the following:

(4) Delineation of existing recharge areas that substantially contribute to the replenishment of the basin, potential recharge areas, and discharge areas, including significant active springs, seeps, and wetlands within or adjacent to the basin.

This section describes areas of significant natural areal recharge and discharge within the EMA. Quantitative information about natural and anthropogenic recharge and discharge is provided in Section 3.3.

Groundwater Recharge Areas

Within the Santa Ynez Uplands area of the EMA, groundwater recharge occurs as distributed areal percolation of precipitation (particularly in areas where the units are exposed at ground surface), infiltration into and through streambeds, agricultural return flows, septic system return flows (leachate), and water system distribution losses. Within the Tributary Alluvium in the Santa Ynez Uplands, portions of the stream are “losing,” which means streamflow contributes to groundwater recharge into the underlying Paso Robles Formation. Percolation of precipitation is the principal component of groundwater recharge, as discussed in Section 3.3.

Groundwater recharge to principal aquifers also occurs from mountain front recharge. Mountain front recharge includes (1) direct recharge from the underlying bedrock along the San Rafael Mountains to the north and east and from the Santa Ynez Mountains to the south and (2) runoff from the mountains that subsequently percolates into the ground. The magnitude of this recharge is discussed in more detail in Section 3.3 along with the other processes of groundwater recharge.

Data provided by the California Soil Resource Lab at University of California (UC) Davis and the UC Agricultural and Natural Resources Department was used to develop a map presenting the areas of potential groundwater recharge. The hydrologic soil groupings are presented on Figure 3-2~~Figure 3-2~~. The major factors that were considered for potential groundwater recharge areas include the following:

- Deep soil percolation
- Root zone residence time
- Topography
- Chemical limitations
- Soil surface condition (UC Davis and UC-ANR, 2020)

Areas with soils that have excellent recharge properties are shown in dark green, moderate recharge properties are shown in yellow, and areas with poor recharge properties are shown in orange and red (Figure 3-17). As shown on the map, the areas of excellent, good, and moderately good ratings are located along tributary valleys of the Alamo Pintado and Santa Agueda Creeks, as well within areas of Older Alluvium (above Paso Robles Formation) in the Santa Ynez Uplands. Notably, a few excellent areas are located south of the town of Santa Ynez along the northern bank of the Santa Ynez River.

Groundwater Discharge Areas

Natural groundwater discharge areas in the EMA include springs and seeps, groundwater discharge to surface water, and evapotranspiration (ET) by phreatophytes. Phreatophytes are plants with roots that tap into groundwater in the alluvium along creeks and streams. Springs and seeps in the EMA identified by the USGS based on the National Hydrography Dataset (NHD) are shown on Figure 3-18~~Figure 3-18~~.

Springs are located in the San Rafael Mountain ranges north of the EMA and at three locations within the Santa Ynez Uplands: one in the Purisima Hills, one near Cachuma Creek, and another at the eastern portion of the EMA. Based on the elevation of mapped springs and seeps, it is likely that these discharge groundwater from bedrock outside of the EMA and from limited, perched water-bearing zones in the Santa Ynez Uplands. The single mapped spring within the EMA occurs within the Paso Robles Formation and likely indicates occasional perched groundwater conditions within steeply dipping strata of gravel and sand, which are exposed at higher elevations that are perched on less permeable beds of silt and clay (LaFreniere and French, 1968).

Groundwater discharge as subsurface outflow from the Santa Ynez Uplands portion of the EMA to the adjoining CMA is relatively small (LaFreniere and French, 1968). At the time that the USGS studied groundwater outflow (1946 to 1964), much of the groundwater flow was understood to exit the uplands as surface water flow in the tributaries to the Santa Ynez River, particularly on the lower end of Zanja de Cota Creek. The reported outflow was an average of 2,800 AFY for all tributaries. Groundwater discharge from the higher-elevation Santa Ynez Uplands into the lower-lying Santa Ynez River along the southern border of this area is limited because relatively impermeable bedrock along the southern boundary forms a barrier that forces groundwater to the surface along the Santa Ynez River (Hoffman, 1996). The tTEM geophysical survey supports the interpretation that there are no substantial buried channels that are cutting through the bedrock on the lower ends of these tributaries, where the subsurface outflow would occur. In these areas, discharge from the Paso Robles Formation occurs either as surface water or subsurface flow from the alluvium present in the tributaries to the Santa Ynez River. Very small quantities of groundwater flow may occur through fractures in the bedrock (which can occur as chert deposits) in consolidated rocks in the Ballard Canyon area (LaFreniere and French, 1968) and may be less than 100 AFY. Surface water also discharges from the EMA as underflow from the Santa Ynez River alluvium that crosses into the CMA ~~every year~~ (Stetson, 2004).

Figure 3-17. Recharge Potential on Agricultural Lands

Figure 3-18. Seeps and Springs

3.1.4.6 Water Quality

~~§~~§ 354.14 Hydrogeological Conceptual Model.

(b) The hydrogeologic conceptual model shall be summarized in a written description that includes the following:

(4) Principal aquifers and aquitards, including the following information:

(D) General water quality of the principal aquifers, which may be based on information derived from existing technical studies or regulatory programs.

This section provides a general discussion of the natural groundwater quality in the EMA. A more complete discussion of the distribution and concentrations of specific constituents is presented in Section 3.2.3. This assessment of the general water quality of the EMA is based on the results from water quality samples collected and analyzed for various studies and programs for compliance with regulatory programs, sampling conducted by the USGS, data from the USGS National Water Information System (NWIS), and SWRCB's GeoTracker Groundwater Ambient Monitoring and Assessment (GAMA) Program database.

Groundwater quality in the EMA is suitable for potable and agricultural uses. Since implementation of SGMA, exceedances of maximum contaminant levels (MCLs) for gross alpha and trihalomethane were reported in three potable water supply wells. Wells classified as potable include both municipal and domestic wells. Exceedances of secondary MCLs (SMCLs) were reported in 11 potable water supply wells, and exceedances of water quality objectives (WQOs) set by the Regional Water Quality Control Board (RWQCB) were reported in 35 potable water supply wells. Summary tables of general groundwater quality are provided in Section 3.2.3.

3.1.4.7 Primary Beneficial Uses

~~§~~§ 354.14 Hydrogeological Conceptual Model.

(b) The hydrogeologic conceptual model shall be summarized in a written description that includes the following:

(4) Principal aquifers and aquitards, including the following information:

(E) Identification of the primary use or uses of each aquifer, such as domestic, irrigation, or municipal water supply.

Groundwater from both principal aquifers has many beneficial uses within the EMA including agricultural use, municipal and industrial (M&I) use, domestic use, and environmental uses, particularly where groundwater is connected to surface water that supports groundwater dependent ecosystems (GDEs). This section summarizes the primary uses of water produced from each of the principal aquifers. Fourteen mutual water companies, along with many individual private well owners, rely on groundwater to satisfy water demands for agricultural and rural domestic uses from both principal aquifers (Figure 2-7).

Groundwater produced from the Paso Robles Formation and Careaga Sand is used for a variety of beneficial uses by municipal water purveyors, mutual water companies, and private pumpers. The municipal water purveyors that pump water from these principal aquifers include ID No. 1 and the City of Solvang, entities that provide water from these and other sources for M&I, agricultural, and domestic uses within their service areas. The water from these agencies is blended with water from other sources for distribution to customers. Mutual water companies and private pumpers provide water from the same wells for both agricultural and domestic potable uses. The volumes of water provided from each of these sources and beneficial uses are provided in Section 3.3.

3.1.5 Data Gaps and Uncertainty

§§ 354.14 Hydrogeological Conceptual Model.

(b) The hydrogeologic conceptual model shall be summarized in a written description that includes the following:

(5) Identification of data gaps and uncertainty within the hydrogeologic conceptual model.

This section summarizes several portions of this HCM that constitute data gaps, focused primarily on the data gaps that that "could affect the ability of the Plan to achieve the sustainability goal" (§ 354.38 [a]) for the EMA. The adequacy of the monitoring networks to achieve this goal is discussed in Section 5.

Per the SGMA regulations, a data gap is defined as the following:

- A lack of information that significantly affects the understanding of the basin setting or evaluation of the efficacy of Plan implementation and could limit the ability to assess whether a basin is being sustainably managed.

This section also presents the authors' estimates of the levels of uncertainty with regard to the principal data relied upon for this HCM.

3.1.5.1 Groundwater Elevations

Central to the understanding of groundwater conditions within the EMA is a reliable, frequently sampled, and well-distributed water elevation data set for each of the principal aquifers. Groundwater elevation data are fundamental to assessing whether there are undesirable results for each sustainability indicator. Based on the importance of this parameter, regular monitoring of groundwater elevations throughout the Santa Ynez Uplands of the EMA in each the two principal aquifers must be conducted. As of 2019, approximately 45 wells were measured by Santa Barbara County staff in the spring months and 3 wells were monitored in the fall months. However, in the fall of 2020, the fall groundwater monitoring effort was expanded to include more complete groundwater monitoring such that in October 2020, Santa Barbara County staff measured groundwater levels in 20 wells within the EMA (Figure 3-19Figure 3-19).

Even with the additional wells measured in October 2020, to measure water levels during the post-irrigation season, it is recommended that fall water level measurements be continued and the monitoring program expanded to include more wells completed within the Paso Robles Formation and the Careaga Sand in the northwest portion of the EMA near the shared border with the San Antonio Groundwater Basin and within the Paso Robles Formation in the general area of Happy Canyon.

Figure 3-19. Representative Wells with Spring 2018 Groundwater Elevation Data

3.1.5.2 Fault Influence on Groundwater Flow

Although Section 3.1.2 discusses many faults in the EMA, the Baseline Fault may constitute a barrier to groundwater flow. The current understanding of groundwater flow across the Baseline Fault is that the Baseline Fault is either permeable or semipermeable and does not constitute a barrier to groundwater flow. The addition of groundwater monitoring located on either side of the fault would clarify the relationship of water levels across the fault and, by extension, its potential role in controlling groundwater flow. Selection of wells for this purpose should be considered when expanding the groundwater monitoring network. This is discussed in more detail later in Section 4.

3.1.5.3 Well Completion Data

The construction details for many wells included in the monitoring network is unknown. An accurate understanding of the completion of each well construction is important to interpret and assign groundwater levels to the appropriate principal aquifer. To comply with the SGMA regulations, the water level within a well must represent a single aquifer, a condition that requires the accurate understanding of the completion of the well. As discussed further in Section 4, the well completion information in the monitoring network should be determined by the use of either video logs of wells and/or the provision of well completion information for wells included in the water level monitoring program as well as all of the wells within the EMA. Well completion information may require relationship building with well owners, encouraging them to provide the information.

3.1.5.4 Subsidence Monitoring

Subsidence monitoring has not been conducted on a routine basis to date and there is no indication that subsidence is occurring within the EMA. Section 4 includes a discussion of the proposed subsidence monitoring program.

3.2 Groundwater Conditions [§ 354.16]

~~§~~§ 354.16 Groundwater Conditions. Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:

This section describes the current and historical groundwater conditions in the principal aquifers within the Basin. In accordance with the SGMA ~~emergency~~ regulations, current conditions are any conditions occurring after January 1, 2015. By implication, historical (or legacy) conditions are any conditions occurring prior to January 1, 2015. This section focuses on information required by the GSP regulations and information that is important for developing an effective plan to achieve sustainability. The organization of this section aligns with the ~~six~~five sustainability indicators specified in SGMA and the ~~GSP~~SGMA regulations as they apply to the EMA, including the following:

- **Chronic lowering of groundwater levels** indicating a significant and unreasonable depletion of supply
- ~~Reduction~~Significant and unreasonable **reduction of groundwater in storage**
- ~~Degraded~~Significant and unreasonable **degraded groundwater quality**
- ~~Land subsidence~~
- Significant and unreasonable **land subsidence** that substantially interferes with surface land uses

- **Depletion of interconnected surface water** that has significant and unreasonable adverse impacts on beneficial uses of the surface water

The EMA is isolated from the Pacific Ocean and is not threatened by seawater intrusion; therefore, the sixth SMC, seawater intrusion, is not applicable in the EMA and is not further discussed in this section.

Variations in climatic conditions directly affect groundwater conditions. Climate affects both (1) recharge to the Basin, which rises significantly during wet periods in response to increase precipitation and (2) water use, which can increase in response to prolonged drought in the absence of rainfall and/or supplemental water supplies. This section includes a limited discussion of the variability of groundwater conditions in response to climatic variability. The discussion of the volumes of surface water and groundwater flowing into and out of the EMA portion of the Basin in the historical water budget discussion also includes a more thorough discussion of the variability of groundwater conditions in response to climatic variability (Section 3.3).

3.2.1 Chronic Lowering of Groundwater Levels

3.2.1.1 Groundwater Elevation Contours

§§ 354.16 Groundwater Conditions. Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:

(a) Groundwater elevation data demonstrating flow directions, lateral and vertical gradients, and regional pumping patterns, including:

(1) Groundwater elevation contour maps depicting the groundwater table or potentiometric surface associated with the current seasonal high and seasonal low for each principal aquifer within the basin.

Groundwater elevation conditions are largely based on water level data collected by the USGS through the NWIS database for the acquisition, processing, review, and storage of water data. The available water level data in the EMA were collected by the USGS and Santa Barbara County as part of the Water Data for the Nation program.[22] In the spring of 2019, Santa Barbara County took responsibility for annual groundwater level monitoring in the EMA after the USGS discontinued its monitoring efforts. Additional groundwater elevation data for wells were obtained from the City of Solvang and several mutual water companies. A summary of the groundwater water level data compiled for use in this GSP are presented on Table 3-5Table 3-5.

[22] Funded through a joint funding agreement with USGS and Santa Barbara County Water Agency.

Table 3-5. Summary of Available Groundwater Level Data

Source	Coverage	Period of Record
USGS (NWIS) includes California Statewide Groundwater Elevation Monitoring (CASGEM), local agencies and Santa Barbara County data	583 wells within and surrounding EMA	1905 to present
City of Solvang	10 wells	2008 to present
Mutual Water Companies	Several wells in Santa Ynez Uplands	Recent years only; varies by water company

From these wells, 78 were selected for incorporation into the groundwater elevation assessment (depending on the year and season) based on the quality of data and period of record for each well. Additional information about the monitoring network is provided in Section 5.3.

The set of wells used in the groundwater elevation assessment was selected based on the following criteria:

- The wells have groundwater elevation data for spring 2018
- Sufficient information exists to assign the well to either of the two principal aquifers
- Groundwater elevation data were deemed representative of static conditions

Based on these data, groundwater elevation contour maps were created for the two principal aquifers for the spring 2018 period. Prior to the late 1970s, the USGS and/or Santa Barbara County conducted water level monitoring throughout the EMA in the spring and fall, typically in April and October of each year. Since the late 1970s, very limited groundwater monitoring has conducted in the fall throughout the county. These fall monitoring events included three wells within the EMA; thus, there is limited understanding of groundwater levels following the summer irrigation season. The locations of the wells selected as representative of the principal aquifers with groundwater elevation data in spring of 2018 are shown on Figure 3-19~~Figure 3-19~~. Reference elevations of these wells were surveyed by GSI ~~Water Solutions, Inc.~~ in 2020 to satisfy the SGMA regulations, which require vertical elevations of reference points (wellheads) to be measured to an accuracy of 0.5 feet, or best available information, relative to the North American Vertical Datum of 1988 (NAVD88).

Groundwater elevation contour maps were created for the spring 2018 period to assess current groundwater conditions, including flow directions and groundwater gradients. The contours are based on groundwater elevation measurements from the selected wells, as presented on Figures 3-20 and 3-21. The groundwater elevation data that were deemed to be either unrepresentative of static conditions, obviously erroneous, or representative of more than a single aquifer were excluded from contouring. A summary of the gradients of each principal aquifer is presented as Table 3-6~~Table 3-6~~.

Table 3-6. Lateral Gradients of Each Principal Aquifer

Principal Aquifer	Location (Lateral Extent)	Horizontal Gradient (feet per foot)	Direction of Flow
Paso Robles Formation	Santa Ynez Uplands	0.02 to 0.03	South and southwest from the San Rafael Mountains
Careaga Sand	Santa Ynez Uplands	0.014 to 0.02	Southwest

Paso Robles Formation

The groundwater elevation contours for the Paso Robles Formation for the spring of 2018 show groundwater elevations ranging from approximately 1,200 feet above NAVD88 in the north to approximately 550 feet NAVD88 in the southern part of the Santa Ynez Uplands area.

Groundwater flow direction in the Paso Robles Formation is generally to the south-southwest with hydraulic gradients ranging from a high of approximately 0.03 feet per foot along the Santa Agueda Creek. Generally, throughout most of the Santa Ynez Uplands, the gradient is between 0.02 to 0.03 feet per foot.

The conformity of the water-level contours indicates that, in general, the Paso Robles Formation may generally be considered as a single storage unit, as shown on ~~Figure 3-20.~~Figure 3-20. Previous contouring of the Paso Robles Formation suggested that there were areas of partial confinement and local areas of perched groundwater within the formation (LaFreniere and French, 1968; Hoffman, 1996).

The Paso Robles Formation extends throughout the Santa Ynez Uplands, extending northwest without interruption into the adjacent San Antonio Groundwater Basin (refer to the geologic cross section of the area on Figures 3-6 and 3-20). The groundwater elevation contours in the area of the shared border with the San Antonio Groundwater Basin in the northwest corner of the EMA's Santa Ynez Uplands suggest that the flow direction is perpendicular to the shared border such that groundwater would neither flow into nor out of the EMA. This apparent direction of groundwater flow in this area is based on groundwater elevation measurements in only two wells near the 5-mile shared border and is therefore somewhat uncertain.

Figure 3-20. Paso Robles Formation Groundwater Elevation Contour Map, Spring 2018

Careaga Sand

All of the known groundwater wells that are completed in the Careaga Sand are located in the western portion of the EMA. The Careaga Sand crops out west of the City of Solvang and dips towards the east, under the Paso Robles Formation at depths too deep for a typical production well. Consequently, groundwater contours for the Careaga Sand are restricted to the western portion of the EMA and based on wells that have been confirmed to be completed within the Careaga Sand.

In spring 2018, Careaga Sand groundwater elevations ranged from approximately 1,150 feet above NAVD88 in the north to approximately 320 feet NAVD88 in the southern part of the Basin.

Groundwater flow direction in the Careaga Sand is generally to the south-southwest with hydraulic gradients ranging from 0.014 feet per foot near the City of Solvang to approximately 0.02 feet per foot in the northwest portion of the Santa Ynez Uplands near the shared border with the San Antonio Groundwater Basin. Near the southwestern border with the CMA, the groundwater flow is towards the CMA. The magnitude of this flow is discussed further in Section 3.3. Groundwater flow through this area extends into the Careaga Sand, which is present below Adobe Canyon and into the CMA below the Santa Ynez River, as shown on Figure 3-21~~Figure 3-21~~.

At the shared border with the San Antonio Groundwater Basin, however, the direction of flow is uncertain because very few wells exist in that area. The few wells that do exist suggest that the hydraulic gradient in the area is perpendicular to the groundwater basin boundary, which would indicate that no appreciable flow enters or leaves the EMA along that border. This uncertainty of the groundwater flow direction along the San Antonio Groundwater Basin boundary is identified as a data gap.

Figure 3-21. Careaga Sand Groundwater Elevation Contour Map, Spring 2018

3.2.1.2 Groundwater Hydrographs

§§ 354.16 Groundwater Conditions. Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:

(a) Groundwater elevation data demonstrating flow directions, lateral and vertical gradients, and regional pumping patterns, including:

(2) Hydrographs depicting long-term groundwater elevations, historical highs and lows, and hydraulic gradients between principal aquifers.

To demonstrate the long-term variability and trends of groundwater elevations in the EMA, hydrographs for wells in the two principal aquifers were created. Representative wells presented on Figure 3-19Figure 3-19 were chosen because they have sufficient periods of record to identify trends and/or responses to climatic conditions, are geographically distributed, and represent a single aquifer system.

Paso Robles Formation

Representative hydrographs for four wells completed in the Paso Robles Formation are presented as Figure 3-22Figure 3-22 and Figure 3-23Figure 3-23. The complete set of hydrographs for the representative wells are included in Appendix D. As required, these hydrographs for the period of record present the water level elevation relative to NAVD88 and the ground surface elevation to illustrate the depth to water. The hydrographs also present the periods of climatic variation, which were based on precipitation data representative of conditions in the EMA.

Overall, the Paso Robles Formation well hydrographs illustrate the long-term stability of water levels over time except during drought periods. Water levels in the Paso Robles Formation show a strong correlation with climatic conditions. Some wells show water elevation decreases of more than 100 feet during prolonged drought cycles, but most wells appear to fully recover within a few years when the drought conditions end. Changes in water levels are likely also related to groundwater pumping as well. The Paso Robles Formation is the most productive and most widely pumped aquifer in the EMA. During periods of drought, water levels decline in response to a combination of increased pumping and decreased areal recharge.

Seasonal fluctuations in water levels in the Paso Robles Formation appear to be relatively small (less than 30 feet). This observation is based on hydrographs that have water level records predating 1980, when the USGS began monitoring water levels annually in the spring, instead of bi-annually in the spring and fall.

Figure 3-22. Representative Paso Robles Formation Hydrographs: Wells -08P02 and -07G06

Figure 3-23. Representative Paso Robles Formation Hydrographs: Wells -01P03 and -16B01

Careaga Sand

The Careaga Sand hydrographs presented on Figure 3-24~~Figure 3-24~~ generally illustrate the long-term stability of water levels over the period of record for the two representative wells with continuous data since the mid-1960s. These wells show minimal change in water level elevation from the 1960s to present. Water levels in some wells show muted correlation with climatic conditions, exhibiting minor decreases during drought conditions and rising water levels during wet periods.

One reason for the stable water levels in the Careaga Sand is that the formation is not pumped significantly relative to the Paso Robles Formation. Wells completed in the Careaga Sand typically have relatively low yields compared to the yields of the Paso Robles Formation. The volume of water extracted from the Careaga Sand is likely a small portion of the total available storage, which may explain why water levels do not show significant decline due to drought conditions.

Figure 3-24. Representative Careaga Sand Hydrographs: Wells -10F01 and -04A01

3.2.2 Groundwater in Storage

§§ 354.16 Groundwater Conditions. Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:

(b) A graph depicting estimates of the change in groundwater in storage, based on data, demonstrating the annual and cumulative change in the volume of groundwater in storage between seasonal high groundwater conditions, including the annual groundwater use and water year type.

The changes in groundwater in storage within the EMA are discussed in Section 3.3, Water Budget.

3.2.3 Degraded Groundwater Quality

§ 354.16 Groundwater Conditions. Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:

(d) Groundwater quality issues that may affect the supply and beneficial uses of groundwater, including a description and map of the location of known groundwater contamination sites and plumes.

This section provides a summary of the groundwater quality distribution and trends in the EMA. Water quality is presented in terms of beneficial use (potable water and agricultural irrigation), point sources of groundwater contamination, and naturally occurring salts and nutrient constituents in groundwater. Groundwater quality samples were collected and analyzed throughout the Basin for various studies and programs. Historical groundwater quality data was acquired from the SWRCB GeoTracker GAMA database.

This GSP focuses on constituents that relate to beneficial uses of groundwater that might be impacted by groundwater management activities. The constituents of concern are chosen for either or both of the following reasons:

1. The constituent has a drinking water standard (MCL or SMCL).
2. The constituent has a WQO set by the RWQCB in the Water Quality Control Plan for the Central Coast Basin (RWQCB et al., 2017).

While there are some wells that have constituent concentrations that exceed Basin Water Quality Objectives set by the RWQCB, it is possible that these exceedances are a result of natural conditions and not caused by land use or other anthropogenic activities. Elevated boron concentrations are naturally occurring in many central coast basins and elevated total dissolved solids (TDS), chloride, and sodium are often associated with rocks of marine origin that are present in the EMA. Any projects and management actions that are currently being considered, even if tentatively, are not anticipated to directly cause concentrations of any of these constituents in groundwater to increase.

Groundwater Quality Suitability for Potable Water

Water quality data from potable water supply wells were analyzed to identify exceedances of drinking water standards. For purposes of this assessment, potable water quality was analyzed for wells that serve water for potable purposes, including both municipal and domestic wells. The data reviewed include water quality analytical results from groundwater samples collected between January 1984 and January 2019 from 79 potable water supply wells in the EMA. Drinking water standards are established by federal and state agencies by setting concentration thresholds for certain groundwater constituents using MCLs and SMCLs. MCLs are regulatory thresholds and SMCLs are guidelines established for nonhazardous aesthetic considerations such as taste, odor, and color. WQOs are set by the RWQCB to protect all beneficial uses of groundwater.

Groundwater in the EMA is generally suitable for potable water purposes. Constituents with reported concentrations at or above their respective MCL or SMCL for samples collected from potable water supply wells are presented in Table 3-7~~Table 3-7~~.

Groundwater Quality Suitability for Agricultural Irrigation

Groundwater in the Basin is generally suitable for agricultural purposes based on comparison with basin WQOs as discussed in this section and based on feedback from agricultural stakeholders. The agricultural suitability of groundwater within the EMA was evaluated using the following two metrics:

1. Salinity as indicated by concentrations of dissolved solids
2. Specific ion toxicity as indicated by concentrations of sodium, chloride, and boron

Groundwater quality data from the GeoTracker GAMA data sets, excluding wells associated with cleanup sites, were evaluated. The data reviewed consists of 680 sampling events from 153 wells in the EMA collected between January 1984 and January 2021. Table 3-8~~Table 3-8~~ summarizes constituents with reported concentrations at or above their respective basin WQO.

Samples collected from 59 of 138 wells indicated TDS concentrations exceeding the WQO (600 milligrams per liter [mg/L]) in 127 of 437 samples (Table 3-8~~Table 3-8~~). The largest concentration of wells with reported concentrations of TDS at or above the WQO are located in the in the southwest and northwest regions of the EMA. Elevated TDS concentrations in the southwestern portion of the EMA may be a result of natural conditions as groundwater moves from recharge areas with low TDS to downgradient locations where TDS is higher. According to stakeholders, concentrations of TDS exceeding the WQO have not been a limiting factor for agricultural production.

Concentrations of boron, sodium, and chloride have also been reported at concentrations exceeding the WQO in the EMA. These constituents are generally associated with salt-containing minerals that are naturally present in the watershed. Samples analyzed for concentrations of sodium from 138 of 138 wells exceeded the WQO (20 mg/L) in 435 of 437 samples. According to stakeholders, concentrations of sodium exceeding the WQO have not been a limiting factor for agricultural production.

Samples analyzed for concentrations of chloride from 78 of 138 wells exceeded the WQO (50 mg/L) in 196 of 440 samples (Figure 3-27~~Figure 3-27~~). The largest concentration of wells with reported concentrations of chloride exceeding the WQO are located in the southwest region of the EMA. According to stakeholders, concentrations of chloride exceeding the WQO have not been a limiting factor for agricultural production.

Analytical results for eight water samples indicate some caution should be used if irrigating crops, specifically fruit (including grapes) (Hanson, Grattan, and Fulton, 2006), due to potential boron ion toxicity (SWRCB, 2019).

Table 3-7. Potable Water Quality Results

Constituent	MCL (mg/L)	SMCL[1] (mg/L)	Number of Wells Sampled	Number of Wells with Constituent Concentrations at or above the WQ Standard	Number of Samples	Number of Samples with Constituent Concentrations Above the WQ Standard	Maximum Constituent Concentration Reported (mg/L)	Mean Constituent Concentration Reported (mg/L)
Chromium	0.05	--	34	1	181	1	0.059	0.02
Fluoride	2	--	41	1	158	1	15	0.35
Gross Alpha[2]	15	--	30	3	170	7	37.9	5.78
Nitrate[3]	10	--	68	6	604	40	16	4.3
Trihalomethanes	0.080	--	13	1	20	1	0.09	0.02
Carbon Tetrachloride	0.0005	--	18	1	24	1	0.0014	0.0002
Iron	--	0.3	29	13	117	34	15	1.32
Manganese	--	0.05	28	5	105	20	0.69	0.07
Foaming Agents (MBAS)	--	0.5	19	1	70	1	1.2	0.23
TDS	--	1,000	68	2	230	8	1,700	565

Notes

[1] Upper SMCL (SWRCB, 2018)
[2] Gross Alpha concentrations reported in picocuries per liter (pCi/L)
[3] Nitrate reported as nitrogen.

-- = No value
MBAS = methylene blue active substances
MCL = maximum contaminant level
mg/L = milligrams per liter
SMCL = secondary maximum contaminant level
WQ = water quality
TDS = total dissolved solids

Table 3-8. Summary of Agricultural Irrigation Water Quality

Constituent	WQO (mg/L)	Number of Wells Sampled	Number of Wells with Constituent Concentrations at or above the WQO	Number of Samples	Number of Samples with Constituent Concentrations above the WQO	Maximum Constituent Concentration Reported (mg/L)	Mean Constituent Concentration Reported (mg/L)
TDS	600	138	59	437	127	1700	550
Chloride	50	138	78	440	196	195	55
Boron	0.5	49	4	174	8	0.69	0.16
Sodium	20	138	138	437	435	228	49
Nitrate (as N)	1	104	88	694	634	16	4.1

Notes

mg/L = milligrams per liter

TDS = total dissolved solids

WQO = median groundwater quality objective for Santa Ynez sub-area (SWRCB, 2019)

Samples analyzed for concentrations of boron from 4 of 49 wells exceeded the WQO (0.5 mg/L) in 8 of 174 samples (Figure 3-29Figure 3-29). Wells with reported concentrations of boron at or above the WQO are located to the west of Los Olivos.

Distribution and Concentrations of Point Sources of Groundwater Constituents

Potential point sources of groundwater quality degradation were identified, and waste discharge requirement permits were reviewed using the SWRCB GeoTracker data management system. Table 3-9Table 3-9 summarizes information from GeoTracker for open/active contaminated sites and Table 3-10Table 3-10 summarizes constituents historically found in exceedance of their respective drinking water quality standards in monitoring wells associated with point source contamination sites. Each of these exceedances occurred in a geographically isolated area and do not reflect typical groundwater quality within the EMA.

The locations of these potential groundwater contaminant point sources and the locations of completed/case closed sites is presented on Figure 3-25. The open/active cases include Jim's Service Center (Site ID T0608300118), two landfill sites, and one oil and gas site in the vicinity of the Zaca Oil Field and gas well fields shown on Figure 3-4.

The Jim's Service Center site was eligible for closure as of January 30, 2019, per the RWQCB Low Threat Closure Policy (Santa Barbara County Public Health Department, 2019). Site assessment reports indicate there are dissolved-phase benzene and methyl tert-butyl ether (MTBE) detections in groundwater beneath the site. Alamo Pintado Creek was determined to be the sensitive downgradient receptor. Due to the measured groundwater gradient in the area of the site, the classification of Alamo Pintado Creek as a losing stream by the USGS NHD, and the decreasing benzene and MTBE concentrations, a minimal threat to groundwater as a potable water source was determined (Flowline, 2018).

Other actively monitored sites include the closed landfills Foxen Canyon Class III Landfill, Ballard Canyon Landfill, and the Zaca Oil Field. Although groundwater contamination is associated with each of the landfill sites, the extent of contamination is well defined and contained on-site, the sites are continuously monitored, and they pose little threat to the beneficial use of groundwater in the EMA (Geosyntec, 2021a and 2021b). These sites are listed in Table 3-9Table 3-9 and their locations are shown on Figure 3-25.

Table 3-9. Potential Point Source of Groundwater Contamination

Site ID/Site Name	Site Type	Constituent(s) of Concern	Status
Jim's Service Center (T0608300118)	LUST Cleanup Site	Benzene and methyl tert-butyl ether (MTBE)	Open – Eligible for Closure as of 1/30/2019
Foxen Canyon Closed Class III Landfill (L10004697449)	Land Disposal Site	Tetrachloroethylene (PCE)	Open – Facility Closed/With Monitoring as of 9/28/2012
Ballard Canyon Closed Landfill (L10004435913)	Land Disposal Site	vinyl chloride, tetrachloroethylene (PCE), trichloroethylene (TCE), cis-1,2 dichloroethylene (cis-1,2 DCE) and benzene	Open – Facility Closed/With Monitoring as of 9/28/2012
Zaca Oil Field - Produced Water Facilities (T10000011845)	Other Oil and Gas Projects	Petroleum hydrocarbons	Open - Inactive as of 7/27/2018

Notes

Source: MCLs, DLRs, and PHGs for Regulated Drinking Water Contaminants (SWRCB, 2020)

LUST = leaking underground storage site

Table 3-10. Constituents Associated with Point Source Contamination Sites Listed in Table 3-9

Constituent	Units	MCL	SMCL	Number of Wells Sampled	Number of Wells with Constituent Concentrations at or above the WQ Standard	Number of Samples	Number of Samples with Constituent Concentrations above the WQ Standard	Maximum Constituent Concentration Reported	Mean Constituent Concentration Reported
Aluminum	mg/L	1	--	1	1	3	3	13	6.6
Arsenic	mg/L	0.01	--	8	1	11	1	0.012	0.005
Cadmium	mg/L	0.005	--	23	1	349	1	0.025	0.005
Iron	mg/L	--	0.3	21	14	352	50	32.4	1.3
Manganese	mg/L	--	0.05	20	14	343	141	2.13	0.09
Selenium	mg/L	0.05	--	23	13	349	31	0.171	0.03
Thallium	mg/L	0.002	--	23	10	349	16	0.033	0.02
1,1-Dichloroethene	µg/L	6	--	39	1	565	2	50	3.2
1,2-Dichloroethane	µg/L	0.5	--	63	11	1,208	103	180	9.3
cis-1,2-Dichloroethene	µg/L	6	--	28	2	434	10	71	3.4
Benzene	µg/L	1	--	63	29	1,324	232	66,000	387
Ethylbenzene	µg/L	300	--	63	8	1,324	65	52,000	523
Methyl tert-butyl ether	µg/L	13	--	63	16	1,294	110	150,000	4,706
Toluene	µg/L	150	--	63	4	1,324	17	9,500	113
Trichloroethene	µg/L	5	--	39	1	565	2	50	1.6
Vinyl chloride	µg/L	0.5	--	28	2	434	23	21.6	7.2
Total Xylenes	µg/L	1,750	--	58	4	1,052	20	21,000	722

Notes

-- = No value

µg/L = micrograms per liter MCL = maximum contaminant level

mg/L = milligrams per liter

SMCL = secondary maximum contaminant level

WQ = water quality

Figure 3-25. Location of Potential Point Sources of Groundwater Contaminants

Distribution and Concentrations of Diffuse or Natural Groundwater Constituents

The distribution and concentrations of several diffuse or naturally occurring constituents are discussed in the following subsections. Groundwater quality data were evaluated from the GeoTracker GAMA data set. The data reviewed consists of groundwater samples collected from 153 wells in the Basin between January 1984 and January 2021. Each of the constituents are compared to their drinking water standard, if applicable, or their WQO.

The available data show that wells with reported diffuse or naturally occurring constituent concentrations in groundwater at or above the respective WQO are distributed throughout the EMA with increasing concentrations in the direction of the groundwater flow towards the southwest.

While there are some wells that have constituent concentrations that exceed regulatory standards, it is possible that these exceedances are a result of natural conditions and not caused by land use activities. Elevated boron concentrations are naturally occurring in many Central Coast basins and elevated TDS, chloride, and sodium are often associated with rocks of marine origin that are present in the EMA. EMA agricultural stakeholders have not indicated that these are impacting agricultural production or drinking water quality.

Total Dissolved Solids

TDS is defined as the total amount of dissolved minerals and salts in a given volume of water. TDS is a constituent of concern in groundwater because it has been detected at concentrations greater than its WQO of 600 mg/L in a total of 59 wells in the EMA. The SMCL for TDS has been established for aesthetic considerations (including color, odor, and taste) rather than health-related concerns. The SMCL includes a recommended standard of 500 mg/L, an upper limit of 1,000 mg/L and a short-term limit of 1,500 mg/L (SWRCB, 2018). TDS concentrations have ranged from 290 to 1,700 mg/L with an average of 551 mg/L in the EMA. Water quality data from wells with known zones of completion indicate that mean TDS concentrations reported from wells screened in the Careaga Sand are greater than those collected from wells screened in the Paso Robles Formation, which is not unexpected because the Careaga Sand is of marine origin. Based on a review of the publicly available groundwater quality data, the largest concentration of wells with mean TDS concentrations at or above the WQO are located in the southwest (downgradient) region of the EMA (Figure 3-26) and the northwest region of EMA.

Figure 3-26. Total Dissolved Solids 1984–2021 Average

Chloride

Chloride has been detected at concentrations greater than its WQO of 50 mg/L in a total of 78 wells located in the EMA. The SMCL for chloride has been established for color, odor, and taste, rather than human health effects. The SMCL includes a recommended standard of 250 mg/L, an upper limit of 500 mg/L and a short-term limit of 600 mg/L (SWRCB, 2018). Chloride concentrations have ranged from 16 to 195 mg/L with an average of 55 mg/L in the EMA. Water quality data from wells with known zones of completion indicate that mean chloride concentrations reported from wells screened in the Careaga Sand are greater than those collected from wells screened in the Paso Robles Formation, which is not unexpected because the Careaga Sand is of marine origin. Based on a review of the publicly available groundwater quality data, wells with mean chloride concentrations at or above the WQO are located throughout the EMA, with the largest concentrations of wells in the southwest region (Figure 3-27).

Figure 3-27. Chloride 1984–2021 Average

Sulfate

Sulfate has been detected at concentrations greater than its WQO of 10 mg/L in 135 wells located in the EMA. The SMCL for sulfate was established to avoid causing digestive problems in humans. The SMCL includes a recommended standard of 250 mg/L, an upper limit of 500 mg/L, and a short-term limit of 600 mg/L (SWRCB, 2018). Sulfate concentrations have ranged from 3.1 to 366 mg/L with an average of 93 mg/L in the EMA. Water quality data from wells with known zones of completion indicate that mean sulfate concentrations reported from wells screened in the Careaga Sand are greater than those collected from wells screened in the Paso Robles Formation. Based on a review of the publicly available groundwater quality data, wells with mean sulfate concentrations at or above the WQO are located throughout the EMA and are likely naturally occurring (Figure 3-28).

Figure 3-28. Sulfate 1984–2021 Average

Boron

Boron is an unregulated constituent and therefore does not have a regulatory standard. However, boron is a constituent of concern because elevated boron concentrations have been found to impact the productivity of some agricultural crops, particularly vineyard grapes. Boron has been detected at concentrations greater than its WQO of 0.5 mg/L in four wells located in the EMA. Boron concentrations have ranged from 0.013 to 0.69 mg/L with an average of 0.17 mg/L in the EMA. Water quality data from wells with known zones of completion indicate that mean boron concentrations reported from wells screened in the Careaga Sand are greater than those collected from wells screened in the Paso Robles Formation. Based on a review of the publicly available groundwater quality data, wells with mean boron concentrations at or above the WQO are located to the west of Los Olivos.

Figure 3-29. Boron 1984–2021 Average

Sodium

Sodium is an unregulated constituent and therefore does not have a regulatory standard. However, sodium is a constituent of concern because elevated sodium concentrations in water can damage crops and affect plant growth. Sodium has been detected at concentrations greater than its WQO of 20 mg/L in the EMA in all wells sampled, and 435 of 437 samples analyzed. Sodium concentrations have ranged from 18.4 to 228 mg/L with an average of 49 mg/L in the EMA. Water quality data from wells with known zones of completion indicate mean sodium concentrations reported from wells screened in the Careaga Sand are greater than those collected from wells screened in the Paso Robles Formation. Based on a review of the publicly available groundwater quality data, wells with mean sodium concentrations at or above the WQO are located throughout the EMA (Figure 3-30). EMA agricultural stakeholders have not indicated that this naturally occurring constituent is impacting agricultural production.

Figure 3-30. Sodium 1984–2021 Average

Nitrate

Nitrate is a widespread constituent in California groundwater (California Department of Public Health, 2014). Elevated concentrations of nitrate in groundwater can be associated with agricultural activities, septic systems, confined animal facilities, landscape fertilizers, and wastewater treatment facilities. Nitrate is the primary form of nitrogen detected in groundwater. It is soluble in water and can easily pass through soil to the groundwater table. Nitrate can persist in groundwater for decades and accumulate to increased concentrations as more nitrogen is applied to the land surface each year (California Department of Public Health, 2014).

Nitrate has been detected at concentrations greater than its WQO of 1 mg/L (as N) in the EMA. Groundwater samples collected from 88 of 104 wells indicated nitrate concentrations exceeding the WQO in 634 of 694 samples. The MCL for nitrate has been established at 10 mg/L (SWRCB, 2020). Nitrate concentrations ranged from 0.1 to 16 mg/L (as N) with an average of 4 mg/L (as N). Wells with nitrate concentrations exceeding the MCL are located within three localized areas near the towns of Santa Ynez and Ballard (Heal the Ocean, 2019). Water quality data from wells with known zones of completion indicate mean nitrate concentrations reported from wells screened in the Careaga Sand are greater than those collected from wells screened int the Paso Robles Formation. Nitrate concentrations reported at or above the WQO are located throughout the EMA (Figure 3-31). Six of 68 wells sampled had nitrate concentrations exceeding drinking water standards (refer to Table 3-7). Concentrations of nitrate in groundwater will need to continue to be monitored to protect drinking water beneficial uses.

Other Constituents

Other diffuse or naturally occurring groundwater constituents reported at concentrations at or above their respective MCL or SMCL include iron, chromium, manganese, zinc, gross alpha, fluoride, and foaming agents (methylene blue active substances or MBAS). Each of these exceedances occurred in samples from a small number of wells, indicating isolated occurrences of these elevated constituent concentrations rather than widespread occurrences, affecting the entire EMA. Sustainability projects and management actions implemented as part of this GSP are not anticipated to directly cause concentrations of any of these constituents in groundwater to increase. The volatile organic water quality constituents reported above the MCLs were generally associated with cleanup sites that are now closed due to adequate mitigation, as presented in Figure 3-25~~Figure 3-25~~. The constituents listed in this section are generally isolated detections and not widespread within the EMA.

An MCL of 10 mg/L for hexavalent chromium recommended by the California Department of Public Health was adopted into the California Code of Regulations (CCR) in 2015. In 2017 the Superior Court of Sacramento County (Court) invalidated the MCL and ordered it removed from the CCR. The Court determined the MCL did not comply with all of the requirements in the Safe Drinking Water Act, including considering the economic feasibility of complying with an MCL (SWRCB, 2017). A revised MCL for hexavalent chromium is being evaluated by the SWRCB. Hexavalent chromium is currently regulated under the total chromium MCL of 0.05 mg/L. A report of a total chromium concentration at or above the respective MCL in a potable water supply well was reported once in 2002 and not since.

Some constituents are reported at elevated concentrations that do not have an established MCL or SMCL but do have an environmental screening level established for environmental cleanup sites. The screening levels are based on a human health risk assessment, the concentrations for which are published by the San Francisco Regional Water Quality Control Board, which publishes environmental screening levels pertinent to the entire state (SFRWQCB, 2019). Reported concentrations of constituents with environmental screening levels but no MCL or SMCL standard are either single detections or concentrations that were reported historically.

Figure 3-31. Nitrate 1984–2021 Average

3.2.4 Land Subsidence

§ 354.16 Groundwater Conditions. Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:

(e) The extent, cumulative total, and annual rate of land subsidence, including maps depicting total subsidence, utilizing data available from the Department, as specified in Section 353.2, or the best available information.

Land surface elevation data within the EMA were compiled from the DWR's SGMA Data Viewer Web-based geographic information system (GIS) viewer.[23] The data reviewed to assess the extent, cumulative total, and annual rate of land surface elevation changes include the following:

- Estimated land surface elevation using Interferometric Synthetic Aperture Radar (InSAR) data that are collected by the European Space Agency Sentinel-1A satellite and processed by TRE ALTAMIRA Inc. for the period from June 13, 2015, through September 19, 2019 (TRE ALTAMIRA, Inc., 2020). The InSAR data "accurately models change in ground elevation to an accuracy tested to be 18 millimeters (0.71 inches or 0.059 feet) vertical accuracy at 95% confidence level" (Towill, Inc., 2020 and 2021).
- Estimated land surface elevation using InSAR data collected by the European Space Agency Sentinel-1A satellite and processed by the National Aeronautics and Space Administration (NASA) Jet Propulsion Laboratory (JPL) for the period between spring of 2015 and summer of 2017 (NASA JPL, 2018).
- Measured land surface elevation data collected by a network of continuous global positioning system (CGPS) stations operated by University NAVSTAR Consortium (UNAVCO), including measured land surface elevation data collected by CGPSs for one location in the EMA and in in two locations immediately outside of the EMA (UNAVCO, 2020).
- No USGS or DWR extensometers are present within the Basin.

The land surface elevation data from InSAR includes point data that represent average vertical displacement values for points within 100-meter-by-100-meter areas, as well as coverage for the entire EMA interpolated from the point data. An example of the point data for total vertical displacement relative to June 13, 2015, is presented on Figure 3-32~~Figure 3-32~~ in monthly time steps for the period between 2015 and 2019. The ground surface elevation at the location shown on Figure 3-32~~Figure 3-32~~ east of Los Olivos shows vertical ground surface elevation changing monthly during over the 4-year period, with seasonal fluctuations and an overall net decline of 0.056 feet.

[23] The SGMA data viewer is available on the DWR SGMA website: https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#landsub. (Accessed September 2020.)

Figure 3-32. InSAR Vertical Displacement Point Data

Figure 3-33. Total Subsidence, 2015 to 2019

The lateral extent of the InSAR data covers the entire EMA, as presented on Figure 3-33~~Figure 3-33~~. The dark tan areas on the figure have experienced a measured land surface elevation decrease of up to 0.07 feet, which is equal to a rate of 0.018 feet per year. The teal area represents a ground surface elevation increase of up to 0.09 feet over the 4-year period. Review of the data throughout the EMA indicates that the greatest amount of land surface elevation decrease in the EMA has occurred in the wedge-shaped area that is north of Ballard and the Baseline Fault within the Santa Ynez Uplands. Others have experienced 0.09 feet up uplift. The InSAR-based annual land surface elevation decrease rate of 0.018 feet per year (0.21 inches) is below the accuracy range of 0.059 feet per year (0.71 inches), and therefore the reported displacements are within the range of uncertainty of the InSAR data.

A review of water level hydrographs for wells in the areas of greatest land surface elevation decrease indicates that there does not appear to be a strong correlation between measured groundwater elevations and the observed land surface elevation changes. Furthermore, a review of the extent of the 2018 agricultural lands and urbanized areas relative to the land surface elevation changes presented on Figure 3-33~~Figure 3-33~~ suggest that the developed, central portions of the EMA, which potentially have a higher rate of groundwater production, may not correlate with areas of the greatest land surface elevation changes. In addition, the measured land surface changes (elevation decrease or increase) may be dominantly controlled by folding and tectonics, where anticlinal structures may correlate with areas of uplift and synclinal structures may correlate with areas of subsidence.

Ground surface elevation data recorded from the UNAVCO CGPS Stations are presented on Figure 3-33~~Figure 3-33~~, which includes time-series plots of land surface elevation for the three CGPS stations. One of these stations is located near the Santa Ynez Airport, while the other two stations are in the periphery of the EMA and indicate ground surface elevations regionally. Total land surface elevation increases or decreases recorded by the station in the EMA indicate that, since 2015, a total change in ground surface elevation decrease of 20 millimeters, or 0.065 feet, has occurred. The majority of the change occurred as an abrupt shift in early 2017, likely due to a downward abrupt shift toward the north that occurred in that year and not related to groundwater pumping. For context, the CPGS stations located immediately surrounding the EMA showed approximately plus or minus 10 millimeters, or 0.03 feet, of land surface elevation change during the approximately 19-year period of record (~2001 through 2020). This is a minor rate of land surface elevation change and is insignificant.

To supplement the InSAR and UNAVCO data, GEI Consultants conducted a preliminary subsidence evaluation to assess the general susceptibility of the EMA to experience subsidence as a result of lowering groundwater levels below historical levels, based on review of subsurface geologic information and groundwater level data for key wells. The preliminary evaluation included estimating ranges of possible long-term subsidence that might be expected in the future. The evaluation, which is included in Appendix E, included the following key conclusions:

- There have been no reports from landowners or public agencies of impacts resulting from subsidence.
- The analysis was completed at two representative well locations and showed an estimated total potential subsidence of on the order of 0.5 to 3 feet over the next 20 years. This estimate is considered speculative due to the lack of data on the material properties of geologic materials in the Basin.

The well logs used in the evaluations include relatively thick sections of clayey materials (which would be expected to drain slowly), which are not necessarily representative of the entire Basin. The Paso Robles Formation contains relatively thin, often discontinuous, sand and gravel layers interbedded with thicker layers of silt and clay; however, the fine-grained material that may be subject to subsidence are not laterally continuous, which tends to reduce the likelihood for significant subsidence. The Careaga Sand consists of fine-grained to medium-grained, uniform, massive, marine sand with some gravel and limestone; therefore, lacking laterally continuous fine-grained material susceptible to significant subsidence. It is unlikely that the full amount of estimated subsidence (of 0.5 to 3 feet) would be observed, unless groundwater elevations declined significantly below what has been observed historically and did not recover for an extended period.

There likely has been, some subsidence that occurred historically as a result of groundwater extraction, but there have been no reported or documented impacts to surface features.

The limited magnitude of the measured ground surface elevation changes and limited temporal extent (duration) of the data make determination of cause and effect difficult at the time of this writing. The available data show a minor amount of land surface elevation change that is relatively insignificant, likely a result of tectonic activity in the region, and not a major concern for the EMA. However, ongoing subsidence over many years could add up to a more significant decrease in ground surface elevation; thus, the GSAs will continue to monitor annual subsidence.

3.2.5 Interconnected Groundwater and Surface Water

§ 354.16 Groundwater Conditions. Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:

(f) Identification of interconnected surface water systems within the basin and an estimate of the quantity and timing of depletions of those systems, utilizing data available from the Department, as specified in Section 353.2, or the best available information.

Surface water bodies interact with groundwater in three basic ways, as follows (see also ~~Figure 3-35).~~Figure 3-34). Note that one surface water body can interact in more than one of these three ways at different locations and at different times depending on groundwater and surface water conditions.

- Upward migration of groundwater through the stream bed (gaining stream condition). This requires the elevation of the water table in the vicinity of the surface water body to be higher than the elevation of the surface water body surface.
- Downward migration of surface water from the stream bed into groundwater (losing stream condition). This condition requires the elevation of the water table in the vicinity of the surface water body to be lower than the elevation of the surface water body surface.
- Downward migration of surface water from the streambed into groundwater, without direct connection to the underlying groundwater (disconnected).

Any connection of surface and groundwater systems can be affected by natural processes including prolonged wet periods or periods of drought, as well as anthropogenic processes, such land development, stream alteration, and pumping of surface water and/or groundwater. In addition to affecting the direction of water flow and volume of water exchanged between surface and groundwater systems, these processes can also affect water quality and GDEs where there is a prolonged interconnection between groundwater and surface water.

The classification of EMA streams, using acquired data and are defined by the USGS NHD (USGS, 2020), is presented in ~~Figure 3-34.~~Figure 3-35. According to the NHD data set, the entire Santa Ynez River is defined as a perennial stream, as are several of its tributaries. The EMA includes many types of creeks, several which are perennial, some of which are intermittent, and others that are perennial in places and intermittent in other places. Upstream of Bradbury Dam, perennial creeks include both Santa Cruz Creek and Cachuma Creek, which flow into Lake Cachuma. Below Bradbury Dam, the other creeks classified as perennial include the following (in order from upstream to downstream): San Lucas Creek, Zanja de Cota Creek, Quiota Creek, and Alisal Creek. Some of these creeks (e.g., Zanja de Cota) are perennial only in certain reaches. Three creeks are classified as intermittent over their full length: Happy Canyon Creek, Alamo Pintado Creek, and Ballard Canyon. The upstream portions of Santa Agueda Creek and Zaca Creek are perennial and become intermittent downstream.

The surface water system of the Santa Ynez River, including underflow within the Santa Ynez Alluvium, is subject to the regulatory jurisdiction of the SWRCB and is not managed by the EMA GSA under SGMA (refer to Appendix K for an additional discussion of the distinction between groundwater and the surface water system under in accordance with SGMA).

The following sections discuss the current understanding of the relationship between surface water and groundwater flow. Notably, the Santa Ynez River flow and connection to its baseflow is well documented and regulated. This surface water system is not discussed herein because groundwater within the EMA uplands does not interconnect with the river except where upland groundwater discharges to tributaries that then discharge into the river. The groundwater within the uplands does not directly interconnect with the riverSanta Ynez River due to the presence of low permeability bedrock that underlies the river and creates a barrier to flow (refer tosee Section 3.1.3). For the tributaries leading to the Santa Ynez River, however, the relationships between the streams and groundwater, though less well-documented, are discussed below.

3.2.5.1 Tributary Alluvium

A significant source of recharge to the Paso Robles Formation occurs within the shallow alluvial sand and gravel beds of tributaries where they are in direct contact with the Paso Robles Formation. Percolating groundwater moves readily through the tributary alluvium in the Santa Ynez Uplands (LaFreniere and French, 1968). In these areas, the tributaries are losing streams, contributing to that recharge the groundwater in the underlying Paso Robles Formation (and Older Alluvium).) and are completely disconnected from the underlying regional groundwater table and principal aquifer (see Section 3.2). Within these portions of the tributaries, the regional groundwater table is significantly lower than the elevation of the tributaries and there is no continuous saturated zone between the surface and water table, except in the lower ends of Alamo Pintado and Zanja de Cota Creeks.

Further south, nearNear the distal endsconfluence of thethese tributaries, the streams draining the Santa Ynez Uplands discharge into the north side of with the Santa Ynez River. Groundwater within the tributary alluvium at these locations encounters, groundwater in the principal aquifers discharge to surface water in the distal ends of these tributaries because relatively impermeable bedrock to the north of and underlying the Santa Ynez River, which forces the groundwater to discharge to surface water (Upson and Thomasson, 1951).

As early as 1968, groundwater contours prepared by the USGS indicated that groundwater historically discharged into the alluvium of Alamo Pintado and Santa Cruz Creeks (LaFreniere and French, 1968) from the Paso Robles Formation. The only exception to this condition in the groundwater basin was in the lower part of Happy Canyon, where the water level contours were convex downstream and intermittent, indicating that underflow or surface flow in Happy Creek was discharging to the deeper the Paso Robles Formation (LaFreniere and French, 1968) (Figure 3-35Figure 3-35).

Where the tributary valleys are narrow, the bedrock surface is relatively shallow and the cross-sectional area of alluvial filltributary alluvium is decreased, groundwater may be forced to the surface and at times become surface water flow in the stream channels., particularly near the southern ends of the tributaries. Such narrowing and shallowing occurs where stream channels have cut through the consolidated rocks that form the south boundary of the Santa Ynez Uplands area. This causes the re-emergence of streamflow during spring and early summer months in Alamo Pintado, Santa Agueda, Zanja de Cota, and Zaca Creeks (Figure 3-34). near the confluences with the

Santa Ynez River (Figure 3-35). Groundwater modeling that was conducted of potential stream depletion in these areas resulting from groundwater conditions occurring throughout the EMA is discussed in Section 5.10, which presents the modeled results of the timing and magnitude of surface water depletions in these GDE areas.

Review of the data presented on ~~Figure 3-34~~Figure 3-35 indicates that the entirety of Cachuma and Santa Cruz Creeks, as well as the lower end of Zanja De Cota Creek and the upper portion of Santa Agueda Creek, are perennial. All other groundwater that discharges naturally from the EMA is either transpired by plants, discharged as underflow through thin, narrow strands of alluvium that line the valleys tributary to the Santa Ynez River, or exists as surface water flowing into the Santa Ynez River that has resulted from discharge of groundwater from some tributaries, particularly near the confluence with the Santa Ynez River (e.g., Alamo Pintado and Zanja de Cota Creeks).

Santa Agueda and Alamo Pintado Creeks had streamflow gauging stations, which have been terminated. The only streamflow gauges that remain in the tributaries to the Santa Ynez River are within Alamo Pintado Creek and Santa Cruz Creek. Surface water flow has been estimated for Alisal, Santa Agueda, Zanja de Cota, Alamo Pintado, and Zaca Creeks for the period between 1941 and 2019 based on correlations with documented streamflow from old stream gauges that no longer exist (Stetson, 2008).

Figure 3-34. Gaining and Losing Streams

Figure 3-35. Stream Classifications

3.2.6 Groundwater Dependent Ecosystems

§ 354.16 Groundwater Conditions. Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:

(g) Identification of groundwater dependent ecosystems within the basin, utilizing data available from the Department, as specified in Section 353.2, or the best available information.

SGMA and DWR's GSPthe SGMA regulations establish requirements for the identification of GDEs, and, if present, identification of impacts on GDEs from management actions in the EMA. or groundwater conditions occurring throughout the EMA. GDEs are defined in the SGMA regulations as "ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface." Determination of whether an area within a groundwater basin contains GDEs is the responsibility of the GSAs. DWR created the Natural Communities Commonly Associated with Groundwater data set (hereafter referred to as the Natural Communities data set), to assist GSAs with identification of potential GDEs, the data for which are presented on Figure 3-36Figure 3-36.

The Natural Communities data set is a compilation of 48 publicly available state and federal agency data sets that map vegetation, wetlands, springs, and seeps in California. A working group that includes DWR, California Department of Fish and Wildlife (CDFW), and The Nature Conservancy (TNC) reviewed the compiled data set and conducted a screening process to (1) exclude vegetation and wetland types less likely to be associated with groundwater and (2) retain types commonly associated with groundwater as described in Klausmeyer et al. (2018). Two habitat classes are included in the Natural Communities data set statewide:

- Wetland features commonly associated with the surface expression of groundwater under natural, unmodified conditions
- Vegetation types commonly associated with the subsurface presence of groundwater (phreatophytes)

The data included in the Natural Communities data set do not represent the determination of a GDE by DWR, only the potential existence of a GDE. However, the Natural Communities data set can be used by GSAs as a starting point when approaching the task of identifying GDEs within a groundwater basin that are both classified as potential GDEs and are connected to groundwater.

The EMA GSA is fully supportive of the comprehensive and ongoing efforts, dating back to the 1990s, to develop and implement surface flow and non-flow measures in the mainstem lower Santa Ynez River and certain tributaries for the protection of public trust resources, including but not limited to steelhead and its critical habitat within the Santa Ynez River. The member agencies of the EMA GSA remain actively involved with numerous federal, state, and local entities in proceedings before the SWRCB and in the current re-consultation process under the federal Endangered Species Act to protect steelhead and its critical habitat in the lower Santa Ynez River. Notably, however, steelhead and other species residing in the Santa Ynez River depend on surface and underflow components of the surface water system and are not groundwater dependent based on the analyses set forth in this GSP.

3.2.6.1 Identification of Potential GDEs

TNC developed a guidance document based on best available science to assist agencies, consultants, and stakeholders to efficiently incorporate GDE analysis into GSPs. In the guidance, five steps were outlined to inform the GSP process (Rohde et al., 2018):

- **Step 1** – Identify potential GDEs
- **Step 1.1** - Map GDEs
- **Step 1.2** - Characterize GDE Condition
- **Step 2** – Determine Potential Effects of Groundwater Management on GDEs
- **Step 3** – Consider GDEs when Establishing Sustainable Management Criteria
- **Step 4** – Incorporate GDEs into the Monitoring Network
- **Step 5** – Identify Projects and Management Actions to Maintain or Improve GDEs

The two objectives within Step 1, to map (Step 1a) and characterize (Step 1b) GDEs in the EMA, are the focus of this section. The remaining steps are considered in later sections of the GSP, specifically in the Monitoring Network (Section 4), Sustainable Management Criteria (Section 5), and Projects and Management Actions (Section 6).

Based on review of the Natural Communities data set, several palustrine and riverine wetland features, three mapped springs, and five types of vegetation communities are present within the EMA. The five Natural Communities vegetation types are the following:

- Coast Live Oak
- Valley Oak
- Riparian Mixed Hardwoods
- Riversidean Alluvial Scrub
- Willow

The Natural Communities vegetation classifications are a collection of multiple vegetation species. The classifications named after a specific species (e.g., willow) are generally the predominant species in the classification (Klausmeyer et al., 2018). These five Natural Communities vegetation classifications are presented as polygons on Figure 3-36~~Figure 3-36~~ as they occur throughout the EMA. Each of the vegetation classifications are described in detail below. The Natural Communities wetland classifications are also presented on Figure 3-36~~Figure 3-36~~ (as one wetland area category). They are, however, difficult to discern, as they are composed of essentially linear features aligned along surface water courses. The three mapped springs are also shown on Figure 3-36~~Figure 3-36~~.

Potential GDE Vegetation Classifications

The Natural Communities vegetation classifications in the EMA are summarized in this section.

The **Coast Live Oak** Natural Communities classification occurs throughout the EMA, covering an area of 5,830 acres as shown in orange on Figure 3-36~~Figure 3-36~~. Coast live oak (*Quercus agrifolia*) dominates this type that occurs primarily on protected north-facing ravines within the river channel. Coast live oak is considered the most fire-resistant California tree oak, but the species does not tolerate extended flooding (USDA, 2009). It has evergreen leaves, thick bark, and an ability to sprout from the trunk and roots, given its food reserves stored in an extensive root system (USDA, 2009). Associated species include toyon (*Heteromeles arbutifolia*) and elderberry (*Sambucus mexicana*) (SWRCB, 2011). Reported maximum rooting depths for the coast live oak range from 24 to 35 feet (TNC, 2020).

The **Valley Oak** Natural Communities classification occurs throughout the EMA, covering an area of 1,265 acres as shown in red on Figure 3-36~~Figure 3-36~~. Valley oak (*Q. lobata*) savanna and woodlands normally occur at elevations below 2,000 feet in valley bottoms on deep, well-drained soils (Meridian Consultants, 2012). Understory vegetation in relatively undisturbed areas may comprise native perennial bunchgrasses.

This community may also contain scattered coast live oaks and blue oaks. Reported maximum rooting depth for valley oak is 80 feet (Lewis and Burgy, 1964).

The **Riparian Mixed Hardwoods** Natural Communities classification occurs in several isolated stands in the EMA, covering an area of 495 acres, as shown in purple on Figure 3-36~~Figure 3-36~~. Riparian mixed hardwoods are found along perennial and intermittent streams in areas that are less frequently and less intensely disturbed by flood events than in areas dominated by riparian scrub. The dominant tree species include Fremont or black cottonwood (*Populus fremontii*, *P. balsamifera* ssp. *trichocarpa*), California sycamore (*Platanus racemosa*), willow (either arroyo, red or yellow), California walnut (*Juglans californica*), white alder (*Alnus rhombifolia*), and coast live oak (Meridian Consultants, 2012). Understory species, when present, include mugwort, wild rose, poison oak, blackberry, wild cucumber, and non-native plants such as periwinkle and nasturtium (Meridian Consultants, 2012). Apart from coast live oak, a few of this category's primary plant species (willow, Fremont cottonwood, and black cottonwood) have rooting depth information in the GDE Database (TNC, 2020), with ranges of from 1 to 7 feet.

The **Riversidean Alluvial Scrub** Natural Communities classification occurs in one 7-acre area located near the midpoint of the northern boundary of the EMA, as shown in light green on Figure 3-36~~Figure 3-36~~. Scalebroom (*Lepidospartum squamatum*) is generally regarded as an indicator for this alliance (Hanes et al. 1988). Riversidean Alluvial Scrub habitats are found in alluvial fans and dry washes with flood patterns. The history of ground disturbance can play a significant contribution in the mixture of vegetation species. In addition to scalebroom, other species included in the Riversidian Alluvial Scrub CALVEG alliance are California buckwheat (*Eriogonum fasciculatum*), California sagebrush (*Artemisia californica*), white sage (*Salvia apiana*), and brittlebush (*Encelia* spp.), prickly pear (*Opuntia* spp.), chaparral yucca (*Yucca whipplei*), various sumac species (*Rhus* spp.), and California juniper (*Juniperus californica*) (USDA, 2009). No information about scalebroom rooting depth is provided in the GDE Rooting Depths Database. However, the other species associated with this Natural Communities classification (California buckwheat, chaparral yucca, and white sage) have reported rooting depths ranging from 2 to 5 feet (TNC, 2020).

The **Willow** Natural Communities classification occurs in two small areas within the EMA, totaling 7 acres. One willow classification area is in the Santa Ynez River Area and the other area is located near the midpoint of the northern boundary of the EMA, as shown in green on Figure 3-36~~Figure 3-36~~. The Willow CALVEG alliance is defined by the dominance of a single or a combination of deciduous willow tree species including black (*Salix gooddingii*), red (*S. laevigata*), arroyo (*S. lasiolepis*), and/or shining (*S. lucida*) willows (USDA, 2009). While the presence of the Natural Communities willow classification is limited within the EMA, willow as individual species may also be found in the Riparian Mixed Hardwood CALVEG alliance (USDA, 2009). They are found on the edge of active channels and floodplain terraces where they have access to shallow groundwater. Other riparian species found within this CALVEG alliance include the Fremont cottonwood and California sycamore and a variety of perennial and annual forbs. No information about rooting depth of the specific willow species listed above is provided in the GDE Rooting Depths Database. However, other willow species in the same genus have reported maximum rooting depths ranging up to 8 feet (TNC, 2020).

Screening of Potential GDEs

To confirm whether the Natural Community vegetation and wetland polygons are connected to groundwater, local hydrologic information may be used to confirm a groundwater connection to the potential GDE. TNC guidance provides a list of questions to assess whether Natural Community polygons are connected to groundwater. These questions include the following from Worksheet 1 of the guidance:

1. Is the Natural Community polygon underlain by a shallow unconfined or perched aquifer that has been delineated as being part of a Bulletin 118 principal aquifer in the Basin?
2. Is the depth to groundwater under the Natural Community polygon less than 30 feet?

3. Is the Natural Community polygon located in an area known to discharge groundwater (e.g., springs/seeps)?

If the answer is yes to any of these three questions, per TNC guidance, it is likely a GDE. As a part of the process, some Natural Community polygons are removed and other GDE polygons may be added, where appropriate. TNC recommends that Natural Community polygons with insufficient hydrologic data also be considered GDEs but be flagged for further investigation.

Contoured groundwater elevation data for spring 2015 was used to determine areas where the Natural Communities polygons were within 30 feet depth to groundwater. Spring 2015 groundwater elevations were chosen for this analysis because this marked a period of the greatest recent data availability.[24] These data are considered representative of average spring-summer conditions within the last 5 years.[25] Areas with spring 2015 depth to groundwater of 30 feet or less are shown in purple on Figure 3-37~~Figure 3-37~~ and the Natural Communities polygons that intersect with these areas are shown on Figure 3-38. Note that the Santa Ynez River Area has been excluded from the analysis, as this area is managed by the SWRCB and is therefore not under the purview of SGMA. The EMA GSA is not responsible for managing any aspect of the Santa Ynez River and related groundwater system (including assessment of impacts to GDEs).

The Natural Communities polygons associated with the spring 2015 depth to groundwater of 30 feet or less shown on Figure 3-38 are considered potential GDEs within the EMA. A brief aerial photo review indicates the potential GDEs identified in this step generally match areas of visible vegetation within the 30 foot or less depth-to-groundwater areas. An on-site biological survey is recommended by TNC (2019) as a final GDE verification step. Biological surveys have not been completed in preparation of this GSP. However, the presence of these potential GDEs will be verified during GSP implementation. The potential vegetation and wetland GDEs within the EMA are summarized in Tables 3-11 and 3-12.

Table 3-11. Potential Vegetation GDEs in the EMA (Excluding the Santa Ynez River Area)

Natural Communities Vegetation Classification	Acres
Coast Live Oak	1,250
Valley Oak	279
Riparian Mixed Hardwood	192
Riversidean Alluvial Scrub	5
Willow	4
Total	**1,731**

[24] The spatial distribution and density of spring 2015 groundwater elevation data satisfies the TNC recommendation for using wells that are located within 5 kilometers (3.1 miles) of the Natural Communities polygons (TNC, 2019).
[25] Groundwater elevations are generally the highest in the spring, following recharge from winter rains. Spring-time groundwater elevations in 2015, a relatively dry year, are considered representative of average modern conditions as measured throughout the spring-summer months, during the period of maximum annual evapotranspiration. It also represents the period when SGMA was enacted; GDEs observed after January 2015 are subject to evaluation under SGMA.

Table 3-12. Potential Wetland GDEs in the EMA (Excluding Santa Ynez River Area)

Natural Communities Wetland Classification	Acres
Palustrine, Emergent, Persistent, Seasonally Flooded	0.4
Palustrine, Forested, Seasonally Flooded	3
Riverine, Upper Perennial, Unconsolidated Bottom, Permanently Flooded	11
Riverine, Lower Perennial, Unconsolidated Bottom, Permanently Flooded	7
Riverine, Unknown Perennial, Unconsolidated Bottom, Semi-permanently Flooded	6
Total	**27[1]**

Note

[1] The potential wetland GDE acres overlap in many areas with potential vegetation type GDEs. Therefore, the total potential GDE acreage in the EMA is less than the sum of the potential wetland GDE and the potential vegetation type GDE acres.

Three USGS mapped springs are located within the EMA, as shown on Figure 3-36~~Figure 3-36~~. There are no Natural Communities polygons coincident with these mapped springs. A brief aerial imagery review reveals little evidence to support or refute the continued presence of springs at these locations. The presence of these springs and any associated GDEs will be verified during GSP implementation.

Figure 3-36. Native Communities Commonly Associated with Groundwater Dataset

Figure 3-37. Potential Groundwater Dependent Ecosystems 30-foot Depth to Groundwater Screening

Figure 3-38. Potential Groundwater Dependent Ecosystems

Categorization of Potential GDEs

The potential GDEs identified in the section above are further categorized based on their proximity to, and association with, the regional principal aquifers in the EMA (refer to Figure 3-39) as follows:

- **Category A** refers to potential GDEs that are associated with a principal aquifer in the EMA and are potentially affected by groundwater management activities.
- **Category B** refers to potential GDEs that are unlikely to be affected by pumping and groundwater management activities within the EMA.

The focus of this GSP is to preserve the existing Category A GDEs where identified, regardless of composition or condition.

The Category A potential GDEs are concentrated in the southwestern portion of the EMA in the areas surrounding the lower, generally perennial reaches of Alamo Pintado and Zanja de Cota Creeks (Figure 3-39). These potential GDEs are located where the southerly flow of groundwater in the regional confined principal aquifers is forced to the surface by the underlying bedrock of the Monterey Formation (LaFreniere and French, 1968). These potential GDEs are also supported with (1) underflow in the tributary alluvium (Upson and Thomasson, 1951) and—in the case of the GDEs surrounding the lower reaches of Zanja de Cota Creek—(2) effluent from the Chumash Casino Resort Wastewater Treatment Plant (WWTP). In total, there are 184 acres of Category A potential GDEs within the EMA, as shown on Figure 3-39 and in ~~Table 3-13.~~Table 3-13. The Category A potential GDEs are considered in the development of sustainable management criteria (Section 5) and in projects and management actions (Section 6).

In total, there are 1,546 acres of Category B potential GDEs in the EMA as shown on Figure 3-39 and in ~~Table 3-13. All of~~Table 3-13. All the orange areas identified on Figure 3-39 are Category B areas for the following reasons:

- The potential GDEs in the upper portions of Zaca Creek and upper Alamo Pintado Creek are categorized as Category B due to apparent hydrogeologic separation between the perched tributary alluvium, which supports the potential GDEs, and the deeper principal aquifer groundwater elevations that support significant agricultural irrigation in the area.
- The potential GDEs located in upper Santa Agueda Creek and Happy Canyon are categorized as Category B due to limited groundwater production occurring within the area and the apparent hydrogeologic separation between the perched tributary alluvium aquifers and the deeper principal aquifer groundwater elevations.
- The potential GDEs located in the eastern portion of the EMA in Cachuma and Santa Cruz Creeks are categorized as Category B due to the absence of significant groundwater production in the area and an assumed hydrogeologic separation between the perched tributary alluvium aquifers and the deeper principal aquifer groundwater elevations.

Figure 3-39. Categorized Potential Groundwater Dependent Ecosystems

Table 3-13. Categorized Potential GDEs in the EMA (Excluding Santa Ynez River Area)

Potential GDE Category	Natural Communities Vegetation Classification	Acres
A	Coast Live Oak	91
	Riparian Mixed Hardwood	93
	Subtotal	**184**
B	Coast Live Oak	1,159
	Valley Oak	279
	Riparian Mixed Hardwood	99
	Riversidean Alluvial Scrub	5
	Willow (Shrub)	4
	Subtotal	**1,546**
	Total	**1,731**

3.2.6.2 Special-Status Species Occurrence

A literature review was completed to determine the terrestrial and aquatic special-status species that may use potential GDE units within the EMA. The documents reviewed include a 2000 Biological Opinion prepared for USBR (NMFS, 2000),[26] the 2011 Cachuma Project Division of Water Rights Final Environmental Impact Report[27] (SWRCB, 2011), the 2012 City of Solvang Water System Master Plan Update Environmental Impact Report (Meridian Consultants, 2012), the 2016 U.S. Forest Service Happy Canyon Environmental Assessment (USDA, 2016), and the 2019 SWRCB Order regarding the USBR Cachuma Project (SWRCB, 2019). The U.S. Fish and Wildlife Service (USFWS) Critical Habitat Mapper[28] was also consulted. No original analysis was conducted for the special status species review of the EMA.

For the purposes of this GSP, special-status species are defined as those:

- Listed, proposed, or under review as endangered or threatened under the federal Endangered Species Act (ESA) or the California Endangered Species Act (CESA)
- Designated by California Department of Fish and Wildlife (CDFW) as a Species of Special Concern
- Designated by CDFW as Fully Protected under the California Fish and Game Code (§§ 3511, 4700, 5050, and 5515)

Table 3-14~~Table 3-14~~ lists the special-status species that are documented to occur within the EMA based on review of the documents listed above. Note that this list includes documented occurrence within the entire Bulletin 118 boundary of the EMA, including the Santa Ynez River Area, which is managed by the SWRCB and therefore not under the purview of SGMA. Wildlife species were evaluated for potential groundwater dependence using the Critical Species Lookbook (Rohde et al., 2019). This potential groundwater

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[26] *Biological Opinion, U.S. Bureau of Reclamation Operation and Maintenance of the Cachuma Project on the Santa Ynez River in Santa Barbara County, California*, issued September 11, 2000 (Biological Opinion) (NMFS, 2000).
[27] The full title of the document is *Division of Water Rights Final Environmental Impact Report, Consideration of Modifications to the U.S. Bureau of Reclamation's Water Right Permits 11308 and 11310 (Applications 11331 and 11332) to Protect Public Trust Values and Downstream Water Rights on the Santa Ynez River below Bradbury Dam (Cachuma Reservoir). State Clearinghouse #1999051051* (SWRCB, 2011).
[28] Available at https://ecos.fws.gov/ecp/report/table/critical-habitat.html. (Accessed July 26, 2021.)

dependence rating is indicative of the species' general documented reliance on groundwater and should not be considered a statement of specific groundwater reliance occurring within the potential GDEs of the EMA. As stated above, the presence of the potential GDEs will be verified during GSP implementation.

No special-status plant species were identified within the EMA.

The following sections describe three of the federally listed special-status species in greater detail.

Table 3-14. Special-Status Species within the EMA, Including the Santa Ynez River Area (Bulletin 118 Boundary)

Common Name	Scientific Name	Status	Potential Dependence on GW[1]	Potential Location
Arroyo Chub	*Gila orcutti*	State species of special concern	Direct	SYR, Up
California Red-Legged Frog	*Rana draytonii*	Federally listed (Threatened)	Direct	SYR, Up
Coast Range Newt	*Taricha torosa*	State species of special concern	Direct	SYR, Up
Southern California Coast Steelhead DPS	*Oncorhynchus mykiss*	Federally listed (Endangered)	Direct	SYR
Southwestern Pond Turtle	*Actinemys marmorata pallida*	State species of special concern	Direct	SYR, Up
Western Pond Turtle	*Emys marmorata*	State species of special concern	Direct	SYR, Up
Least Bell's Vireo	*Vireo bellii pusillus*	State and federally listed (Endangered)	Indirect[3]	SYR
Silvery Legless Lizard	*Anniella pulchra*	State species of special concern	Indirect[3]	SYR, Up
Two-Striped Garter Snake	*Thamnophis hammondii*	State species of special concern	Indirect[3]	SYR, Up
Vernal Pool Fairy Shrimp[2]	*Branchinecta lynchi*	Federally listed (Threatened)	Unknown	Up

Notes

[1] Potential reliance on groundwater (GW) is determined from the Critical Species Lookbook (Rohde et al., 2019) and is not an indication of specific GW reliance within the EMA.

[2] Although there have been no documented occurrences, USFWS has identified critical vernal pool fairy shrimp habitat within the EMA.

[3] This species relies on other groundwater dependent organism(s).

DPS = distinct population segment

GW = groundwater

SYR = Santa Ynez River area

Up = Santa Ynez Uplands area

Southern California Coast Steelhead DPS

The Santa Ynez River below Bradbury Dam supports steelhead belonging to the Southern California Coast Distinct Population Segment (DPS) (*Oncorhynchus mykiss*), which is federally listed as endangered. Within this DPS, the population of steelhead have both been identified as Core 1 populations, which means the population has the following:

- The highest priority for recovery actions
- A known ability or potential to support viable populations
- The capacity to respond to recovery actions (NMFS, 2012)

One critical recovery action listed by the National Marine Fisheries Service (NMFS) includes the implementation of operating criteria to ensure surface flows allow for essential steelhead habitat functions (NMFS, 2012). Figures 3-40 and 3-41 show the documented steelhead spawning and rearing habitat within and adjacent to the EMA (SWRCB, 2011). The occurrence of steelhead within the EMA is entirely confined to the Santa Ynez River Area (see Figures 3-40 and 3-41), which is ~~managed~~regulated by the SWRCB and therefore not under the purview of SGMA.

The EMA GSA is fully supportive of the comprehensive and ongoing efforts, dating back to the 1990s, to develop and implement surface flow and non-flow measures in the mainstem lower Santa Ynez River and certain tributaries for the protection of public trust resources, including, but not limited to, steelhead and its critical habitat (e.g., National Marine Fisheries Service September 2000 Biological Opinion for U.S. Bureau of Reclamation Operation and Maintenance of the Cachuma Project on the Santa Ynez River in Santa Barbara County, California; State Water Resources Control Board Water Order WR 2019-0148 for the Cachuma Project on the Santa Ynez River). The member agencies of the EMA GSA remain actively involved with numerous federal, state, and local entities in proceedings before the SWRCB and in the current re-consultation process under the federal Endangered Species Act to protect steelhead and its critical habitat in the lower Santa Ynez River (refer to Appendix K for an additional discussion of this issue).

California Red-Legged Frog and Vernal Pool Fairy Shrimp

Santa Ynez River tributaries that may support the California red-legged frog (*Rana draytonii*) include Alamo Pintado and Cachuma Creeks within the EMA (Figure 3-42) (SWRCB, 2011). In 2001, the USFWS designated critical habitat for this species, including the upper reaches of Cachuma Creek and Happy Canyon within the EMA and the eastern tip of the EMA (see Figure 3-42). There are no documented occurrences of vernal pool fairy shrimp (*Branchinecta lynchi*) within the EMA, however, the USFWS has designated critical habitat for this species throughout the Happy Canyon area within the EMA (see figure 3-42).

3.2.6.3 Ecological Condition of Potential GDEs

Once potential GDEs are mapped, TNC guidance recommends that the condition of each GDE unit be inventoried and documented by describing the species composition, habitat condition, and other relevant information reflected in Worksheet 2 of the guidance (Rohde et al., 2018). Then the ecological condition of the GDE unit should be characterized as having a high, moderate, or low ecological value based on the criteria provided in the TNC guidance. This additional characterization was not performed and will not be performed post-GSP. The focus of this GSP will be to preserve the existing Category A GDEs where identified, regardless of composition or condition. Further confirmation of the extent and types of plants and animals that live in the Category A potential GDE area and the extent to which they are supported by groundwater will be completed as discussed in the projects and management actions section of the GSP (see Section 6).

Figure 3-40. Steelhead Spawning Habitat

Figure 3-41. Steelhead Rearing Habitat

Figure 3-42. California Red-Legged Frog and Vernal Pool Fairy Shrimp Habitat

3.3 Water Budget [§ 354.18]

§§ 354.18 Water Budget.

(a) Each Plan shall include a water budget for the basin that provides an accounting and assessment of the total annual volume of groundwater and surface water entering and leaving the basin, including historical, current and projected water budget conditions, and the change in the volume of water stored. Water budget information shall be reported in tabular and graphical form.

(b) The water budget shall quantify the following, either through direct measurements or estimates based on data:

(1) Total surface water entering and leaving a basin by water source type.

(2) Inflow to the groundwater system by water source type, including subsurface groundwater inflow and infiltration of precipitation, applied water, and surface water systems, such as lakes, streams, rivers, canals, springs and conveyance systems.

(3) Outflows from the groundwater system by water use sector, including evapotranspiration, groundwater extraction, groundwater discharge to surface water sources, and subsurface groundwater outflow.

(4) The change in the annual volume of groundwater in storage between seasonal high conditions.

(5) If overdraft conditions occur, as defined in Bulletin 118, the water budget shall include a quantification of overdraft over a period of years during which water year and water supply conditions approximate average conditions.

(6) The water year type associated with the annual supply, demand, and change in groundwater stored.

A water budget is the key integrating aspect of the Basin Setting. For the EMA, the HCM (see Section 3.1) and water budgets (this section) together form the basis for the numerical flow model to be used for quantitatively evaluating the management alternatives to be considered in this GSP.

This section summarizes the estimated water budgets for the EMA, including information required by the SGMA regulations and information that is important for developing an effective GSP that achieves groundwater sustainability. In accordance with SGMA regulations § 354.18, the GSP must include a water budget that provides an accounting and assessment of the annual volume of groundwater and surface water entering and leaving the Basin and include the historical, current, and projected hydrologic conditions, as well as the change in the annual volume of groundwater in storage. The regulations require that the water budget be reported in graphical and tabular formats.

3.3.1 Overview of Water Budget Development

§§ 354.18 Water Budget.

(d) The Agency shall utilize the following information provided, as available, by the Department pursuant to Section 353.2, or other data of comparable quality, to develop the water budget:

(1) Historical water budget information for mean annual temperature, mean annual precipitation, water year type, and land use.

(2) Current water budget information for temperature, water year type, evapotranspiration, and land use.

(3) Projected water budget information for population, population growth, climate change, and sea level rise.

(e) Each Plan shall rely on the best available information and best available science to quantify the water budget for the basin in order to provide an understanding of historical and projected hydrology, water demand, water supply, land use, population, climate change, sea level rise, groundwater and surface water interaction, and subsurface groundwater flow. If a numerical groundwater and surface water model is not used to quantify and evaluate the projected water budget conditions and the potential impacts to beneficial uses and users of groundwater, the Plan shall identify and describe an equally effective method, tool, or analytical model to evaluate projected water budget conditions.

(f) The Department shall provide the California Central Valley Groundwater-Surface Water Simulation Model (C2VSIM) and the Integrated Water Flow Model (IWFM) for use by Agencies in developing the water budget. Each Agency may choose to use a different groundwater and surface water model, pursuant to Section 352.4.

This section presents an overview of the data sources used for development of the water budget from a variety of publicly available data. As noted above, this water budget refers to the EMA portion of the Basin, as defined in Section 1.2 and depicted on Figure 1-1. This section presents a water budget as required by the regulations, which accounts for and assesses the annual volume of groundwater and surface water entering and leaving the EMA, including historical, current, and projected water budget conditions, each of which present both surface water and groundwater components.

The estimated inflow and outflow components as well as the sustainable yield are presented following the water budget. The sustainable yield is not a fixed constant value but can fluctuate over time as the groundwater inflows and outflows change; thus, the calculated sustainable yield within the EMA can be estimated and likely modified during a future update of the GSP, depending on the representativeness of the long-term hydrologic conditions present at that time or availability of improved estimates of the water budget components.

The water budget analysis is inextricably tied to the SGMA requirement to ensure the Basin is operated within its sustainable yield. Sustainable yield is defined in SGMA as "the maximum quantity of water, calculated over a base period representative of long-term conditions in the basin and including any temporary surplus that can be withdrawn annually from a groundwater supply without causing an undesirable result." An undesirable result is one or more of the following effects caused by groundwater ~~pumping~~conditions occurring throughout the ~~Basin~~EMA:

- Chronic lowering of groundwater levels in the aquifer(s) indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if groundwater extractions and recharge are managed as necessary to ensure that reductions of groundwater levels or storage during a period of drought are offset by increases of groundwater levels or storage during other periods.
- Significant and unreasonable reduction of groundwater in storage.
- Significant and unreasonable degradation of water quality, including the migration of contaminant plumes that impair water supplies.
- Seawater intrusion.
- Significant and unreasonable land subsidence that substantially interferes with surface land uses.
- Depletion of interconnected surface water that has significant and unreasonable adverse impacts on beneficial uses of surface water.

Defining the sustainable yield of a groundwater basin based upon a water budget provides a starting point that may be adjusted by considering whether there are undesirable results associated with any of the six sustainability indicators described above. Consideration of the sustainability indicators for defining sustainable yield is presented in Section 5.

Section 354.18 of the SGMA regulations requires development of a water budget that includes both groundwater and surface water components to provide an accounting of the total volume of water entering and leaving a basin. To satisfy the requirements of the regulations, a water budget was prepared for the EMA for each water budget period. A general schematic diagram of the hydrologic cycle, each component of which is included in the water budget, is presented on Figure 3-43~~Figure 3-43~~.

The Santa Ynez River and associated underflow within the Santa Ynez River Alluvium is included in the surface water system that is summarized in the budget, along with the surface water in the tributaries within the Santa Ynez Uplands and Santa Ynez mountains to the south. As surface water, the Santa Ynez River Alluvium is not considered a principal aquifer because the water within this geological unit is present within the defined bed and banks of the channel and thus is not considered groundwater in accordance with Water Code, § 10721(g). The surface water system is managed under the jurisdiction of SWRCB and is not within the purview of SGMA. The description of principal aquifers and the authority associated with managing the Santa Ynez River and associated underflow is discussed in Section 3.1. On the basis of this authority and the Water Code definitions, water both aboveground and belowground within the Santa Ynez River (SYRWCD's Zone A portion of the EMA) is part of the surface water budget for the EMA. The extents of the Santa Ynez Uplands (groundwater area) and Santa Ynez River (surface water area) are shown on Figure 3-1.

The surface water budget also includes estimates of the flow through the tributaries that drain the San Rafael Mountains and Santa Ynez Uplands to the north and Santa Ynez Mountains to the south (including Zaca Creek, Alamo Pintado Creek, Happy Canyon, Alisal Creek, Hilton Creek, Quiota Creek, San Lucas Creek, Santa Aqueda Creek, and Teqepis Creek). Flows from Cachuma Creek and Santa Cruz Creek are included in the numerical groundwater flow model, but are not included in the surface water budget, because implementation of the GSP will not affect groundwater use (for agricultural, domestic, municipal or environmental uses), nor groundwater and surface water conditions within these tributaries.

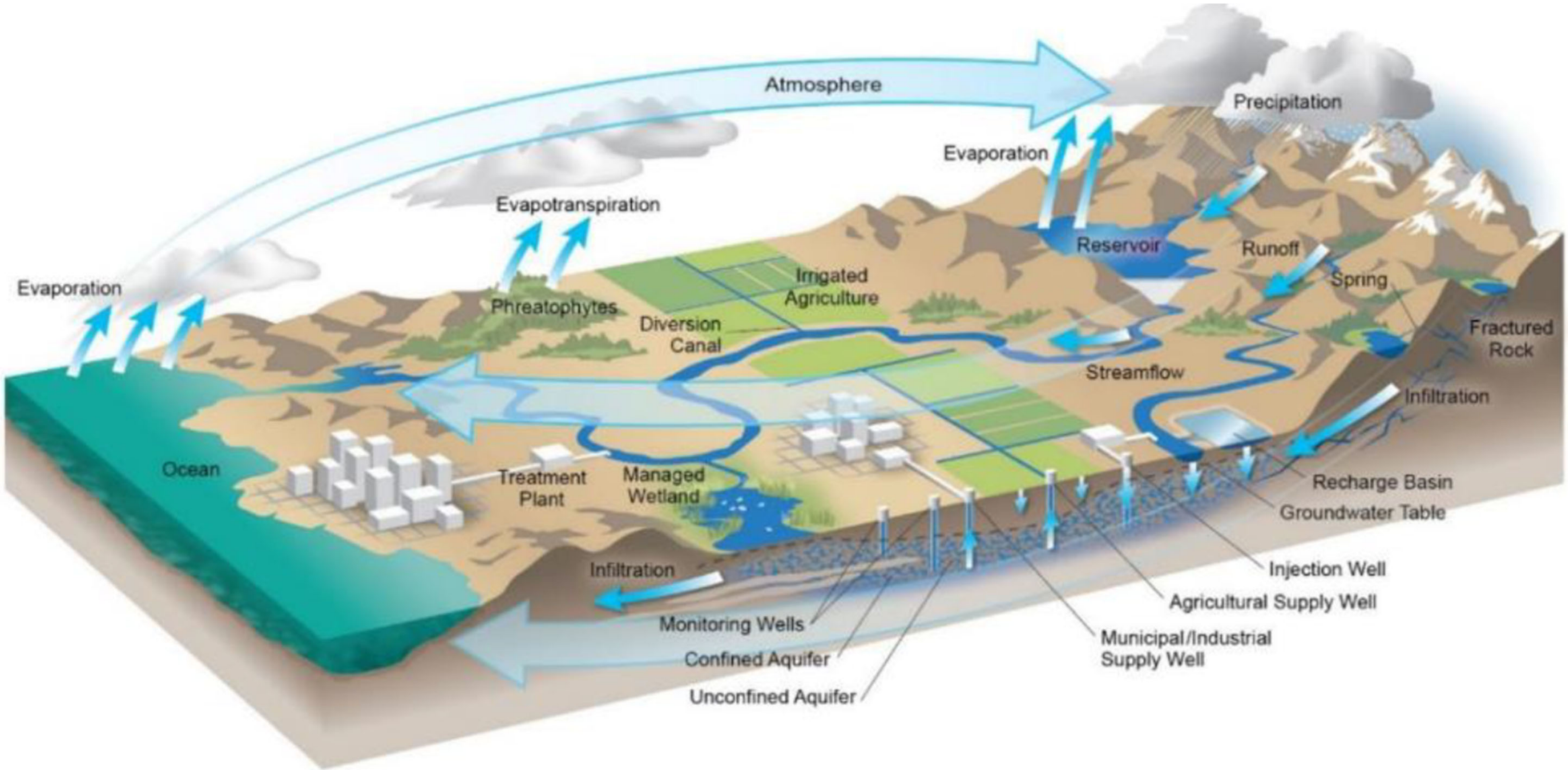

Figure 3-43. Hydrologic Cycle

(Source: DWR, 2016a)

A few components of the water budget, such as streamflow at a gauging station or groundwater pumping from a metered well, can be measured directly. Other components of the water budget, such as recharge from precipitation or unmetered groundwater pumping, are estimated. The water budget is an inventory and accounting of total surface water and groundwater inflows (recharge) and outflows (discharge) from the EMA, including the following:

Surface Water Inflows (Santa Ynez River):

- Streamflow and subsurface inflow into the Santa Ynez River Alluvium from both the upstream Santa Ynez River and Santa Ynez Uplands tributaries
- Runoff of precipitation into streams and rivers or diversion structures that enter the EMA from the surrounding watershed
- Irrigation return flow to the Santa Ynez River Alluvium
- Return flows from septic systems
- Imported surface water (e.g., from the SWP)

Surface Water Outflows (Santa Ynez River):

- Streamflow exiting the EMA through the Santa Ynez River and Zaca Creek
- Subsurface flow through the Santa Ynez River Alluvium into the downstream CMA
- Pumping from river wells completed in the Santa Ynez River Alluvium
- Phreatophyte ET

Groundwater Inflows:

- Recharge from precipitation
- Percolation of tributary flows to groundwater
- Subsurface groundwater inflow, including mountain front recharge
- Irrigation return flow (water not consumed by crops/landscaping)
- Percolation of treated wastewater
- Septic tank return flows
- Urban irrigation return flow (including water distribution system leakage and water from imported sources)

Groundwater Outflows:

- Groundwater pumping
- Phreatophyte ET
- Subsurface groundwater outflows to adjoining groundwater system
- Groundwater discharge to surface water

The difference between inflows to and outflows from the groundwater system in the Santa Ynez Uplands is equal to the change of groundwater in storage.

The historical water budget period is water years 1982 through 2018. The current water budget period is water years 2011 through 2018. The projected water budget extends to 2072 (Figure 3-44Figure 3-44).

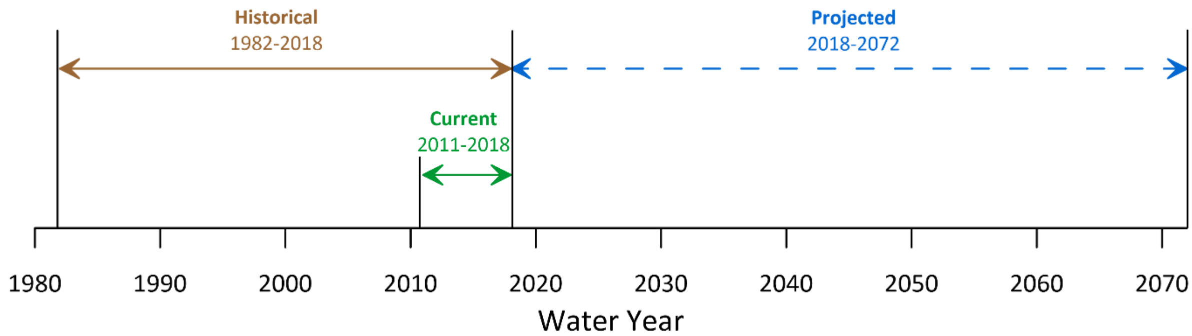

Figure 3-44. Historical, Current, and Projected Water Budget Periods

In the GSP, the discussion of the historical water budget period refers to water years, which run between October 1 and September 30 of the following year. For example, the period between October 1, 2017, and September 30, 2018, constitutes water year 2018.

The 37-year period between water years 1982 and 2018 (inclusive) has been selected for the historical water budget to comply with DWR regulatory requirements. This same period is used on all three GSPs prepared for the Basin, which require the following:

“a quantitative assessment of the historical water budget (be prepared) starting with the most recently available information and extending back a minimum of 10 years, or as sufficient to calibrate and reduce the uncertainty of the tools and methods used to estimate and project future water budget information and future aquifer response to proposed sustainable groundwater management practices over the planning and implementation horizon.”

The 37-year period selected for the historical water budget includes the most recently available information, two wet and two dry hydrologic cycles, recent changes in imported water supply availability, changes to water demand associated with cropping patterns, and associated land use. The selection of the historical period considered the availability of good-quality data for the principal water budget components, including streamflow, precipitation, and land use, which will be discussed individually later. For example, in the historical period (since the first land use survey of the EMA was available in 1985), the documented land uses changed significantly, with decreases in pastureland and coincident increases in other types of agricultural uses.

The historical water budget period was chosen to define a specific period for which all of the elements of recharge and discharge to the EMA may be compared to other periods (current and projected). This historical period allows for the identification of long-term trends in basin supply and demand, water level trends, changes of groundwater in storage, and estimates of the annual components of inflow and outflow to the zone of saturation. This information is fundamental to development of the EMA numerical groundwater flow model (discussed in Appendix F).

Further, the SGMA regulations require that the historical water budget provide a “quantitative evaluation of the availability or reliability of historical surface water supply deliveries” … based on the most recent 10ten years of surface water supply information (§” (§ 354.18[c][2]).

A representative historical water budget period should do the following:

- Be representative of long-term hydrologic conditions (precipitation and streamflow)
- Include wet, dry, and average (normal)[29] years of precipitation
- Span a 20-to-30-year period (Mann, 1968)
- Have its start and end years preceded by comparatively similar rainfall quantities (DWR, 2002)
- Preferably start and end in a dry period (Mann, 1968), which minimizes water draining (in transit) through the vadose zone
- Include recent cultural conditions (DWR, 2002)

Determination of an appropriate historical water budget period included consideration of data availability, surface water inflows, and the historical development of water supplies imported from outside of the Basin and the EMA.

This historical water budget period selection also helps inform the projected water budget which utilizes "50 years of historical precipitation, ET, and streamflow information as the baseline condition for estimating future hydrology" (SGMA regulations § 354.18(c)(3)). Notably, the selection of both the historical and current water budget periods are based on this requirement. The historical water budget period (base period) closely approximates long-term hydrologic conditions based on precipitation. While the historical water budget period selection may include consideration of streamflow, the flow in the Santa Ynez River upstream of the EMA is highly regulated by three upstream dams. Because of this, the consideration of streamflow in the Santa Ynez River is neither meaningful nor useful for the selection of the historical period. Therefore, precipitation data are used as the principal recharge component for the selection of the historical period.

In addition to the consideration of precipitation and streamflow variability, the historical period selected must include high-quality, reliable data with regard to all of the principal components of the water budget. The historical period generally includes reliable data for most, but not all, of the water budget components. For components for which reliable data were not readily available, additional analysis was conducted to provide reliable estimates of the components. Many of these components were verified by numerical groundwater flow modeling (discussed in Appendix F).

The historical period was determined based on review of long-term precipitation records from 12 precipitation stations located in, and adjacent to, the EMA (discussed in Section 2). Of the 12 stations, eight were chosen for this analysis based on approximately representing the historical record (based on both geographic distribution and period of record). A map of these stations, with the exception of the upstream stations to the west, is presented as Figure 2-~~1~~14.

The four stations excluded from the analysis were either located too far from the EMA (i.e., Los Alamos) or had limited available data (i.e., Foxen Canyon, Midland School, and Happy Canyon). The eight precipitation stations used for the analysis are summarized in Table 3-15~~Table 3-15~~.

[29] Normal: average precipitation over a long period, sometimes 30 years

Table 3-15. Precipitation Stations Used for Historical Period Selection

Station No.	Station Name	Beginning of Record	Location	Elevation (Feet)	Period Average (Inches)
218	Santa Ynez Fire Station #32	1951	Within EMA	600	15.7
393	Solvang PW Water	1965	Within EMA	485	18.3
233	Buellton Fire Station	1955	Surrounding	360	17.2
421	Figueroa Mountain	1961	Surrounding	3,200	21.3
332	Cachuma	1953	Adjacent to EMA	800	19.7
204	Los Alamos Fire Station	1910	San Antonio Groundwater Basin	580	15.3
230	Gibraltar Reservoir	1920	Upstream	1,500	26.2
232	Jameson Dam	1926	Upstream	2,230	28.7

Note

EMA = Eastern Management Area

Graphs showing the cumulative departure from mean precipitation for the eight precipitation stations were created. The precipitation station with the longest period of record (more than 100 years) is the Los Alamos Fire Station, located 6 miles west of the EMA in the adjacent San Antonio Groundwater Basin. For the five precipitation stations within or immediately surrounding the EMA, precipitation averages approximately 18 to 19 inches per year. These five stations each have at least 53 years of reliable precipitation data: Santa Ynez, Solvang, Buellton, Figueroa Mountain, and Cachuma. From these data, it was determined that the Santa Ynez Fire Station #32 data were most representative for the EMA.

The precipitation data for the Santa Ynez Fire Station #32 gauge is presented as Figure 3-45~~Figure 3-45~~. In the EMA, precipitation occurs primarily as rainfall. The average EMA precipitation, measured at the Santa Ynez Fire Station #32 is 15.7 inches for the period of record since 1951. The upper portion of the chart shows the annual precipitation. Climatic trends (historical wet-dry cycles) were identified using DWR guidance for defining water year type. GSI selected climactic trends in the context of longer-term multi-year climatic periods of wet, normal, and drought conditions within the EMA, which are more relevant to the EMA than the year-to-year climatic conditions used by the SWRCB or USGS. These wet, variable, normal, and dry periods determined from the EMA precipitation data are presented on all hydrographs and water budget graphs in this GSP and help to inform groundwater management within the EMA to a greater degree than individual water years. The lower portion of the chart shows the climatic variability by showing the cumulative departure from the mean precipitation; upward trending portions (blue areas) represent wet periods of above-average rainfall, and downward trending portions (tan areas) represent drought periods of below-average rainfall.

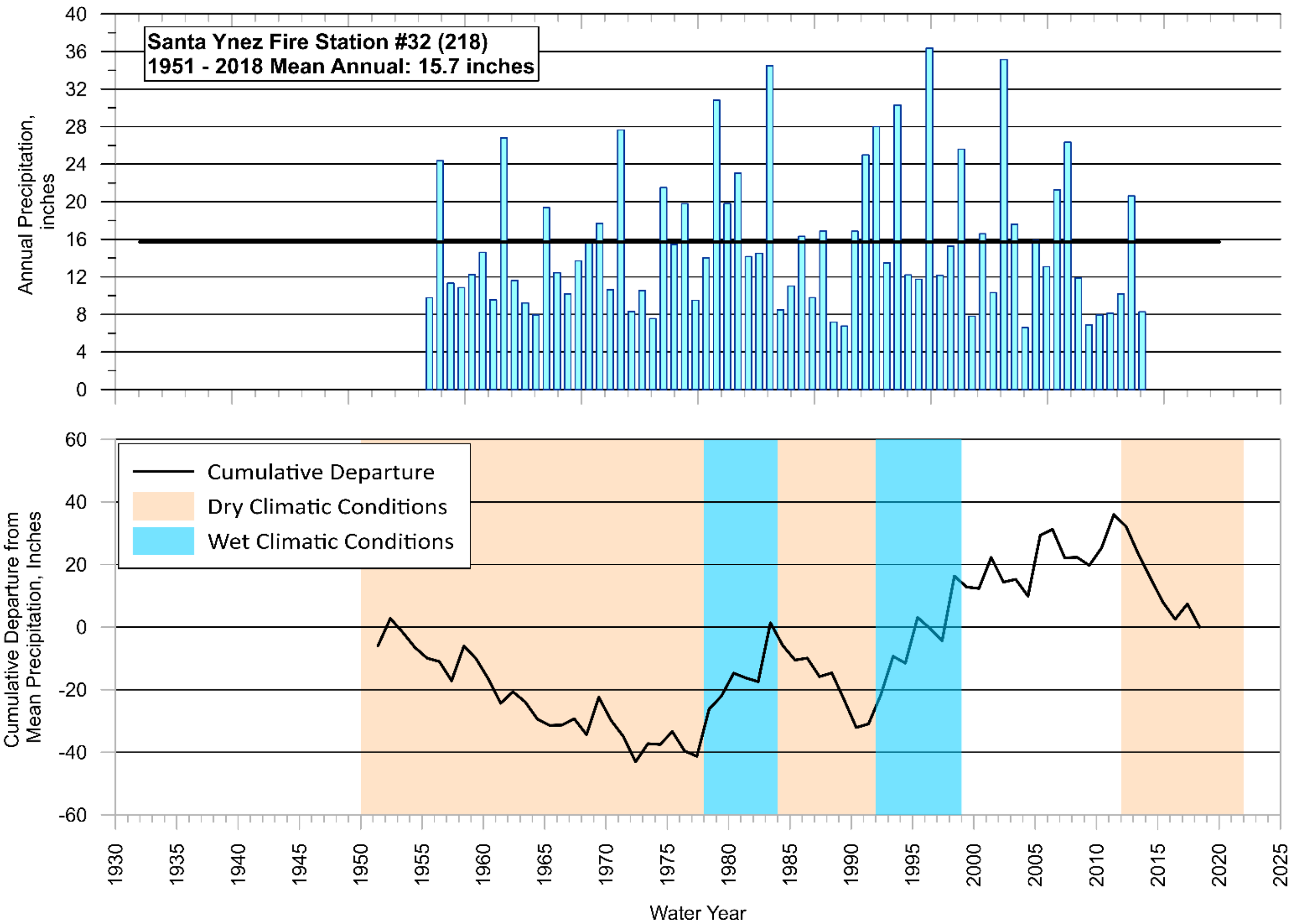

Figure 3-45. Precipitation and Climatic Periods, Santa Ynez Fire Station #32

Highly variable precipitation patterns —multi-year cycles of drought punctuated by shorter, intense wet periods—are common to the area. EMA climate variability is evident on Figure 3-45~~Figure 3-45~~ and Table 3-16~~Table 3-16~~.

Table 3-16. Historical Hydrologic Conditions - Water Year Type

Period (Water Years)	Hydrologic Condition	Duration (No. of Years)	Precipitation Deviation (Inches)	Deviation Rate (Inches per year)
1951 to 1977	Drought	27	- 40	- 1.5
1978 to 1983	Wet	6	+ 44	+ 7.3
1984 to 1991	Drought	8	- 33	- 4.1
1992 to 1998	Wet	7	+ 48	+ 6.8
1999 to 2011	Variable	13	+20	+ 1.6
2012 to 2018 (onward through 2021)	Drought	7	- 36	- 5.1

Notable aspects of these periods include the following:

- A long, moderate drought occurred between the beginning of the period of record in water year 1951 and lasted through 1977. During this 27-year drought, the annual precipitation deviated below the long-term average by a modest 1.5 inches per year.
- Between 1978 and 1983, a short but intense wet period occurred, during which the average precipitation was 7.3 inches above the long-term average.
- After the intense wet period, a 6-year drought (1992 to 1998) and a 6-year wet periods (1992 to 1998). The wettest month on record occurred during this wet period occurred in February of 1998, when a total of 16.2 inches of rain fell. That year (1998) was the wettest on record with more than 36 inches of rain.
- The current drought started in water year 2012 and remains the most severe drought during this period with an average rainfall deficit of 5.1 inches per year, compared to the long-term average. The period included a single wet year in 2017 (and another in 2019, not shown on the table). The two prior droughts had similar total deviation from the long-term average. The current drought is continuing beyond the years shown on the Table 3-2 into water year 2021, extending the current drought to 10 years (water years 2012 through 2021 inclusive).

Based on review of precipitation data, the initial year for a suitable historical period could be 1976, 1978, 1981, or 1982, all of which start in a dry year preceded by at least one dry year. The ending year of 2018 is a dry year in an overall dry period. The period between 1982 and 2018 (inclusive) is the most balanced period and representative of the long-term period of record. In consideration of the availability of good-quality data, especially reported groundwater pumping data, the period between 1982 and 2018 (inclusive) will be used for the EMA numerical groundwater flow modeling and for the historical water budget analysis. The historical water budget information is presented in Section 3.3.3.

The current water budget period was selected to be between 2011 and 2018. This period represents a very dry period overall, which—although not as hydrologically balanced as the historical period—is considered representative of the current drought conditions. Precipitation at the Santa Ynez Fire Station #32 during this period averaged 12.5 inches, which is just 79 percent of the historical period. The current water budget information is presented in Section 3.3.4.

The projected water budget, for the 55-year period between 2018 and 2072, extends 50 years past the 2022 submittal of this GSP. The projected water budget information is presented in Section ~~3.3.5.~~3.3.5.

3.3.2 Water Budget Data Sources

The historical and current water budget analysis was developed in a tabular accounting format by water year using various publicly available data sets. The projected water budget analysis was developed in part using the EMA numerical groundwater flow model, described further below. The groundwater inflow and outflow components of the water budget pertain to the principal aquifers, the Paso Robles Formation and the Careaga Sand, which are located within the Santa Ynez Uplands portion of the EMA. The surface water inflow and outflow components of the water budget generally refer to the SWRCB-regulated Santa Ynez River (aboveground and underflow within the Santa Ynez River Alluvium) and the surface flow from the tributaries in the Santa Ynez Uplands to the Santa Ynez River.

Table 3-17~~Table 3-17~~ provides a summary of the data sources used for developing the historical and current water budget analyses and a description of each data set's qualitative data rating. Each of these data sets is described in further detail in the following sections.

A qualitative discussion of the estimated level of uncertainty associated with each data source is described in the table below and for each water budget term. This discussion focuses on the level of uncertainty and the authors' confidence in the data, as well as the assumptions and interpretations of the information used to develop the water budgets. Higher quality data represent lower uncertainty. The level of uncertainty can significantly affect the GSA's ability sustainably manage the EMA. TheIn our opinion, the data associated with the EMA is adequate to estimate the surface and groundwater inflow and outflow components of the water budget. The qualitative data rankings presented in Table 3-17Table 3-17 acknowledge that the directly measured data —which includes gauged streamflow (surface water), groundwater pumpage, precipitation and groundwater levels (groundwater)— is of the highest quality. (and lowest uncertainty). Generally, the surface water flow volumes and metered pumpage in the Santa Ynez Uplands (groundwater) and Santa Ynez River Area (surface water) are of the highest quality and lowest uncertainty.

The calculated and modeled values are generally of medium quality. Data derived from other sources—including water duty factors for irrigated crops for the estimation of agricultural pumping and related irrigation return flow—are less certain and therefore of medium/low quality (with the highest uncertainty).

These are the best-available data available for the EMA and are similar to the quality and sources of data available in similar groundwater basins throughout the state. Importantly, these data and the resulting water budgets summarized in this section support the sustainable management of the groundwater resource. As discussed in this section and later in Section 6 (Projects and Management Actions), the quality of many of these data will improve during GSP implementation, which will enable adaptive and sustainable groundwater management. Moreover, the sustainable management criteria (Section 5) are based largely on groundwater elevation measurements, which are data of high quality and low uncertainty.

Any significant uncertainty in the data could limit the GSA's ability to effectively develop sustainable management criteria, select appropriate projects and management actions, and determine whether the Basin is being sustainably managed. These uncertainties are discussed within each water budget data source section and later within the subsequent sections. Data with significant uncertainty that may have an impact on management of the EMA are identified and will be addressed as part of the management actions associated with this GSP.

Table 3-17. Water Budget Data Sources

Water Budget Component	Data Source(s)	Comment(s)	Qualitative Data Rating[1]
Surface Water Inflow Components			
Bradbury Dam Releases	U.S. Bureau of Reclamation	Data provided by Stetson Engineers	Metered - High
Cachuma Project	U.S. Bureau of Reclamation	Data provided by SYRWCD, ID No.1	Metered - High
Native Streamflow	USGS BCM runoff, gauge data	BCM calibrated to existing data	Calibrated Model - Medium
Imported: State Water Project	Central Coast Water Authority	Data provided by SYRWCD, ID No. 1	Metered - High
Groundwater Inflow Components			
Deep Percolation of Precipitation	USGS BCM Recharge	BCM calibrated to Basin weather station data	Calibrated Model - Medium
Tributary Percolation	Santa Ynez RiverWare Model, USGS BCM	Collaborative modeling efforts: Stetson Engineers and GSI Water Solutions, Inc.	Calibrated Model – Medium/Low
Subsurface Groundwater Inflow: Mountain Front Recharge	USGS BCM Recharge	BCM calibrated to Basin precipitation and streamflow station data	Calibrated Model – Medium
Irrigation Return Flows	Land use surveys, SYRWCD crop-specific water duty factors, self-reported pumping data	Methods described in text	Estimated – Medium/Low
Percolation of Treated Wastewater	Chumash Casino Resort WWTP Operations Manager	Verbal, described in text	Estimated – Medium/Low
Percolation from Septic Systems (includes urban return flow)	RWQCB data set, census data	Methods described in text	Estimated – Medium
Surface Water Outflow Components			
Santa Ynez River Outflow	U.S. Bureau of Reclamation, USGS BCM runoff, gauge data	Methods described in text	Gauged and Estimated – High/Medium
Pumping from River Wells[2]	City of Solvang, ID No. 1, SYRWCD self-reported pumping data	Methods described in text	City of Solvang: High, SYRWCD, ID No. 1: High, Self-reported SYRWCD: Medium/Low
Groundwater Outflow Components			
Agricultural Irrigation Pumping	Land use surveys, SYRWCD crop-specific water duty factors, self-reported pumping data	Methods described in text	Estimated – Medium/Low
Municipal Pumping[2]	City of Solvang, ID No. 1, SYRWCD self-reported pumping data	Methods described in text	City of Solvang: High, SYRWCD, ID No. 1: High, self-reported: Medium/Low
Rural Domestic Pumping (outside SYRWCD)	RWQCB data set, census data	Methods described in text	Estimated - Low
Small Public Water Systems Pumping (outside SYRWCD)	DRINC, census data	Methods described in text	Estimated – Medium/Low
Phreatophyte ET	LandFire	Methods described in text	Estimated – Medium
Subsurface Outflow	Darcian Flux Calculations, Numerical Groundwater Flow Model	Methods described in text	Estimated - Low

Notes

[1] Higher quality data represent lower uncertainty.

[2] Includes all self-reported domestic pumping that occurs within the SYRWCD area.

The quality of other data sources central to compliance with sustainable management criteria (Section 5) is not shown on this table. These data include groundwater water elevation and ground surface elevation measurements, which are of high quality and low uncertainty.

BCM = Basin Characterization Model
DRINC = Drinking Water Information Clearinghouse
ET = evapotranspiration
GSI = GSI Water Solutions, Inc.
RWQCB = Regional Water Quality Control Board
Stetson = Stetson Engineers
SYRWCD = Santa Ynez River Water Conservation District
SYRWCD, ID No.1 = Santa Ynez River Water Conservation District, Improvement District No. 1
USGS = U.S. Geological Survey
WWTP = wastewater treatment plant

3.3.2.1 Surface Water Inflow Components

Surface water inflows to the EMA include runoff in the Santa Ynez River main stem that is attributable to precipitation, releases from the Lake Cachuma, and rainfall runoff in various tributaries to the Santa Ynez River within the EMA. Surface water inflows also include water imported into the EMA as part of the SWP.

The individual components of surface water inflows are described below.

Bradbury Dam Releases

Downstream releases and spillway flows from Lake Cachuma are controlled and monitored by USBR at Bradbury Dam (the dam). Flows in the Santa Ynez River below the dam are a combination of volumes released through the Bradbury Dam outlet works, the Hilton Creek Watering System, and occasional releases over the dam spillway. Except for releases over the spillway, releases from Lake Cachuma are governed by both a State Water Rights Order 2019-0148 and the 2000 NMFS Biological Opinion to support fish migration, spawning, and habitat maintenance in the Lower Santa Ynez River. These releases satisfy downstream water rights, replenish the Santa Ynez River alluvium, and ensure protection of public trust resources downstream of Bradbury Dam. The USBR monthly release and spillway flow data for Bradbury Dam were provided by Stetson Engineers for water years 1982 through 2018. These data were used as provided for EMA surface water inflows.

The uncertainty associated with the data from Bradbury Dam releases provided by the USBR is considered low and does not limit the GSA's ability to sustainably manage the Santa Ynez Uplands groundwater within the EMA.

Native Streamflow

Native streamflow in the Santa Ynez River main stem and in tributary creeks to the Santa Ynez River downstream of Bradbury Dam (see Table 3-18~~Table 3-18~~) were estimated using a combination of the USGS Basin Characterization Model (BCM) for California (Flint and Flint, 2017), runoff data, and stream gauge data (as available). The BCM data are provided statewide on a 270 by 270-meter grid.[30] As a quality assurance check on the BCM data, the gridded BCM monthly precipitation data were compared to the monthly precipitation reported at weather stations across the entire Santa Ynez River Basin. On average, over the 37-year period of record, from October 1981 through September 2018, the BCM precipitation across all ~~of~~ these stations was 1.4 percent higher than the weather station reported values. For month-to-month comparisons, however, weather stations reported more discrepancies between the BCM values for individual locations. A correction was applied to the BCM values for each monthly time step such that the adjusted BCM data exactly matched all recorded weather station monthly precipitation values. These monthly adjustments were also applied to the BCM-generated runoff and recharge data sets. These adjusted BCM runoff and recharge data sets were then compared to tributary stream flow gauge data, where available, and calibrated to fit the gauge data.[31]

The native streamflow in tributary creeks where they enter the Basin were determined using the adjusted and calibrated BCM recharge and runoff data sets summed over the contributing watershed areas outside the Basin. The BCM data were initially adjusted to match existing data and then calibrated using the

[30] Inflow from the Santa Cruz and Cachuma Creek sub-water sheds flow into Lake Cachuma. Implementation of the GSP will not affect groundwater use in the Santa Cruz or Cachuma Creek sub-watersheds (for agricultural, domestic, municipal, or environmental uses), nor groundwater and surface water conditions within these tributaries.

[31] The BCM runoff data were calibrated to match stream gauge data (where available) by routing excess or deficit volumes to/from recharge (discussed further in Section 3.3.2.2 as Streamflow Percolation, Mountain Block Recharge, and/or Deep Percolation of Precipitation).

numerical groundwater flow model as discussed in greater detail in the model documentation included in Appendix F.

The Santa Ynez River is accurately gauged and highly regulated. Therefore, the level of uncertainty of these data is low. The flow from the tributary creeks, however, is ungauged and estimated based on BCM and Santa Ynez River Hydrologic Model (SYRHM) data outputs. The tributaries to the Santa Ynez River within the EMA are listed in Table 3-18~~Table 3-18~~. The uncertainty of these data is considered moderate, because large scale regional models (the USBR BCM) and a calibrated model for the EMA (SYRHM) are being used to estimate these water budget terms. The uncertainty associated with estimated tributary flow will not limit the GSA's ability to manage the Santa Ynez Uplands groundwater system because these water budget terms for tributary inflow are small relative to other water budget terms. Likewise, projects and management actions will be developed to avoid significant and unreasonable depletion of interconnected surface water, will be developed to avoid impacts to GDEs in two of the tributaries that have been determined to be interconnected with groundwater present in the principal aquifers (refer to Section 5).

Table 3-18. Tributary Creeks to the Santa Ynez River Downstream of Bradbury Dam

Creek Name	Contributing Watershed Area
Santa Agueda Creek	San Rafael Mountains (north from Santa Ynez Uplands)
Zanja de Cota Creek	San Rafael Mountains (north from Santa Ynez Uplands)
Alamo Pintado Creek	San Rafael Mountains (north from Santa Ynez Uplands)
Zaca Creek	San Rafael Mountains (north from Santa Ynez Uplands)
Hilton Creek	Santa Ynez Mountains (south)
San Lucas Creek	Santa Ynez Mountains (south)
Calabazal Creek	Santa Ynez Mountains (south)
Alisal Creek	Santa Ynez Mountains (south)

Note

Santa Cruz and Cachuma Creeks flow though the Santa Ynez Uplands directly into Lake Cachuma. The flow in tributaries discharging to Lake Cachuma are included in the numerical groundwater flow model but are not included in the surface water budget because these flows will not affect groundwater conditions or use (for agricultural, domestic, municipal, or environmental uses) within the Basin.

Cachuma Project~~/~~/Imported State Water Project Supplies

As described in Section 3.3.2.1~~.5~~, ID No. 1 receives a portion of its water supply through the USBR Cachuma Project. Prior to 1997, Cachuma Project water was delivered directly to ID No. 1 via pipeline. Since 1997, when the Coastal Branch of the SWP came online, ID No. 1 has received its Cachuma Project water through the 1993 Santa Ynez River/State Water Project Exchange Agreement (Exchange Agreement) with the South Coast Cachuma Project Member Units, whereby the South Coast Members take ID No.1's portion of Cachuma water and ID No. 1 takes an equivalent amount of SWP water at the ID No. 1 turnout. As a member agency of CCWA, ID No. 1 imports additional SWP water through its contractual entitlement to SWP Table A supplies, a portion of which ID No. 1 has contractually allocated to the City of Solvang. USBR monthly Cachuma Project water delivery data were provided by ID No. 1 for the water year 1981 to 1997 period. CCWA monthly SWP water delivery data (for both ID No. 1 Exchange Agreement deliveries and Table A deliveries to ID No. 1 and City of Solvang) were provided by ID No. 1 for the period from 1997 to present.

The level of uncertainty of these data is low because they are measured values and thus, do not limit the GSA's ability to sustainably manage the Santa Ynez Uplands groundwater within the EMA.

Subsurface Inflow: Mountain Front Recharge to Surface Water

The southern portion of the EMA along the Santa Ynez River is bounded by the Santa Ynez Mountains (Figure 2-23-1). Water enters the Basin around the edges of the EMA where water-bearing deposits abut the Monterey Formation and underlying bedrock on the mountain slopes. This component of inflow is called mountain front recharge. This recharge component occurs both from the north via the San Rafael Mountains, which contribute groundwater recharge to the Santa Ynez Uplands, and from the south via the Santa Ynez Mountains, which contribute recharge to the Santa Ynez River both above and belowground. Mountain front recharge from the Santa Ynez Mountains, which flows directly into the tributary streams (surface water) and ultimately into the Santa Ynez River Alluvium (considered to be surface water) was calculated using the adjusted and calibrated BCM model, as described in Section 3.3.2.1.2..

The uncertainty of these data is considered moderate because large-scale regional models are being used to estimate this water budget term. The authors do not have other reliable methods for estimating this term and are applying best available science. However, the authors have attempted to constrain this term through the calibration process for the numerical groundwater flow model. The authors do not believe that uncertainty associated with estimates of mountain front recharge limit the GSA's ability to manage the Santa Ynez Uplands groundwater system, because the overall water budget is consistent with the calibrated numerical groundwater flow model. Refer to the model documentation in Appendix F and Section 3.2.

Imported Water: State Water Project

As noted above, monthly volumes of imported SWP water were provided by ID No. 1 from September 1997 through to the present. These volumes include imported SWP water received by ID No. 1 in exchange for Cachuma Project water. Prior to 1997, no water was imported into the Basin. The SWP data are measured values with low uncertainty and the data do not limit the GSA's ability to sustainably manage the Santa Ynez Uplands groundwater within the EMA.

3.3.2.2 Groundwater Inflow Components

The data sources used for inflows to the groundwater system of the Santa Ynez Uplands are described below. Note that the groundwater system includes only the aquifers in the Santa Ynez Uplands portion of the EMA and specifically excludes all water in the Santa Ynez River Alluvium, which is managed as surface water under the jurisdiction of the SWRCB (refer to Section 3.1.1.1 for additional discussion of these conclusions).

Deep Percolation of Precipitation

Precipitation falling on the land surface of the EMA represents the principal source of inflows to the groundwater in the Santa Ynez Uplands. Precipitation varies spatially and exhibits a strong seasonal variability (GSI, 2020). The precipitation that falls on the ground surface within contributing watersheds to the Basin either runs off into stream channels that eventually discharge to the Santa Ynez River or infiltrates into the soil zone.

Recharge to groundwater from deep percolation of precipitation was determined using the USGS BCM gridded recharge data set. As described in Section 3.3.2.1.2,3.3.2.1, the BCM recharge data set has been adjusted, based on comparison to monthly precipitation records at weather stations, across the entire Basin. The adjusted BCM recharge data set was then further adjusted in conjunction with comparisons to tributary streamflow gauge data as described in Section 3.3.2.1.2.3.3.2.1. As a result of these adjustments[32] in the water budget, approximately 14 percent of the BCM recharge volume (not the total precipitation volume) was routed to streamflow and the remaining 86 percent was input as deep percolation of precipitation. That is, of the volume of precipitation that initially infiltrates, 86 percent percolates deeply to groundwater, while the small remainder of 14 percent flows laterally and subsequently discharges to nearest stream channel as base flow.[33]

The level of uncertainty of these data is considered moderate. These data are based on calibrated analytical methods and the calibrated numerical groundwater flow model and are within the range of values commonly applied in similar geologic settings. Further discussion of the numerical groundwater flow model, specifically with regard to its calibration, is included in the model documentation included in Appendix F.

Tributary Percolation

Tributary percolation, the deep percolation of surface water to groundwater through the tributary streambeds, was estimated using the adjusted BCM model. Portions of the adjusted BCM runoff and recharge data sets routed to tributary streamflow percolation were determined in conjunction with comparisons to tributary streamflow gauge data, as described in Section 3.3.2.1.2.3.3.2.1. The level of uncertainty of these data is moderate. These data are based on a calibrated analytical methods and calibrated numerical groundwater flow model and are within the range of values commonly applied to similar geologic settings.

Subsurface Inflow: Mountain Front Recharge

The EMA is surrounded by the San Rafael Mountains to the north and east, as shown on Figure 2-23-1. Groundwater enters around the edges of the EMA where water-bearing deposits abut the Monterey Formation and underlying bedrock on the mountain slopes; this groundwater inflow is called mountain front recharge.

Mountain front recharge was calculated as the sum of the adjusted and calibrated BCM recharge data set over the contributing watershed areas outside the EMA minus the portion routed to native streamflow and the Santa Ynez River Alluvium. The calculation is further described in Section 3.3.2.1.2.

The uncertainty of these data is considered moderate because large-scale regional models are being used to estimate this water budget term. The authors do not have other reliable methods for estimating this term and are applying best available science and have attempted to constrain this term through the groundwater model calibration process. The authors do not believe that uncertainty associated with estimates of mountain front recharge limits the GSA’s ability to manage the Santa Ynez Uplands groundwater system, because the overall water budget is consistent with the calibrated numerical groundwater flow model. Refer to the model documentation in Appendix F and Section 3.2.

Irrigation Return Flows

Irrigation return flow is the water applied to crops in excess of crop ET demand, which percolates below the root zone and back to groundwater. The proportion of applied water that is utilized to satisfy crop ET demand is equivalent to the irrigation efficiency, expressed as a percentage. The remaining percentage of applied

[32] The adjustments to the BCM data were conducted in conjunction with consultants who are preparing the GSPs for the CMA and WMA within the Basin. Adjustments similar to those made for the EMA were made for the CMA and WMA, based on the same data. Similar adjustments were also made for the adjacent San Antonio Groundwater Basin. Furthermore, these adjustments were verified by the numerical groundwater flow model created for the EMA.
[33] These percentages pertain to the historical period (water years 1982 through 2018).

water is equivalent to the irrigation return flow. Return flows can re-enter the hydrologic system as deep drainage and recharge to groundwater, or as water that leaves the cropped field as surface flow tail water and discharges to a nearby stream. It is assumed that most of the irrigation return flow percolates to groundwater within the EMA. For irrigated agriculture in the EMA, an irrigation efficiency of 80 percent is assumed for all crops except vineyards, which are generally irrigated using a drip system at an efficiency of 90 percent.[34] The urban (residential and commercial) landscape irrigation efficiency is assumed to be 70 percent,[35] which results in return flow recharge to the groundwater system. These irrigation return flow proportions were estimated using a consistent method for all three management areas in the Basin. The assumed values are based on published values and information from representatives from the CMA, WMA, and the adjacent San Antonio Groundwater Basin GSAs. Irrigation return flow volumes have been calculated using the previously stated efficiencies multiplied by the calculated annual volumes of irrigation water applied to each crop type (based on land use surveys within the EMA in 1985, 1996, 2014, 2016, and 2018), assigned crop-specific water duty factors, and self-reported irrigation pumping data. These applied water volumes are discussed further in Section 3.3.2.4.

A portion of the water that ID No. 1 serves its customers is used for agricultural irrigation, which is derived in part from imported sources (SWP Table A, Exchange Agreement, and Cachuma). Water from imported and native surface water sources is commingled with other sources of water within ID No. 1's distribution system and used throughout ID No. 1's service area for agricultural, municipal, domestic, commercial, and industrial uses. As noted above, ID No. 1 also produces surface water (underflow) from the Santa Ynez River main stem pursuant to licenses issued by the SWRCB. Those waters are applied for domestic, agricultural, commercial, and institutional uses in portions of the Santa Ynez Uplands groundwater system.

For agricultural uses, ID No. 1 delivered an estimated 1,364 AFY from imported sources (SWP Table A, Exchange Agreement, and Cachuma Project) and another 620 AFY of surface water produced from river wells located within the Santa Ynez River main stem during the historical period. In total, 1,984 AFY was derived from these sources and used for irrigation in both the Santa Ynez Uplands and the Santa Ynez River Alluvium. The proportion of the return flow within the Santa Ynez Uplands was based on an analysis of irrigated acreage of agricultural areas within ID No. 1’s service area and within the Santa Ynez River Alluvium (Zone A) area (Figure 2-4) (Stetson, 2021). Of this applied irrigation water derived from imported and surface water sources, a total of 317 AFY (16 percent)[36] returned to the ground; 287 AFY of which returned to the upland groundwater system, and 30 AFY of which returned to the Santa Ynez River (Zone A).

These groundwater recharge components were estimated based on published values for irrigation efficiency, which were used throughout both the entire Basin and adjacent basins. Therefore, the level of uncertainty of these data is relatively low. The variability and magnitude of this recharge component are included in the calibrated numerical groundwater flow model provided in Appendix F, using best available science and industry-standard methods.

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[34] Irrigation efficiencies in vineyards have increased from 70 percent in the 1970s to 80 percent in the 1980s and to 90 percent more recently, based on Tetra Tech, 2010, and DWR, 1994, and personal conversations with local irrigators including Kevin Merrill and Kris Beal.
[35] Irrigation return flows estimated based in part on data provided in Tetra Tech, 2010 *Assessment of Groundwater Availability on the Santa Ynez Chumash Reservation* and DWR 1994, *California Water Plan Update.*
[36] Based on weighted average irrigation efficiency.

Percolation of Treated Wastewater

There are two WWTPs in the EMA: a small treatment plant for the Chumash Casino Resort (Casino) owned by the Santa Ynez Band of Chumash Indians (Tribe) and a larger municipal treatment plant that serves the City of Solvang.

Discharge of treated wastewater from the Casino was estimated based on verbal communication with Casino WWTP operator Kevin McKennon, as well as details of plant operation specified in the *Assessment of Groundwater Availability on the Santa Ynez Chumash Reservation* report (Tetra Tech, 2010). Prior to 2003, all Casino wastewater was transmitted to the Solvang WWTP. Beginning in 2003, upon completion of the Chumash WWTP for the Casino, between 40 AFY and 120 AFY of effluent have been discharged from the Casino WWTP into Zanja de Cota Creek. This discharge subsequently flows into the Santa Ynez River underflow. There has been a trend of increasing wastewater reuse by the Casino, causing a reduction in discharge to the creek over time. The Santa Ynez Community Services District maintains the Chumash wastewater treatment and collection system.

The residences and businesses in the City of Solvang and much of the eastern portion of the town of Santa Ynez, west of Highway 154, are connected to sewer service. Wastewater flows from these properties are collected by the Santa Ynez Community Services District and are transmitted to the Solvang WWTP and subsequently discharged to the percolation ponds located adjacent to Santa Ynez River downstream of the western EMA border near the Santa Ynez River. These WWTP discharges occur within the CMA and do not contribute to the EMA water budget.

This groundwater recharge component of this flow term was estimated using a range of industry accepted values for soils in this region. The volume of flow is relatively small; therefore, uncertainties in this estimate do not appreciably affect the overall water budget.

Percolation from Septic Systems

Outside of the sewer service areas in the EMA, domestic, commercial, and institutional wastewater is discharged to on-site wastewater treatment systems (OWTSs, formerly referred to as septic tank – leach field systems). Return flows from these OWTS provide recharge to the groundwater in the Santa Ynez Uplands. The locations and distribution of these OWTS were estimated by using aerial photography to identify residences not served by a sewer system and then comparing OWTS data to data provided by Heal the Ocean (HTO, 2019). Within the EMA, the total number of OWTS in 2018 was multiplied by an estimated return flow rate of 0.11 AFY per unit (Tetra Tech, 2010). This was then scaled through time using a compilation of census data for nearby communities.

The water used within the service areas of ID No. 1 and the City of Solvang are derived in part from native and imported surface water sources (~~Sections~~Section 3.3.2.1~~.2 and 3.3.2.1.5)~~) and from groundwater pumped from upland wells completed in the Paso Robles Formation and Careaga Sand. Water for ID No. 1 from imported and native surface water sources is commingled with Santa Ynez Uplands groundwater within its distribution system and used throughout the ID No. 1's service area for agricultural, potable domestic, commercial, and institutional uses. On average, ID No. 1 delivered a total of 2,587 AFY for non-agricultural uses, of which 1,117 AFY of water was delivered from imported sources (SWP Table A, Exchange Agreement, and Cachuma Project), and another 539 AFY of which was from surface water sources. The remainder of 931 AFY of water was delivered from groundwater pumped from the Santa Ynez Uplands groundwater sources.

A portion of the water from these sources (60 to 65 percent on average) is used for exterior landscaping on domestic parcels and a portion (35 to 40 percent) is used for indoor use.[37] Where the indoor water use is not located within an area with sewer service, the indoor water is delivered to septic systems, the vast majority of which ultimately percolates to groundwater. Assuming a wastewater generation rate of 0.4 AFY per dwelling unit, a total 900 AFY of septic system percolation flows returned to the groundwater basin on average during the historical period.

These groundwater recharge components were estimated based primarily on published values for municipal water and wastewater deliveries, estimated return flow rates, and indoor and outdoor water use proportions. The level of uncertainty of these data is considered moderate because the values are estimated from published literature and not measured; however, this component of the water budget is relatively small compared to the rest of the area and so will not have a significant effect on the GSA's ability to manage the EMA.

3.3.2.3 Surface Water Outflow Components

The data sources used for surface water outflows are described below.

Santa Ynez River Outflow

Santa Ynez River surface water outflows were quantified based on gauged flow as measured near the City of Solvang and from Zaca Creek from a gauge near the intersection of Highways 154 and 101. The location of the streamflow gauges is shown on Figure 2-~~11~~13.

The Santa Ynez River is accurately gauged and, therefore, the level of uncertainty of this data is low.

Subsurface Outflow

Subsurface outflow from the Santa Ynez River is accounted for in the water budget as surface water outflows. This outflow occurs at the downstream end of the EMA along the border with the CMA. The magnitude of this flow has been calculated using Darcy's law with estimated values for hydraulic conductivity, the average hydraulic gradient, and the outflow plane cross-sectional area (based on saturated thickness estimates). This estimate was made in coordination with Stetson Engineers for the downstream CMA, which accounts for this same volume of outflow from the EMA as inflow into the CMA. Furthermore, these flow volumes have been verified by the numerical groundwater models being created separately for the CMA and EMA.

The quantity of subsurface outflow through Santa Ynez River Alluvium was estimated using industry standard methods and a calibrated surface water model prepared by Stetson Engineers. The level of uncertainty of this data is considered low.

Pumping Extractions

Pumping extractions occur from the Santa Ynez River Alluvium for municipal, domestic, industrial, and agricultural uses, including water used for urban landscape irrigation. Pumping data from this area of the EMA are provided by the City of Solvang, ID No. 1, and from SYRWCD as "self-reported" pumping data from well owners within SYRWCD. These data from ID No. 1 and the other self-reported pumping records aggregate uses together into three categories: (1) agricultural; (2) "other" water, which includes municipal, industrial, small public water systems, and domestic use; and (3) "special" irrigation water, which refers to urban landscape and golf course irrigation. These pumping volumes have been compiled on a water year

[37] 1992 *Water Resources Management Plan* for the Santa Ynez River Water Conservation District (Stetson).

basis and are reported annually on a July-through-June fiscal year basis in SYRWCD's annual reports, which have been prepared for 42 years. These data include all of the agricultural and non-agricultural groundwater pumping that occurs within the SYRWCD. ID No. 1 and the City of Solvang produce surface water from the underflow of the Santa Ynez River main stem pursuant to a pending permit (City of Solvang) and licenses (ID No. 1) issued by the SWRCB.

Pumping volumes provided by the City of Solvang and ID No. 1 are from metered pumping and are considered highly reliable. Likewise, some of the self-reported pumping data provided by SYRWCD annual reports are also from metered pumping records. These data sets have low uncertainty. A large portion of the self-reported SYRWCD pumping data outside of the municipal providers is estimated from self-reported records utilizing crop-specific water duty factors provided by SYRWCD for its water use estimates and annual reports. Pumping estimates based on self-reported records are of medium quality with moderate uncertainty, due to the uncertainty of standardized crop water duty factors and reliability of self-reporting.

Phreatophyte ET

Phreatophyte ET, also referred to as riparian ET, was calculated using the LandFire Existing Vegetation Type (EVT) spatial data set[38] to determine acreages of riparian vegetation types occurring within the Santa Ynez River Alluvium portion of the EMA between the base of Bradbury Dam, through the EMA to the shared border with the CMA near the City of Solvang. The LandFire EVT data set was constrained to the lateral extent of SYRWCD's Zone A to avoid including acreage on adjacent hillsides and riparian vegetation within the tributaries that are part of the groundwater budget, which is accounted for there as a groundwater outflow component. Because flows within the Santa Ynez River are carefully managed and subject to the conditions of the 2020 Biological Assessment (USBR, 2020), the NMFS Biological Opinion (NMFS, 2000), and SWRCB's 2019 Cachuma Project Order (SWRCB, 2019), it is assumed that the riparian acreage in the EMA did not change significantly during the historical period.

The riparian acreage determined from the LandFire EVT analysis was then multiplied by a variable riparian water duty factor (determined by the LandFire EVT), which varied based on water year type. The riparian water duty factor used in the water budget is 4.5 AF per acre per year, on average. Phreatophyte ET is a major component of surface water outflow and thought to decrease surface water flow in the tributary alluvium and reduce infiltration into the upland groundwater basin.

The acreage and water use factors used to estimate phreatophyte ET are based on authoritative sources. The acreage, however, has been collected by remote-sensing methods and has not been field-verified to confirm the presence of the indicated plants. In addition, there is considerable uncertainty associated with the phreatophyte ET, because the inputs to this water budget term are not directly measured and there is likely to be considerable variability. Therefore, the uncertainty associated with this data source is considered to be high.

3.3.2.4 Groundwater Outflow Components

The data sources used for groundwater outflows are described below.

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[38] LandFire is a shared program between the wildland fire management programs of the U.S. Department of Agriculture Forest Service and U.S. Department of the Interior, providing landscape scale geo-spatial products to support cross-boundary planning, management, and operations. More information on LandFire is available at https://landfire.gov. (Accessed September 3, 2021.)

Agricultural Irrigation Pumping

To satisfy the crop irrigation demand, groundwater is pumped and subsequently applied to the cropped land throughout the Santa Ynez Uplands portion of the EMA. The bulk of water used to irrigate crops in the EMA is sourced by pumping groundwater from the Santa Ynez Uplands. To a lesser degree, imported and native surface water is applied for agricultural irrigation purposes within the service area of ID No. 1, which overlaps and is within the boundaries of SYRWCD. Within its system, water from imported and native surface water is commingled with pumped groundwater from wells located in the Santa Ynez Uplands.

In the absence of metered pumping records, individual groundwater pumpers located within the SYRWCD boundaries area are required to report their estimated pumping volumes for each 6-month period to SYRWCD. These estimates are based on planted acreages and crop-specific water duty factors specified in SYRWCD's Groundwater Production Information and Instructions (Groundwater) pamphlet (SYRWCD, 2010). The groundwater users specify the type of water they are using (agricultural, special [i.e., parks, schools, and golf courses], or other [i.e., M&I]). The self-reported agricultural irrigation volumes, categorized as Agricultural Water, were provided by SYRWCD for inclusion in the water budget.

Groundwater produced by ID No. 1 and the City of Solvang, which is reported to SYRWCD, is based on metered production.

For areas of the EMA outside of the SYRWCD boundaries area (the SGMA-designated "white area"[39] shown on Figure 2-4), agricultural pumping is not reported. Therefore, the agricultural irrigation pumping was estimated using periodic land use surveys provided by DWR to determine crop types and acreages and applying the crop-specific water duty factors specified in the SYRWCD Groundwater pamphlet to estimate crop water demand in the white areas. The land use surveys for the EMA were available for the periods 1985, 1996, 2014, 2016, and 2018 from DWR-provided sources. Land and water uses were also estimated based on an analysis for the area prepared by Dudek Consultants for Santa Barbara County (Dudek, 2016). As discussed below, agricultural water use was estimated for each year of the three water budget periods based on the water duties from the SYRWCD Groundwater pamphlet.

The spatial distribution of six main crop groups for the four land use survey periods between 1985 and 2018 are presented as ~~Figure 3-46 through Figure 3-50.~~Figure 3-46 through 3-50. The crops presented on these maps are combined into six groups: deciduous fruit and nuts; field crops; ornamentals; pasture; truck, nursery, and berry crops; and vineyards. Cannabis, a crop new to the EMA, has not been documented in any of the crop surveys. A summary of the total area of irrigated crops in the past 20 years within the Santa Ynez Uplands (outside of the SYRWCD) is presented in ~~Table 3-19.~~Table 3-19.

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[39] "White areas" under SGMA are areas that are not served by a water district and that depend solely on groundwater supplies.

Figure 3-46. Crop Distribution 1985

Figure 3-47. Crop Distribution 1996

Figure 3-48. Crop Distribution 2014

Figure 3-49. Crop Distribution 2016

Figure 3-50. Crop Distribution 2018

Table 3-19. Summary of Irrigated Acres Outside of Santa Ynez River Water Conservation District

(Values in acres)

Crop Group	1996	2014	2016	2018
Deciduous Fruit and Nuts	37	93	93	74
Field Crops	267	273	812	1,090
Ornamentals	5	29	21	3
Pasture	1,350	839	858	747
Truck, Nursery, and Berry Crops	141	714	675	498
Vineyards	944	1,804	1,932	1,828
Cannabis	0	0	0	0
Total	**2,743**	**3,752**	**4,390**	**4,241**

The total irrigated area outside of the SYRWCD was 4,241 acres in 2018, the period of the most recent land use survey. In the 22 years between 1996 and 2018, a total of 1,678 acres of irrigated acres were added within the EMA area outside of the SYRWCD boundaries. As of 2018, a total of 1,828 acres of vineyards were planted. While a further discussion of the projected trends in irrigated acreages is included in the Projected Water Budget Section ~~3.3.5,~~3.3.5, a brief discussion of the trends in individual crops is also warranted here. The expansion of vineyard acreage has slowed considerably in recent years, compared to the rapid growth that occurred between during the late 1990s and early 2000s. Between 1996 and 2014, vineyards were growing at an average rate of approximately 3.7 percent per year; however, since 2014 this has moderated to near zero growth.

The acreages of the crop groups presented in ~~Table 3-19~~Table 3-19 show significant variability and slight reduction in acreages in the most recent years. While deciduous fruit and nuts and ornamentals were relatively unchanged, field crops experienced a large increase in recent years, which has added an average of 28 acres per year since 1996. Meanwhile, the acreage of truck, nursery, and berry crops, as well as pastureland, have declined significantly, as shown on Figures 3-~~43~~46 through 3-~~47~~50. Truck, nursery, and berry crops increased from 171 acres in 1996 to 714 acres in 2014, and has since declined significantly, losing more than 50 acres per year on average. The acreage of pasture has likewise declined, by approximately 23 acres per year on average since 2014 (Figure 3-48~~Figure 3-48~~).

The land use surveys provide estimates of irrigated crop acreages, crop evapotranspiration (ETc), evapotranspiration of applied water (ETAW), effective precipitation (EP), and applied water (AW) for 20 crop categories each year that the survey was performed. These values are estimated from reference evapotranspiration (ETo) or pan evaporation (Ep) data, crop development over time (crop coefficients), soil characteristics, rooting depths, and the quantity and timing of precipitation. ETAW estimates include adjustments for irrigation efficiencies as well as the amount of water required for specific agricultural practices, such as the ponding of water in rice fields or extra water applied to leach-accumulated salts from the soil. Spatial-temporal interpolations were made between the land use surveys for the intervening years and water duty factors from the SYRWCD Groundwater pamphlet. The 2014, 2016, and 2018 land use data, prepared by Land IQ and provided to DWR, are the most recent data sets pertaining to the historical and current water budget time periods. For these recent years, the data represent a statewide, comprehensive, field-scale assessment of agricultural land use, as well as urban and managed wetland boundaries. The data were delineated from imagery provided by the National Agriculture Imagery Program.[40] The data are derived from a combination of remote sensing, agronomic analysis, and ground verification. The data set provides information for resource planning and assessments across multiple agencies throughout the state and serves as a consistent base layer for a broad array of potential users and multiple end uses.

While the accuracy of the land use mapping of irrigated crops for the recent years is high, uncertainty remains in the estimates of water use from these irrigated lands and hence the assumed amount of pumping needed to meet the crop water requirement. The volume of groundwater pumping needed to satisfy these agricultural crop water demands are presented below.

Municipal and Other Reported Pumping

Groundwater pumping in the Santa Ynez Uplands serves municipal, domestic, industrial, and agricultural uses, including urban landscape irrigation. Pumping data were provided by the City of Solvang, ID No. 1, and the SYRWCD (as self-reported pumping data). The City of Solvang provides water only for municipal and potable uses. The SYRWCD summarizes pumping within its boundaries into three categories including “other” water, which includes municipal, industrial, small public water systems, and domestic use. These pumping volumes have been compiled on a water-year basis from data reported annually on a fiscal year basis (July 1 through June 30),[41] in SYRWCD’s annual reports, which have been prepared for 42 years. These data include all the agricultural and non-agricultural (other and special) groundwater pumping that occurs within the SYRWCD. Pumping from all of Zone E (Santa Ynez Uplands) and the portion of Zone C (Other Areas) that are within the EMA are derived from the two principal aquifers: the Paso Robles Formation and the Careaga Sand.

Pumping volumes from the City of Solvang and ID No. 1 are from metered pumping and are considered highly reliable. Likewise, some of the self-reported pumping data provided by SYRWCD annual reports to estimate this use are also from metered pumping records. A large portion of the self-reported SYRWCD pumping data outside of the municipal providers is estimated from self-reported acreage of irrigated crops multiplied by SYRWCD-provided water use factors. The data derived from the metered pumpers are considered to be of very high quality with a low level of uncertainty. However, the water use estimates based on self-reported acreages for irrigated crops is of medium quality with moderate uncertainty due to the uncertainty of standardized crop water duty factors and reliability of self-reporting. In addition, there is uncertainty about whether the crop water duty factors should be adjusted downward during periods of above-normal rainfall.

Rural Domestic Pumping (Outside of SYRWCD)

Rural domestic pumping is considered to be all non-agricultural pumping that occurs outside of SYRWCD’s jurisdiction that is not associated with a small public water system. This area includes all of the rural areas of the EMA that are not served by a water district or mutual water company and are solely reliant on groundwater supplies. These areas constitute unincorporated lands outside of the SYRWCD, ID No. 1, and the City of Solvang boundaries, where all groundwater pumping is considered rural domestic. This area (Figure 2-4) is not within the boundaries of any water agency and therefore falls under the jurisdiction of Santa Barbara County (Stetson, 2021). Rural domestic pumping was estimated based on a review of the potential rural domestic parcels outside of SYRWCD from 2018 satellite imagery and parcel data provided by the County of Santa Barbara.[42] The domestic water demand for each of these land parcels was estimated

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[40] Data are available at https://www.fsa.usda.gov/programs-and-services/aerial-photography/imagery-programs/naip-imagery/. (Accessed February 15, 2021.)
[41] As defined by the Water Code Section 75507 (a).
[42] Data are available at https://countyofsb.org/mapping.sbc. (Accessed March 12, 2021.)

using variable demand factors based on parcel acreage, as estimated by Tetra Tech (Tetra Tech, 2010) (see Table 3-20~~Table 3-20~~). The calculated 2018 rural domestic demand was then scaled through time for other years included in the water budget using a compilation of census data for nearby communities.

Table 3-20. Rural Domestic Demand Factors Based on Lot Size

Lot Size (Acres)	Annual Water Use (AFY per lot)
0.16	0.14
0.5	0.52
1	0.82
5	0.98
10	1.15

Note

Source: Tetra Tech (2010)

While the accuracy of the rural domestic pumping is roughly estimated, the overall magnitude of this pumping is small. Therefore, the relatively moderate uncertainty does not adversely affect the GSA's ability to sustainably manage the groundwater resource.

Small Public Water Systems Pumping (Outside of SYRWCD)

Reported pumping data was compiled from California Drinking Water Information Clearinghouse[43] for a limited number of years for most of the small public water systems within the EMA but outside of SYRWCD (listed in Table 3-21.~~Table 3-21.~~ Small public water systems production volumes reported for 2018 were scaled through time using a compilation of census data for nearby communities. While additional small water systems in the EMA have been identified, the systems listed in Table 3-21~~Table 3-21~~ are those for which production data were available.

Table 3-21. Small Public Water Systems Outside of SYRWCD

Small Public Water System Name
Midland School Corporation
Oak Trail Estates Mutual Water Company
Oak Trail Ranch Mutual Water Company
Rancho Ynecita Mutual Water Company
Santa Ynez Rancho Estates Mutual Water Company
Woodstock Property Owners Association
Cachuma Village
Bridlewood Winery
San Lorenzo Seminary

[43] Available at https://drinc.ca.gov/drinc/. (Accessed February 15, 2021.)

Small public water system pumping is roughly estimated. Because the overall magnitude of this pumping is small, the relatively moderate uncertainty does not adversely affect the GSA's ability to sustainably manage the groundwater resource.

Phreatophyte ET

Phreatophyte ET outflow from the underlying groundwater within the Santa Ynez Uplands was calculated using the LandFire EVT spatial data set to determine acreages of riparian vegetation types occurring within the EMA. The LandFire EVT data set was constrained to the extent of the tributary (younger) alluvium located outside of the main stem of the Santa Ynez River. It is assumed that the riparian acreage in the EMA has not changed significantly and therefore was kept constant for the historical period. The riparian acreage determined from the LandFire EVT analysis was multiplied by a variable riparian water duty factor determined by the LandFire EVT, which varied based on water year type. The riparian water duty factor used in the water budget is 4.5 AF per acre per year, on average. Phreatophyte ET is a major component of outflow from the Santa Ynez Uplands and is thought to decrease infiltration and reduce groundwater recharge. This value of ET from phreatophytes is separate from the ET derived from BCM data, which, in this analysis, have been assigned mutually exclusive areal extents. Additional details regarding the use of LandFire EVT and BCM to estimate phreatophyte and natural vegetation ET are presented in documentation for the numerical groundwater flow model (refer to Appendix F)).

The acreage and water use factors utilized to estimate phreatophyte extractions are based on authoritative sources. The acreage, however, has been collected by remote-sensing methods and has not been field-verified to confirm the presence of the indicated plants. In addition, there is considerable uncertainty associated with phreatophyte ET because the inputs for this term are not directly measured and there is likely to be considerable variability. Therefore, the uncertainty associated with this data source is considered to be high.

Subsurface Groundwater Outflow

A relatively small volume of subsurface groundwater outflow occurs to the west through the shallow alluvial canyons along Ballard Canyon, near the Purisima Hill and through the alluvium of Zaca Creek. For the annual water budget, the magnitude of this flow has been calculated using Darcy's law with estimated values for hydraulic conductivity, the average hydraulic gradient, and the outflow plane cross-sectional area (based on saturated thickness estimates). This estimate was made in coordination with Stetson Engineers for the downstream CMA. Ultimately, these values have been verified by the numerical groundwater model.

Limited groundwater level data and numerical modeling results indicate that neither subsurface inflow nor outflow occurs along the shared boundary with the San Antonio Groundwater Basin on the northwest boundary of the EMA. The USGS is developing a groundwater flow model for the San Antonio Groundwater Basin and has characterized this boundary as a no-flow boundary. This boundary has also been investigated by Santa Barbara County using aerial electromagnetic geophysical methods (SkyTEM); however, the results of this work are discussed in Section ~~3.1.4.2.1.~~3.1.4.2.

The quantity of subsurface outflow through shallow alluvial canyons was estimated using industry standard methods and terms associated with the calibrated surface water model prepared by Stetson Engineers. The level of uncertainty of this water budget term is considered low and is not considered a substantial part of the water budget that affects management of the EMA.

3.3.3 Historical Water Budget (Water Years 1982 through 2018)

§§ 354.18 Water Budget.

(c) Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:

(2) Historical water budget information shall be used to evaluate availability or reliability of past surface water supply deliveries and aquifer response to water supply and demand trends relative to water year type. The historical water budget shall include the following:

(A) A quantitative evaluation of the availability or reliability of historical surface water supply deliveries as a function of the historical planned versus actual annual surface water deliveries, by surface water source and water year type, and based on the most recent ten years of surface water supply information.

(B) A quantitative assessment of the historical water budget, starting with the most recently available information and extending back a minimum of 10 years, or as is sufficient to calibrate and reduce the uncertainty of the tools and methods used to estimate and project future water budget information and future aquifer response to proposed sustainable groundwater management practices over the planning and implementation horizon.

(C) A description of how historical conditions concerning hydrology, water demand, and surface water supply availability or reliability have impacted the ability of the Agency to operate the basin within sustainable yield. Basin hydrology may be characterized and evaluated using water year type.

The SGMA regulations require that a historical water budget be based on at least the most recent 10 years of data. The period for water years 1982 through 2018 was selected as the historical water budget period because it is long enough to capture typical climate variations (with two wet and two dry hydrologic cycles) and includes recent changes in imported water supply availability, changes to water demand associated with cropping patterns, and associated land use.

Estimates and assumptions of the surface water and groundwater inflows and outflows and changes in total water and groundwater in storage for the historical period are provided below.

3.3.3.1 Surface Water Inflows

Local Surface Water Inflow

Local surface water inflows include (1) surface water flows that enter the EMA from precipitation runoff within the watershed and (2) Santa Ynez River inflow to the EMA, regulated by SWRCB as release outflows from Lake Cachuma. Also included in the local surface water inflow totals is water delivered from the Cachuma Project directly to ID No. 1 via pipeline prior to 1997. Prior to 1997, ID No. 1 received an average of 2,200 AFY from the Cachuma Project. As noted in the next section, Cachuma Project deliveries to ID No. 1 after 1997 are derived from imported SWP supplies under the Exchange Agreement. The Cachuma Project deliveries after 1997 are of volumes similar to those prior to 1997 (2,500 AFY).

The estimated average annual total inflow from these sources, including surface flows, over the historical period is about 93,000 AFY. The largest component of this average inflow is due to releases from Bradbury Dam and subsequent flow in the Santa Ynez River. The surface water flow into the EMA during this historical period averaged 60,800 AFY as measured from Bradbury Dam outflow. This outflow into the Santa Ynez

River below the dam is a combination of volumes released through the Bradbury Dam outlet works, the Hilton Creek Watering System, and occasional releases over the dam spillway. A more complete discussion of the outflow from Bradbury Dam is presented in Section 3.1.1.3.

The annual average, minimum, and maximum volumes of local surface water sources (native and imported) during the historical period of 1982 through 2018 are presented in Table 3-22Table 3-22. The large difference between the minimum and maximum inflows reflects the climatic variability and the difference between dry and wet years in the EMA and contributing watershed.

Imported Surface Water from State Water Project

As described in Section 3.3.3.1.1, imported surface water through the SWP became available after completion of the Coastal Branch pipeline in 1997. As a member agency of the CCWA, ID No. 1 has an annual contractual SWP Table A allocation of 2,000 AFY and a drought buffer of 200 AFY. Of this total, 1,500 AFY are contractually committed for use by the City of Solvang. The annual amount of SWP Table A supplies available to ID No. 1 (and the City of Solvang) depends on the yearly SWP allocation issued by DWR.

Separate from the SWP Table A supplies utilized by ID No. 1 and the City of Solvang, additional SWP supplies are used by ID No. 1 pursuant to the Exchange Agreement between ID No. 1 and the South Coast Cachuma Project Member Units (SYRWCD and SYRWCD ID No. 1, 1993). Prior to the SWP coming online, ID No. 1 received its Cachuma Project supplies by direct delivery via the Santa Ynez Valley pipeline. Between 1982 and 1997, this averaged 2,223 AFY.

Since completion of the SWP Coastal Branch in 1997, ID No. 1 has been receiving its Cachuma Project supplies in accordance with the Exchange Agreement, whereby the South Coast Cachuma Member Units take ID No. 1’s portion of Cachuma Project water and ID No. 1 takes an equivalent amount of SWP water at the ID No. 1 turnout. Under a full allocation of Cachuma Project supplies, ID No. 1’s 10.31 percent share is 2,651 AFY. Based on Cachuma Project allocations during the 1998 through 2018 period, approximately 2,100 AFY on average has been delivered to ID No. 1 in the form of exchanged SWP deliveries.

Imported surface water from the SWP has been utilized at times as supplemental water supply, in lieu of groundwater pumping, for domestic and agricultural purposes. The annual average, minimum, and maximum volumes of imported SWP water during the historical period are presented in Table 3-22Table 3-22. The imported water supply provides approximately 4.6 percent of the total volume of surface water that enters the EMA. Native inflow from tributaries from the Santa Ynez Uplands and the Santa Ynez Mountains contributes 29 percent of the total surface water inflow.

Table 3-22. Annual Surface Water Inflow, Historical Period (1982 through 2018)

(Values in acre-feet per year)

Surface Water Inflow Component	Average	Minimum[1]	Maximum[1]
Santa Ynez River Inflow	61,600	3,100	397,600
Santa Ynez River Tributary Inflow[2]	27,000	1,000	147,800
Mountain Front Recharge	4,200	0	10,200
Precipitation Recharge	200	0	800
Septic Return Flow	10	10	10
Agriculture Irrigation Return Flows	70	40	110
Cachuma Project (Imported)[3]	960	0	5,050
SWP Exchange Agreement (Imported)[3]	1,230	0	3,240
SWP Table A (Imported)[4]	720	0	1,350
Local	**93,070**	—	—
Imported	**2,910**	—	—
Total	**95,980**	—	—

Notes

[1] Minimum and maximum values are not totaled because the values for each component may have occurred in different years.

[2] Tributaries include Hilton, San Lucas, Calabazal, Alisal, Santa Agueda, Zanja de Cota, Alamo Pintado, and Zaca Creeks. Tributary inflow from Cachuma and Santa Cruz Creeks are accounted after they enter Lake Cachuma, enter the Santa Ynez River and enter the Santa Ynez River area portion of the EMA as surface and subsurface flow.

[3] Since 1998, ID No. 1 exchanged its Cachuma Project entitlement supplies for an equivalent amount of SWP water that is delivered to the ID No. 1 turnout, referred to as "SWP Exchange" water.
Cachuma Project average 1982 to 1997: 2,223 AFY.
Exchange Agreement average 1998 to 2018: 2,165 AFY.

[4] SWP Table A includes 426 AFY Table A water for the City of Solvang and 291 AFY Table A water for ID No. 1.

SWP = State Water Project

3.3.3.2 Surface Water Outflows

The estimated annual average total historical surface water outflow from the EMA (as aboveground and belowground flow) in the Santa Ynez River is summarized in Table 3-23~~Table 3-23~~.

Table 3-23. Annual Surface Water Outflow, Historical Period (1982 through 2018)

(Values in acre-feet per year)

Surface Water Outflow Component	Average	Minimum[1]	Maximum[1]
Santa Ynez River Outflow (including Zaca Creek)	85,700	600	655,500
Pumping (River Wells)	5,000	1,900	9,000
Subsurface Outflow	1,800	1,800	1,800
Phreatophyte ET	4,100	4,000	4,300
Total	**96,600**	—	—

Note

[1] Minimum and maximum values are not totaled because the values for each component may have occurred in different years.

ET = evapotranspiration

Note that imported water from SWP Table A, Exchange Agreement, and the Cachuma Project sources are included as an inflow component in the water budgets. The outflow of this water, along with the commingled water from Santa Ynez Uplands groundwater sources includes consumptive use, percolation as irrigation return flow and urban irrigation return flow (which includes system leakage) and septic system return flow. The remainder of this water flows to the municipal treatment plant, which serves the City of Solvang, where it is percolated back into the Santa Ynez River Alluvium downstream and outside of the EMA. Subsurface outflow through the Santa Ynez River Alluvium has been calculated using Darcy's law with estimated values for hydraulic conductivity, average hydraulic gradient, and outflow plane cross-sectional area near the downstream shared border with the CMA (based on relatively steady saturated thickness estimates). This estimate was made in coordination with Stetson Engineers for the downstream CMA, where this same volume of outflow is accounted for as inflow to the CMA. Furthermore, these flow volumes have been verified by the numerical groundwater models being created separately for the CMA and EMA.

Components of surface water outflow vary less than inflow components. Whereas the variability of inflow is large, the extraction by phreatophytes is continual during most climatic conditions and subsurface outflow is very steady due to a stable subsurface hydraulic gradient at the western end of the Santa Ynez River Alluvium.

The estimated average annual total outflow from these surface water sources for the historical period is approximately 96,600 AFY. The largest component of this outflow is gauged surface flow within the Santa Ynez River near the City of Solvang and flow through Zaca Creek near the intersection of Highways 101 and 154, which together total 89 percent of the total surface water outflow. The remainder of the surface water outflow, or 11 percent of the total, leaves the EMA through the Santa Ynez River Alluvium either as subsurface outflow near the City of Solvang; pumping by the City of Solvang, ID No. 1 and other users; or phreatophyte ET. The large difference between the minimum and maximum outflows reflects the difference between dry and wet years in the EMA and contributing watershed.

3.3.3.3 Groundwater Inflows and Outflows

During the historical period from water year 1982 through water year 2018, groundwater from both of the two principal aquifers (the Paso Robles Formation and the Careaga Sand) supplied a vast majority of the water used in the EMA. This section presents a summary of estimated groundwater inflows, groundwater outflows, and a change of groundwater in storage under historical conditions.

3.3.3.4 Groundwater Inflow

Groundwater inflow components include deep percolation of direct precipitation, stream percolation, subsurface groundwater inflow (including mountain front recharge), agricultural irrigation return flow, domestic/urban irrigation return flow, domestic/urban septic return flow, and percolation of treated wastewater. The annual groundwater inflows during the historical period are summarized in Table 3-24~~Table 3-24~~.

Table 3-24. Groundwater Inflow, Historical Period (1982 through 2018)

(Values in acre-feet per year)

Groundwater Inflow Component	Average	Minimum[1]	Maximum[1]
Deep Percolation of Direct Precipitation	11,300	100	25,500
Tributary Percolation	700	300	1,600
Subsurface Groundwater Inflow[2]	3,100	0	7,200
Agricultural Irrigation Return Flow	2,600	2,100	3,400
Domestic/Urban Irrigation Return Flow	130	10	260
Septic Return Flow	900	700	1,100
Wastewater Effluent Percolation	40	0	120
Total	**18,770**	**—**	**—**

Notes

[1] Minimum and maximum values are not totaled because the values for each component may have occurred in different years.

[2] Subsurface inflow includes mountain front recharge.

During the historical period, an average of 18,770 AFY of groundwater inflow occurred. During this time, the groundwater inflow ranged from 4,060 to 53,200 AFY. This large variation was due primarily to variations in precipitation over the historical period. The largest groundwater inflow component was percolation of direct precipitation, which accounts for approximately 60 percent of the total annual average inflow.

3.3.3.5 Groundwater Outflows

Groundwater outflow components include groundwater pumping from all water use sectors, subsurface groundwater outflow to tributaries and the adjacent management area, and phreatophyte ET. Groundwater discharges to surface water are included as discharges that ultimately flow to surface water in the Santa Ynez River. This volume was estimated using the EMA numerical groundwater flow model in consultation with consultants in the adjacent management areas. Details about the numerical modeling are presented in Appendix F. The estimated annual groundwater outflows for the historical period are summarized in Table 3-25~~Table 3-25~~.

Table 3-25. Annual Groundwater Outflow, Historical Period (1982 through 2018)

(Values in acre-feet per year)

Groundwater Outflow Component	Average	Minimum[1]	Maximum[1]
Total Groundwater Pumping	14,700	13,280	16,680
Subsurface Groundwater Outflow	2,800	100	17,600
Phreatophyte ET	3,100	3,000	3,200
Total	**20,600**	—	—

Notes

[1] Minimum and maximum values are not totaled because the values for each component may have occurred in different years.

ET = evapotranspiration

Components of groundwater outflow vary much less than the components of inflow. The variability of inflow is large, such as percolation of precipitation that can vary by two orders of magnitude (100x) in response to widely varying climatic conditions. Outflow components associated with beneficial uses (including pumping, plant uptake, or subsurface outflow) vary by a single order of magnitude. Groundwater pumping is relatively steady as shown in Table 3-26~~Table 3-26~~ based on the available data and methodology used for this estimate. Extraction by phreatophytes is similarly continual and relatively steady.

Table 3-26. Annual Groundwater Pumping by Water Use Sector, Historical Period (1982 through 2018)

(Values in acre-feet per year)

Water Use Sector	Average	Minimum[1]	Maximum[1]
Agricultural[2]	11,700	10,600	13,100
Municipal/Reported Domestic[3]	1,950	800	3,920
Rural Domestic[4]	300	200	300
Small Public Water Systems[4]	820	650	950
Total	**14,770**	—	—

Notes

[1] Minimum and maximum values are not totaled because the values for each component may have occurred in different years.

[2] Includes all metered and estimated agricultural irrigation pumping, both inside and outside of the SYRWCD.

[3] Includes all metered and self-reported domestic pumping that occurs within the SYRWCD.

[4] Includes only pumping that occurs outside of the SYRWCD.

SYRWCD = Santa Ynez River Water Conservation District

The estimated annual groundwater pumping by water use sector for the historical period is summarized in Table 3-26~~Table 3-26~~. Of all pumping, agricultural production was the largest component, followed by municipal production, accounting for about 79 percent and 13 percent, respectively, of total pumping over the historical period. Agricultural pumping fluctuated over time, but only slightly increased overall during the historical period. Municipal pumping that occurs within the SYRWCD area generally increased through 1997 when imported SWP water became available; the rate of pumping has since remained approximately constant. Rural domestic and small water system pumping occurring outside of the SYRWCD account for 2 percent and 6 percent, respectively, of total pumping during the historical period.

3.3.3.6 Changes of Groundwater in Storage

Annual variations in the volumes of groundwater in storage were calculated for each year of the historical period. The changes of groundwater storage for the 37-year period were used to (1) evaluate conditions of water supply in storage, surplus, and/or deficiency and (2) identify long-term lowering of groundwater levels and associated depletion of storage.

A summary of the average inflows and outflows associated with each component of the water budget within the EMA for the historical period are presented graphically on Figure 3-50.Figure 3-51. The average inflow of approximately 18,770 AFY is less than the average total outflow of 20,600 AFY. This indicates that, on average, there has been a reduction of groundwater in storage with an average groundwater in storage deficit (also referred to as overdraft occurring over multiple years) of 1,830 AFY over the historical period of 1982 through 2018.

Average inflow and outflow components of the water budget are presented for each year of the historical period on Figure 3-5152. Inflow components are shown above the zero line and outflow components are shown below the zero line. The figure also presents the cumulative change of groundwater in storage during each year and the overall historical period. Note that this section refers to changes of groundwater in storage, which not the same as “dewatered storage.” Increases of groundwater in storage indicate that more water is present in the ground, while increases in “dewatered storage” (used outside of the SGMA context) refers to a decrease of water present in the ground. The data are also presented in Table 3-27.Table 3-27. In addition, references to a deficit of groundwater in storage is equivalent to overdraft if this consistently occurs over many years.

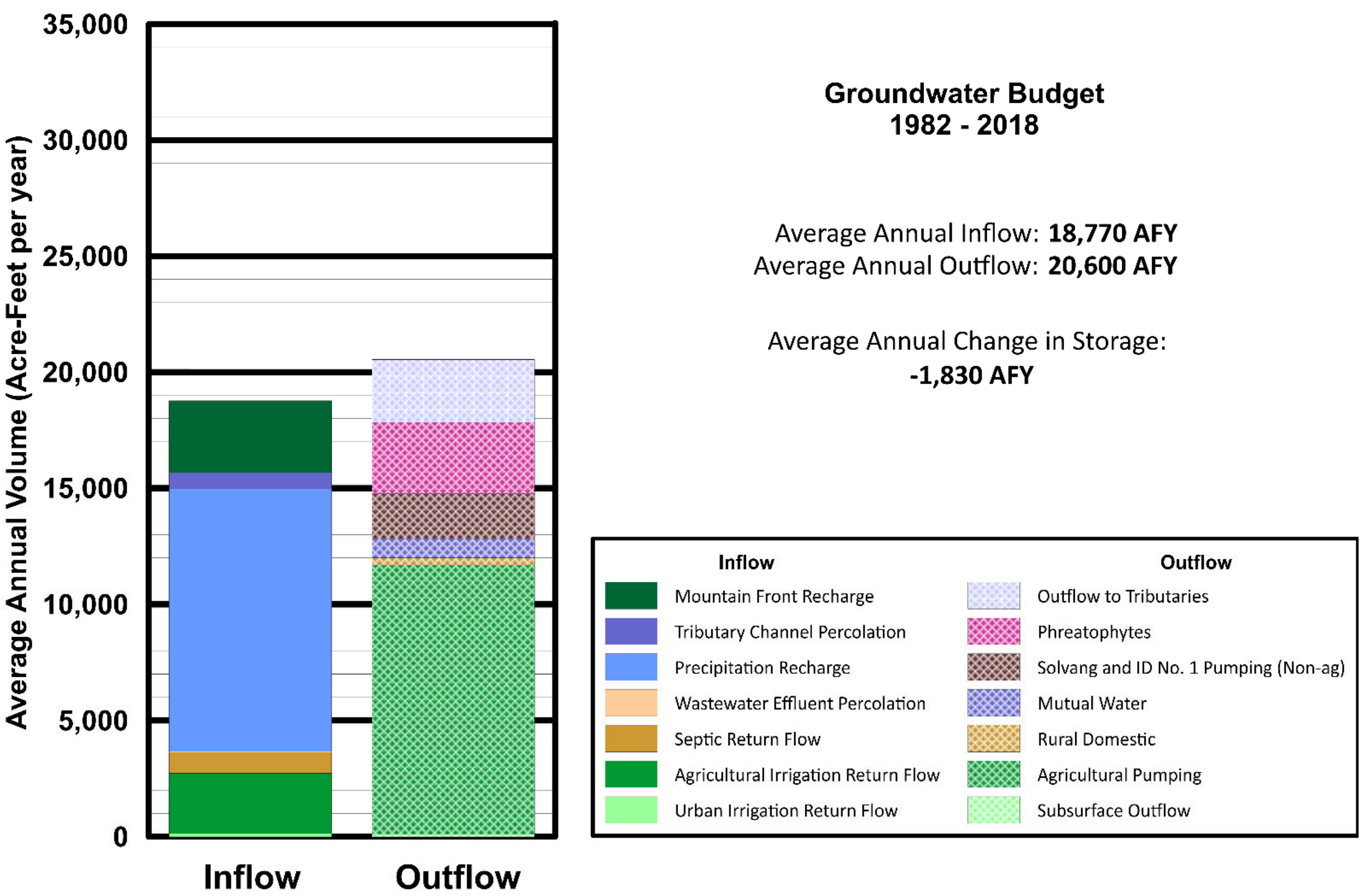

Figure 3-51. Average Groundwater Budget Volumes, Historical Period (1982 through 2018)

Table 3-27. Santa Ynez River Groundwater Basin Eastern Management Area Historical and Current Water Budget Summaries

Page 2 of Table 3-27

Page 3 of Table 3-27

Figure 3-52. Historical Groundwater Budget

Variability in the components of the water budget is directly influenced by annual variations in climatic conditions, as shown on Figure 3-52~~Figure 3-52~~. During the historical period, two full periods of wet and dry climatic cycles were evident. Dry climatic conditions (drought) prevailed from 1984 through 1991 and again from 2012 through the current water in 2021, as depicted by the peach-colored areas on Figure 3-52~~Figure 3-52~~. During these dry climatic periods (drought), the amount of recharge was relatively low. For example, during the drought between 2012 and 2016, recharge from precipitation and mountain front recharge were reduced significantly, to near zero. The graph indicates that the drought resulted in a net reduction of groundwater in storage. The variability within the water budget generally follows the trends evident in the representative water level wells, which are presented as hydrographs in Figures 3-22 through 3-24.

In contrast, wet conditions prevailed in the early 1980s, again between 1992 and 1998 (as shown by blue areas on Figure 3-52~~Figure 3-52~~), as well as during occasional single alternating wet/dry years. During otherwise normal (average) periods (indicated by gray areas on Figure 3-52~~Figure 3-52~~) and during the wet periods, the amount of recharge and streamflow percolation was relatively high. The net result during these periods was a gain of groundwater in storage.

The water budget for the historical period is also influenced by the amount of groundwater pumping that occurs. Over the historical period, the total amount of groundwater pumping decreased in the early 1990s, corresponding with a period when irrigation of alfalfa and pasture acreage (high water use factors) declined and irrigated vineyard acreage (a low water use factor) increased. The transition from alfalfa and pasture to vineyards resulted in an estimated net decrease of groundwater pumping because the irrigation demand per acre of vineyards is significantly less than the per-acre demand for alfalfa and pasture. This decrease in pumping contributed to an increase of groundwater in storage during the 1990s.

Over the 37-year historical period, a total net decline of groundwater in storage of about 62,100 AF occurred. The average annual groundwater storage decline during the historical period—or the difference between inflow and outflow to groundwater in the EMA—is approximately 1,830 AFY. This estimate of the groundwater deficit is similar to the deficit projected by the County of Santa Barbara, which, in 2003, estimated the demand in 2020 to be 1,600 AFY. It was projected that this shortfall would continue at approximately this level through 2040.

Sustainable Yield Estimate of the Basin

The water budget for the historical period of 1982 through 2018 indicates that total groundwater outflow exceeded the total inflow in the EMA by an average of 1,830 AFY. The sustainable yield in the EMA was estimated by adding the average change of groundwater in storage (negative 1,830 AFY) to the estimated total average amount of groundwater pumping (14,700 AFY) for the historical period. This results in a sustainable yield of about 12,870 AFY. This estimated value reflects balanced historical climatic and hydrologic conditions and provides insight into the amount of groundwater pumping that can be sustained in the EMA such that groundwater inflows (including pumping) do not exceed outflows (recharge).

The sustainable yield estimate includes recharge and discharge estimates from a combination of imported and native local sources. Of the groundwater recharge components, which averaged 18,770 AFY during the historical period, approximately 287 AFY is derived from percolation of irrigation water into the Santa Ynez Uplands from imported sources and another 339 AFY from septic return flow from imported sources. Together, these two components add 626 AFY, or 3 percent of the groundwater recharge from imported sources.

Long-term withdrawals in excess of sustainable yield can lead to undesirable results. It should be recognized that the concepts of safe yield, sustainable yield, and overdraft reflect conditions of water supply and use over a long-term period. Given the importance of the conjunctive use of both surface water and groundwater in the EMA, short-term water supply differences are satisfied largely by groundwater pumping, which, in any given year, often exceed the sustainable yield of the groundwater within the EMA. The EMA, however, has a very large amount of groundwater in storage that can be used as carryover storage during years when there is little native recharge. The large amount of groundwater in storage can be replenished in future years by reduced pumping and increased surface water use, or from various types of projects, including, for instance, artificial recharge.

3.3.3.7 Reliability of Historical Surface Water Supplies

§§ 354.18 Water Budget.

(c) Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:

(2) Historical water budget information shall be used to evaluate availability or reliability of past surface water supply deliveries and aquifer response to water supply and demand trends relative to water year type. The historical water budget shall include the following:

(A) A quantitative evaluation of the availability or reliability of historical surface water supply deliveries as a function of the historical planned versus actual annual surface water deliveries, by surface water source and water year type, and based on the most recent ten years of surface water supply information.

The historical reliability of the surface water supply has been a function of the availability of local and imported surface water, subject to the SWP allocation and operation of the Cachuma Project. The long-term reliability of the surface water from the local sources, including Bradbury Dam outflow releases and tributary runoff from the Santa Ynez Uplands, is subject to climatic variability and is subject to requirements for dam releases to meet in-stream habitat and water rights requirements. Releases from Lake Cachuma for these purposes have maintained a stable surface water supply within the EMA. Flow in the Santa Ynez River main stem will continue to be regulated and determined by terms of the State Board Order (SWRCB, 2019) and NMFS Biological Opinion (NMFS, 2000).

The variability of historical supply was discussed in Section 3.3.2.1, which documents the sources of surface water supply as (1) surface water flows that enter the EMA from precipitation runoff within the watershed;(2) Santa Ynez River inflow to the EMA, regulated by SWRCB as release outflows from Lake Cachuma; (3) water delivered from the Cachuma Project directly to ID No. 1 via pipeline prior to 1997; and (4) deliveries of imported SWP supplies under the Exchange Agreement (since 1997).

The estimated average annual total inflow into the entire EMA, including the Santa Ynez River area, from all sources over the historical period is about 93,000 AFY. The largest component of this average inflow is due to releases from Bradbury Dam and subsequent flow in the Santa Ynez River, which averaged 60,800 AFY during the historical period. A more complete discussion of the outflow from Bradbury Dam is presented in Section 3.1.1.3. The large difference between the minimum and maximum inflows in Table 3-22~~Table 3-22~~ reflects the climatic variability and the difference between dry and wet years in the EMA and contributing watershed.

The annual average, minimum, and maximum volumes of local surface water sources (native and imported) during the historical period are presented in Table 3-22~~Table 3-22~~. The imported surface water averaged 2,910 AFY. During most years this averaged 3,200 AFY, except for the 4 exceptionally dry years during this period (1990, 1992, 1995, and 2016), when much less water was delivered. During these 4 years, the volume of water delivered from imported sources (SWP Table A and Cachuma Project) was as little as no water delivered (2016) to 891 AFY delivered (1992).

If drought conditions persist locally, regionally, and state-wide, surface water supplies from Lake Cachuma releases and imported surface water from the SWP may be curtailed. This condition would increase the reliance on local groundwater supplies to meet demands for water, which could lead to lowered groundwater levels and an increase in the annual deficit of groundwater in storage. DWR best management practices acknowledge that overdraft that occurs during drought conditions does not necessarily require implementation of projects and management actions; however, if water levels do not recover after normal climate conditions return, then projects and management actions must be implemented (refer to Section 6) (DWR 2016a, 2016b, and 2016c). The GSA may decide to implement some projects and management actions at some point during the drought to avoid undesirable results and extend the availability of groundwater to meet demands during an unprecedented drought.

3.3.4 Current Water Budget (Water Years 2011 through 2018)

§§ 354.18 Water Budget.

(c) Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:

(1) Current water budget information shall quantify current inflows and outflows for the basin using the most recent hydrology, water supply, water demand, and land use information.

SGMA regulations require that a water budget under current conditions be developed based on the most recent hydrology, water supply, water demand, and land use information. For this GSP, the period selected to represent current conditions is water years 2011 through 2018. This period is a subset of the historical period described above in Section 3.3.3.

The current water budget period is dominated by a drought period when annual precipitation averaged about 78 percent of the historical average and percolation of direct precipitation averaged about 62 percent of the historical average. As a result, the current water budget period represents drought conditions and is not representative of the long-term, balanced conditions needed for sustainability planning purposes.

Estimates of the surface water and groundwater inflow and outflow, and changes in groundwater storage for the current water budget period are provided below.

3.3.4.1 Surface Water Inflows

As with the water budget under historical conditions, the current water budget includes two surface water source types: local supplies and SWP.

Local Surface Water Supplies

Current local surface water supplies include surface water flows that enter the EMA from precipitation runoff within the watershed and Santa Ynez River inflow to the EMA, regulated as releases from Lake Cachuma at Bradbury Dam. The annual average, minimum, and maximum values for these inflows for the current period are shown in Table 3-28~~Table 3-28~~. Both ID No. 1 and the City of Solvang produce local surface water from the Santa Ynez River main stem (including underflow) for applied use in the Santa Ynez Uplands area of the EMA.

Table 3-28. Annual Surface Water Inflow, Current Period (2011 through 2018)

(Values in acre-feet per year)

Surface Water Inflow Component	Average	Minimum[1]	Maximum[1]
Santa Ynez River Inflow	22,500	6,900	93,700
Santa Ynez River Tributary Inflow[2]	12,100	1,200	54,100
Mountain Front Recharge	2,100	0	8,900
Precipitation Recharge	200	0	600
Septic Return Flow	20	20	20
Agricultural Irrigation Return Flow	60	40	70
Cachuma Project (Imported)[3]	0	0	0
SWP Exchange Agreement (Imported)[3]	1,570	0	3,126
SWP Table A (Imported)[3]	1,220	69	2,330
Local	**36,980**	—	—
Imported	**2,790**	—	—
Total	**39,770**	—	—

Notes

[1] Minimum and maximum values are not totaled because the values for each component may have occurred in different years.

[2] Tributaries include Hilton, San Lucas, Calabazal, Alisal, Santa Agueda, Zanja de Cota, Alamo Pintado, and Zaca Creeks.

[3] ID No. 1 exchanged its Cachuma Project entitlement supplies for an equivalent amount of SWP water that is delivered to the ID No. 1 turnout.

SWP = State Water Project

The estimated average annual total inflow from these sources during the current water budget period was about 39,770 AFY, or about 41 percent of the average annual inflow during the historical period of 95,980 AFY. Inflow of surface water from the Santa Ynez River and contributing tributaries during the current period was significantly lower than during the historical period. The reduction in surface water inflows reflects the drought conditions that prevailed during the current water budget period.

Imported Surface Water from State Water Project

Imported SWP water has been used by ID No. 1 and the City of Solvang during the current water budget period, as described in Section 3.3.2.1.~~5.~~ The annual average, minimum, and maximum values for the imported SWP water use during the current water budget period are summarized in Table 3-28~~Table 3-28~~.

3.3.4.2 Surface Water Outflows

The estimated annual surface water outflow leaving the EMA as flow in the Santa Ynez River and subsurface flow over the current water budget period is summarized in Table 3-29~~Table 3-29~~. Reductions in surface water outflow for the current water budget period were similar to reductions for the surface water inflows.

Table 3-29. Annual Surface Water Outflow, Current Period (2011 through 2018)

(Values in acre-feet per year)

Surface Water Outflow Component	Average	Minimum[1]	Maximum[1]
Santa Ynez River Outflow (including Zaca Creek)	23,600	4,900	120,400
Pumping (River Wells)	5,300	3,200	7,100
Subsurface Outflow	1,800	1,800	1,800
Phreatophyte ET	4,200	4,100	4,300
Total	**34,900**	—	—

Notes

[1] Minimum and maximum values are not totaled because the values for each component may have occurred in different years.

ET = evapotranspiration

3.3.4.3 Groundwater Inflows and Outflows

The water budget for the current period includes a summary of the estimated groundwater inflows, groundwater outflows, and change of groundwater in storage. Groundwater supplied most of the water used in the EMA during the current water budget period.

Groundwater Inflows

Groundwater inflow components include deep percolation of direct precipitation, streamflow percolation, subsurface groundwater inflow (including mountain front recharge), agricultural irrigation return flow, domestic/urban irrigation return flow, and domestic/urban septic return flow, and percolation of treated wastewater. The annual groundwater inflows during the historical period are summarized in Table 3-24~~Table 3-24~~. Groundwater inflows during the current period are summarized in Table 3-30.

Table 3-30. Groundwater Inflow, Current Period (2011 through 2018)

(Values in acre-feet per year)

Groundwater Inflow Component	Average	Minimum[1]	Maximum[1]
Deep Percolation of Direct Precipitation	7,000	100	30,000
Tributary Percolation	600	300	1,200
Subsurface Groundwater Inflow[2]	1,900	0	7,000
Agricultural Irrigation Return Flow	2,400	2,100	2,600
Domestic/Urban Irrigation Return Flow	200	160	220
Septic Return Flow	1,100	1,000	1,100
Wastewater Effluent Percolation	50	40	110
Total	**13,250**	—	—

Notes

[1] Minimum and maximum values are not totaled because the values for each component may have occurred in different years.

[2] Subsurface groundwater inflow includes mountain front recharge.

For the current period, estimated total inflow to the groundwater from the Santa Ynez Uplands ranged from 4,060 to 41,300 AFY, with an average inflow of 13,250 AFY. Notable observations from the summary of groundwater inflows for the current period include the following:

- Average total inflow during the current water budget period was about 70 percent of the average total inflow for the historical period.
- Total annual average recharge from direct precipitation for the current period was about 62 percent of the recharge from direct precipitation for the historical period.

Groundwater Outflows

Groundwater outflow components include groundwater pumping from all water use sectors, subsurface groundwater outflow to tributaries and the adjacent management area, and phreatophyte ET. Groundwater discharges to surface water are included as discharges that ultimately flow to surface water in the Santa Ynez River. This volume was estimated using the EMA numerical groundwater flow modeling in consultation with consultants within the adjacent management areas. The estimated annual groundwater outflows for the current period are summarized in Table 3-31~~Table 3-31~~.

Table 3-31. Annual Groundwater Outflow, Current Period (2011 through 2018)

(Values in acre-feet per year)

Groundwater Outflow Component	Average	Minimum[1]	Maximum[1]
Total Groundwater Pumping	15,000	13,620	15,410
Subsurface Groundwater Outflow	1,700	100	10,100
Phreatophyte ET	3,100	3,000	3,200
Total	**19,800**	—	—

Notes

[1] Minimum and maximum values are not totaled because the values for each component may have occurred in different years.

ET = evapotranspiration

Groundwater pumping was the largest groundwater outflow component, totaling 76 percent of all of the groundwater outflow. The estimated annual groundwater pumping by water use sector for the current period is summarized in Table 3-32~~Table 3-32~~.

Table 3-32. Annual Groundwater Pumping by Water Use Sector, Current Period (2011 through 2018)

(Values in acre-feet per year)

Water Use Sector	Average	Minimum[1]	Maximum[1]
Agricultural[2]	11,700	10,900	12,200
Municipal/Reported Domestic[3]	2,100	1,500	2,600
Rural Domestic[4]	300	300	300
Small Public Water Systems[4]	900	900	950
Total	**15,000**	**—**	**—**

Notes

[1] Minimum and maximum values are not totaled because the values for each component may have occurred in different years.

[2] Includes all metered and estimated agricultural irrigation pumping, both inside and outside of the SYRWCD.

[3] Includes all metered and self-reported domestic pumping that occurs within the SYRWCD.

[4] Includes only pumping that occurs outside of the Santa Ynez River Water Conservation District.

Pumping for municipal uses accounts for 14 percent of total pumping over the current period. Agricultural pumping fluctuated over time but is estimated to have increased only slightly during the current period. As noted above, agricultural pumping outside SYRWCD is not reported. Rural domestic and small water system pumping occurring outside of the SYRWCD boundaries area account for 2 percent and 4 percent, respectively, of total pumping during the current period. Overall, the total average groundwater outflows during the current period were very similar to groundwater outflows during the historical period.

3.3.4.4 Changes of Groundwater in Storage

Average groundwater inflows and outflows within the EMA for the current period are presented on Figure 3-53~~Figure 3-53~~, and a summary of annual groundwater inflows and outflows are presented on Figure 3-54. Inflow components are graphed above the zero line and outflow components are graphed below the zero line on Figure 3-54. The cumulative change of groundwater in storage during the current period on Figure 3-~~12~~53 indicates that the average inflow of approximately 13,250 AFY is less than the average total outflow of 19,800 AFY. On average, there has been a reduction of groundwater in storage with an average ~~overdraft~~deficit of approximately 6,580 AFY over the current period of 2011 through 2018. The total reduction of groundwater in storage during the current period was approximately 52,800 AF. As stated previously, the current water budget was developed during a severe drought period and is not representative of long-term basin conditions.

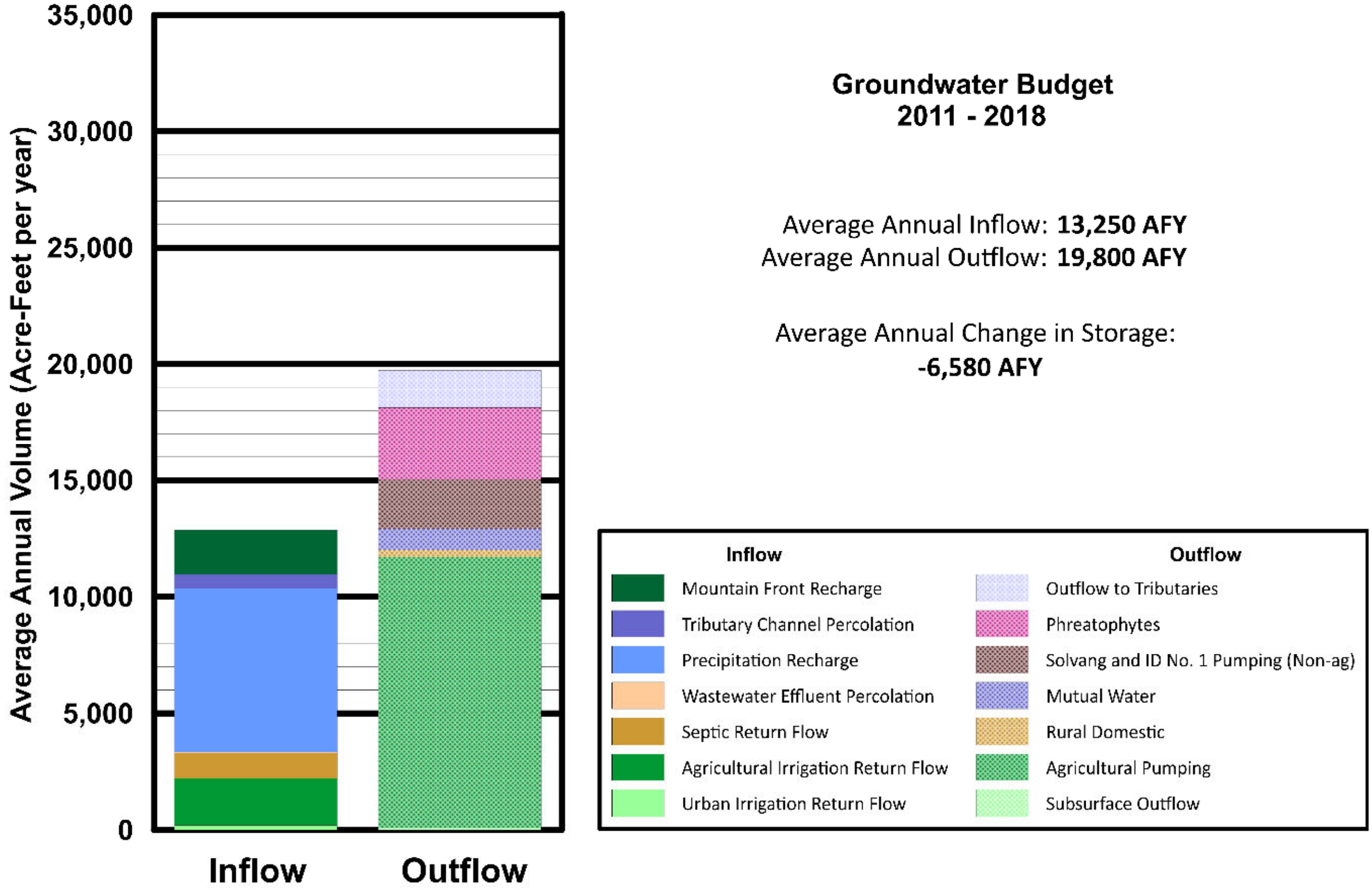

Figure 3-53. Average Groundwater Budget Volumes, Current Period

Figure 3-54. Current Groundwater Budget

3.3.5 Projected Water Budget

§§ 354.18 Water Budget.

(c) Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:

(3) Projected water budgets shall be used to estimate future baseline conditions of supply, demand, and aquifer response to Plan implementation, and to identify the uncertainties of these projected water budget components. The projected water budget shall utilize the following methodologies and assumptions to estimate future baseline conditions concerning hydrology, water demand and surface water supply availability or reliability over the planning and implementation horizon:

> **(A) Projected hydrology shall utilize 50 years of historical precipitation, evapotranspiration, and streamflow information as the baseline condition for estimating future hydrology. The projected hydrology information shall also be applied as the baseline condition used to evaluate future scenarios of hydrologic uncertainty associated with projections of climate change and sea level rise.**
>
> **(B) Projected water demand shall utilize the most recent land use, evapotranspiration, and crop coefficient information as the baseline condition for estimating future water demand. The projected water demand information shall also be applied as the baseline condition used to evaluate future scenarios of water demand uncertainty associated with projected changes in local land use planning, population growth, and climate.**
>
> **(C) Projected surface water supply shall utilize the most recent water supply information as the baseline condition for estimating future surface water supply. The projected surface water supply shall also be applied as the baseline condition used to evaluate future scenarios of surface water supply availability and reliability as a function of the historical surface water supply identified in Section 354.18(c)(2)(A), and the projected changes in local land use planning, population growth, and climate.**

3.3.5.1 Projected Water Budget Calculation Methods [§ 354.18(d)(1),(d)(2),(d)(3),(e), and (f)]

The SGMA regulations require the following regarding projected water budgets:

- Projected water budgets shall be used to estimate future baseline conditions of supply, demand, and aquifer response to Plan implementation, and to identify the uncertainties of these projected water budget components.
- Projected hydrology shall utilize 50 years of historical precipitation, evapotranspiration, and streamflow information as the baseline condition for estimating future hydrology.
- Projected water demand shall utilize the most recent land use, evapotranspiration, and crop coefficient information as the baseline condition for estimating future water demand.
- Projected surface water supply shall utilize the most recent water supply information as the baseline condition for estimating future surface water supply.

The subsurface groundwater inflow and outflow components of the projected water budget in the EMA were estimated utilizing estimated future land uses from the Santa Barbara County Association of Governments, related pumping volumes, and repeating factors associated with the historical climatic conditions projected forward in time through 2032 and 2072. The effects of climate change were also evaluated using DWR-provided climate change factors. This section briefly describes the estimated components of the projected water budget that include (1) the effects of changing land use and water demand and (2) effects caused by climate change.

The 2030 and 2070 precipitation and ET climate change factors are available on 6-kilometer resolution grids. The climate data sets have also been analyzed with a soil moisture accounting model known as the Variable Infiltration Capacity (VIC) hydrology model and routed to the outlet of subbasins defined by 8-digit Hydrologic Unit Codes (HUCs). The resulting downscaled hydrologic time series are available on the SGMA Data Viewer hosted by DWR.[44] Precipitation and ET data used in this analysis were downloaded from the SGMA Data Viewer for climate grid cells covering the EMA within HUC 18060010, which covers the entire Santa Ynez River Valley Groundwater Basin. Monthly time series change factors were then developed for the EMA. Monthly time series change factors for inflow in the Santa Ynez River—which will continue to be regulated by the State Board Order (SWRCB, 2019) and the 2000 Biological Opinion (NMFS, 2000)—were similarly retrieved from the SGMA Data Viewer. Mean monthly and annual values were computed from the time series to show projected patterns of change under 2030 and 2070 conditions.

Projected Hydrology [§ 354.18(c)(3)(A)]

~~§~~§ 354.18 Water Budget.

(c) Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:

(3) Projected water budgets shall be used to estimate future baseline conditions of supply, demand, and aquifer response to Plan implementation, and to identify the uncertainties of these projected water budget components. The projected water budget shall utilize the following methodologies and assumptions to estimate future baseline conditions concerning hydrology, water demand and surface water supply availability or reliability over the planning and implementation horizon:

(A) Projected hydrology shall utilize 50 years of historical precipitation, evapotranspiration, and streamflow information as the baseline condition for estimating future hydrology. The projected hydrology information shall also be applied as the baseline condition used to evaluate future scenarios of hydrologic uncertainty associated with projections of climate change and sea level rise.

DWR's Water Budget and Modeling Best Management Practices (DWR, 2016b, 2016c, and 2020b) describe the use of climate change data to estimate projected hydrology. DWR has also provided SGMA Climate Change Data and published a Guidance for Climate Change Data Use for Groundwater Sustainability Plan Development (DWR, 2018b) as the primary source of technical guidance used in this analysis.

The DWR-provided climate change data are based on the California Water Commission's Water Storage Investment Program climate change analysis results, which used global climate models and radiative forcing scenarios recommended for hydrologic studies in California by the Climate Change Technical Advisory Group. Climate data from the recommended General Circulation Model models and scenarios have also been

[44] Available at https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#currentconditions. (Accessed February 15, 2021.)

downscaled and aggregated to generate an ensemble time series of change factors that describe the projected change in precipitation and ET values for climate conditions that are expected to prevail at midcentury and late century, centered around 2030 and 2070, respectively. The DWR data set also includes two additional simulation results for extreme climate scenarios under 2070 conditions. Use of the extreme scenarios (which represent Drier/Extreme Warming [2070DEW] and Wetter/Moderate Warming [2070WMW] conditions in GSPs) is optional.

This section describes the retrieval, processing, and analysis of DWR-provided climate change data to project the impact of climate change on precipitation, ET, upstream inflow, and imported flows under 2030 and 2070 conditions using at least 50 years of observed historical hydrology, and up to 97 years of hydrology, projected forward in time.

Projected Changes in Streamflow. Within the entire Basin, and therefore the EMA, streamflow is projected to increase slightly, by 0.5 percent in 2030 and 3.8 percent in 2070, based on the DWR climate change factors and other factors in the VIC analyses for the Basin. This projected change in streamflow pertains to the flow in the Santa Ynez River and flow from the tributaries both upstream and downstream of Lake Cachuma to the Santa Ynez River. Notably, the projection of changes of local surface water flow into the Santa Ynez River portion of the EMA is complicated and subject to significant error due to (1) the impoundment of the flow in the Santa Ynez River behind three reservoirs, (2) diversions through three tunnels to communities outside of the watershed to the south along the coast, and (3) requirements for regulated releases to the river, which flow into the EMA and onward downstream. The projected changes to streamflow resulting from the climate change factors have been applied to the flow that will occur through the tributaries that flow through the Santa Ynez Uplands and ultimately into the Santa Ynez River.

Projected Changes in Evapotranspiration. Crops require more water to sustain growth in a warmer climate, and this increased water requirement is characterized in climate models using the rate of ET. Under 2030 conditions, the EMA is projected to experience average annual ET increases of 3.8 percent relative to the historical period. The largest monthly changes would occur in winter and early summer with projected increases of 4.3 percent to 4.8 percent in January and 3.8 percent to 4 percent in June. Under 2070 conditions, annual ET is projected to increase by 8 percent relative to the historical period. The largest monthly changes would occur in December with projected increases of between 12.8 percent and 13.5 percent. Summer increases peak at approximately 8 percent in May and June.

Projected Changes in Precipitation. The seasonal timing of precipitation in the EMA is projected to change. Sharp decreases in early fall and late spring precipitation accompanied by increases in winter and early summer precipitation are projected to occur. Under 2030 conditions, the largest monthly changes would occur in May with projected decreases of 14 percent, while increases of approximately 9 percent and 10 percent are projected in March and August, respectively. Under 2070 conditions, decreases of up to 31 percent are projected in May while the largest increases are projected to occur in September (25 percent) and January (17 percent). The EMA is projected to experience minimal changes in total annual precipitation, although, the drought that has continued since before 2012 is concerning to Basin stakeholders. Annual precipitation increases by 0.8 percent or less are projected under 2030 conditions relative to the historical period. Under 2070 conditions, small decreases in annual precipitation are projected, with changes of less than 1 percent.

Projected Water Budget [§ 354.18(c)(3)(B)]

~~§~~§ 354.18 Water Budget.

(c) Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:

(3) Projected water budgets shall be used to estimate future baseline conditions of supply, demand, and aquifer response to Plan implementation, and to identify the uncertainties of these projected water budget components. The projected water budget shall utilize the following methodologies and assumptions to estimate future baseline conditions concerning hydrology, water demand and surface water supply availability or reliability over the planning and implementation horizon:

(B) Projected water demand shall utilize the most recent land use, evapotranspiration, and crop coefficient information as the baseline condition for estimating future water demand. The projected water demand information shall also be applied as the baseline condition used to evaluate future scenarios of water demand uncertainty associated with projected changes in local land use planning, population growth, and climate.

Based on the conditions documented in the historical water budget, the inflow and outflow from the EMA were estimated into the future through the GSP implementation period through 2042 as well as for 50 total years after this GSP is submitted, through 2072. This section describes the methods and results to estimate the groundwater inflow and outflow components in the Santa Ynez Uplands through 2042 and 2072. Obviously, uncertainty exists in the estimates for the current and projected water supply and demand. The level of uncertainty is compounded as the forecast time horizon extends from 20 to 50 years. To minimize the uncertainty that will always exist, this projected water budget is based the best available data and compiled in coordination and collaboration with water users within the EMA, the entire Basin, and adjacent groundwater basin.

Agricultural Acreage. Between water years 1982 and 2018, irrigated agricultural pumping within the Santa Ynez Uplands averaged 11,700 AFY. During 2018, the year of the most recent crop survey, there was an estimated 6,818 acres of irrigated land within the Santa Ynez Uplands. Of this area, a total of 4,241 acres were planted in irrigated crops in the areas outside of the SYRWCD boundaries, for which a total of 8,976 AFY was pumped. This is equal to an application rate of an average of 2.11 acre-feet per acre per year.

The available crop survey data from 1985, 1996, 2014, 2016, and 2018 indicate that groundwater pumping occurred in areas outside of the SYRWCD boundaries is used to satisfy a variety of crops, the acreages of which vary from year to year. A summary of the land use trends for the recent years is presented in Table 3-33~~Table 3-33~~. The crop types presented are combined into six groups of similar crops (and cannabis).

Table 3-33. Summary of Historical and Projected Irrigated Agricultural Acreage, Outside of Santa Ynez River Water Conservation District

(Values in acres)

Crop Group	Recent Trend	1996	2014	2016	2018	2042 (Projected)	2072 (Projected)
Deciduous Fruit and Nuts	Modest increase	37	93	93	74	130	199
Field Crops	Rising (+ 4.5% / year)	267	273	812	1,090	1,752	2,581
Ornamentals	Unchanged	5	29	21	3	14	28
Pasture	Declining	1,350	839	858	747	500	500
Truck, Nursery, and Berry Crops	Declining	141	714	675	498	300	300
Vineyards	Very modest increase	944	1,804	1,932	1,828	1,900	1,990
Cannabis	Large increase expected	0	0	0	0	500	1,000
	Total	**2,743**	**3,752**	**4,390**	**4,241**	**5,096**	**6,598**
					Change Since 2018	**+ 856**	**+2,357**
					Annual Increase	**+ 36**	**+ 45**
					Annual Change, Percent	**+ 0.77 %**	**+ 0.82 %**

The total irrigated area outside of the SYRWCD was 4,241 acres in 2018, the period of the most recent land use survey. The total irrigated area consisted principally of vineyards and field crops, as well as lesser acreages of pasture and truck, nursery, and berry crops. The projection of estimated changes of irrigated crop acreages into the future were considered individually for the six crop groups (and cannabis) in consultation with the GSA Committee and EMA GSA member agency staff, at a public meeting with the input of local irrigators.[45]

Based on the available data, only field crops exhibited an upward trend in recent years, rising at 4.5 percent per year. This projection was projected into the future at this rate, which would add 28 acres of field crops on average per year. By 2042, the number of acres of field crops outside of the SYRWCD is projected to increase from 1,090 acres in 2018 to 1,752 acres. This may increase further to 2,581 acres by 2072 using this projected rate of growth.

The data indicated that the area of truck, nursery, and berry crops has declined significantly. Truck, nursery, and berry crops have lost an average of 50 acres per year since 2014 and covered 498 acres in 2018. For the sake of the projection, the authors have estimated that a total of 300 acres of these crops will remain within the EMA for the foreseeable future (through 2042 and 2072).

[45] Based on personal conversations with local irrigators, including Kevin Merrill, and feedback from board members and public comments collected during a public meeting held February 25, 2021. Considerations for projection of individual crop groups included market conditions and projected changes in water availability and cost.

Likewise, pasture, which covered 747 acres in 2018, has been declining recently, losing more than 20 acres per year on average. For the sake of the projection of this crop type, the authors have assumed that this decline will continue but will not drop below a total of 500 total acres within the area outside of the SYRWCD.

The expansion of vineyard acreage has slowed considerably in recent years, compared to the rapid growth that occurred during the late 1990s and early 2000s. Between 1996 and 2014, vineyards grew at an average rate of approximately 3.7 percent per year; however, since 2014 this has moderated to near zero growth, which is included in the projection as less than 0.2 percent per year annual growth. This is equal to an increase of 3 acres per year on average.

While not included as a crop category in the recent crop surveys, cannabis production is projected to enter the Santa Ynez Valley and the EMA in the coming years. The County of Santa Barbara has placed an upper limit on the maximum number of acres county-wide allowed to be planted with cannabis. The assumption for the EMA is that cannabis production will reach a limit for the Santa Ynez Valley over the next several years and will increase beyond the current limit. Review of the four current cannabis permit applications, one of which has been approved, suggest that a total of approximately 350 acres of cannabis production are being considered within the EMA. Three of the four parcels with pending cannabis permits are located on parcels that are not currently irrigated; thus, the authors have assumed that this land use will represent newly irrigated acreage within the EMA. The estimated acreage of this crop projected through 2042 and 2072 are only estimates and are subject to much uncertainty.

The estimated projected total acreages of the ornamentals and deciduous fruit and nuts remained relatively unchanged, based on the crop surveys and are not projected to increase significantly during the projected water budget period.

Overall, the summation of the individual cropping changes result in a projected increase in irrigated acreage outside of SYRWCD from 4,241 acres in 2018 to 5,259 acres in 2042, at an annual growth rate of approximately 0.8 percent per year. Between 2042 and 2072, the total irrigated acreage is projected to increase further relative to 2018, to 6,598 acres at the same average annual growth rate. This growth is expected to occur mostly due to increases in field crops and cannabis acreage. The projected agricultural acreages and water use are projected to increase only modestly over the next 20 and 50 years. This increase, based principally on conversion to field crops and a more modest increase in vineyard acreage, are together similar in scale to the estimated projected increase in cannabis acreage. The projected rate of expansion of acreage is equal to 36 acres added per year. This rate is reasonably consistent with the current rate of change of the crop groups presented in and was confirmed with the GSA Committee and member agency staff to reasonably represent an estimate of future land use.

Agricultural Pumping. Projected future ET values were derived for each of these crop groups for 2042 and 2072 by multiplying the acreage of each crop by historical crop ET and the DWR climate change factors. The water use of each crop group varies between 1.05 acre-feet per acre per year for field crops to 3.11 acre-feet per acre per year for truck, nursery, and berry crops, as shown in Table 3-34~~Table 3-34~~.

The assigned water duty factors are based on SYRWCD's Groundwater pamphlet (SYRWCD, 2010). There has been some discussion in public meetings that the water duty factor of 1.60 acre-feet per acre per year for vineyards may be too high and the current water use for the crop may be closer to 1.0 to 1.2 acre-feet per acre per year inclusive of irrigation and frost protection. Adjusting the water use factor for this crop could have an effect on the current and projected water budgets. This is discussed further later in this section.

Table 3-34. Water Duty Factors for Crop Groups

Crop Group	Annual Crop Demand (acre-feet per acre per year)
Deciduous Fruit and Nuts	2.14
Field Crops	1.05
Ornamentals	3.00
Pasture	3.50
Truck, Nursery, and Berry Crops	3.11
Vineyards[1]	1.60
Cannabis[2]	1.50

Notes

[1] The assigned water duty factors are based on SYRWCD's Groundwater Production Information and Instructions pamphlet (SYRWCD, 2010).

[2] From Battany, 2019, An Initial Estimate of a Water Duty Factor for Field-Grown CBD Hemp in The Paso Robles Area. The University of California working in cooperation with San Luis Obispo County and the U.S. Department of Agriculture. April 22, 2019.

The agricultural demand was estimated throughout the Santa Ynez Uplands both within and outside of the SYRWCD. In 2018, a total of 2,900 AFY of water was pumped within the SYRWCD to satisfy agricultural demands. Agricultural pumping data from within the SYRWCD were based on metered production from ID No. 1 and the City of Solvang, and other self-reported pumping records of the total volume of water pumped but lacking information about the crops that will be irrigated. Throughout the historical period, agricultural pumping within the SYRWCD has been declining. Before 2000, agricultural pumpage averaged 4,113 AFY; since 2000, agricultural pumpage has declined to an average of 2,984 AFY. This moderate decline is equal to an average reduction of 51 AFY of agricultural pumping over the historical period within the SYRWCD. To estimate agricultural pumping within the SYRWCD, the authors assume that the modest decline will continue, from 2,900 AFY in 2018 to 2,497 AFY in 2042, as summarized in Table 3-35~~Table 3-35~~.

Based on results of the projection, the overall agricultural pumping within the Santa Ynez Uplands will decrease slightly. The net effect of the increase in agricultural pumping outside of SYRWCD and decrease in pumping inside SYRWCD will result in an overall decrease in agricultural pumping. In 2018, agricultural pumping in the entire Santa Ynez Uplands was 11,301 AFY, which was similar to the average for the entire historical period of 11,700 AFY. Together with the declining agricultural pumping trend within the SYRWCD and conversion of crop acreages throughout the Santa Ynez Uplands to lower water use crops, pumping to satisfy crop demands is projected to decrease slightly to 11,129 AFY in 2042 and 10,584 AFY in 2072. These projections indicate that irrigated agricultural demand, not accounting for climate change, will decline by less than a percent by 2042 and 2072, as summarized in Table 3-35~~Table 3-35~~.

Table 3-35. Summary of Projected Irrigated Agricultural Pumping (Excluding Climate Change), Santa Ynez Uplands

(Values in acre-feet per year)

Crop Group	2018	2042 (Projected)	2072 (Projected)
Deciduous Fruit and Nuts	159	277	425
Field Crops	1,143	1,838	2,707
Ornamentals	10	43	85
Pasture	2,615	1,750	1,750
Truck, Nursery, and Berry Crops	1,550	933	933
Vineyards	2,925	3,040	3,184
Cannabis	0	750	1500
SYRWCD	2,900	2,497	2,270
Total	**11,301[1]**	**11,129**	**10,584**
	Change	**- 172**	**- 717**
	Annual Change	**-7**	**-13**
	Annual Change, Percent	**- 0.06 %**	**- 0.12 %**

Note

[1] Agricultural pumping from Santa Ynez Uplands between 1982 and 2018 averaged 11,700 AFY

SYRWCD = Santa Ynez River Water Conservation District

Climate Change. The effects of climate change are projected to increase ET and therefore groundwater pumping for agriculture. DWR requires that consideration of climate change factors is consistent with DWR guidance for water budget projections. By 2042, the EMA is projected to experience average annual ET increases of 5.1 percent relative to the baseline historical period, and 8.2 percent by 2072. To satisfy these increases in ET, the total pumping for agriculture is projected to rise at magnitudes that are similar to the projected decreases due to cropping changes. Precipitation is projected to change slightly as a result of climate change in the future, increasing by 0.8 percent in 2042 and decreasing by 1 percent in 2072.

As presented on the Table 3-36~~Table 3-36~~, climate change may increase pumping demand for agriculture by 568 AFY by 2042 and by 868 AFY by 2072. With the projected decrease in agricultural demand due to changes in cropping patterns and increase in demand due to climate change, the net effect is a slight increase in agricultural water demand of 3.5 percent in 2042 and a lesser increase of 1.3 percent in 2072.

Table 3-36. Summary of Projected Irrigated Agricultural Pumping Including Climate Change

(Values in acre-feet per year)

Crop Group	2018	2042 (Projected)	2072 (Projected)
Agricultural Demand	11,301	11,129	10,584
Climate Change	--	+ 568 (+5.1%)	+ 868 (+8.2%)
Ag + Climate Change	11,301[1]	11,696	11,452
	Change Since 2018	**+ 395**	**+ 151**
	Change Since 2018, Percent	**+ 3.5 %**	**+ 1.3 %**
	Change Since Historical Average, Percent	**- 0.03 %**	**- 2.1 %**

Notes

[1] Agricultural pumping from Santa Ynez Uplands between 1982 and 2018 averaged 11,700 AFY.
Ag = Agricultural demand

The average agricultural pumping during the historical period was higher than the average for the single year of 2018. During the historical period, pumping for agriculture averaged 11,700 AFY, which was 400 AFY higher than in the single year 2018. Therefore, the projected effect of climate change combined with changes in cropping patterns into the future may result in little change in overall water use relative to the historical period, with a net decline of 0.03 percent in 2042 and 2.1 percent in 2072.

A water duty factor of 1.1 acre-feet per acre per year for vineyards (which is relatively lower than the value of 1.6 acre-feet per acre per year used in the calculation above) would decrease the overall agricultural pumping estimate from 11,129 AFY in 2042 to 10,179 AFY, for a net reduction of projected pumping by 950 AFY. Likewise, the estimated pumping for vineyard irrigation would decline from 10,584 AFY in 2072 to 9,589 AFY, for a reduction of 995 AFY relative to the values presented in Table 3-36~~Table 3-36~~. Including climate change, this would reduce the overall pumping for all crops to 10,698 AFY in 2042 and 10,375 AFY in 2072.

Municipal and Industrial Pumping. Future M&I demands were estimated based on records of current demand for non-agricultural uses for the City of Solvang, ID No. 1, mutual water companies, and rural domestic users. To estimate future M&I demands, GSI~~ Water Solutions, Inc.~~ reviewed historical demand records from the City of Solvang and ID No. 1, along with population projections for the City of Solvang and unincorporated communities in the EMA based on pumping records from several mutual water companies, Santa Barbara County Association of Governments Regional (population) Growth Forecasts (SBCAG, 2012), the California Department of Finance Population and Housing Estimates (DOF, 2020) and discussions with agency staff. Based on these data sources, it was determined that the City of Solvang anticipates a population increase of approximately 1 percent per year while ID No. 1 and the unincorporated areas of the EMA (including Los Olivos, Ballard, the Chumash Reservation, and other areas) are not expected to increase in population through 2042 and 2072. Overall, the net effects of the increased population in the City of Solvang and unchanged populations within the other areas are a net increase in water use. This net change has also been assigned to the mutual water companies and rural domestic users.

Together, the growth estimates from these sources were used to project overall changes in municipal demand as presented in Table 3-37~~Table 3-37~~. The minor expansion of M&I pumping within the Santa Ynez Uplands is equal to a 5 percent overall increase by 2042 and an 11 percent increase by 2072 compared to the historical period. This component of the water budget was applied to the projected growth of M&I;

mutual and rural demands (outflow components); and Chumash WWTP effluent flow, septic return flow and urban irrigation return flows (inflow components).

Table 3-37. Summary of Projected Municipal, Industrial, and Rural Domestic Pumping

(Values in acre-feet per year)

Water Budget Component	Historical Average	2042 (Projected)	2072 (Projected)
City of Solvang and ID No. 1 (Non-agricultural)	1,940	2,040	2,150
Mutual Water Companies	820	860	910
Rural Domestic	300	320	330
Total	**3,060**	**3,220**	**3,390**
Change, AFY	**–**	**+ 160**	**+ 330**
Change, Percent	**–**	**+ 5 %**	**+ 11 %**

Other Groundwater Inflow Components. All of the components of the groundwater budget were projected forward into the future for the 2042 and 2072 periods. In addition to changes to both agricultural and M&I pumping discussed above, the other components were adjusted to reflect the projected climate and hydrological changes, which are presented in Table 3-38~~Table 3-38~~.

The water budget components related to agricultural pumping (agricultural return flow) were adjusted by the same magnitude as the adjustments to agricultural pumping described above. That is, increasing pumping for irrigated agricultural pumping in turn increases agricultural return flow by the same amount.

Water budget components related to streamflow include tributary percolation (inflow) and outflow of groundwater to these tributaries. Both of these components were varied based on guidance by DWR, which projected that streamflow would increase in EMA by 1 percent in 2042 and 4 percent in 2072. These changes are incorporated into the projected water budget in Table 3-38~~Table 3-38~~.

Precipitation recharge is projected to change slightly in the future, increasing by 0.8 percent in 2042 and decreasing by 1 percent in 2072. These adjustments were applied to projected change in precipitation recharge and mountain front recharge, which are both inflow components.

The only component that did not change in the projected water budget was the subsurface outflow, which is minor and not significantly affected by the hydrologic changes projected to occur.

Within the EMA Santa Ynez Uplands, agricultural and M&I demands are projected to increase.

Table 3-38. Summary of Historical, Current, and Projected Water Budget with Climate Change, Santa Ynez Uplands

(Values in acre-feet per year)

Water Budget Component	Historical	Current	2042 (Projected)	2072 (Projected)
Inflow Components				
Mountain Front Recharge	3,100	1,900	3,110	3,070
Tributary Percolation	700	600	710	730
Precipitation Recharge	11,300	7,000	11,330	11,190
Chumash WWTP Effluent	40	50	40	40
Septic Return Flows	900	1,100	950	1,000
Ag Irrigation Return Flows	2,600	2,400	2,660	2,630
Urban Irrigation Return Flows	130	200	140	140
Groundwater Inflow	**18,770**	**13,250**	**18,940**	**18,800**
Outflow Components				
City of Solvang and ID No. 1 Pumping (Non-agricultural)	1,940	2,130	2,040	2,150
Agricultural Pumping	11,700	11,700	11,700	11,450
Mutual Water	820	900	860	910
Rural Domestic	300	300	320	330
Outflow to Tributaries	2,700	1,600	2,740	2,800
Phreatophyte ET	3,081	3,100	3,240	3,330
Subsurface Outflow	100	100	100	100
Groundwater Outflow	**20,641**	**19,800**	**21,000**	**21,070**
Groundwater Change in Storage	**-1,830**	**-6,580**	**-2,060**	**-2,270**

Notes

Ag = agriculture

ET = evapotranspiration

WWTP = wastewater treatment plant

The M&I and agricultural demands are satisfied with both groundwater pumping from the Santa Ynez Uplands and surface water from local and imported water sources. Imported SWP water became available to the City of Solvang in 2002, which caused groundwater pumping demand to decrease compared to previous years. M&I demand is projected to increase by 5 percent in 2042 and 11 percent in 2072. Agricultural demand with climate change is projected to decrease very slightly by 0.03 percent in 2042 and decrease by 2.1 percent in 2072. A summary of the projected pumping from the Santa Ynez Uplands is presented as Table 3-39~~Table 3-39~~.

Table 3-39. Summary of Projected Pumping with Climate Change

(Values in acre-feet per year)

Pumping Component	Historical Average	2042 (Projected)	2072 (Projected)
Agricultural	11,700	11,700	11,700450
Municipal, Rural Domestic, and Industrial	3,060	3,220	3,390
Total Pumping	**14,760**	**14,920**	**14,840**
Change		**+ 160**	**+ 80**
Change, Percent		**+ 1.1 %**	**+ 0.5 %**
Average Annual Change, Percent		**+ 0.04 %**	**+ 0.01 %**

At the end of the GSP implementation period in 2042 and into 2072, the total pumping in the EMA is projected to increase very slightly (by 1.1 percent or less relative to the historical period) in response to the combination of agricultural and M&I demands along with climate change projections. This increase represents an annual growth of projected pumping of approximately 0.1 percent per year through 2042 and 2072. The modest increase in demand in 2042 is presented graphically on Figure 3-1355 and in 2072 on Figure 3-56Figure 3-56.

Projected Surface Water Supply [§ 354.18(c)(3)(C)]

§§ 354.18 Water Budget.

(c) Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:

(3) Projected water budgets shall be used to estimate future baseline conditions of supply, demand, and aquifer response to Plan implementation, and to identify the uncertainties of these projected water budget components. The projected water budget shall utilize the following methodologies and assumptions to estimate future baseline conditions concerning hydrology, water demand and surface water supply availability or reliability over the planning and implementation horizon:

(C) Projected hydrology shall utilize 50 years of historical precipitation, evapotranspiration, and streamflow information as the baseline condition for estimating future hydrology. The projected hydrology information shall also be applied as the baseline condition used to evaluate future scenarios of hydrologic uncertainty associated with projections of climate change and sea level rise.

Now and in the future, surface water is expected to be supplied to the EMA for use both in the Santa Ynez River and Santa Ynez Uplands. The surface water supplies from local and imported sources have been approximately 2,900 AFY through the historical period. Notably, the water supply available to the EMA was significantly lower between 2012 and 2016 (and 2018), when supplemental surface water supplies from the SWP were reduced due to drought conditions statewide.

Based on planning guidance from the CCWA and DWR's Delivery Capability Report (DWR, 2020a), a 58 percentthe average delivery allocation of SWP water to the EMA is the minimum projected volume of imported waterwas 58 percent. However, since that may be availablereport was published, the CCWA and

DWR delivery projection for 2022 is less than 5 percent of planned allocations. This would suggest that the volume of imported water supply available to serve ID No. 1 (including the City of Solvang) for the ~~foreseeable~~near future may be ~~between 58 and 100 percent of~~significantly less than the historical deliveries~~, or between 1,682 and 2,900 AFY.~~; therefore, the EMA will need to rely more on local groundwater if drought conditions persist.

Water supply from local surface water sources (diversion from the Santa Ynez River) was estimated based on climate-based adjustments to Santa Ynez River streamflow, which indicate that streamflow will increase by a total of 0.5 percent by 2030 and 3.8 percent by 2072. Together, pumping from the Santa Ynez River, managed as surface water diversions, averaged 5,000 AFY during the historical period, which is projected to increase to 5,520 AFY by 2042 and 5,550 AFY by 2072, or up to the pumping volume allowed by the SWRCB for individual water rights. These calculations indicate that downstream surface water production by ID No. 1, City of Solvang, and other river water right holders and riparian landowners will likely be maintained.

3.3.5.2 Summary of Projected Water Budget

Overall, groundwater outflows from the Santa Ynez Uplands are projected to exceed inflows in the future. At the end of the implementation period in 2042, the groundwater outflows will exceed the groundwater inflows by 2,060 AFY as presented on Figure 3-55, which includes the anticipated effects of climate change. This represents a deficit.

In 2072, groundwater outflows from the Santa Ynez Uplands are projected to exceed inflow components by 2,270 AFY as presented on Figure 3-56~~Figure 3-56~~, which includes the anticipated effects of climate change. This represents a deficit.

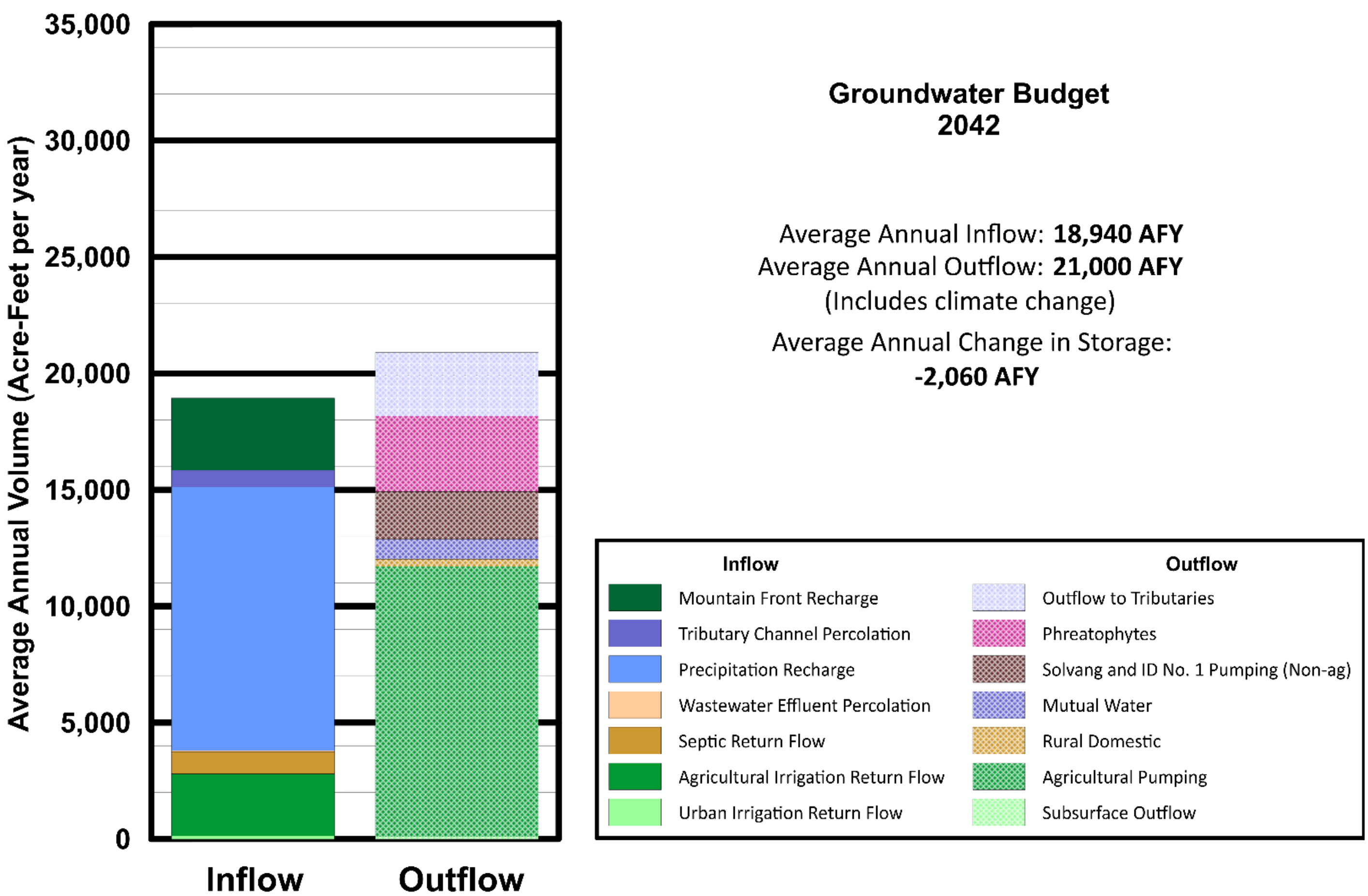

Figure 3-55. Projected Groundwater Budget, 2042

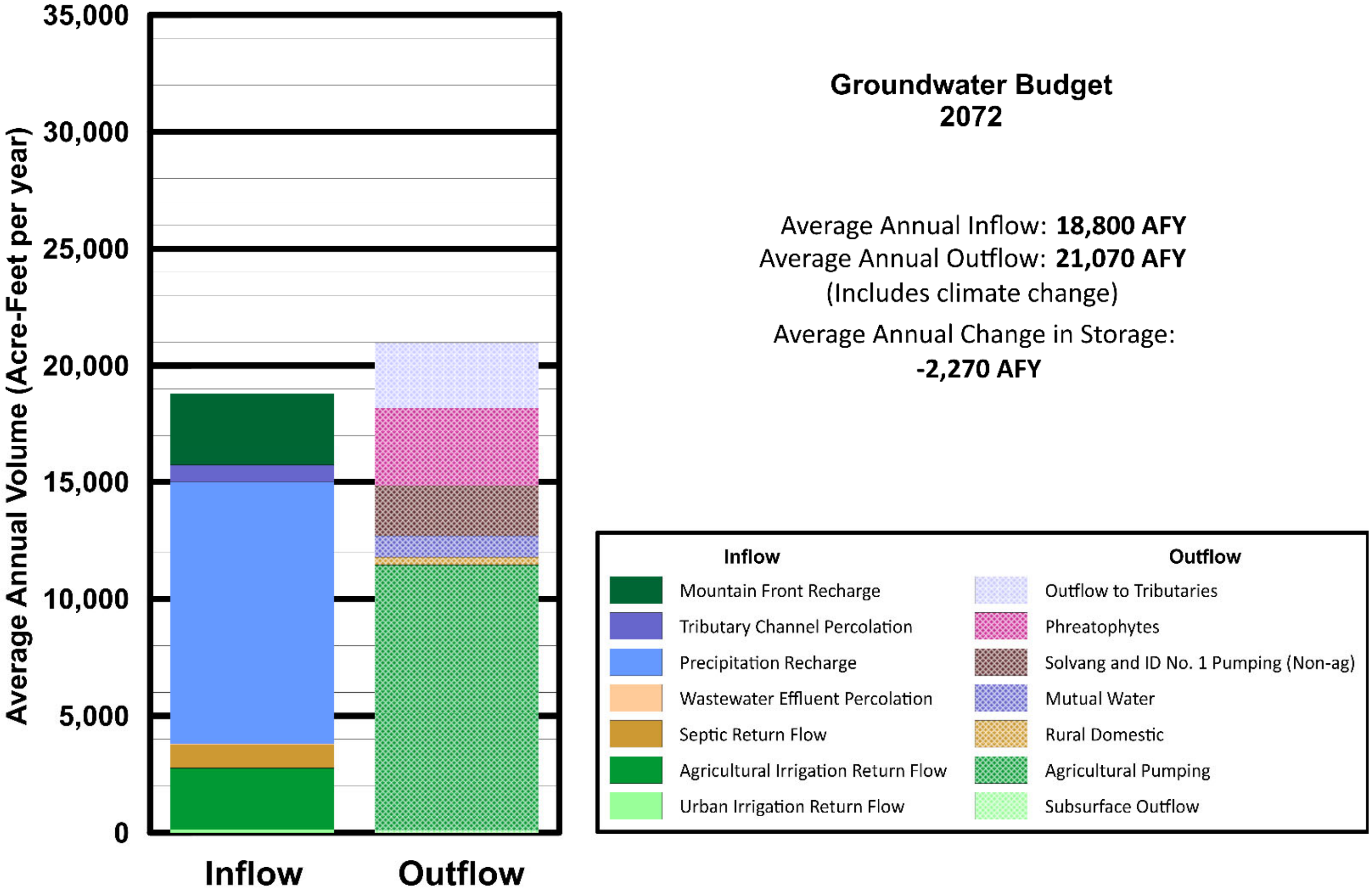

Figure 3-56. Projected Groundwater Budget, 2072

During the historical period, production from wells in the Santa Ynez Uplands served increasing demands for areas that did not have access to surface water supply. In the future, it is assumed that surface water supplies, including imported water sources, will not be sufficient to meet new demand from agricultural and M&I uses, and so increased demand will be supplied by local groundwater.

The combined effects of these changes in supply and demand are that total groundwater pumping in the EMA may increase by approximately 1.1 percent, from 14,760 AFY under historical conditions to 14,920 AFY under 2042 conditions, and to 14,840 AFY by 2072, unless measures are implemented to increase supply or reduce demand. The water budget calculations indicate that the current deficit (outflows exceeding inflows) could increase to an average of 2,060 AFY in 2042 and further to 2,270 AFY in 2072.

This analysis points out that, if demand for groundwater increases in the future, projects and management actions may need to be developed to address the current and projected deficit (overdraft) anticipated to remain in 2042, the year that DWR requires the Basin to be balanced and sustainable without undesirable results.

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SECTION 4: **Monitoring Networks**

4.1 Introduction to Monitoring Networks

§§ 354.32 Introduction to Monitoring Networks. This Subarticle describes the monitoring network that shall be developed for each basin, including monitoring objectives, monitoring protocols, and data reporting requirements. The monitoring network shall promote the collection of data of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the basin and evaluate changing conditions that occur through implementation of the Plan.

This section describes existing monitoring networks and improvements to the monitoring networks that will be developed for the Santa Ynez River Valley Groundwater Basin (Basin) Eastern Management Area (EMA) as part of Groundwater Sustainability Plan (GSP) implementation. This section is prepared in accordance with the Sustainable Groundwater Management Act (SGMA) regulations § 354.32, § 354.34, § 354.36, § 354.38, and § 354.40 and includes monitoring objectives, monitoring protocols, assessment and improvement of monitoring network, representative monitoring, and data reporting requirements.

The monitoring networks presented in this section are largely based on existing monitoring sites. During the 20-year GSP implementation period, it may be necessary to expand the existing monitoring networks, if existing wells are unavailable, and identify or install more monitoring sites to fully demonstrate sustainability and improve the groundwater flow model. Monitoring networks and data gaps are described for each of the five applicable sustainability indicators. Identified data gaps will be addressed during GSP implementation to improve the Groundwater Sustainability Agency's (GSA's) ability to track progress and demonstrate sustainability.

The groundwater level monitoring network section of this GSP is largely based on historical groundwater data compiled by the U.S. Geological Survey (USGS) National Water Information System (NWIS) program, the California Statewide Groundwater Elevation Monitoring (CASGEM) program,[46] and semi-annual groundwater monitoring conducted by Santa Barbara County. The groundwater quality monitoring network section of this GSP is largely based on historical groundwater data compiled by the USGS Groundwater Ambient Monitoring and Assessment (GAMA) Program.[47] The subsidence monitoring program will rely on existing Interferometric Synthetic Aperture Radar (InSAR) and University NAVSTAR Consortium (UNAVCO) satellite monitoring information that may be supplemented with surveyed benchmarks if the satellite data suggest that subsidence is occurring as a result of groundwater pumping. Depletion of interconnected surface water and potential significant and unreasonable adverse impacts to GDEs will be monitored in new piezometers that will be installed in two tributaries where groundwater is interconnected with surface water. Data gaps have been identified in the monitoring programs that will be addressed during GSP implementation.

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[46] Available at NWIS, https://maps.waterdata.usgs.gov/mapper/index.html; CASGEM, https://water.ca.gov/Programs/Groundwater-Management/Groundwater-Elevation-Monitoring–CASGEM; and http://www.countyofsb.org/pwd/SYRVGWB.sbc; respectively. (Accessed May 20, 2021.)

[47] Available at GAMA, https://gamagroundwater.waterboards.ca.gov/gama/gamamap/public/. (Accessed May 20, 2021.)

4.2 Monitoring Network Objectives and Design Criteria

§§ 354.34 Monitoring Network.

(a) Each Agency shall develop a monitoring network capable of collecting sufficient data to demonstrate short-term, seasonal, and long-term trends in groundwater and related surface conditions, and yield representative information about groundwater conditions as necessary to evaluate Plan implementation.

(b) Each Plan shall include a description of the monitoring network objectives for the basin, including an explanation of how the network will be developed and implemented to monitor groundwater and related surface conditions, and the interconnection of surface water and groundwater, with sufficient temporal frequency and spatial density to evaluate the affects and effectiveness of Plan implementation. The monitoring network objectives shall be implemented to accomplish the following:

(1) Demonstrate progress toward achieving measurable objectives described in the Plan.

(2) Monitor impacts to the beneficial uses or users of groundwater.

(3) Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds.

(4) Quantify annual changes in water budget components.

(d) The monitoring network shall be designed to ensure adequate coverage of sustainability indicators. If management areas are established, the quantity and density of monitoring sites in those areas shall be sufficient to evaluate conditions of the basin setting and sustainable management criteria specific to that area.

(f) The Agency shall determine the density of monitoring sites and frequency of measurements required to demonstrate short-term, seasonal, and long-term trends based upon the following factors:

(1) Amount of current and projected groundwater use.

(2) Aquifer characteristics, including confined or unconfined aquifer conditions, or other physical characteristics that affect groundwater flow.

(3) Impacts to beneficial uses and users of groundwater and land uses and property interests affected by groundwater production, and adjacent basins that could affect the ability of that basin to meet the sustainability goal.

(4) Whether the Agency has adequate long-term existing monitoring results or other technical information to demonstrate an understanding of aquifer response.

The SGMA regulations require monitoring networks be developed to promote the collection of data of sufficient quality, frequency, and spatial distribution to characterize groundwater and related surface water conditions in the basin and to evaluate changing conditions that occur through implementation of the GSP. TheDevelopment of the monitoring network shouldin this GSP considered four factors (§ 354.34)(f)(1-4):

- Amounts of groundwater use
- Aquifer characteristics that affect groundwater flow
- Impacts to beneficial uses and users
- Adequate monitoring results to demonstrate an understanding of aquifer response

Furthermore, the monitoring network is intended to accomplish the following:

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

The density of monitoring sites and frequency of measurements are described in Sections 4.3.2, 4.4.2, 4.5.2, 4.6.2, and 4.7.

The minimum thresholds and measurable objectives established for each sustainability indicator to be monitored by the networks are described in Section 5. Section 6 includes a discussion of how the monitoring data will be used to inform the GSA regarding progress toward achieving measurable objectives and avoiding undesirable results caused by groundwater conditions occurring throughout the EMA.

4.2.1 Monitoring Networks

Monitoring networks have been developed considering the factors presented above for each of the five sustainability indicators that are applicable to the EMA:

- Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon
- Significant and unreasonable reduction of groundwater storage
- Significant and unreasonable degraded water quality
- Significant and unreasonable land subsidence that substantially interferes with surface land uses
- Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water

The EMA is isolated from the Pacific Ocean and is not threatened by seawater intrusion; therefore, this GSP does not provide monitoring for the seawater intrusion sustainability indicator.

The SGMA regulations allow the GSP to use existing monitoring sites for the monitoring network; however, some monitoring sites do not presently meet all SGMA requirements that include state well identification number, well location, ground surface elevation, well depth, and perforated intervals. Well information and data will be submitted to the SGMA Portal Monitoring Network Module (MNM). Currently, some wells in the groundwater level monitoring network do not have well construction information. Well construction information and other monitoring well information will be obtained during GSP implementation.

The approach for establishing the monitoring network for the EMA is to leverage historical or existing monitoring programs and incorporate, as needed, additional monitoring locations that have been made available by cooperating entities. The monitoring networks are limited to locations with data that are publicly available and not collected under confidentiality agreements. This section identifies data gaps in each monitoring network and proposes locations and methods for filling those data gaps.

4.2.2 Management Areas

The Santa Ynez River Valley Groundwater Basin is identified by the California Department of Water Resources (DWR) in Bulletin 118 as Basin No. 3-015 (DWR, 2018). The greater Santa Ynez River Valley Basin is located in the Central Coastal region of California. For the purposes of groundwater management and SGMA compliance, the Santa Ynez River Valley Groundwater Basin is divided into three separate management areas: the Western Management Area (WMA), the Central Management Area (CMA), and the EMA (County of Santa Barbara et al., 2016). Each management area has its own monitoring networks. The quantity and density of monitoring sites in the EMA is sufficient to evaluate conditions of the EMA and establish sustainable management criteria specific to the EMA.

4.3 Groundwater Level Monitoring Network

23 Cal. Code Regs. §§ 354.34 Monitoring Network.

(e) A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.

(g) Each Plan shall describe the following information about the monitoring network:

(1) Scientific rationale for the monitoring site selection process.

(2) Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.

(3) For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.

(h) The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.

(j) An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.

The minimum thresholds and measurable objectives for the chronic lowering of groundwater levels sustainability indicator are evaluated by monitoring groundwater levels at groundwater wells identified as representative monitoring sites (RMSs). The SGMA regulations require a network of monitoring wells sufficient to demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features. To the degree possible, the four factors of (1) groundwater use, (2) aquifer characteristics that affect groundwater flow, (3) impacts to beneficial uses and users and (4) adequate monitoring results to demonstrate an understanding of aquifer response, were central to the development of the water level monitoring network, within the limits of the available data.

Groundwater well construction information and water level data were obtained from the following sources:

- USGS NWIS
- DWR CASGEM
- County of Santa Barbara
- City of Solvang
- Santa Ynez River Water Conservation, District Improvement District No. 1 (ID No.1)
- DWR Online System for Well Completion Reports[48]

These data sources resulted in a data set of more than 600 wells, each analyzed using the following steps to assess whether they would be included in the groundwater level monitoring network:

- **Include only currently measured wells:** To reduce the possibility of selecting a well that has not been monitored in many years or that may no longer be accessible, wells were excluded that could not be measured in 2021.
- **Remove wells for which access agreements were denied by well owners:** The monitoring agency (i.e., the County of Santa Barbara) was not able to obtain access agreements for some private wells included in the groundwater level monitoring program, and therefore these wells are excluded from the existing groundwater level monitoring network. An effort is ongoing to reach out to private and public well owners to discuss participation in the groundwater level monitoring network.

All wells in the groundwater level monitoring network presented in this GSP are RMSs, which are also referred to as representative wells. The representative wells are defined in the SGMA regulations as monitoring sites that are representative of groundwater conditions in each of the principal aquifers within the EMA. These representative wells are evaluated in terms of sustainable management criteria in Section 5. The groundwater level representative wells network is summarized in Tables 4-1 and 4-2. There are 24 representative wells in the groundwater level monitoring network. Additionally, there are 13 wells in the EMA monitored by Santa Barbara County that do not meet the criteria of representative wells, totaling 37 wells that are currently monitored in the EMA. The distribution of both the representative wells and all the wells included in the Santa Barbara County's monitoring network within the EMA are shown on Figure 4-1.

Representative wells have the following characteristics:

- ~~They are screened exclusively within a single principal aquifer.~~
- They are spatially distributed to provide information across most of the EMA~~.~~ (factors 1 and 3).
- They are screened exclusively within a single principal aquifer (factor 2).
- They have a reasonably long record of data (period of record) so that trends can be determined~~.~~ (factors 3 and 4).
- The wells serve multiple beneficial uses including agricultural, domestic, and municipal uses (factor 3).

[48] Available at DWR, https://water.ca.gov/Programs/Groundwater-Management/Wells/Well-Completion-Reports. (Accessed May 20, 2021.)

- They have hydrograph signatures that are representative of wells in the surrounding area. (factor 4).

The representative wells network for groundwater level consists of 24 wells (15 wells in the Paso Robles Formation and 9 wells in the Careaga Sand) that will be used to monitor groundwater levels and storage. Ten wells are production wells used for agricultural irrigation, seven wells are domestic drinking water wells, and seven wells are municipal drinking water wells. While not ideal for use as a monitoring well because they are production wells, these wells are currently included as representative wells because of their locations in the EMA, available well construction information, and a long period of record. Seventeen of the wells lack complete well construction information such as total depth and the top and bottom depths of perforations (see Tables 4-1 and 4-2). This is a data gap that will be addressed during GSP implementation.

Table 4-1. Groundwater Level Monitoring Network – Paso Robles Formation Wells

Representative Well ID	Well Use	Well Depth (ft)	Screen Interval(s) (ft bgs)	Ground Elevation (ft NAVD 88)	Reference Point Elevation (ft NAVD 88)	First Date Measured	Last Date Measured	Years
6N/29W-07L01	Agricultural	—	—	868.9	870.7	1960	2021	62
6N/29W-08P01	Domestic	—	210 to ?	915.2	915.4	1934	2021	88
6N/29W-08P02	Domestic	—	—	896.0	897.0	1966	2021	56
6N/30W-07G05	Municipal	166	—	604.3	606.7	1962	2021	60
6N/30W-07G06	Municipal	566	305 to 410	602.3	604.3	1962	2021	60
6N/30W-11G04	Agricultural	400	130 to 390	681.1	683.1	2010	2021	12
6N/31W-01P03	Municipal	505	195 to 490	633.1	634.7	1967	2021	55
6N/31W-02K01	Domestic	—	—	619.6	620.8	1942	2021	80
6N/31W-13D01	Domestic	152	—	625.1	626.6	1941	2021	81
7N/30W-16B01	Agricultural	—	—	1,066.4	1,069.3	1950	2021	72
7N/30W-19H01	Agricultural	—	—	1,090.1	1,105.9	1954	2021	68
7N/30W-29D01	Agricultural	—	—	917.8	919.3	1905	2021	117
7N/30W-30M01	Agricultural	—	—	806.5	807.5	1905	2021	117
7N/30W-33M01	Agricultural	349	150 to 340	764.3	764.7	1954	2021	68
7N/31W-36L02	Domestic	—	—	722.6	723.6	1942	2021	80

Notes

— = No data available
? = Unknown
bgs = below ground surface
ft = feet
NAVD 88 = North American Vertical Datum of 1988

Table 4-2. Groundwater Level Monitoring Network – Careaga Sand Wells

Representative Well ID	Well Use	Well Depth (ft)	Screen Interval(s) (ft bgs)	Ground Elevation (ft NAVD 88)	Reference Point Elevation (ft NAVD 88)	First Date Measured	Last Date Measured	Years
7N/31W-34M02	Agricultural	—	—	671.1	673.1	2014	2021	8
6N/31W-03A01	Domestic	—	—	738.5	740.0	1963	2021	59
6N/31W-04A01	Domestic	259	—	601.1	603.1	1956	2021	66
6N/31W-09Q02	Municipal	550	250 to 540	756.9	754.0	2011	2021	11
6N/31W-10F01	Agricultural	265	—	555.6	556.7	1966	2021	56
6N/31W-11D04	Agricultural	447	93 to ?	565.3	560.6	1955	2021	67
6N/31W-16N07	Municipal	145	99 to 127	479.3	478.2	2011	2021	11
6N/31W-xxxx[1]	Municipal	329	190 to 325	503.2	500.9	2011	2021	11
Solvang HCA[1]	Municipal	490	180 to 470	398.0	402.8	2011	2021	11

Notes

[1] The State Well Number for these wells is not known at this time.
— = No data available
? = Unknown
bgs = below ground surface
ft = feet
NAVD 88 = North American Vertical Datum of 1988

Figure 4-1. Groundwater Level Monitoring Network

4.3.1 Protocols for Monitoring Groundwater Levels

> **§§ 354.34 Monitoring Network.**
>
> **(i) The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.**

The GSA adopted monitoring protocols using guidelines in the SGMA regulations and Best Management Practices (BMPs) published by DWR on monitoring protocols (DWR, 2010 and 2016a). The following information or procedure is collected and documented for each monitoring site:

- Informal access agreements. Access agreements include semi-annual access to the site.
- A unique identifier that includes a general written description of the site location, date established, access instructions and point of contact, type of information to be collected, latitude, longitude, and elevation. The written description for each monitoring location also tracks all modifications to the site in a modification log.

The following considerations for groundwater level measuring protocols are considered:

- Groundwater level data are taken from the correct location and relative to the correct measuring point.
- Groundwater level data are accurate and reproducible, by measuring the water level three times during each measurement event.
- Groundwater level data collection protocols are completed in accordance with the Data Quality Objectives process defined by the U.S. Environmental Protection Agency (EPA) *Guidance on Systematic Planning Using the Data Quality Objective Process* (EPA, 2006).
- All important information is recorded to correct, if necessary, and compare data.
- A data collection and management quality assurance/quality control (QA/QC) program has been implemented to ensure data integrity.

Water level data is collected under the following conditions:

- All groundwater levels are collected within as short a time as possible, preferably within a 1- to 2-week period.
- Well owners (or operators) will ensure that the wells are not pumped for a period of 8 to 12 hours prior to measurement to ensure that the water levels represent static conditions.
- Depth to groundwater is measured relative to an established reference point (RP) on the well casing. The RP is usually identified with a permanent marker, paint spot, or a notch in the lip of the well casing. By convention, in open casing monitoring wells, the RP reference point is located on the north side of the well casing. If no mark is apparent, the person performing the measurement measures the depth to groundwater from the north side of the top of the well casing.
- The elevation of the RP of each well is surveyed to the North American Vertical Datum of 1988. The elevation of the RP is accurate to within 0.5 foot (ft).

- The sampler removes the appropriate cap, lid, or plug that covers the monitoring access point listening for pressure release. If a release is observed, the measurement follows a period of time to allow the water level to equilibrate.
- Depth to groundwater is measured to an accuracy of 0.1 ft below the RP.
- If used in the future, water level transducers must be able to record groundwater elevation to an accuracy of 0.1 ft. Transducer data should be compared to hand-measured groundwater levels to monitor electronic drift or cable movement.
- The water level meter is decontaminated before measuring domestic wells.

4.3.2 Assessment and Improvement of Groundwater Level Monitoring Network

§§ 354.38 Assessment and Improvement of Monitoring Network.

(a) Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.

(b) Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.

(c) If the monitoring network contains data gaps, the Plan shall include a description of the following:

(1) The location and reason for data gaps in the monitoring network.

(2) Local issues and circumstances that limit or prevent monitoring.

(d) Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.

(e) Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:

(1) Minimum threshold exceedances.

(2) Highly variable spatial or temporal conditions.

(3) Adverse impacts to beneficial uses and users of groundwater.

(4) The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.

~~§~~§ 354.34 Monitoring Network.

(c) Each monitoring network shall be designed to accomplish the following for each sustainability indicator:

(1) Chronic Lowering of Groundwater Levels. Demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features by the following methods:

(A) A sufficient density of monitoring wells to collect representative measurements through depth-discrete perforated intervals to characterize the groundwater table or potentiometric surface for each principal aquifer.

(B) Static groundwater elevation measurements shall be collected at least two times per year, to represent seasonal low and seasonal high groundwater conditions.

This section summarizes several portions of the groundwater level monitoring network that constitute data gaps, focused primarily on those data gaps that that “could affect the ability of the Plan to achieve the sustainability goal” (§ 354.38 [a]) for the EMA. Table 4-3 compares the suggested attributes of a groundwater level monitoring network from the BMPs to the current network and identifies data gaps (DWR, 2016b).

Per the SGMA regulations, a data gap:

> “refers to a lack of information that significantly affects the understanding of the basin setting or evaluation of the efficacy of Plan implementation and could limit the ability to assess whether a basin is being sustainably managed.”

This section also presents estimates of uncertainty regarding the principal data relied upon for the GSP.

The SGMA regulations require a sufficient density of monitoring wells to characterize the groundwater table or potentiometric surface for each principal aquifer. Professional judgment is also used to determine an adequate level of monitoring density. The monitoring density should allow for the sustainable management of the groundwater resource.

The BMP suggests a range of 0.2 to 10 wells per 100 square miles, with a median of 5 wells per 100 square miles from various cited studies to be sufficient to adequately represent groundwater conditions within a basin. For this density to be considered sufficient, the distribution of the wells within the basin to “yield representative information and about groundwater conditions as necessary to evaluate Plan implementation” (§ 354.34). The EMA is approximately 156 square miles, and the groundwater level monitoring network consists of 15 wells in the Paso Robles Formation and 9 wells in the Careaga Sand; which equates to approximately 10 wells and 6 wells per 100 square miles for the well density in the Paso Robles Formation and Careaga Sand, respectively.

Although the existing groundwater level monitoring network satisfies the well density guidance cited in the BMP, there ~~is one area~~are two areas identified within the EMA (see Figure 4-2) where the addition of monitoring wells would improve the hydrogeologic conceptual model (HCM) discussed in Section 3.2.

Table 4-3. Summary of Best Management Practices, Implementation Measures, and Data Gaps in the Groundwater Level Monitoring Network

Best Management Practice	Implementation Measures	Data Gap
Groundwater level data will be collected from each principal aquifer in the basin.	Groundwater level data is collected from 15 wells in the Paso Robles Formation and 9 wells in the Careaga Sand.	There are two areas of low density of monitoring points identified in the Paso Robles Formation. The GSA will contact well owners in these areas to determine if additional wells can be added to the network.
Groundwater level data must be sufficient to produce seasonal maps of groundwater elevations throughout the basin that clearly identify changes in groundwater flow direction and gradient (spatial density).	The groundwater level monitoring network is sufficient to produce seasonal maps of groundwater elevations throughout the EMA that clearly identify changes in groundwater flow direction and gradient (spatial density).	Some data used to prepare groundwater elevation maps (see Section 3.2) lack well construction information. Well construction information will be obtained from video surveys as funding allows.
Groundwater levels will be collected during the middle of October and March for comparative reporting purposes, although more frequent monitoring may be required (frequency).	All wells in the groundwater level monitoring network are monitored semi-annual basis in the spring and fall.	None Identified.
Data must be sufficient for mapping groundwater depressions, recharge areas, and along margins of basins where groundwater flow is known to enter or leave a basin.	The groundwater level monitoring network is sufficient for mapping groundwater depressions, recharge areas, and along margins of the EMA where groundwater flow is known to enter or leave the EMA, except in the vicinity of the Baseline Fault.	The addition of groundwater monitoring located on either side of the Baseline Fault would clarify the relationship of water levels across the fault and, by extension, its potential role in controlling groundwater flow. Selection of wells for this purpose will be considered when expanding the groundwater level monitoring network.

Best Management Practice	Implementation Measures	Data Gap
Well density must be adequate to determine changes in storage.	The groundwater level monitoring network is sufficiently distributed and meets California Department of Water Resources density requirements to determine changes in groundwater in storage.	The distribution of wells used to determine changes of storage would be optimized by including wells in the northwestern and central portions of the EMA. The GSA will contact well owners in these areas to determine if wells can be added to the network.
Long-term access agreements should be obtained for wells included in the monitoring network. Access agreements include year-round site access to allow for increased monitoring frequency.	There are currently informal well access agreement for wells included in the groundwater level monitoring network.	Formalized well access agreements will be obtained for wells in the groundwater level monitoring network. The GSA will contact well owners to formalize well access agreements during the GSP implementation period.

Notes

EMA = Santa Ynez River Valley Groundwater Basin Eastern Management Area

Figure 4-2. Groundwater Level Monitoring Network Low Well Density Areas

One area where the addition of monitoring wells would improve the HCM is in the Paso Robles Formation in the northwestern portions of the Santa Ynez Uplands from Los Olivos to the northern boundary of the Basin, including the northern reaches of Zaca creek and Alamo Pintado Creek. A second area where the addition of monitoring wells would improve the HCM is in the Paso Robles Formation in the central portion of the Basin, generally between Santa Agueda Creek and Happy Canyon (see Figure 4-2) An effort will be made during GSP implementation to contact owners of wells in these areas to determine if they can be included in the monitoring program. Including these additional wells in the groundwater level monitoring network would minimize the uncertainty of groundwater elevation trends and assist in sustainably managing the EMA.

Based on the State Water Resources Control Board (SWRCB) Irrigated Lands Regulatory Program (ILRP), private agricultural supply and domestic supply wells have been identified in the northwestern uplands and the central portion of the EMA. There are wells monitored by Santa Barbara County in these areas. However, most of these wells do not represent a single aquifer and therefore do not meet the criteria for a representative well. The Los Olivos Community Service District (LOCSD) is currently developing a monitoring plan for monitoring nitrate concentrations near Los Olivos. The nitrate monitoring plan will include the installation of at least one nested monitoring well completed in the Paso Robles Formation. This monitoring well (or wells) ~~will~~may be included in the EMA groundwater level monitoring network once completed. An effort will be made by the EMA GSA to strategically coordinate with the LOCSD monitoring program.

There are currently informal well access agreements for wells in the monitoring network. The GSP will contact well owners to formalize well access agreements during GSP implementation. Additionally, well construction information for 14 of 24 wells included in the groundwater level monitoring network is unknown. Section 352.4 of the SGMA regulations states that the water level within a well must represent a single aquifer, requiring accurate well construction information of the well. The well construction information in the groundwater level monitoring network should be determined using either video logs of wells and/or encouragement of owners to provide any well construction information for wells included in the groundwater level monitoring network.

The current understanding of groundwater flow across the Baseline Fault, discussed in Section 3.1.2.1 is that the Baseline Fault is either permeable or semipermeable and does not constitute a barrier to groundwater flow. The addition of groundwater monitoring on either side of the fault would clarify the relationship of water levels across the fault and, by extension, its potential role in controlling groundwater flow. Selection of wells for this purpose should be considered when expanding the groundwater level monitoring network.

There may be opportunities to optimize the groundwater level monitoring network in the EMA~~.~~ with regard to the monitoring frequency and density of the monitoring sites to provide an adequate level of detail about groundwater conditions. The number of wells included in the groundwater level monitoring network will be evaluated during each 5-year GSP interim review period~~.~~ to assess the effectiveness of management actions in response to (1) minimum threshold exceedances, (2) variable spatial or temporal conditions, (3) adverse impacts to beneficial uses and users of groundwater, and (4) the potential to adversely affect the implementation of the GSP or impede achievement of the sustainability goals. Hydrograph signatures from wells included in the groundwater level monitoring network will be compared for redundancy. Section 6 includes a discussion of how the monitoring network will be improved during GSP implementation.

4.4 Groundwater Storage Monitoring Network

§§ 354.34 Monitoring Network.

(e) A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.

(g) Each Plan shall describe the following information about the monitoring network:

(1) Scientific rationale for the monitoring site selection process.

(2) Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.

(3) For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.

(h) The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.

(j) An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.

This GSP uses groundwater levels as a proxy for assessing change in groundwater in storage (see Section 5). The groundwater level monitoring network described in Section 4.3 will be used to create groundwater elevation contour maps and calculate change of groundwater in storage for each principal aquifer. The SYRWCD prepares annual reports, which present calculations of the change of groundwater in storage within the SYRWCD boundaries. To the extent possible, wells used for this purpose are included in this groundwater level monitoring network. Therefore, the four factors of (1) groundwater use, (2) aquifer characteristics that affect groundwater flow, (3) impacts to beneficial uses and users, and (4) adequate monitoring results to demonstrate an understanding of aquifer response, that must be considered for the density of this monitoring network were considered for the development of the groundwater storage monitoring network.

4.4.1 Protocols for Monitoring Groundwater Storage

§§ 354.34 Monitoring Network.

(i) The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.

The groundwater level monitoring network will be used as a proxy for the groundwater storage monitoring network. Therefore, the protocols described in Section 4.3.1 for the groundwater level monitoring network are representative of protocols for the groundwater storage monitoring network.

4.4.2 Assessment and Improvement of Groundwater Storage Monitoring Network

§§ 354.38 Assessment and Improvement of Monitoring Network.

(a) Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.

(b) Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.

(c) If the monitoring network contains data gaps, the Plan shall include a description of the following:

(1) The location and reason for data gaps in the monitoring network.

(2) Local issues and circumstances that limit or prevent monitoring.

(d) Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.

(e) Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:

(1) Minimum threshold exceedances.

(2) Highly variable spatial or temporal conditions.

(3) Adverse impacts to beneficial uses and users of groundwater.

(4) The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.

§ 354.34 Monitoring Network.

(c) Each monitoring network shall be designed to accomplish the following for each sustainability indicator:

(2) Reduction of Groundwater Storage. Provide an estimate of the change in annual groundwater in storage.

The groundwater level monitoring network will be used as a proxy for the groundwater storage monitoring network. Therefore, the data gaps discussed in Section 4.3.2 for the groundwater level monitoring network are representative of data gaps in the groundwater storage monitoring network.

4.5 Seawater Intrusion Monitoring Network

§ 354.34 Monitoring Network.

(c) Each monitoring network shall be designed to accomplish the following for each sustainability indicator:

(3) Seawater Intrusion. Monitor seawater intrusion using chloride concentrations, or other measurements convertible to chloride concentrations, so that the current and projected rate and extent of seawater intrusion for each applicable principal aquifer may be calculated.

(e) A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.

(g) Each Plan shall describe the following information about the monitoring network:

(1) Scientific rationale for the monitoring site selection process.

(2) Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.

(3) For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.

(h) The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.

(i) The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.

(j) An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.

§ 354.38 Assessment and Improvement of Monitoring Network.

(a) Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.

(b) Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.

(c) If the monitoring network contains data gaps, the Plan shall include a description of the following:

(1) The location and reason for data gaps in the monitoring network.

(2) Local issues and circumstances that limit or prevent monitoring.

(d) Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.

(e) Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:

(1) Minimum threshold exceedances.

(2) Highly variable spatial or temporal conditions.

(3) Adverse impacts to beneficial uses and users of groundwater.

(4) The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.

The EMA is isolated from the Pacific Ocean and is not threatened by seawater intrusion; therefore, this GSP does not provide monitoring for the seawater intrusion sustainability indicator.

4.6 Degraded Water Quality Monitoring Network

§§ 354.34 Monitoring Network.

(e) A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.

(g) Each Plan shall describe the following information about the monitoring network:

(1) Scientific rationale for the monitoring site selection process.

(2) Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.

(3) For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.

(h) The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.

(j) An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.

The sustainability indicator for degraded water quality is evaluated by monitoring groundwater quality at a network of existing supply and monitoring wells. The SGMA regulations require sufficient spatial and temporal data from each principal aquifer to determine groundwater quality trends for water quality indicators to address known water quality issues. To the degree possible, the four factors of (1) groundwater use, (2) aquifer characteristics that affect groundwater flow, (3) impacts to beneficial uses and users, and (4) adequate monitoring results to demonstrate an understanding of aquifer response, were central to the development of the degraded water quality monitoring network. However, the degraded monitoring network for water quality included all of the data discussed in this section and, therefore, considers all of these factors to the greatest extent possible. Section 6 discusses management actions intended to improve the water quality monitoring network.

Potential point sources of groundwater quality degradation were identified using the SWRCB GeoTracker data management system. Waste Discharge Requirement permits from the SWRCB GeoTracker data management system were also reviewed. Section 3.2.3.1.3 summarizes information from GeoTracker for open/active contaminated sites. Figure 3-25 shows the locations of these potential groundwater contaminant point sources and the locations of completed/case-closed sites. The single open/active case is Jim's Service Center (Site ID T0608300118) that was eligible for closure as of January 30, 2019, per the Central Coast Regional Water Quality Control Board (RWQCB) Low-Threat Closure Policy (SBCPHD, 2019) and is included in the SWRCB leaking underground storage tank (LUST) Program. Site assessment reports indicate there are dissolved-phase benzene and methyl tert-butyl ether (MTBE) plumes in groundwater beneath the site. Alamo Pintado Creek was determined to be the sensitive downgradient receptor. Due to (1) the measured groundwater gradient in the area of the site, (2) the classification of Alamo Pintado Creek as a losing stream by the USGS National Hydrography Dataset (NHD), and (3) decreasing benzene and MTBE concentrations, a minimal threat to groundwater as a potable water source was determined (Flowline Consulting, Inc., 2018). Two monitoring sites (Well T0608300118-MW-8A and T0608300118-MW-4) are currently monitored at this site as part of the LUST program. However, these are shallow monitoring wells are completed in the tributary alluvium, which is not one of the two principal aquifers and hence the wells are not included in monitoring plan.

According to the California Department of Conservation, Geologic Energy Management Division online Well Finder, or WellSTAR, tool, the Zaca Oil Field is the only oil and gas field located within or adjacent to the EMA. The USGS, in cooperation with SWRCB, initiated the California Oil, Gas, and Groundwater (COGG) Program in 2015[49]. The objective of the COGG Program is to determine where and to what extent groundwater quality may be adversely impacted by proximal oil and gas development activities (Davis, et al., 2018). Results and interpretations from the COGG Program are not yet available for review. If results and interpretations do become available during the implementation period of this GSP, the GSA will consider these findings during GSP review periods.

Existing groundwater quality monitoring programs in the EMA and groundwater quality distribution and trends are described in Section 3.2.3. Identified constituents of concern are based on state and federal regulatory standards (maximum contaminant levels [MCLs] and secondary MCLs [SMCLs]) for drinking water established by the SWRCB Division of Drinking Water (DDW)[50] and the EPA, respectively. For agricultural uses, constituents of concern are based on water quality objectives presented in the *Water Quality Control Plan for the Central Coastal Basin* (WQ Basin Plan) (RWQCB, 2019). No minimum thresholds have been established for regulated contaminants because state regulatory agencies, including the RWQCB and the Department of Toxic Substances Control, have the responsibility and authority to regulate and direct actions that address contamination. Minimum thresholds and measurable objectives pertaining to concentrations of salts and nutrients (total dissolved solids [TDS], chloride, sulfate, boron, sodium, and nitrate) have been established based upon water quality objectives established in the WQ Basin Plan by the RWQCB.

Constituents of concern for drinking water will be assessed at municipal water supply wells as part of the SWRCB DDW program. Constituents of concern for agricultural and domestic use will be assessed as part of the state ILRP and reported on the GeoTracker website. According to the RWQCB proposed Ag Order 4.0, beginning in 2022, all ranches enrolled in the ILRP must conduct annual sampling of all on-farm domestic drinking water supply and irrigation wells between March 1 and May 31 of each year. All groundwater samples must be collected by a qualified third party using proper sample collecting and handling method. All groundwater monitoring data sampled to meet the minimum groundwater monitoring requirements of the Order will be submitted electronically to the SWRCB's GeoTracker database by the testing laboratory. (RWQCB, 2021)

Wells included in the groundwater level monitoring network are listed in Tables 4-1 and 4-2 and shown on Figure 4-3. All the wells from the GSP groundwater water quality monitoring network are RMS wells. Only wells completed in one of the two principal aquifers in the Santa Ynez Uplands are included in the groundwater quality monitoring network.

The groundwater quality monitoring network includes 26 municipal and public water system wells that were identified by reviewing data available from the SWRCB DDW located in the SWRCB's GAMA database.

49 Description available at https://webapps.usgs.gov/cogg/. (Accessed May 18, 2021.)
50 Available at SWRCB, https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Chemicalcontaminants.html (Accessed May 21, 2021)

Selected wells were sampled for at least one of the constituents of concern during 2015 or more recently. The 26 wells are listed in Table 4-4 and shown on Figure 4-3.

The agricultural supply wells and domestic supply wells included in the groundwater quality monitoring network were identified by reviewing data available from the ILRP located in the SWRCB's GAMA database. Selected wells were sampled in 2015 or more recently. There is a total of 35 ILRP wells in the groundwater quality monitoring network; 10 wells were determined to be domestic supply wells based on their GAMA ID and 25 wells were determined to be agricultural supply wells. ILRP wells are listed in Table 4-4 and shown on Figure 4-3. All wells in Table 4-4 associated with an Agricultural or Domestic "Well Use" are part of the ILRP. Going forward, wells that are sampled as part of the ILRP will be used to assess groundwater quality at agricultural and domestic wells.

Table 4-4. Groundwater Quality Monitoring Network

Well ID	Well Use[1]	Well Depth (ft bgs)	Top of Screen (ft bgs)	First Date Measured	Last Date Measured[2]	Years Measured
4200531-010	Municipal	—	75	10/25/1999	12/10/2018	20
4200612-006	Municipal	—	25	11/9/1999	2/7/2019	21
4200616-004	Municipal	—	120	8/16/2000	12/2/2018	19
4200800-001	Municipal	—	523	10/6/1987	2/14/2019	33
4200802-001	Municipal	—	243	4/13/1988	12/1/2018	31
4200802-002	Municipal	—	180	3/31/1999	12/1/2018	20
4200804-006	Municipal	—	410	5/8/2002	10/17/2018	17
4200804-008	Municipal	—	440	3/6/2003	10/17/2018	16
4200807-006	Municipal	—	230	7/14/2000	12/1/2018	19
4200807-009	Municipal	—	360	2/7/2001	12/2/2018	18
4200837-003	Municipal	—	480	1/8/2001	10/10/2018	18
4200837-004	Municipal	—	395	8/21/2002	10/10/2018	17
4200881-002	Municipal	—	—	3/3/2003	12/1/2018	16
4200881-005	Municipal	—	650	10/31/2001	12/1/2018	18
4200893-002	Municipal	—	240	7/23/2003	5/16/2018	16
4200893-003	Municipal	—	280	7/18/2005	5/16/2018	14
4200895-001	Municipal	—	125	8/5/2002	11/12/2018	17
4200915-001	Municipal	—	—	6/6/2000	3/25/2019	20
4200931-002	Municipal	—	—	10/21/2010	7/31/2018	9
4210013-001	Municipal	145	100	1/19/1984	11/14/2018	35
4210013-006	Municipal	550	250	6/12/1995	12/19/2018	24
4210013-015	Municipal	490	—	11/4/2014	12/19/2018	5
4210020-011	Municipal	—	—	7/24/1987	5/19/2015	29

Table 4-4. Groundwater Quality Monitoring Network

Well ID	Well Use[1]	Well Depth (ft bgs)	Top of Screen (ft bgs)	First Date Measured	Last Date Measured[2]	Years Measured	Number of Sampling Events	Aquifer
4210020-018	Municipal	—	130	3/22/1989	1/22/2019	31	53	Unknown
4210020-027	Municipal	—	540	11/8/2005	12/26/2018	14	28	Unknown
4210020-031	Municipal	—	640	8/13/2008	12/27/2018	11	23	Unknown
AGL020000786-ROBLAR_D/I	Domestic/ Agricultural	—	—	12/9/2013	11/29/2017	5	4	Unknown
AGL020000888-CLMWC	Agricultural	—	—	10/15/2012	9/7/2018	7	4	Unknown
AGL020000888-FAITH WELL	Agricultural	—	—	10/15/2012	9/7/2018	7	4	Unknown
AGL020001203-BW DOM	Domestic	—	—	10/10/2012	10/25/2017	6	4	Unknown
AGL020001203-WELL BW1	Agricultural	—	—	10/10/2012	10/25/2017	6	4	Unknown
AGL020002508-WELL	Agricultural	—	—	6/25/2015	11/10/2017	3	3	Unknown
AGL020003217-J BLOCK	Agricultural	—	—	11/21/2014	10/18/2017	4	4	Unknown
AGL020003217-WINERY	Agricultural	—	—	11/21/2014	10/18/2017	4	4	Unknown
AGL020003217-XRDS	Agricultural	—	—	4/25/2017	10/18/2017	1	2	Unknown
AGL020003684-TIERRA ALTA AG	Agricultural	—	—	11/28/2012	10/26/2017	6	4	Unknown
AGL020003684-TIERRA ALTA DOM	Domestic	—	—	11/28/2012	10/26/2017	6	4	Unknown
AGL020003688-FOX AG/DOMESTIC	Domestic/ Agricultural	—	—	3/27/2013	10/26/2017	5	3	Unknown

Table 4-4. Groundwater Quality Monitoring Network

Well ID	Well Use[1]	Well Depth (ft bgs)	Top of Screen (ft bgs)	First Date Measured	Last Date Measured[2]	Years Measured	Number of Sampling Events	Aquifer
AGL020003701-STAG CANYON DOM	Domestic	—	—	11/28/2012	10/26/2017	6	4	Unknown
AGL020004012-ESTELLE 8 & 9	Agricultural	—	—	3/27/2013	10/26/2017	5	3	Unknown
AGL020004012-ESTELLE VINEYAR	Agricultural	—	—	11/28/2012	10/26/2017	6	4	Unknown
AGL020004744-PRIMARY	Agricultural	—	—	9/19/2012	12/4/2017	6	4	Unknown
AGL020006120-COGVIN_D/I	Domestic/ Agricultural	—	—	12/4/2013	8/1/2017	5	4	Unknown
AGL020007172-VINEYARD WELL	Agricultural	—	—	10/15/2012	10/20/2017	6	4	Unknown
AGL020007556-WDVINEYARD	Agricultural	—	—	6/21/2015	12/12/2017	3	3	Unknown
AGL020007594-MIDDLE WELL	Agricultural	—	—	6/12/2017	12/29/2017	1	2	Unknown
AGL020012024-CAMP4_DOM	Domestic	—	—	12/3/2013	8/1/2017	5	3	Unknown
AGL020012024-CAMP4_IRR	Agricultural	—	—	12/3/2013	8/1/2017	5	3	Unknown
AGL020012024-CMP4NEW_I	Agricultural	—	—	8/1/2017	8/1/2017	1	1	Unknown
AGL020014886-SANGER RANCH A	Domestic	—	—	11/28/2012	10/26/2017	6	4	Unknown
AGL020023842-CCGC_0520	Agricultural	—	—	8/1/2017	8/1/2017	1	1	Unknown

Table 4-4. Groundwater Quality Monitoring Network

Well ID	Well Use[1]	Well Depth (ft bgs)	Top of Screen (ft bgs)	First Date Measured	Last Date Measured[2]	Years Measured	Number of Sampling Events	Aquifer
AGL020027368-WELL	Agricultural	—	—	6/7/2016	9/15/2016	1	2	Unknown
AGL020027634-EDISON WELL	Agricultural	—	—	8/12/2015	11/19/2015	1	2	Unknown
AGL020027634-IRRIGATION WELL	Agricultural	—	—	8/12/2015	11/19/2015	1	2	Unknown
AGL020027994-SYV#1	Agricultural	—	—	6/15/2017	6/15/2017	1	1	Unknown
AGL020027994-SYV#2	Agricultural	—	—	12/1/2017	12/1/2017	1	1	Unknown
AGL020028004-AG WELL 1	Agricultural	—	—	12/26/2017	1/16/2018	2	2	Unknown
AGL020028294-PEGASUS DOM	Domestic	—	—	4/12/2018	4/12/2018	1	1	Unknown
AGL020028294-PEGASUS IRR	Agricultural	—	—	11/20/2017	4/11/2018	2	2	Unknown
AGL020028389-VINE WELL	Agricultural	—	—	4/28/2017	10/26/2017	1	2	Unknown
AGL020028425-RODNEYSVYD	Domestic	—	—	12/20/2017	4/12/2018	2	2	Unknown

Notes

[1] Municipal designation includes municipal wells and other public water supply wells.
[2] Based on data available at the time of this analysis.
Data available at: https://gamagroundwater.waterboards.ca.gov/gama/gamamap/public/

— = No data available
? = Unknown
bgs = below ground surface
Tca = Careaga Sand

Figure 4-3. Groundwater Quality Monitoring Network

4.6.1 Protocols for Monitoring Degraded Water Quality

§§ 354.34 Monitoring Network.

(i) The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.

Water quality samples are currently being collected in accordance with the SWRCB DDW for municipal drinking water supply wells and ILRP requirements for agricultural and domestic wells. The ILRP data are currently collected under Central Coast RWQCB Agricultural Order 3.0 (see Section 2). The ILRP samples are collected under the Tier 1, Tier 2, or Tier 3 monitoring and reporting programs. Beginning in 2022, ILRP water quality data will be collected under Central Coast RWQCB Ag Order 4.0. Copies of these monitoring and reporting programs are included in Appendix G and incorporated herein as monitoring protocols. These protocols will continue to be followed during GSP implementation for the groundwater quality monitoring.

4.6.2 Assessment and Improvement of Water Quality Monitoring Network

§§ 354.38 Assessment and Improvement of Monitoring Network.

(a) Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.

(b) Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.

(c) If the monitoring network contains data gaps, the Plan shall include a description of the following:

(1) The location and reason for data gaps in the monitoring network.

(2) Local issues and circumstances that limit or prevent monitoring.

(d) Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.

(e) Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:

(1) Minimum threshold exceedances.

(2) Highly variable spatial or temporal conditions.

(3) Adverse impacts to beneficial uses and users of groundwater.

(4) The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.

§ 354.34 Monitoring Network.

(c) Each monitoring network shall be designed to accomplish the following for each sustainability indicator:

(4) Degraded Water Quality. Collect sufficient spatial and temporal data from each applicable principal aquifer to determine groundwater quality trends for water quality indicators, as determined by the Agency, to address known water quality issues.

Groundwater quality data do not indicate a need for additional monitoring locations and that current programs provide adequate spatial and temporal coverage for the purposes of the GSP. There is adequate spatial coverage in the groundwater quality monitoring network to assess impacts, if any, to beneficial uses and users. Table 4-5 summarizes the recommendations for groundwater quality monitoring from DWR BMPs, the current network, and identified data gaps. For 40 of 61 wells in the monitoring network, well construction information is unknown and will be addressed during GSP implementation by using DWR Online System for Well Completion Reports data and continued outreach by the GSA to groundwater users in EMA.

The LOCSD is currently developing a monitoring plan for monitoring nitrate concentrations near Los Olivos, including constructing new wells. An effort will be made by the EMA to strategically coordinate with the LOCSD monitoring program and include the Los Olivos monitoring wells into the EMA monitoring program.

The degraded groundwater quality monitoring network in the EMA will be optimized during the implementation period with regard to the monitoring frequency and density of the monitoring sites to provide an adequate level of detail about groundwater conditions. The number of wells included in the groundwater level monitoring network will be evaluated during each 5-year GSP interim review period to assess the effectiveness of management actions in response to (1) minimum threshold exceedances, (2) variable spatial or temporal conditions, (3) adverse impacts to beneficial uses and users of groundwater, and (4) the potential to adversely affect the implementation of the GSP or impede achievement of the sustainability goal. Section 6 discusses management actions intended to improve the water quality monitoring network.

Table 4-5. Summary of Best Management Practices, Implementation Measures, and Data Gaps in the Water Quality Monitoring Network

Best Management Practice	Implementation Measure	Data Gap
Monitor groundwater quality data from each principal aquifer in the basin that is currently, or may be in the future, impacted by degraded water quality. The spatial distribution must be adequate to map or supplement mapping of known contaminants. Monitoring should occur based upon professional opinion, but generally correlate to the seasonal high and low groundwater level, or more frequent as appropriate.	Public databases provide adequate spatial and temporal water quality data to identify and evaluate water quality trends in principal aquifers in the EMA.	The current groundwater quality monitoring network is of adequate spatial distribution to map or supplement mapping of any known contaminants. Due to a lack of well construction information, aquifers are not assigned to 58 of 61 wells in the water quality monitoring network. Well construction information will be included as available, and aquifers will be assigned as funding allows.
Collect groundwater quality data from each principal aquifer in the basin that is currently, or may be in the future, impacted by degraded water quality. Agencies should use existing water quality monitoring data to the greatest degree possible. For example, these could include ILRP, GAMA, existing RWQCB monitoring and remediation programs, and drinking water source assessment programs.	The water quality monitoring network within the EMA includes 26 municipal wells (monitored by the SWRCB DDW program) and 35 agricultural and domestic wells (monitored by the SWRCB ILRP) within principal aquifers that have been regularly sampled since at least 2015 for groundwater quality.	The current monitoring network utilizes existing water quality monitoring data from the SWRCB DDW and ILRP. Wells included in these programs provide adequate spatial distribution to map water quality in principal aquifers in the EMA. Well construction information will be developed as funding allows
Define the three-dimensional extent of any existing degraded water quality impact.	The water quality monitoring network provides adequate spatial distribution and coverage of principal aquifers to define the three-dimensional extent of any existing degraded water quality impact.	Well construction information for 40 of 61 wells in the groundwater quality monitoring network is unknown. Well construction information will be developed as funding allows
Data should be sufficient to assess groundwater quality impacts to beneficial uses and users.	The water quality monitoring network provides sufficient water quality data, spatial distribution, and coverage of principal aquifers to assess potential impacts to beneficial uses and users of groundwater in the EMA.	Well construction information for 40 of 61 wells in the groundwater quality monitoring network is unknown. Well construction information will be developed as funding allows.

Best Management Practice	Implementation Measure	Data Gap
Data should be adequate to evaluate whether management activities are contributing to water quality degradation.	Projects and management actions proposed for implementation by the GSA will be evaluated for potential impacts to all five sustainability indicators applicable to the EMA. Existing groundwater quality monitoring programs (SWRCB DDW, ILRP, and LUST program), spatial distribution of monitored wells, and coverage of principal aquifers will provide adequate data to evaluate whether management activities are contributing to water quality degradation throughout the GSP implementation period. Additionally, select projects and management actions (e.g., recharge of treated wastewater) may be subject to further regulatory review such as the California Environmental Quality Act.	None identified.

Notes

DDW = Division of Drinking Water
GSA = Groundwater Sustainability Agency
GSP = Groundwater Sustainability Plan
ILRP = Irrigated Lands Regulatory Program
InSAR = Interferometric Synthetic-Aperture Radar
LUST = leaking underground storage tank
RWQCB = Regional Water Quality Control Board
SWRCB = State Water Resources Control Board

4.7 Land Subsidence Monitoring Network

§ 354.34 Monitoring Network.

(c) Each monitoring network shall be designed to accomplish the following for each sustainability indicator:

(5) Land Subsidence. Identify the rate and extent of land subsidence, which may be measured by extensometers, surveying, remote sensing technology, or other appropriate method.

(e) A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.

(g) Each Plan shall describe the following information about the monitoring network:

(g) Each Plan shall describe the following information about the monitoring network:

(1) Scientific rationale for the monitoring site selection process.

(3) For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.

(h) The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.

(j) An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.

Locally defined significant and unreasonable conditions for land subsidence are (1) land subsidence rates exceeding rates estimated by using ~~Interferometric Synthetic Aperture Radar (InSAR)~~InSAR data that are collected by the European Space Agency Sentinel-1A satellite and processed by TRE ALTAMIRA, Inc. for the period from June 13, 2015, through September 19, 2019 (TRE ALTAMIRA, Inc., 2020) and the National Aeronautics and Space Administration (NASA) Jet Propulsion Laboratory (JPL) for the period between spring of 2015 and summer of 2017 (NASA JPL, 2018); and (2) land subsidence that causes significant and unreasonable damage to or substantially interferes with groundwater supply, land uses, infrastructure, and property interests. InSAR measured subsidence in the EMA are presented on Figure 3-33. The dark blue areas are areas with measured ground surface rise of between 0 feet (ft) and 0.25 ft. The teal area on Figure 3-33 is the area with measured ground surface drop of 0 ft to 0.25 ft. Random sampling of the 100-meter by 100-meter (328-ft by 328-ft) calculation grid cells indicates the greatest amount of subsidence in the EMA has occurred in the wedge-shaped area that is bound by and includes Los Olivos, State Highway 154, and the base of the San Rafael Mountains. Total measured negative change in land surface elevation in the EMA from June 13, 2015, through September 19, 2019, has been less than 0.06 ft, or 0.015 ft per year. Recorded subsidence could be due to tectonic activity, groundwater extraction, oil and gas extraction, or a combination of the three. This is considered a minor rate of land surface elevation change and is relatively insignificant and not a major concern for the EMA. However, ongoing subsidence over many years could add up to a more significant ground surface drop. The EMA will continue to monitor annual land surface elevation change using InSAR and UNAVCO satellite systems.

4.7.1 Protocols for Monitoring Land Subsidence

§ 354.34 Monitoring Network.

(g) Each Plan shall describe the following information about the monitoring network:

(2) Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.

(i) The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.

The DWR BMP notes that no standard operating procedures exist for collecting land subsidence data. DWR InSAR data will continue to be monitored annually throughout the GSP implementation period. If additional relevant data sets become available, they will be evaluated and incorporated into the monitoring program.

Should potential land subsidence be observed at rates exceeding the minimum threshold (see Section 5), the GSA will first assess whether the subsidence may be due to (1) groundwater pumping and (2) elastic processes (subsidence that will recover with rising groundwater). If subsidence is observed, approaches the minimum threshold, causes undesirable results, and appears to be related to pumping, the GSA will undertake a program to install land surface elevation benchmarks at critical infrastructure locations, and monitor subsidence with measured land surface elevations on an annual basis.

4.7.2 Assessment and Improvement of Land Subsidence Monitoring Network

§§ 354.38 Assessment and Improvement of Monitoring Network.

(a) Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.

(b) Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.

(c) If the monitoring network contains data gaps, the Plan shall include a description of the following:

(1) The location and reason for data gaps in the monitoring network.

(2) Local issues and circumstances that limit or prevent monitoring.

(d) Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.

(e) Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:

(1) Minimum threshold exceedances.

(2) Highly variable spatial or temporal conditions.

(3) Adverse impacts to beneficial uses and users of groundwater.

(4) The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.

The subsidence minimum thresholds are set to avoid significant and unreasonable subsidence that could substantially interfere with groundwater supply, land uses, infrastructure, and property interests. Available data indicate that there is currently little subsidence occurring in the EMA that affects groundwater supply, land uses, infrastructure, and property interests. If an undesirable result occurs, the land subsidence monitoring network may be expanded to include additional monitoring stations near areas identified as having critical infrastructure, oil and gas extraction, or significant groundwater pumping.

The adequacy of the subsidence monitoring network in the EMA will be evaluated annually during preparation of the annual report. If the satellite monitoring data indicate that subsidence may be occurring, a network of land surface elevation benchmarks will be added to the monitoring program.

4.8 Depletion of Interconnected Surface Water Monitoring Network

§§ 354.34 Monitoring Network.

(c) Each monitoring network shall be designed to accomplish the following for each sustainability indicator:

(6) Depletions of Interconnected Surface Water. Monitor surface water and groundwater, where interconnected surface water conditions exist, to characterize the spatial and temporal exchanges between surface water and groundwater, and to calibrate and apply the tools and methods necessary to calculate depletions of surface water caused by groundwater extractions. The monitoring network shall be able to characterize the following:

(A) Flow conditions including surface water discharge, surface water head, and baseflow contribution.

(B) Identifying the approximate date and location where ephemeral or intermittent flowing streams and rivers cease to flow, if applicable.

(C) Temporal change in conditions due to variations in stream discharge and regional groundwater extraction.

(D) Other factors that may be necessary to identify adverse impacts on beneficial uses of the surface water.

(e) A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.

(g) Each Plan shall describe the following information about the monitoring network:

(1) Scientific rationale for the monitoring site selection process.

(2) Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.

(3) For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.

(h) The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.

(j) An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.

The classification of the streams within the EMA using the USGS NHD are presented in Section 3.2.5 (USGS, 2020). Stream classifications in the EMA include perennial, intermittent, and streams that are perennial in some segments and intermittent in other segments.

According to the NHD, the entire Santa Ynez River is defined as a perennial stream, as are several of its tributaries. Upstream of Bradbury Dam, perennial creeks include both Santa Cruz Creek and Cachuma Creek, which flow into Cachuma Reservoir (Lake Cachuma). Below Bradbury Dam, the other creeks classified as perennial include the following (in order from upstream to downstream): San Lucas Creek, Zanja de Cota Creek, Quiota Creek, and Alisal Creek. The entirety of three creeks are classified as intermittent: Happy Canyon Creek, Alamo Pintado Creek, and Ballard Canyon. The upstream portions of Santa Agueda Creek and Zaca Creek are perennial and become intermittent downstream.

Diversions from the Santa Ynez River alluvium are regulated by the SWRCB because it is considered underflow associated with the Santa Ynez River. Therefore, the EMA GSA will not be responsible for managing any aspect of the Santa Ynez River.

A significant source of recharge to the Paso Formation occurs within the shallow alluvial sand and gravel beds of tributaries where they are in direct contact with the underlying Paso Robles Formation. Percolating water moves readily through the alluvium in the Santa Ynez Uplands (LaFreniere and French, 1968). In these areas, the tributaries are losing streams, contributing to the groundwater in the underlying Paso Robles Formation (and Older Alluvium). Further south, near the distal ends of the tributaries, the streams draining the Santa Ynez Uplands discharge into the north side of the Santa Ynez River. Groundwater in the tributary alluvium at these locations encounters relatively impermeable bedrock underlying the Santa Ynez River, which forces the groundwater to discharge to surface water (Upson and Thomasson, 1951).

Where the valleys are narrow and the cross-sectional area of tributary alluvium is decreased, groundwater may be forced to the surface and at times become intermittent or perennial flow in the stream channels. Such narrowing occurs where stream channels have cut through the consolidated rocks that form the south boundary of the Santa Ynez Uplands area. This causes the re-emergence of streamflow typically during the spring and early summer months within Alamo Pintado, Santa Agueda, Zanja de Cota, and Zaca Creeks (Figure 3-34). The entirety of Cachuma and Santa Cruz Creeks as well as the lower end of Zanja De Cota Creek and the upper portion of Santa Agueda Creek are perennial. All other groundwater that discharges naturally from the EMA is either transpired by plants or discharged as underflow through thin, narrow strands of alluvium that line the valley's tributaries to the Santa Ynez River.

Santa Agueda Creek and Ballard Canyon Creek have had streamflow gauging stations, which have been removed. Streamflow gages remain in the tributaries to the Santa Ynez River within Alamo Pintado Creek and Santa Cruz Creek. Surface water flow has been estimated for Alisal, Santa Agueda, Zanja de Cota, Alamo Pintado, and Zaca Creeks for the period between 1941 and 2019 based on correlations with documented streamflow in Salsipuedes Creek and the prior stream gages that no longer exist (Stetson, 2008).

As discussed in Section 3.2, an analysis was completed to identify potential groundwater dependent ecosystems (GDEs) within the Santa Ynez Uplands (identified as Category A GDEs). To avoid impacts to Category A GDEs, groundwater levels will be used as a proxy for monitoring interconnected surface water because installation of surface water gauging stations is not considered feasible due to access and channel configuration limitations. Shallow monitoring wells, or piezometers, are planned to be installed and monitored within the Category A GDE areas identified near the confluence of Alamo Pintado and Zanja de Cota Creeks with the Santa Ynez River (see Figure 4-4). Piezometers will be constructed in accordance with SGMA requirements (§ 352.4). Avoiding adverse impacts on beneficial uses of interconnected surface water present in the EMA and preserving existing habitat are the focus of the depletion of interconnected surface sustainability indicator (see Section 5.10). The sustainability criterion for depletion of interconnected surface water is focused on avoiding significant and unreasonable adverse impacts to GDEs and sensitive species.

There is no intention at this time, nor a regulatory requirement, to create new habitat or restore habitat that existed prior to the enactment of SGMA in January of 2015. In conjunction with the Natural Communities Commonly Associated with Groundwater data set available from DWR, measured groundwater elevation data was used to identify locations in the EMA where groundwater levels were within 30 ft of ground surface. The Nature Conservancy guidelines suggest that areas overlying groundwater by more than 30 ft may be removed from the GDE category, as the depth is too great to support habitat (TNC, 2019). The evaluation mapped GDEs in the watershed include both aquatic and riparian habitat types located in Alamo Pintado and Zanja de Cota Creek.

Groundwater elevation near the potential GDEs discussed in Section 3.2 will be used as a proxy for the depletion of interconnected surface water sustainability indicator. The existing condition supports significant habitat values. As a result, significant and unreasonable effects to Category A GDEs include the following:

- Permanent loss or significant degradation of existing native riparian or aquatic habitat due to lowered groundwater levels caused by ~~pumping~~groundwater extractions
- Temporary acute loss of aquatic habitat in specific locations critical to sensitive aquatic species due to lowered groundwater levels caused by ~~pumping~~groundwater extractions
- Groundwater levels will be used as a proxy for the depletion of interconnected surface water sustainability indicator. Groundwater levels measured below the maximum rooting depth of GDEs along with an aforementioned loss of habitat would be significant and unreasonable

Monitoring of groundwater levels near the confluence of Alamo Pintado and Zanja de Cota Creek with the Santa Ynez River will be conducted by the GSA as part of the EMA interconnected surface water monitoring program to assess whether there is potential for a long-term depletion of interconnected surface water and decline in the health of the vegetation and eventual permanent habitat loss. Minimum thresholds and measurable objectives for the surface water depletion indicator have been established at these locations.

Figure 4-4. Interconnected Surface Water Monitoring Network

4.8.1 Protocols for Monitoring Depletion of Interconnected Surface Water

§§ 354.34 Monitoring Network.

(i) The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.

Groundwater level measurements from piezometers will be used for the interconnected surface water monitoring network. Pressure transducers will continuously monitor groundwater levels in the piezometers. When there is time of drought/reduced surface water flow, data will be collected from the transducers in the piezometers monthly. Manual measurements will be used to calibrate the pressure transducers. Therefore, the protocols described for the groundwater level monitoring network are representative of protocols for the interconnected surface water network.

4.8.2 Assessment and Improvement of Depletion of Interconnected Surface Water Monitoring Network

Groundwater levels will be used as a proxy for monitoring interconnected surface water. To that end, shallow monitoring wells, or piezometers, are planned to be installed and monitored within the Category A GDE areas identified near the confluence of Alamo Pintado and Zanja de Cota Creeks with the Santa Ynez River (see Figure 4-4). Piezometers will be constructed in accordance with SGMA requirements (§ 352.4).

As discussed in the Projects and Management Actions section (Section 6) and the implementation plan (Section 7), groundwater levels will be used as a proxy for monitoring surface water depletion because it is not feasible to install reliable surface water gauging stations. New piezometers are planned to be installed to monitor surface water depletion in two tributaries where interconnected surface water and groundwater is evident. The adequacy of the interconnected surface water monitoring network will be evaluated annually and during each 5-year GSP review period to assess the effectiveness of management actions considering (1) minimum threshold exceedances, (2) variable spatial or temporal conditions, (3) adverse impacts to beneficial uses and users of groundwater, and (4) the potential to adversely affect the implementation of the GSP or impede achievement of the sustainability goal.

4.9 Representative Monitoring Sites

§§ 354.36 Representative Monitoring. Each Agency may designate a subset of monitoring sites as representative of conditions in the basin or an area of the basin, as follows:

(a) Representative monitoring sites may be designated by the Agency as the point at which sustainability indicators are monitored, and for which quantitative values for minimum thresholds, measurable objectives, and interim milestones are defined.

(b) 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.

(2) Measurable objectives established for groundwater elevation shall include a reasonable margin of operational flexibility taking into consideration the basin setting to avoid undesirable results for the sustainability indicators for which groundwater elevation measurements serve as a proxy.

(c) The designation of a representative monitoring site shall be supported by adequate evidence demonstrating that the site reflects general conditions in the area.

All the wells in the EMA groundwater level monitoring network are RMSs. Representative wells for the groundwater level monitoring network were selected based on criteria presented in Section 4.3. Minimum thresholds and measurable objectives for chronic groundwater level decline are presented in Sections 5.5.2 and 5.5.3, and minimum thresholds and measurable objectives for reduction of groundwater in storage are presented in Sections 5.6.2 and 5.6.3.

The RMS wells are included in the broader EMA groundwater quality monitoring program that includes municipal wells monitored for DDW compliance and agricultural and domestic wells that are sampled as part of the ILRP. Data from RMS wells are evaluated in terms of the sustainable management criteria presented in Section 5.8. The groundwater quality RMS network is indicated in Table 4-4 and shown in Figure 5-3. Minimum thresholds and measurable objectives for degraded groundwater quality are presented in Sections 5.8.2 and 5.8.3.

The potential for impacts to interconnected surface water and GDEs are discussed in Section 5.10.1. Minimum thresholds and measurable objectives for interconnected surface water and GDEs are presented in Sections 5.10.2 and 5.10.3.

4.10 Reporting Monitoring Data to the Department (Data Management System)

§§ 354.40 Reporting Monitoring Data to the Department. Monitoring data shall be stored in the data management system developed pursuant to Section 352.6. A copy of the monitoring data shall be included in the Annual Report and submitted electronically on forms provided by the Department.

The SGMA regulations provide broad requirements on data management, stating that a GSP must adhere to the following guidelines for a data management system (DMS):

- Article 3, Section 352.6: "Each Agency shall develop and maintain a data management system that is capable of storing and reporting information relevant to the development or implementation of the Plan and monitoring of the basin."
- Article 5, Section 354.40: "Monitoring data shall be stored in the data management system developed pursuant to Section 352.6. A copy of the monitoring data shall be included in the Annual Report and submitted electronically on forms provided by the Department."

SGMA-related data for the EMA will be incorporated into the DMS. Entities in the EMA that collect and report data will have access and authorization to enter their data into the DMS. The data and information stored in the DMS will be presented on a web-based map viewer that displays data relevant to SGMA implementation, GSP development, and annual reporting to the DWR. The map viewer accommodates data within and outside of GSA monitoring networks. The types of data visualized on the map and available via the map's navigation menu are listed in Table 4-6. Details of the DMS are included in Appendix H.

Data sources used to populate the DMS are listed on Table 4-7. Details of the data sources are included in Appendix H. Data templates are used to standardize the format of the data going into the DMS to support data consistency and provide for QA/QC of the data. The templates are Excel documents that include rules restricting formatting and alphanumeric properties. The templates include pop-up windows to describe the type of data that should be entered in each column. As a second level of QA/QC, the compiled data is reviewed by the DMS development team before they are migrated into the database. This review is focused and limited in scope. It includes the following checks:

- Identifying outliers that may have been introduced during the original data entry process
- Removing or flagging questionable data
- Visualizing data in various software platforms outside the DMS to further assess the quality of the data

The automated and manual data checks above make sure data is in an appropriate range but do not confirm the quality of the data for a single observation.

Data stored in the DMS are separated by categories into tables. Each field within the tables hold a specific type of data, such as a number, text, or date, as shown in Figure 4-5. The figure is color-coordinated to show the relationship between tables:

- Main tables (shown in blue) include point data with a unique identification and unique point location to be added to database (e.g., WellIWell_Info and SiteStation_Info).
- Sub-tables (shown in green) are related to the main table and hold additional details about the well or unique identifier (e.g., correlation of a well point with a water level or water quality)

A brief description of the main tables and sub tables is provided as Table 4-8.

Table 4-6. Summary of Data Available for Sustainability Indicators

Sustainability Indicator	Data Types
Groundwater Levels	Water level data and well construction information
Groundwater in storage	Groundwater storage monitoring network sites
Water Quality	Water quality well and station data as reported by GAMA, including the DDW, ILRP, and LUST programs
Land Subsidence	Land elevation data from the UNAVCO CGPS ORES and InSAR data.
Interconnected Surface Water	Groundwater levels, stream gages, and precipitation stations.

Notes

CGPS = continuous global positioning system
DDW = Division of Drinking Water
GSA = Groundwater Sustainability Agency
GAMA = Groundwater Ambient Monitoring and Assessment Program
ILRP = Irrigated Lands Regulatory Program
InSAR = Interferometric Synthetic-Aperture Radar
LUST = leaking underground storage tank
UNAVCO = University NAVSTAR Consortium

Table 4-7. Summary of Data Sources

Data Type	Source	Coverage	Period of Record
Well and Site Info	DWR, ID No. 1, SYRWCD, Cities, local agencies, mutual water companies	Entire EMA	Current
Aquifer Properties	Participating Agencies Aquifer Testing (forthcoming)	Southern	
Water Level Data	USGS (NWIS) includes CASGEM, local agencies and Santa Barbara County data	583 wells within and surrounding EMA	1905 to present
Water Level Data	City of Solvang	Solvang	2008 to present
Water Level Data	ID No. 1	ID No. 1 within EMA	Pending
Water Level Data	Mutual water companies	Uplands	Recent years
Water Quality Data	GeoTracker Groundwater Ambient Monitoring & Assessment (GAMA)[1]	Entire EMA	Historical and current
Precipitation Data	Santa Barbara County	EMA and surrounding	1910 to present (Mostly 1950 to present)
Groundwater Pumpage	SYRWCD	SYRWCD	1979 to present
Oil and Gas Well Geophysical Logs	California Geologic Energy Management Division (CalGEM)	117 wells within EMA	Complete
Ground Surface Elevation	USGS	1 Meter Lidar	2018
Land Subsidence	UNAVCO CGPS ORES and InSAR data	Entire watershed and EMA	2001 to present (UNAVCO) 2015 to 2019 (InSAR)
Pumping Data (including injections for recharge)	SYRWCD and SWRCB	SYRWCD and some outlying portions of EMA	Various years through present

Notes

[1] Available at https://gamagroundwater.waterboards.ca.gov/gama/gamamap/public/

CASGEM = California Statewide Groundwater Elevation Monitoring CGPS = continuous global positioning system DWR = California Department of Water Resources
GAMA = Groundwater Ambient Monitoring and Assessment Program ID No. 1 = Santa Ynez River Water Conservation District, Improvement District No. 1
InSAR = Interferometric Synthetic Aperture Radar NWIS = National Water Information System SWRCB = State Water Resources Control Board
USGS = U.S. Geological Survey UNAVCO = University NAVSTAR Consortium

Table 4-8. Data Management System Table Descriptions

Table	Description
Main Tables	
Station Info	Information about type of station (well, recharge site, diversion, gage, extensometer, GSP) and location information
Well Info	General information about well, including identifiers used by various agencies
Sub Tables	
Agencies	Agency associated with the well or site
Sustainability Indicators	Minimum thresholds and measurable objectives set for monitoring network sites tracking sustainable management criteria for SGMA compliance
Well Construction	Well construction information, including depth, diameter, etc.
Well Construction Screen	Supplements 'Well Construction' with well screen information (one well can have many screens)
Well Geologic Aquifer	Information about the aquifer parameters of the well such as pumping test information, confinement, and transmissivity
Well Geologic Lithology	Lithologic information at a well site (each well may have many lithologies at different depths)
Water Level	Water level measurements for wells
Well Pumping	Pumping measurements for wells, annual or monthly
Managed Recharge	Recharge measurements for a recharge site, annual or monthly
SW Diversion	Diversion volume measurements for a diversion site, annual or monthly
Water Quality	Contains water quality data for wells or any other type of site

Notes

GSP = Groundwater Sustainability Plan
SGMA = Sustainable Groundwater Management Act

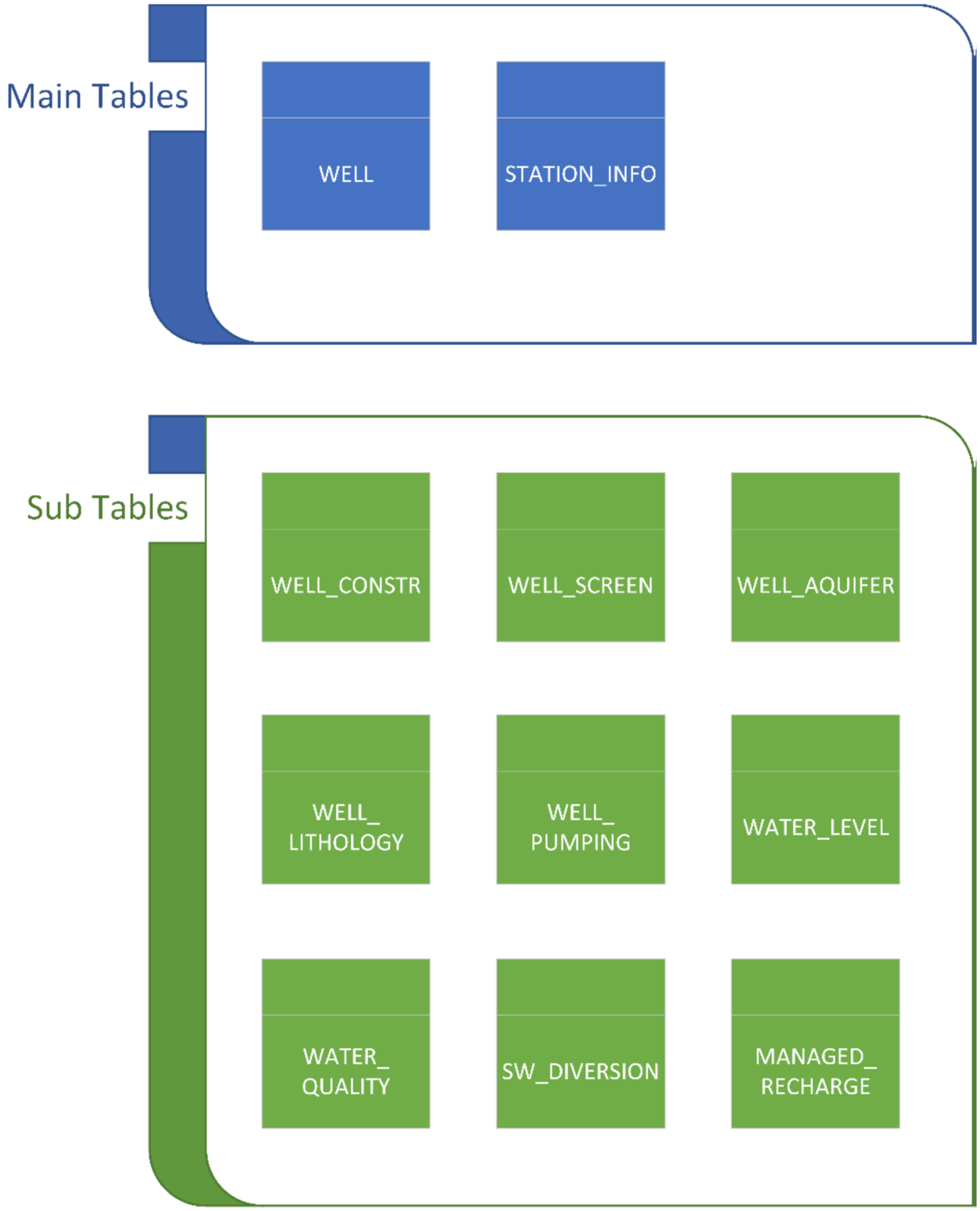

Figure 4-5. Santa Ynez Groundwater Basin Eastern Management Area Data Management System Tables

4.11 References and Technical Studies

§§ 354.4 General Information.

(b) Each Plan shall include the following general information: A list of references and technical studies relied upon by the Agency in developing the Plan. Each Agency shall provide to the Department electronic copies of reports and other documents and materials cited as references that are not generally available to the public.

County of Santa Barbara et al. 2016. *Draft Memorandum of Understanding for Implementation of the Sustainable Groundwater Management Act in the Santa Ynez River Valley Groundwater Basin*. Executed by the County of Santa Barbara; Santa Ynez River Water Conservation District; Santa Ynez River Water Conservation District, Improvement District No. 1; City of Solvang, City of Buellton; City of Lompoc; Vandenburg Village Community Services District; and Mission Hills Community Services District.

Davis, T.A, M.K Landon, and G.L Bennett. 2018. Prioritization of Oil and Gas Fields for Regional Groundwater Monitoring Based on Preliminary Assessment of Petroleum Resource Development and Proximity to California's Groundwater Resources. Scientific Investigation Report 2018-5065.

DWR. 2010. California Statewide Groundwater Elevation Monitoring (CASGEM) Program Procedures for Monitoring Entity Reporting. December.

DWR. 2016a. Best Management Practices for the Sustainable Management of Groundwater – Monitoring Protocols, Standards, and Sites.

DWR. 2016b. Best Management Practices for the Sustainable Management of Groundwater – Monitoring Networks and Identification of Data Gaps.

DWR. 2018. Santa Ynez River Valley Groundwater Basin Bulletin 118 Update 2016. Prepared by the California Department of Water Resources.

EPA. 2006. Guidance on Systematic Planning Using the Data Quality Objective Process. Prepared by the U.S. Environmental Protection Agency.

Flowline Consulting, Inc. 2018. Fourth Quarter 2018 Monitoring Report and Request for Case Closure, 2015 Mission Drive (Hwy 246), Solvang, California, LUFT Site #50121, SWRCB Global ID #T0608300118. December 20, 2018.

ID No. 1 et al. 2017. *Memorandum of Agreement for Formation of a Groundwater Sustainability Agency for the Eastern Management Area in the Santa Ynez River Valley Groundwater Basin Under the Sustainable Groundwater Management Act*. Prepared by Santa Ynez River Water Conservation District, Improvement District No. 1, City of Solvang, Santa Ynez River Water Conservation District, and Santa Barbara County Water Agency.

LaFreniere, G.F., and J.J. French. 1968. Ground-Water Resources of the Santa Ynez Upland Ground-Water Basin, Santa Barbara County, California. Prepared by G.F. LaFreniere and J.J. French in cooperation with the Santa Barbara County Water Agency for the U.S. Geological Survey.

NASA JPL. 2018. InSar Land Surveying and Mapping Services in Support of the DWR SGMA Program Technical Report.

RWQCB. 2019. Water Quality Control Plan for the Central Coastal Basin. June.

RWQCB. 2021. Proposed General Waste Discharge Requirements for Discharges from Irrigated Lands. April.

SBCPHD. 2019. 2015 Mission Drive, Solvang, California; Jim's Service Center, LUFT Site # 50121. Santa Barbara County Public Health Department, Environmental Health Services Division: Letter from E. Steven Nailor, REHS, EIT, SBCPHD, to Jim Enderle, Jim's Service Center.

Stetson. 2008. Description and Documentation for Santa Ynez River RiverWare Model Task 2: Operation Model- Draft. Prepared by Stetson Engineers, Inc.

TNC. 2019. Identifying GDEs Under SGMA, Best Practices for Using the NC Dataset. Prepared by The Nature Conservancy (TNC). July 2019.

TRE ALTAMIRA, Inc. 2020. InSar Land Surveying and Mapping Services in Support of the DWR SGMA Program Technical Report. March.

USGS. 2020. The National Map, Data Download and Visualization Services. NHD National Hydrography Dataset View (V1.0). Provided by the U.S. Geological Survey. Available at https://www.usgs.gov/media/files/nhdplus-high-resolution-data-model-v10. (Accessed August 5, 2021.)

Upson, J.E., and H.G. Thomasson, Jr. 1951. Geology and Water Resources of the Santa Ynez River Basin, Santa Barbara County, California. Prepared by J.E. Upson and H.G. Thomasson, Jr. in cooperation with Santa Barbara County for the U.S. Geological Survey.

SECTION 5: **Sustainable Management Criteria** [Article 5, Subarticle 3]

§§ 354.22 Introduction to Sustainable Management Criteria. This Subarticle describes criteria by which an Agency defines conditions in its Plan that constitute sustainable groundwater management for the basin, including the process by which the Agency shall characterize undesirable results, and establish minimum thresholds and measurable objectives for each applicable sustainability indicator.

This section defines the conditions that constitute sustainable groundwater management and discusses the process by which the Santa Ynez River Valley Groundwater Basin (Basin) Eastern Management Area (EMA) Groundwater Sustainability Agency (GSA) will characterize undesirable results and establish minimum thresholds and measurable objectives for eachthe five sustainability indicatorindicators in the EMA in accordance with the Sustainable Groundwater Management Act (SGMA).

Section 5 presents the data and methods used to develop sustainable management criteria (SMCs) and demonstrates how these criteria take into consideration beneficial uses and groundwater users. The SMCs presented in this section are based on currently available data and application of the best available science. As noted in Section 3 of this EMA Groundwater Sustainability Plan (GSP or Plan), data gaps exist in the hydrogeologic conceptual model. Uncertainty caused by these data gaps was considered when developing the SMCs. These SMCs are considered initial criteria and will be reevaluated and potentially modified in the future as new data become available.

The SMCs are grouped by sustainability indicator. The following five sustainability indicators are applicable in the EMA and could lead to significant and unreasonable effects caused by groundwater conditions occurring throughout the EMA:

- Chronic lowering of groundwater levels
- Reduction of groundwater in storage
- Degraded groundwaterwater quality
- Land subsidence
- Depletion of interconnected surface water

The EMA is isolated from the Pacific Ocean and is not threatened by seawater intrusion; therefore, the sixth SMC, seawater intrusion, is not applicable in the EMA.

According to SGMA regulations, “Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.” (GSP Regulations, § 354.26(a)).

To retain a consistent and organized approach, this section follows the same format for each sustainability indicator. The description of each SMC includes all the information required by § 354.22 et seq. of the SGMA regulations and outlined in the SMC best management practice (BMP) guidance (DWR, 2017), including the following:

- How the definition of what might constitute significant and unreasonable effects was developed
- How undesirable results were developed, including:
  - The criteria for defining when and where the potential effects on beneficial uses and users of groundwater as described by the sustainability indicators cause undesirable results (when the effects are significant and unreasonable), based on a quantitative description of the combination of minimum threshold exceedances (§ 354.26 (b)(2))
  - The potential causes of undesirable results (§ 354.26 (b)(1))
  - The effects of these undesirable results on beneficial users and uses, and on land uses and property interests (§ 354.26 (b)(3))
- How minimum thresholds were developed, including the following:
  - The information and methodology used to develop minimum thresholds (§ 354.28 (b)(1))
  - The relationship between minimum thresholds and each sustainability indicator (§ 354.28 (b)(2))
  - The effect of minimum thresholds on neighboring basins (§ 354.28 (b)(3))
  - The effect of minimum thresholds on beneficial uses and users, and on land uses and property interests (§ 354.28 (b)(4))
  - How minimum thresholds relate to relevant federal, state, or local standards (§ 354.28 (b)(5))
  - The method for quantitatively measuring minimum thresholds (§ 354.28 (b)(6))
- How measurable objectives and interim milestones were developed, including the following:
  - The methodology for setting measurable objectives (§ 354.30)
  - The methodology for setting interim milestones (§§ 354.30 (a), 354.30 (e), and 354.34 (g)(3))

5.1 Definitions

SGMA and the SGMA regulations include several terms relevant to the SMCs. The terms below use the definitions in the SGMA regulations (§ 351, Article 2). Where appropriate, additional explanatory text is added in italics. This explanatory text is not part of the official definitions of these terms. To the extent where appropriate, plain language, with only a limited use of highly technical terms and acronyms, was used to assist as broad an audience as possible in understanding the development process and implications of the SMCs.

Groundwater-dependent ecosystem (GDE) refers to ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface.

Interconnected surface water refers to 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 completely depleted. *Interconnected surface waters are parts of streams, lakes, or wetlands where the groundwater table is close enough to the ground surface to influence water in the lakes, streams, or wetlands or vice versa.*

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

Management area (MA) refers to an area within a basin for which the Plan may identify different minimum thresholds, measurable objectives, monitoring, or projects and management actions based on differences in water use sector, water source type, geology, aquifer characteristics, or other factors.

Measurable objectives (MOs) refer to 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 Plan is designed to achieve.

Minimum thresholds (MTs) refer to numeric values for each sustainability indicator that are used to define undesirable results. Minimum thresholds ~~are~~have been established at representative monitoring sites. *Minimum thresholds are set once potential undesirable results are defined when an unreasonable condition might occur. For example, a particular groundwater level might be a minimum threshold if lower groundwater levels would result in a significant and unreasonable reduction of groundwater in storage or depletion of supply.*

Representative monitoring site (RMS) refers to a monitoring site within a broader network of sites that typifies one or more conditions within the basin or an area of the basin. This term is synonymous with representative well site.

Sustainability indicator refers to any of the effects caused by groundwater conditions due to groundwater use occurring throughout the basin that, when significant and unreasonable, cause undesirable results. *They are the set of six conditions defined by the California Department of Water Resources (DWR) that may be present in a basin that may result in effects, when significant and unreasonable, that cause undesirable results (defined below), and impact sustainability of the basin as described in California Water Code § 10721(x).*

Uncertainty refers to a lack of understanding of the basin setting that significantly affects the Agency's[51] ability to develop SMCs and appropriate projects and management actions in the Plan,[52] or to evaluate the efficacy of Plan implementation, and therefore may limit the ability to assess whether a basin is being sustainably managed.

Undesirable result refers to the definition provided in § 10721(x) of SGMA, which states that:

> *Undesirable result means one or more of the following effects caused by groundwater conditions occurring throughout the basin:*
>
> *(1)* ***Chronic lowering of groundwater levels*** *indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. 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.*
>
> *(2) Significant and unreasonable* ***reduction of groundwater storage.***
>
> *(3) Significant and unreasonable* ***seawater intrusion.***
>
> *(4) Significant and unreasonable* ***degraded water quality****, including the migration of contaminant plumes that impair water supplies.*
>
> *(5) Significant and unreasonable* ***land subsidence*** *that substantially interferes with surface land uses.*
>
> *(6)* ***Depletions of interconnected surface water*** *that have significant and unreasonable adverse impacts on beneficial uses of the surface water.*

[51] The EMA-GSA is the Agency referred to in this definition.
[52] The EMA GSP is the Plan referred to in this definition.

Section 354.26(b)(2) of the SGMA regulations states that "The criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin."

5.2 Sustainability Goal [§ 354.24]

§ 354.24 Sustainability Goal. Each Agency shall establish in its Plan a sustainability goal for the basin that culminates in the absence of undesirable results within 20 years of the applicable statutory deadline. The Plan shall include a description of the sustainability goal, including information from the basin setting used to establish the sustainability goal, a discussion of the measures that will be implemented to ensure that the basin will be operated within its sustainable yield, and an explanation of how the sustainability goal is likely to be achieved within 20 years of Plan implementation and is likely to be maintained through the planning and implementation horizon.

Per § 354.24 of the SGMA regulations, this GSP's discussion of the sustainability goal consists of three parts:

- A description of the sustainability goal
- A discussion of the measures that will be implemented to ensure the EMA will be operated within sustainable yield
- An explanation of how the sustainability goal is likely to be achieved

Sustainability Goal: Because each of the groundwater management areas together encompass the entire Basin, a single sustainability goal has been adopted for the entire Santa Ynez River Valley Groundwater Basin as follows:

In accordance with the Sustainable Groundwater Management Act (SGMA), the sustainability goal for the Santa Ynez River Valley Groundwater Basin (Basin) is to sustainably manage the groundwater resources in the Western, Central, and Eastern Management Areas to ensure that the Basin is operated within its sustainable yield for the protection of reasonable and beneficial uses and users of groundwater. The absence of undesirable results, as defined by SGMA and the Groundwater Sustainability Plans (GSPs), will indicate that the sustainability goal has been achieved. Sustainable groundwater management as implemented through the GSPs is designed to ensure that:

1. *Long-term groundwater elevations are adequate to support existing and future reasonable and beneficial uses throughout the Basin,*
2. *A sufficient volume of groundwater storage remains available during drought conditions and recovers during wet conditions,*
3. *Groundwater production, and projects and management actions undertaken through SGMA, do not degrade water quality conditions in order to support ongoing reasonable and beneficial uses of groundwater for agricultural, municipal, domestic, industrial, and environmental purposes.*

Groundwater resources will be managed through projects and management actions implemented under the GSPs by the respective Groundwater Sustainability Agencies (GSAs). Management of the Basin will be supported by monitoring groundwater levels, groundwater *in storage, groundwater quality, land surface elevations, interconnected surface water, and seawater intrusion. The GSAs will adaptively manage any projects and management actions to ensure that the GSPs are effective and undesirable results are avoided.*

The EMA GSP includes a monitoring program (see Section 4) that addresses each of the applicable sustainability indicators. If, based on the results of the monitoring program, minimum thresholds are exceeded such that undesirable effects are present or imminent, the GSA will identify management actions and projects that will be implemented to avoid an undesirable result (see Section 6). Other projects and management actions may be implemented immediately upon GSP adoption, without a specific nexus to undesirable results, to address data gaps and collect important data regarding basin conditions.

5.2.1 Qualitative Objectives for Meeting Sustainability Goals

Qualitative objectives are designed to help stakeholders understand the overall purpose for sustainably managing groundwater resources (e.g., avoid chronic lowering of groundwater levels) and reflect the local economic, social, and environmental values within the EMA. A qualitative objective is often compared to a mission statement. The qualitative objectives for the EMA are the following:

- **Avoid Chronic Lowering of Groundwater Levels**
  - Maintain groundwater levels that continue to support current and ongoing beneficial uses and users of groundwater use in the EMA.
- **Avoid Chronic Reduction of Groundwater in Storage**
  - Maintain sufficient groundwater volumes in storage to sustain current and ongoing beneficial uses and users of groundwater which maintains access to groundwater supplies, including during prolonged drought conditions while avoiding permanent degradation of GDEs resulting from groundwater ~~pumping~~conditions occurring throughout the EMA.
- **Avoid Degraded Groundwater Quality**
  - Maintain groundwater access to suitable water quality for all beneficial uses to ensure sustainability of groundwater drinking water supplies for all beneficial uses.
  - Evaluate changes in groundwater quality resulting from groundwater ~~pumping~~conditions occurring throughout the EMA.
- **Avoid Land Subsidence**
  - Reduce or prevent land subsidence that causes significant and unreasonable effects to groundwater supply, current land uses, and water supply infrastructure, and property interests.
- **Avoid Depletion of Interconnected Surface Water**
  - Avoid depletions of interconnected surface water that have significant and unreasonable adverse impacts to beneficial uses of the surface water, including GDEs, caused by groundwater ~~pumping~~conditions occurring throughout the EMA.
  - Maintain sufficient groundwater levels to maintain areas of interconnected surface water existing as of January 2015 when SGMA was enacted.
- **Avoid Seawater Intrusion**
  - Not applicable due to the inland location of the EMA.

5.3 Process for Establishing Sustainable Management Criteria [§ 354.26(a)]

§ 354.26 Undesirable Results.

(a) **Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.**

This section presents the process that was used to develop the SMCs for the EMA, including input obtained from EMA stakeholders, the criteria used to define undesirable results, and the information used to establish minimum thresholds and measurable objectives.

5.3.1 Public Input

The public input process was developed in conjunction with the GSA member agencies and included engagement with local stakeholders and interested parties on GSP issues. This included the formation of the Citizens Advisory Group (CAG), whose members were selected by the GSA Committee because they have an interest in maintaining a healthy agricultural and business community, good water quality, and a healthy environment as being representative of the various beneficial uses and users of groundwater in the EMA. The SMCs and beneficial uses presented in this section were developed using a combination of information from public input, public meetings, written comments submitted to the GSA, hydrogeologic analysis, and meetings with CAG members. Details of outreach efforts and efforts to obtain public input are described in Section 2.3.

The general process for establishing SMCs included the following:

- Holding a CAG meeting that outlined the GSP development process and introduced stakeholders to SMCs.
- Conducting public meetings to present initial conceptual minimum thresholds and measurable objectives and receive additional public input. Six public meetings on SMCs were held.[53] The meetings were held remotely due to COVID-19 restrictions on public gatherings.

[53] See https://portal.santaynezwater.org/calendar?gsaKey=EMA for details on the meetings and workshops.

5.3.2 Criteria for Defining Undesirable Results [§ 354.26(b)(1) and (d), (b)(3)]

§ 354.26 Undesirable Results.

(b) The description of undesirable results shall include the following:

(1) The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.

(d) An Agency that is able to demonstrate that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin shall not be required to establish criteria for undesirable results related to those sustainability indicators.

(3) Description of potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results.

Section 5.2.1 discusses the qualitative objectives for meeting sustainability goals. These goals were discussed in terms of avoiding undesirable results for each of the sustainability indicators. The general criteria used to define undesirable results in the EMA are as follows:

- There must be significant and unreasonable effects caused by groundwater conditions occurring throughout the basin
- A minimum threshold is exceeded in a specified number of representative wells over a prescribed period such that there is a depletion of supply
- Impacts to beneficial uses, including GDEs, are likely to occur, including to GDEs and/or threatened or endangered species

These criteria may be refined periodically during the 20-year GSP implementation period based on monitoring data and analysis.

5.3.3 Information and Methodology Used to Establish Minimum Thresholds and Measurable Objectives [§ 354.28(b)(1),(c)(1)(A)(B), and (e)]

§ 354.28 Minimum Thresholds.

(b) The description of minimum thresholds shall include the following:

(1) The information and criteria relied upon to establish and justify the minimum thresholds for each sustainability indicator. The justification for the minimum threshold shall be supported by information provided in the basin setting, and other data or models as appropriate, and qualified by the uncertainty in the understanding of the basin setting.

(c) Minimum thresholds for each sustainability indicator shall be defined as follows:

(1) Chronic Lowering of Groundwater Levels. The minimum threshold for chronic lowering of groundwater levels shall be the groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results. Minimum thresholds for chronic lowering of groundwater levels shall be supported by the following:

(A) The rate of groundwater elevation decline based on historical trend, water year type, and projected water use in the basin.

(B) Potential effects on other sustainability indicators.

(e) An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish minimum thresholds related to those sustainability indicators.

The following information and data were used to establish minimum thresholds and measurable objectives for each of the sustainability indicators.

5.3.3.1 Avoid Chronic Lowering of Groundwater Levels

The information used for establishing the minimum thresholds and measurable objectives that pertain to chronic lowering of groundwater levels includes the following:

- Information gathered from the public meetings about the public's perspective of significant and unreasonable conditions and preferred current and future groundwater levels.
- Historical groundwater level data plotted versus time from wells monitored by the U.S. Geological Survey (USGS); Santa Ynez River Water Conservation District Improvement District No. 1 (ID No. 1); City of Solvang; U.S. Bureau of Reclamation; mutual water companies; Santa Barbara County; and other public agencies.
- Well construction details and locations of existing wells were compiled from DWR databases and from water purveyors. A well impact analysis was performed by comparing spring 2018 water level elevations with top of well screen elevations for agricultural, municipal wells, and domestic wells. The percentage of wells with water levels below top of screen was calculated in 5-foot increments, starting with spring 2018 water levels (see Section 3.2). Water levels that are chronically below the top of screen in more

than 40 percent of wells used in the analysis is considered undesirable because a reduction in well production and depletion of supply may occur.

- Maps of current and historical groundwater level data.
- Mapping of the location and types of GDEs where groundwater is interconnected with surface water.

The monitoring network and protocols that will be used to measure groundwater levels at the RMSs are presented in Section 4.

5.3.3.2 Avoid ChronicSignificant and Unreasonable Reduction of Groundwater in Storage

Groundwater levels can be used as a proxy for assessing changes in groundwater in storage and evaluating whether total groundwater withdrawals within the EMA could lead to undesirable results. Therefore, the information that is used to establish minimum thresholds and measurable objectives for the chronic groundwater level decline sustainability indicator will be used to define the sustainability criteria for chronicsignificant and unreasonable reduction of groundwater in storage.

5.3.3.3 Avoid Significant and Unreasonable Degraded Groundwater Quality

The information used for assessing degraded groundwater quality thresholds includes the following:

- Historical groundwater quality data from wells in the EMA
- Municipal drinking water supply wells (City of Solvang, ID No. 1, and mutual water company wells) and water quality data obtained from the State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW) public supply well water quality program
- Domestic and irrigation well water quality data obtained from the SWRCB Irrigated Lands Regulatory Program (ILRP) and USGS National Water Information System
- Observation well water quality data obtained from Santa Barbara County and the California Statewide Groundwater Elevation Monitoring (CASGEM) program, the USGS Groundwater Ambient Monitoring and Assessment (GAMA) Program, and SWRCB GeoTracker database
- Federal and state drinking water quality standards (SWRCB, 2019) and EMA water quality objectives (WQOs) presented in the Water Quality Control Plan for the Central Coastal Basin (WQ Basin Plan) (RWQCB, 2019)
- Feedback about significant and unreasonable conditions from the GSA Committee Members, CAG, and the public

The historical groundwater quality data used to establish thresholds are presented in Section 3.2.3.

Thresholds for contaminants (e.g., volatile organic compounds) are not proposed because assessment, source identification, and cleanup of these constituents of concern are regulated under the authority of state agencies, including the Central Coast Regional Water Quality Control Board (RWQCB). The GSA does not have the responsibility nor the authority to manage contaminants. It is, however, the responsibility of the GSA to ensure concentrations, if any, of these constituents present in groundwater prior to the enactment of SGMA in January 2015 are not increased because of groundwater pumping, or actions taken by the GSA. Elevated concentrations of salts and nutrients (e.g., total dissolved solids [TDS], sulfate, chloride, and nitrate) can impact beneficial uses, including drinking water and agricultural uses. Thus, minimum thresholds and measurable objectives are proposed for these constituents in accordance with the WQ Basin Plan.

5.3.3.4 Avoid Significant and Unreasonable Land Subsidence

Minimum thresholds for land subsidence were established to protect groundwater supply, land uses, and infrastructure from significant and unreasonable land subsidence that may lead to undesirable results. Changes in land surface elevation may be caused by tectonic activity, oil and gas production, and groundwater pumping. Changes in ground surface elevation are presently measured using Interferometric Synthetic Aperture Radar (InSAR) data available from DWR and the two University NAVSTAR Consortium (UNAVCO) Continuous Global Positioning Systems (CGPSs), located on the periphery of the EMA in Solvang and Los Olivos. The general minimum threshold is the absence of long-term significant and unreasonable land subsidence arising from groundwater pumping in the EMA that substantially interferes with surface land uses. Section 3.2.4 includes a detailed discussion of the InSAR data provided by DWR and the measured land subsidence data collected by the UNAVCO CGPSs.

As described in Section 3.1.3 of the GSP, the Principal Aquifers in the Basin include the Paso Robles Formation and Careaga Sand. The Paso Robles Formation contains relatively thin, often discontinuous sand and gravel layers interbedded with thicker layers of silt and clay; however, the fine-grained material that would be subject to subsidence are not laterally continuous, which tends to reduce the likelihood for significant subsidence. The Careaga Sand consists of fine-grained to medium-grained, uniform, massive, marine sand with some gravel and limestone; therefore, lacking laterally continuous fine-grained material susceptible to significant subsidence. Land surface elevation changes recorded by the UNAVCO CGPSs located in periphery of EMA during the 19-year period of record (approximately 2001 through 2020) is approximately plus or minus 10 millimeters (mm), or 0.03 feet. There have been no reports from landowners or public agencies of impacts resulting from subsidence.

To supplement the InSAR and UNAVCO data, a preliminary subsidence evaluation was completed to assess the range of possible long-term ground surface elevation changes related to withdrawal of groundwater from the EMA. The preliminary evaluation included developing stratigraphic profiles from well logs and estimating ranges of possible long-term subsidence that might be expected in the future. The analysis was completed at two well locations (ID1 5a and ID1 6) with estimated potential subsidence on the order of 0.5 to 3 feet over the next 20 years resulting from the changes in groundwater elevation reported in the hydrographs. This report is presented in Appendix E and additional discussion is included in Section 3.2.4. This estimate is considered speculative due to the lack of data on material properties of geologic materials in the basin. Due to a lack of subsidence data for the portion of the EMA where pumping effects are likely to be the greatest, a subsidence monitoring program is proposed and presented in Section 4.

5.3.3.5 Avoid Significant and Unreasonable Depletion of Interconnected Surface Water

The information used for establishing minimum thresholds and measurable objectives for depletion of interconnected surface water includes the following:

- Available data from streamflow gauging stations (see Table 3-1).
- Water budget computations using the groundwater model that show estimated exchanges between surface water and groundwater within the areas where groundwater is interconnected with surface water (distal ends of Zanja de Cota and Alamo Pintado Creeks).
- Published documents and independent analysis that identify the extent and distribution of potential GDEs, including designated critical habitat for steelhead.
- Public input.

5.3.4 Relationship between Individual Minimum Thresholds and Other Sustainability Indicators [§ 354.28(b)(2)]

§ 354.28 Minimum Thresholds.

(b) The description of minimum thresholds shall include the following:

(2) The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.

Section 354.28 of the SGMA regulations requires that the description of all minimum thresholds include a discussion about the relationship between the minimum thresholds for each sustainability indicator. In its BMP guidance for SMCs (DWR, 2017), DWR has clarified this requirement. The GSP must describe the relationship between each sustainability indicator's minimum threshold and describe the relationship between the selected minimum threshold and minimum thresholds for other sustainability indicators.

5.4 Representative Monitoring Sites

Minimum thresholds and measurable objectives are measured at RMSs (also referred to as representative wells) that are deemed to be representative of local and EMA-wide groundwater conditions in each Principal Aquifer. Representative wells were selected from a subset of the wells that have been monitored over time in the EMA and have the following characteristics:

- They are screened exclusively within a Principal Aquifer.
- They are spatially distributed to provide information across most of the EMA.
- They are presently being monitored and have a reasonably long record of data (period of record) so that trends can be determined.
- They have signatures (groundwater levels or water quality trends) that are representative of wells in the surrounding area.

See Section 4 for a detailed discussion of the rationale for selecting RMSs. In summary, the RMS network for groundwater levels consists of 24 wells (15 wells in the Paso Robles Formation and 9 wells in the Careaga Sand) that will be used to help identify whether chronic reductions in groundwater levels and significant and unreasonable reductions of groundwater storage are occurring. Seven wells are municipal drinking water supply wells operated by the City of Solvang and ID No. 1, 10 wells are production wells used for agricultural irrigation, and seven wells are domestic drinking water wells. These active pumping wells are currently included as RMSs because of their location in the EMA, available well construction data, and a long period of record.

RMS wells and many other wells with historical water level data were used in the modeling of groundwater level changes under historical and predicted future groundwater demand with and without climate change influences. Minimum thresholds and measurable objectives have been established using measured groundwater level data.

The RMS for subsidence utilizes InSAR and UNAVCO satellite data. Should these satellite-based subsidence monitoring methods indicate that subsidence may be occurring or if there is evidence of damage to infrastructure and property interests, benchmarks for monitoring land surface elevations will be established in the EMA. The RMS for monitoring depletion of interconnected surface water and impacts to GDEs will be established at two new piezometers installed on the distal ends of Alamo Pintado and Zanja de Cota Creeks.

Minimum thresholds and measurable objectives for chronic groundwater level decline are presented in Section 5.5, and minimum thresholds and measurable objectives for reduction of groundwater in storage are presented in Section 5.6. The potential for impacts to GDEs for the chronic lowering of groundwater levels sustainability indicator are discussed in Section 5.5 and for the interconnected surface water sustainability indicator in Section 5.10. Minimum thresholds and measurable objectives for degraded groundwater quality are discussed in Section 5.8 and for land subsidence in Section 5.9.

5.5 Chronic Lowering of Groundwater Levels Sustainable Management Criterion

5.5.1 Undesirable Results for Water Levels [§ 354.26(a),(b)(2),(c) and (d)]

§ 354.26 Undesirable Results.

(a) Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.

(b) The description of undesirable results shall include the following:

(2) The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.

(c) The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.

(d) An Agency that is able to demonstrate that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin shall not be required to establish criteria for undesirable results related to those sustainability indicators.

Conditions in the EMA that could lead to significant and unreasonable effects on groundwater levels include the following:

- **Extended drought.** Extensive droughts may lead to excessively low groundwater levels and undesirable results. Short-term impacts due to drought are anticipated in the SGMA regulations with recognition that management actions need sufficient flexibility to accommodate drought periods and ensure short-term impacts can be offset by increases in groundwater levels or storage during normal or wet periods.

- **High rate of pumping in the Paso Robles Formation.** If the amount of pumping in the Paso Robles Formation exceeds the long-term rate of recharge, then groundwater levels may decline, which could affect Paso Robles Formation well production and result in depletion of supply, a reduction in groundwater discharge to interconnected surface water, and potential impacts to GDEs.
- **High rate of pumping in the Careaga Sand.** If the amount of pumping in the Careaga Sand exceeds the long-term rate of natural recharge then groundwater levels may decline, which could affect Careaga Sand well production and result in depletion of supply, a reduction in groundwater discharge to interconnected surface water, and potential impacts to GDEs.

Lowering of groundwater levels that are likely to cause undesirable results are characterized as follows:

- Groundwater levels in the Paso Robles Formation or Careaga Sand aquifers remain below minimum thresholds (see Section 5.5.2) after 2 consecutive years of average and above-average precipitation in 50 percent of representative wells.
- Existing agricultural, municipal, and domestic wells are unable to produce ~~historical average quantities~~the estimated sustainable yield of ~~groundwater~~the EMA due to chronic decline in groundwater levels caused by groundwater conditions occurring throughout the EMA (e.g., significant and unreasonable depletion of supply).

As discussed in Section 3.2.1, Paso Robles Formation and Careaga Sand well hydrographs illustrate that water levels go up and down in response to changes in rainfall. Water levels have still not recovered fully from the severe drought observed between water year (WY) 2012 and 2016 and rainfall continues to be below average. Based on input from water users in the EMA and review of available water level data, no significant and unreasonable effects associated with groundwater level decline have been observed in the EMA, including the period since 2015 after SGMA came into effect. There have been no specific reports from stakeholders that wells have needed to be deepened or replaced. DWR's database on dry domestic wells in the state was reviewed and there was no data showing domestic wells going dry within the EMA. Local drillers were also consulted, and they indicated that there have not been a significant number of deeper replacement wells drilled in the EMA. If current and/or increased rates of pumping continue and drought conditions persist (see Section 3.3.5), undesirable results could occur in the future.

5.5.2 Minimum Thresholds for Water Levels [§ 354.28(a),(b)(1),(c)(1)(A)(B),(d), and (e)]

§ 354.28 Minimum Thresholds.

(a) Each Agency in its Plan shall establish minimum thresholds that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site established pursuant to Section 354.36. The numeric value used to define minimum thresholds shall represent a point in the basin that, if exceeded, may cause undesirable results as described in Section 354.26.

(b) The description of minimum thresholds shall include the following:

(1) The information and criteria relied upon to establish and justify the minimum thresholds for each sustainability indicator. The justification for the minimum threshold shall be supported by information provided in the basin setting, and other data or models as appropriate, and qualified by the uncertainty in the understanding of the basin setting.

(c) Minimum thresholds for each sustainability indicator shall be defined as follows:

(1) Chronic Lowering of Groundwater Levels. The minimum threshold for chronic lowering of groundwater levels shall be the groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results. Minimum thresholds for chronic lowering of groundwater levels shall be supported by the following:

(A) The rate of groundwater elevation decline based on historical trend, water year type, and projected water use in the basin.

(B) Potential effects on other sustainability indicators.

(d) 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.

(e) An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish minimum thresholds related to those sustainability indicators.

Section 354.28(c)(1) of the SGMA regulations states that "The minimum threshold for chronic lowering of groundwater levels shall be the groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results." In a public GSA meeting, one of the GSA Committee members identified several guiding principles for setting minimum thresholds that other committee members unanimously supported, including:

- Thresholds should be adaptive to observed conditions – not everything is known
- Learn from other basins that have significant problems that must be avoided
- Use the same thresholds for all well types

- Protect the most vulnerable groundwater users and well types
- An ounce of prevention is worth more than a pound of cure

When selecting the minimum thresholds, the GSA Committee considered these principles: the groundwater in storage deficit that was estimated for the historical period and the projected future period (see Section 3.3); the potential for impacts to domestic, municipal, and agricultural wells if water levels continue to decline (discussed below); and the potential for depletion of surface water and impacts to identified GDEs (see Section 5.10). Members of the GSA Committee were also concerned about the severity of the existing drought and the lack of rainfall recharge in the Basin.

The well impact analysis was performed to aid in identifying undesirable results and selecting minimum thresholds for the chronic lowering of groundwater levels sustainability indicator. Spring 2018 groundwater elevations were compared with top of well screen elevations for a total of 487 agricultural, municipal, and domestic wells screened in principal aquifers within the EMA. These wells were selected because of known location and well construction details. The percentage of wells with water levels below top of screen was calculated in 5-foot increments, starting with spring 2018 water levels (see Figures 3-20 and 3-21). Water levels that consistently fall below the top of screen are likely to result in increased well clogging from biological growth and mineral precipitation, cascading water, sand pumping, and reduced yield and pump efficiencies and possibly if continued, well failure. Fundamental to this analysis is the assumption that these conditions are indicative of a significant and unreasonable depletion of supply.[54]

These conditions are considered by the GSA to be undesirable. The magnitude of this impact on well production differs depending on well type (i.e., agricultural versus municipal, versus domestic). For example, domestic wells tend to be shallower and may be more sensitive to water levels falling within the screen interval. Likewise, municipal wells serve drinking water to citizens living in the EMA and so supply reduction cannot be easily addressed. Agricultural wells often are deeper and have longer well screens that can tolerate loss of efficiency and more drawdown resulting from water levels falling below top of screen.

Spring 2018 groundwater elevations measured in EMA monitoring wells were used to assess how many wells have static water levels that are below the top of screen elevation as of that date and how many would be below top of screen if groundwater levels were lower.[55] The well impact analysis was used to determine the number and type of wells in the EMA that would be further impacted (groundwater elevations below well top of screen elevation) if groundwater elevations decline further compared to spring 2018 groundwater elevations. When considering where to set the minimum thresholds, specific consideration was given to domestic wells, which are generally shallower, and municipal wells, which serve larger populations.[56]

[54] There was considerable debate among stakeholders about how much depletion of supply could result from water levels falling below the top of screen. Municipal, agricultural, and domestic wells have different sensitivities to this condition and will experience depletion of supply differently. The methodology and results of this analysis were discussed with stakeholders and ultimately accepted by the GSA Committee as the basis for establishing undesirable results and minimum thresholds.
[55] Spring 2018 groundwater elevations were selected based on recent available data with the greatest number of monitoring locations.
[56] Domestic well owners and local municipalities cannot easily respond to a reduction in supply, particularly during extended dry periods, and would have to absorb substantial cost if wells had to be deepened or replaced. The GSA decided to not allow water levels in municipal wells to drop below the top of screen if possible. Local agricultural interests were less concerned about water levels falling below top of screen because they have not observed undesirable results or depletion of supply and so wanted to set the minimum thresholds deeper.

The results of the analysis presented in Figures 5-1 and 5-2 indicate that groundwater water elevations in spring 2018 were below top of screen in 28 percent of domestic wells and 34 percent of agricultural wells screened in the Paso Robles Formation. No municipal wells had groundwater elevations below the top of well screen (see Figure 5-1). Groundwater elevations in the Careaga Sand aquifer were below top of screen in 35 percent of domestic wells, 28 percent of agricultural wells, and 17 percent of municipal wells (including one well owned by the City of Solvang; see Figure 5-2).

Table 5-1 presents the minimum thresholds and measurable objectives to be measured at representative wells completed in the Paso Robles Formation and Careaga Sand. Appendix I of the GSP presents a well location map and hydrographs showing the minimum thresholds for each representative well that will be used to monitor for chronic lowering of groundwater levels and depletion of storage.

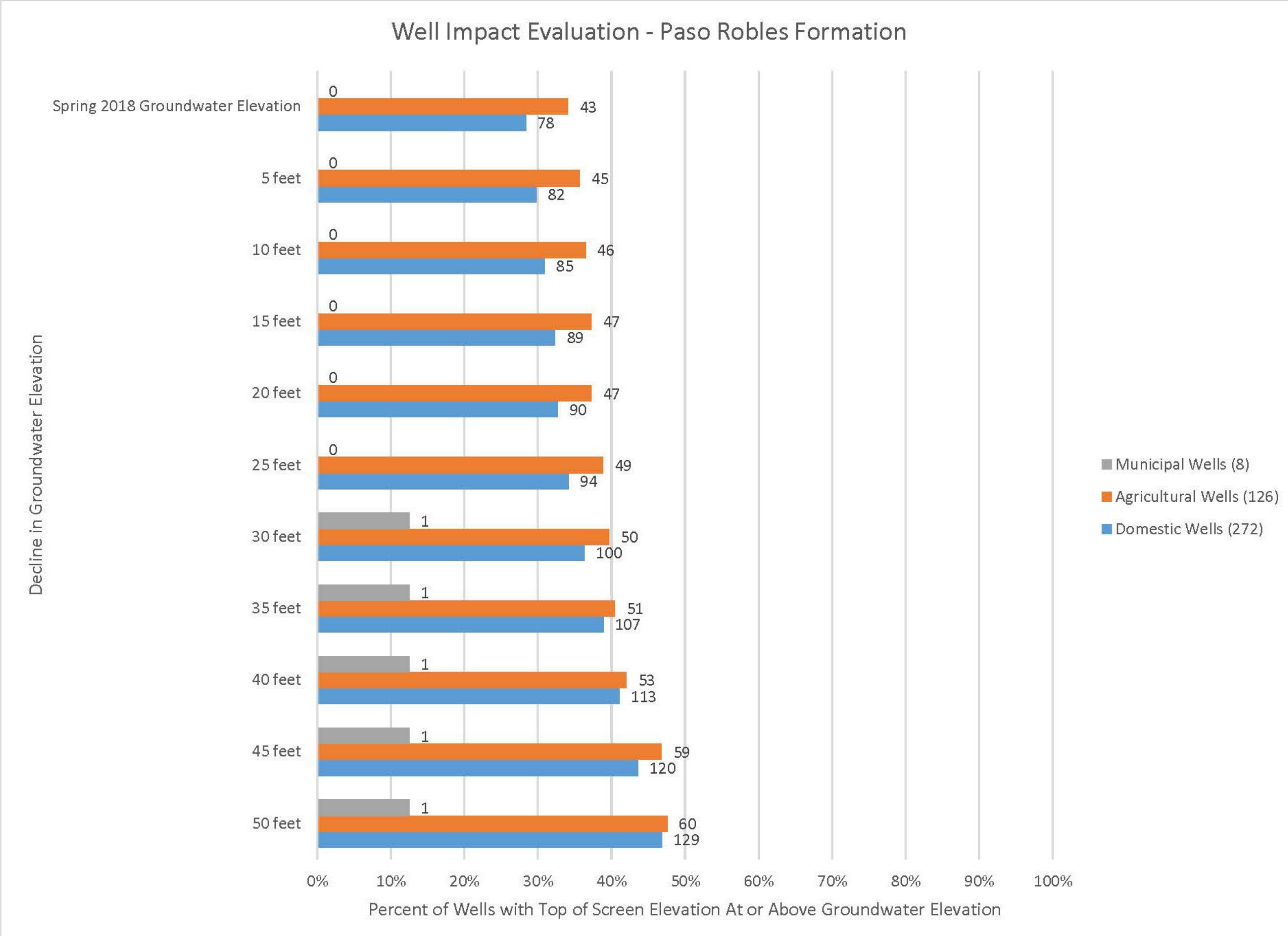

Figure 5-1. Well Impact Evaluation – Selected Wells Completed in the Paso Robles Formation

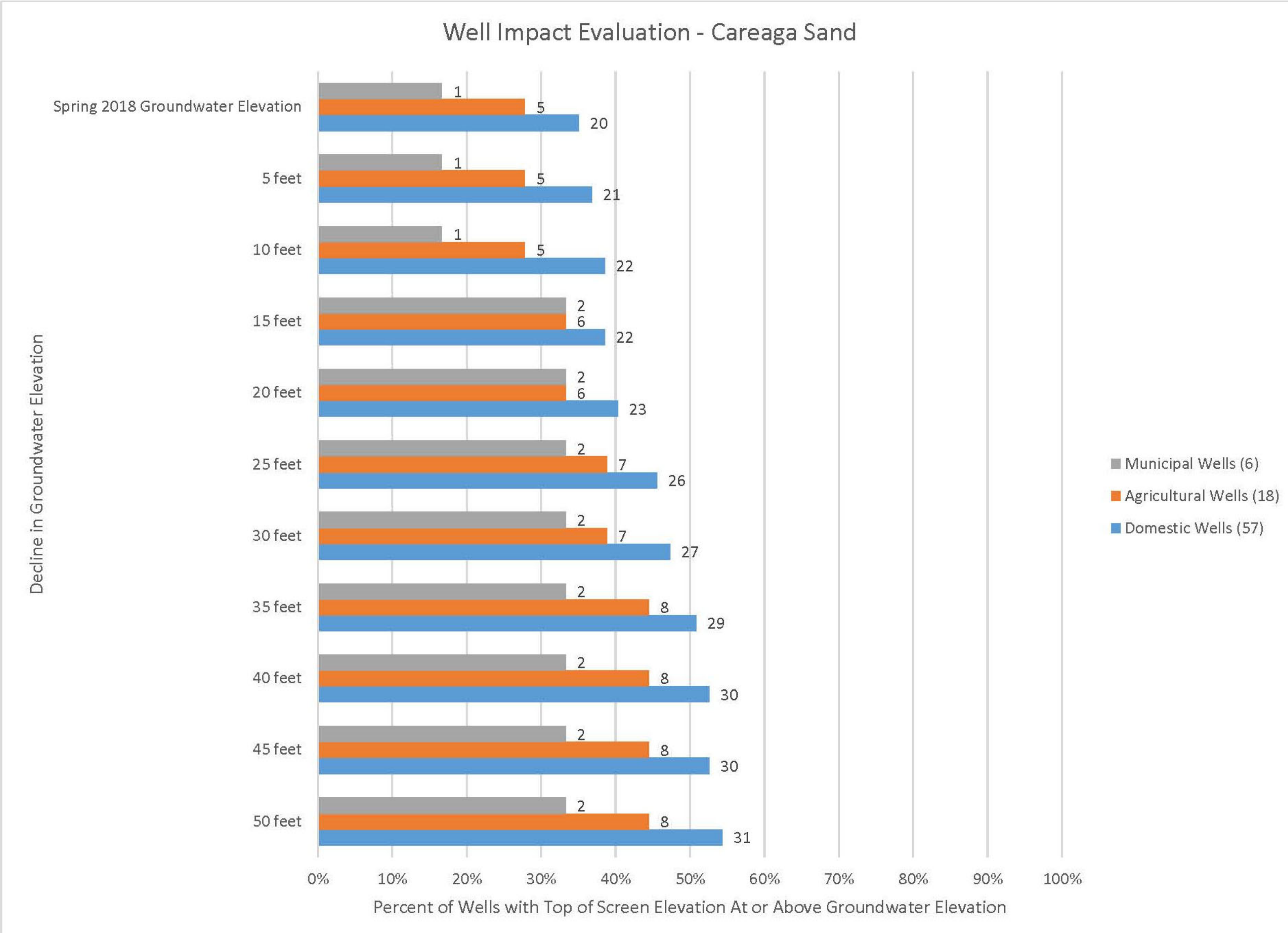
Well Impact Evaluation - Careaga Sand
Decline in Groundwater Elevation
Spring 2018 Groundwater Elevation
5 feet
10 feet
15 feet
20 feet
25 feet
30 feet
35 feet
40 feet
45 feet
50 feet
1
5
20
1
5
21
1
5
22
2
6
22
2
6
23
2
7
26
2
7
27
2
8
29
2
8
30
2
8
30
2
8
31
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Percent of Wells with Top of Screen Elevation At or Above Groundwater Elevation
Municipal Wells (6)
Agricultural Wells (18)
Domestic Wells (57)

Figure 5-2. Well Impact Evaluation – Selected Wells Completed in the Careaga Sand

Table 5-1. Chronic Lowering of Groundwater Levels Minimum Thresholds and Measurable Objectives for the Paso Robles Formation and the Careaga Sand

RMS ID[1]	Well Type	Minimum Threshold (feet NAVD 88)	Measurable Objective (feet NAVD 88)
Paso Robles Formation			
6N/29W-07L01	Agricultural	639	681
6N/29W-08P01	Domestic	676	712
6N/29W-08P02	Domestic	654	686
6N/30W-07G05	Municipal	515	554
6N/30W-07G06	Municipal	513	552
6N/30W-11G04	Agricultural	512	609
6N/31W-01P03	Municipal	516	556
6N/31W-02K01	Domestic	557	592
6N/31W-13D01	Domestic	495	520
7N/30W-16B01	Agricultural	1,021	1,047
7N/30W-19H01	Agricultural	912	932
7N/30W-29D01	Agricultural	850	893
7N/30W-30M01	Agricultural	559	669
7N/30W-33M01	Agricultural	514	565
7N/31W-36L02	Domestic	616	681
Careaga Sand			
7N/31W-34M02	Agricultural	484	505[2]
6N/31W-03A01	Domestic	573	598
6N/31W-04A01	Domestic	483	506
6N/31W-09Q02 21	Municipal	446	476[2]
6N/31W-10F01	Agricultural	464	483
6N/31W-11D04	Agricultural	502	526
6N/31W-16N07 4	Municipal	377	397
6N/31W-xxxx 22	Municipal	467	484
Solvang HCA South	Municipal	320	360[2]

Notes

[1] Refer to Figure 3-19 and Appendix I for representative well locations.

[2] No water level data is available for spring 2011.

NAVD 88 = North American Vertical Datum of 1988

RMS = representative monitoring site

5.5.2.1 Minimum Thresholds for the Paso Robles Formation

Based on the well impact analysis, the GSA Committee agreed to set the minimum threshold for representative wells screened in the Paso Robles Formation at 15 feet below spring 2018 groundwater levels. If groundwater levels continued to decline at current rates (2019 to 2021) in representative wells, minimum thresholds for the chronic lowering of groundwater levels sustainability indicator would be exceeded in 50 percent of representative wells (see Section 5.5.2.7), approximately one to 2 years following implementation of the GSP. Section 6 discusses management actions and projects that are intended to reduce the chances for this to occur. Water levels at or above these thresholds are not expected to cause significant and unreasonable depletion of supply in municipal, agricultural, and domestic wells, or cause a significant and unreasonable reduction of groundwater in storage.

5.5.2.2 Minimum Thresholds for the Careaga Sand

Based on the well impact analysis, the GSA Committee agreed to set the minimum threshold for representative wells screened in the Careaga Sand at 12 feet below spring 2018 groundwater levels. If groundwater levels continued to decline at current rates (2019 to 2021) in representative wells, minimum thresholds for the chronic lowering of groundwater levels sustainability indicator would be exceeded in 50 percent of representative wells (see Section 5.5.2.7), approximately 4 to 5 years following implementation of the GSP. Water levels at or above these thresholds are not expected to cause a significant and unreasonable reduction of groundwater in storage.

5.5.2.3 Relationship between Individual Minimum Thresholds and Relationships to Other Sustainability Indicators [§ 354.28(b)(2) and (d)]

§ 354.28 Minimum Thresholds.

(b) The description of minimum thresholds shall include the following:

(2) The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.

(d) 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.

Groundwater level minimum thresholds can potentially influence other sustainability indicators, such as the following:

- **Avoid ~~Chronic~~ Significant and Unreasonable Reduction of Groundwater in Storage.** Changes in groundwater levels reflect changes in the amount of groundwater in storage. Pumping at, or less than, the sustainable yield will maintain long-term average groundwater levels in the EMA. Likewise, the groundwater level minimum thresholds will maintain an adequate amount of groundwater in storage over an extended period when pumping is equal to or less than the sustainable yield. Thus, maintaining groundwater levels at or above minimum thresholds will not result in long-term significant and unreasonable reduction of groundwater in storage.

- **Avoid Significant and Unreasonable Degraded Groundwater Quality.** A significant and unreasonable condition for groundwater quality is the increase in concentration of constituents of concern exceeding EMA WQOs or state or federal maximum contaminant level (MCL) or secondary maximum contaminant level (SMCL) (regulatory thresholds) for drinking water caused by groundwater pumping. As described below, maintaining groundwater levels above minimum thresholds helps minimize the potential for experiencing degraded groundwater quality (since enactment of SGMA in 2015) or exceeding regulatory thresholds for constituents of concern in drinking water and agricultural wells. Groundwater quality could be affected through two processes:

    1. Low groundwater levels caused by pumping in an area could cause deeper, poor-quality groundwater to flow into existing supply wells. Groundwater level minimum thresholds are set below current groundwater levels, meaning a flow of deep, poor-quality groundwater could occur in the future at or below minimum threshold levels. The Careaga Sand is underlain by marine deposits. Consequently, groundwater within these underlying marine deposits likely contains increased salt concentrations and is of poorer quality than the groundwater within the overlying Careaga Sand. Should groundwater quality degrade due to lower groundwater levels, the groundwater level minimum thresholds will be reviewed.

    2. Changes in groundwater levels arising from management actions implemented by the GSA to achieve sustainability could change groundwater gradients, which could cause poor-quality groundwater to flow towards supply wells that would not have otherwise been impacted. Examples of these actions may include installation of groundwater recharge facilities (e.g., gravity stormwater recharge or aquifer recharge with recharge wells using treated wastewater). Because these kinds of projects are subject to review under the California Environmental Quality Act, concerns about the potential to introduce or mobilize contaminant plumes would be evaluated before such a project could be implemented.

- **Avoid Significant and Unreasonable Land Subsidence.** A significant and unreasonable condition for subsidence is permanent pumping-induced subsidence that substantially interferes with surface land use and damages infrastructure. The groundwater level minimum thresholds are set just below existing and historical groundwater elevations, which is unlikely to induce additional subsidence. Based on a geotechnical study performed for the EMA, local geological conditions do not appear to be susceptible to compaction and subsidence because there are no known thick clay layers that extend across the full area where the Paso Robles Formation is present (although some clay layers are distinctly present in localized areas). Groundwater levels would likely have to be substantially lower than are predicted to occur in the future to produce significantly more subsidence (see Appendix E). Should significant and unreasonable subsidence be observed from lowering groundwater levels, the GSA may consider adjusting groundwater level minimum thresholds to avoid this subsidence.
- **Avoid Significant and Unreasonable Depletion of Interconnected Surface Water.** Significant increases in groundwater pumping beyond what has been observed in the past could result in the depletion of interconnected surface water resulting in impacts to GDEs on the distal, or lower, ends of Zanja de Cota and Alamo Pintado creeks where the interconnection potentially exists. Although the minimum thresholds for groundwater levels are set a short distance below the historical low groundwater elevation observed in some RMSs, no significant or unreasonable effects have been observed in association with interconnected surface water during the historical period (1981 to 2018) and none are expected in the future. Results from groundwater modeling indicate that groundwater will continue to discharge to surface water at the lower ends of the tributaries (e.g., Alamo Pintado and Zanja de Cota Creeks) and so significant and unreasonable depletion of surface water is not expected.

- **Avoid Seawater Intrusion.** This sustainability indicator is not applicable to the EMA.

The minimum thresholds set for chronic groundwater level decline are protective of all beneficial uses and users of groundwater and do not result in significant and unreasonable effects for the other sustainability indicators.

5.5.2.4 Effects of Minimum Thresholds on Neighboring Basins [§ 354.28(b)(3)]

§ 354.28 Minimum Thresholds.

(b) The description of minimum thresholds shall include the following:

(3) How minimum thresholds have been selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.

Neighboring basins include the Central Management Area (CMA) of the Santa Ynez River Valley Groundwater Basin and the San Antonio Creek Valley Groundwater Basin (SACV). The CMA is hydrologically downgradient of the EMA and the SACV is not hydraulically connected to the EMA; groundwater flows from the Paso Robles Formation in the EMA to the Santa Ynez River Alluvium where gaps in the underlying Monterey Formation bedrock occur. The Santa Ynez River Alluvium is present in the EMA and CMA management areas. Groundwater present within the Careaga Sand flows from the EMA and discharges directly to the CMA as subsurface flow. Therefore, changes in groundwater levels within the EMA could have an impact on groundwater levels in the CMA if a substantial reduction in groundwater levels in the EMA were to occur (depending on the location in the EMA) and over a long period, the amount of groundwater flowing into the CMA could be reduced. The groundwater level minimum thresholds for the EMA are set just below historical and current levels, which could theoretically reduce groundwater flow into the adjacent CMA during certain periods. Changes in groundwater levels in the EMA are not anticipated to result in significant and unreasonable changes in groundwater flow to the CMA because, as discussed in Section 3.3, the average surface water outflow and groundwater subsurface outflow was less than 2,000 acre-feet per year (AFY) over the historical period (1981 to 2018). This amount of annual subsurface outflow is small compared with annual variations in pumping and the amount of annual climate-driven variation that occurs in several of the water budget terms in the EMA and CMA. The EMA GSA has developed a cooperative working relationship with the downstream Santa Ynez River Valley Groundwater Basin – Central Management Area GSA (CMA GSA) that is preparing the GSP for the CMA. Additionally, a SGMA-compliant Coordination Agreement is being prepared and will remain in place between the EMA GSA, the CMA GSA, and the downstream Western Management Area GSA.

Based on limited available information, groundwater gradients at the boundary between the EMA and SACV are such that groundwater does not flow between the EMA and SACV and therefore, the SACV would not be impacted by the minimum threshold for the chronic lowering of groundwater levels sustainability indicator in the EMA. However, if production wells are located in close proximity of the boundary, it is possible that the gradient would change in either direction, depending on where the well is located. Identification of additional monitoring wells and continued monitoring of water levels is needed to improve the understanding of groundwater flow in this area.

5.5.2.5 Effects of Minimum Thresholds on Beneficial Uses and Land Uses [§ 354.28(b)(4)]

§ 354.28 Minimum Thresholds.

(b) The description of minimum thresholds shall include the following:

(4) How minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.

The groundwater level minimum thresholds have been selected to protect beneficial uses in the EMA while providing a reliable and sustainable groundwater supply. Groundwater modeling indicates that future projected water levels in the Paso Robles Formation and Careaga Sand are unlikely to impact Category A GDEs; however, extended extreme droughts could reduce groundwater elevations below historically measured levels, potentially affect Category A GDEs, and reduce baseflow in the tributary creeks and discharge to the Santa Ynez River (see Section 3.2 and Figure 3-40).

When setting the minimum threshold for chronic water level decline, consideration was given to several factors that could have a significant or unreasonable effect on beneficial uses. These factors included effects on existing municipal, domestic, and agricultural wells (see Section 5.5.2); continued reduction of groundwater in storage (see Section 5.6); and depletion of interconnected surface water and associated impacts to GDEs (see Section 5.10).

5.5.2.6 Relevant Federal, State, or Local Standards [§ 354.28(b)(5)]

§ 354.28 Minimum Thresholds.

(b) The description of minimum thresholds shall include the following:

(5) How state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the Agency shall explain the nature of and basis for the difference.

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

5.5.2.7 Methods for Quantitative Measurement of Minimum Thresholds [§ 354.28(a) and (b)(6)]

§ 354.28 Minimum Thresholds.

(a) Each Agency in its Plan shall establish minimum thresholds that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site established pursuant to Section 354.36. The numeric value used to define minimum thresholds shall represent a point in the basin that, if exceeded, may cause undesirable results as described in Section 354.26.

(b) The description of minimum thresholds shall include the following:

(6) How each minimum threshold will be quantitatively measured, consistent with the monitoring network requirements described in Subarticle 4.

Groundwater level minimum thresholds will be directly measured from existing representative monitoring wells. The groundwater level monitoring program will be conducted in accordance with the monitoring plan outlined in Section 4 and will consist of collecting groundwater level measurements that reflect non-pumping conditions. The groundwater level monitoring program will be designed and conducted to meet the requirements of the technical and reporting standards included in the SGMA regulations. As discussed in Section 5.5.1, the potential exists for undesirable results to occur if minimum thresholds are exceeded in 50 percent of the representative wells for 2 consecutive years of average and above-average precipitation.

5.5.3 Measurable Objectives for Water Levels [§ 354.30(a),(b),(c),(d), and (g)]

§ 354.30 Measurable Objectives.

(a) Each Agency shall establish measurable objectives, including interim milestones in increments of five years, to achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon.

(b) Measurable objectives shall be established for each sustainability indicator, based on quantitative values using the same metrics and monitoring sites as are used to define the minimum thresholds.

(c) Measurable objectives shall provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, and periods of drought, and be commensurate with levels of uncertainty.

(d) An Agency may establish a representative measurable objective 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 measurable objectives as supported by adequate evidence.

(g) An Agency may establish measurable objectives that exceed the reasonable margin of operational flexibility for the purpose of improving overall conditions in the basin, but failure to achieve those objectives shall not be grounds for a finding of inadequacy of the Plan.

The measurable objectives for chronic lowering of groundwater levels provides a target to be reached over the 20-year GSP implementation period to ensure reliable access to groundwater through dry to critically dry hydrologic periods, such as the critically dry period from 2012 through 2016. Measurable objectives for chronic lowering of groundwater levels provide operational flexibility above minimum threshold levels to ensure that the EMA can be managed sustainably over a reasonable range of climate and hydrologic variability. Measurable objectives may change after GSP adoption, as new information and hydrologic data become available.

5.5.3.1 Methodology for Setting Measurable Objectives

Measurable objectives were established to meet the sustainability goal and were based on trends in historical groundwater level data, historical precipitation data, and input from the CAG, other public stakeholders, and the EMA-GSA Committee. The measurable objective levels were set so that: (1) natural variations in groundwater levels as were observed in the past during wet and dry periods are considered, and (2) there is enough groundwater in storage to get through a multi-year drought as was observed in WYs 2012 to 2021 with 2 wet years in WYs 2017 and 2019 without undesirable results. Table 5-1 includes the estimated elevations for the measurable objectives established for the Paso Robles Formation and the Careaga Sand. Hydrographs showing the measurable objectives are presented in Appendix I.

5.5.3.2 Measurable Objectives for the Paso Robles Formation

The measurable objectives for the Paso Robles Formation are the average groundwater levels measured at each RMS prior to the recent drought beginning in WY 2012. These levels were selected using available groundwater elevation monitoring data and climatic data.

5.5.3.3 Measurable Objectives for the Careaga Sand

The measurable objectives for the Careaga Sand are the average groundwater levels measured at each RMS prior to the recent drought beginning in WY 2012. These levels were selected using available groundwater elevation monitoring data and climatic data.

5.5.4 Interim Milestones for Water Levels [§ 354.30(e)]

§ 354.30 Measurable Objective.

(e) Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin with 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.

Interim milestones show how the GSA would move from current conditions to meeting the measurable objectives in the 20-year GSP implementation horizon. Prior to the recent drought (WYs 2012 to 2021 with 2 wet years in WYs 2017 and 2019), the cumulative change of groundwater in storage in the EMA was positive (see Table 3-11). During the historical period (1981 to 2018), which included the recent drought, the estimated average annual change in groundwater in storage was -1,830 AFY (see Table 3-11). The recent drought was the most severe drought during the historical period and, consequently, much of the observed decline in water levels and current groundwater in storage deficit is due to the drought and not pumping of groundwater. While no significant and unreasonable effect has been observed in the EMA as a result of lowering of groundwater levels to date, interim milestones are being proposed in order to ensure that the GSA is on track for eliminating the storage deficit going forward (see Table 5-2). The GSA intends to move forward with selected projects and management actions (see Section 6) very early after GSP submittal to ensure that groundwater levels recover when normal or above normal rainfall conditions return. The proposed approach for setting interim milestones recognizes that it will take some time to plan and implement the management actions; therefore, it is possible that if drought conditions persist, water levels could approach or fall below the minimum threshold in some representative wells. Progress toward achieving the measurable objective will be slow initially and then steadily increase over the 20-year implementation period. The general approach for setting the interim milestone values for each representative well is shown on Figure 5-3 and Table 5-2.

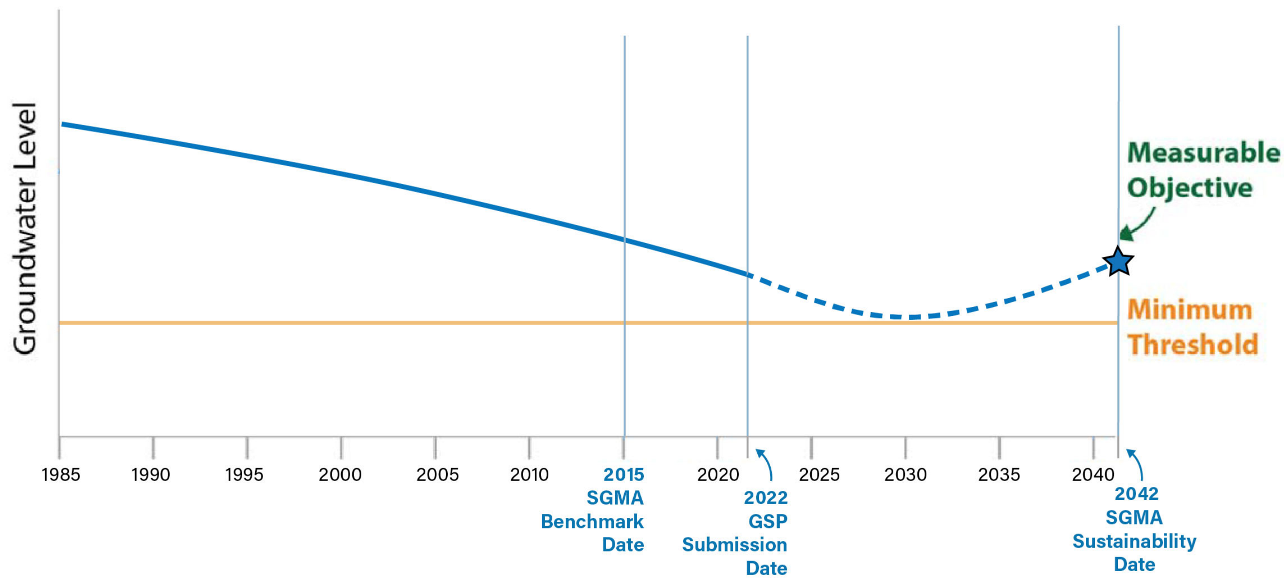

Figure 5-3. Generalized Approach to Setting Interim Milestones

Table 5-2. Chronic Lowering of Groundwater Levels and Chronic Reduction of Groundwater in Storage Interim Milestones for the Paso Robles Formation and the Careaga Sand

RMS ID[a]	Well Type	Year 5[b]	Year 10	Year 15	Year 20
Paso Robles Formation					
6N/29W-07L01	Agricultural	641	639	671	681
6N/29W-08P01	Domestic	686	676	703	712
6N/29W-08P02	Domestic	654	640[c]	675	686
6N/30W-07G05	Municipal	523	517	545	554
6N/30W-07G06	Municipal	521	516	543	552
6N/30W-11G04	Agricultural	516	512	585	609
6N/31W-01P03	Municipal	523	516	546	556
6N/31W-02K01	Domestic	562	557	583	592
6N/31W-13D01	Domestic	508	495	514	520
7N/30W-16B01	Agricultural	1,043	1,022	1,041	1,047
7N/30W-19H01	Agricultural	927	913	927	932
7N/30W-29D01	Agricultural	862	855	884	893
7N/30W-30M01	Agricultural	561	562	642	669
7N/30W-33M01	Agricultural	526	514	552	565
7N/31W-36L02	Domestic	614[c]	616	665	681
Careaga Sand					
7N/31W-34M02	Agricultural	484	479	499	505-[d]
6N/31W-03A01	Domestic	581	572[c]	592	598
6N/31W-04A01	Domestic	492	482[c]	500	506
6N/31W-09Q02 21	Municipal	476[e]	468	474	476-[d]
6N/31W-10F01	Agricultural	472	462[c]	478	483
6N/31W-11D04	Agricultural	502	500[c]	520	526
6N/31W-16N07 4	Municipal	395	377	392	397
6N/31W-xxxx 22	Municipal	473	467	480	484
Solvang HCA South	Municipal	328	322	351	360-[d]

Notes

[a] Refer to Figure 3-19 and Appendix I for representative well locations.

[b] Based on estimates from spring 2021 measurements.

[c] Value is below the minimum thresholds.

[d] No water level data is available for spring 2011. IM values have been estimated from water level trends.

[e] Measurable objective based on recent water levels.

NAVD 88 = North American Vertical Datum of 1988

RMS = representative monitoring site

5.6 Reduction of Groundwater in Storage Sustainable Management Criterion

5.6.1 Undesirable Results for Storage Reduction [§ 354.26(a),(b)(2),(c), and (d)]

§ 354.26 Undesirable Results.

(a) Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.

(b) The description of undesirable results shall include the following:

(2) The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.

(c) The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.

(d) An Agency that is able to demonstrate that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin shall not be required to establish criteria for undesirable results related to those sustainability indicators.

Conditions in the EMA that could lead to significant and unreasonable effects on groundwater in storage include the following:

- **Extended drought.** Extensive droughts may lead to excessively low groundwater levels, a reduced amount of groundwater in storage, and undesirable results. Short-term impacts due to drought are anticipated in the SGMA regulations with recognition that management actions need sufficient flexibility to accommodate drought periods and ensure short-term impacts can be offset by increases in groundwater levels or storage during normal or wet periods.
- **High rate of pumping in the Paso Robles Formation.** If the amount of pumping in the Paso Robles Formation exceeds the long-term rate of recharge, then groundwater levels may decline, which could affect Paso Robles Formation well production, groundwater discharge to surface water, GDEs, groundwater quality, and the volume of groundwater in storage.
- **High rate of pumping in the Careaga Sand.** If the amount of pumping in the Careaga Sand exceeds the long-term rate of natural recharge, then groundwater levels may decline, which could affect Careaga Sand well production, reduce groundwater discharge to surface water, GDEs, groundwater quality, and the volume of groundwater in storage.

Significant and unreasonable reduction of groundwater in storage that are likely to cause undesirable results are characterized as follows:

- Groundwater levels in the Paso Robles Formation or Careaga Sand aquifers fall below minimum thresholds (see Section 5.5.2) after 2 consecutive years of average and above-average precipitation in 50 percent of representative wells.
- Existing agricultural, municipal, and domestic wells are unable to produce historical average quantities of groundwater due to chronic decline in groundwater levels (e.g., depletion of supply).

As discussed in Section 3.2.1, Paso Robles Formation and Careaga Sand well hydrographs illustrate that water levels go up and down in response to changes in rainfall. Water levels continue to decline from the severe drought observed between WYs 2012 to 2021 with 2 wet years in WYs 2017 and 2019 and rainfall continues to be below average. Based on input from water users in the EMA and review of available water level data, no significant and unreasonable effects associated with the observed groundwater level decline or reduction in storage have been observed in the EMA. However, the decline indicates the potential for undesirable results and if current/or increased rates of pumping continue and drought conditions persist (see Section 3.3.5), undesirable results could occur in the future.

The practical effect of protecting against undesirable results arising from a reduction of groundwater in storage is that it encourages the maintenance of long-term stability in groundwater levels and storage during average hydrologic conditions over multiple years and decades. Maintaining long-term stability in groundwater levels also maintains long-term stability in groundwater storage and prevents chronic declines, thereby providing beneficial uses and users with continued access to groundwater on a long-term basis and preventing undesirable results associated with groundwater withdrawals. Pumping above the long-term sustainable yield during drought years would likely temporarily lower groundwater levels and reduce the amount of groundwater in storage. Such short-term impacts due to drought are anticipated in SGMA and the SGMA regulations with recognition that management actions need sufficient flexibility to accommodate drought periods and ensure short-term impacts can be offset by increases in groundwater levels or storage during normal or wet periods. Prolonged reductions in the amount of groundwater in storage could lead to undesirable results affecting beneficial users and uses of groundwater. In particular, groundwater pumpers that rely on water from shallow wells (e.g., domestic wells) in the EMA may be temporarily impacted by temporary reductions in the amount of groundwater in storage and lower groundwater levels in their wells.

5.6.2 Minimum Thresholds for Storage Reduction [§ 354.28(a),(b)(1),(c)(2),(d), and (e)]

§ 354.28 Minimum Thresholds.

(a) Each Agency in its Plan shall establish minimum thresholds that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site established pursuant to Section 354.36. The numeric value used to define minimum thresholds shall represent a point in the basin that, if exceeded, may cause undesirable results as described in Section 354.26.

(b) The description of minimum thresholds shall include the following:

(1) The information and criteria relied upon to establish and justify the minimum thresholds for each sustainability indicator. The justification for the minimum threshold shall be supported by information provided in the basin setting, and other data or models as appropriate, and qualified by the uncertainty in the understanding of the basin setting.

(c) Minimum thresholds for each sustainability indicator shall be defined as follows:

(2) Reduction of Groundwater Storage. The minimum threshold for reduction of groundwater storage shall be a total volume of groundwater that can be withdrawn from the basin without causing conditions that my lead to undesirable results. Minimum thresholds for reduction of groundwater storage shall be supported by the sustainable yield of the basin, calculated based on historical trends, water year type, and projected water use in the basin.

(d) 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.

(e) An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish minimum thresholds related to those sustainability indicators.

Section 354.28(c)(2) of the SGMA regulations states that "The minimum threshold for reduction of groundwater storage shall be a total volume of groundwater that can be withdrawn from the basin without causing conditions that may lead to undesirable results. Minimum thresholds for reduction of groundwater storage shall be supported by the sustainable yield of the basin, calculated based on historical trends, water year type, and projected water use in the basin."

The minimum threshold for reduction of groundwater in storage is based on the estimated sustainable yield and is consistent with the minimum thresholds for chronic groundwater level decline because they are interrelated; therefore, the minimum thresholds for reduction in groundwater in storage is established for the EMA as a whole, not for individual aquifers.

In accordance with the SGMA regulation cited above, the minimum threshold metric is a volume of pumping per year, or an annual pumping rate. Conceptually, the sustainable yield is the total volume of groundwater that can be pumped annually from the EMA on a long-term (multi-year/multi-decadal) basis without leading to undesirable results. This GSP adopts changes in groundwater levels as a proxy for the change of groundwater in storage metric. As provided in § 354.36(b)(1) of the SGMA regulations, an average of the groundwater elevation data at the RMSs will be reported annually as a proxy to track changes in the amount of groundwater in storage.

Based on well-established hydrogeologic principles, maintaining long-term stability in groundwater levels above the minimum threshold for chronic lowering of groundwater levels will limit continued depletion of groundwater from storage. Therefore, using groundwater elevation levels as a proxy, the minimum threshold for chronic reduction of groundwater in storage at each RMS is defined by the minimum threshold for chronic lowering of groundwater levels (see Table 5-1).

5.6.2.1 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators [§ 354.28(b)(2)]

§ 354.28 Minimum Thresholds.

(b) The description of minimum thresholds shall include the following:

(2) The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.

The minimum threshold for reduction of groundwater in storage is based on the groundwater level minimum thresholds established for chronic groundwater level decline at RMSs. Therefore, the concept of potential conflict between minimum thresholds at different locations in the EMA is not applicable.

The minimum threshold for reduction of groundwater in storage could influence other sustainability indicators. The minimum threshold for reduction of groundwater in storage was selected to avoid undesirable results for other sustainability indicators, as outlined below:

- **Avoid Chronic Lowering of Groundwater Levels.** Because groundwater levels will be used as a proxy for estimating groundwater pumping and changes in groundwater storage, the groundwater in storage sustainability criteria would not cause undesirable results for this sustainability indicator.
- **Avoid Degraded Groundwater Quality.** The minimum threshold proxy of long-term stability in groundwater levels helps minimize the potential for experiencing degraded groundwater quality or exceeding regulatory limits for constituents of concern in supply wells.
- **Avoid Land Subsidence.** Future groundwater levels would likely have to be substantially lower than are predicted to occur in the future to produce significant subsidence. Should significant and unreasonable subsidence be observed from future groundwater levels, the groundwater level minimum thresholds for this sustainability indicator will be revisited by the EMA-GSA to avoid this subsidence.

- **Avoid Depletion of Interconnected Surface Water.** A significant and unreasonable condition for depletion of interconnected surface water is a pumping-induced reduction in groundwater discharge in specific locations where groundwater is interconnected to surface water and resulting impacts to Category A GDEs (see Section 3.2 and Figure 3-40). As discussed in Section 5.10, groundwater levels and related groundwater in storage that continues to decline below historical levels in the future may have an impact on Category A GDEs. No significant or unreasonable effects have been observed thus far in association with interconnected surface water during periods of historical low groundwater levels and groundwater in storage.
- **Avoid Seawater Intrusion.** This sustainability indicator is not applicable to the EMA.

5.6.2.2 Effects of Minimum Thresholds on Neighboring Basins [§ 354.28(b)(3)]

§ 354.28 Minimum Thresholds.

(b) The description of minimum thresholds shall include the following:

(3) How minimum thresholds have been selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.

The SACV Basin abuts the EMA on the northwest side. Based on available information, groundwater gradients at the boundary between the EMA and SACV are such that groundwater does not flow between the EMA and SACV and, therefore, the SACV would not be impacted by the minimum threshold for the groundwater in storage sustainability indicator in the EMA.

The CMA is hydrologically downgradient of the EMA; groundwater flows from the Paso Robles Formation in the EMA to the Santa Ynez River Alluvium where gaps in the underlying Monterey Formation bedrock occur. The Santa Ynez River Alluvium is present in the EMA and CMA management areas. Groundwater present within the Careaga Sand flows from the EMA and discharges directly to the CMA as subsurface flow. Therefore, changes in groundwater levels within the EMA could have an impact on groundwater levels in the CMA if a substantial reduction in groundwater levels in the EMA were to occur (depending on location in the EMA) and over a long period, the amount of groundwater flowing into the CMA could be reduced. The groundwater level minimum thresholds for the EMA are set just below historical and current levels, which could theoretically reduce groundwater flow into the adjacent CMA during certain periods. Changes in groundwater levels in the EMA are not anticipated to result in significant and unreasonable changes in groundwater flow to the CMA because, as discussed in Section 3.3, the average surface water outflow and groundwater subsurface outflow was less than 2,000 AFY over the historical period (1981 to 2018). This amount of annual subsurface outflow is small compared with annual variations in pumping and the amount of annual climate-driven variation that occurs in several of the water budget terms in the EMA and CMA. The EMA GSA has developed a cooperative working relationship with the downstream CMA GSA that is preparing the GSP for the CMA. Additionally, a ~~SGMA-compliant~~ Coordination Agreement ~~is being~~has been prepared and ~~will remain in place~~entered into between the EMA GSA, the CMA GSA, and the ~~downstream Western Management Area (~~WMA~~)~~ GSA and will be uploaded to the SGMA Portal.

5.6.2.3 Effects of Minimum Thresholds on Beneficial Uses and Land Uses [§ 354.28(b)(4)]

§ 354.28 Minimum Thresholds.

(b) The description of minimum thresholds shall include the following:

(4) How minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.

The minimum thresholds for reduction of groundwater in storage and lowering of groundwater levels have been established to avoid undesirable results for multiple sustainability indicators. For this reason, groundwater serving beneficial uses (including current pumpers, pumping volumes, and GDEs) and land uses will not be adversely affected.

5.6.2.4 Relevant Federal, State, or Local Standards [§ 354.28(b)(5)]

§ 354.28 Minimum Thresholds.

(b) The description of minimum thresholds shall include the following:

(5) How state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the Agency shall explain the nature of and basis for the difference.

No federal, state, or local standards exist for reductions in groundwater storage.

5.6.2.5 Methods for Quantitative Measurement of Minimum Thresholds [§ 354.28(b)(6)]

§ 354.28 Minimum Thresholds.

(b) The description of minimum thresholds shall include the following:

(6) How each minimum threshold will be quantitatively measured, consistent with the monitoring network requirements described in Subarticle 4.

The measurement program for evaluating the minimum thresholds for reductions in groundwater in storage will rely on the groundwater elevation monitoring program described previously for chronic lowering of groundwater levels (see Section 5.5). Groundwater levels (as a surrogate for change of groundwater in storage) that drop below the minimum threshold values for decline in groundwater levels in 50 percent of the same representative wells over 2 years of average or above-average precipitation may lead to long-term reduction of groundwater in storage.

5.6.3 Measurable Objectives for Storage Reduction [§ 354.30(a),(c),(d), and (g)]

§ 354.30 Measurable Objectives.

(a) Each Agency shall establish measurable objectives, including interim milestones in increments of five years, to achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon.

(c) Measurable objectives shall provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, and periods of drought, and be commensurate with levels of uncertainty.

(d) An Agency may establish a representative measurable objective 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 measurable objectives as supported by adequate evidence.

(g) An Agency may establish measurable objectives that exceed the reasonable margin of operational flexibility for the purpose of improving overall conditions in the basin, but failure to achieve those objectives shall not be grounds for a finding of inadequacy of the Plan.

The sustainability indicators for avoiding chronic reductions of groundwater in storage use average groundwater levels as a proxy. The minimum thresholds and measurable objectives that protect against significant and unreasonable reduction in groundwater storage are based on those used to protect against chronic lowering of groundwater levels. The measurable objective for chronic reduction in groundwater in storage, using the groundwater level proxy, is equivalent to the measurable objective for chronic lowering of groundwater levels, using average groundwater levels measured at each RMS prior to the recent drought beginning in WY 2012. These levels were selected using available groundwater elevation monitoring data and climatic data. Measurable objectives may change after GSP adoption, as new information and hydrologic data become available.

5.6.4 Interim Milestones for Storage Reduction [§ 354.30(e)]

§ 354.30 Measurable Objective.

(e) Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin with 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.

Interim milestones show how the GSA would move from current conditions to meeting the measurable objectives in the 20-year GSP implementation horizon. Prior to the recent drought (WYs 2012 to 2021 with 2 wet years in WYs 2017 and 2019) the cumulative change of groundwater in storage in the EMA was positive (see Table 3-11). During the historical period (1981 to 2018), which included the recent drought, the estimated average annual change in groundwater in storage was -1,830 AFY (see Table 3-11). The recent drought was the most severe drought during the historical period and, consequently, much of the observed decline in water levels and current groundwater in storage deficit is due to the drought and not pumping of groundwater. Rainfall continues to be well below average and so the drought may not actually be over.

While no significant and unreasonable effect on groundwater in storage has been observed in the EMA as a result of lowering of groundwater levels to date, interim milestones are being proposed in order to ensure that the GSA is on track for eliminating the storage deficit going forward (see Table 5-2). The GSA intends to move forward with selected projects and management actions (see Section 6) very early after GSP submittal to ensure that groundwater levels recover when normal or above normal rainfall conditions return.

5.7 Seawater Intrusion Sustainable Management Criterion (Not Applicable)

The seawater intrusion sustainability indicator is not applicable to the EMA.

5.8 Degraded Groundwater Quality Sustainable Management Criterion

This sustainability indicator takes into consideration protection of municipal drinking water supplies, domestic uses, and agricultural uses of groundwater in the EMA. For municipal wells and drinking water supplied by domestic wells, federal and state regulatory standards (MCL and SMCL) established by the SWRCB DDW and U.S. Environmental Protection Agency, respectively, were used to establish thresholds. For agricultural uses, thresholds were established using WQOs presented in the WQ Basin Plan (RWQCB, 2019). The GSA is not charged with managing groundwater quality unless it can be shown that water quality degradation is caused by groundwater pumping in the EMA or the GSA implements a project that degrades water quality.[57]

5.8.1 Undesirable Results for Water Quality [§ 354.26(a),(b)(1),(b)(2), and (d)]

§ 354.26 Undesirable Results.

(a) Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.

(b) The description of undesirable results shall include the following:

(1) The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.

(2) The criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.

(d) An Agency that is able to demonstrate that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin shall not be required to establish criteria for undesirable results related to those sustainability indicators.

The following conditions may lead to an undesirable result for groundwater quality in the EMA:

- **Concentrations of regulated contaminants** in untreated groundwater pumped from private domestic wells, agricultural wells, or municipal wells exceed regulatory thresholds as a result of pumping or GSA activities.

[57] A group of agricultural stakeholders proposed establishing minimum thresholds for concentrations of salts and nutrients in groundwater considering constituent concentrations suitable for agricultural use and SMCL (whichever standard was higher). Feedback was offered that different standards could also be applied to different well types, depending upon their use (e.g., agricultural vs. domestic). Some of the proposed concentration standards are higher than WQOs in the WQ Basin Plan. The GSA determined it appropriate to reference the WQOs established by the RWQCB because they were developed to be protective of all beneficial uses. It was also decided to use a consistent methodology for all wells when setting minimum thresholds for salts and nutrients because there are multiple well types located in proximity to one another, and all wells share a common resource (the Paso Robles Formation and Careaga Sand aquifers).

- **Groundwater pumping or GSA activities** cause concentrations of TDS, chloride, sulfate, boron, sodium, or nitrate to increase and exceed WQOs and is greater than concentrations since SGMA was enacted in January 2015.

5.8.2 Minimum Thresholds for Water Quality [§ 354.28(b)(1),(c)(4), and (e)]

§ 354.28 Minimum Thresholds.

(b) The description of minimum thresholds shall include the following:

(1) The information and criteria relied upon to establish and justify the minimum thresholds for each sustainability indicator. The justification for the minimum threshold shall be supported by information provided in the basin setting, and other data or models as appropriate, and qualified by the uncertainty in the understanding of the basin setting.

(c) Minimum thresholds for each sustainability indicator shall be defined as follows:

(4) Degraded Water Quality. The minimum threshold for degraded water quality shall be the degradation of water quality, including the migration of contaminant plumes that impair water supplies or other indicator of water quality as determined by the Agency that may lead to undesirable results. The minimum threshold shall be based on the number of supply wells, a volume of water, or a location of an isocontour that exceeds concentrations of constituents determined by the Agency to be of concern for the basin. In setting minimum thresholds for degraded water quality, the Agency shall consider local, state, and federal water quality standards applicable to the basin.

(e) An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish minimum thresholds related to those sustainability indicators.

Section 354.28(c)(42) of the SGMA regulations states that "The minimum threshold shall be based on the number of supply wells, a volume of water, or a location of an isocontour that exceeds concentrations of constituents determined by the Agency to be of concern for the basin." The purpose of the minimum thresholds for constituents of concern in the EMA is to avoid increased degradation of groundwater quality from baseline concentrations since enactment of SGMA in January 2015. Minimum thresholds established for contaminants and for salts and nutrients are presented in the following subsections.

5.8.2.1 Non-Point Source Contaminants

No minimum thresholds have been established for contaminants because: 1) there is little if any documented contamination in the basin and so setting minimum thresholds for contamination is not warranted, and 2) state regulatory agencies, including RWQCB and DTSC, have the responsibility and authority to regulate and direct actions that address contamination.

Groundwater quality samples have been collected and analyzed throughout the EMA for various studies and programs. Historical groundwater quality data was acquired from the SWRCB GeoTracker GAMA database. Water quality data was also obtained for wells owned by municipal water purveyors as part of its DDW compliance monitoring program.

Constituents of concern for agricultural and domestic use will be assessed as part of the state ILRP and reported on the GeoTracker website (see Section 4). According to the RWQCB proposed Ag Order 4.0, beginning in 2022, all ranches enrolled in the ILRP must conduct annual sampling of all on-farm domestic drinking water supply and irrigation wells between March 1 and May 31 of each year. The GSA will use this database to track water quality in domestic and agricultural wells (i.e., private wells) in the EMA. Exceedance of WQOs in the WQ Basin Plan in 50 percent of the private wells will be the basis for minimum thresholds for degraded groundwater quality at private agricultural and domestic wells. It may be necessary to adjust the threshold for the percentage of wells exceeding the limit if there are many wells in a particular area that experience degraded groundwater quality.

Table 5-3 presents regulatory standards for selected constituents of concern for drinking water listed in the WQ Basin Plan (RWQCB, 2019) and California Code of Regulations, Title 22, drinking water quality standards (SWRCB, 2019), and concentration of select constituents of concern in groundwater around the time SGMA was enacted (January 2015). The constituents with reported concentrations at or above the respective WQO for all wells, for wells known to be completed in each Principal Aquifer, and for surface water samples are presented as Table 3-9. Based on available data, wells with reported constituent concentrations in groundwater at or above the respective WQO are distributed throughout the EMA with increasing concentrations in the direction of the groundwater flow towards the southwest. Wells with reported concentrations of TDS, sodium, chloride, and boron at or above the WQO are located in the Santa Ynez Uplands, adjacent to Santa Ynez River and its tributaries, with the largest number of wells in the southwest region of the EMA (specifically for concentrations of TDS and boron).

While there are some wells that have constituent concentrations that exceed regulatory standards, it is possible that these exceedances are a result of natural conditions and not caused by land use or other anthropogenic activities. Elevated boron concentrations are naturally occurring in many central coast basins and elevated TDS, chloride, and sodium are often associated with rocks of marine origin that are present in the EMA.

Figure 3-25 shows the locations of potential groundwater contaminant point sources and the locations of completed/case closed sites. The single open/active leaking underground storage site case is Jim's Service Center (GeoTracker Site ID T0608300118) that was eligible for closure as of January 30, 2019, per the RWQCB Low Threat Closure Policy (SBCPHD, 2019). Site assessment reports indicate there are dissolved-phase benzene and methyl tert-butyl ether (MTBE) concentrations in groundwater beneath the site. Alamo Pintado Creek was determined to be the sensitive downgradient receptor. Due to the measured groundwater gradient in the area of the site, the classification of Alamo Pintado Creek as a losing stream by the USGS National Hydrography Dataset, and decreasing benzene and MTBE concentrations, this site was determined to be a minimal threat to groundwater as a drinking water source (Flowline Consulting, Inc., 2018). Figure 3-25 also shows a landfill site (L10004697449) that is presently closed. Site monitoring wells indicate that contaminants are either not detected or below regulatory standards. One active oil and gas project site (T10000011845) is present in the northwest corner of the EMA (see Section 3.2.3.1.3 for more details on these sites). Based on available information, none of the identified sources of contamination have widespread unremediated contaminant plumes and detected contaminants appear to be localized.

Table 5-3. Water Quality Standards for Selected Constituents of Concern

Constituent	MCL (mg/L)	SMCL[2] (mg/L)	WQO (mg/L)
Chromium	0.05	—	—
Fluoride	2	—	—
Gross Alpha[2]	15	—	—
Nitrate[3]	10	—	1
Trihalomethanes	0.080	—	—
Carbon Tetrachloride	0.0005	—	—
Foaming Agents (MBAS)	—	0.5	—
Iron	—	0.3	—
Manganese	—	0.05	—
Boron	—	—	0.5
Chloride	—	500	50
Sodium	—	—	20
Sulfate	—	500	10
Total Dissolved Solids	—	1,000	600

Notes

[1] Nitrate concentration measured as nitrogen (EPA MCL)

[2] Upper consumer acceptance level

[3] State of California DDW MCL

SWRCB. 2019. California Code of Regulations, Title 22. April 16. California State Water Resources Control Board (SWRCB).

RWQCB. 2019. Water Quality Control Plan for the Central Coastal Basin, June 2019 Edition. California Environmental Protection Agency. Central Coast Regional Water Quality Control Board (RWQCB).

— = No value

DDW = Division of Drinking Water

EPA = U.S. Environmental Protection Agency

mg/L = milligram per liter

MCL = maximum contaminant level (drinking water)

SMCL = secondary maximum contaminant level (drinking water)

WQO = water quality objective (median groundwater objective)

5.8.2.2 Salts and Nutrients [§ 354.28(a) and (d)]

§ 354.28 Minimum Thresholds.

(a) Each Agency in its Plan shall establish minimum thresholds that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site established pursuant to Section 354.36. The numeric value used to define minimum thresholds shall represent a point in the basin that, if exceeded, may cause undesirable results as described in Section 354.26.

(d) 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.

Minimum thresholds pertaining to salts and nutrients measured in groundwater are as follows:

- Concentrations of TDS, chloride, sulfate, boron, sodium, and nitrate are equal to or greater than WQOs in 50 percent of representative wells or are equal to concentrations present when SGMA was enacted (January 2015).

The WQOs for each constituent are presented in Table 5-3 are considered the minimum thresholds for salts and nutrients. In cases where the ambient (prior to January 2015) water quality exceeds the WQO, the ambient water quality is considered the minimum threshold.

5.8.2.3 Relationship between Individual Minimum Thresholds and Other Sustainability Indicators [§ 354.28(b)(2) and (c)]

§ 354.28 Minimum Thresholds.

(b) The description of minimum thresholds shall include the following:

(2) The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.

(c) The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.

The groundwater quality minimum thresholds were set based on state and federal drinking water quality standards, as well as WQOs included in the WQ Basin Plan.

Because SGMA regulations do not require projects or actions to improve groundwater quality beyond what existed prior to January 1, 2015 (Water Code § 10727.2(b)(4)), or beyond that required by other regulatory agencies with clear jurisdiction over the matter and because the basin has no history of material water quality issues in this regard, there will be no direct actions under the GSP associated with the groundwater quality minimum thresholds at this time, though the GSA will continue to monitor water quality. Therefore, there are no actions that directly influence other sustainability indicators, as described below.

- **Avoid Chronic Lowering of Groundwater Levels.** Groundwater quality minimum thresholds could influence groundwater level minimum thresholds by limiting the types of water that can be used for groundwater recharge to raise groundwater levels. Water used for recharge cannot exceed any of the groundwater quality minimum thresholds.
- **Avoid Chronic Reduction of Groundwater in Storage.** Nothing in the groundwater quality minimum thresholds promotes pumping in excess of the sustainable yield. Therefore, the groundwater quality minimum thresholds will not result in an exceedance of the groundwater storage minimum threshold.
- **Avoid Land Subsidence.** Nothing in the groundwater quality minimum thresholds promotes a condition that will lead to additional subsidence; therefore, the groundwater quality minimum thresholds will not result in a significant or unreasonable level of subsidence.
- **Avoid Depletion of Interconnected Surface Waters.** There is no information indicating that the groundwater quality minimum thresholds would have significant and unreasonable effects on interconnected surface waters. Nothing in the groundwater quality minimum thresholds promotes additional pumping or lower groundwater levels in areas where interconnected surface waters may exist. Therefore, the groundwater quality minimum thresholds will not result in a significant or unreasonable depletion of interconnected surface waters.
- **Avoid Seawater Intrusion.** This sustainability indicator is not applicable to the EMA.

5.8.2.4 Effects of Minimum Thresholds on Neighboring Basins [§ 354.28(b)(3)]

§ 354.28 Minimum Thresholds.

(b) The description of minimum thresholds shall include the following:

(3) How minimum thresholds have been selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.

The CMA is hydrologically downgradient of the EMA; thus, groundwater generally flows from the EMA into the CMA. Poor groundwater quality, should such condition ever occur in the EMA, could flow into the CMA, affecting the ability to achieve sustainability in the CMA. The degraded groundwater quality minimum threshold for salts and nutrients is set to prevent unreasonable movement of poor-quality groundwater or further degrade groundwater quality that could impact overall beneficial uses of groundwater. Therefore, it is unlikely that the groundwater quality minimum thresholds established for the EMA will prevent the CMA from achieving sustainability. The groundwater gradients at the boundary between the EMA and SACV are such that groundwater does not flow between the EMA and SACV and, therefore, the SACV would not be impacted by the minimum threshold for the degraded groundwater quality sustainability indicator in the EMA.

5.8.2.5 Effects of Minimum Thresholds on Beneficial Uses and Land Uses [§ 354.26(b)(3)]

§ 354.26 Undesirable Results.

(b) The description of undesirable results shall include the following:

(3) Potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results.

The minimum thresholds for degraded groundwater quality have been established to avoid undesirable results. For this reason, groundwater serving beneficial uses (including GDEs) and land uses will not be adversely affected, as described below:

- **Agricultural land uses and users.** The degraded groundwater quality minimum thresholds generally benefit the agricultural water users in the EMA. For example, setting the minimum threshold for salts and nutrients at the WQOs described in the WQ Basin Plan ensures that a supply of usable groundwater will exist for beneficial all agricultural uses.
- **Municipal uses and users.** The degraded groundwater quality minimum thresholds generally benefit the municipal water users in the EMA because there are existing regulatory programs and agencies that ensure there is an adequate supply of good quality groundwater are in place to ensure that drinking water standards are satisfied for municipal uses. In addition, water quality standards and the related minimum thresholds for salts and nutrients are intended to be protective of drinking water uses.
- **Domestic users.** The degraded groundwater quality minimum thresholds for municipal generally benefit the domestic water users in the EMA because these uses share the aquifer with municipal water supply wells. In addition, water quality standards and the related MTs for contaminants, salts, and nutrients are intended to be protective of drinking water uses.
- **Ecological land uses and users.** Although the degraded groundwater quality minimum thresholds do not directly benefit ecological uses, it can be inferred that the degraded groundwater quality minimum thresholds will indirectly benefit ecological water uses in the EMA because these thresholds limit future increases in concentrations of constituents of concern from what they are now, or prior to what they were when SGMA was enacted in January of 2015.

5.8.2.6 Relevant Federal, State, or Local Standards [§ 354.28(b)(5)]

§ 354.28 Minimum Thresholds.

(b) The description of minimum thresholds shall include the following:

(5) How state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the Agency shall explain the nature of and basis for the difference.

The degraded groundwater quality minimum thresholds for salts and nutrients specifically incorporate federal and state drinking water standards. State regulatory agencies have responsibility and authority for responding to contaminant detections that may impair drinking water quality.

5.8.2.7 Methods for Quantitative Measurement of Minimum Thresholds [§ 354.28(b)(6)]

§ 354.28 Minimum Thresholds.

(b) The description of minimum thresholds shall include the following:

(6) How each minimum threshold will be quantitatively measured, consistent with the monitoring network requirements described in Subarticle 4.

Degraded groundwater quality will be directly measured from existing or new municipal (DDW compliance monitoring program), domestic (if landowners participate in monitoring), and agricultural supply wells (ILRP). Degraded groundwater quality minimum thresholds will be directly measured from RMSs. Exceedances of regulatory standards and WQOs will be assessed on an annual basis in accordance with the monitoring program (see Section 4). Minimum thresholds for the degradation of groundwater quality sustainability indicator are met when concentrations of constituents of concern exceed the regulatory threshold (WQOs defined in the WQ Basin Plan and concentrations present when SGMA was enacted [January 2015]) for three consecutive monitoring events in more than 50 percent of RMSs.

5.8.3 Measurable Objectives for Water Quality [§ 354.30(a),(b),(c),(d), and (g)]

§ 354.30 Measurable Objectives.

(a) Each Agency shall establish measurable objectives, including interim milestones in increments of five years, to achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon.

(b) Measurable objectives shall be established for each sustainability indicator, based on quantitative values using the same metrics and monitoring sites as are used to define the minimum thresholds.

(c) Measurable objectives shall provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, and periods of drought, and be commensurate with levels of uncertainty.

(d) An Agency may establish a representative measurable objective 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 measurable objectives as supported by adequate evidence.

(g) An Agency may establish measurable objectives that exceed the reasonable margin of operational flexibility for the purpose of improving overall conditions in the basin, but failure to achieve those objectives shall not be grounds for a finding of inadequacy of the Plan.

5.8.3.1 Measurable Objectives Pertaining to Contaminants

Remediating groundwater contamination Improving groundwater quality is not a required under SGMA; however, protecting it from further degradation due to groundwater production or GSA activity is important to the beneficial users and uses of the resource in the EMA so that pumping can be maintained at desired levels. Thus, the measurable objective as it relates to contaminants is to not make contamination issues worse and to maintain groundwater quality equal to or below regulatory standards or, equal to or below concentrations present in groundwater when SGMA was enacted.

5.8.3.2 Measurable Objectives Pertaining to Salts and Nutrients

The measurable objective as it relates to salts and nutrients (i.e., TDS, chloride, sulfate, boron, sodium, and nitrate) is to maintain groundwater quality equal to or below WQOs presented in the WQ Basin Plan, or equal to or below concentrations present in groundwater when SGMA was enacted.

5.8.4 Interim Milestones for Water Quality [§ 354.30(e)]

§ 354.30 Measurable Objective.

(e) Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin with 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.

Interim milestones show how the GSA anticipates moving from current conditions to meeting the measurable objectives. No significant and unreasonable results have been observed in the EMA in association with degraded groundwater quality. Therefore, no interim milestones are being proposed.

5.9 Land Subsidence Sustainable Management Criterion

5.9.1 Undesirable Results for Subsidence [§ 354.26(a),(b)(1),(b)(2), and (d)]

§ 354.26 Undesirable Results.

(a) Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.

(b) The description of undesirable results shall include the following:

(1) The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.

(2) The criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.

(d) An Agency that is able to demonstrate that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin shall not be required to establish criteria for undesirable results related to those sustainability indicators.

Conditions that may lead to an undesirable result in the EMA include a shift in pumping locations or substantial increase in pumping beyond what has been observed, which could lead to a substantial decline in groundwater levels that could result in land subsidence that exceeds the minimum thresholds. Presently, there is no data to indicate whether the geologic materials comprising the basin are susceptible to subsidence. The Basin is located in a very tectonically active region and so the ground surface may rise or fall as a result.

Locally defined significant and unreasonable conditions for land subsidence are land ~~subsidence~~surface elevation change rates exceeding rates estimated by using the data sets described below and land subsidence that causes damage to groundwater supply, land uses, infrastructure, and property interests:

- Estimated land ~~subsidence~~surface elevation using InSAR data that are collected by the European Space Agency Sentinel-1A satellite and processed by TRE ALTAMIRA Inc. for the period from June 13, 2015, through September 19, 2019 (TRE ALTAMIRA, Inc., 2020).
- Estimated land ~~subsidence~~surface elevation using InSAR data processed by European Space Agency Sentinel-1A satellite and processed by the National Aeronautics and Space Administration Jet Propulsion Laboratory for the period between spring of 2015 and summer of 2017 (NASA JPL, 2018).
- Measured land ~~subsidence~~surface elevation data collected by a network of CGPS stations operated by UNAVCO. Measured land subsidence data collected by CGPSs located in areas immediately outside of the EMA were reviewed (UNAVCO, 2020).

For clarity, this SMC uses two related concepts to define significant and unreasonable conditions:

- **Land subsidence** is a gradual settling of the land surface caused by, among other processes, compaction of subsurface materials due to lowering of groundwater levels from groundwater pumping. Land subsidence from dewatering subsurface clay layers can be an inelastic process and the potential decline in land surface could be permanent. This can also be caused by exploitation of oil and gas from fields located within or near the EMA.
- **Land surface elevation fluctuation.** Land surface may rise or fall, elastically, in any one year. Land surface elevation fluctuation may or may not indicate long-term permanent subsidence. This can be caused by tectonic activity in the earth. It can also be caused by grading activities, particularly in agricultural areas or housing developments.

By regulation, the ground surface subsidence undesirable result is a quantitative combination of subsidence minimum threshold exceedances. Therefore, the ground surface subsidence undesirable results include the following:

- Significant and unreasonable subsidence caused by groundwater extraction exceeds the minimum threshold and causes damage to structures and infrastructure and substantially interferes with surface land uses.

Figure 3-36 shows the InSAR measured ~~subsidence~~land surface elevation changes in the EMA. The dark blue areas are areas with measured ground surface rise of between 0 feet and 0.25 feet. The teal area on Figure 3-36 is the area with measured ground surface drop of 0 feet to 0.25 feet. Random sampling of the 100-meter by 100-meter (328-foot by 328-foot) calculation grid cells indicates the greatest amount of ~~subsidence~~land surface elevation changes in the EMA has occurred in the wedge-shaped area that is bound by and includes Los Olivos, State Highway 154, and the base of the San Rafael Mountains. Total measured ~~subsidence~~land surface elevation changes in the area from June 13, 2015, through September 19, 2019, is less than 0.06 feet, or 0.015 feet per year. The data accuracy report for the InSAR data (Towill, Inc., 2020) states that "InSAR data accurately models change in ground elevation to an accuracy tested to be 16 mm at 95% confidence." Therefore, the InSAR-based annual ~~subsidence rate~~land surface elevation decline of 0.015 feet (0.18 inches) is below the accuracy range of 0.053 feet (0.63 inches). The reported ~~subsidence~~rate of decline is ~~within~~below the range of uncertainty of the InSAR data, indicating that no significant subsidence within the Basin has been recorded.

Elevation data recorded from the UNAVCO CGPS Stations is presented on Figure 3-37, which includes time-series plots of ~~subsidence.~~land surface elevation. One of these stations is located near the Santa Ynez Airport, while the other two stations are located in the periphery of the Basin and indicate what is occurring with regard to surface elevations regionally. Total subsidence, or uplift, recorded by the station within the EMA, indicate that, since 2015, ~~subsidence~~land surface elevation change is 4 mm per year (plus or minus approximately 1 mm per year), for a total ~~subsidence~~decline of 20 mm (0.065 feet). For the stations immediately surrounding the EMA during the approximately 19-year period of record (approximately 2001 through 2020) total ~~subsidence~~land surface elevation decline has been approximately plus or minus 10 mm (0.03 feet). This is a minor rate of ~~subsidence~~decline or uplift and is insignificant.

To supplement the InSAR and UNAVCO data, a preliminary evaluation was completed to assess the range of possible long-term ground surface elevation changes related to withdrawal of groundwater from the EMA. The preliminary evaluation included developing stratigraphic profiles from well logs and estimating ranges of possible long-term subsidence that might be expected in the future. The analysis was completed at two well locations (ID1 5a and ID1 6) with estimated potential subsidence of on the order of 0.5 to 3 feet resulting from the changes in groundwater elevation reported in the hydrographs. This report is presented in Appendix E and additional discussion is included in Section 3.2.4. Due to a lack of ~~subsidence~~land surface elevation data for the portion of the EMA where pumping effects are likely to be the greatest, a land surface elevation (subsidence) monitoring program is proposed and presented in Section 4.

Recorded ~~subsidence~~land surface elevation changes could be due to tectonic activity, groundwater extraction, oil and gas extraction, or a combination of the three. Should potential subsidence be observed, the GSA will first assess whether the ~~subsidence~~land surface elevation changes may be due to (1) groundwater pumping and (2) elastic processes (~~subsidence~~land surface elevations that will recover with rising groundwater). If the subsidence is not elastic or is due to pumping, the GSA will undertake a program to correlate the observed subsidence with measured groundwater elevations.

Staying above the minimum threshold will avoid the subsidence undesirable result and protect the beneficial uses and users from impacts to groundwater supply, land uses, infrastructure, and property interests.

5.9.2 Minimum Thresholds for Subsidence [§ 354.26(c) and 354.28(a),(b)(1),(c)(5)(A)(B),(d), and (e)]

§ 354.26 Undesirable Results.

(c) The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.

§ 354.28 Minimum Thresholds.

(a) Each Agency in its Plan shall establish minimum thresholds that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site established pursuant to Section 354.36. The numeric value used to define minimum thresholds shall represent a point in the basin that, if exceeded, may cause undesirable results as described in Section 354.26.

(b) The description of minimum thresholds shall include the following:

(1) The information and criteria relied upon to establish and justify the minimum thresholds for each sustainability indicator. The justification for the minimum threshold shall be supported by information provided in the basin setting, and other data or models as appropriate, and qualified by the uncertainty in the understanding of the basin setting.

(c) Minimum thresholds for each sustainability indicator shall be defined as follows:

(5) Land Subsidence. The minimum threshold for land subsidence shall be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results. Minimum thresholds for land subsidence shall be supported by the following:

(A) Identification of land uses and property interests that have been affected or are likely to be affected by land subsidence in the basin, including an explanation of how the Agency has determined and considered those uses and interests, and the Agency's rationale for establishing minimum thresholds in light of those affects.

(B) Maps and graphs showing the extent and rate of land subsidence in the basin that defines the minimum threshold and measurable objectives.

(d) 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.

(e) An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish minimum thresholds related to those sustainability indicators.

Section 354.28(c)(5) of the SGMA regulations states that “The minimum threshold for land subsidence shall be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results.”

The subsidence minimum threshold is as follows and summarized in Table 5-4:

- The rate of subsidence does not exceed 0.08 feet (1 inch) per year for 3 consecutive years.

This minimum threshold was selected because undesirable results have not been observed and this rate of subsidence is consistent with what has been measured by the InSAR and UNACVO CGPS datasets. Three consecutive years of observed ~~subsidence~~land surface elevation decline was chosen because the available land surface elevation data shows that the land surface may rise or fall over 1 or 2 years. Three data points are needed to define a trend. The GSA may conduct land surface elevation monitoring using high-resolution GPS equipment at benchmarks located in the vicinity of critical infrastructure. The expected precision and accuracy of this method will be equal to or better than the InSAR and UNAVCO CGPS methods.

Table 5-4. Land Subsidence Minimum Threshold

RMS ID	Rate of Land Subsidence (feet per year)
InSAR and UNAVCO Methods	0.08[1]

Notes

[1] Land subsidence must also cause damage to groundwater supply, land uses, infrastructure, and property interests.

InSAR = Interferometric Synthetic Aperture Radar

RMS = representative monitoring site

UNAVCO = University NAVSTAR Consortium

5.9.2.1 Relationship between Individual Minimum Thresholds and Other Sustainability Indicators [§ 354.28(b)(2)]

§ 354.28 Minimum Thresholds.

(b) The description of minimum thresholds shall include the following:

(2) The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.

Subsidence minimum thresholds have little or no impact on other minimum thresholds, as described below:

- **Avoid Chronic Lowering of Groundwater Levels.** Subsidence minimum thresholds will not result in significant or unreasonable lowering of groundwater levels.
- **Avoid Chronic Reduction of Groundwater in Storage.** The subsidence minimum thresholds will not change the amount of groundwater pumping and will not result in a significant or unreasonable change of groundwater in storage.
- **Avoid Degraded Groundwater Quality.** The subsidence minimum thresholds will not change the groundwater flow directions or gradients of groundwater pumping and therefore and will not result in a significant or unreasonable change in groundwater quality.
- **Avoid Depletion of Interconnected Surface Waters.** The groundwater level subsidence minimum thresholds will not change the amount or location of groundwater pumping and will not result in a significant or unreasonable depletion of interconnected surface waters.
- **Avoid Seawater Intrusion.** This sustainability indicator is not applicable in the EMA.

5.9.2.2 Effects of Minimum Thresholds on Neighboring Basins [§ 354.28(b)(3)]

§ 354.28 Minimum Thresholds.

(b) The description of minimum thresholds shall include the following:

(3) How minimum thresholds have been selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.

The ground surface subsidence minimum thresholds are set to prevent any long-term subsidence that could harm groundwater supply, land uses, infrastructure, and property interests. Therefore, the subsidence minimum thresholds for the EMA will not prevent the downstream CMA and adjacent SACV from achieving sustainability.

5.9.2.3 Effects of Minimum Thresholds on Beneficial Uses and Land Uses [§ 354.28(b)(4)]

§ 354.28 Minimum Thresholds.

(b) The description of minimum thresholds shall include the following:

(4) How minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.

The subsidence minimum thresholds are set to prevent subsidence that could harm groundwater supply, land uses, infrastructure, and property interests. Available data indicate that there is currently little subsidence occurring in the EMA, and no subsidence that has been observed to substantially interfere with groundwater supply, land uses, infrastructure, and property interests. Therefore, there is no likely negative impact on any beneficial uses or users of groundwater.

5.9.2.4 Relevant Federal, State, or Local Standards [§ 354.28(b)(5)]

§ 354.28 Minimum Thresholds.

(b) The description of minimum thresholds shall include the following:

(5) How state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the Agency shall explain the nature of and basis for the difference.

There are no federal, state, or local regulations related to subsidence.

5.9.2.5 Methods for Quantitative Measurement of Minimum Thresholds [§ 354.28(b)(6)]

§ 354.28 Minimum Thresholds.

(b) The description of minimum thresholds shall include the following:

(6) How each minimum threshold will be quantitatively measured, consistent with the monitoring network requirements described in Subarticle 4.

Minimum thresholds will be assessed using DWR-supplied InSAR and UNAVCO CGPS data and land surface elevation monitoring (see Section 4).

5.9.3 Measurable Objectives for Subsidence [§ 354.30(a)]

§ 354.30 Measurable Objectives.

(a) Each Agency shall establish measurable objectives, including interim milestones in increments of five years, to achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon.

5.9.3.1 Methodology for Setting Measurable Objectives

The measurable objectives are set based on maintaining current conditions (e.g., rate of subsidence does not significantly change). Changes are measured by DWR-supplied InSAR data, UNAVCO CGPS data, and land surface elevation monitoring if performed by the GSA.

5.9.3.2 Measurable Objectives for the Basin [§ 354.30(b),(c),(d), and (g)]

§ 354.30 Measurable Objectives.

(b) Measurable objectives shall be established for each sustainability indicator, based on quantitative values using the same metrics and monitoring sites as are used to define the minimum thresholds.

(c) Measurable objectives shall provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, and periods of drought, and be commensurate with levels of uncertainty.

(d) An Agency may establish a representative measurable objective 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 measurable objectives as supported by adequate evidence.

(g) An Agency may establish measurable objectives that exceed the reasonable margin of operational flexibility for the purpose of improving overall conditions in the basin, but failure to achieve those objectives shall not be grounds for a finding of inadequacy of the Plan.

The measurable objectives for subsidence represent target ~~subsidence~~land surface elevation change rates in the EMA. Available information does not suggest the occurrence of significant and unreasonable subsidence in the EMA. Therefore, the measurable objective for subsidence is the accuracy range of the InSAR data at 95 percent confidence (0.053 feet) and is summarized in Table 5-5.

Table 5-5. Land Subsidence Measurable Objective

RMS ID	Rate of Land Subsidence (feet per year)
InSAR	0.053

Notes

RMS = representative monitoring site

InSAR = Interferometric Synthetic Aperture Radar

5.9.4 Interim Milestones for Subsidence [§ 354.30(e)]

§ 354.30 Measurable Objective.

(e) Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin with 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.

Interim milestones show how the GSA anticipates moving from current conditions to meeting the measurable objectives. No significant or unreasonable effect has been observed in the EMA in association with land subsidence. Therefore, no interim milestones are being proposed.

5.10 Depletion of Interconnected Surface Water Sustainable Management Criterion

5.10.1 Undesirable Results for Surface Water Depletion [§ 354.26(a),(b)(1)(2), and (d)]

§ 354.26 Undesirable Results.

(a) Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.

(b) The description of undesirable results shall include the following:

(1) The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.

(2) The criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.

(d) An Agency that is able to demonstrate that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin shall not be required to establish criteria for undesirable results related to those sustainability indicators.

The conditions that may lead to an undesirable result for interconnected surface water in the EMA include the following:

- **Groundwater level declines.** A significant and unreasonable condition for depletion of interconnected surface water is a pumping-induced reduction in groundwater levels in specific locations where groundwater is interconnected with surface water that causes depletion of the interconnected surface water, resulting in significant and unreasonable adverse impacts to Category A GDEs (see Section 3.2 and Figure 3-40). As discussed in Section 5.10, groundwater levels that continue to decline below historical levels in the future may reduce groundwater flow in areas that are connected to surface water and have significant and unreasonable adverse impacts on Category A GDEs and reductions of discharge of surface water to the Santa Ynez River. No significant or unreasonable effects have been observed thus far in areas identified as being interconnected with surface water during periods of historical low groundwater levels and groundwater in storage.
- **Severe drought** would reduce recharge to the Paso Robles Formation and Careaga Sand aquifers; thus, lowering groundwater levels and reducing surface water flow in Alamo Pintado and Zanja de Cota Creeks, which could result in depletions of interconnected surface water that could have a significant and unreasonable adverse impact to Category A GDEs and reductions of discharge of surface water to the Santa Ynez River. Short-term impacts due to drought are anticipated in SGMA and the SGMA regulations, with recognition that management actions need sufficient flexibility to accommodate

drought periods and ensure short-term impacts can be offset by increases in groundwater levels or storage during normal or wet periods.

Locally defined significant and unreasonable conditions for depletion of interconnected surface water that could cause significant and unreasonable adverse impacts to Category A GDEs were assessed using several resources:

- Potential GDE identification using the Natural Communities Commonly Associated with Groundwater (NCCAG) data set from DWR and The Nature Conservancy guidance on screening for potential GDEs (see Section 3.2.6)
- Identification of interconnected surface water (see Section 3.2.5)
- Groundwater elevation monitoring data (see Section 3.2.1)
- Groundwater flow model of the EMA used to assess whether surface water depletion is evident during the historical period and the projected future period, with and without climate change

As discussed in Section 3.1.1.1, groundwater discharge as subsurface outflow from the Santa Ynez Uplands portion of the EMA is relatively small (LaFreniere and French, 1968). At the time that the USGS studied groundwater outflow (1946 to 1964), much of the groundwater flow was understood to exit the uplands as surface water flow, particularly on the lower end of Zanja de Cota Creek, with an average of 2,800 AFY for all tributaries. This groundwater discharge from the higher-elevation Santa Ynez Uplands into the lower-lying Santa Ynez River along the southern border of this area is limited due to the relatively impermeable bedrock boundary that forms a barrier to groundwater flow along the Santa Ynez River and the relatively limited thickness of saturated alluvium within the major tributaries in this area (Hoffman, 1996). Conceptually, it is believed that this discharge occurs primarily as surface water flow leaving the tributaries just upstream of the confluence with the Santa Ynez River.

The focus of this sustainability indicator is avoiding significant and unreasonable adverse impacts on beneficial uses of interconnected surface water in the EMA caused by groundwater use. Category A GDEs are a beneficial use in the subject areas. In addition, significant and unreasonable reductions in interconnected surface water flowing into the Santa Ynez River caused by groundwater use in the principal aquifers should be avoided. Section 3.2 describes the methodology used to identify GDEs in the EMA. In summary, measured groundwater level data and groundwater elevation contours within the Principal Aquifers were compared to the NCCAG data set available from DWR to identify locations within the EMA where groundwater levels were within 30 feet of ground surface. The Nature Conservancy's guidelines suggests that potential GDEs in areas where groundwater occurs more than 30 feet below ground surface can be removed from the GDE category since this depth is too great to support habitat (TNC, 2019). Based on this evaluation, GDEs (Category A) associated with one of the Principal Aquifers were identified on the downstream ends of Alamo Pintado and Zanja de Cota Creek (see Figure 3-40) where there is evidence that groundwater is interconnected with surface water. Other potential GDEs were identified in other parts of the Basin; however, they were excluded from consideration because they are located in higher elevations above the regional water table, likely supported by perched water, not associated with a Principal Aquifer, or are outside of the areas that are affected by groundwater use in the Basin (e.g., north and east of Cachuma Reservoir [Lake Cachuma]).

According to local stakeholders, Alamo Pintado and Zanja de Cota Creeks are generally dry except during periods of rainfall. The lower end of these creeks near the confluence with the Santa Ynez River are reported to be perennially wet because groundwater present in the underlying Principal Aquifer (Paso Robles Formation or Careaga Sand) is "upwelling" into the creek at these locations. The upwelling occurs because low permeability marine bedrock that underly the Santa Ynez River form a groundwater dam that causes the upwelling and discharge to surface water. This is the reason why GDEs have been sustained in these areas.

The current GDEs have survived through the recent drought (WYs 2012 to 2021 with 2 wet years in WYs 2017 and 2019) that saw historical low groundwater levels in many EMA groundwater wells. When surface water is present or when groundwater levels are above the maximum rooting depth of the plants, it can be inferred that GDEs are not adversely affected (because no impacts to GDEs have been observed to date).

No studies have been found that evaluated historical or existing habitat composition or condition in the GDE area along Alamo Pintado and Zanja de Cota Creek. Without completing an additional assessment, it cannot be determined whether the Alamo Pintado and Zanja de Cota Creek's ability to support GDEs has changed over time as a result of drought conditions in the region or whether pumping in the EMA has caused impacts. To avoid impacts to Category A GDEs in the future, groundwater monitoring is planned. Construction of shallow monitoring wells, or piezometers, are proposed within the Category A GDE areas identified near the confluence of Alamo Pintado and Zanja de Cota Creek with the Santa Ynez River (see Figure 3-40). Groundwater elevation will be used as a proxy for the depletion of interconnected surface water sustainability indicator.

Because GDEs are a beneficial use of interconnected surface water in the subject areas, the minimum threshold for depletion of interconnected surface water is focused on avoiding significant and unreasonable adverse impacts to Category A GDEs. It also will avoid significant and unreasonable depletion of surface water that discharges to the Santa Ynez River. The areas near the confluence of Alamo Pintado and Zanja de Cota Creek with the Santa Ynez River (see Figure 3-40) are the only locations identified in the EMA where groundwater from a Principal Aquifer is interconnected with surface water.

Significant and unreasonable adverse impacts on beneficial uses of surface water that result in undesirable results include the following:

- Permanent loss or significant and unreasonable adverse impacts to existing native riparian or aquatic habitat in the Category A GDE area due to lowered groundwater levels caused by pumping

A sustained drop in groundwater levels below root zones caused by groundwater pumping could result in permanent loss of GDEs and reduce surface water discharge to the Santa Ynez River. Monitoring of groundwater levels near the confluence of Alamo Pintado and Zanja de Cota Creek with the Santa Ynez River will be conducted by the GSA as part of EMA monitoring programs (see Section 4) to assess whether there is potential for significant and unreasonable adverse impacts and long-term decline in the health of the GDEs in the subject areas and significant reduction in surface water discharge to the river.

5.10.2 Minimum Thresholds for Surface Water Depletion [§ 354.28(a),(b)(1),(c)(6)(A)(B),(d), and (e)]

§ 354.28 Minimum Thresholds.

(a) Each Agency in its Plan shall establish minimum thresholds that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site established pursuant to Section 354.36. The numeric value used to define minimum thresholds shall represent a point in the basin that, if exceeded, may cause undesirable results as described in Section 354.26.

(b) The description of minimum thresholds shall include the following:

(1) The information and criteria relied upon to establish and justify the minimum thresholds for each sustainability indicator. The justification for the minimum threshold shall be supported by information provided in the basin setting, and other data or models as appropriate, and qualified by the uncertainty in the understanding of the basin setting.

(c) Minimum thresholds for each sustainability indicator shall be defined as follows:

(6) Depletions of Interconnected Surface Water. The minimum threshold for depletions of interconnected surface water shall be the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results. The minimum threshold established for depletions of interconnected surface water shall be supported by the following:

(A) The location, quantity, and timing of depletions of interconnected surface water.

(B) A description of the groundwater and surface water model used to quantify surface water depletion. If a numerical groundwater and surface water model is not used to quantify surface water depletion, the Plan shall identify and describe an equally effective method, tool, or analytical model to accomplish the requirements of this Paragraph.

(d) 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.

(e) An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish minimum thresholds related to those sustainability indicators.

Section 354.28(c)(6) of the SGMA regulations states that "The minimum thresholds for depletion of interconnected surface water shall be the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results."

The numerical groundwater model was used to assess the timing and magnitude of potential depletions of interconnected surface waters that may have occurred in the past along these two creeks where an interconnection with groundwater likely exists since there are no surface water gauging sites. The model was also used to assess whether future predicted changes in land use, pumping, and climate (with and without climate change) cause depletion that may cause significant and unreasonable adverse impacts to beneficial uses (e.g., GDEs and discharge to the river) in the Category A GDE area shown on Figure 3-40. As has been observed from past monitoring, groundwater levels vary significantly in response to wet and dry cycles and so the interconnection with surface water is also expected to vary. The groundwater flow model of the EMA was used to assess whether surface water depletion is evident where groundwater is discharging to surface water in Alamo Pintado and Zanja de Cota Creeks. The approach used was to create a zone water budget for each of these two subareas using the model and determine the quantity of groundwater discharge to surface water during the historical period and the projected future period, with and without climate change. It is expected that the discharge volumes would vary as a result of climatic variation. Chronic depletion would be exhibited by a steady reduction in discharge over time.

The results of the depletion analysis using the groundwater model are illustrated on Figures 5-4 and 5-5 for Alamo Pintado and Zanja de Cota Creeks, respectively.

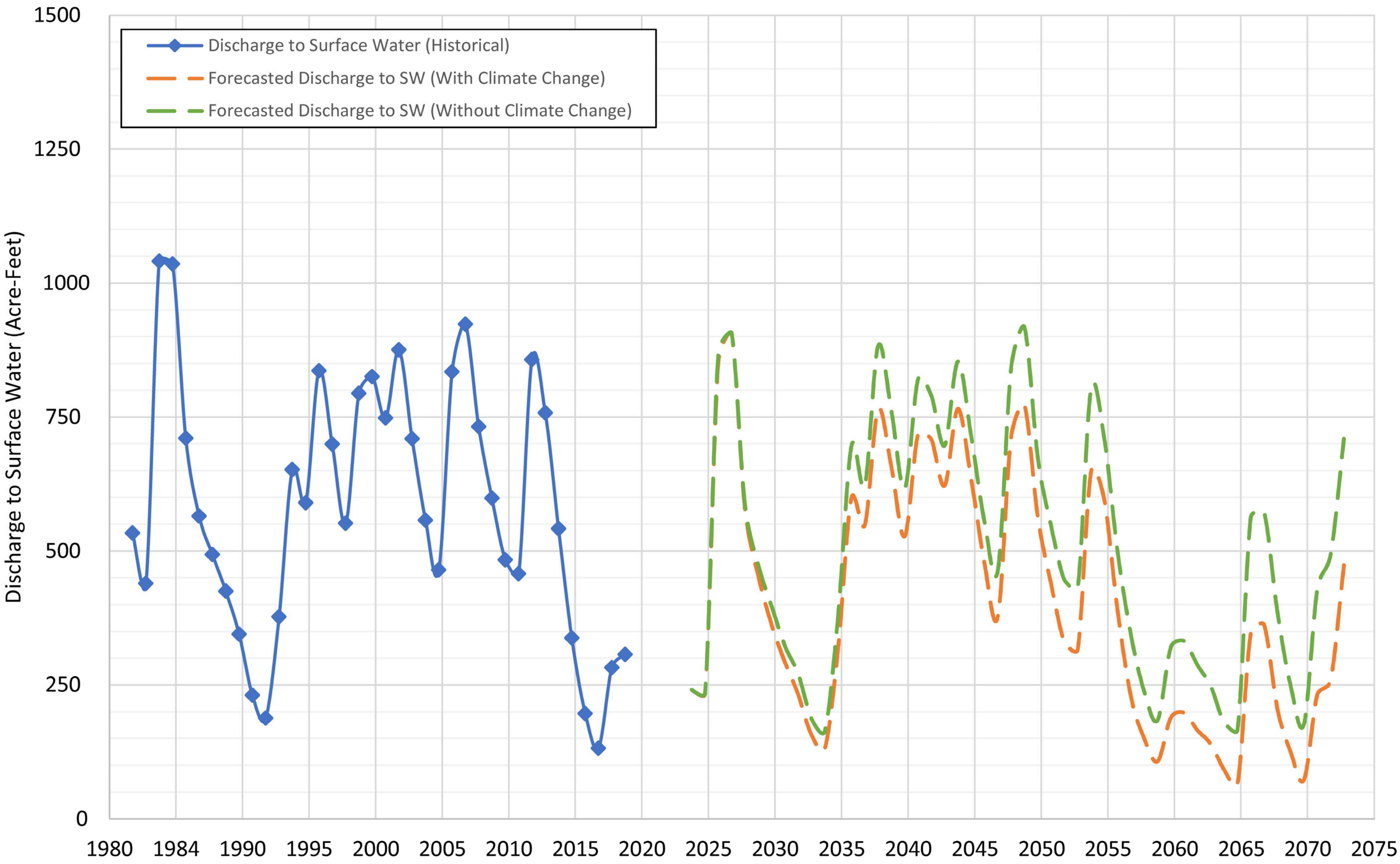

Figure 5-4. Modeled Discharges to Surface Water in Alamo Pintado, Category A GDE Area

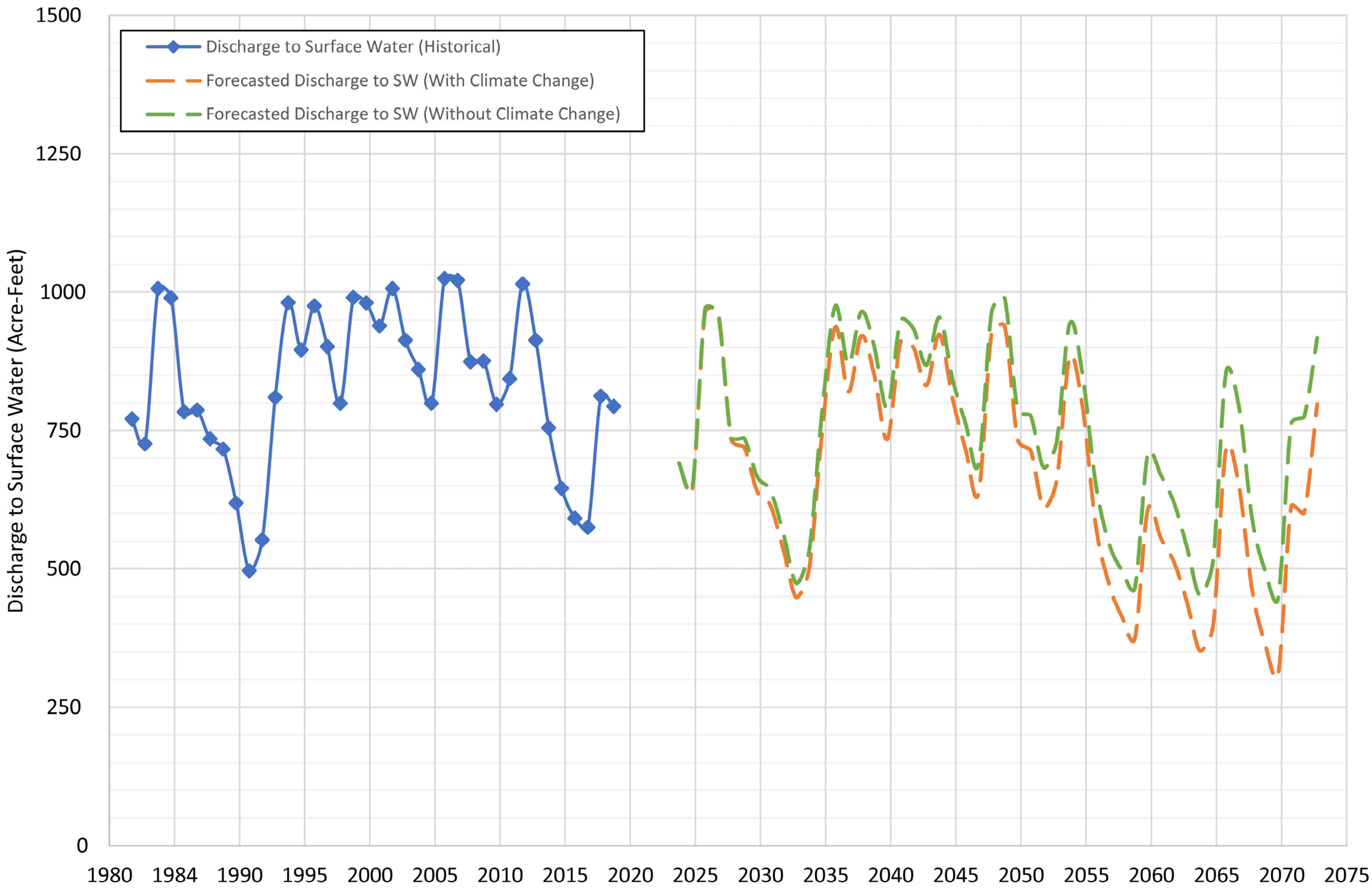

Figure 5-5. Modeled Discharges to Surface Water in Zanja de Cota Creek, Category A GDE Area

The modeling results show fluctuating amounts of discharge to surface water depending on climate but no distinct negative trend that would indicate that surface water depletion occurred as a result of groundwater use during the historical period. The results for the predicted future condition (green dashed lines, without climate change) at these locations show a similar range of groundwater discharge to surface water as the historical period. A slight decrease in groundwater discharge to surface water of less than 25 acre-feet (AF) can be observed for relatively short durations in the future period compared to the historical period. It is inferred that this slight decrease is a result of groundwater use since the historical climate was projected forward in time and there are expected to be small increases in pumping and changes in land use in the future. This change in flow (<25 AF) is very small relative to the range of 150 to 900 AF of groundwater discharge to surface water and is not considered significant. The future condition with climate change shows that surface water depletion caused by climate change can be expected. This is particularly true after the year 2050. Based on these modeling analyses, it is not believed that groundwater use results in significant and unreasonable depletion of surface water. Climate is predicted to have the predominant effect.

GDEs in the Category A GDE area are a beneficial use of interconnected surface water in the upland area. In addition, significant and unreasonable reductions in interconnected surface water flowing into the Santa Ynez River caused by groundwater use in the principal aquifers should be avoided. Because surface water gauges on these tributaries do not exist, gauges may not be feasible to install, and continued use of the groundwater model for estimating future depletion is not as reliable as direct measurements, groundwater levels will be used as a proxy for establishing the minimum the minimum threshold for depletion of interconnected groundwater and surface water. The minimum threshold for this sustainability indicator is presented below and in Table 5-6:

- Groundwater levels measured at the piezometers proposed to be installed in the GDE areas of Alamo Pintado and Zanja de Cota Creek are 15 feet below the stream bed.

This minimum threshold was selected because it represents the lowest groundwater level that most GDE plants can typically access with their roots, assuming that capillary action will bring groundwater further up into the profile. It is also intended to ensure that groundwater use does not significantly reduce the flow of surface water from the tributaries into the Santa Ynez River. The modeling results indicate that surface water flowing seasonally within the tributaries will continue to support the GDEs present there and discharge to the Santa Ynez River unless there is a reduced rainfall or significant drought. During drought conditions, GDEs must rely on groundwater levels being maintained within the root zone. Capillary action in fine-grained sediments within the creek bed will also bring water farther up (as much as several feet) into the vicinity of the plant roots. Based on groundwater modeling results, this threshold has not been reached in the past and is not expected in the future with the assumed climate and land use changes (see Appendix C). Groundwater levels measured at proposed monitoring wells located within the Category A GDE areas of Alamo Pintado and Zanja de Cota Creeks will be used to assess whether depletion of interconnected surface water is occurring and whether significant and unreasonable adverse impacts to GDEs or reductions in discharge of interconnected surface water to the Santa Ynez River are likely to occur as a result of groundwater use. Once sufficient groundwater levels data is obtained from the new monitoring wells, the minimum threshold for surface water depletion will be reviewed and reevaluated if necessary.

Figure 4-4 shows the location of the proposed piezometers in the Category A GDE areas identified in Alamo Pintado and Zanja de Cota Creek.

Table 5-6. Depletion of Interconnected Surface Water Minimum Thresholds

RMS ID	Minimum Threshold
Piezometer(s)[1]	15 feet below respective stream bed[2]

Notes

[1] See Figure 4-4 for locations of proposed piezometers.

[2] To meet the minimum threshold, groundwater levels in piezometers must be equal to or below 15 feet below the stream bed in the Category A GDE areas of Alamo Pintado and Zanja de Cota Creek.

RMS = representative monitoring site

5.10.2.1 Relationship between Individual Minimum Thresholds and to Other Sustainability Indicators [§ 354.28(b)(2)]

§ 354.28 Minimum Thresholds.

(b) The description of minimum thresholds shall include the following:

(2) The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.

Because of the interrelationship between groundwater level, changes in storage, and interconnected surface water, it is possible that one set of thresholds could affect the other set of thresholds for these indicators. The relationship between the depletion of interconnected surface water and the other sustainability indicators is presented below:

- **Avoid Chronic Lowering of Groundwater Levels.** The depletion of interconnected surface water minimum threshold is related to groundwater level minimum thresholds because they are interdependent. If groundwater levels in the Principal Aquifers decline such that there is a significant reduction in upwelling to Zanja de Cota and Alamo Pintado Creeks near their confluences with the Santa Ynez River, surface water depletion of interconnected surface water and significant and unreasonable adverse impacts to GDEs is possible. Monitoring of groundwater levels within the Category A GDE areas will indicate whether this is occurring. If groundwater levels reach depletion of surface water minimum thresholds, then an evaluation, and potentially management actions, would be conducted in a timely manner to avoid significant and unreasonable adverse impacts to GDEs.
- **Avoid Chronic Reduction of Groundwater in Storage.** Nothing about the minimum threshold promotes groundwater pumping in excess of the sustainable yield. Therefore, the minimum threshold for depletion of interconnected surface water will not result in an exceedance of the groundwater in storage minimum threshold.
- **Avoid Degraded Groundwater Quality.** The minimum threshold for depletion of interconnected surface water will not change the groundwater flow directions or gradients, and, therefore, will not result in a significant or unreasonable change in groundwater quality.
- **Avoid Land Subsidence.** Nothing about the minimum threshold for depletion of interconnected surface water promotes a condition that will lead to additional subsidence. Therefore, the minimum threshold for depletion of interconnected surface water will not result in a significant or unreasonable level of subsidence.
- **Avoid Seawater Intrusion.** This sustainability indicator is not applicable to the EMA.

5.10.2.2 Effects of Minimum Thresholds on Neighboring Basins [§ 354.28(b)(3)]

§ 354.28 Minimum Thresholds.

(b) The description of minimum thresholds shall include the following:

(3) How minimum thresholds have been selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.

The CMA is hydrologically downgradient of the EMA. As discussed in Section 3.1, groundwater and surface water generally flow from the EMA into the CMA. The minimum threshold for depletion of interconnected surface water is set to protect habitat and sensitive species at specific locations in the EMA where there is a connection between groundwater and surface water. The minimum threshold for depletion of interconnected surface water in the EMA is not anticipated to impact sustainability in the CMA because according to the groundwater model, conditions that are necessary to avoid impacts to Category A GDEs in the EMA will continue to support flows into the CMA.

Groundwater gradients at the boundary between the EMA and SACV indicate that groundwater does not flow between the EMA and SACV and, therefore, the SACV would not be impacted by the minimum threshold for the depletion of interconnected surface water sustainability indicator in the EMA.

5.10.2.3 Effects on Beneficial Uses and Land Uses [§ 354.28(b)(4)]

§ 354.28 Minimum Thresholds.

(b) The description of minimum thresholds shall include the following:

(4) How minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.

The minimum threshold for depletion of interconnected surface water has been selected to avoid significant and unreasonable adverse impacts to Category A GDEs in the EMA and reductions in surface water discharge to the Santa Ynez, while providing a reliable and sustainable groundwater supply. The minimum thresholds for depletion of interconnected surface water have been established to avoid undesirable results. For this reason, groundwater serving beneficial uses (including GDEs) and land uses will not be adversely affected. The groundwater flow model indicates that significant and unreasonable depletion of surface water caused by groundwater use has not been occurring or is expected to occur near the locations where groundwater is connected to surface water in the tributaries. Consequently, reductions in surface water flowing from the tributaries into the Santa Ynez River is not expected to be significant or unreasonable. However, the modeling results indicate that future climate change may have an effect on these beneficial uses.

5.10.2.4 Relevant Federal, State, or Local Standards [§ 354.28(b)(5)]

§ 354.28 Minimum Thresholds.

(b) The description of minimum thresholds shall include the following:

(5) How state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the Agency shall explain the nature of and basis for the difference.

There are no federal, state, or local regulations related to interconnected surface water depletion where this interconnection with groundwater has been identified. The groundwater flow model indicates that significant and unreasonable depletion of surface water as a result of groundwater use has not been occurring and is not expected in the future under climatic conditions observed in the past near the location where groundwater is connected to surface water in the tributaries. Consequently, reductions in surface water flowing from the tributaries into the Santa Ynez River are not expected to be significant or unreasonable.

5.10.2.5 Methods for Quantitative Measurement of Minimum Thresholds [§ 354.28(b)(6)]

§ 354.28 Minimum Thresholds.

(b) The description of minimum thresholds shall include the following:

(6) How each minimum threshold will be quantitatively measured, consistent with the monitoring network requirements described in Subarticle 4.

As a surrogate for surface water flow measurements, groundwater levels will be measured in piezometers proposed to be installed in the Category A GDE areas of Alamo Pintado and Zanja de Cota Creek as shown on Figure 4-4. Details of this monitoring program are presented in Section 4.

5.10.3 Measurable Objectives for Depletion of Surface Water [§ 354.30(a),(b),(c),(d), and (g)]

§ 354.30 Measurable Objectives.

(a) Each Agency shall establish measurable objectives, including interim milestones in increments of five years, to achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon.

(b) Measurable objectives shall be established for each sustainability indicator, based on quantitative values using the same metrics and monitoring sites as are used to define the minimum thresholds.

(c) Measurable objectives shall provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, and periods of drought, and be commensurate with levels of uncertainty.

(d) An Agency may establish a representative measurable objective 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 measurable objectives as supported by adequate evidence.

(g) An Agency may establish measurable objectives that exceed the reasonable margin of operational flexibility for the purpose of improving overall conditions in the basin, but failure to achieve those objectives shall not be grounds for a finding of inadequacy of the Plan.

The measurable objective for depletion of interconnected surface water uses groundwater levels as a proxy because of the lack of locations of existing surface water gaging stations and because avoiding impacts to Category A GDEs in Alamo Pintado and Zanja de Cota Creeks is the focus for this sustainability indicator. The measurable objective for depletion of interconnected surface water has been established in groundwater at 5 feet below the streambed level measured at the piezometers proposed to be installed in the Category A GDE areas of Alamo Pintado and Zanja de Cota Creek (see Figure 4-4). This groundwater level was chosen because it is well within the root zone of vegetation commonly associated with GDEs and is a target by which to compare future groundwater levels. The measurable objective for depletion of interconnected surface water is summarized in Table 5-7.

Table 5-7. Depletion of Interconnected Surface Water Measurable Objectives

RMS ID	Measurable Objectives
Piezometer(s)[1]	Groundwater level that is 5 feet below the stream bed[2]

Notes

[1] See Figure 4-4 for locations of proposed piezometers.

[2] To meet the measurable objective, groundwater levels in piezometers must be 5 feet below the stream bed in the Category A GDE areas of Alamo Pintado and Zanja de Cota Creek for consecutive summer and fall monitoring events.

RMS = representative monitoring site

5.10.4 Interim Milestones for Depletion of Surface Water [§ 354.30(e)]

§ 354.30 Measurable Objective.

(e) **Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin with 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.**

Interim milestones show how the GSA anticipates moving from current conditions to meeting the measurable objectives. Interim milestones are set for each 5-year interval following GSP adoption. For this sustainability indicator, there has been no known or documented significant and unreasonable adverse impact to beneficial uses of surface water, nor impacts to GDEs, to date. The recent historical drought resulted in low groundwater levels and surface water flows. However, there is no indication that any impacts to GDEs were a result of groundwater extractions. The groundwater flow model indicates that significant and unreasonable depletion of surface water as a result of groundwater use has not been occurring and is not expected in the future near the location where groundwater is connected to surface water in the tributaries. Consequently, reductions in surface water flowing from the tributaries into the Santa Ynez River is not expected to be significant or unreasonable. For these reasons, no interim milestones are planned.

5.11 References and Technical Studies [§ 354.4(b)]

~~§ 354.4 General Information.~~

~~(b) Each Plan shall include the following general information: A list of references and technical studies relied upon by the Agency in developing the Plan. Each Agency shall provide to the Department electronic copies of reports and other documents and materials cited as references that are not generally available to the public.~~

§ 354.4 General Information.

(b) Each Plan shall include the following general information: A list of references and technical studies relied upon by the Agency in developing the Plan. Each Agency shall provide to the Department electronic copies of reports and other documents and materials cited as references that are not generally available to the public.

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SECTION 6: Projects and Management Actions [Article 5, SubArticle 5]

6.1 Introduction [§ 354.42, 354.44(a),(c), and (d)]

§§ 354.42 Introduction to Projects and Management Actions. This Subarticle describes the criteria for projects and management actions to be included in a Plan to meet the sustainability goal for the basin in a manner that can be maintained over the planning and implementation horizon.

§ 354.44 Projects and Management Actions

(a) Each Plan shall include a description of the projects and management actions the Agency has determined will achieve the sustainability goal for the basin, including projects and management actions to respond to changing conditions in the basin.

(c) Projects and management actions shall be supported by best available information and best available science.

(d) An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.

Sustainable Groundwater Management Act (SGMA) regulations require each Groundwater Sustainability Plan (GSP) to include a description of projects and management actions necessary to achieve the basin sustainability goals and to respond to changing conditions in the basin discussed. This section describes the projects and management actions that will allow the Santa Ynez River Valley Groundwater Basin (Basin) Eastern Management Area (EMA), as part of GSP implementation, to attain sustainability in accordance with § 354.42 and § 354.44 of SGMA regulations. In this GSP, groundwater management actions generally refer to activities that support groundwater sustainability through policy and regulations without infrastructure; projects are defined as activities supporting groundwater sustainability that require infrastructure.

The EMA Groundwater Sustainability Agency (GSA) has developed a portfolio of potential management actions and projects compatible with the respective operational philosophiesEMA GSA sustainability goals that can be implemented in a phased manner as the conditions in the Basin dictate. The identified potential management actions and potential future projects are categorized into three groups, with the management actions included in Group 1 to be initiated within 1 year of GSP adoption by the EMA GSA. The Group 2 management actions and Group 3 projects may be considered for implementation in the future as conditions in the Basin dictate and the effectiveness of the other management actions are assessed. It is important to note that the Group 2 management actions and Group 3 projects may not be necessary if the implementation of the Group 1 management actions results in conditions within the EMA that are trending toward meeting the EMA GSA sustainability goals and measurable objectives. Further, the EMA GSA may determine that the implementation of Group 2 management actions and/or Group 3 projects is desirable for reasons other than reaching sustainability within the EMA and may elect to implement initiatives from either Group 2 or 3 at any time.

Based on the results of the analysis that was performed in conjunction with the development of this GSP, the EMA GSA concludes that the sustainability goals described in this GSP and required under the provisions of SGMA can be achieved through the implementation, as needed, of the Group 1 management actions described in Sections 6.3 through 6.6. Therefore, the EMA GSA does not plan at this time to implement any of the Group 2 management actions and /or to initiate the construction of any Group 3 project infrastructure for the specific goal of achieving sustainability until such time that evidence exists that the effects of the Group 1 implemented management actions are considered insufficient.

The EMA GSA plans to continually monitor and assess its progress toward meeting the sustainable management criteria (SMCs) (see Section 5). Under conditions where minimum thresholds are projected to be reached, the EMA GSA will perform assessments to determine whether the trends are related to groundwater pumping, drought conditions, or other factors. If groundwater level data are trending toward reaching minimum thresholds as a direct consequence of groundwater pumping in the EMA, then the EMA GSA may consider the implementation of Group 2 management actions and Group 3 projects.

Management actions and potential future projects discussed in this section have been developed to address sustainability goals, measurable objectives, and undesirable results identified for the EMA in Section 5. Inclusion of management actions and projects in this GSP does not forego obligations under local, state, or federal regulatory programs. While the EMA GSA has an obligation to oversee progress toward groundwater sustainability, it is not the primary regulator of land use, water quality, or environmental project compliance. The GSA will work with the County of Santa Barbara land use staff and outside regulatory agencies, as needed, to ensure that projects and management actions undertaken pursuant to SGMA are in compliance with all applicable laws. The EMA GSA may choose to collaborate with land use and regulatory agencies on specific overlapping interests, such as well permitting, water supply considerations, water quality monitoring, and oversight of projects developed within the EMA.

The projects and management actions in this GSP are designed to achieve several outcomes, including:

- Achieving groundwater sustainability within 20 years of GSP adoption.
- Ensuring that they benefit all uses and users of groundwater.
- Developing funding for GSA operations. Funds will also be used for future EMA monitoring and the implementation of projects and management actions that are identified by the GSA to be appropriate.
- Providing controls and incentives to manage groundwater pumping, if needed, to support sustainability goals.

The projects and management actions described in this section provide a framework for achieving sustainability; however, specific details will need to be finalized and negotiated before any of the projects and management actions can be implemented. Costs for implementing projects and management actions are in addition to the agreed-upon funding to sustain the operation of the EMA GSA and the funding needed for monitoring and reporting. The array of projects and management actions developed by the GSA included in this section demonstrate that options and alternative paths exist to reach sustainability, and it may not be necessary to implement all the projects and management actions to maintain sustainability over the long term. Importantly, the projects and management actions included herein should be considered as a list of options that will be refined during GSP implementation, during which stakeholders will be provided an opportunity to participate in the public process before projects and actions are undertaken.

SGMA regulation § 354.44 requires that projects and management actions described in the GSP include a discussion of the following:

- Relevant measurable objectives being addressed
- The expected benefits of the action
- The circumstances under which management actions or projects will be implemented
- How the public will be noticed
- Relevant regulatory and permitting considerations

- Implementation schedules
- Legal authority required to take the actions
- Estimated costs

A summary of the management actions and projects identified by the EMA are listed below.

Potential Management Actions

- Address Data Gaps
    - Expand Monitoring Well Network in the EMA to Increase Spatial Coverage and Well Density
    - Perform Video Surveys in Representative Wells That Currently Do Not Have Adequate Construction Records to Confirm Well Construction
    - Install Shallow Piezometers in Alamo Pintado Creek and Zanja de Cota Creek Groundwater Dependent Ecosystem (GDE) Areas
    - Review/Update Water Usage Factors and Crop Acreages and Update Water Budget
    - Survey and Investigate Potential Groundwater Dependent Ecosystems (GDEs) in the EMA
- Groundwater Pumping Fee Program
- Well Registration and Well Meter Installation Programs
- Water Use Efficiency Programs
- Groundwater Base Pumping Allocation (BPA) Program
- Groundwater Extraction Credit (GEC) Marketing and Trading Program
- Voluntary Agricultural Crop Fallowing Programs

Potential Projects

- Distributed Stormwater Managed Aquifer Recharge (DSW-MAR) Basins (In-Channel and Off-Stream Basins)
- City of Solvang / Santa Ynez Community Services District (SYCSD) Wastewater Treatment Facility (WWTF) Recycled Water & Reuse In Lieu of Groundwater Pumping or Indirect Potable Reuse
- Los Olivos Community Service District (LOCSD) Wastewater Treatment Facility (WWTF) Recycled Water & Reuse In Lieu of Groundwater Pumping or Indirect Potable Reuse
- Santa Ynez Band of Chumash Indians Wastewater Treatment Facility (WWTF) Recycled Water & Reuse In Lieu of Groundwater Pumping or Indirect Potable Reuse
- EMA GSA to Become Funding Partner to Santa Barbara County Precipitation Enhancement Program
- Conjunctive Use - Managed Aquifer Recharge (MAR) Projects Using Imported (State Water Project [SWP] and Santa Ynez River [SYR]) Water
- In Lieu Recharge Projects to Deliver Unused and Surplus Imported Water to Offset Groundwater Extractions
- Aquifer Storage and Recovery Projects

Table 6-1 presents a summary of the benefits, costs, reliability, and permitting requirements for management actions and projects presented in this GSP. These projects and management actions are itemized by group. The EMA GSA will perform periodic assessments of the effectiveness of the implemented projects and management actions and utilize adaptive management strategies to re-evaluate the implementation sequencing and priorities, as deemed appropriate. At any point, the GSA may choose to implement any of the individual projects or programs listed in any group, if it is determined that it would be beneficial to do so. Further, the EMA GSA may identify other projects and/or management actions that are not included in Groups 1 through 3, for implementation at any time. A brief description of each the management actions and projects in Groups 1 through 3 is presented below, followed by more detailed discussion of each management action and project.

Table 6-1. Summary of Benefits, Cost, Reliability, and Permitting Requirements for Projects and Management Actions

	Group No.	Relevant Measurable Objective Benefits					Required Permits	Pumping Reduction Outcome Reliability	Estimated Implementation Cost[1]	Benefit : Cost Ratio
		Groundwater Levels	Reduction in Storage	Water Quality	Groundwater Dependent Ecosystems	Subsidence				
Potential Management Actions										
Address Data Gaps										
Expand Monitoring Well Network in the EMA to Increase Spatial Coverage and Well Density	1	N/A	N/A	N/A	N/A	N/A	Santa Barbara County (if a new well)	N/A	$20,000 to $200,000	Moderate - High
Perform Video Surveys in Representative Wells That Currently Do Not Have Adequate Construction Records to Confirm Well Construction	1	N/A	N/A	N/A	N/A	N/A	None	N/A	$25,000 to $75,000	High
Install Shallow Piezometers in Alamo Pintado Creek and Zanja de Cota Creek Groundwater Dependent Ecosystem (GDE) Areas	1	N/A	N/A	N/A	N/A	N/A	Santa Barbara County, CDFW	N/A	$75,000 to $125,000	High
Review/Update Water Usage Factors and Crop Acreages and Update Water Budget	1	N/A	N/A	N/A	N/A	N/A	None	N/A	$20,000 to $30,000	High
Survey and Investigate Potential Groundwater Dependent Ecosystems (GDEs) in the EMA	1	N/A	N/A	N/A	N/A	N/A	None	N/A	$20,000 to $40,000	High
Groundwater Pumping Fee Program	1	√	√	√	√	√	Proposition 26 / 218 or Local Ballot Initiative	Moderately Reliable	$100,000 to $200,000	Moderate - High
Well Registration and Well Meter Installation Programs	1	√	√	√	√	√	None	Moderately Reliable	$75,000 to $150,000	Moderate - High
Water Use Efficiency Programs	1	√	√	√	√	√	None	Moderately Reliable	$50,000 to $125,000	Moderate - High
Groundwater Base Pumping Allocation (BPA) Program	2	√	√	√	√	√	None	Highly Reliable	$75,000 to $150,000	Moderate - High
Groundwater Extraction Credit (GEC) Marketing and Trading Program	2	√	√	√	√	√	None	Highly Reliable	$150,000 to $200,000	Moderate - High
Voluntary Agricultural Crop Fallowing Programs	2	√	√	√	√	√	None	Highly Reliable	$75,000 to $150,000	Moderate - High

	Group No.	Relevant Measurable Objective Benefits: Groundwater Levels	Reduction in Storage	Water Quality	Groundwater Dependent Ecosystems	Subsidence	Required Permits	Pumping Reduction Outcome Reliability	Estimated Implementation Cost[1]	Benefit : Cost Ratio
Potential Projects										
Distributed Stormwater Managed Aquifer Recharge (DSW-MAR) Basins (In-Channel and Off-Stream Basins)	3	√	√	N/A	√	√	Santa Barbara County, USACE, DWR, CDFW, CEQA	Highly Variable	>$1,000,000	Low - Moderate
City of Solvang / Santa Ynez Community Services District (SYCSD) Wastewater Treatment Facility (WWTF) Recycled Water & Reuse In Lieu of Groundwater Pumping or Indirect Potable Reuse	3	√	√	N/A	√	√	Santa Barbara County, RWQCB, DWR, CEQA	Moderately Reliable	>$5,000,000	Low
Los Olivos Community Service District (LOCSD) Wastewater Treatment Facility (WWTF) Recycled Water & Reuse In Lieu of Groundwater Pumping or Indirect Potable Reuse	3	√	√	N/A	√	√	Santa Barbara County, RWQCB, DWR, CEQA	Moderately Reliable	>$5,000,000	Low
Santa Ynez Band of Chumash Indians Wastewater Treatment Facility (WWTF) Recycled Water & Reuse In Lieu of Groundwater Pumping or Indirect Potable Reuse	3	√	√	N/A	√	√	Santa Barbara County, RWQCB, DWR, CEQA	Moderately Reliable	>$5,000,000	Low
EMA GSA to Become Funding Partner to Santa Barbara County Precipitation Enhancement Program	3	√	√	√	√	√	Santa Barbara County, CEQA	Highly Variable	>$200,000	Moderate
Conjunctive Use - Managed Aquifer Recharge (MAR) Projects Using Imported (State Water Project and Santa Ynez River) Water	3	√	√	N/A	√	√	Santa Barbara County, RWQCB, DWR, CDFW, CEQA	Moderately Reliable	>$1,000,000	Low - Moderate
In Lieu Recharge Projects to Deliver Unused and Surplus Imported Water to Offset Groundwater Extractions	3	√	√	N/A	√	√	Santa Barbara County, RWQCB, DWR, CEQA	Moderately Reliable	>$1,000,000	Low - Moderate
Aquifer Storage and Recovery Projects	3	√	√	N/A	√	√	Santa Barbara County, RWQCB, DWR, CEQA	Moderately Reliable	>$1,000,000	Low - Moderate

Notes

[1] The estimates in this table are planning-level cost estimates that are subject to refinement and revision by the EMA GSA after GSP adoption.

CDFW = California Department of Fish and Wildlife
CEQA = California Environmental Quality Act
DWR = California Department of Water Resources
EMA = Eastern Management Area
N/A = not applicable
RWQCB = Regional Water Quality Control Board
USACE = U.S. Army Corps of Engineers

Group 1 Management Actions

The EMA GSA will initiate Group 1 management actions within 1 year of GSP adoption and submittal. These management actions are focused primarily on filling identified data gaps, developing funding for GSA operations and future EMA monitoring, registering and metering wells, and developing new and expanding existing water use efficiency programs for implementation within the EMA.

As a critical element of GSP implementation, the Groundwater Pumping Fee Program is included as a Group 1 management action to provide the GSA with a source of funding for ongoing operations, including continued monitoring of conditions in the EMA. The ancillary benefits include the generation of funding for the EMA GSA to invest in the Group 2 management actions and Group 3 projects in this GSP that may be pursued.

Group 2 Management Actions

The EMA GSA may consider initiating work on Group 2 management actions to the extent that implementation of the Group 1 management actions does not make sufficient progress toward EMA sustainability goals.

The Group 2 management actions include the development and implementation of a Groundwater BPA Program, a GEC Marketing and Trading Program, and a Voluntary Agricultural Crop Fallowing Program. The Groundwater BPA Program would provide a structured process for managing pumping allocations over time to reach the sustainable yield within the next 20 years. Prior to initiating this program, any new production and/or well installation may be required to follow a California Environmental Quality Act (CEQA) review process to assess potential impacts (including environmental). If potential impacts are found, mitigation actions might include purchasing credits through the GEC may be required.

The GEC Marketing and Trading Program and the Voluntary Agricultural Crop Fallowing Program go hand in hand with the BPA program and have multiple benefits. They can provide flexibility for groundwater pumpers to adjust their operations and business models. They also can allow for enhanced water conservation, voluntary fallowing of irrigated agricultural croplands, and promotion of beneficial uses of water and land by providing for the potential to monetize voluntary water conservation and the elimination of water-intensive uses. In combination, the Group 2 management actions are designed to assist the EMA GSA in the avoidance of undesirable results, including chronic lowering of groundwater levels, reduction of groundwater in storage, depletion of interconnected surface water, and potentially degraded water quality.

If implemented, the EMA GSA will monitor the effectiveness of Group 2 management actions to determine whether they will be sufficient to achieve groundwater basin sustainability. The overall effectiveness of individual Group 2 management actions will be evaluated periodically to determine whether continued investment in those activities is warranted or whether other projects and actions should be considered.

Group 3 Projects

In this GSP, all potential projects that have been identified and evaluated are included in Group 3. The EMA GSA does not have a current plan to initiate the construction of any Group 3 project infrastructure for the specific goal of achieving sustainability until data have been collected that determine that Group 1 management actions have made insufficient progress towards sustainability goals. Although the EMA GSA has no near-term plans to initiate construction of any specific projects for the purposes of achieving sustainability, there may be interest by the EMA GSA in the future in proceeding with the study, planning, and preliminary design/engineering and permitting phases for one or more projects that have been identified by the EMA GSA for potential future consideration. A brief description of the Group 3 projects is included in Section 6.10.

As work on supplemental water supply and resource management efforts is ongoing, it may be the case that additional projects and/or management actions may be identified and added to the list in future GSP updates.

6.2 Management Action Implementation Approach [§ 354.44(b)(6)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(6) An explanation of how the project or management action will be accomplished. If the project or management actions rely on water from outside the jurisdiction of the Agency, an explanation of the source and reliability of that water shall be included.

The amount of groundwater pumping in the EMA in recent years is more than the estimated sustainable yield of about 12,870 acre-feet per year (AFY), as discussed in Section 3.3, and declining groundwater levels have been documented. As a result, the EMA GSA will begin to initiate implementation of Group 1 management actions within 1 year after GSP adoption. The effect of the management actions will be reviewed periodically, and additional Group 2 management actions and Group 3 projects may be considered and implemented as necessary to avoid undesirable results. A graphical depiction of the implementation sequence is presented in Figure 6-1.

In general, the management actions will apply to all areas within the EMA. The management actions reflect basic GSP implementation requirements, such as extraction measurement, monitoring, reporting and outreach, necessary studies and early planning work, monitoring and filling data gaps, annual reports and GSP updates. The EMA GSA anticipates that new policies, ordinances, and regulations may be necessary to implement of some of the potential projects and management actions. Developing and adopting these policies, ordinances, and regulations would likely require substantial planning and negotiations among the EMA GSA, local public, and various EMA stakeholders. Outreach and negotiations will be used to define and gain approvals for the scope and detail associated with GSA-imposed requirements after GSP adoption.

Public meetings and hearings will be held, as needed, during the process of determining when and where in the EMA projects and management actions may be implemented to maximize their benefits to the Basin. Implementation of some of these actions may require compliance with CEQA and other legal requirements.

A proportional and equitable approach to funding implementation of the GSP and any optional actions will be developed in accordance with all state laws and applicable public process requirements. During these meetings and hearings, input from the public, interested stakeholders, and groundwater pumpers will be considered and incorporated into the decision-making process. The EMA GSA will periodically assess the progress that the implemented projects and management actions have made in stabilizing groundwater levels and meeting the sustainability metrics described in this GSP. The EMA GSA will reassess the need for continuing and/or expanding these actions. At a minimum, the reassessment process will be done as part of the 5-year review and reporting on the GSP.

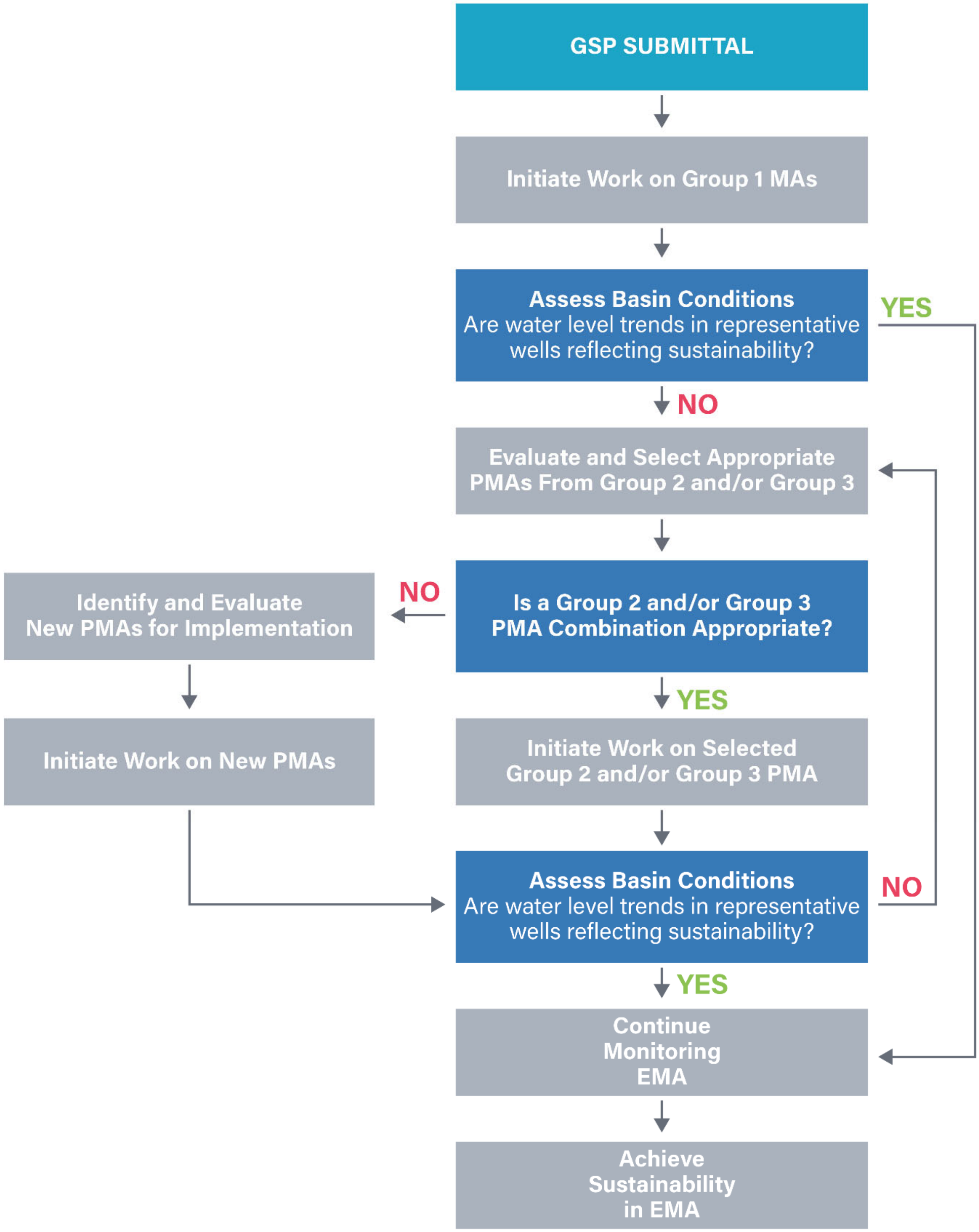

Figure 6-1. Adaptive Implementation Strategy for Projects and Management Actions

Notes

EMA = Santa Ynez River Valley Groundwater Basin Eastern Management Area

MA = management action

PMA = project and/or management action

6.3 Group 1 Management Action 1 – Address Data Gaps [§ 354.44(b)(1), (d)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.

(d) An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.

SGMA regulations require identification of data gaps and a plan for filling them (§ 354.38(b)). In conjunction with the development of this GSP, data have been collected and reported for each of the five sustainability indicators that are relevant to the following:

- Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon
- Significant and unreasonable reduction in groundwater storage
- Significant and unreasonable degraded water quality
- Significant and unreasonable land subsidence that substantially interferes with surface land uses
- Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water

As part of the process, it has been determined that specific data gaps exist that require additional investigation because they are important for future management of the EMA. The identified initial management actions undertaken will be designed to fill the identified data gaps, which include the following activities:

- Expand Monitoring Well Network in the EMA to Increase Spatial Coverage and Well Density
- Perform Video Surveys in Representative Wells That Do Not Have Adequate Well Construction Records
- Install Shallow Piezometers in Alamo Pintado Creek and Zanja de Cota Creek Identified GDE Areas
- Review/Update Water Usage Factors and Crop Acreages and Update Water Budget
- Survey and Investigate Additional Potential GDEs in the EMA

6.3.1 Expand Monitoring Well Network in the EMA to Increase Spatial Coverage and Well Density

The specific data gaps identified in Section 4 are related to the existing groundwater level monitoring network, including increasing the spatial coverage and density of wells in portions of the EMA. The areas where additional monitoring well data are needed are depicted in Figure 4-2. The areas where the addition of monitoring wells would improve the understanding of basin conditions have been previously discussed in

Section 3.2. As previously described, the data gap areas include both the Paso Robles Formation and the Careaga Sand units (the northwestern and northcentral portions of the uplands from Los Olivos to the northern boundary of the EMA, including the northern reaches of Zaca Creek and Alamo Pintado Creek) where the addition of monitoring wells would improve the understanding of basin conditions.

The proposed strategy for adding monitoring wells and Representative Monitoring Sites (RMS) to the monitoring network will be to first incorporate existing wells to the extent possible. Owners of identified candidate existing wells will be contacted to determine interest in participating in the monitoring program. Wells considered for incorporation into the monitoring network will be inspected to ensure they are adequate for monitoring and to determine depth, perforated intervals, and aquifer designation. Access agreements will be secured with well owners to ensure that data can be reported from the wells.

If an existing well in a particular area cannot be identified or permission to use data from an existing well cannot be secured to fill a data gap, then a new monitoring well and/or RMS may be considered. The EMA GSA will obtain required permits and access agreements before drilling new wells. The EMA GSA will retain the services of licensed geologists and/or engineers and qualified drilling companies for drilling new wells. The EMA GSA will also evaluate the availability of grants to provide funding assistance for new wells. Once drilled, the new wells will be tested as necessary and equipped for monitoring. All well construction information, including the aquifer that is being monitored, will be registered with the well.

6.3.2 Perform Video Surveys in Representative Wells That Currently Do Not Have Adequate Construction Records to Confirm Well Construction

The EMA GSA has determined that several of the representative wells that are planned to be included in the GSP monitoring well network do not have adequate documentation regarding the depth, geologic formations intersected, casing characteristics, screened intervals, pump setting, and/or well construction details. To address this data gap, the EMA GSA will perform video logging to ascertain well construction details and the location of well production zones. The information gained will be incorporated into the monitoring well network.

Concurrent with the video surveys, EMA GSA representatives will interview each well owner regarding the well maintenance history, operational issues or events, surface issues that may affect the well, and water quality within the well. The objective of the video survey work and owner interview is to assess the characteristics of each well regarding the following criteria:

- Depth
- Screened interval
- Material type and condition of the casing and screen
- Presence of scaling, sediment, or bacteria
- Well integrity
- Color and clarity of the water
- Gas intrusion
- Water quality
- Other similar observations that may relate to potential water-quality issues
- Historical pumping rate
- Specific capacity

Note that some information may be unobtainable at specific sites due to well construction or other factors.

All relevant information acquired on wells will be added to the Data Management System (DMS), subject to the requirements of any confidentiality agreements with the well owner. All wells in the monitoring well network and wells identified as RMSs, including those used for water quality monitoring, will be registered under the GSP Well Registration Program. During the well video survey process, if other wells are identified that may further improve the network, they may also be added to the network.

6.3.3 Install Shallow Piezometers in Alamo Pintado Creek and Zanja de Cota Creek Identified GDE Areas

As discussed in Section 3.2, Category A GDEs appear to be concentrated in the southwestern portion of the EMA in the areas surrounding the lower, generally perennial reaches of Alamo Pintado and Zanja de Cota Creeks (see Figure 3-39). These GDEs are located where the southerly flow of groundwater in the regional confined principal aquifers is forced to the surface by the underlying bedrock of the Monterey Formation (LaFreniere and French, 1968). These GDEs appear to be receiving underflow in the tributary alluvium (Upson and Thomasson, 1951), and, in the case of the GDEs surrounding the lower reaches of Zanja de Cota Creek, they also receive effluent from the Chumash Casino Resort Wastewater Treatment Plant (WWTP).

To avoid undesirable results to Category A GDEs and interconnected surface water discharging to the Santa Ynez River from these tributaries, construction of shallow piezometers are proposed within the Category A GDE areas identified near the confluence of Alamo Pintado and Zanja de Cota Creeks with the Santa Ynez River (see Figure 4-4). The proposed shallow piezometers (<50 feet in depth) are expected to provide valuable data that will allow an enhanced understanding of the interconnected surface water system in Category A GDEs and provide the basis for future refinements in the EMA hydrogeologic conceptual model (HCM) (see Section 3.1).

6.3.4 Review/Update Water Usage Factors and Crop Acreages and Update Water Budget

As described in Section 3.3, approximately 7,329 acres of irrigated cropland in the EMA use an estimated 14,545 acre-feet (AF) of groundwater annually. The estimated volume of water pumped is calculated from individual groundwater pumpers located within the EMA and Santa Ynez River Water Conservation District (SYRWCD) boundaries and is based partially on reported extractions and partially on planted acreages and crop-specific water duty factors. These water duty factors are calculated using information included in SYRWCD's Groundwater Production Information and Instructions pamphlet (SYRWCD, 2010). Some landowners within SYRWCD have meters on their groundwater wells and report their production values. For areas of the EMA outside of the SYRWCD boundaries, agricultural pumping is neither metered nor reported. For purposes of developing the groundwater budgets in this GSP for recent years, the agricultural groundwater extractions were estimated using land use data provided by DWR and the crop-specific water use factors provided by SYRWCD. The DWR data sets are derived from a combination of remote sensing, agronomic analysis, and ground verification.

While the accuracy of the DWR and SYRWCD data for irrigated crops for the recent years is relatively high, uncertainty remains regarding the estimates of water use on the irrigated lands within the EMA. To address this uncertainty, the EMA GSA plans to review and update water usage factors and crop acreages, which will be incorporated into future refinements in the EMA water budget. Once the metering program is fully implemented, crop-specific water usage factors may no longer be needed.

6.3.5 Survey and Investigate Potential GDEs in the EMA

As described in Section 3.2.6, a preliminary assessment evaluated the potential GDEs within the EMA. The assessment methodology was applied in accordance with guidance developed by The Nature Conservancy (TNC, 2019). Based on the results of the preliminary assessment, it was determined that GDEs may exist within the EMA. No biological or habitat surveys have yet been completed to verify the existence of the potential GDEs in preparation of this GSP. Note that potential GDEs relating to the Santa Ynez River were excluded from the GDE analysis because the Santa Ynez River and its underflow are considered to be surface water underflow managed by the State Water Resources Control Board (SWRCB), rather than “groundwater” as defined by SGMA, and therefore is not under the purview of SGMA or the EMA GSA. The EMA GSA will not be responsible for managing any aspect of the Santa Ynez River and related underflow (including assessment of impacts to GDEs).

The potential GDEs identified in the EMA for additional evaluation are further categorized based on their proximity to and association with the regional principal aquifers in the EMA. The potential GDEs located within the northern and eastern portions of the EMA are Category B potential GDEs, indicating that they are unlikely to be affected by groundwater management activities and pumping. Therefore, no additional investigation is planned for these Category B GDE areas.

A preliminary evaluation indicates there are insufficient data available to confirm the existence of and the full nature and extent of Category A potential GDEs and certain other potential GDE areas identified in Section 3.1. To address this uncertainty, the recommended next step is to conduct field surveys to document and characterize the Category A potential GDEs. The findings from the proposed field surveys could be incorporated into future refinements in the EMA HCM (see Section 3.1) and SMCs (see Section 5).

6.3.6 Relevant Measurable Objective(s) for Addressing Data Gaps [§ 354.44(b)(1)]

~~§~~§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.

Each of the management actions described in herein will be designed and implemented for the specific purpose of obtaining data that will support understanding of the groundwater conditions in the EMA, the interconnected surface water systems in areas of the EMA, and the agricultural water demands in the EMA, from a spatial and temporal perspective. The information that will be data obtained through these management actions will support future refinements in the EMA HCM and the EMA water budget (see Sections 3.1 and 3.3, respectively). Although extremely valuable in supporting EMA GSA management decisions, the implementation of these management actions will not have any direct impact on meeting the measurable objectives described in Section 5, except insofar as they are used as a basis to trigger other management actions by the GSA.

6.3.7 Implementation Triggers for Addressing Data Gaps [§ 354.44(b)(1)(A)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) The Plan shall include the following:

(A) A description of the circumstances under which projects or management actions shall be implemented, the criteria that would trigger implementation and termination of projects or management, and the process by which the Agency shall determine that conditions requiring the implementation of particular projects or management actions have occurred.

The management actions described in this section are deemed critical for the successful implementation of this GSP and are included in the Group 1 implementation category. The EMA GSA will initiate work on Group 1 management actions within 1 year of GSP adoption.

6.3.8 Public Notice Process for Addressing Data Gaps [§ 354.44(b)(1)(B)]

~~§§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) The Plan shall include the following:

(B) The process by which the Agency shall provide notice to the public and other agencies that the implementation of projects or management actions is being considered or has been implemented, including a description of the actions to be taken.

Public outreach meetings, in addition to regularly scheduled EMA GSA meetings, will be held periodically to inform groundwater users and other stakeholders of the current and projected EMA groundwater conditions, the need to address data gaps, and the parameters of the actions to be undertaken. At these meetings, groundwater users and interested stakeholders will have the opportunity to provide input and comments on how the management actions related to addressing data gaps are being or will be implemented in the EMA.

Information on the progress towards achieving an enhanced understanding of groundwater conditions in the EMA, the interconnected surface water systems in areas of the EMA, and the agricultural water demands in the EMA will also be provided to the public through annual GSP reports and links to relevant information on the EMA GSA website.

Additionally, specific well owners may be contacted directly to discuss specific management actions, including the potential for requesting to include their existing wells in the monitoring and/or RMS network, if not already included. Well owners may also be contacted regarding access to wells for performing video surveys to determine operational status, construction details, and aquifer designation.

6.3.9 Overdraft Mitigation for Addressing Data Gaps [§ 354.44(b)(2)]

~~§~~§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(2) If overdraft conditions are identified through the analysis required by Section 354.18, the Plan shall describe projects or management actions, including a quantification of demand reduction or other methods, for the mitigation of overdraft.

Each of the management actions described in this section will be designed and implemented for the specific purpose of obtaining data that will support understanding of the groundwater conditions in the EMA, the interconnected surface water systems in areas of the EMA, and the agricultural water demands in the EMA, from a spatial and temporal perspective. The data obtained from these management actions will provide the basis for future refinements in the EMA HCM and the EMA water budget (see Sections 3.1 and 3.3, respectively). Although extremely valuable and important, the implementation of these management actions will not have any direct impact on the mitigation of the estimated storage deficit as described in Section 3.3, except insofar as the data collected are used as a basis to trigger other management actions by the GSA.

6.3.10 Permitting and Regulatory Process for Addressing Data Gaps [§ 354.44(b)(3)]

~~23 Cal. Code Regs §~~§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(3) A summary of the permitting and regulatory process required for each project and management action.

The EMA GSA anticipates that well construction permits may need to be obtained from the Santa Barbara County Department of Public Health Environmental Health Services for any proposed monitoring wells, including piezometers. It is not expected that preparation of CEQA documentation would be required prior to construction of monitoring wells. All new wells will require registration with the EMA GSA and the SYRWCD.

No permitting or regulatory processes are required for the implementation of the remaining management actions that are associated with filling data gaps.

6.3.11 Implementation Timeline for Addressing Data Gaps [§ 354.44(b)(4)]

§§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(4) The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.

The Group 1 management actions described in this section are deemed critical for the successful implementation of this GSP. The EMA GSA will initiate work on Group 1 management actions within 1 year of GSP adoption.

6.3.12 Anticipated Benefits for Addressing Data Gaps [§ 354.44(b)(5)]

§§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(5) An explanation of the benefits that are expected to be realized from the project or management action, and how those benefits will be evaluated.

The management actions described in this section will be designed and implemented for the specific purpose of obtaining data that will allow an enhanced understanding of groundwater conditions in the EMA, the interconnected surface water system in areas of the EMA, and the agricultural water demands in the EMA, from a spatial and temporal perspective. The information that will be gained through these management actions will provide the basis for future refinements in the EMA HCM and the EMA water budget (see Sections 3.1 and 3.3, respectively). In addition, the information acquired through the implementation of the management actions described in this section will help guide the EMA GSA in determining the optimal strategy for sequencing the implementation of the Group 2 management actions and Group 3 projects (if needed), which are described in the following Sections 6.4 through 6.10.

6.3.13 Legal Authority for Addressing Data Gaps [§ 354.44(b)(7)]

23 Cal. Code Regs §§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(7) A description of the legal authority required for each project and management action, and the basis for that authority within the Agency.

SGMA regulations require identification of data gaps and a plan for filling them (§ 354.38). The legal authority required to implement the Group 1 management actions, if any, are described in Table 6-1.

6.3.14 Cost and Funding for Addressing Data Gaps [§ 354.44(b)(8)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(8) A description of the estimated cost for each project and management action and a description of how the Agency plans to meet those costs.

Costs associated with this management action will be defined during the early stages of GSP implementation. An appropriate fee collection structure will be determined during that time. For budgetary planning purposes, the following estimates are provided for each of the identified data gaps (see Table 6-1):

- Expand Monitoring Well Network in the EMA to Increase Spatial Coverage and Well Density
  - Budgetary Estimate: $20,000 to $200,000 (high end if well has to be drilled)
- Perform Video Surveys in Representative Wells That Currently Do Not Have Adequate Construction Records to Confirm Well Construction
  - Budgetary Estimate: $25,000 to $75,000
- Install Shallow Piezometers in Alamo Pintado Creek and Zanja de Cota Creek GDE Areas
  - Budgetary Estimate: $75,000 to $125,000
- Review/Update Water Usage Factors and Crop Acreages and Update Water Budget
  - Budgetary Estimate: $20,000 to $30,000
- Survey and Investigate Potential GDEs in the EMA
  - Budgetary Estimate: $20,000 to $40,000

6.3.15 Drought Offset Measures for Addressing Data Gaps [§ 354.44(b)(9)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(9) A description of the management of groundwater extractions and recharge to ensure that chronic lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels or storage during other periods.

Although valuable and important, the implementation of the management actions described herein will not have any direct impact regarding ensuring that chronic lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels or storage during other periods, except insofar as the data collected are used as a basis to trigger other management actions by the GSA.

6.4 Group 1 Management Action 2 – Groundwater Pumping Fee Program [§ 354.44(b)(1)(d)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.

(d) An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.

As part of the GSP implementation process, the EMA GSA will explore various financing options to cover its operational costs and to generate funding for the ongoing EMA monitoring program and the implementation of Group 1 management actions and potential future Group 2 management actions and Group 3 projects. Based on the results of these efforts, the EMA GSA may adopt a management action to levy groundwater pumping fees to generate funding for the EMA GSA.

The initial financing evaluation will be focused on program design, policy and regulatory development, CEQA compliance, and stakeholder outreach. The EMA GSA will identify and evaluate an effective and equitable fee structure for the EMA. The following potential fee structures may be considered as well as others that the EMA GSA may identify in the future.

- Per Parcel Fee
- Parcel Fee and Groundwater Extraction Based Fee
- Parcel Tax
- Fee on Groundwater Extraction
- Fee on Estimated Groundwater Extraction

Fees to be levied for groundwater pumping will likely be in addition to a tiered base fee structure that will be levied against all groundwater pumpers in the EMA, including de minimis pumpers. The base fees will provide funding for the general administration and operation of the EMA GSA. The groundwater pumping fees to be collected would also be used to fund the costs for GSA operations, the EMA monitoring program, and for the implementation of Group 1 management actions. If the implementation of Group 1 management actions prove insufficient to achieve basin sustainability, then the fees may also be used for funding potential future Group 2 management actions and Group 3 projects. It is expected that the imposition of fees will encourage all pumpers to use groundwater as efficiently as possible.

6.4.1 Relevant Measurable Objective(s) for the Groundwater Pumping Fee Program [§ 354.44(b)(1)]

§§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.

The primary benefits of the Groundwater Pumping Fee Program would be to fund to the EMA GSA for administration, operation, and continued monitoring of the condition of the EMA. Secondarily, the measurable objectives supported by implementation of the Groundwater Pumping Fee Program include:

- **Groundwater Elevation Measurable Objectives:** The Groundwater Pumping Fee Program creates a financial incentive to reduce pumping, which may result in higher groundwater elevations.
- **Groundwater Storage Measurable Objectives:** Implementation of the Groundwater Pumping Fee Program creates a financial incentive to reduce pumping and would help achieve the goal of reducing total extractions from the long-term sustainable yield.
- **Land Subsidence Measurable Objectives:** The Groundwater Pumping Fee Program creates incentives for reducing pumping, thereby reducing the pumping stress on the local aquifer(s) and reducing the potential for subsidence.
- **Depletion of Interconnected Surface Water Measurable Objective:** The Groundwater Pumping Fee Program creates incentives for reducing pumping, which would result in higher groundwater elevations in support of identified GDEs.
- **Degradation of Water Quality:** Improvements to water quality are expected as a result of reduction of groundwater pumping and fertilizer use and irrigation return flows to the aquifer, thereby limiting the amount of nitrate and total dissolved solids (TDS) infiltrating to the aquifer.

6.4.2 Implementation Triggers for the Groundwater Pumping Fee Program [§ 354.44(b)(1)(A)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) The Plan shall include the following:

(A) A description of the circumstances under which projects or management actions shall be implemented, the criteria that would trigger implementation and termination of projects or management, and the process by which the Agency shall determine that conditions requiring the implementation of particular projects or management actions have occurred.

The management action described in this section is deemed critical for the successful implementation of the GSP and is included in Group 1. The EMA GSA will initiate work on Group 1 management actions within 1 year of GSP adoption. The initial phase of the Groundwater Pumping Fee program will be focused on program design, policy and regulatory development, CEQA compliance, and stakeholder outreach. As part of program development, the EMA GSA will undertake a study to evaluate an effective and equitable fee structure. In conjunction with the development of the Groundwater Pumping Fee Program, the EMA GSA will (1) ensure that any charges that the GSA plans to place on groundwater extraction are carefully reviewed under applicable standards and (2) identify the required regulatory/statutory processes. Levying groundwater pumping fees will be implemented in concert with the installation of flow meters and other quantification methods for groundwater users as described in Section 6.5. Meters will be required for groundwater users who pump more than 2 AFY. De minimis pumpers, i.e., those that pump less than 2 AFY for domestic purposes, will need to report groundwater pumping using an approved alternative method. Full implementation of the metering program is anticipated to take time; therefore, the pumping fee program will be based on both metering data and estimated pumping data using other methods. Once fully implemented, the Groundwater Pumping Fee Program will result in immediate benefit to the EMA by provided needed funds for EMA GSA administration and operation, along with funding to support ongoing monitoring of the EMA. Additionally, funds may be available for the implementation of potential future Group 2 management actions and Group 3 projects, if necessary. The program is expected to be ongoing throughout the GSP implementation period and may be modified by the EMA GSA in response to changing needs.

6.4.3 Public Notice Process for the Groundwater Pumping Fee Program [§ 354.44(b)(1)(B)]

§§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) The Plan shall include the following:

(B) The process by which the Agency shall provide notice to the public and other agencies that the implementation of projects or management actions is being considered or has been implemented, including a description of the actions to be taken.

The Groundwater Pumping Fee Program will be developed in an open and transparent process. Targeted outreach meetings and technical workshops, in addition to regularly scheduled EMA GSA meetings, will be held periodically to inform all groundwater pumpers and other stakeholders about the details of the proposed Groundwater Pumping Fee Program. Groundwater pumpers and interested stakeholders will have the opportunity at these meetings to learn about the programs as well as the opportunity to provide input and comments on how the pumping fee program may be implemented in the EMA. The targeted public outreach meetings and technical workshops may be supplemented with informational mailers to be sent to all identified well owners in the EMA and informational press releases will be distributed to local media. If deemed valuable, EMA GSA representatives may work directly with individual well owners to explain program requirements and help with program implementation. The Groundwater Pumping Fee Program may also be promoted through annual GSP reports and links to relevant information on the EMA GSA website.

6.4.4 Overdraft Mitigation for the Groundwater Pumping Fee Program [§ 354.44(b)(2)]

§§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(2) If overdraft conditions are identified through the analysis required by Section 354.18, the Plan shall describe projects or management actions, including a quantification of demand reduction or other methods, for the mitigation of overdraft.

The Groundwater Pumping Fee Program is expected to directly result in greater focus on efficiency by pumpers and a related reduction of the total volume of groundwater that will be pumped, and consequently mitigation of the estimated storage deficit within the EMA. These reductions in pumping are expected to occur during periods of normal, above normal, and below normal rainfall year conditions.

6.4.5 Permitting and Regulatory Process for the Groundwater Pumping Fee Program [§ 354.44(b)(3)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(3) A summary of the permitting and regulatory process required for each project and management action.

California Water Code Sections 10730 and 10730.2 authorize the imposition and collection of fees by the EMA GSA. Notably, SGMA does not interfere with the ability of the GSA or other agencies to impose fees under other legal authorities (Water Code § 10730.8). This legislation states the following:

> *A groundwater sustainability agency may impose fees, including, but not limited to, permit fees and fees on groundwater extraction or other regulated activity, to fund the costs of a groundwater sustainability program, including, but not limited to, preparation, adoption, and amendment of a groundwater sustainability plan, and investigations, inspections, compliance assistance, enforcement, and program administration, including a prudent reserve. A groundwater sustainability agency shall not impose a fee pursuant to this subdivision on a de Minimis extractor unless the agency has regulated the users pursuant to this part.*

6.4.6 Implementation Timeline for the Groundwater Pumping Fee Program [§ 354.44(b)(4)]

~~§§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(4) The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.

The Groundwater Pumping Fee Program is critical for funding the operations of the GSA and for the successful implementation of this GSP. It is included as a Group 1 management action. The EMA GSA will initiate work on Group 1 management actions within 1 year of GSP adoption. The initial phase of the program will be focused on program design, policy and regulatory development, CEQA compliance, and stakeholder outreach. This phase is anticipated to take 12 to 18 months. Metering will be required with implementation of this GSP, with all non-de minimis wells in the EMA to be equipped with meters, or an EMA GSA-approved alternative method of extraction measurement. Full implementation of the program is anticipated following CEQA review, if needed. Once implemented, the program will result in immediate benefit to the Basin. The program is expected to be ongoing throughout the GSP implementation period with periodic fee structure reviews to occur as the effectiveness of the implemented management actions and projects are assessed.

6.4.7 Anticipated Benefits from the Groundwater Pumping Fee Program [§ 354.44(b)(5)]

~~§~~§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(5) An explanation of the benefits that are expected to be realized from the project or management action, and how those benefits will be evaluated.

The primary purpose of the program will be to provide a source of funding for GSA operations and EMA future monitoring. Funding may also be used for the development and implementation of potential projects and management actions as needed.

As a critical element of the GSP implementation, the Groundwater Pumping Fee Program is expected to mitigate a portion of the estimated storage deficit by motivating groundwater users to reduce pumping or pump groundwater supplies in a more sustainable fashion. In 2018, there was an estimated 7,329 acres of irrigated cropland in the EMA with a corresponding water demand of approximately 14,545 AFY. Assuming a Groundwater Pumping Fee Program would result in a 5 percent reduction in EMA-wide agricultural pumping on an annual basis, the resulting benefit would be approximately 725 AFY.

The Groundwater Pumping Fee Program will help contribute to achieve the avoidance of undesirable results. The benefits to the Basin may vary significantly depending upon levied fees, water year, and sensitivity to cost factors.

6.4.8 Legal Authority for the Groundwater Pumping Fee Program [§ 354.44(b)(7)]

~~23 Cal. Code Regs §~~§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(7) A description of the legal authority required for each project and management action, and the basis for that authority within the Agency.

See Section 6.4.5 for more information on the permitting and regulatory process. SGMA's enabling legislation included establishing California Water Code § 10730, which states that:

> *A groundwater sustainability agency may impose fees, including, but not limited to, permit fees and fees on groundwater extraction or other regulated activity, to fund the costs of a groundwater sustainability program, including, but not limited to, preparation, adoption, and amendment of a groundwater sustainability plan, and investigations, inspections, compliance assistance, enforcement, and program administration, including a prudent reserve. A groundwater sustainability agency shall not impose a fee pursuant to this subdivision on a de Minimis extractor unless the agency has regulated the users pursuant to this part.*

6.4.9 Cost and Funding for the Groundwater Pumping Fee Program [§ 354.44(b)(8)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(8) A description of the estimated cost for each project and management action and a description of how the Agency plans to meet those costs.

The planning-level development cost for establishing the Groundwater Pumping Fee Program is estimated to be approximately $100,000 to $200,000 and separate from development of this GSP.

Potential sources of funding for the Groundwater Pumping Fee Program components include state grants, reimbursement through groundwater extraction fees, transaction fees from extraction credit trades, and other mechanisms as may be identified by the EMA GSA.

6.4.10 Drought Offset Measures for the Groundwater Pumping Fee Program [§ 354.44(b)(9)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(9) A description of the management of groundwater extractions and recharge to ensure that chronic lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels or storage during other periods.

The development and implementation of the Groundwater Pumping Fee Program in the EMA would provide a source of funding that the EMA GSA can use to fund future projects and/or management actions, as the EMA GSA deems necessary, to ensure that groundwater production is carried out within the sustainable yield of the EMA. More specifically, as indicated above, a Groundwater Pumping Fee Program is expected to incentivize more efficient water use and reduce groundwater pumping. Assuming a fee program would result in a 5 percent reduction in EMA-wide agricultural pumping on an annual basis, the resulting benefit would be approximately 725 AFY. These reductions in pumping are expected to occur during periods of normal, above normal, and below normal rainfall year conditions.

As groundwater level monitoring in the EMA continues, the EMA GSA will quantify the impact that the implemented management actions are having on basin conditions. This data will be used to refine the EMA water budget. This information will assist the EMA GSA in making adaptive management decisions during periods of drought.

6.5 Group 1 Management Action 3 – Well Registration and Well Meter Installation Programs [§ 354.44(b)(1)(d)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.

(d) An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.

The EMA GSA will require that all groundwater production wells, including wells used by de minimis pumpers, be registered with the EMA GSA. If the wells have a meter, the meter should be calibrated on a regular schedule in accordance with manufacturer standards and any programs developed by the EMA GSA. Well registration is intended to establish an accurate count of all the active wells in the EMA. Well metering is intended to improve estimates of the amount of groundwater extracted from the EMA. The EMA GSA may also develop and implement reporting protocols applicable to de minimis pumpers to ensure their production is reflected in the total amount of pumping in the EMA and to address circumstances in which de minimum pumpers are or may be exceeding the de minimis thresholds. De minimis production is defined in part by SGMA and by other provisions of the California Water Code and Code of Regulations.

The EMA GSA will require all non-de minimis groundwater pumpers to report extractions at an interval to be determined by the EMA GSA and use a water-measuring method satisfactory to the EMA GSA in accordance with Water Code § 10725.8. It is anticipated that the EMA GSA will develop and adopt guidelines and a regulatory framework to implement this program, which may also include a system for reporting and accounting for water conservation initiatives, voluntary irrigated land fallowing (temporary and permanent), stormwater capture projects, or other activities that individual pumpers may elect to implement. The information collected will be used to account for pumping that would have otherwise occurred, to provide additional information to be used by the EMA GSA for analyzing projected EMA conditions, updating the HCM, and completing annual reports and 5-year GSP assessment reports for DWR.

The existing water supply wells that are operated by SYRWCD, Improvement District No. 1 (ID No. 1) and the City of Solvang are fully metered, and all groundwater extractions are reported to the SYRWCD. However, most other groundwater extraction by private well owners throughout the EMA has never been metered. Moreover, except for those who report the amounts of their groundwater pumping within the boundaries of the SYRWCD, most of the pumping is not reported in any fashion. Extractions from these wells, which are used primarily for irrigated agricultural operations, will be required to be metered and extractions reported. Until the metering program is fully implemented, water-measuring methods satisfactory to the GSA may be utilized in accordance with Water Code § 10725.8.

Agriculture irrigators have voiced concerns regarding the costs associated with the requirement for meters. Although the cost associated with installing and maintaining meters is a legitimate concern, meters can improve the overall management of water and improve the efficiency of the groundwater supply system. The resulting improvement of water efficiency provides a return on the investment. Research and on-the-ground observations have demonstrated that greater water use efficiency directly benefits pumpers by lowering pumping and distribution costs and reducing water use. Research at the Irrigation Technology Center at Texas A&M University has demonstrated that water measurement by itself can reduce crop irrigation water use by 10 percent. When measurement was combined with education about on-farm irrigation management, water use was reduced by 20 to 40 percent (TWRI, 2001).

As a Group 1 management action, the EMA GSA plans to initiate a pilot program to determine the most feasible means of implementing a well metering/measurement program within 1 year of GSP adoption. The measurement alternatives and data processing methods to be evaluated may include the following:

- Use of power records to correlate energy usage with volume of water pumped (to be considered until meters are fully installed)
- Conventional mechanical or magnetic flow meters
- Automated meter infrastructure (AMI) systems

Although the EMA GSA does not have permitting authority for issuing permits for new well construction within the EMA (permits for new wells are required to be obtained from the Santa Barbara County Department of Public Health Environmental Health Services), the EMA GSA will require registration of all new wells and the installation of meters on those wells. The EMA GSA will work with the County as the well permitting authority to evaluate the applicability of CEQA for new wells, or categories thereof, in the EMA.

6.5.1 Relevant Measurable Objective(s) for the Well Registration and Well Meter Installation Programs [§ 354.44(b)(1)]

§§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.

The Well Registration and Well Meter Installation Programs will be designed and implemented for the specific purpose of obtaining data that will allow an enhanced understanding of the total volume of water being extracted from the EMA, both from a spatial and temporal perspective. The information that will be gained through this management action will provide the basis for future refinements in the EMA HCM and the EMA water budget (see Sections 3.1 and 3.3, respectively). The installation of metering on non-de minimis wells, particularly in conjunction with a fee program, is projected to result in a reduction in the volume of groundwater extracted on an annual basis. These reductions would result in progress toward achieving or maintaining relevant measurable objectives in the EMA, including:

- **Groundwater Elevation Measurable Objectives:** Well Registration and Well Meter Installation Programs will focus on reducing pumping through an enhanced understanding of actual water usage by the pumper. Less pumping will result in higher groundwater elevations.

- **Groundwater Storage Measurable Objectives:** This measurable objective is based on total pumping in the EMA. Therefore, the implementation of Well Registration and Well Meter Installation Programs will focus on providing the water user with an enhanced understanding of actual water usage that will encourage reduced pumping and will help achieve the goal of reducing total extractions to the long-term sustainable yield.
- **Land Subsidence Measurable Objectives:** Well Registration and Well Meter Installation Programs will focus on reducing pumping through an enhanced understanding of actual water usage by the pumper, thereby reducing the pumping stress on the local aquifer(s) and reducing the potential for subsidence.
- **Depletion of Interconnected Surface Water Measurable Objective:** Well Registration and Well Meter Installation Programs will focus on reducing pumping through an enhanced understanding of actual water usage by the pumper. Less pumping will result in higher groundwater elevations, which will eventually benefit GDEs.
- **Degradation of Water Quality:** Improvements to water quality are expected if less water is being used and as a result of reduction of irrigation return flows to the aquifer, thereby limiting the amount of primarily nitrate and TDS infiltrating to the aquifer.

6.5.2 Implementation Triggers for the Well Registration and Well Meter Installation Program [§ 354.44(b)(1)(A)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) The Plan shall include the following:

(A) A description of the circumstances under which projects or management actions shall be implemented, the criteria that would trigger implementation and termination of projects or management, and the process by which the Agency shall determine that conditions requiring the implementation of particular projects or management actions have occurred.

The management action described in this section is deemed critical for the successful implementation of this GSP and is included in Group 1 management actions. The EMA GSA will initiate work on the Group 1 management actions within 1 year of GSP adoption. This management action is linked to the Groundwater Pumping Fee Program and is a prerequisite to the possible future implementation of a Groundwater BPA Program (see Management Action 6 in Section 6.8).

6.5.3 Public Notice Process for the Well Registration and Well Meter Installation Program [§ 354.44(b)(1)(B)]

§§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) The Plan shall include the following:

(B) The process by which the Agency shall provide notice to the public and other agencies that the implementation of projects or management actions is being considered or has been implemented, including a description of the actions to be taken.

Public outreach meetings, in addition to regularly scheduled EMA GSA meetings, will be held periodically to inform groundwater pumpers and other stakeholders regarding the development and implementation of the Well Registration and Well Metering Program. Groundwater pumpers and interested stakeholders will have the opportunity at these meetings to provide input and comments on how the management actions related to registering wells and the requirements for groundwater extraction measurement are being implemented in the EMA. The public outreach meetings will be supplemented with informational mailers to be sent to all well owners in the EMA and informational press releases will be distributed to local media. It is probable that EMA GSA representatives will need to contact some individual well owners to explain the program requirements and help some well owners achieve compliance.

As additional information is gained through the implementation of these management actions, it will be conveyed to the participants in future public outreach meetings and will be used to update the EMA HCM and the EMA water budget (see Sections 3.1 and 3.3, respectively). These future refinements will also be provided through annual GSP reports and links to relevant information on the EMA GSA website.

6.5.4 Overdraft Mitigation for the Well Registration and Well Meter Installation Program [§ 354.44(b)(2)]

§§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(2) If overdraft conditions are identified through the analysis required by Section 354.18, the Plan shall describe projects or management actions, including a quantification of demand reduction or other methods, for the mitigation of overdraft.

The management action described in this section will be designed and implemented for the specific purpose of obtaining data that will allow an enhanced understanding of the total volume of water being extracted from the EMA, both from a spatial and temporal perspective. The information that will be gained through this management action will help the EMA GSA better understand the factors involved in the storage deficit and how it can be mitigated. Reduced pumping associated with implementation of this management action will mitigate some of the estimated storage deficit as described in Section 3.3.

6.5.5 Permitting and Regulatory Process for the Well Registration and Well Meter Installation Program [§ 354.44(b)(3)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(3) A summary of the permitting and regulatory process required for each project and management action.

To implement this management action, the EMA GSA will develop a program that requires all non-de minimis extractors to report extractions and use a water-measuring method satisfactory to the GSA in accordance with Water Code § 10725.8. Pursuant to SGMA and other applicable authorities, additional reporting protocols will be developed for de minimis producers. The EMA GSA may adopt a regulation governing the Well Registration and Well Meter Installation Program.

6.5.6 Implementation Timeline for the Well Registration and Well Meter Installation Program [§ 354.44(b)(4)]

~~§§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(4) The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.

The management action described in this section is deemed critical for the successful implementation of this GSP and is included in the Group 1 management actions. The EMA GSA will initiate work on Group 1 management actions within 1 year of GSP adoption. This management action is a prerequisite to the possible implementation of a future Groundwater BPA Program (see Management Action 6 in Section 6.8).

6.5.7 Anticipated Benefits from the Well Registration and Well Meter Installation Program [§ 354.44(b)(5)]

~~§~~§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(5) An explanation of the benefits that are expected to be realized from the project or management action, and how those benefits will be evaluated.

The management action described in this section will be designed and implemented for the specific purpose of obtaining data that will allow an enhanced understanding of the total volume of water being extracted from the EMA, both from a spatial and temporal perspective. The information that will be gained through this management action will provide the basis for future refinements in the EMA HCM and the EMA water budget (see Sections 3.1 and 3.3, respectively). In addition, the information acquired though the implementation of the management action described in this section will help guide the EMA GSA in determining the optimal strategy for sequencing the implementation of the future management actions and projects (described in Sections 6.6 through 6.10) should they be necessary. This management action is a prerequisite to the implementation of a Groundwater BPA Program, should it become necessary (see Management Action 6 in Section 6.8).

Additionally, studies have shown that the installation of meters on wells can directly result in reduced groundwater pumping by 10 percent or more. For perspective, assuming the meter installation program achieves 5 percent reduction in pumping, the resulting benefit would be approximately 725 AFY.

6.5.8 Legal Authority for the Well Registration and Well Meter Installation Program [§ 354.44(b)(7)]

~~23 Cal. Code Regs §~~§ **354.44 Projects and Management Actions.**

(b) Each Plan shall include a description of the projects and management actions that include the following:

(7) A description of the legal authority required for each project and management action, and the basis for that authority within the Agency.

The legal authority to empower the EMA GSA to require well registration and groundwater extraction by pumpers in the EMA is included in SGMA. For example, Water Code § 10725.8 authorizes a GSA to require through its GSP that the use of every groundwater extraction facility (except those operated by de minimis extractors) be measured.

6.5.9 Cost and Funding for the Well Registration and Well Meter Installation Program [§ 354.44(b)(8)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(8) A description of the estimated cost for each project and management action and a description of how the Agency plans to meet those costs.

Planning-level costs for developing and establishing the Well Registration and Well Meter Installation Programs are estimated to be approximately $75,000 to $150,000 and are separate from development of this GSP. According to SGMA § 10725.8(b), costs associated with individual measurement devices are to be borne by the well owner/operator, so the cost exposure to EMA GSA for implementing a Well Registration and Well Metering Program can be distributed among all well owners. Depending on the method of extraction measurement that the EMA GSA approves, the costs associated with the selected method to measure and record groundwater extractions within the EMA may vary widely, based on the requirements for equipment, infrastructure, installation, and for operations and maintenance. EMA GSA members that provide public water supplies (i.e., City of Solvang and ID No. 1) already fund and operate metering facilities on their wells; therefore, costs associated with the acquisition and installation of metering equipment will be borne by the owners of wells used for agricultural irrigation and other non-de minimis well owners.

Potential sources of funding for the Well Registration and Well Meter Installation Programs components may include well owners, state and/or federal grants, reimbursement via groundwater extraction fees, transaction fees from extraction credit trades, and other mechanisms as may be identified by the EMA GSA.

6.5.10 Drought Offset Measures for the Well Registration and Well Meter Installation Program [§ 354.44(b)(9)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(9) A description of the management of groundwater extractions and recharge to ensure that chronic lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels or storage during other periods.

The information that will be gained through the metering of all non-de minimis groundwater pumpers will provide the basis for future refinements in the EMA HCM and the EMA water budget (see Sections 3.1 and 3.3, respectively). In addition, the metered groundwater extraction data would be used in the possible development and administration of a future groundwater (BPA) allocation and GEC marketing and trading programs should they be necessary. The information acquired through well metering will be critical to the EMA GSA in making adaptive management decisions, where lowering of groundwater levels or depletion of supply during periods of drought could be offset by increases in groundwater levels or storage during other periods.

6.6 Group 1 Management Action 4 – Water Use Efficiency Programs [§ 354.44(b)(1)(d)]

~~23 Cal. Code Regs §§~~ **354.44 Projects and Management Actions.**

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.

(d) An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.

The EMA GSA has included the implementation of Water Use Efficiency Programs for public water agencies, domestic well owners, and agricultural groundwater pumpers in the Group 1 management actions. The Water Use Efficiency Programs are generally described as follows:

- **Urban and Domestic Water Use Efficiency Programs:** Initiatives that promote increasing water use efficiency by achieving reductions in the amount of water used for municipal, commercial, industrial, landscape irrigation, rural domestic, and aesthetic purposes. These programs can include incentives, public education, technical support, and other efficiency-enhancing programs.
- **Agricultural Water Use Efficiency Programs:** Initiatives that promote increasing water use and irrigation efficiency and achieving reductions in the amount of water used for agricultural irrigation. These programs can include incentives, public education, technical support, training, implementation of best management practices (BMPs), and other efficiency-enhancing programs.

Urban, rural, and agricultural water use efficiency has been practiced in the EMA for more than two decades and has been effective in significantly reducing water use within the region outside of the EMA. Existing programs promote responsible design of landscapes and appropriate choices of appliances, irrigation equipment, and the other water-using devices to enhance the efficient use of water. In recent years, many agencies in the state have passed regulations that require efficient plumbing devices, appliances, and landscape designs. Retail water supply agencies in the EMA offer programs that encourage and/or require customers to conserve.

The water use efficiency management actions to be developed for implementation by municipal, agricultural, and rural domestic pumpers will promote expansion and supplementation of the existing water use efficiency programs that currently exist. These programs will also be developed to be aligned with the requirements of water conservation mandates that have been put in place by the State of California. Effective urban water use efficiency measures could include the following:

- High Water Use Outreach (High Use Reports)
- Meter Audits to Proactively Detect Leaks (Leak Reports)
- Rebates on Water-Saving Fixtures (i.e., clothes/dish washers)
- Rebates on Sustainable Landscape Conversion Programs (i.e., Cash for Grass)

- Water Awareness Outreach Events (i.e., at library/outdoor market events)
- Enhanced Efficient Irrigation/BMPs
- U.S. Environmental Protection Agency's WaterSense Program Alignment (Fix-a-Leak Week)

As described in Section 3.3, groundwater pumping from the EMA for agricultural irrigation represents a significant demand. For this reason, the EMA GSA will strongly encourage and incentivize pumpers to implement the most effective water use efficiency methods applicable, often referred to as BMPs. Provisions of the Agricultural Water Conservation Act (amending Division 6, Part 2.55 of the Water Code and passed into law in November 2009 regarding agricultural water conservation and management) can be used to inform GSA decisions and water use efficiency programs. While these new laws do not require water use objectives or savings thresholds, they do encourage more efficient use of water by the agricultural sector. It is anticipated that key stakeholders and industry leaders in the Basin will assist the EMA GSA in facilitating workshops and technical training programs or support the implementation of other programs designed to communicate the latest best water use practices for their industry. Effective BMPs could result in the following:

- Enhanced efficient irrigation/BMPs.
- Irrigation audits and delivery of technical support for optimizing water use.
- Development of new weather stations and automated data for landowners using frost protection.
- Encourage non-water intensive methods for frost protection.
- Encourage use of soil amendments (i.e., compost) to improve health of soils, plant health, and reduce water use.
- Encourage cover cropping and no-till/reduced tillage for increased water percolation/infiltration and less runoff, decreased soil moisture loss and less bare soil.
- More optimal irrigation practices by monitoring crop water use with soil and plant monitoring devices and tie monitoring data to evapotranspiration estimates.
- Encourage conversion from high water demand crops to lower water demand crops.
- Use satellite spectral/remote sensing data to refine irrigation practices.
- Encourage urban greening, shade trees, and grass to increase evapotranspiration rates for cooling and to reduce heat buildup from surfaces such as roofs, roads, and sidewalks.

Many growers already use BMPs, but improvements can be made. A goal of promoting BMPs is to broaden their use to more growers in the EMA. Rural de minimis groundwater users will be encouraged to use BMPs as well. Promoting BMPs will include broad outreach to groundwater pumpers in the EMA to emphasize the importance of using BMPs and communicate their positive benefits for mitigating declining groundwater levels and forestalling potential mandated limitations in groundwater extraction on their properties.

The EMA GSA will also collaborate with other entities that can offer resources and technical assistance to the water users in the EMA. The organizations will include, without limitation, the Cachuma Resource Conservation District; the U.S. Department of Agriculture, Natural Resources Conservation Service, Conservation Technical Assistance Program; California Water Efficiency Partnership; Santa Barbara Water Wise Program; and the California Polytechnic State University Irrigation Training and Research Center.

6.6.1 Relevant Measurable Objective(s) for the Water Use Efficiency Programs [§ 354.44(b)(1)]

§§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.

The measurable objectives benefiting from the implementation of Water Use Efficiency Programs include:

- **Groundwater Elevation Measurable Objectives:** Water use efficiency programs will focus on reducing pumping through water conservation. Less pumping can likely result in higher groundwater elevations.
- **Groundwater Storage Measurable Objectives:** This measurable objective is based on total pumping in the EMA. Therefore, the implementation of water use efficiency programs will focus on identifying BMPs that will reduce pumping and will help achieve the goal of reducing total extractions to the long-term sustainable yield.
- **Land Subsidence Measurable Objectives:** Water use efficiency programs will focus on reducing pumping through water conservation, thereby reducing the pumping stress on the local aquifer(s) and reducing the potential for subsidence.
- **Depletion of Interconnected Surface Water Measurable Objective:** Water use efficiency programs will focus on reducing pumping through water conservation. Less pumping will result in higher groundwater elevations in support of identified GDEs.
- **Degradation of Water Quality:** Improvements to water quality are expected as a result of Water Use Efficiency Programs that reduce irrigation return flows to the aquifer, thereby potentially limiting the amount of nitrate and TDS infiltrating to the aquifer.

6.6.2 Implementation Triggers for the Water Use Efficiency Programs [§ 354.44(b)(1)(A)]

23 Cal. Code Regs §§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) The Plan shall include the following:

(A) A description of the circumstances under which projects or management actions shall be implemented, the criteria that would trigger implementation and termination of projects or management, and the process by which the Agency shall determine that conditions requiring the implementation of particular projects or management actions have occurred.

The management action described in this section is critical for the successful implementation of the GSP and is included in Group 1 management actions. The EMA GSA will initiate work on this Group 1 management action within 1 year of GSP adoption.

6.6.3 Public Notice Process for the Water Use Efficiency Programs [§ 354.44(b)(1)(B)]

§§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) The Plan shall include the following:

(B) The process by which the Agency shall provide notice to the public and other agencies that the implementation of projects or management actions is being considered or has been implemented, including a description of the actions to be taken.

Targeted outreach meetings and technical and training workshops, in addition to regularly scheduled EMA GSA meetings, will be held periodically to inform the groundwater pumpers and other stakeholders regarding the development and implementation of the water use efficiency workshops. Groundwater pumpers and interested stakeholders will have the opportunity at these meetings to learn about water conservation methods, technologies, and BMPs as well as the opportunity to provide input and comments on how the management actions related to development, implementation and performance of the water use efficiency programs that are being implemented in the EMA. The targeted public outreach meetings and technical and training workshops will be supplemented with informational mailers to be sent to all well owners and water agency customers in the EMA and informational press releases will be distributed to local media. If deemed valuable, the EMA GSA representatives may work directly with individual well owners to explain program requirements and help with program implementation. The Water Use Efficiency Programs will also be promoted through annual GSP reports and links to relevant information on the EMA GSA website.

6.6.4 Overdraft Mitigation for the Water Use Efficiency Programs [§ 354.44(b)(2)]

~~§§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(2) If overdraft conditions are identified through the analysis required by Section 354.18, the Plan shall describe projects or management actions, including a quantification of demand reduction or other methods, for the mitigation of overdraft.

The development and implementation of Water Use Efficiency Programs within the EMA are intended to directly result in a reduction of the volume of groundwater that will be pumped from the EMA. These reductions in pumping will occur during periods of normal, above normal, and below normal rainfall year conditions. Pumping reductions that occur as a result of the implementation of both urban and agricultural water efficiency programs will directly result in groundwater pumping demand reductions and mitigation of the estimated storage deficit within the EMA.

6.6.5 Permitting and Regulatory Process for the Water Use Efficiency Programs [§ 354.44(b)(3)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(3) A summary of the permitting and regulatory process required for each project and management action.

No permitting or regulatory process is needed for the development and implementation of urban and agricultural water use efficiency programs.

6.6.6 Implementation Timeline for the Water Use Efficiency Programs [§ 354.44(b)(4)]

§§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(4) The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.

The management action described in this section is deemed critical for the successful implementation of this GSP and included as a Group 1 project and management action. The EMA GSA will initiate work on this Group 1 management action within 1 year of GSP adoption.

6.6.7 Anticipated Benefits from the Water Use Efficiency Programs [§ 354.44(b)(5)]

§§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(5) An explanation of the benefits that are expected to be realized from the project or management action, and how those benefits will be evaluated.

The benefits to the EMA from the implementation of Water Use Efficiency Programs include:

- Water use efficiency programs will focus on reducing pumping through water conservation, which would likely result in higher groundwater elevations.
- The implementation of water use efficiency programs will focus on identifying BMPs that will reduce pumping and help achieve the goal of reducing total extractions to support the long-term sustainable yield.
- Water use efficiency programs will focus on reducing pumping through water conservation, thereby reducing the pumping stress on the local aquifer(s) and reducing the potential for subsidence.
- Water use efficiency programs will focus on reducing pumping through water conservation, resulting in higher groundwater elevations in support of identified GDEs.

For perspective, the implementation of water use efficiency and best management measures have been shown to reduce water usage by up to 20 percent or more. Assuming EMA-wide implementation of these programs achieves a 10 percent reduction in pumping, the resulting benefit would be approximately 1,450 AFY.

6.6.8 Legal Authority for the Water Use Efficiency Programs [§ 354.44(b)(7)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(7) A description of the legal authority required for each project and management action, and the basis for that authority within the Agency.

None required.

6.6.9 Cost and Funding for the Water Use Efficiency Programs [§ 354.44(b)(8)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(8) A description of the estimated cost for each project and management action and a description of how the Agency plans to meet those costs.

Planning-level development costs for establishing the Water Use Efficiency Programs are estimated to be approximately $50,000 to $125,000 and separate from development of this GSP.

Potential sources of funding for the Water Use Efficiency Programs' components include state grants and the groundwater extraction fee program to be implemented by the EMA GSA.

6.6.10 Drought Offset Measures for the Water Use Efficiency Programs [§ 354.44(b)(9)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(9) A description of the management of groundwater extractions and recharge to ensure that chronic lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels or storage during other periods.

The development and implementation of Water Use Efficiency Programs within the EMA will directly result in a reduction of the volume of groundwater that will be pumped from the Basin, which will contribute to the mitigation of the estimated storage deficit within the Basin. These reductions in pumping will occur during periods of normal, above normal, and below normal rainfall year conditions.

As monitoring of the groundwater levels in the Basin occur in the future, the EMA GSA will quantify the beneficial impact that the water use efficiency initiatives are having on the condition of the EMA, which will allow for future refinements to the program in the EMA. The information acquired will be critical to the EMA GSA in making adaptive management decisions that may allow lowering of groundwater levels or depletion of supply during periods of drought to be offset by increases in groundwater levels or storage during other periods.

6.7 Group 2 Management Action 5 – Groundwater Base Pumping Allocation (BPA) Program [§ 354.44(b)(1)(d)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.

(d) An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.

The volume of groundwater pumped from the EMA in recent years is more than the estimated sustainable yield of about 12,870 AFY. This condition has led to a persistent deficit of groundwater in storage. Although there will be benefits to the EMA because of the other planned and potential projects and management actions, the EMA GSA has determined that the volume of groundwater being pumped must be stabilized to maintain the sustainable yield of the EMA over the next 20-year period and beyond. To achieve this goal, the EMA GSA may seek to develop and implement a regulatory program to equitably allocate a groundwater BPA volume of water to be pumped annually from the EMA. Under such a program, individual non-de minimis pumpers could be provided an annual groundwater BPA to further assist in stabilizing overall production, which then could be adjusted over time, as needed, to ensure sustainable yield within the EMA by 2042. As described in SGMA, any limitation on extractions by the EMA GSA “shall not be construed to be a final determination of rights to extract groundwater from the basin or any portion of the basin” (Water Code, § 10726.4(a)(2)).

The amount of pumping reduction, if needed in the future, is uncertain and will depend on several factors including climate conditions, the effectiveness and timeliness of voluntary actions by pumpers, and the success of other planned and potential projects and management actions described in this GSP. The water budget presented in Section 3.3 indicates that the current estimated annual storage deficit is approximately 1,830 AFY. It is reasonable to expect that the Group 1 management actions may eliminate this relatively modest deficit. If they do not, it may be necessary to develop and implement other projects and management actions, which could include a Groundwater BPA Program. After GSP adoption, developing a Groundwater BPA Program would require various analyses and steps, including but not limited to:

- Establishing a methodology for determining baseline pumping considering:
  - Sustainable yield of the EMA
  - Groundwater level trends

  - Historical groundwater production
  - Land uses and corresponding water use requirements.
  - CEQA compliance
- Establishing a methodology to consider, among other factors determine groundwater, water rights and evaluation of anticipated benefits from other relevant actions individual pumpers take.
- An implementation timeline.
- Approving a formal regulation to enact the program.

As noted above, a baseline pumping allocation schedule could be implemented and adjusted over time, as needed, and according to relevant factors, to meet groundwater extraction targets in the EMA (consistent with the sustainable yield). Analyses would be updated periodically as new data are developed. It is anticipated that the EMA groundwater model would be used as a tool to evaluate alternative pumping reduction programs and schedules as part of any Groundwater BPA Program. It is also expected that CEQA review would be undertaken in advance of considering the formal adoption and implementation of any Groundwater BPA Program.

Should the EMA GSA elect to develop a Groundwater BPA Program, the program would consist of the following general components:

- Estimation of the EMA sustainable yield.
- Determination of pumping allocation amounts (i.e., groundwater extraction credits) for groundwater producers, including an evaluation of de minimis production in the EMA.
- Pumping allocation reduction recommendations over the implementation period to ensure sustainable yield in the EMA by 2042.

The EMA GSA understands that municipalities and public water agency groundwater pumpers face public health and safety requirements and other considerations regarding the volume of water produced by these agencies to meet demands within their service areas. These factors would be specifically considered and addressed during the development of a Groundwater BPA Program.

The EMA GSA also realizes that certain landowners may need or desire to periodically use an amount of groundwater in excess of their annual allocations. To this end, it would be possible for a pumping fee policy be developed in connection with a BPA Program to allow landowners, under special circumstances, to pump groundwater beyond their groundwater allocations, but at considerably higher cost.

Through coordination with the County of Santa Barbara well permitting authority, the EMA GSA may seek to develop supplemental conditions to be placed on new wells and new production in the EMA. The GSA may also work with the County well permitting authority to evaluate the applicability of CEQA for new wells, or categories thereof, in the EMA.

Given that the Basin currently has an estimated storage deficit, the EMA GSA may elect to place an adjustment factor in the groundwater BPA that would establish an additional limitation on the volume of water that can be pumped annually from any new well and new production from existing wells.

6.7.1 Relevant Measurable Objective(s) for the Groundwater Base Pumping Allocation (BPA) Program [§ 354.44(b)(1)]

§§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.

The measurable objectives benefiting from the implementation of the Groundwater BPA Program include:

- **Groundwater Elevation Measurable Objectives:** A Groundwater BPA Program would focus on reducing pumping that is likely to result in higher groundwater elevations, provided that additional pumping in the aggregate is not allowed to occur.
- **Groundwater Storage Measurable Objectives:** This measurable objective is based on total pumping in the Basin. Therefore, the implementation of a Groundwater BPA Program would focus on reducing pumping and maintaining support the long-term sustainable yield.
- **Land Subsidence Measurable Objectives:** A Groundwater BPA Program would focus on reducing pumping, thereby reducing the pumping stress on the principal aquifers and reducing the potential for subsidence.
- **Depletion of Interconnected Surface Water Measurable Objective:** A Groundwater BPA Program would focus on reducing pumping, which will result in higher groundwater elevations in support of identified GDEs.
- **Degradation of Water Quality:** Improvements to water quality are expected as a result of reduction of pumping and related associated reduction in irrigation return flows to the aquifer, thereby limiting the amount of nitrate and TDS (primarily) infiltrating to the aquifer.

6.7.2 Implementation Triggers for the Groundwater Base Pumping Allocation (BPA) Program [§ 354.44(b)(1)(A)]

23 Cal. Code Regs §§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) The Plan shall include the following:

(A) A description of the circumstances under which projects or management actions shall be implemented, the criteria that would trigger implementation and termination of projects or management, and the process by which the Agency shall determine that conditions requiring the implementation of particular projects or management actions have occurred.

The management action described in this section is included in the Group 2 management actions. Implementation of Group 2 management actions may be considered by the EMA GSA if previously implemented projects and management actions are not resulting in trends towards achieving the EMA GSA sustainability goals. If the EMA GSA elects to implement a Groundwater BPA Program, the initial phase of the program will be focused on program design, policy and regulatory development, CEQA compliance, and stakeholder outreach. Once implemented, the program could result in immediate benefit to the EMA. The program could be adjusted throughout the GSP implementation period.

6.7.3 Public Notice Process for the Groundwater Base Pumping Allocation (BPA) Program [§ 354.44(b)(1)(B)]

§§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) The Plan shall include the following:

(B) The process by which the Agency shall provide notice to the public and other agencies that the implementation of projects or management actions is being considered or has been implemented, including a description of the actions to be taken.

A Groundwater BPA Program would be developed in an open and transparent process. Targeted outreach meetings and technical workshops, in addition to regularly scheduled EMA GSA meetings, would be held periodically to inform groundwater pumpers and other stakeholders about the details of a proposed Groundwater BPA Program. Groundwater pumpers and interested stakeholders would have the opportunity at these meetings to learn about potential elements of a BPA Program, as well as the opportunity to provide input and comments on how a program could be implemented in the EMA. The targeted public outreach meetings and technical workshops could be supplemented with informational mailers sent to well owners and stakeholders in the EMA and informational press releases distributed to local media. If deemed valuable, EMA GSA representatives may work directly with individual well owners to explain potential program requirements and help with program implementation. A Groundwater BPA Program could also be promoted through annual GSP reports and links to relevant information on the EMA GSA website.

6.7.4 Overdraft Mitigation for the Groundwater Base Pumping Allocation (BPA) Program [§ 354.44(b)(2)]

~~§§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(2) If overdraft conditions are identified through the analysis required by Section 354.18, the Plan shall describe projects or management actions, including a quantification of demand reduction or other methods, for the mitigation of overdraft.

If needed, the development and implementation of a Groundwater BPA Program within the EMA could directly result in a reduction of the volume of groundwater being pumped from the EMA, provided, however, that new wells and new production in the EMA would need to be suspended to ensure that increased production in the aggregate would not negate the effects of reducing existing production. Pumping allocations and reduced production could occur during periods of normal, above normal, and below normal rainfall year conditions. Pumping reductions associated with a BPA Program could directly result in reducing groundwater pumping demands and mitigation of the estimated storage deficit within the Basin.

6.7.5 Permitting and Regulatory Process for the Groundwater Base Pumping Allocation (BPA) Program [§ 354.44(b)(3)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(3) A summary of the permitting and regulatory process required for each project and management action.

Any permitting or other regulatory compliance requirements will be identified and pursued during the initial phase of the implementation of this management action. A Groundwater BPA Program would be accompanied by CEQA review and developed in accordance with all applicable groundwater laws and include protections for all groundwater rights.

6.7.6 Implementation Timeline for the Groundwater Base Pumping Allocation (BPA) Program [§ 354.44(b)(4)]

§§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(4) The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.

The management action described in this section is included in the Group 2 management actions. Implementation of Group 2 management actions may be considered by the EMA GSA if previously implemented projects and management actions are not resulting in trends towards achieving the EMA GSA sustainability goals. The initial phase of a BPA Program would be focused on program design, policy and regulatory development, CEQA compliance, and stakeholder outreach. This phase may take 12 to 18 months or more.

6.7.7 Anticipated Benefits of the Groundwater Base Pumping Allocation (BPA) Program [§ 354.44(b)(5)]

§§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(5) An explanation of the benefits that are expected to be realized from the project or management action, and how those benefits will be evaluated.

If implemented, a Groundwater BPA Program could result in immediate benefit to the EMA, including supporting the avoidance of undesirable results including chronic lowering of groundwater levels, reduction of groundwater in storage, and potentially degraded water quality. Peripheral benefits may also include potential investment in alternate land uses or taking advantage of potential GEC and/or land fallowing management programs (see Sections 6.8 and 6.9, respectively).

6.7.8 Legal Authority for the Groundwater Base Pumping Allocation (BPA) Program [§ 354.44(b)(7)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(7) A description of the legal authority required for each project and management action, and the basis for that authority within the Agency.

SGMA provides the EMA GSA with authority to "control groundwater extractions by regulating, limiting, or suspending extractions from individual groundwater wells or extractions from groundwater wells in the aggregate, . . . or otherwise establishing groundwater extraction allocations" (Water Code, § 10726.4(a)).

6.7.9 Cost and Funding for Groundwater Base Pumping Allocation (BPA) Program [§ 354.44(b)(8)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(8) A description of the estimated cost for each project and management action and a description of how the Agency plans to meet those costs.

The planning-level development cost for establishing a Groundwater BPA Program is estimated to be approximately $75,000 to $150,000 and is separate from development of this GSP.

Potential sources of funding for the Groundwater BPA Program components include state grants, groundwater extraction fees, and other mechanisms as may be identified by the EMA GSA.

6.7.10 Drought Offset Measures for the Groundwater Base Pumping Allocation (BPA) Program [§ 354.44(b)(9)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(9) A description of the management of groundwater extractions and recharge to ensure that chronic lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels or storage during other periods.

The development and implementation of a Groundwater BPA Program within the EMA could directly result in a reduction of the volume of groundwater being pumped from the Basin. These reductions in pumping could occur during periods of normal, above normal, and below normal rainfall year conditions, depending on how the program is structured. Pumping reductions resulting from the implementation of a Groundwater BPA Program could directly result in reduced groundwater pumping demands and mitigation of the estimated storage deficit within the EMA. Notably, construction of new wells and new groundwater production in the EMA may need to be suspended as part of a Groundwater BPA Program to ensure that increased production in the aggregate would not negate the effects of reductions in existing production.

As monitoring of groundwater levels in the EMA occurs in the future, the EMA GSA would quantify the effects of a Groundwater BPA Program on the conditions of the Basin, which would assist in future refinements in the EMA water budget. The information acquired would be critical to the EMA GSA in making adaptive management decisions that could allow lowering of groundwater levels or depletion of supply during periods of drought to be offset by increases in groundwater levels or storage during other periods.

6.8 Group 2 Management Action 6 – Groundwater Extraction Credit (GEC) Marketing and Trading Program [§ 354.44(b)(1)(d)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.

(d) An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.

As previously described, the EMA GSA may, as needed, develop and implement a Groundwater BPA Program that would assign pumping allocations in the EMA annually and, if necessary, impose a schedule on the pumping allocations over time to bring total pumping in the EMA within its sustainable yield within 20 years of GSP adoption. In conjunction with a Groundwater BPA Program, the EMA GSA may also pursue the development and implementation of a Groundwater Extraction Credit (GEC) Marketing and Trading Program to provide increased flexibility to groundwater producers in using their pumping allocations. The program could enable voluntary transfers of allocations between parties, on a temporary or permanent basis, through an exchange of GECs. Among other potential benefits, a GEC Marketing and Trading Program could assist existing groundwater users or new groundwater users in acquiring needed groundwater supplies from other pumpers, in the form of GECs, to support economic activities in the EMA, encourage and incentivize water conservation, enable temporary and permanent fallowing of agricultural lands, and facilitate a control of pumping allocations as needed during the 20-year GSP implementation period.

Within the confines and rules of a GEC Marketing and Trading Program that may be developed and managed by the EMA GSA, participants could privately negotiate the sale of all or a portion of their GECs with willing purchasers. For example, upon agreement between pumpers, a proposed trade would be submitted to the EMA GSA for review and approval, or separate mechanisms may be established regarding trades.

Additionally, appropriate limitations could be developed to prevent unintended consequences such as hoarding, out-of-basin transfers, well interference, price fixing, or overpumping in any one part of the EMA. The program could also include requirements for demonstrating actual water use within a specified period for irrigated lands that are being used as a credit. As warranted, the GEC Marketing and Trading Program would be reviewed as part of the GSP review process and updated as needed.

As part of a GEC Marketing and Trading Program, the EMA GSA may consider a policy to define groundwater extraction carryover provisions from year to year and/or to allow multi-year pumping averages. These types of components could provide useful flexibility and may be useful to growers who could change cropping patterns or voluntarily fallow acreage. Though there is a risk that extreme drought may induce exceptionally high pumping in a single year, under this program, groundwater users may be able to strategize and better manage their assets. A groundwater extraction credit and carryover structure would be designed to provide groundwater pumpers with as much flexibility as possible in using their groundwater allocation from year to year.

A potential approach by the EMA GSA to develop a GEC Marketing and Trading Program would likely include the following elements:

- Identify stakeholders/participants and conduct interviews and meetings to receive input and identify concerns to be addressed in program development.
- Evaluate existing programs in other basins and guidance from DWR.
- Identify potential unintended consequences of the GEC Marketing and Trading Program to be addressed in development of governing documents.
- Present findings of the interviews and fact-finding effort and provide recommendations to the EMA GSA.
- Collaborate with pumpers, EMA GSA member agencies, and key stakeholders to develop core components of a GEC Marketing and Trading Program.
- Draft preliminary provisions for a GEC Marketing and Trading Program (i.e., allowable frequency and amount of water to be traded), allowable water uses (i.e., area of origin/spatial restrictions, fees and penalties requirements, accounting scope, enforcement requirements, and other similar provisions)
- Develop a governing structure for GEC trades and program administration.
- Develop a monitoring and enforcement structure.
- Develop and test an accounting/register system to track groundwater BPA, pumping allowance, GEC trades and compliance through metering of groundwater production.
- Determine applicability of and undertake any required CEQA review for a GEC Marketing and Trading Program.
- Finalize the details of the initial GEC Marketing and Trading Program into a comprehensive GEC Marketing and Trading Program Policy document to be approved by the EMA GSA.
- Adopt GEC Marketing and Trading Program implementing regulations.

6.8.1 Relevant Measurable Objective(s) for the Groundwater Extraction Credit (GEC) Marketing and Trading Program [§ 354.44(b)(1)]

§§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.

A GEC Marketing and Trading Program would be intended, as necessary, to avoid undesirable results in the EMA by providing incentives and flexibility to Basin pumpers for water conservation, the transfer of GECs between users to allow voluntary fallowing and other beneficial uses, conversion of irrigated lands to dry land farming operations, and the reduction of water intensive land uses. A GEC Marketing and Trading Program would be implemented in a manner consistent with a Groundwater BPA Program to achieve the sustainability objectives developed for the GSP.

The measurable objectives benefiting from the implementation of a GEC Marketing and Trading Program include:

- **Groundwater Elevation Measurable Objectives:** A GEC Marketing and Trading Program would provide pumpers greater flexibility to conserve water, fallow irrigated cropland, and otherwise reduce pumping that could likely result in higher groundwater elevations.
- **Groundwater Storage Measurable Objectives:** This measurable objective is based on total pumping in the EMA. Therefore, the implementation of a GEC Marketing and Trading Program would provide pumpers greater flexibility to conserve water, fallow irrigated cropland, and otherwise reduce pumping that could help achieve the goal of reducing total extractions consistent with supporting the long-term sustainable yield of the EMA.
- **Land Subsidence Measurable Objectives:** A GEC Marketing and Trading Program would provide pumpers greater flexibility to conserve water, fallow irrigated cropland, and otherwise reduce pumping, thereby reducing the pumping stress on the principal aquifer and reducing the potential for subsidence.
- **Depletion of Interconnected Surface Water Measurable Objective:** A GEC Marketing and Trading Program would provide pumpers greater flexibility to conserve water, fallow irrigated cropland, and otherwise reduce pumping that could result in higher groundwater elevations in support of identified GDEs.
- **Degradation of Water Quality:** Improvements to water quality are expected as a result of the combination of the BPA and GEC programs that result in reduced pumping and reduced irrigation return flows to the aquifer, thereby limiting the amount of nitrate and TDS infiltrating to the aquifer.

6.8.2 Implementation Triggers for the Groundwater Extraction Credit (GEC) Marketing and Trading Program [§ 354.44(b)(1)(A)]

> ~~23 Cal. Code Regs §§~~ **354.44 Projects and Management Actions.**
>
> **(b) Each Plan shall include a description of the projects and management actions that include the following:**
>
> **(1) The Plan shall include the following:**
>
> **(A) A description of the circumstances under which projects or management actions shall be implemented, the criteria that would trigger implementation and termination of projects or management, and the process by which the Agency shall determine that conditions requiring the implementation of particular projects or management actions have occurred.**

The management action described in this section is included in the Group 2 management actions. Implementation of Group 2 management actions may be considered by the EMA GSA if previously implemented projects and management actions are not resulting in trends towards achieving the EMA GSA sustainability goals. The initial phase of a BPA Program would be focused on program design, policy and regulatory development, CEQA compliance, and stakeholder outreach. This phase may take 12 to 18 months or more.

A Groundwater BPA Program (see Section 6.7), which would need to be developed in parallel with this program, would need to be deployed before this management action could be initiated. Once implemented, a GEC Marketing and Trading Program could result in immediate benefit to the EMA and stakeholders by providing flexibility to landowners and allowing for credits to be held by the EMA GSA for the benefit of the EMA. A GEC Marketing and Trading Program could be ongoing throughout the GSP implementation period in coordination with a Groundwater GPA Program.

6.8.3 Public Notice Process for the Groundwater Extraction Credit (GEC) Marketing and Trading Program [§ 354.44(b)(1)(B)]

> ~~§§~~ **354.44 Projects and Management Actions.**
>
> **(b) Each Plan shall include a description of the projects and management actions that include the following:**
>
> **(1) The Plan shall include the following:**
>
> **(B) The process by which the Agency shall provide notice to the public and other agencies that the implementation of projects or management actions is being considered or has been implemented, including a description of the actions to be taken.**

A GEC Marketing and Trading Program would be developed in an open and transparent process. Targeted outreach meetings and technical workshops, in addition to regularly scheduled EMA GSA meetings, could be held periodically to inform groundwater pumpers and other stakeholders about the details of a GEC Marketing and Trading Program. Groundwater pumpers and interested stakeholders would have the opportunity at these meetings to learn about the program, as well as the opportunity to provide input and comments on how a GEC Marketing and Trading Program would be implemented in the EMA. The targeted public outreach meetings and technical workshops could be supplemented with informational mailers to be sent to all well owners in the EMA and informational press releases could be distributed to local media. If deemed valuable, EMA GSA representatives may work directly with individual well owners to explain potential program requirements and help with program implementation. A Groundwater GEC Program could also be promoted through annual GSP reports and links to relevant information on the EMA GSA website.

6.8.4 Overdraft Mitigation for the Groundwater Extraction Credit (GEC) Marketing and Trading Program [§ 354.44(b)(2)]

~~§§~~ **354.44 Projects and Management Actions.**

(b) Each Plan shall include a description of the projects and management actions that include the following:

(2) If overdraft conditions are identified through the analysis required by Section 354.18, the Plan shall describe projects or management actions, including a quantification of demand reduction or other methods, for the mitigation of overdraft.

The development and implementation of a GEC Marketing and Trading Program, in conjunction with the implementation of a Groundwater BPA Program within the EMA, could directly result in a reduction of the volume of groundwater being pumped from the Basin, provided, however, that new wells and new groundwater production in the EMA would need to be controlled to ensure that increased production in the aggregate would not negate the effects of reducing baseline production through an allocation, marketing, and trading framework. These reductions in pumping could occur during periods of normal, above normal, and below normal rainfall year conditions. Pumping reductions could help mitigate the estimated storage deficit within the Basin.

6.8.5 Permitting and Regulatory Process for the Groundwater Extraction Credit (GEC) Marketing and Trading Program [§ 354.44(b)(3)]

~~23 Cal. Code Regs §§~~ **354.44 Projects and Management Actions.**

(b) Each Plan shall include a description of the projects and management actions that include the following:

(3) A summary of the permitting and regulatory process required for each project and management action.

No specific permit or regulatory compliance process would be required for the EMA GSA to develop and adopt a GEC Marketing and Trading Program, although, as noted above, CEQA compliance may be required in connection with the overall program or individual trades. The program would be developed and implemented in accordance with all applicable groundwater laws and respect all groundwater rights.

6.8.6 Implementation Timeline for the Groundwater Extraction Credit (GEC) Marketing and Trading Program [§ 354.44(b)(4)]

§§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(4) The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.

The management action described in this section is included in the Group 2 management actions. Implementation of Group 2 management actions may be considered by the EMA GSA if previously implemented projects and management actions are not resulting in trends towards achieving the EMA GSA sustainability goals. The initial phase of work would be to conduct the appropriate stakeholder outreach, draft the policy development, solicit public comment, undertake legal review, develop an accounting system, and finalize an initial GEC policy. This phase would be anticipated to take 12 to 18 months or more. As noted above, a Groundwater BPA Program (see Section 6.7) would need to be developed and established prior to a GEC Program, and, as further described below, a Voluntary Agricultural Crop Fallowing Program (see Sections 6.9) could be developed as a complement to the GEC Program. The timetable for implementation of a GEC Marketing and Trading Program would depend on the schedule to complete any required CEQA review. Once implemented, a program could result in immediate benefit to the Basin and could be ongoing throughout the GSP implementation period.

6.8.7 Anticipated Benefits of the Groundwater Extraction Credit (GEC) Marketing and Trading Program [§ 354.44(b)(5)]

§§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(5) An explanation of the benefits that are expected to be realized from the project or management action, and how those benefits will be evaluated.

If implemented, a GEC Marketing and Trading Program could result in immediate benefit to the EMA, including supporting the avoidance of undesirable results including chronic lowering of groundwater levels, reduction of groundwater in storage, and potentially degraded water quality. Such a program could be designed to provide an economic incentive for conserving water, voluntary fallowing of irrigated agricultural croplands, and promote beneficial uses of water and land uses by providing for the potential to monetize voluntary water conservation or the elimination of water intensive uses. For example, a GEC Program could encourage the restoration of irrigated lands for use as open or recreational space, which also could serve to reduce pumping in certain areas or shift pumping from areas with declining groundwater levels. The implementation of a GEC Marketing and Trading Program could be designed to result in more efficient use of water and greater resiliency to long-term climate variability.

6.8.8 Legal Authority for the Groundwater Extraction Credit (GEC) Marketing and Trading Program [§ 354.44(b)(7)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(7) A description of the legal authority required for each project and management action, and the basis for that authority within the Agency.

It is the established policy of the State of California "to facilitate the voluntary transfer of water and water rights where consistent with the public welfare" (Water Code, § 109(a)). Additionally, "the Legislature hereby finds and declares that voluntary water transfers between water users can result in a more efficient use of water, benefitting both the buyer and the seller" (Water Code, § 475).

Under SGMA, the EMA GSA can "authorize temporary and permanent transfers of groundwater extraction allocations within the agency's boundaries, if the total quantity of groundwater extracted in any water year is consistent with the provisions of the groundwater sustainability plan" (Water Code, § 10726.4(a)(3)).

6.8.9 Cost and Funding for the Groundwater Extraction Credit (GEC) Marketing and Trading Program [§ 354.44(b)(8)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(8) A description of the estimated cost for each project and management action and a description of how the Agency plans to meet those costs.

The planning-level cost to develop and establish a GEC Marketing and Trading Program is estimated to be approximately $150,000 to $200,000; the cost of a program would be separate from the development of this GSP.

Potential sources of funding for a GEC Marketing and Trading Program include state grants, groundwater extraction fees, transaction fees from extraction credit trades, and other mechanisms as may be identified by the EMA GSA.

6.8.10 Drought Offset Measures for the Groundwater Extraction Credit (GEC) Marketing and Trading Program [§ 354.44(b)(9)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(9) A description of the management of groundwater extractions and recharge to ensure that chronic lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels or storage during other periods.

The development and implementation of a GEC Marketing and Trading Program, in conjunction with the implementation of a Groundwater BPA Program within the EMA, could directly result in a reduction of the volume of groundwater being pumped from the Basin because an allocation and market-based framework would be designed to reduce overall water production and increase efficient water use. These reductions in pumping could occur during periods of normal, above normal, and below normal rainfall year conditions and thereby mitigate the estimated storage deficit within the EMA.

As monitoring of the groundwater levels in the EMA occurs in the future, the EMA GSA would quantify the beneficial effects of any Groundwater BPA and GEC Marketing and Trading Programs that are developed and implemented, which would promote achievement of EMA sustainability objectives. The information acquired could be utilized in making adaptive management decisions that may allow lowering of groundwater levels or depletion of supply during periods of drought to be offset by increases in groundwater levels or storage during other periods.

6.9 Group 2 Management Action 7 – Voluntary Agricultural Crop Fallowing and Crop Conversion Programs [§ 354.44(b)(1)(d)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.

(d) An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.

In 2018, there were approximately 7,329 acres of active irrigated agriculture within the EMA, which were being irrigated with approximately 14,545 AF of water on an annual basis. Voluntary land fallowing and conversion to lower water use crops have been used historically in other locations as both a temporary and permanent solution to water shortages. The EMA GSA has identified voluntary agricultural crop fallowing and crop conversion as a potential management action that may be considered if Group 1 management actions are not proving effect in achieving sustainability in the EMA within 20 years of GSP adoption. As deemed necessary during the GSP implementation period, the EMA GSA may develop programs that would permit voluntary fallowing and land use conversions on a temporary or permanent basis as a means of reducing total water production in the EMA. As with the Groundwater BPA and GEC Marketing and Trading Programs discussed above, an important consideration in developing a voluntary fallowing and crop conversion program would be to include protections of water rights for producers who choose to fallow or carry out their land use conversions.

Factors that may be considered during the development of a fallowing and land conversion program could include, without limitation, the current extent of agriculture land and water use, the intended land and water use after fallowing or conversion, and the potential environmental impacts associated with fallowing / conversion, such as airborne emissions through wind-blown dust, the introduction or spreading of invasive plant species, and changes to the landscape that could adversely affect visual quality. The land uses proximal to proposed fallowing / conversion projects would also be considered as part of this management action. For example, differing levels of site stabilization or restoration may be needed or required based on the land use intended post-fallowing. Temporary stabilization may be less expensive and may be appropriate for properties to be developed for other uses in the near term. A passive restoration approach may be applied for permanent fallowing if the goal is for the property to eventually return to native habitat, and active restoration may be applied for relatively near-term restoration to native habitat with the goal of providing open space, parks, or public trails.

An initial program phase would be to evaluate key issues associated with program development, such as:

- Guidelines for maintaining water rights associated with land that is temporarily fallowed or converted to a lower water use crop.
- Development of a framework for incentivizing landowners to voluntarily fallow.
- Development and implementation of an incentive framework for conversion from irrigated agriculture to dry land farming.
- Evaluation of future land use alternatives.
- Ensuring avoidance of unintended consequences from unmanaged fallowed land.
- Identification of land restoration goals.
- Identifying land management, inspection, and enforcement procedures.
- Development of a regulatory document that includes rules for characterizing and tracking fallowed ground.
- Consideration of programmatic and/or project-based CEQA review.

As part of this management action, the EMA GSA would develop an EMA-wide accounting system that tracks landowners who decide to voluntarily fallow or convert their land and reduce groundwater pumping or otherwise refrain from using groundwater. If given the opportunity to create a “placeholder” for their ability to pump under regulations adopted by the EMA GSA, some property owners currently irrigating crops (or that might want to irrigate in the future) may choose to forego the expense of farming and extracting water if those rights can be accounted for and protected. A Voluntary Agricultural Crop Fallowing Program could be developed in parallel with Groundwater BPA and GEC Marketing and Trading Programs described in Sections 6.7 and 6.8.

The implementation of a voluntary fallowing and crop conversion program within the EMA may benefit from the provisions of Assembly Bill (AB) 252, which was introduced in January 2021. If passed, AB 252 would create the Multi-Benefit Land Repurposing Incentive Program, which is intended to help alleviate the impacts of SGMA on farmers and ensure that farmland taken out of production due to SGMA is reused to provide conservation, recreation, or other benefits to local communities. Specifically, this bill would create a pilot program to support repurposing formerly irrigated agricultural land for groundwater recharge, biodiversity conservation, pollinator habitat, cattle grazing, and other beneficial and less water-intensive uses. A primary goal of the Multi-Benefit Land Repurposing Program is to help make the critical transition to sustainable groundwater management. The program proposed in this bill also can reduce potential negative impacts of taking land out of production, such as spreading invasive weeds and greater dust emissions, and instead bring substantial benefits to rural communities and wildlife habitat.

6.9.1 Relevant Measurable Objective(s) for the Voluntary Agricultural Crop Fallowing and Crop Conversion Programs [§ 354.44(b)(1)]

§§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.

The measurable objectives benefiting from the implementation of a Voluntary Agricultural Crop Fallowing Program include:

- **Groundwater Elevation Measurable Objectives:** A voluntary fallowing and crop conversion program would focus on reducing pumping, which could result in higher groundwater elevations.
- **Groundwater Storage Measurable Objectives:** This measurable objective is based on total pumping in the EMA. Therefore, the implementation of a voluntary fallowing and crop conversion program would focus on reducing pumping and help achieve the goal of reducing total extractions consistent with the long-term sustainable yield.
- **Land Subsidence Measurable Objectives:** A voluntary fallowing and crop conversion program would focus on reducing pumping, thereby reducing the pumping stress on the principal aquifers and reducing the potential for subsidence.
- **Depletion of Interconnected Surface Water Measurable Objective:** A voluntary fallowing and crop conversion program would focus on reducing pumping which could result in higher groundwater elevations in support of identified GDEs.
- **Degradation of Water Quality:** Improvements to water quality are expected as a result of reduction of groundwater pumping and associated irrigation return flows to the aquifer, thereby limiting the amount of nitrate and TDS infiltrating to the aquifer.

6.9.2 Implementation Triggers for the Voluntary Agricultural Crop Fallowing and Crop Conversion Programs [§ 354.44(b)(1)(A)]

~~23 Cal. Code Regs §§~~ **354.44 Projects and Management Actions.**

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) The Plan shall include the following:

(A) A description of the circumstances under which projects or management actions shall be implemented, the criteria that would trigger implementation and termination of projects or management, and the process by which the Agency shall determine that conditions requiring the implementation of particular projects or management actions have occurred.

The management action described in this section is included in the Group 2 management actions. Implementation of Group 2 management actions may be considered by the EMA GSA if previously implemented projects and management actions are not resulting in trends towards achieving the EMA GSA sustainability goals. The initial phase of a Voluntary Agricultural Crop Fallowing and Crop Conversion Program would be focused on program design, policy development, CEQA compliance, and stakeholder outreach. This phase is anticipated to take 6 to 9 months or more, and (as noted above) would need to follow the development and establishment of a Groundwater BPA Program. Once implemented, a voluntary fallowing and crop conversion program could result in immediate reductions in groundwater pumping, which may increase with the addition of fallowed lands and fluctuate depending on the nature and timing of converted land use. As noted above, new wells and new production in the EMA would need to be controlled to ensure that increased production in the aggregate would not negate the effects of reducing baseline production through an allocation, marketing, and/or fallowing and crop conversion framework.

6.9.3 Public Notice Process for the Voluntary Agricultural Crop Fallowing and Crop Conversion Programs [§ 354.44(b)(1)(B)]

~~§§~~ **354.44 Projects and Management Actions.**

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) The Plan shall include the following:

(B) The process by which the Agency shall provide notice to the public and other agencies that the implementation of projects or management actions is being considered or has been implemented, including a description of the actions to be taken.

Targeted outreach meetings and technical and training workshops, in addition to regularly scheduled EMA GSA meetings, could be held periodically to inform groundwater pumpers and other stakeholders about the details of a voluntary fallowing and crop conversion program. Groundwater pumpers and interested stakeholders would have the opportunity at these meetings to learn about the proposed components of a fallowing and crop conversion program as well as the opportunity to provide input and comments on how the fallowing and crop conversion initiatives could be implemented in the EMA. The targeted public outreach meetings and technical and training workshops could be supplemented with informational mailers to be sent to all well owners in the EMA and informational press releases could be distributed to local media. If deemed valuable, EMA GSA representatives may work directly with individual well owners to explain program requirements and help with program implementation. A Voluntary Agricultural Crop Fallowing and Crop Conversion Program could also be promoted through annual GSP reports and links to relevant information on the EMA GSA website.

6.9.4 Overdraft Mitigation for the Voluntary Agricultural Crop Fallowing and Crop Conversion Programs [§ 354.44(b)(2)]

~~§§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(2) If overdraft conditions are identified through the analysis required by Section 354.18, the Plan shall describe projects or management actions, including a quantification of demand reduction or other methods, for the mitigation of overdraft.

The development and implementation of a voluntary fallowing and crop conversion program within the EMA could directly result in a reduction of the volume of groundwater being pumped from the Basin. These reductions in pumping could occur during periods of normal, above normal, and below normal rainfall year conditions and thereby mitigate the estimated storage deficit within the EMA.

6.9.5 Permitting and Regulatory Process for the Voluntary Agricultural Crop Fallowing and Crop Conversion Programs [§ 354.44(b)(3)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(3) A summary of the permitting and regulatory process required for each project and management action.

Establishment of a voluntary land fallowing and crop conversion program is expressly authorized under SGMA (Water Code, § 10726.2(c)). The fallowing and crop conversion program, including program standards, would be developed and undergo CEQA review, as necessary.

6.9.6 Implementation Timeline for the Voluntary Agricultural Crop Fallowing and Crop Conversion Programs [§ 354.44(b)(4)]

§§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(4) The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.

The management action described in this section is included in the Group 2 management actions. Implementation of Group 2 management actions may be considered by the EMA GSA if previously implemented projects and management actions are not resulting in trends towards achieving the EMA GSA sustainability goals. The initial phase of a voluntary fallowing and crop conversion program would be focused on program design, policy development, CEQA compliance, and stakeholder outreach. This phase would be anticipated to take 6 to 12 months or more, and (as noted above) would need to follow the development and establishment of a Groundwater BPA Program. Once implemented, the program could result in immediate groundwater savings, which may continue to increase with the addition of fallowed lands and fluctuate depending on the nature and timing of converted land use.

6.9.7 Anticipated Benefits for the Voluntary Agricultural Crop Fallowing and Crop Conversion Programs [§ 354.44(b)(5)]

§§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(5) An explanation of the benefits that are expected to be realized from the project or management action, and how those benefits will be evaluated.

In addition to the benefits from reduced pumping, the program may allow for a level of land use and community planning for converted properties not otherwise available. Depending on the nature of land uses implemented, the program could result in increased recreational space or potential economic benefits from conversion of land use types. For example, the conversion of previously fallowed land to Managed Aquifer Recharge (MAR) projects discussed in Section 6.10 may be investigated.

For perspective, in 2018, there was an estimated 7,329 acres of irrigated cropland in the EMA with a corresponding water demand of approximately 14,545 AFY. A voluntary fallowing and conversion program involving 10 percent of the irrigated cropland could result in a benefit of approximately 1,450 AFY.

6.9.8 Legal Authority for the Voluntary Agricultural Crop Fallowing and Crop Conversion Programs [§ 354.44(b)(7)]

> ~~23 Cal. Code Regs §§~~ **354.44 Projects and Management Actions.**
>
> **(b) Each Plan shall include a description of the projects and management actions that include the following:**
>
> **(7) A description of the legal authority required for each project and management action, and the basis for that authority within the Agency.**

Establishment of a voluntary land fallowing and crop conversion program is expressly authorized under SGMA (Water Code, § 10726.2(c)).

6.9.9 Cost and Funding for the Voluntary Agricultural Crop Fallowing and Crop Conversion Programs [§ 354.44(b)(8)]

> ~~23 Cal. Code Regs §§~~ **354.44 Projects and Management Actions.**
>
> **(b) Each Plan shall include a description of the projects and management actions that include the following:**
>
> **(8) A description of the estimated cost for each project and management action and a description of how the Agency plans to meet those costs.**

The planning-level cost for developing and establishing a Voluntary Agricultural Crop Fallowing and Crop Conversion Program is estimated to be approximately $75,000 to $150,000 and is separate from development of this GSP.

Potential sources of funding for a Voluntary Fallowing Program include state grants, groundwater extraction fees, transaction fees from extraction credit trades, and other mechanisms as may be identified by the EMA GSA.

6.9.10 Drought Offset Measures for the Voluntary Agricultural Crop Fallowing and Crop Conversion Programs [§ 354.44(b)(9)]

> ~~23 Cal. Code Regs §§~~ **354.44 Projects and Management Actions.**
>
> **(b) Each Plan shall include a description of the projects and management actions that include the following:**
>
> **(9) A description of the management of groundwater extractions and recharge to ensure that chronic lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels or storage during other periods.**

The development and implementation of a Voluntary Agricultural Crop Fallowing and Crop Conversion Program within the EMA could directly result in a reduction of the volume of groundwater that would be pumped from the Basin. These reductions in pumping could occur during periods of normal, above normal, and below normal rainfall year conditions and thereby mitigate the estimated storage deficit within the EMA.

As monitoring of the groundwater levels in the EMA occurs in the future, the EMA GSA would quantify the beneficial effects of a voluntary fallowing and crop conversion program, which may allow for future refinements in the EMA water budget. The information acquired could be used by the EMA GSA in making adaptive management decisions that may allow lowering of groundwater levels or depletion of supply during periods of drought to be offset by increases in groundwater levels or storage during other periods.

6.10 Group 3 Projects [§ 354.44(b)(1)(d)]

~~23 Cal. Code Regs~~ §§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.

(d) An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.

The EMA GSA does not currently plan to initiate the construction of any Group 3 project infrastructure for the specific goal of achieving basin sustainability until evidence exists that such a project may prove effective and economically feasible. Although the EMA GSA has no near-term plans to initiate construction of any specific projects for the purposes of achieving basin sustainability, the EMA GSA and/or other local agencies may be interested in proceeding with the study, planning, preliminary design/engineering, and permitting phases for several projects that were identified by the EMA GSA for potential future consideration. A description of the projects that the EMA GSA identified for future consideration and associated summary information are presented in the Sections 6.10.1 through 6.10.10.

The projects that the EMA GSA identified for future consideration include the following:

- Distributed Stormwater Managed Aquifer Recharge (DSW-MAR) Basins (In-Channel and Off-Stream Basins)
- City of Solvang / Santa Ynez Community Services District WWTF Recycled Water & Reuse In Lieu of Groundwater Pumping or Indirect Potable Reuse
- Los Olivos Community Service District WWTF Recycled Water & Reuse In Lieu of Groundwater Pumping or Indirect Potable Reuse
- Santa Ynez Band of Chumash Indians WWTF Recycled Water & Reuse In Lieu of Groundwater Pumping or Indirect Potable Reuse
- GSA to become Funding Partner to Santa Barbara County Precipitation Enhancement Program
- Conjunctive Use - MAR Projects Using Imported (SWP and SYR) Water

- In Lieu Recharge Projects to Deliver Unused and Surplus Imported Water to Offset Groundwater Extractions
- Aquifer Storage and Recovery Projects

A brief description of the projects that have been identified by the EMA GSA for possible implementation in the future is presented below.

Distributed Stormwater Managed Aquifer Recharge (DSW-MAR) Basins (In-Channel and Off-Stream Basins)

DSW-MAR is a landscape management strategy that could help to reduce the storage deficit and maintain long-term water supply reliability. DSW-MAR targets relatively small drainage areas (generally 100 to 1,000 acres) from which stormwater runoff can be collected to infiltrate 100 to 300 AF of water per year, per individual basin. Infiltration can be accomplished in surface basins, typically having an area of 1 to 5 acres, or potentially through flooding of agricultural fields or flood plains, use of drywells, or other strategies. Smaller projects might provide additional benefit, but unit costs are likely to be somewhat greater. Larger projects may require more infrastructure and/or maintenance costs.

The initial phase of this project may include the completion of a study to identify the optimal number and location of a series of DSW-MAR facilities, based on hydrogeologic and watershed conditions. The subject study may include an evaluation of the potential benefits to the EMA, from an expansion of the precipitation enhancement program described below.

City of Solvang WWTF Recycled Water & Reuse In Lieu of Groundwater Pumping or Indirect Potable Reuse

The City of Solvang (City) currently operates a Sequencing Batch Reactor type WWTP with a design capacity of 1.5 million gallons per day (MGD) which is operated under a Waste Discharge Permit issued by the Central Coast Regional Water Quality Control Board (RWQCB). In 2021, the average daily flow was approximately 0.8 MGD. The WWTP currently receives and treats wastewater from the City and the Santa Ynez Community Services District (SYCSD), which serves the town of Santa Ynez. The SYCSD utilizes 0.30 MGD capacity in the Solvang WWTP. The WWTP provides full secondary treatment of the wastewater received. The WWTP discharges treated wastewater to percolation ponds located adjacent to the Plant. The WWTP, including percolation ponds, is located near the southwestern limits but outside of the EMA. Treated effluent percolates into the ground and ultimately discharges to the Santa Ynez River.

The City has plans to upgrade the WWTP, with initial phases to include a new aeration system and the addition of clarifiers, offices, and laboratory facilities. Subsequent phases may provide for adding treatment processes that could allow the City to produce recycled water that meets Title 22 requirements and the construction of a recycled water distribution (“purple pipe”) system. The future supply of recycled water may be used by agricultural and/or commercial water users in lieu of pumping groundwater or introduced into the basin aquifers for indirect potable water reuse. A potentially long pipeline would have to be constructed at considerable cost to serve users and uses located within or outside of the City limits in the EMA.

Los Olivos Community Service District WWTF Recycled Water & Reuse In Lieu of Groundwater Pumping or Indirect Potable Reuse

The unincorporated community of Los Olivos has a population of approximately 1,150 residents, along with several commercial businesses, which currently use onsite wastewater treatment systems (OWTS) exclusively for the disposal of wastewater. In 2016, the estimated average daily flow (ADF) from the collective OWTS’s was estimated to be 0.107 MGD at 20-year build-out conditions (i.e., 2036) (AECOM, 2016). The Los Olivos Community Service District (LOCSD) was formed by voters in 2018 to provide a funding mechanism for the development, building, and operation of facilities necessary to collect and treat wastewater. The Los Olivos Wastewater Reclamation Program Project was undertaken by the LOCSD to define a strategy to provide economically viable wastewater treatment and reclamation solutions that meet public health needs and the regulatory requirements of the RWQCB. A primary component of this project includes the proposed construction of a phased collection and treatment system that will include the construction of a membrane bioreactor treatment facility to serve the central business core and immediate surrounding residential areas. The membrane bioreactor treatment facility will be sited to accommodate modular expansion, should further study warrant a facility expansion. The system will be designed for potential future expansion and to provide treatment that improves wastewater quality before it is reused, recycled, or discharged. Reclaimed wastewater is proposed to be treated to levels compliant with California Code of Regulations, Title 22 discharge requirements to allow for the following:

- Beneficial reuse through underground infiltration
- Groundwater recharge
- Strategic flushing of existing nitrate/contaminates
- Local irrigation as site conditions allow

The future supply of recycled water may be used by agricultural and/or other water users in lieu of pumping groundwater or introduced into basin aquifers for indirect potable water reuse.

Santa Ynez Band of Chumash Indians WWTF Recycled Water & Reuse In Lieu of Groundwater Pumping or Indirect Potable Reuse

The Santa Ynez Band of Chumash Indians own and operate a WWTF that serves approximately 6,450 people (including hotel guests) on the Santa Ynez Reservation, Casino & Hotel Complex, Administration Buildings and Health Clinic, which serves about 350 residents, 100 employees, and 6,000 patrons per day. The existing plant utilizes membrane bioreactor treatment to provide a treatment capacity of 0.32 MGD, and produces effluent that meets California Code of Regulations, Title 22 recycled water use standards. The average discharge flow rate is approximately 0.12 MGD. Wastewater collected through the sewer system gravity flows to the WWTP. Operation and maintenance of the facility and collection system is conducted by the SYCSD.

The facility is permitted to discharge into Zanja de Cota Creek, a tributary of the Santa Ynez River. Approximately 1.3 miles downstream of the outfall, the creek flows off the Reservation and into California state waters. Tertiary treated effluent that is not discharged is stored on-site before being reused on-site for toilet flushing, on-site irrigation, off-site irrigation, or in the cooling system at the casino. The facility has obtained a Waste Discharge Restrictions Requirements permit from the Central Coast RWQCB to send recycled wastewater off-site outside of Tribal boundaries (i.e., land Tribally owned but not held in trust). Water is reused primarily during periods of drought. Some potential may exist for utilizing the recycled water from this facility by agricultural and/or other water users in lieu of pumping groundwater or introduced into the Basin aquifers for indirect potable water reuse.

GSA to Become Funding Partner to Santa Barbara County Precipitation Enhancement Program

The project would ~~be an~~ provide financial assistance to the Santa Barbara County Water Agency for the continued operation and potential expansion of the existing precipitation enhancement program that has been operated by Santa Barbara County Water Agency since 1981. This program has been historically operated by the County in the vicinity of upper elevation tributaries entering Cachuma Reservoir (Lake Cachuma). The precipitation enhancement project involves implementation of a cloud seeding program to augment natural precipitation to increase surface water runoff and aquifer recharge in the Basin. This process includes introduction of silver iodide into clouds to increase nucleation (i.e., the process by which water in clouds freezes to then precipitate out). The precipitation enhancement program would potentially expand the use of both ground-based seeding and aerial seeding to improve the probability of increased rainfall. Ground-based seeding would be conducted using remote-controlled flare systems, set up along key mountain ridges and would be automated. Aerial seeding would use small aircraft carrying flare racks along its wings to release silver iodide into clouds while flying through and above them. This program has lost participation from some of its historical funding partners and this project would allow the GSA to support the continued operation of this program.

Conjunctive Use - MAR Projects Using Supplemental (SWP and SYR) Water

Direct recharge of aquifers can be done by introducing supplemental water supplies, including water from the SWP and/or the SYR system, through recharge basins or injection wells. Intentional, direct recharge is commonly referred to as Managed Aquifer Recharge (MAR). Recharge basins are large artificial ponds that are filled with water that seeps from the basin into the groundwater system. Recharge efficiencies can range greatly, and the recharge efficiency of a recharge basin is contingent on the size, geometry and location of the basin along with the properties of the underlying soil, losses to evaporation, and potential seepage into streams or shallow sediments before it can recharge the deeper aquifers. Recharge efficiencies are difficult to measure without sophisticated subsurface monitoring.

Recharge through recharge basins using supplemental water supplies can occur year-round to the extent that access to imported water is available; although efficiency might be lower during the rainy seasons if underlying soils are already saturated. Recharge basins have the advantage of generally being less expensive to build and operate than in lieu distribution systems or injection systems.

Injection wells are used to inject available water supplies directly into the groundwater basin when source water is available and then recovering the water during times of water scarcity. Injection can occur year-round, including during the rainy season. Injection wells are typically more efficient at raising groundwater elevations than recharge basins because they target specific aquifers; although a well's recharge ability is affected by the surrounding aquifer properties. The injected water typically flows through the aquifer from the injection location to locations with lower groundwater elevations. The rate of travel depends on the hydraulic conductivity of the aquifer. Although they have a very high efficiency, injection wells are generally more expensive to operate than recharge basins. Additionally, injection wells require higher quality water than recharge basins.

The availability and reliability of supplemental supplies from the SWP and SYR are limiting factors. For example, the latest estimates of anticipated SWP water availability under future conditions are included in the DWR *2019 SWP Delivery Capability Report* (DCR) (DWR, 2019). The 2019 DCR anticipates approximately 59 percent of Table A, and other contract amounts, will be available on average to the SWP Contractors under anticipated future conditions. These estimates are based on outputs from the CalSim-2 Operations Model (DWR, 2019). However, the availability of these SWP water supplies will be variable year by year based on hydrologic conditions. The historical delivery of annual allocations from the SWP ranges from 5 to 100 percent of the contracted amount. Given the variable availability of SWP water supplies, and current uses to which SWP supplies are already dedicated in the area, a MAR project to would likely need to be designed to operate sporadically, with recharge occurring during wet years to balance out lower, or non-existent delivery amounts, during dry years.

In Lieu Recharge Projects to Deliver Unused and Surplus Supplemental Water to Offset Groundwater Extractions

Direct delivery of surplus SWP and/or SYR system supplies, to the extent they are physically and legally available, could be done in lieu of groundwater pumping. This option could offset the use of groundwater, allowing the groundwater basin to recharge naturally. Direct delivery projects rely on the construction of pipelines and associated infrastructure to deliver the water to agricultural or municipal users, as well as pumping stations and storage facilities to handle supply and demand variations. Direct delivery is a highly efficient method to reduce groundwater pumping because it directly offsets the amount of water pumped from the aquifer, allowing the principal aquifer groundwater elevations to rebound through natural recharge. One of the drawbacks of direct delivery is that the delivered water must be available during the times when the users need it, which often occurs at times when competition for those water supplies are highest and are less likely to be available, especially during a dry year. The construction of storage facilities can mitigate these challenges to some extent, but this additional infrastructure results in substantially increased capital and operational costs.

Aquifer Storage and Recovery Projects

Aquifer storage and recovery (ASR) would provide for the injection of supplemental water supplies, to the extent they are available, into the natural structure of basin aquifers for use as an underground storage reservoir. The source water for injection must be drinking water quality. The supplemental water to be injected would be from the SWP coastal pipeline route, which is a treated supply. Water stored in the Basin as a result of an ASR project could provide a drought supply for the EMA service area or could be used in connection with other projects and management actions in the Basin.

A significant limitation of this project is the availability and cost of the supplemental SWP water used for injection source water. Existing SWP water supplies within the EMA are fully allocated to existing users; SWP water would have to be purchased from other users that do not intend to fully use their allocation or from a water bank located elsewhere in the SWP system.

Any ASR project would need to be designed with additional capacity to contribute to the sustainability of the Basin. Prior to implementing an ASR project, the EMA GSA would perform supplemental hydrogeologic and engineering investigations and initiate a pilot testing program. Pilot testing involves injecting water into the Basin's aquifers and recovering it to assess injection and recovery capacities and monitor water quality impacts to native groundwater resources and recovered water quality. Information generated by pilot test evaluations will help quantify the degree to which ASR is a feasible part of EMA GSA strategy to improve the reliability of its water supply, along with helping to evaluate whether an ASR project can be developed.

6.10.1 Relevant Measurable Objective(s) for Group 3 Projects [§ 354.44(b)(1)]

~~§~~§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.

Because the EMA GSA does not currently plan to implement the identified Group 3 projects, they will not have any impact on the measurable objectives for the EMA. If the EMA GSA determines that one or more of the Group 3 projects may be required or desirable, then there will be a benefit to all the measurable objectives that are identified in this GSP.

6.10.2 Implementation Triggers for Group 3 Projects [§ 354.44(b)(1)(A)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) The Plan shall include the following:

(A) A description of the circumstances under which projects or management actions shall be implemented, the criteria that would trigger implementation and termination of projects or management, and the process by which the Agency shall determine that conditions requiring the implementation of particular projects or management actions have occurred.

The projects identified in this section are not deemed critical for the successful implementation of this GSP and are included in the Group 3 projects as future options should they become necessary or otherwise desirable in the overall strategy for sustainable EMA management. Although, the EMA GSA does not currently plan to initiate construction on any of these projects, there may be interest in proceeding with the study, planning, preliminary design/engineering, CEQA compliance, and permitting phases for several projects that are identified by the EMA GSA for potential future consideration.

6.10.3 Public Notice Process for Group 3 Projects [§ 354.44(b)(1)(B)]

~~§§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) The Plan shall include the following:

(B) The process by which the Agency shall provide notice to the public and other agencies that the implementation of projects or management actions is being considered or has been implemented, including a description of the actions to be taken.

No specific notice to the public or other agencies is currently planned regarding the identified Group 3 projects. If the EMA GSA elects to pursue one or more of the projects, an approach for informing the public and other agencies will be developed and implemented.

6.10.4 Overdraft Mitigation for Group 3 Projects [§ 354.44(b)(2)]

~~§§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(2) If overdraft conditions are identified through the analysis required by Section 354.18, the Plan shall describe projects or management actions, including a quantification of demand reduction or other methods, for the mitigation of overdraft.

Because the EMA GSA does not currently plan to implement the identified Group 3 projects, they will not have any impact on the mitigation of the estimated storage deficit within the Basin. The potential effects that any specific project may have on the Basin would be addressed during the study, planning, and preliminary design/engineering phases of any projects that are identified by the EMA GSA for potential future consideration.

6.10.5 Permitting and Regulatory Process for Group 3 Projects [§ 354.44(b)(3)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(3) A summary of the permitting and regulatory process required for each project and management action.

Each of the identified Group 3 projects would require planning and permitting prior to implementation, and all would require compliance with applicable regulations, including CEQA. These permitting and regulatory compliance issues for any specific project would be addressed during the study, planning, preliminary design/engineering, and permitting phases of any project that is identified by the EMA GSA for potential future consideration.

6.10.6 Implementation Timeline for Group 3 Projects [§ 354.44(b)(4)]

~~§~~§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(4) The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.

The Group 3 projects identified in this section are not deemed critical for the successful implementation of the GSP. The EMA GSA has no near-term plans to initiate construction of any specific projects for the purposes of achieving basin sustainability. However, there may be interest in proceeding with the study, planning, preliminary design/engineering, CEQA compliance, and permitting phases for several projects that are identified by the EMA GSA for potential future consideration.

6.10.7 Anticipated Benefits from Group 3 Projects [§ 354.44(b)(5)]

~~§~~§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(5) An explanation of the benefits that are expected to be realized from the project or management action, and how those benefits will be evaluated.

Because the EMA GSA does not currently plan to implement the identified Group 3 projects, they will not have any direct benefit to the Basin. If the EMA GSA determines that one or more of the projects may be required or otherwise desirable, assessment of anticipated benefits will be characterized at that time. Anticipated benefits that any specific project may have on the EMA will be addressed during the study, planning, preliminary design/engineering, and permitting phases of all projects that are identified by the EMA GSA for potential future consideration.

6.10.8 Legal Authority for Group 3 Projects [§ 354.44(b)(7)]

~~23 Cal. Code Regs §~~§ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(7) A description of the legal authority required for each project and management action, and the basis for that authority within the Agency.

Legal authority for any specific project would be addressed during the study, planning, preliminary design/engineering, and permitting phases of all projects that are identified by the EMA GSA for potential future consideration.

6.10.9 Cost and Funding for Group 3 Projects [§ 354.44(b)(8)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(8) A description of the estimated cost for each project and management action and a description of how the Agency plans to meet those costs.

Project costs and proposed mechanisms for funding for any specific project would be addressed during the study, planning, preliminary design/engineering, and permitting phases of all projects that are identified by the EMA GSA for potential future consideration.

6.10.10 Drought Offset Measures for Group 3 Projects [§ 354.44(b)(9)]

~~23 Cal. Code Regs §§~~ 354.44 Projects and Management Actions.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(9) A description of the management of groundwater extractions and recharge to ensure that chronic lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels or storage during other periods.

Because the EMA GSA does not currently plan to implement the identified Group 3 projects, they will not have any impact on mitigating chronic lowering of groundwater levels or depletion of supply during periods of drought within the Basin. The potential effects that any specific project may have on the Basin regarding offsetting the effects of drought would be addressed during the study, planning, preliminary design/engineering, and permitting phases of any projects that are identified by the EMA GSA for potential future consideration.

6.11 References

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SECTION 7: Groundwater Sustainability Plan Implementation

7.1 Introduction

This section provides a conceptual roadmap for the Santa Ynez River Valley Groundwater Basin (Basin) – Eastern Management Area (EMA) Groundwater Sustainability Agency's (GSA's) efforts to implement this Groundwater Sustainability Plan (GSP) after adoption and discusses implementation efforts in accordance with Sustainable Groundwater Management Act (SGMA) regulations § 354.8(f)(2).

This implementation plan is based on the EMA GSA's current understanding of the EMA's conditions and anticipated administrative considerations that affect the management actions described in Section 6. Understanding of Basin conditions and administrative considerations will evolve over time, based on future refinement of the hydrogeologic setting, groundwater flow conditions, and input from EMA stakeholders.

Implementation of this GSP requires robust administrative and financing structures, with adequate staff and funding to support compliance with SGMA. The GSP calls for the EMA GSA to routinely provide information to the public about GSP implementation, progress towards sustainability, and the need to use groundwater efficiently. The GSP calls for a website to be maintained as a communication tool for posting data, reports, and meeting information.

Section 6 identifies three groups of projects and management actions that may be considered for implementation by the EMA GSA that could do the following:

- Address data gaps and reduce uncertainty
- Improve understanding of Basin conditions and how they may change over time
- Create opportunities to promote conservation and optimize water use in the Basin

The EMA GSA developed a portfolio of projects and management actions that can be implemented as the conditions in the Basin dictate. The identified management actions and potential future projects are categorized into three groups, with the management actions included in Group 1 to be initiated within 1 year of GSP adoption by the GSA. The Group 2 management actions and Group 3 projects may be considered for implementation in the future as conditions in the Basin dictate and the effectiveness of the other management actions are assessed. It is important to note that the projects and management actions included in Groups 2 and 3 may not be necessary if the implementation of Group 1 management actions result in conditions within the EMA that are trending toward meeting the EMA GSA sustainability goals and measurable objectives. However, the EMA GSA may determine that the implementation of Group 2 management actions and/or Group 3 projects is desirable for reasons other than reaching sustainability within the EMA and may elect to implement initiatives from either Group 2 or Group 3 at any time.

Based on the results of the analysis performed in conjunction with the development of this GSP, the EMA GSA concludes that the sustainability goals described in this GSP and required under the provisions of SGMA can be achieved through the implementation, as needed, of the Group 1 management actions described in Sections 6.3 through 6.6. Therefore, the EMA GSA does not plan at this time to implement any of the Group 2 management actions and/or to initiate the construction of any project infrastructure (Group 3) for the specific goal of achieving sustainability until such time as evidence shows that the effects of the Group 1 implemented management actions are insufficient. These possible future Group 2 management actions and Group 3 projects are briefly described in Sections 6.7 through 6.10.

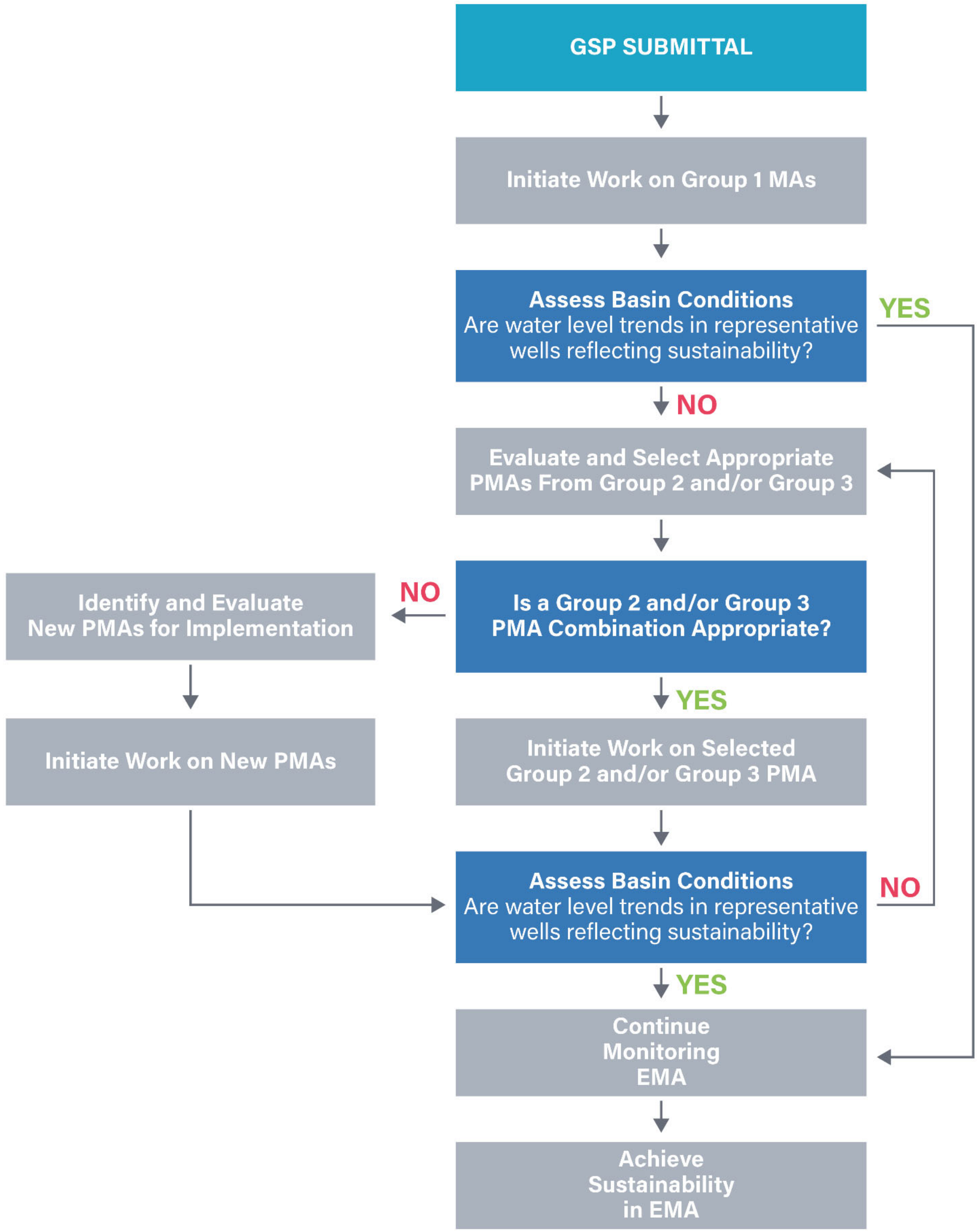
This section of the GSP describes how these Group 1 management actions will be—and possible future Group 2 management actions and Group 3 projects may be—implemented, and includes descriptions of the following:

- Administrative approach and implementation timing
- Annual Reporting
- 5-Year GSP Evaluation and Update
- Management Action Implementation
- EMA GSA Annual Budget Estimates
- Funding Sources

7.2 Administrative Approach and Implementation Timing

The EMA GSA will likely hire consultant(s), assign a member agency to conduct or manage the effort, and/or hire staff to implement the GSP. If consultants are hired, it is anticipated that qualified professionals will be identified and hired through a competitive selection process. It is also anticipated that the lead for a particular task will keep the EMA GSA informed via periodic updates to the EMA GSA Committee and the public. As needed, the EMA GSA would likely conduct specific studies and analyses necessary to improve understanding of Basin conditions. The EMA GSA would likely then use new information on Basin conditions to identify, evaluate, and/or improve management actions to achieve sustainability. This GSP calls for actions considered by the EMA GSA to be vetted through a public outreach process whereby groundwater pumpers and other stakeholders will have opportunities to provide input to the decision-making process.

Using authorities outlined in California Water Code §§ 10725 to 10726.9, the EMA GSA will ensure the maximum degree of local control and flexibility consistent with this GSP to commence management actions. Because the amount of groundwater pumping in the EMA in recent years has been more than the estimated sustainable yield of about 12,870 acre-feet per year, as discussed in Section 3.3, and groundwater levels have been declining in some areas, the EMA GSA will begin to implement Group 1 management actions within 1 year after GSP adoption. The EMA GSA plans to continually monitor and assess its progress toward meeting the sustainable management criteria (SMCs) (see Section 5). Under conditions in which minimum thresholds are projected to be reached, the EMA GSA will perform assessments to determine whether the trends are related to groundwater pumping, drought conditions, or other factors. If groundwater level data are trending toward reaching minimum thresholds as a direct consequence of groundwater pumping in the EMA, then the EMA GSA may consider the implementation of Group 2 management actions and/or Group 3 projects. A graphical depiction of the implementation sequence is presented in Figure 7-1.


GSP SUBMITTAL
Initiate Work on Group 1 MAs
Assess Basin Conditions
Are water level trends in representative wells reflecting sustainability?
YES
NO
Evaluate and Select Appropriate PMAs From Group 2 and/or Group 3
Is a Group 2 and/or Group 3 PMA Combination Appropriate?
NO
Identify and Evaluate New PMAs for Implementation
Initiate Work on New PMAs
YES
Initiate Work on Selected Group 2 and/or Group 3 PMA
Assess Basin Conditions
Are water level trends in representative wells reflecting sustainability?
NO
YES
Continue Monitoring EMA
Achieve Sustainability in EMA

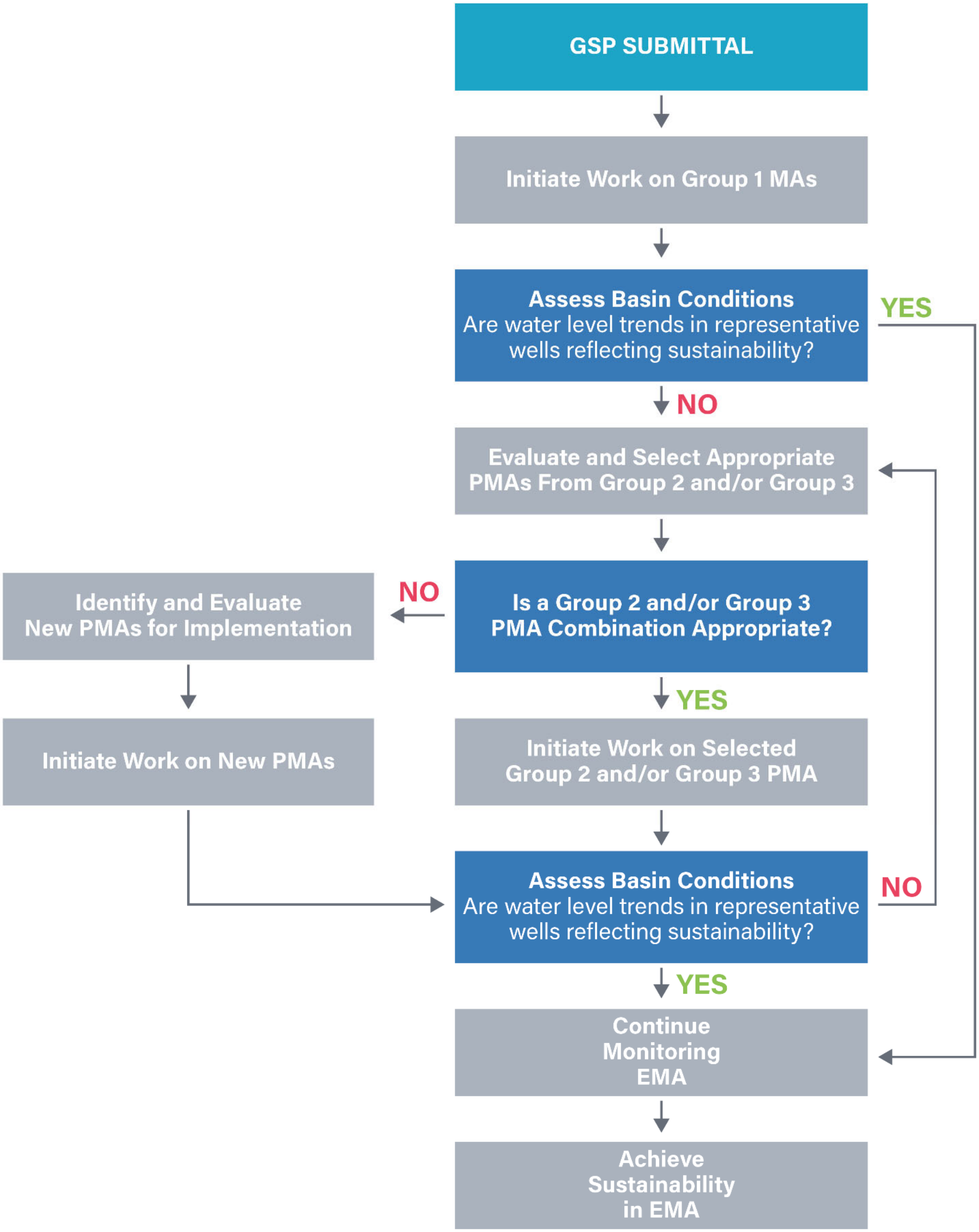


Figure 7-1. Adaptive Implementation Strategy for Projects and Management Actions

Notes

EMA = Santa Ynez River Valley Groundwater Basin Eastern Management Area

MA = management action PMA = project and/or management action

7.3 Annual Reporting

The EMA GSA will submit an annual report to the DWR by April 1 of each year following the adoption of the GSP. The annual report will include the following components for the preceding water year:

1. General information, including an executive summary and a location map depicting the Basin covered by the report.
2. A detailed description and graphical representation of the following conditions of the Basin managed in the GSP:
   a. Groundwater elevation data from monitoring wells identified in the monitoring network will be analyzed and displayed as follows:
      i. Groundwater elevation contour maps for each principal aquifer in the Basin illustrating, at a minimum, the seasonal high and seasonal low groundwater conditions.
      ii. Hydrographs of groundwater elevations and water year type using historical data to the greatest extent available.
   b. Groundwater extraction for the preceding water year. Data will be collected using the best available measurement methods and will be presented in a table that summarizes groundwater extractions by water use sector and identifies the method of measurement (direct or estimate) and accuracy of measurements, and a map that illustrates the general location and volume of groundwater extractions.
   c. Surface water supply used or available for use, for groundwater recharge or in lieu use, will be reported based on quantitative data that describes the annual volume and sources for the preceding water year.
   d. Total water use will be collected using the best available measurement methods and will be reported in a table that summarizes total water use by water use sector, water source type, and identifies the method of measurement (direct or estimate) and accuracy of measurements.
   e. Change in groundwater in storage will include the following:
      i. Change in groundwater in storage maps for each principal aquifer in the Basin.
      ii. A graph depicting water year type, groundwater use, the annual change in groundwater in storage, and the cumulative change in groundwater in storage for the Basin based on historical data to the greatest extent available.
3. A description of progress towards implementing the GSP, including achieving interim milestones, and implementation of projects or management actions since the previous annual report (California Code of Regulations [CCR] § 356.2).

7.4 5-Year GSP Evaluation and Update

The EMA GSA will evaluate its GSP at least every 5 years and whenever the GSP is amended and provide a written assessment to DWR. The assessment will describe whether the GSP implementation, including implementation of projects and management actions, are meeting the sustainability goal in the EMA, and will include the following:

1. A description of current groundwater conditions for each applicable sustainability indicator relative to measurable objectives, interim milestones and minimum thresholds.
2. A description of the implementation of any projects or management actions, and the effect on groundwater conditions resulting from those projects or management actions.
3. Elements of the GSP, including the Basin setting, management areas, or the identification of undesirable results and the setting of minimum thresholds and measurable objectives, will be reconsidered and revisions proposed, if necessary.
4. An evaluation of the Basin setting in light of significant new information or changes in water use, and an explanation of any significant changes. If the EMA GSA's evaluation shows that the Basin is experiencing overdraft conditions, the EMA GSA will include an assessment of measures to mitigate that overdraft.
5. A description of the monitoring network within the Basin, including whether data gaps exist, or any areas within the Basin are represented by data that does not satisfy the requirements of the GSP Regulations (23 CCR §§ 352.4 and 354.34(c)). The description will include the following:
    a. An assessment of monitoring network function with an analysis of data collected to date, identification of data gaps, and the actions necessary to improve the monitoring network, consistent with the requirements of § 354.38.
    b. If the EMA GSA identifies data gaps, the GSP will describe a program for the acquisition of additional data sources, including an estimate of the timing of that acquisition, and for incorporation of newly obtained information into the GSP.
    c. The GSP will prioritize the installation of new data collection facilities and analysis of new data based on the needs of the Basin.
6. A description of significant new information that has been made available since GSP adoption or amendment, or the last 5-year assessment. The description will also include whether new information warrants changes to any aspect of the GSP, including the evaluation of the Basin setting, measurable objectives, minimum thresholds, or the criteria defining undesirable results.
7. A description of relevant actions taken by the EMA GSA, including a summary of regulations or ordinances related to the GSP.
8. Information describing any enforcement or legal actions taken by the EMA GSA in furtherance of the sustainability goal for the Basin.
9. A description of completed or proposed GSP amendments.
10. Where appropriate, a summary of coordination that occurred between multiple GSAs in a single basin, GSAs in hydrologically connected basins, and land use agencies.
11. Other information the EMA GSA deems appropriate, along with any information required by DWR to conduct a periodic review as required by California Water Code § 10733 (CCR § 356.4).

7.5 Management Action Implementation

Details of the projects and management actions identified by the EMA GSA for possible implementation are presented in Section 6. The identified projects and management actions are categorized into three groups. The management actions included in Group 1 are to be initiated within 1 year of GSP adoption by the GSA. The Group 2 management actions and Group 3 projects may be considered for implementation in the future as conditions in the Basin dictate and the effectiveness of the other management actions are assessed. It is important to note that the management actions and projects included in Groups 2 and 3 may not be necessary if the implementation of Group 1 management actions result in EMA conditions that trend toward meeting the EMA GSA sustainability goals and measurable objectives. However, the EMA GSA may determine that the implementation of Group 2 management actions and/or Group 3 projects is desirable for reasons other than reaching sustainability within the EMA and may elect to implement initiatives from either Group 2 or 3 at any time. An estimate of the planning- level costs associated with the implementation of the Group 1 and Group 2 management actions are summarized in Table 7-1. The EMA GSA will develop planning-level costs for the Group 3 project(s), along with any other potential projects and management actions that may be identified for consideration by the EMA GSA in the future.

Table 7-1. Conceptual Planning-Level Cost Estimate for Potential GSP Management Action Implementation

Activity	Planning Level Estimate[1]	
	Low	High
Address Data Gaps		
Expand Monitoring Well Network in the EMA to Increase Spatial Coverage and Well Density	$20,000	$200,000
Perform Video Surveys in Representative Wells That Currently Do Not Have Adequate Construction Records to Confirm Well Construction	$25,000	$75,000
Install Shallow Piezometers in Alamo Pintado Creek and Zanja de Cota Creek GDE Areas	$75,000	$125,000
Review/Update Water Usage Factors and Crop Acreages and Update Water Budget	$20,000	$30,000
Survey and Investigate Potential GDEs in the EMA	$20,000	$40,000
Groundwater Pumping Fee Program	$100,000	$200,000
Well Registration and Well Meter Installation Programs	$75,000	$150,000
Water Use Efficiency Programs	$50,000	$125,000
Groundwater BPA Program	$75,000	$150,000
Groundwater Extraction Credit (GEC) Marketing and Trading Program	$150,000	$200,000
Voluntary Agricultural Crop Fallowing Programs	$75,000	$150,000
TOTAL	**$685,000**	**$1,445,000**

Notes
[1] The estimates in this table are planning-level cost estimates that are subject to refinement and revision by the EMA GSA after GSP adoption.
Basin = Santa Ynez River Valley Groundwater Basin
BPA = Base Pumping Allocation
EMA = Santa Ynez River Valley Groundwater Basin – Eastern Management Area
EMA GSA = Eastern Management Area Groundwater Sustainability Agency
GDE = groundwater- dependent ecosystem
GSP = groundwater sustainability plan

7.6 EMA GSA Annual Budget Estimates

The EMA GSA will incur costs for internal management and operation of the EMA GSA, including monitoring of the condition in the EMA and GSP implementation. The associated cost estimates are still in the development stages and will depend on the management and organizational structure that the EMA GSA selects. Additional variable costs may include engineering and other consulting services, permits and fees, California Environmental Quality Act compliance, legal expenses, and other administrative costs associated with the implementation of the Group 1 management actions, along with the potential for additional costs associated with the potential future implementation of the Group 2 management actions and/or Group 3 projects. Additionally, the EMA GSA will incur costs associated with the preparation of required annual reports to DWR and the required 5-year GSP evaluation and, if necessary, updates to the GSP. An estimate of the conceptual planning-level costs for EMA GSA annual management and operation are summarized in Table 7-2.

Table 7-2. Conceptual Planning-Level Cost Estimate for EMA GSA Annual Management and Operation

Activity	Planning Level Estimate[1]	
	Low	High
EMA GSA Staffing	$120,000	$200,000
Consulting Services	$75,000	$100,000
Public Outreach	$15,000	$30,000
Basin Monitoring[2]	$50,000	$75,000
Legal	$20,000	$50,000
Insurance	$4,500	$7,500
Audit / Accounting	$7,500	$15,000
Miscellaneous Expenses	$10,000	$15,000
GSP Annual Reporting	$65,000	$95,000
TOTAL	**$367,000**	**$425,500**

Notes
[1] The estimates in this table are planning-level cost estimates that are subject to refinement and revision by the EMA GSA after GSP adoption.
[2] Responsibility for executing the Basin monitoring program has not been established.
Basin = Santa Ynez River Valley Groundwater Basin
EMA = Santa Ynez River Valley Groundwater Basin – Eastern Management Area
EMA GSA = Eastern Management Area Groundwater Sustainability Agency
GSA = Groundwater Sustainability Agency
GSP = groundwater sustainability plan

7.7 Funding Sources

A Groundwater Pumping Fee Program is included as a Group 1 management action in this GSP. As described in Section 6.4, the EMA GSA may consider measures to fund GSP implementation using a combination of groundwater extraction charges, including monthly fixed charges and variable pumping fees, assessments/parcel taxes, parcel fees, and grants. Because of constitutional limitations imposed through California Propositions 13, 218, and 26, there are strict rules about what constitutes a fee, charge, assessment, or tax. Santa Barbara County Water Agency and grants from DWR have funded the majority of the EMA GSP costs to date and it is expected that grants available from general obligation bonds, such as Proposition 68, may be available to help fund GSP implementation.

Regarding potential funding opportunities, the DWR has issued a Proposal Solicitation Package (PSP) for the implementation of GSPs. Funding for the program will be from the Sustainable Groundwater Management Grant Program Implementation Grants using funds authorized by the California Drought, Water, Parks, Climate, Coastal Protection, and Outdoor Access for All Act of 2018 (Proposition 68). These funds can be used for eligible projects that address drought and groundwater challenges to achieve regional sustainability for investments in groundwater recharge projects with surface water, stormwater, recycled water, and other conjunctive use projects. Eligible projects include those activities associated with the implementation of an adopted GSP or approved alternative and must also be listed within an adopted GSP or approved alternative. The Round 2 grant solicitation will provide approximately $77 million for medium- and high-priority (including critically over-drafted) basins.

- At least $62 million for medium- and high-priority basins that meet the eligibility requirements outlined in the 2019 Guidelines and those in Section III of the PSP.
- At least $15 million for projects that solely benefit and are located within an Underrepresented Community, address the needs of those communities as outlined in the 2020 Disadvantaged Community Initiative Statewide Needs Assessment Report, have a minimum of five letters of support from the community, and meet the requirements outlined within the Public Resources Code § 80146(a).

Only one application will be accepted per basin. Applicants who apply on behalf of a GSA(s) are required to obtain and submit a letter of support from each GSA they represent. The tentative schedule is for the Round 2 Grants Solicitation to open in spring 2022 with grant awards to be announced in fall 2022. The minimum grant amount is $2 million per basin and the maximum grant amount is $5 million per basin. A minimum match of 25 percent of the project cost as local cost share is required. Eligible project expenses must be incurred after January 31, 2022.

Additionally, on May 14, 2021, Governor Newsom rolled out his California Comeback Plan marking unprecedented and notable one-time funding investments. This comes after a year of unprecedented moments from a global pandemic, record-breaking wildfires, and increased momentum to build equity across multiple segments of society. Of particular interest to the EMA GSA is potential funding from Assembly Bill 350, a bill to create a 3-year grant program to assist farmers and ranchers in critically over-drafted basins with conservation management planning. As part of this measure, the Governor is proposing $300 million in funds for implementation and planning of the SGMA.

After GSP adoption, the EMA GSA may perform a preliminary financing plan options evaluation to determine a funding structure to fund the proposed EMA GSA activities and expected financial commitments throughout GSP implementation. Development of the funding mechanism(s) is critical to facilitate successful implementation of the GSP consistent with the requirements of SGMA. A key success factor is preparing a cost allocation that is equitable to EMA GSA members and stakeholders. After the evaluation of financing plan options, a preliminary financing model may be developed to determine revenue required to fund the operating plan, reserve balances, and to evaluate required adjustments to the fee structure over time.