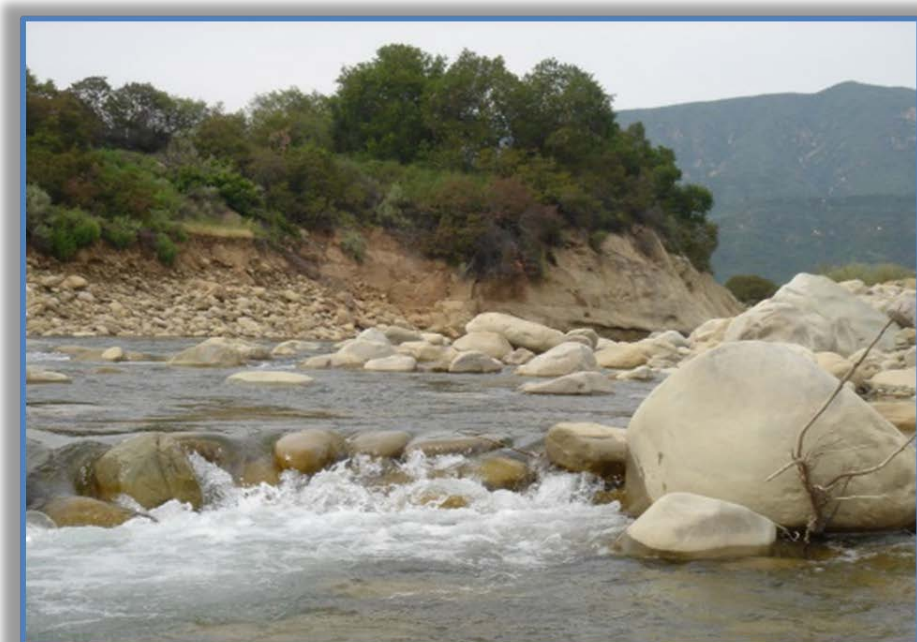
PRELIMINARY DRAFT

Upper Ventura River Valley Basin

Groundwater Sustainability Plan



Upper Ventura River
GROUNDWATER AGENCY
SUSTAINABLE MANAGEMENT

[June 24 2021]

Executive Summary [§354.4(a)]

§354.4 General Information. *Each Plan shall include the following general information:*

(a) *An executive summary written in plain language that provides an overview of the Plan and description of groundwater conditions in the basin.*

Introduction

The State of California enacted the Sustainable Groundwater Management Act (SGMA), effective January 1, 2015, to mandate comprehensive sustainable groundwater resources management. SGMA provides a statewide framework for groundwater management by locally formed Groundwater Sustainability Agencies (GSAs). The Upper Ventura River Groundwater Agency (UVRGA) was formed in 2016 to satisfy the requirement for a GSA to fully cover the Upper Ventura River Valley Basin (Department of Water Resources Basin 4-3.01) (UVRGB, or Basin).

UVRGA was designated as the exclusive GSA for the Basin by the State on July 20, 2017. UVRGA was formed pursuant to a joint exercise of powers agreement (JPA) between five local public agencies overlying the Basin: Casitas Municipal Water District (CMWD), Meiners Oaks Water District (MOWD), Ventura River Water District (VRWD), the City of Ventura (officially named San Buenaventura), and the County of Ventura (Figure 2.1-01). CMWD is a wholesale and retail water agency that operates Lake Casitas, the primary water supply in the watershed. MOWD and VRWD are retail water suppliers to residential, commercial, and agricultural customers in the Basin and immediately surrounding areas. The City of Ventura is located south of the Basin but owns land in the basin and operates water production facilities in the southern part of the Basin at Foster Park that provide a portion of the City's water supply. The County of Ventura exercises land use authority on land overlying most of UVRGB. UVRGA is governed by a seven-member board comprised of one director appointed by each above-listed member public agency and two stakeholder directors representing agricultural and environmental interests. UVRGA contracts for all of its staffing needs.

Following submittal of an initial notification on December 20, 2017, UVRGA developed this GSP to comply with SGMA's statutory and regulatory requirements and initiated planning by engaging with stakeholders and holding public meetings pursuant to an adopted Stakeholder Engagement Plan.

The goal of this GSP is to sustainably manage the groundwater resources of the UVRGB for the benefit of current and anticipated future beneficial users of groundwater and the welfare of the general public who rely directly or indirectly on groundwater. This GSP outlines the approach to achieve and maintain a sustainable groundwater resource free of undesirable results pursuant to the SGMA, while establishing long-term reliability no later than 20 years from GSP adoption.

The content of this GSP includes administrative information, description of the Basin setting, development of quantitative sustainable management criteria that considers the interests of all beneficial uses and users of groundwater, identification of projects and management actions and monitoring networks that will ensure the Basin is demonstrably managed in a sustainable manner no later than the 20-year sustainability timeframe and for the duration of the entire 50-year planning and implementation horizon.

This GSP is organized following California Department of Water Resources (DWR) guidance documents (DWR, 2016b):

ES-1 Plan Area Description

The geographic area covered by this GSP and managed by UVRGA includes the entire UVRGB (DWR Basin No. 4-003.01), as defined by DWR Bulletin No. 118, "California's Groundwater," Update 2020 (DWR, 2020). The UVRGB is located in the central portion of the Ventura River Watershed along the Ventura River near the communities of Casitas Springs, Mira Monte, and Meiners Oaks (Figure 3.1-03). The UVRGB is bordered by the Ojai and Lower Ventura River Groundwater Basins to the east and south, respectively (DWR Basin Nos. 4-002 and 4-003.02). No groundwater basins exist immediately west and north of UVRGB.

Land use in the Basin is dominated by low to medium density residential uses in the communities of Casitas Springs, Mira Monte, and Meiners Oaks, and open space and agricultural in the remaining Basin areas. The principal land-use planning agency in the Basin is the County of Ventura, which recently completed its 2040 General Plan. The City of Ojai overlaps with a very small portion (~0.75 square miles) of the Basin.

ES-2 Beneficial Uses

Beneficial uses of groundwater extracted from the Basin include municipal, residential, and agricultural water supply (Figure 3.1-37). Groundwater provides approximately one-third of the water supply in the Basin. Other sources of water supply for the Basin include local surface water stored in Lake Casitas, which provides approximately two thirds of the water supply in the Basin. Lake Casitas supplies are derived from runoff in the drainages surrounding the lake (outside of the Basin) and a diversion from the Ventura River located within the Basin.

Riparian and aquatic habitats in the Basin also rely on groundwater and are referred to as groundwater-dependent ecosystems (GDEs) in SGMA. Two riparian GDE units were identified in the Basin: (1) South Santa Ana GDE Unit and (2) Foster Park GDE Unit (Figure 3.2-15). The riparian GDE units consist primarliy of mixed hardwood and wetland habitats that are federaly designated critical habitat for multiple species and support a number of other special status species.

Five Aquatic GDE areas were identifed in areas of the Basin, although only two were determed to be susceptible to potential significant and unreasonable effect related to depletion of interconnected surface water by groundwater extractions (Figure 3.2-16). These two areas are the (1) Confluence Aquatic Habitat Area and (2) Foster Park Aquatic Habitat Area. The Confluence Habitat Area occurs in the southern portion of the Basin near the confluence of the Ventura River with San Antonio Creek. This habitat area is characterized by upwelling groundwater and inflow from San Antonio Creek. The Confluence Habitat Area includes federally designated critical habitat for steelhead and California red-legged frog and provides important habitat for two-striped garter snake, southwestern pond turtle, and Pacific lamprey. The Foster Park Habitat Area occurs in the southernmost portion of the Basin. Stream flow in the Foster Park Habitat Area is generally considered perennial. During dry seasons, much of the flow is the result of groundwater discharge to the Ventura River. The Foster Park Habitat Area has been studied by various investigators including consultants, federal and state resource agencies, and local public agencies. The Foster Park Habitat Area includes federally designated critical habitat for steelhead and provides suitable habitat for special status aquatic species including:

- Spawning and rearing habitat for steelhead;
- Breeding, rearing, and dispersal/migratory habitat for California red-legged frog;
- Foraging and dispersal habitat for two striped garter snake;
- Feeding, nesting, and basking habitat for southwestern pond turtle; and
- Pacific lamprey spawning corridor and potentially spawning and rearing.

Other beneficial uses of surface water in the Basin considered in the GSP include two Ventura River diversions within the Basin, which include CMWD's Robles Diversion and one private agricultural diversion. Recreation beneficial use of surface water is also considered in the GSP.

ES-3 Regional Water Management Framework

Groundwater management pursuant to this GSP complements or overlaps with existing and future potential water management programs in the region. Importantly, certain future monitoring activities may overlap with the GSP monitoring networks. UVRGA will coordinate with these programs to minimize duplication of efforts/costs.

Casitas Municipal Water District Water Supply Management

CMWD operates Lake Casitas, which provides approximately two thirds of the water supply in the Basin. CWMD operates Lake Casitas pursuant to its combined 2015 Urban Water Management Plan (UWMP) and Agricultural Water Management Plan (2020 update of UWMP in progress).

CMWD is also currently working on a Comprehensive Water Resources Plan (draft as of June 2020) that identifies the safe demand for its water supplies and identifies projects to address the gap between supply and demand for implementation over the next 10 years. Implementation of this plan is expected to address CMWD's anticipated supply gap, thereby preventing increased reliance on groundwater supply which would otherwise potentially impact UVRGB operational flexibility.

City of Ventura Water Supply Management

The City's Urban Water Management Plan (Kennedy/Jenks Consultants, 2016) describes their existing and planned sources of water supply and demand, as well as their water management programs. The City's 2020 Comprehensive Water Resources Report (Ventura Water, 2020b) provides updated information and projections on impacts of the City's water resources management program. Another related planning document is the City's Water Shortage Event Contingency Plan (Ventura Water, 2015), which identifies actions to be taken during the various stages of a water shortage. These documents are relevant for estimating future groundwater extractions by the City.

Casitas Municipal Water District Robles Diversion Operations

CMWD operates the Robles Diversion on the Ventura River (located within UVRGB) in accordance with a National Oceanic and Atmospheric Administration National Marine Fisheries Service Biological Opinion (BO), which includes certain stream flow criteria for diversion operations that are intended to furnish a downstream flow regime that mimics the natural storm recession rate and address flow depth for fish passage in critical riffles located within UVRGB. CMWDs' diversions are not considered to limit basin operational flexibility because, although the diversions may reduce basin recharge under certain circumstances, the benefit of storing water in Lake Casitas and having non-groundwater water supplies available during droughts provides substantially greater overall water supply flexibility to the Basin as a whole.

RWQCB Water Quality Management Programs

UVRGB falls within the jurisdiction of the Los Angeles Regional Water Quality Control Board (RWQCB), which has established a regional Water Quality Control Plan (i.e., Basin Plan). The Basin Plan contains the regional water quality regulations and programs to implement these regulations, including the National Pollutant Discharge Elimination System (NPDES) permits issued under federal delegation for discharges to surface water and total maximum daily loads (TMDLs). Stormwater discharges are regulated through NPDES permits of which the municipal separate stormwater sewer systems (MS4) is most significant. The MS4 permit identifies discharge prohibitions and sets effluent and receiving water limitations in accordance with Basin Plan water quality standards. In addition, stormwater management program minimum control measures are outlined to manage potential pollutant discharges from the MS4. The Ventura County Stormwater Quality Management Program is implemented to meet the requirements of the Ventura County Stormwater Permits (i.e., MS4 permit). This includes water quality sampling, watershed assessments, business inspections, and pollution prevention programs. The Ventura County Agricultural Irrigated Lands Group (VCAILG) Water Quality Management Plan (WQMP) is implemented to comply with the agricultural conditional waiver of waste discharge requirements. The plan addresses measurement and control of discharges from irrigated farmland to protect surface water quality. The Ventura River and Tributaries Algae, Eutrophic Conditions, and Nutrients TMDL (Algae TMDL) was adopted by the Regional Board on December 6, 2012, and approved by United States Environmental Protection Agency on June 28, 2013. The Algae TMDL establishes numeric targets for dissolved oxygen and pH, as well as algal and phytoplankton biomass and percent cover. To address nutrient sources, the Algae TMDL assigned waste load allocations and load allocations to discharges into the Ventura River watershed. The RWQCB Basin Plan (RWQCB-LA, 2019) and water quality regulatory programs do not limit basin operational flexibility because actions undertaken by RWQCB contribute to maintenance of groundwater quality below the measurable objective concentrations.

Integrated Regional Water Management (IRWM) Program and Plan (Ventura River Watershed Council [VRWC])

UVRGA actively participates in the VRWC, which was formed in 2006 and produced the Ventura River Watershed Management Plan in 2015. The Watershed Management Plan is a comprehensive online resource of information about the watershed and identifies key issues in the watershed and proposes a number of campaigns (strategies to collectively solve shared watershed problems and manage shared resources). The Watershed Management Plan is not mandatory, so implementation is voluntary. Nonetheless, the Watershed Management Plan and VRWC creates an important forum and functions as a clearinghouse for exchange of information and ideas concerning important water management issues.

Ojai Basin Groundwater Management Agency (OBGMA)

OBGMA manages the Ojai Basin east of UVRGB. Management of the Ojai Basin impacts stream flow in San Antonio Creek, a key tributary that flows into to the Ventura River in the southern portion of the UVRGB near Casitas Springs. Inflows from San Antonio Creek are an important source of water for sustaining the Confluence and Foster Park aquatic and riparian GDEs within the UVRGB. OBGMA is developing a GSP for the Ojai Basin.

California Water Action Plan Ventura River Streamflow Enhancement (SWRCB and CDFW)

The Ventura River is one of five streams prioritized pursuant to the California Water Action Plan (CWAP) for efforts to enhance flows for anadromous fish. In 2021, CDWF published recommended flow regimes for various steelhead life stages and the habitats in the Ventura River and San Antonio Creek. SWRCB will consider this information together with surface water and groundwater modeling to establish objectives for streamflow enhancement. The streamflow objectives are expected in 2023-24. Measures to achieve the forthcoming flow objectives are not yet identified.

Ventura Watershed Instream Flow Enhancement and Water Resiliency Regional Framework (VRIF)

This grant-funded planning project is being undertaken by the Ventura County Resource Conservation District to develop a framework and project planning tools to help enhance streamflow in the Ventura River and increase water supply reliability for the region. The tools will provide landowners and others a means of quantifying water demand, infiltration, and opportunities for reduced consumptive use at the parcel scale.

Ventura River Watershed Adjudication (titled Santa Barbara Channelkeeper v. State Water Resources Control Board and the City of San Buenaventura (Los Angeles County Superior Court, Case No. 19STCP01176)

In 2014, Santa Barbara Channelkeeper filed a lawsuit against the City of Ventura and the State of California related to the balance between human and non-human use of the Watershed. Specifically, Channelkeeper asserted that the City’s use of water from the Foster Park area (located within the UVRGB) violated the Reasonable Use Doctrine because the City’s municipal use was harming the Southern California Steelhead. Ultimately, the Court of Appeal held that the reasonableness of the City’s use had to be measured against all other users of the Watershed, and therefore allowed the City to bring into the lawsuit everyone currently extracting or who could extract water from the system in the future (cross-complaint).

In 2019, the City of Ventura entered into a settlement agreement with Santa Barbara Channelkeeper that includes certain flow and non-flow measures. The settlement agreement was executed in September 2019 and amended in August 2020. The flow measures are known as the “Foster Park Protocols” and involve monitoring river gages and shutting down the City’s extraction facilities when certain surface water flow thresholds are reached. The Foster Park Protocols are relevant to this GSP because they contribute to addressing one of the six SGMA sustainability indicators: depletions of interconnected surface water. The

Foster Park Protocols address direct depletion of the Ventura River by the City of Ventura's Foster Park water extraction facilities.

In 2020, certain adjudication parties developed a proposed physical solution to settle the cross-complaint. The proposed physical solution seeks to address the habitat conditions for the Steelhead population in order to return the habitat to good condition, and then maintain it. The Foster Park Protocols are a component of the proposed physical solution. The proposed physical solution has not yet been considered by the Court.

A future judgment will likely include aspects relevant to implementation of the GSP. There is no definitive timeline for a judgment. UVRGA will monitor, and to the extent possible, coordinate with the adjudication process during GSP implementation. Note that UVRGA is not a party to the lawsuit.

ES-4 Basin Setting and Groundwater Conditions

Overview

The UVRGB is a thin, highly permeable, alluvial fill groundwater basin located along the Ventura River in the central portion of the Ventura River Watershed. The UVRGB consists of two distinct areas: 1) the alluvial aquifer located between the banks of the Ventura River and (2) areas outside of the banks that consist of older alluvium that is generally elevated above the water table; much of the groundwater in this area outside of the Ventura River banks is extracted from bedrock formations. Groundwater and surface water are intimately interconnected in the Basin. The groundwater budget and flow conditions in the alluvial aquifer are dominated by interaction with the Ventura River, which provides most of the recharge to the Basin as stream flow percolation in the northern portion of the Basin and receives most of the discharge from the Basin as down-valley groundwater flow that feeds springs in the Ventura River in the southern portion of the Basin. Groundwater extractions are secondary to spring discharge to the Ventura River except during dry periods when spring flows decrease substantially due to low Ventura River stream flow entering the northern end of the Basin.

The thinness of the aquifer, high permeability, large north-south topographic gradient, and intimate interconnection between groundwater and surface water causes UVRGB to behave materially different than most groundwater basins in the State. The Basin groundwater levels and storage trends closely mimic surface water flows, with groundwater levels and storage exhibiting large and rapid fluctuations relative to the total saturated thickness and total groundwater storage, more so than perhaps any other groundwater basin in the State. During non-drought periods, the Basin fills up on the order of two out of every three years and significant surface water base flow is sustained by rising groundwater in the southern part of the Basin. During droughts, much of the Basin groundwater storage drains out naturally to the Ventura River within the first few years causing a significant decrease in Ventura River base flow in the lower part of the Basin.

To facilitate discussion within the GSP, the Basin has been subdivided into six hydrogeologic areas based on the hydrogeology, stratigraphy, and primary recharge and discharge processes (Figure 3.1-01). Four of these – the Kennedy, Robles, Santa Ana and Casitas Springs Areas – run north to south along the Ventura River corridor and were delineated primarily based on groundwater-surface water interaction characteristics. The Mira Monte/Meiners Oaks Area located east of the Ventura River underlain by older alluvium that is generally above the water table; many wells in this area are believed to extract groundwater from bedrock formations such as the Ojai Conglomerate that do not have significant hydraulic connectivity with the Ventura River. The Terraces Area west of the Ventura River consists of alluvial deposits that are elevated above and separated from the Ventura River floodplain by bedrock and, therefore, have a very limited hydraulic connection with aquifer. Wells in the Terraces Area appear to generally draw water from the underlying Sepse Formation (bedrock).

Basin Setting Components

Topography and Surface Water Features. The topography of the Basin consists largely of the Ventura River channel features and the adjacent alluvial terraces and bedrock outcrops. The Ventura River enters the subbasin at the north at an elevation of approximately 900 feet and leaves the Basin at an elevation of approximately 200 feet roughly 10 miles to the south. The surrounding watershed outside the subbasin consists of steep mountains and foothills with elevations up to approximately 6,000 feet.

All water in the Ventura River Watershed derives locally from the hydrologic cycle as precipitation. The climate is Mediterranean-type, characterized by a long summer-fall dry season and a cool winter-spring wet season (VRWC, 2015). Rainfall is variable on a seasonal and year-to-year basis, although the watershed tends to experience cycles of wetter and drier years (VRWC, 2015).

The Ventura River is the main surface water feature within the Basin, and its primary tributaries include Matilija Creek, North Fork Matilija Creek, San Antonio Creek and Coyote Creek (Figure 3.1-08). Flows in the Ventura River and tributaries are characterized by extreme spatial and temporal variability. During the wet season, runoff can be “flashy,” with sudden rises following the onset of precipitation and relatively rapid declines in streamflow after the rainfall event. Flows can range from near zero to over ten thousand cubic feet per second (cfs) within a few hours during major storms on the mainstem of the Ventura River. During the summer-fall dry season, streamflow at various locations in the watershed is influenced by a complex interaction of factors including precipitation, spring discharges, groundwater levels and pumping, surface water diversions, storage, water supply releases and treated wastewater discharge (Entrix, 2001).

Geologic Setting and Basin Hydrogeology. The Basin is within the tectonically active Transverse Ranges geomorphic province of California, characterized by mountain ranges and valleys with an east-west orientation. Rocks in this region have been folded into a series of predominantly east-west-trending anticlines and synclines associated with thrust and reverse faults. The Ventura River Watershed includes one of the earth's most rapidly uplifting tectonic conditions, demonstrated by the massive shedding of debris into reservoirs such as Matilija, overturned Cenozoic strata, faulted river terraces, and other indicators of tectonic activity. There is an approximate balance between rate of uplift due to faulting and the rate of Ventura River down-cutting (Rockwell et al., 1984; USBR, 2000), which explains why the young alluvial sediments that comprise the Basin are thin.

The UVRGB extends as a north-south trending narrow and shallow erosional trough, filled with young alluvium deposited by the Ventura River between Camino Cielo Road in the north and the United States Geological Survey (USGS) gauging station at Casitas Vista Bridge in the south. The young alluvial deposits are highly permeable (hydraulic conductivity as high as approximately 3,500 feet per day) and have relatively high storage coefficients (specific yield as high as approximately 14%). North of approximately Highway 150, the young alluvial deposits are typically underlain by older alluvium that has significantly lower permeability and water storage capabilities. South of approximately Highway 150 the Ventura River may have eroded completely through the older alluvium deposits and the young alluvial deposits are in direct contact with the bedrock (as evidenced from the bedrock outcrops along the edges of the Ventura River floodplain). The eastern portion of the UVRGB extends east from the Ventura River encompassing the communities of Meiners Oaks and Mira Monte and is underlain by older alluvium deposits that are generally above the water table and various bedrock formations which have limited hydraulic connectivity with the Ventura River. Many wells in the Mira Monte – Meiners Oaks Area may be screened in the Ojai Conglomerate, a bedrock formation that has low permeability and water storage capability (for example, the yield of a relatively new municipal well in this area is only approximately 50 gallons per minute). The "Terrace" areas west of the Ventura River is also underlain by older alluvium that is uplifted above the regional water table and, hence, is largely hydraulically disconnected from the principal aquifer of the Basin.

A series of east-west trending reverse faults cross the Basin along which bedrock units are uplifted affecting the aquifer thickness and groundwater flow. The effect of faulting on erosion and deposition by the Ventura River has resulted in generally thicker alluvium north of Santa Ana Blvd. and generally thinner alluvium near Santa Ana Blvd and to the south. During periods of low water table conditions, the alluvial aquifer can become completely desaturated near Santa Ana Blvd, temporarily disconnecting the upper 2/3 and lower 1/3 of the Basin. An unnamed fault located north of Highway 150 uplifts the Sepse Formation significantly reducing alluvium thickness locally and causing an abrupt narrowing of the Ventura River channel near Meiners Oaks. This feature subdivides the area north of the Highway 150 into two groundwater storage areas along the Ventura River, which can become hydraulically disconnected during low water table conditions.

Faulting appears to affect the balance or erosion and deposition of the Ventura River, resulting in variation in the thickness of the alluvial deposits (Figures 3.1-17 and 3.1-18). Within the UVRGB, alluvial deposits reach a maximum thickness of approximately 180 feet north of Highway 150 and thin to about 60 feet or less south of Highway 150.

Generally, groundwater flow is from a northern to southern direction, following the surface drainage and the slight but relatively consistent gradient of the basin (SWRCB, 1956; VRWC, 2015) (Figures 3.2-01 and 3.2-02). Groundwater levels in the UVRGB fluctuate seasonally with the highest water levels occurring in the winter to early spring and the lowest levels occurring in fall or winter (Figure 3.2-05). Groundwater levels do not display significant long-term temporal trends. Water level declines are seen during the droughts of the late 1980s and the 2010s (when historical lows were observed); however, the water levels rebound rapidly in the wet years that follow with complete basin refilling. The changes in groundwater storage from rapid cyclical draining and filling of most of the total basin storage is in stark contrast with most Basins in the State, in which the range of storage change is small compared to the total basin storage and storage changes are more gradual over time.

In general, due to the unconfined conditions of the groundwater, the quality of the groundwater in the UVRGB is heavily influenced by (a) the quality and quantity of surface water runoff that recharges the groundwater basin, (b) leaching of nutrients from fertilizers and manure, and (c) percolation of return flows from applied waters and septic system leachate. Nitrate is the primary groundwater quality concern in the UVRGB with some municipal wells exceeding the nitrate Maximum Contaminant Level in the Mira Monte area. Nitrate concentrations in groundwater within the gaining portions of the Ventura River (Casitas Springs Area and southern portion of the Santa Ana Area) are generally lower than the RWQCB Basin Plan water quality objective of 5 mg/L for surface water.

ES-5 Water Budget

The groundwater flow model was used to quantify water budgets for the historical, current, and projected conditions, including the evaluation of uncertainty due to climate change (Appendix F). As required by SGMA, potential effects of land use change and population growth were evaluated for the projected water budget. It was concluded that these factors are not anticipated to have a material impact on future water demand and the water budgets for the Basin because of land use policies and ordinances that greatly limit the potential for material growth in the Basin.

The total surface water inflows to the Basin (including direct runoff within the Basin) are characterized by high variability and constitute the major water source for the basin. Most of the surface water inflows leave the basin at the southernmost end of the UVRGB. The Ventura River is characterized by highly dynamic surface-groundwater interactions. In general, river reaches north of the Casitas Springs Area tend to be losing or intermittent, with the reaches in the Casitas Springs areas mostly gaining (except during very dry conditions with low groundwater levels). Exchanges with the Ventura River (percolation into the Basin and spring-fed surface water flow) comprise the largest components of the groundwater budget (Figure 3.3-01). Recharge from infiltration of precipitation, M&I return flows, agricultural irrigation return flows and septic system leachate) provided relatively much less input to the Basin. Groundwater extractions (pumping) and evapotranspiration are from other groundwater outflow components but are typically much smaller than natural groundwater discharge to the Ventura River.

Table ES-1 Summary of Average Water Budget Components (acre-feet/year).

	Surface Water	Groundwater
Historical (1986-2016)		
Total in	48,025	13,546
Total out	48,025	15,433
Change in Storage	n/a	(1,882)
Current (2017-2019)		
Total in	86,241	22,602
Total out	86,241	16,371
Change in Storage	n/a	6,237
Projected (2020-2070)		
Baseline Total in	96,474	19,891
Baseline Total out	96,474	19,696
Baseline Change in Storage	n/a	197
2030 Climate Change Total in	94,026	19,219
2030 Climate Change Total out	94,026	19,030
2030 Climate Change Change in Storage	n/a	190
2070 Climate Change Total in	99,856	19,063
2070 Climate Change Total out	99,856	18,838
2070 Climate Change Change in Storage	n/a	220

SGMA Regulations require the development of a projected surface water and groundwater budget to estimate future baseline conditions of supply, demand, and aquifer response to GSP implementation. The future water budget provides a baseline against which effects of climate change are compared to evaluate uncertainty. As shown in Table ES-1, climate change is not anticipated to have a significant effect on the projected future surface water and groundwater budgets.

Overdraft Assessment

GSP Emergency Regulations §354.18(b)(5) requires quantification of overdraft over a period of years during which water year and water supply conditions approximate average conditions if overdraft conditions exist. Bulletin 118, Update 2003 describes groundwater overdraft as:

> "The condition of a groundwater basin or subbasin in which the amount of water withdrawn by pumping exceeds the amount of water that recharges the basin over a period of years, during which the water supply conditions approximate average conditions. Overdraft can be characterized by groundwater levels that decline over a period of years and never fully recover, even in wet years. If overdraft continues for a number of years, significant adverse impacts may occur, including increased extraction costs, costs of well deepening or replacement, land subsidence, water quality degradation, and environmental impacts."

The water budget results do not indicate and overdraft condition in the Basin currently or in the future. Groundwater levels have not been observed to decline over a period of years without fully recovering. Numerical model results for the projected water budget indicate that groundwater levels will continue to fully recovery following droughts.

Sustainable Yield

GSP Emergency Regulations § 354.18(b)(7) requires an estimate of the sustainable yield for the basin. Water Code Section 10721(w) defines "Sustainable yield" 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.

Modeling results for the future projection period indicate that the projected inflows and outflows will be approximately balanced during the 50-year SGMA implementation period even with climate change considered. Therefore, an estimate of the sustainable yield is the modeled projected groundwater extractions minus the modeled surface water depletions that could potentially cause undesirable results for the depletions of interconnected surface water sustainability indicator. This calculation results in an estimated sustainable yield of approximately 5,500 to 5,600 acre-feet per year, depending on climate change assumptions. However, there are two very important caveats to the sustainable yield estimate. First, it is noted that more groundwater could be extracted during wet periods without causing undesirable results because the Ventura River can readily recharge more water into the Basin. Second, undesirable results could occur during dry periods even if the sustainable yield is not exceeded on average over a long-term period of average hydrologic conditions because the Basin has a very small amount of groundwater storage which naturally and rapidly drains to the Ventura River during dry periods. In summary, the concept of a sustainable yield over a long-term average period is not relevant to the management of the UVRGB.

REMAINDER OF EXECUTIVE SUMMARY WILL BE ADDED AT THE SAME TIME THE CORRESPONDING GSP SECTIONS ARE ADDED TO THE DRAFT DOCUMENT

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Definitions of Key SGMA Terms

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 acrefeet 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

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.

Acronyms and Abbreviations

AF	acre-foot
AF/yr	acre-feet per year
Algae TMDL	Ventura River and Tributaries Algae, Eutrophic Conditions, and Nutrients TMDL
amsl	above mean sea level
Basin	Upper Ventura River Valley Basin (Department of Water Resources Basin 4-3.01)
BMP	Best Management Practice
BO	Biological Opinion
CALVEG	Classification and Assessment with Landsat of Visible Ecological Groupings
CASGEM	California Statewide Groundwater Elevation Monitoring
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CGS	California Geological Survey
CMWD	Casitas Municipal Water District
CWAP	California Water Action Plan
DBSA	Daniel B. Stephens & Associates
DDW	Department of Drinking Water, State of California
DMS	Data Management System
DPS	Distinct Population Segment
DWR	Department of Water Resources, State of California
ENSO	El Nino/Southern Oscillation
ET	evapotranspiration
ft	foot/feet
gal/d/m	gallons per day/gallons per minute
GAMA	Groundwater Ambient Monitoring and Assessment
GDE	groundwater-dependent ecosystem
GIS	geographic information system
GPS	Ground Positioning System
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
HCM	hydrogeologic conceptual model
Hopkins	Hopkins Groundwater Consultants
Hopkins and Padre Study	Hopkins (2013)
HSI	Habitat Suitability Indices
iGDE	indicators of groundwater dependent ecosystem
inSAR	interferometric synthetic aperture radar
IRWM	Integrated Regional Water Management
ISW	interconnected surface water
JPA	joint exercise of powers agreement
LUST	Leaking Underground Storage Tank

M&I	Municipal and Industrial
MCL	maximum contaminant level
mg/L	milligrams per liter
MOWD	Meiners Oaks Water District
MS4	municipal separate stormwater sewer systems
MWCs	mutual water companies
NC	Natural Communities
NCCAG	Natural Communities Commonly Associated with Groundwater
NDMI	Normalized Difference Moisture Index
NDVI	Normalized Difference Vegetation Index
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
OBGMA	Ojai Basin Groundwater Management Agency
Padre	Padre Associates Inc.
PDO	Pacific Decadal Oscillation
RMSE	root mean square error
RWQCB	Regional Water Quality Control Board
SEP	Stakeholder Engagement Plan
SGMA	Sustainable Groundwater Management Act
SMC	Sustainable Management Criteria
SOAR	Save Open Space and Agricultural Resources
SVE	soil vapor extraction
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
TMDL	total maximum daily load
TNC	The Nature Conservancy
USBR	United States Bureau of Reclamation
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UVRGA	Upper Ventura River Groundwater Agency
UVRGB	Upper Ventura River Groundwater Basin
UWMP	Urban Water Management Plan
VCAILG	Ventura County Agricultural Irrigated Lands Group
VCFCD	Ventura County Flood Control District
VCWPD	Ventura County Watershed Protection District
VRIF	Ventura Watershed Instream Flow Enhancement and Water Resiliency Regional Framework
VRWC	Ventura River Watershed Council
VRWD	Ventura River Water District
VWRF	Ventura Water Reclamation Facility
WQMP	Water Quality Management Plan
WQO	Water Quality Objective
WWTP	Wastewater Treatment Plant

1.0 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.*

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 five basic activities:

1. Form one or multiple Groundwater Sustainability Agency(s) (GSAs) to fully cover the basin;
2. Develop one or more Groundwater Sustainability Plan(s) (GSPs) that fully cover the basin;
3. Implement the GSP to achieve sustainable groundwater management;
4. Annual reporting to the California Department of Water Resources (DWR); and
5. Prepare and submit a written assessment of the GSP at least every five-years to DWR and amend the GSP as necessary.

Upper Ventura River Groundwater Agency (UVRGA) was formed in 2016 to satisfy the requirement for a GSA to fully cover the Upper Ventura River Valley Basin (Department of Water Resources Basin 4-3.01; UVRGB or Basin), located in western Ventura County. UVRGA was designated as the exclusive Groundwater Sustainability Agency (GSA) for the Basin by the State on July 20, 2017. UVRGA developed this document to fulfill the GSP requirement for the Basin. This GSP provides administrative information, describes the Basin setting, develops quantitative sustainable management criteria that considers the interests of all beneficial uses and users of groundwater, identifies projects and management actions and monitoring networks that will ensure the Basin is demonstrably managed in a sustainable manner no later than the 20-year sustainability timeframe (2042) and for the duration of the entire 50-year planning and implementation horizon (2072).

Following submittal of an initial notification on December 20, 2017, UVRGA developed this GSP to comply with SGMA's statutory and regulatory requirements. As such, the GSP uses the terminology set forth in these requirements (see e.g., Water Code Section 10721 and 23 CCR Section 351) which is oftentimes different from the terminology utilized in other contexts (e.g., past reports or studies, past analyses, judicial rules, or findings). The definitions from the relevant statutes and regulations are provided in the section titled "Definitions of Key SGMA Terms."

The GSP includes all of the required elements of the GSP Emergency Regulation organized into eight sections plus appendices as follows:

- **Section 1 - Introduction to Plan Contents** provides an overview of SGMA and the plan contents.
- **Section 2 - Administrative Information** provides information about the GSA, a description of the Plan area, and a summary of information relating to notification and communication by the Agency with other agencies and interested parties.

- **Section 3 - Basin Setting** describes the hydrogeologic conceptual model of the Basin, current and historical groundwater conditions, the Basin water budget, and designated management areas within the Basin.
- **Section 4 - Sustainable Management Criteria** describes the Basin sustainability goal and the sustainable management criteria developed for each of the applicable SGMA sustainability indicators. The applicable sustainability indicators for the Basin are Chronic Lowering of Groundwater Levels, Reduction of Groundwater Storage, Degraded Water Quality, and Depletions of Interconnected Service Water. The Seawater Intrusion and Land Subsidence sustainability indicators are not applicable to the Basin.
- **Section 5 - Monitoring Networks** describes the monitoring networks that will be utilized to characterize groundwater and surface water conditions in the Basin, evaluate changing conditions that occur through implementation of the Plan, and demonstrate sustainable management.
- **Section 6 - Projects and Management Actions** describes projects and management actions included in the GSP to meet the sustainability goal for the basin in a manner that can be maintained over the planning and implementation horizon.
- **Section 7 - Plan Implementation** describes steps to implementation, plan implementation costs, and plan funding.
- **Section 8 - References and Technical Studies**: provides a list of references and technical studies relied upon by the GSA in developing the Plan.

Appendices providing supporting information referred to in the GSP:

- This GSP meets regulatory requirements established by the DWR as shown in Appendix A, the Elements of the Plan table.
- The formation of UVRGA Pursuant to Water Code Section 10723.8 is provided in Appendix B.
- The plan for UVRGA's engagement with stakeholders is provided in Appendix C.
- Comments and responses regarding the GSP pursuant to §354.10 are provided in Appendix D.
- Appendix E provides a copy of UVRGA's Initial Notification to DWR for the GSP.
- Appendix F contains a technical memorandum that describes the Numerical Groundwater Model.
- Impacts on groundwater levels from historical pumping in the Basin are provided in Appendix G.
- Streamflow depletions at select locations along the Ventura River are provided in Appendix H.
- Appendix I contains a technical memorandum for the Riparian Groundwater Dependent Ecosystems
- Appendix J contains a technical memorandum for the Aquatic Groundwater Dependent Ecosystems
- Hydrographs for all wells with observed water levels in the UVRGB are provided in Appendix K.

2.0 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.*

Section 2 describes information relating to administrative and other general information about UVRGA and the area covered by the GSP.

2.1 Agency Information [§354.6]

This section describes the UVRGA and its authority in relation to the SGMA. UVRGA is the exclusive GSA for the UVRGB (Department of Water Resources Basin 4-3.01), located in western Ventura County (Figure 2.1-01)

UVRGA was formed in 2016 pursuant to a joint exercise of powers agreement (JPA) between five local public agencies overlying the Basin: Casitas Municipal Water District (CMWD), Meiners Oaks Water District (MOWD), Ventura River Water District (VRWD) the City of Ventura (officially named San Buenaventura), and the County of Ventura (Figure 2.1-02). CMWD is a wholesale water agency that operates Lake Casitas, the primary water supply in the region. CMWD also provides retail water services to residential, commercial, and agricultural customers in the Basin and surrounding region. MOWD and VRWD are retail water suppliers to residential, commercial, and agricultural customers in the Basin and immediately surrounding areas. The City of Ventura is located south of the Basin but owns land in the Basin and operates water production facilities in the southern part of the Basin at Foster Park that provide a portion of the City's water supply. The County of Ventura exercises water management and land use authority on land overlying most of UVRGB.

Per Section 10723.8(a) of the California Water Code, UVRGA gave notice to DWR of its decision to form a GSA for the Basin on April 21, 2017. Copies of the information required pursuant to Water Code Section 10723.8 for GSA Formation, updated as appropriate, is provided in Appendix B. UVRGA was designated as the exclusive GSA for the Basin by the State on July 20, 2017.

2.1.1 Name and Mailing Address [§354.6(a)]

§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.*

- GSA Name: Upper Ventura River Groundwater Agency
- GSA Mailing Address: 202 W. El Roblar Dr., Ojai, CA 93023

2.1.2 Organization and Management Structure [§354.6(b)]

§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.*

UVRGA is governed by a seven-member board comprised of one director appointed by each member public agency (CMWD, MOWD, VRWD, the City of Ventura, and the County of Ventura) and two stakeholder directors representing agricultural and environmental interests. UVRGA contracts with Bondy Groundwater Consulting, Inc. (Bryan Bondy), who serves as the Agency's Executive Director and GSP Plan Manager. UVRGA contracts with additional entities for financial and administrative support. The Executive Director manages day-to-day operations of the Agency, while Board Members vote on actions of the UVRGA. The Board of Directors is UVRGA's decision-making body. Further information about UVRGA's organization and management structure can be found in the UVRGA JPA and bylaws, which are included in Appendix B.

2.1.3 Plan Manager and Contact Information [§354.6(c)]

§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.*

- UVRGA Executive Director: Bryan Bondy, PG, CHG
- Phone Number: (805) 212-0484
- Email: bbondy@uvrgroundwater.org
- Mailing Address: 202 W. El Roblar Dr., Ojai, CA 93023
- Website: https://uvrgroundwater.org/

2.1.4 Legal Authority [§354.6(d)]

§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.*

UVRGA has legal authority to perform duties, exercise powers, and accept responsibility for managing groundwater sustainably within the Basin. UVRGA's legal authority comes from the SGMA, the JPA signed by UVRGA member agencies, and the UVRGA Bylaws. The JPA and bylaws are included in Appendix B. These laws and agreements, taken together, provide the necessary legal authority for the UVRGA Board to carry out the preparation and implementation of the Basin's GSP. Figure 2.1-02 shows the extent of the GSP area, along with the jurisdictional boundary of each of the Member Agencies of UVRGA's JPA. Figure 2.1-02 demonstrates that the entire Basin is covered by UVRGA. Therefore, UVRGA has the legal authority to implement this GSP throughout the entire plan area.

Each of the Member Agency is a local agency eligible to become a groundwater sustainability agency (Water Code Section 10723(a)). The Member Agencies are described below:

Casitas Municipal Water District (CMWD)

CMWD was formed in 1952 under the Municipal Water District Act of 1911, which grants water supply and water management authority. CMWD is the primary water supplier in the watershed, providing water to both water resale agencies and retail customers. The City of Ventura is CMWD's largest customer, and Lake Casitas water serves as one of the main sources of water for the City of Ventura. One of CMWD's important functions is to serve as the "backup" water supply for a number of their customers, including retail water suppliers (such as MOWD and VRWD), as well as farmers, when groundwater levels are low during droughts.

CMWD's service area encompasses 137 square miles and includes the City of Ojai, Upper Ojai, the Ventura River Valley area, the City of Ventura south to about Mills Road, and the coastal Rincon area to the Santa Barbara County line. CMWD's primary water supply is Lake Casitas, which is an off-stream reservoir fed by water diverted from the Ventura River and the reservoir's surrounding drainages. CMWD operates and maintains Lake Casitas and Casitas Dam, the Robles Diversion and Fish Passage Facility on the Ventura River, the Robles Canal, and the Marion Walker Pressure Filtration Plant. CMWD also maintains and operates one well in Mira Monte, which pumps groundwater from UVRGB.

City of San Buenaventura

The City of San Buenaventura (usually referred to as Ventura), located on the shore of the Pacific Ocean in western Ventura County, was founded as a Spanish mission in 1782 and incorporated as a town in 1866 and is the county seat of Ventura County. The City of Ventura proper is located south of the Basin, but the City owns land in the Basin and operates water production facilities in the southern part of the Basin at Foster Park, which provide a portion of the City's water supply (Figure 2.1-02). The City also administers land use within its municipal boundaries, which are limited to the small area in the southern portion of the Basin (Figure 2.1-02).

Meiners Oaks Water District (MOWD)

MOWD is a small water district that supplies water to the community of Meiners Oaks on the east side of the Ventura River. MOWD serves a population of approximately 4,000 via approximately 1,260 service connections. Groundwater is MOWD's primary water supply source. Water from CMWD is used as backup, such as during extended drought periods. MOWD was formed in 1948 as a special district under State law, which authorizes it to exercise water supply and water management authority within its jurisdiction.

MOWD operates five wells in the UVRGB.

Ventura County

The County of Ventura (County) was founded in 1873 and has a total area of 2,208 square miles. The County is the land use jurisdiction for most of the land in the Basin. The County does not provide water service but does permit and regulate groundwater wells and staffs the Ventura County Watershed Protection District (VCWPD), which participates in countywide planning and management efforts on a variety of water resource programs including water quality, stormwater management, and flood control.

Ventura River Water District (VRWD)

VRWD is a small water district that supplies water to the area stretching from the southwestern edge of the City of Ojai down to the northern half of Oak View, and in the eastern half of Casitas Springs. VRWD serves a population of approximately 6,000 via approximately 2,150 service connections. Groundwater is VRWD's primary water supply source. CMWD water is also used, both as a backup source and as a regular source for customers in some locations. VRWD was established in 1957 as a special district under State law, which gives authorization to exercise water supply and water management authority within its jurisdiction.

2.2 Description of Plan Area [§354.8]

This section provides a description of the plan area, including a summary of jurisdictional areas and existing water-resources monitoring and management programs in the Basin.

2.2.1 Summary of Jurisdictional Areas and Other Features [§354.8(a)(1),(a)(2),(a)(3),(a)(4),(a)(5), and (b)]

§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.*

The geographic area covered by this GSP and managed by UVRGA includes the entire UVRGB (Department of Water Resources Basin 4-3.01) as defined by DWR Bulletin No. 118, "California's Groundwater," Update 2020 (DWR, 2020). The extent of UVRGB is shown on Figure 2.1-01. The Basin is located in the central portion of the Ventura River Watershed along the Ventura River near the communities of Casitas Springs, Mira Monte, and Meiners Oaks. The UVRGB is bordered by the Ojai and Lower Ventura River Groundwater Basins to the east and south, respectively (DWR Basin Nos. 4-002 and 4-003.02). No groundwater basins exist immediately west and north of UVRGB. The Ojai Basin is managed by the Ojai Basin Groundwater Management Agency (OBGMA). OBGMA is developing a GSP for the Ojai Basin. The Lower Ventura River Basin is a very low priority basin and is therefore not subject SGMA requirements.

Jurisdictional boundaries of various agencies located within UVRGA are depicted on Figure 2.1-02 and include:

- Ventura County
- City of Ventura
- Casitas Municipal Water District (CMWD)
- Meiners Oaks Water District (MOWD)
- Ventura River Water District (VRWD)
- State Land: UVRGA is not aware of any State land within the Basin.
- Federal Land: The Kennedy Area of the Basin falls within the limits of the Los Padre National Forest; however, the land in this area appears to be privately held (Figure 2.1-01).

There are no adjudicated areas located within UVRGB.

The Basin lies within the traditional tribal territory of the Chumash; however, there are no tribal trust lands located within the basin.

UVRGB is located in the central portion of the Ventura River Watershed along the Ventura River near the communities of Casitas Springs, Mira Monte, and Meiners Oaks. Land use in the Basin is dominated by low- to medium-density residential uses in the communities of Casitas Springs, Mira Monte, and Meiners Oaks (Figure 2.2-01). The "water-use sector" for these land use designations is collectively referred to in this GSP as "municipal and industrial" (M&I). Sources of water for the M&I sector include local groundwater pumped by the water districts (MOWD, VRWD, and CMWD), surface water from Lake Casitas by CMWD delivered to MOWD, VRWD, and direct retail service by CMWD, and a small amount of groundwater pumped by two private mutual water companies. Land use along the Ventura River includes open space, agriculture, and rural residential. Open space has no associated "water use sector." The agricultural "water-use sector" is supplied by groundwater pumped from private wells, MOWD wells, and surface water from Lake Casitas by CMWD. Some rural residential properties are supplied by domestic wells. Details regarding sources and volumes of by water use sectors are provided in Section 3.1.3.4.

The principal land-use planning agency in the Basin is the County of Ventura, which recently completed its 2040 General Plan. The City of Ojai overlaps with a very small (~0.75 square mile) portion of the Basin (Figure 2.2-01). A small area (~0.13 square miles) of the Basin falls within an isolated area of land owned by the City of Ventura (Figure 2.1-02). This land is disconnected from the City proper by approximately 4 miles and consists of open space.

Figure 2.2-02 shows the density of wells per square mile and locations of known agricultural and municipal and industrial water supply wells in the basin. The communities within the Basin are partially dependent upon groundwater from the Basin. Groundwater provides approximately one third of the water supply in the Basin. The other source of water supply for the Basin is local surface water from stored in Lake Casitas, which provides approximately two thirds of the water supply in the Basin. Lake Casitas supplies are derived from runoff in the drainages surrounding the lake (outside of the Basin) and a diversion from the Ventura River located within the Basin.

2.2.2 Water Resources Monitoring and Management Programs [§354.8(c) and (d)]

2.2.2.1 Existing Water Resource Monitoring Programs [§354.8(c) and (d)]

§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.*

Existing water resources monitoring programs are listed in Table 2.2-01.

The water resources monitoring programs that have significant relevance to this GSP are the VCWPD groundwater resource monitoring programs, groundwater quality monitoring by public water system well operators, and streamflow gaging performed by various entities. Details regarding groundwater monitoring locations and parameters monitored by these agencies/programs are provided in Section 5. VCWPD is the California Statewide Groundwater Elevation Monitoring (CASGEM) monitoring entity for the Basin. VCWPD compiles the groundwater level data gathered by Ventura County staff with that gathered by other agencies and uploads the data to the CASGEM website in accordance with CASGEM program requirements. VCWPD will continue in this role and provide data consistent with the CASGEM program. UVRGA plans to continue coordinating with these other programs/agencies to obtain groundwater elevation and quality data to support GSP development, monitoring, and annual reporting, as detailed in Section 5.

The existing water resource monitoring programs do not limit operational flexibility in the basin.

2.2.2.2 Existing Water Resource Management Programs [§354.8(c) and (d)]

§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.*

Existing water resources monitoring programs are listed in Table 2.2-02 and described below.

Casitas Municipal Water District Water Supply Management

CMWD operates Lake Casitas, which provides approximately 2/3 of the water supply in the Basin. CWMD operates Lake Casitas pursuant to its combined 2015 Urban Water Management Plan and Agricultural Water Management Plan (2020 update of Urban Water Management Plan (UWMP) in progress).

CMWD is also currently working on a Comprehensive Water Resources Plan (draft as of June 2020) that identifies the safe demand for its water supplies and identifies projects to address the gap between supply and demand for implementation over the next 10 years. Implementation of this plan is expected to address CMWD's anticipated supply gap thereby preventing increased reliance on groundwater supply, which would otherwise potentially impact UVRGB operational flexibility.

City of Ventura Water Supply Management

The City's Urban Water Management Plan (Kennedy/Jenks Consultants, 2016) describes their existing and planned sources of water supply and demand, as well as their water management programs. The City's 2020 Comprehensive Water Resources Report (Ventura Water, 2020b) provides updated information and projections on impacts of the City's water resources management program. Another related planning document is the City's Water Shortage Event Contingency Plan (Ventura Water, 2015), which identifies actions to be taken during the various stages of a water shortage. These documents are relevant for estimating future groundwater extractions by the City.

Casitas Municipal Water District Robles Diversion Operations

CMWD operates the Robles Diversion on the Ventura River (located within UVRGB) in accordance with a National Oceanic and Atmospheric Administration National Marine Fisheries Service Biological Opinion (BO), which includes certain stream flow criteria for diversion operations that are intended to furnish a downstream flow regime that mimics the natural storm recession rate and address flow depth for fish passage in critical riffles located within UVRGB. CMWDs' diversions are not considered to limit basin operational flexibility because, although the diversions may reduce basin recharge under certain circumstances, the benefit of storing water in Lake Casitas and having non-groundwater water supplies available during droughts provides substantially greater overall water supply flexibility to the Basin as a whole.

RWQCB Water Quality Management Programs

UVRGB falls within the jurisdiction of the Los Angeles Regional Water Quality Control Board (RWQCB), which has established a regional Water Quality Control Plan (i.e., Basin Plan). The Basin Plan contains the regional water quality regulations and programs to implement these regulations, including the National Pollutant Discharge Elimination System (NPDES) permits issued under federal delegation for discharges to surface water and total maximum daily loads (TMDLs). Stormwater discharges are regulated through NPDES permits of which the municipal separate stormwater sewer systems (MS4) is most significant. The MS4 permit identifies discharge prohibitions and sets effluent and receiving water limitations in accordance with Basin Plan water quality standards. In addition, stormwater management program minimum control measures are outlined to manage potential pollutant discharges from the MS4. The Ventura County Stormwater Quality Management Program is implemented to meet the requirements of the Ventura County Stormwater Permits (i.e., MS4 permit). This includes water quality sampling, watershed assessments, business inspections, and pollution prevention programs. The Ventura County Agricultural Irrigated Lands Group (VCAILG) Water Quality Management Plan (WQMP) is implemented to comply with the agricultural conditional waiver of waste discharge requirements. The plan addresses measurement and control of discharges from irrigated farmland to protect surface water quality. The Ventura River and Tributaries Algae, Eutrophic Conditions, and Nutrients TMDL (Algae TMDL) was adopted by the Regional Board on December 6, 2012, and approved by the United States Environmental Protection Agency on June 28, 2013. The Algae TMDL establishes numeric targets for dissolved oxygen and pH, as well as algal and phytoplankton biomass and percent cover. To address nutrient sources, the Algae TMDL assigned waste load allocations and load allocations to discharges into the Ventura River watershed. The RWQCB Basin Plan and water quality regulatory programs do not limit basin operational flexibility because actions undertaken by RWQCB contribute to maintenance of groundwater quality below the measurable objective concentrations.

Integrated Regional Water Management (IRWM) Program and Plan (Ventura River Watershed Council [VRWC])

UVRGA actively participates in the VRWC, which was formed in 2006 and produced the Ventura River Watershed Management Plan in 2015. The Watershed Management Plan is a comprehensive online resource of information about the watershed and identifies key issues in the watershed and proposes a number of campaigns (strategies to collectively solve shared watershed problems and manage shared resources). The Watershed Management Plan is not mandatory, so implementation is voluntary. Nonetheless, the Watershed Management Plan and VRWC creates an important forum and functions as a clearinghouse for exchange of information and ideas concerning important water management issues.

Ojai Basin Groundwater Management Agency (OBGMA)

OBGMA manages the Ojai Basin east of UVRGB. Management of the Ojai Basin impacts stream flow in San Antonio Creek, a key tributary that flows into to the Ventura River in the southern portion of the UVRGB near Casitas Springs. Inflows from San Antonio Creek are an important source of water for sustaining the Confluence and Foster Park aquatic and riparian GDEs within the UVRGB. OBGMA is developing a GSP for the Ojai Basin.

California Water Action Plan Ventura River Streamflow Enhancement (SWRCB and California Department of Fish and Wildlife [CDFW])

The Ventura River is one of five streams prioritized pursuant to the California Water Action Plan (CWAP) for efforts to enhance flows for anadromous fish. In 2021, CDWF published recommended flow regimes for various steelhead life stages and the habitats in the Ventura River and San Antonio Creek. SWRCB will consider this information together with surface water and groundwater modeling to establish objectives for streamflow enhancement. The streamflow objectives are expected in 2023-24. Measures to achieve the forthcoming flow objectives are not yet identified.

Ventura Watershed Instream Flow Enhancement and Water Resiliency Regional Framework (VRIF)

This grant-funded planning project is being undertaken by the Ventura County Resource Conservation District to develop a framework and project planning tools to help enhance streamflow in the Ventura River and increase water supply reliability for the region. The tools will provide landowners and others a means of quantifying water demand, infiltration, and opportunities for reduced consumptive use at the parcel scale.

Ventura River Watershed Adjudication (titled Santa Barbara Channelkeeper v. State Water Resources Control Board and the City of San Buenaventura (Los Angeles County Superior Court, Case No. 19STCP01176)

In 2014, Santa Barbara Channelkeeper filed a lawsuit against the City of Ventura and the State of California related to the balance between human and non-human use of the Watershed. Specifically, Channelkeeper asserted that the City's use of water from the Foster Park area (located within the UVRGB) violated the Reasonable Use Doctrine because the City's municipal use was harming the Southern California Steelhead. Ultimately, the Court of Appeal held that the reasonableness of the City's use had to be measured against all other users of the Watershed, and therefore allowed the City to bring into the lawsuit everyone currently extracting or who could extract water from the system in the future (cross-complaint).

In 2019, the City of Ventura entered into a settlement agreement with Santa Barbara Channelkeeper that includes certain flow and non-flow measures. The settlement agreement was executed in September 2019 and amended in August 2020. The flow measures are known as the "Foster Park Protocols" and involve monitoring river gages and shutting down the City's extraction facilities when certain surface water flow thresholds are reached. The Foster Park Protocols are relevant to this GSP because they contribute to addressing one of the six SGMA sustainability indicators: depletions of interconnected surface water. The Foster Park Protocols address direct depletion of the Ventura River by the City of Ventura's Foster Park water extraction facilities.

In 2020, certain adjudication parties developed a proposed physical solution to settle the cross-complaint. The proposed physical solution seeks to address the habitat conditions for the Steelhead population in order to return the habitat to good condition, and then maintain it. The Foster Park Protocols are a component of the proposed physical solution. The proposed physical solution has not yet been considered by the Court.

A future judgment will likely include aspects relevant to implementation of the GSP. There is no definitive timeline for a judgment. UVRGA will monitor, and to the extent possible, coordinate with the adjudication process during GSP implementation. Note that UVRGA is not a party to the lawsuit.

2.2.2.3 Conjunctive Use Programs [§354.8(e)]

> **§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.*

There are no formal conjunctive use programs in the Basin, although it is noted that MOWD and VRWD and operate their wells conjunctively with Lake Casitas surface water supplies. MOWD and VRWD utilize more groundwater in wet years and less in years and make up the difference via a combination of conservation and Lake Casitas surface water purchased from CMWD. Variable groundwater pumping rates for MOWD and VRWD were incorporated into the water budgets for this GSP.

2.2.3 Land Use/General Plans

The dominant land uses in the Basin are residential, commercial, and open space along the Ventura River. Residential and commercial land uses accounts for approximately 40% of Basin land acreage (Figure 2.2-01). Residential uses vary between large rural parcels with few impervious surfaces to suburban and urban residential parcels associated with higher development densities and surrounded by more impervious surfaces, wider roads and more sidewalks. Open space accounts for approximately 38% of Basin land acreage (Figure 2.2-01). The key area open space that is relevant to this GSP is located along the Ventura River where the Basin receives most of its recharge (Figure 3.1-25). Agricultural land accounts for approximately 500 acres of the Basin (approximately 9% of the Basin land area) (Figure 2.2-01). Agricultural land is typically located outside of key Basin recharge areas.

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

§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.*

California state law requires that cities and counties prepare and adopt a "comprehensive long-term general plan for the physical development of the county or city" and that "elements and parts [of the plan] comprise an integrated, internally consistent and compatible statement of policies for the adopting agency" (California Government Code, Sections 65300 and 65300.5). Among the required elements of the plan is the conservation, development, and utilization of water developed in coordination with groundwater agencies such as UVRGA (California Government Code, Section 65302[d][1]).

All existing general plans and future updates undergo an analysis of environmental impacts under the California Environmental Quality Act (CEQA). In addition, all discretionary projects under municipal, County, and/or state jurisdiction are required to comply with CEQA. In 2019, the Governor's Office of Planning and Research released an update to the CEQA Guidelines that included a new requirement to analyze projects for their compliance with adopted GSPs. Specifically, the applicable significance criteria include the following:

- Would the program or project substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?
- Would the program or project conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?

Therefore, to the extent general plans allow growth that could have an impact on groundwater supply, such projects would be evaluated for their consistency with adopted GSPs and for whether they adversely impact the sustainable management of the Basin. Under CEQA, potentially significant impacts identified must be avoided or substantially minimized unless significant impacts are unavoidable, in which case the lead agency must adopt a statement of overriding considerations.

The following sections contain a description of the land use plans that are applicable to sustainable groundwater management planning within the UVRGB, a discussion of the consideration given to the land use plans, and an assessment of how the GSP may affect those plans. The plans included were selected as the plans with the most salient information relating to sustainable management. General plans are considered applicable to the GSP to the extent that they may change water demands within UVRGB or affect the ability of the GSA to achieve sustainable groundwater management over the planning and implementation horizon.

General Plans applicable to UVRGB include the Ventura County General Plan and, to a much lesser extent the City of Ojai and City of Ventura General Plans (Figure 2.2-01). These land use plans are described below.

In addition to the General Plans, it is important to understand that the agricultural land and open space in the Basin lies is subject to the County of Ventura Save Open Space and Agricultural Resources (SOAR) voter initiative currently approved through 2050 (SOAR, 2015). The SOAR initiative require a majority vote of the people to rezone unincorporated open space, agricultural, or rural land for development. The existence of the SOAR makes it very unlikely that a material change in land use will occur during the foreseeable future. Because agricultural land and open space is not expected to convert to other uses, it is assumed that there is little potential for new development that could impact basin recharge or water demands. These assumptions will be revisited during each five-year GSP assessment.

County of Ventura 2040 General Plan

The Ventura County 2040 General Plan (County of Ventura, 2020) applies to the County as a whole and includes areas-specific plans for distinct unincorporated areas. Most of the Basin falls within unincorporated areas of the County of Ventura (Figure 2.2-01). The unincorporated areas within the Basin primarily include residential land, agricultural land, and open space.

The key recharge area that is relevant to this GSP is open space along the Ventura River where the Basin receives most of its recharge (Figure 3.1-25). Significant areas of agricultural land use also exist in the Basin. The County's General Plan includes numerous elements that discourage development in the open space and agricultural areas and/or continued viability of agricultural activities on agricultural land:

Guiding Principle - Land Use and Community Character: Direct urban growth away from agricultural, rural, and open space lands, in favor of locating it in cities and unincorporated communities where public facilities, services, and infrastructure are available or can be provided.

Guiding Principle - Conservation and Open Space: Conserve and manage the County's open spaces and natural resources, including soils, water, air quality, minerals, biological resources, scenic resources, as well as historic and cultural resources.

Guiding Principle - Agriculture: Promote the economic vitality and environmental sustainability of Ventura County's agricultural economy by conserving soils/land while supporting a diverse and globally competitive agricultural industry that depends on the availability of water, land, and farmworker housing.

WR-6: To sustain the agricultural sector by ensuring an adequate water supply through water efficiency and conservation.

WR-6.1 - Water for Agricultural Uses: The County should support the appropriate agencies in their efforts to effectively manage and enhance water quantity and quality to ensure long-term, adequate availability of high quality and economically viable water for agricultural uses, consistent with water use efficiency programs.

WR-6.2 Agricultural Water Efficiency: The County should support programs designed to increase agricultural water use efficiency and secure long-term water supplies for agriculture.

WR-6.3 Reclaimed Water Use: The County should encourage the use of reclaimed irrigation water and treated urban wastewater for agricultural irrigation in accordance with federal and state requirements in order to conserve untreated groundwater and potable water supplies.

from the Ventura County 2040 General Plan

The Ventura County 2040 General Plan includes an Ojai Valley Area Plan that addresses land use planning for the UVRGB and unincorporated areas located east of the City of Ojai (Figure 2.2-01). The Ojai Valley Area Plan includes growth management measures that significantly limit the potential for development in open space and agricultural lands and increased water demands. These measures include:

OV-1: Locate new development primarily within the existing urban communities and rural residential areas in order to avoid encroaching into established agricultural operations and undeveloped open space lands, and to minimize environmental degradation.

OV-2: Discourage the expansion of Rural and Existing Community designations into the East Ojai and Upper Ojai Valleys.

OV-2.1 - Land Outside Existing Community and Rural Areas: The County shall require land outside the Existing Community and Rural designated areas which is primarily in agricultural use to be designated Open Space.

OV-2.2- Boundary Expansion Restriction: The County shall prohibit outward expansion of the boundaries of the Existing Community areas.

OV-4: To recognize and plan for low density, large lot (2 to 10 acres in size) residential development and other compatible and ancillary land uses in a rural setting.

OV-15: To preserve the undeveloped lands which surround and frame the urban and rural communities of the Ojai Valley as a means of retaining the existing natural, scenic resources of the area.

OV-15.1 - Purpose of the Open Space Designation: The County shall use the Open Space designation to define the boundaries of the Existing Community and Rural designated areas, in order to prevent urban sprawl and to promote the efficient use of public facilities and services by confining the areas of development.

OV-15.3 - Assurance of Agricultural Operations in Open Space: The County shall prohibit all discretionary development that would have a significant unavoidable impact on agricultural operations in Open Space designated lands unless a statement of overriding considerations is adopted by the decision-making body.

OV-16: To maintain the existing rural, small town character of the Ojai Valley.

OV-59: To preserve agricultural lands as a valuable resource in the Ojai Valley.

OV-60: To preserve agricultural land as a resource and economic benefit to the Ojai Valley.

from the Ventura County 2040 General Plan, Ojai Valley Area Plan

The Ventura County 2040 General Plan includes numerous elements designed to facilitate coordinated planning with UVRGA, maintain groundwater recharge, protect groundwater quality, and conserve groundwater resources. These elements include:

WR-1: To effectively manage water supply by adequately planning for the development, conservation, and protection of water resources for present and future generations.

WR-1.1 - Sustainable Water Supply: The County should encourage water suppliers, groundwater management agencies, and groundwater sustainability agencies to inventory and monitor the quantity and quality of the county's water resources, and to identify and implement measures to ensure a sustainable water supply to serve all existing and future residents, businesses, agriculture, government, and the environment.

WR-1.2 - Watershed Planning: The County shall consider the location of a discretionary project within a watershed to determine whether or not it could negatively impact a water source. As part of discretionary project review, the County shall also consider local watershed management plans when considering land use development.

WR-1.3 - Portfolio of Water Sources: The County shall support the use of, conveyance of, and seek to secure water from varied sources that contribute to a diverse water supply portfolio. The water supply portfolio may include, but is not limited to, imported water, surface water, groundwater, treated brackish groundwater, desalinated seawater, recycled water, and storm water where economically feasible and protective of the environmental and public health.

WR-1.4 - State Water Sources: The County shall continue to support the conveyance of, and seek to secure water from, state sources.

WR-1.5 - Agency Collaboration: The County shall participate in regional committees to coordinate planning efforts for water and land use that is consistent with the Urban Water Management Planning Act, Sustainable Groundwater Management Act, the local Integrated Regional Water Management Plan, and the Countywide National Pollutant Discharge Elimination System Permit (storm water and runoff management and reuse).

WR-1.6 - Water Supplier Cooperation: The County shall encourage the continued cooperation among water suppliers in the county, through entities such as the Association of Water Agencies of Ventura County and the Watersheds Coalition of Ventura County, to ensure immediate and long-term water needs are met efficiently.

WR-1.7 - Water Supply Inter-Ties: The County shall encourage the continued cooperation among water suppliers in the county, through entities such as Association of Water Agencies of Ventura County and the Watersheds Coalition of Ventura County, to establish and maintain emergency inter-tie projects among water suppliers.

WR-1.9 - Groundwater Basin Use for Water Storage: Where technically feasible, the County shall support the use of groundwater basins for water storage.

WR-1.10 - Integrated Regional Water Management Plan: The County shall continue to support and participate with the Watersheds Coalition of Ventura County in implementing and regularly updating the Integrated Regional Water Management Plan.

WR-1.11 - Adequate Water for Discretionary Development: The County shall require all discretionary development to demonstrate an adequate long-term supply of water.

WR-1.12 - Water Quality Protection for Discretionary Development: The County shall evaluate the potential for discretionary development to cause deposition and discharge of sediment, debris, waste and other pollutants into surface runoff, drainage systems, surface water bodies, and groundwater. The County shall require discretionary development to minimize potential deposition and discharge through point source controls, storm water treatment, runoff reduction measures, best management practices, and low impact development.

WR-1.14 - Discretionary Development and Conditions of Approval: Golf Course Irrigation: The County shall require that discretionary development for new golf courses shall be subject to conditions of approval that prohibit landscape irrigation with water from groundwater basins or inland surface waters identified as Municipal and Domestic Supply or Agricultural Supply in the California Regional Water Quality Control Board's Water Quality Control Plan unless:

1. The existing and planned water supplies for a Hydrologic Area, including interrelated Hydrologic Areas and Subareas, are shown to be adequate to meet the projected demands for existing uses as well as reasonably foreseeable probable future uses within the area; and
2. It is demonstrated that the total groundwater extraction/recharge for the golf course will be equal to or less than the historic groundwater extraction/recharge for the site as defined in the County Initial Study Assessment Guidelines.
    - Further, where feasible, reclaimed water shall be utilized for new golf courses.

WR-2: To implement practices and designs that improve and protect water resources.

WR-2.1 - Identify and Eliminate of Sources of Water Pollution: The County shall cooperate with Federal, State and local agencies in identifying and eliminating or minimizing all sources of existing and potential point and non-point sources of pollution to ground and surface waters, including leaking fuel tanks, discharges from storm drains, dump sites, sanitary waste systems, parking lots, roadways, and mining operations.

WR-2.2 - Water Quality Protection for Discretionary Development: The County shall evaluate the potential for discretionary development to cause deposition and discharge of sediment, debris, waste, and other contaminants into surface runoff, drainage systems, surface water bodies, and groundwater. In addition, the County shall evaluate the potential for discretionary development to limit or otherwise impair later reuse or reclamation of wastewater or storm water. The County shall require discretionary development to minimize potential deposition and discharge through point source controls, storm water treatment, runoff reduction measures, best management practices, and low impact development.

WR-2.3 - Discretionary Development Subject to CEQA Statement of Overriding Considerations – Water Quality and Quantity: The County shall require that discretionary development not significantly impact the quality or quantity of water resources within watersheds, groundwater recharge areas or groundwater basins.

WR-3: To promote efficient use of water resources through water conservation, protection, and restoration.

WR-3.1 - Non-Potable Water Use: The County shall encourage the use of non-potable water, such as tertiary treated wastewater and household graywater, for industrial, agricultural, environmental, and landscaping needs consistent with appropriate regulations.

WR-3.2 - Water Use Efficiency for Discretionary Development: The County shall require the use of water conservation techniques for discretionary development, as appropriate. Such techniques include low-flow plumbing fixtures in new construction that meet or exceed the California Plumbing Code, use of graywater or reclaimed water for landscaping, retention of storm water runoff for direct use and/or groundwater recharge, and landscape water efficiency standards that meet or exceed the standards in the California Model Water Efficiency Landscape Ordinance.

WR-3.3 - Low-Impact Development: The County shall require discretionary development to incorporate low impact development design features and best management practices, including integration of storm water capture facilities, consistent with County's Storm water Permit.

WR-3.4 - Reduce Potable Water Use: The County shall strive for efficient use of potable water in County buildings and facilities through conservation measures, and technological advancements.

WR-4: To maintain and restore the chemical, physical, and biological integrity and quantity of groundwater resources.

WR-4.1 - Groundwater Management: The County shall work with water suppliers, water users, groundwater management agencies, and groundwater sustainability agencies to implement the Sustainable Groundwater Management Act (SGMA) and manage groundwater resources within the sustainable yield of each basin to ensure that county residents, businesses, agriculture, government, and the environment have reliable, high-quality groundwater to serve existing and planned land uses during prolonged drought years.

WR-4.2 - Important Groundwater Recharge Area Protection: In areas identified as important recharge areas by the County or the applicable Groundwater Sustainability Agency, the County shall condition discretionary development to limit impervious surfaces where feasible and shall require mitigation in cases where there is the potential for discharge of harmful pollutants within important groundwater recharge areas.

WR-4.3 - Groundwater Recharge Projects: The County shall support groundwater recharge and multi-benefit projects consistent with the Sustainable Groundwater Management Act and the Integrated Regional Water Management Plan to ensure the long-term sustainability of groundwater.

WR-4.4 - In-Stream and Recycled Water Use for Groundwater Recharge: The County shall encourage the use of in-stream water flow and recycled water for groundwater recharge while balancing the needs of urban and agricultural uses, and healthy ecosystems, including in-stream waterflows needed for endangered species protection.

WR-4.5 - Discretionary Development Subject to CEQA Statement of Overriding Considerations – Water Quantity and Quality: The County shall require that discretionary development shall not significantly impact the quantity or quality of water resources within watersheds, groundwater recharge areas or groundwater basins.

WR-4.7 - Discretionary Development and Conditions of Approval – Oil, Gas, and Water Wells: The County shall require that discretionary development be subject to conditions of approval requiring proper drilling and construction of new oil, gas, and water wells and removal and plugging of all abandoned wells on-site.

WR-4.8 - New Water Wells: The County shall require all new water wells located within Groundwater Sustainability Agency (GSA) boundaries to be compliant with GSAs and adopted Groundwater Sustainability Plans (GSPs).

WR-5: To protect and, where feasible, enhance watersheds and aquifer recharge areas through integration of multiple facets of watershed-based approaches.

WR-5.1 - Integrated Watershed Management: The County shall work with water suppliers, Groundwater Sustainability Agencies (GSAs), wastewater utilities, and storm water management entities to manage and enhance the shift toward integrated management of surface and groundwater, storm water treatment and use, recycled water and conservation, and desalination.

WR-5.2 - Watershed Management Funding: The County shall continue to seek funding and support coordination of watershed planning and watershed-level project implementation to protect and enhance local watersheds.

WR-7.1 - Water for the Environment: The County shall encourage the appropriate agencies to effectively manage water quantity and quality to address long-term adequate availability of water for environmental purposes, including maintenance of existing groundwater-dependent habitats and in-stream flows needed for riparian habitats and species protection.

from the Ventura County 2040 General Plan

City of Ojai General Plan

A small (~0.75 square mile) area of the Basin falls within the City of Ojai (Figure 2.2-01). An additional ~1 square mile of the Basin lies within the City of Ojai's sphere of influence (Figure 2.2-01).

Ojai's existing General Plan contains nine elements, updated between 1987 and 2013. The City of Ojai kicked off a general plan update 2020. The updated general plan will include a 2045 planning horizon and is expected to be adopted in Fall 2021.

The City of Ojai's General Plan Land Use Element and Conservation Element (City of Ojai, 1997, 1987) includes elements that discourage development in the open space and agricultural areas and limit the potential for significant increases in water demand:

Policy: The City shall ensure that adequate supplies of water be available to all City residents and uses requiring water.

from the Ojai General Plan, Conservation Element

Objective: Preserve Ojai's small-town character and maintain a built environment that does not detract from Ojai's natural environment.

Objective: Manage the growth and pace of development to ensure that community resources are sustainable, and capable of meeting the needs of both present and future residents.

From the General Plan Approach: It is the City's intent that the large unbroken expanses of open lands around the perimeter of the community be preserved. Development within these perimeter lands is intended to consist of agricultural open space and very low intensity development (less than I dwelling unit/10 acres).

LU-8: Within commercially viable agricultural areas, permit only land uses which are oriented toward maintaining the long-term viability of agriculture and require minimum parcel sizes consistent with long-term agricultural use.

LU-9: Prohibit the extension of urban services into areas designated for agricultural, open space, or rural uses.

LU-11: Limit the intensity of new development to that which is consistent with the long-term availability of the resources needed to support existing and future developments, as well as can be supported by adequate public services and facilities within present and reasonably foreseeable budget limitations.

LU-14: Limit the intensity of development within existing open space lands that are not committed to long-term open space to that which is consistent with their environmental values, sensitivity of specific environmental features, and their contribution to the overall small-town character of the community.

from the Ojai General Plan, Land Use Element

2005 Ventura General Plan

A small area (~0.13 square miles) of the Basin falls within an isolated area of land owned by the City of Ventura (Figure 2.2-01), It is extremely unlikely that this area will be developed because it is located in the Ventura River floodplain with sensitive habitat, and the land is disconnected from the City proper by approximately 4 miles. For these reasons, a detailed discussion of the City of Ventura General Plan is not necessary for this GSP.

2.2.3.1.1 How Land Use Plans May Impact Water Demands and Sustainable Groundwater Management

This GSP is not anticipated to be impacted by the County of Ventura land use plan. The general plan includes policies that protect the key recharge area in the Basin (open space along Ventura River). Open space in the key recharge area is further protected from development by SOAR. The general plan and Ojai Valley Area Plan include measures, that when combined with SOAR, greatly limit the potential for new development that would create a material increase in water demand within the UVRB.

Implementation of the City of Ojai General Plan is expected to have a negligible effect on GSP implementation in the UVRB because of the limited area within the Basin (~0.75 square miles) (Figure 2.2-01). Additionally, the City of Ojai overlaps with the Basin is in the eastern portion of the Basin, which is underlain by shallow bedrock of the Sespe Formation or Ojai Conglomerate and is not considered a primary groundwater recharge area (Figure 3.1-25). A small number of water wells are located in the City of Ojai overlap area, but these wells likely draw from a bedrock formation and do not produce large volumes of groundwater (Figure 3.1-37). For these reasons, land use planning in the City of Ojai overlap area is not considered to be significant factor for this GSP. The City of Ojai General Plan includes measures, that when combined with SOAR, greatly limit the potential for new development that would create a material increase in water demand within the UVRGB.

Implementation of the City of Ventura General Plan is expected to have a negligible effect on GSP implementation in the UVRGB because of the very limited area of City land (0.13 square miles) within the Basin. It is extremely unlikely that this area will be developed because it is located in the Ventura River floodplain with sensitive habitat and the land is disconnected from the City of Ventura proper by approximately 4 miles.

2.2.3.1.2 How Sustainable Groundwater Management May Affect Water Supply Assumptions of Land Use Plans

This GSP is not anticipated to impact land use planning because the land use plans, when combined with SOAR, greatly limit the potential for new development. Thus, significant new water demands that could be potential impacted by the GSP are not anticipated. The GSP will not impact land use plans elements that address recharge areas because the key recharge area is already protected from development by County of Ventura General Plan policies and SOAR.

2.2.3.1.3 *Impact of Land Use Plans Outside of Basin on Sustainable Groundwater Management [§354.8(f)(5)]*

> **§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.*

Land use planning for the areas immediately surrounding UVRGB is addressed in the Ventura County 2040 General Plan (County of Ventura, 2020) and City of Ojai General Plan (City of Ojai, 1987, 1997), which were described in Section 2.2.3.1. This GSP is not anticipated to be impacted by these land use plans for the same reasons described in Section 2.2.3.1.1.

2.2.3.2 Well Permitting [§354.8(f)(4)]

> **§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.*

Water well permits are obtained from the Ventura County Groundwater Section, a division of Ventura County Public Works Department. Water well permits are issued pursuant to the requirements of Ventura County Well Ordinance No. 4468. The Ventura County Groundwater Section enforces California's Water Well Standards Bulletins 74-9, 74-81, and 74-90. The Ventura County Groundwater Section monitors and enforces these standards by requiring drilling contractors with a valid C-57 license to submit permit applications for the construction, modification, reconstruction (i.e., deepening), or destruction of any well within their jurisdiction and through inspections. Pursuant to the County of Ventura 2040 General Plan, Ventura County Groundwater Section will review the UVRGA's GSP and related resolutions and ordinances to ensure the compliance with UVRGA requirements prior to issuing a water well permits within the Basin boundary.

In addition to County Water Well Ordinance 4468, the County of Ventura 2040 General Plan includes the following policies on well permitting:

- <u>WR-4.7 - Discretionary Development and Conditions of Approval – Oil, Gas, and Water Wells</u>: The County shall require that discretionary development be subject to conditions of approval requiring proper drilling and construction of new oil, gas, and water wells and removal and plugging of all abandoned wells on-site.

- <u>WR-4.8 - New Water Wells</u>: The County shall require all new water wells located within Groundwater Sustainability Agency (GSA) boundaries to be compliant with GSAs and adopted Groundwater Sustainability Plans (GSPs).

2.2.4 Additional Plan Elements [§354.8(g)]

§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.*

GSP Emergency Regulations [§354.8(g) allows GSAs to include certain "additional plan elements" in the GSP, including:

(a) Control of saline water intrusion.

(b) Wellhead protection areas and recharge areas

(c) Migration of contaminated groundwater.

(d) A well abandonment and well destruction program.

(e) Replenishment of groundwater extractions.

(f) Activities implementing, opportunities for, and removing impediments to, conjunctive use or underground storage.

(g) Well construction policies.

(h) Measures addressing groundwater contamination cleanup, groundwater recharge, in-lieu use, diversions to storage, conservation, water recycling, conveyance, and extraction projects.

(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.

(j) Efforts to develop relationships with state and federal regulatory agencies.

(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.

(l) Impacts on groundwater dependent ecosystems.

UVRGA has determined that the following additional plan elements are appropriate to include in this GSP:

(j) 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: UVRGA will seek opportunities to encourage, promote, and support efforts to increase agricultural water use efficiency.

(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: UVRGA will coordinate with the City of Ventura concerning its General Plan update initiated in November 2020. MBGSA will participate in future general plan updates by the County of Ventura and City of Ventura.

(l) Impacts on groundwater dependent ecosystems: GDEs are comprehensively addressed through the sustainable management criteria, monitoring networks, and projects and management actions included in this GSP. No additional plan elements are needed to address GDEs.

UVRGA will review the need for any additional plan elements, during each five-year GSP evaluation.

2.3 Notice and Communication [§354.10]

UVRGB is a relatively small basin with 2017 estimated groundwater extractions of only 4,356 acre-feet (AF). Only 15 entities operate wells that extract more than 2 AF per year (AF/yr) of groundwater. Nine entities extract groundwater for agricultural beneficial users and are directly represented by the Agricultural Stakeholder Director on the UVRGA Board of Directors. The Agency's Stakeholder Engagement Plan (SEP) (Appendix C) specifically charges the Agricultural Stakeholder Director with engaging the Basin's agricultural users of groundwater and representing their interests before the Agency. Four entities of the 15 pumpers are the three water districts (CMWD, MOWD, and VRWD) and the City of Ventura, all of which have seats on the UVRGA Board of Directors. The remaining two non-de minimis extractors are two mutual water companies (Tico Mutual Water Company and Casitas Mutual Water Company). The UVRGA Board of Directors includes an Environmental Stakeholder Director appointed from nominations received from local environmental nonprofit organizations. The Environmental Stakeholder Director is responsible for engaging stakeholders within the Basin and representing environmental interests before the Agency. Thus, many of the interests in the Basin have direct representation in the SMGA process by virtue of a director on the UVRGA Board of Directors.

Despite the high degree of direct stakeholder representation on the UVRGA Board of Directors, the UVRGA Board appointed an Ad Hoc Stakeholder Engagement Committee to seek, encourage, and consider as much public input on the GSP as possible and to ensure compliance SGMA requirements (Appendix C). The Ad Hoc Stakeholder Engagement Committee was developed in 2017 to seek input on the GSP and consists of three UVRGA Directors, including both Stakeholder Directors. The Ad Hoc Stakeholder Engagement Committee performs one-on-one outreach with stakeholders and coordinates with the UVRGA Executive Director. The UVRGA Board also appointed an Ad Hoc Funding Committee to perform additional one-on-one outreach to groundwater pumpers during the groundwater extraction fee development process during 2018 and 2019.

The Ad Hoc Stakeholder Engagement Committee worked with the Executive Director to develop and implement the SEP (Appendix C). The SEP is tailored to the specific stakeholder landscape of the Basin. The SEP encourages the active involvement of individual stakeholders and stakeholder organizations, and other interested parties in the development and implementation of the GSP for UVRGB (Appendix C). The SEP was designed and developed to ensure compliance with Water Code Section 10723.2, which requires the GSA to "consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing groundwater sustainability plans." The SEP identifies stakeholders, stakeholder outreach and engagement methodologies, opportunities for integration with other overlapping local programs and planning processes, and the public meeting process used by the GSA. The SEP guided notice and communication activities during GSP development and will continue to serve as a guide during GSP implementation. The following subsections provide a summary of information relating to notification and communication by UVRGA with other agencies and interested parties, as required by the GSP Emergency Regulations.

2.3.1 Beneficial Uses and Users [§354.10(a)]

§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.*

Water Code Section 10723.2, requires UVRGA to consider the interests of all beneficial uses and users of groundwater within the Basin. These interests are listed below with a description of the nature of UVRGA's consultation with them.

- **Holders of Overlying Groundwater Rights:**
  - Agricultural Users: There are agricultural users of groundwater operating on land overlying the Basin. To account for these users' interests, the Agency designated a seat on its seven-member governing board to be filled by an Agricultural Stakeholder Director. The Agricultural Stakeholder Director is appointed from nominations received by the Ventura County Farm Bureau. The Agricultural Stakeholder Director is responsible for engaging the Basin's agricultural users of groundwater and representing their interests before the Agency.
  - Domestic Well Owners: Approximately 90 domestic wells were identified during development of the GSP. The majority—if not all—of these domestic wells are believed to be *de minimis* uses, as defined by SGMA. UVRGA addressed the collective interests of domestic users of groundwater wells through outreach to domestic well owners during the development of the Plan and inviting their participation in the Agency's public meetings.
- **Municipal Well Operators:** The Agency is a joint powers authority created by five local public agencies. Four of the Agency's signatory members (CMWD, MOWD, VRWD, and the City of San Buenaventura) operates municipal wells within the Basin and are represented on the Agency's Board of Directors.
- Public Water Systems:
  - Casitas Municipal Water District (CMWD) is the primary water supplier in the watershed, providing water to both water resale agencies and retail customers. CMWD's service area encompasses 137 square miles and includes the City of Ojai, Upper Ojai, the Ventura River Valley area, portions of the City of Ventura, and the coastal Rincon area to the Santa Barbara County line. CMWD's primary water supply is Lake Casitas, which is an off-stream reservoir fed by water diverted from the Ventura River and the reservoir's surrounding drainages. CMWD operates and maintains Lake Casitas and Casitas Dam, the Robles Diversion and Fish Passage Facility on the Ventura River, the Robles Canal, and the Marion Walker Pressure Filtration Plant. CMWD also maintains and operates one well in Mira Monte, which pumps groundwater from UVRGB. CMWD is a signatory member to the JPA Agreement forming the Agency and is represented on the Agency's Board of Directors.
  - Meiners Oaks Water District (MOWD) is a small retail water district that supplies water to the community of Meiners Oaks on the east side of the Ventura River. MOWD serves a population of approximately 4,000 via approximately 1,260 service connections.

Groundwater is MOWD's primary water supply source. Water from CMWD is used as backup, such as during extended drought periods. MOWD was formed in 1948 as a special district under State law, which authorizes it to exercise water supply and water management authority within its jurisdiction. MOWD is a signatory member to the JPA Agreement forming the Agency and is represented on the Agency's Board of Directors.

- Ventura River Water District (VRWD) is a small water district that supplies water to the area stretching from the southwestern edge of the City of Ojai down to the northern half of Oak View, and in the eastern half of Casitas Springs. VRWD serves a population of approximately 6,000 via approximately 2,150 service connections. Groundwater is VRWD's primary water supply source. CMWD water is also used, both as a backup source and as a regular source for customers in some locations. VRWD is a signatory member to the JPA Agreement forming the Agency and is represented on the Agency's Board of Directors.
- Ventura Water (City of San Buenaventura) does not operate a public water system within the Basin boundary but operates wells in the southern portion of the Basin that supply its public water system in the City, which is located approximately 4 miles south of the Basin. The City of San Buenaventura is a signatory member to the JPA Agreement forming the Agency and is represented on the Agency's Board of Directors.

- **Local Land Use Planning Agencies:**
  - The County of Ventura has land use planning authority on unincorporated land overlying the Basin (Figure 2.2-01). The County is a signatory member to the UVRGA JPA Agreement and is represented on the Agency's Board of Directors.
  - The City of Ojai has land use planning authority over a small area (0.75 square miles) in the eastern corner the Basin (Figure 2.2-01). Implementation of the City of Ojai General Plan is expected to have a negligible effect on GSP implementation in the UVRGB because of the limited area within the Basin and because the overlap area and is not considered a primary groundwater recharge area due to the presence of shallow bedrock of the Sespe Formation or Ojai Conglomerate (Figure 3.1-25).
  - The City of San Buenaventura has land use planning authority in a small area (0.13 square miles) of land owned by the City in the southern part of the Basin (Figure 2.2-01). The City is a signatory member to the UVRGA JPA Agreement and is represented on the Agency's Board of Directors.
- **Environmental Users of Groundwater:** Riparian and aquatic habitats in the Basin also rely on groundwater and are referred to as groundwater dependent ecosystems (GDEs) in SGMA.

Two riparian GDE units were identified in the Basin: (1) South Santa Ana GDE Unit and (2) Foster Park GDE Unit. The riparian GDE units consist primarily of mixed hardwood and wetland habitats that are federally designated critical habitat for multiple species and support a number of other special status species.

Five Aquatic GDE areas were identified in areas of the Basin, although only two were determined to be susceptible to potential significant and unreasonable effect related to depletion of interconnected surface water by groundwater extractions. These two areas are the (1) Confluence Aquatic Habitat Area and (2) Foster Park Aquatic Habitat Area. The Confluence Habitat Area occurs in the southern portion of the Basin near the confluence of the Ventura River with San Antonio Creek. This habitat area is characterized by upwelling groundwater and inflow from San Antonio Creek. The Confluence Habitat Area includes federally designated critical habitat for steelhead and California red-legged frog and provides important habitat for two-striped garter snake, southwestern pond turtle, and Pacific lamprey. The Foster Park Habitat Area occurs in the southernmost portion of the Basin. Stream flow in the Foster Park Habitat Area is generally considered perennial. During dry seasons, much of the flow is the result of groundwater discharge to the Ventura River. The Foster Park Habitat Area has been studied by various investigators including consultants, federal and state resource agencies, and local public agencies. The Foster Park Habitat Area includes federally designated critical habitat for steelhead and provides suitable habitat for special status aquatic species including:

- Spawning and rearing habitat for steelhead;
- Breeding, rearing, and dispersal/migratory habitat for California red-legged frog;
- Foraging and dispersal habitat for two striped garter snake;
- Feeding, nesting, and basking habitat for southwestern pond turtle; and
- Pacific lamprey spawning corridor and potentially spawning and rearing.

There are several environmental organizations dedicated to preserving and maintaining environmental values operating within the boundaries of the Basin. To account for these users' interests, the Agency designated a seat on its seven-member governing board to be filled by an Environmental Stakeholder Director. The Environmental Stakeholder Director is appointed from nominations received from local environmental nonprofit organizations supportive of the Basin's groundwater sustainability. The Environmental Stakeholder Director is responsible for engaging stakeholders within the Basin and representing environmental interests before the Agency.

- **Surface Water Rightsholders:** The State Water Resources Control Board (SWRCB) identifies six entities that have claimed either riparian or appropriative surface water rights to the Ventura River.
  - City of San Buenaventura*
  - Casitas Municipal Water District*
  - Meiners Oaks Water District*
  - Ernest Ford
  - Michael Cromer
  - Rancho Matilija Mutual Water Company

Three of these six surface water rights holders are signatory members to the JPA Agreement forming the Agency (*) and are represented on the Agency's Board of Directors. UVRGA has engaged directly with the other three surface water users.

- **Federal Government:** No land overlying the UVRGB is managed by the Federal Government.
- **California Native American Tribes:** A representative of overlying California Native American tribes is on the Agency's interested parties list, as a result this individual receives notices of all Agency meetings and other stakeholder involvement opportunities.

- **Disadvantaged Communities:** Disadvantaged communities in the Basin include the community of Casitas Springs. The community is served by Casitas Mutual Water Company, Ventura River Water District, and Casitas Municipal Water District, the latter two being signatory members to the JPA Agreement forming the Agency. Thus, the community is represented on the Agency's Board of Directors.
- Entities listed in Section 10927 that Monitor and Report Groundwater Elevations:
    - The County of Ventura is the designated California Statewide Groundwater Elevation Monitoring (CASGEM) entity for the Basin. The County is a signatory member to the JPA forming the Agency and represented on the Agency's Board of Directors.

2.3.2 Public Meetings [§354.10(b)]

§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.*

A LIST OF ALL PUBLIC MEETINGS WILL BE INCLUDED IN THE FINAL DRAFT

2.3.3 Public Comments [§354.10(c)]

§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 WILL BE PRESENTED IN THE FINAL DRAFT (Appendix D).

2.3.4 Communication [§354.10(d)]

2.3.4.1 Decision-Making Process [§354.10(d)(1)]

§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 JPA that created UVRGA requires the GSA to hold public meetings at least quarterly that are noticed and meet all of the requirements of the Ralph M. Brown Act for transparency in California government. To hold a valid meeting the UVRGA must have a quorum of the Board of Directors, which consists of a majority of directors plus one director. With these requirements in mind, the UVRGA:

- Holds board meetings on a regular schedule (no less frequently that quarterly),
- Provides written notice of meetings with meeting agenda and meeting material available at least 72 hours prior to regular meetings,
- Sends email meeting reminders to UVRGA's interested parties list; and

- Posts meeting agenda on https://uvrgroundwater.org/ and at the meeting location prior to the meeting, as required by law.

UVRGA agendas include general public comments at the beginning of each board meeting. General comments allow community members to raise any groundwater related issue that is not on the agenda. Public comment time is also given prior to a vote on all agenda items to ensure public opinion can be incorporated into UVRGA Board of Director decisions.

The UVRGA Board of Directors directs the Executive Director to fulfill the various requirements of SGMA. To do this, the Executive Director, with support from consultants, provides the Board with research and recommendation memos, work plans, technical summaries, budgets, and other work products as required to carry out board decisions. UVRGA decisions require a unanimous affirmative vote on first reading. If unanimity is not obtained on the first reading of the matter, the Board shall continue a final vote on the matter during a second reading. Most items can be approved on the second reading with the affirmative vote of a simple majority of Directors. Certain items require a supermajority vote to pass on the second reading. These items include the following:

- Any capital expenditure of $50,000 or more;
- Annual budget and amendments thereto;
- GSP for the Basin or any amendments thereto;
- Adoption of groundwater extraction fees;
- Adoption of any taxes, fees, or assessments subject to Proposition 218;
- Issuance of assessments for contributions by Member Agencies; or
- Any stipulation to resolve litigation concerning groundwater rights within, or groundwater management for, the Basin.

2.3.4.2 Public Engagement [§354.10(d)(2) and (d)(3)]

> **§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.*

UVRGA uses a variety of methods create opportunities for public engagement and obtain public input for consideration in GSP development and implementation. These methods are presented in the UVRGA SEP (Appendix C) and include:

- **Stakeholder Directors:** The UVRGA Board of Directors includes two stakeholder directors, one each for environmental and agricultural interests. Pursuant to the SEP, the stakeholder directors are responsible for actively obtaining input from their respective stakeholder constituencies and communicating that input to the UVRGA Board and Executive Director for consideration.

- **UVRGA Board Meetings:** Regular and Special meetings of the UVRGA Board of Directors provide opportunities for the public to engage with the Board, Executive Director, and consultants and provide direct input. The public is welcomed to comment at each meeting and the UVRGA Board regularly incorporates public suggestions into its deliberations and the decisions it makes during Board meetings. Meeting notes are kept and submitted to the UVRGA Board for approval. All meeting minutes and notes are collected on the UVRAG Website along with supporting agendas, packets, and presentation materials.

- **GSP Workshops:** UVRGA holds public workshops to provide in depth discussion of the GSP and obtain stakeholder feedback. The workshops include polls to help facilitate public input on key issues and identify which outreach methods are most effective. Public input received during the GSP Workshops is reviewed with UVRGA Board of Directors during subsequent Board meetings prior to making decisions.

- **Online Comment Form:** UVRGA's website includes a comment submission form. The online form provides a convenient method for anyone to provide input on the GSP. All comments received via the website were compiled into a table and considered prior to GSP adoption. All comments submitted on-line were responded to in writing (Appendix D).

- **Contact with Staff:** The public is welcomed to contact UVRGA Executive Director and may do so via telephone, e-mail, or website inquiry (https://uvrgroundwater.org/contact/).

UVRGA uses a variety of methods to inform stakeholders and encourage the active involvement of diverse social, cultural, and economic elements of the population within the groundwater pursuant to Water Code Section 10727.8(a). These methods are presented in the UVRGA SEP (Appendix C) and include:

- **Statement Describing the Manner in which Interested Parties May Participate in the Development and Implementation of the Groundwater Sustainability Plan (Water Code Section 10727.8(a)):** The statement was prepared and posted to DWR's SGMA Portal as part of filing a notice of intent to DWR of for UVRGA decision to develop a GSP for the Basin on December 20, 2017. The statement is included in Appendix B and was developed into the UVRGA SEP (Appendix C).
- **Development and Maintenance of an Interest Parties List:** UVRGA developed an interest parties list prior to electing to become a GSA pursuant to Water Code Section 10723.8(a)(4) and maintained that list after becoming as GSA pursuant after to Water Code Section 10723.4. The interested parties list is used it to send e-mail meeting notices, agendas, newsletters, and updates.
- **Public Notices:** In accordance with Water Code Sections 10723(b), 10730(b)(1), and 10728.4, UVRGA publishes public notices in accordance with Government Code Section 6066 prior to electing to be a GSA, before imposing or increasing groundwater extraction fees, and before adopting the GSP.
- **UVRGA Website:** The UVRGA website provides SGMA and agency information, includes meeting information, meeting materials, and links to meeting agendas and packets. The website provides links to agency resource materials, maps, newsletters, presentation materials, and meeting recordings.
- **Newsletters:** UVRGA issues periodic newsletters concerning the Agency status and activities.

- **Existing Outreach Venues:** UVRGA uses the Member Agency outreach networks to provide regular updates about the GSP Development and, going forward, GSP implementation. This includes information via email newsletters, websites, bill inserts, and social media.
- **Ventura River Watershed Council:** The Executive Director provides UVRGA updates during Ventura River Watershed Council meetings and requests publication of UVRGA workshop notices via the Committee's email network.
- **Newspaper Articles:** UVRGA coordinates with the Ojai Valley News to publish articles concerning the GSP.

Public input was used to help shape the GSP development. The input was also used to develop content for UVRGA meetings, newsletters, and the website. UVRGA public meetings were designed to encourage input, discussion, and questions. Because the Basin and number of stakeholders is relatively small, the meetings provided ample opportunity for everyone to provide comments and ask questions.

Examples of how public input helped shape the GSP include:

- During the development of the GSP water budget, outreach to CMWD, MOWD, VRWD, and the City of Ventura was performed to learn about the planned future groundwater pumping rates. The estimates provided were incorporated into the planning process.
- During the development of the GSP water budget, the Ad Hoc Stakeholder Engagement Committee and Executive Director performed outreach to agricultural well owners to develop estimates of anticipated future agricultural groundwater pumping rates. These estimates were incorporated into the planning process.
- In addition to the above-described examples, input received from stakeholders about costs helped focus the Agency on ensuring the GSP is fit-for-purpose for the Basin and only includes aspects absolutely necessary to maintain sustainable conditions in the Basin.
- ADD MORE IN FINAL DRAFT BASED ON FEEDBACK RECEIVED ON DRAFT GSP

2.3.4.3 Progress Updates [§354.10(d)(4)]

> **§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.*

UVRGA will continue to follow its adopted SEP (Appendix C) to inform the public about progress implementing the GSP, including status of projects and actions.

3.0 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 presents information about the physical setting and characteristics of the UVRGB, which provides the basis for defining and assessing pertinent sustainable management criteria, projects, and management actions. This section was prepared under the direction of a certified hydrogeologist and a professional engineer and includes sub-sections that describe the hydrogeologic conceptual model (HCM), current and historical groundwater conditions, a water balance, and management areas within the Basin.

The information provided in this section is based on an extensive literature review of existing hydrogeologic studies, basin-specific hydrologic and geologic data collected by many local agencies and investigators since as early as 1933, and numerical modeling performed for the UVRGB (see Appendix F). The body of cited information and data is the best available data and information known to UVRGA at the time of GSP preparation. Note, the Basin as shown on figures and discussed in this GSP corresponds to the current Basin boundary, which was modified from the original (DWR, 2003) by UVRGA (Kear, 2016) and approved by the California Department of Water Resources (DWR) in 2016.

UVRGA is committed to updating the Basin Setting periodically following GSP adoption based on additional data or information that may be identified or developed when such updates would result in a material change in the sustainable management of the Basin.

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.*

Sections 3.1.1 through 3.1.4 below present the HCM of the Basin. The HCM is based on the best available technical studies, qualified maps, and findings from the numerical modeling that relate to the physical attributes and the hydrologic/hydrogeologic characteristics of the Basin, especially as these relate to groundwater – surface water interactions.

HCM Overview – Key Features of the UVRGB

The UVRGB is a thin, highly permeable, alluvial fill groundwater basin located along the Ventura River in the central portion of the Ventura River Watershed. The UVRGB consists of two distinct areas: 1) the alluvial aquifer located between the banks of the Ventura River and (2) areas outside of the banks that consist of older alluvium that is generally elevated above the water table; much of the groundwater in this area outside of the Ventura River banks is extracted from bedrock formations. Groundwater and surface water are intimately interconnected in the Basin. The groundwater budget and flow conditions in the alluvial aquifer are dominated by interaction with the Ventura River, which provides most of the recharge to the Basin as stream flow percolation in the northern portion of the Basin and receives most of the discharge from the Basin as down valley groundwater flow that feeds springs in the Ventura River in the southern portion of the Basin. Groundwater extractions are secondary to spring discharge to the Ventura River except during dry periods when spring flows decrease substantially due to low Ventura River stream flow entering the northern end of the Basin.

The thinness of the aquifer, high permeability, large north-south topographic gradient, and intimate interconnection between groundwater and surface water causes UVRGB to behave materially different than most groundwater basins in the State. The Basin groundwater levels and storage trends closely mimic surface water flows, with groundwater levels and storage exhibiting large and rapid fluctuations relative to the total saturated thickness and total groundwater storage, more so than perhaps any other groundwater basin in the State. During non-drought periods, the Basin fills up on the order of two out of every three years and significant surface water base flow is sustained by rising groundwater in the southern part of the Basin. During droughts, much of the Basin groundwater storage drains out naturally to the Ventura River within the first few years causing a significant decrease in Ventura River base flow in the lower part of the Basin.

To facilitate discussion within the GSP, the Basin has been subdivided into six hydrogeologic areas based on the hydrogeology, stratigraphy, and primary recharge and discharge processes (Figure 3.1-01 and discussed in detail in Sections 3.1.1 and 3.1.3). For ease of discussion, the text will refer to these areas in the following sections. Four of the hydrogeologic areas– the Kennedy, Robles, Santa Ana and Casitas Springs Areas – run north to south along the Ventura River corridor and were delineated primarily based on groundwater-surface water interaction characteristics. The Mira Monte/Meiners Oaks Area located east of the Ventura River underlain by older alluvium that generally above the water table; many wells in this area are believed to extract groundwater from bedrock formations such as the Ojai Conglomerate that do not have significant hydraulic connectivity with the Ventura River. The groundwater-bearing formations in the Mira Monte/Meiners Oaks Area have much lower permeability compared to the younger deposits along the Ventura River. The Terraces Area west of the Ventura River consists of alluvial deposits that are elevated above and separated from the Ventura River floodplain by bedrock; therefore, groundwater in the Terraces Area has very limited hydraulic connection with the rest of the Basin.

3.1.1 Regional Hydrology

3.1.1.1 Precipitation, Topography and Watershed Boundary [§354.14(d)(1)]

§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 UVRGB is located within the Ventura River Watershed and lies under and adjacent to the northern part of the Ventura River. The Ventura River Watershed encompasses about 227 miles in northwest Ventura County with a small portion of the watershed in the southeastern edge of Santa Barbara County

(Figure 3.1-02). The Ventura River runs through the center of the watershed, draining numerous tributaries along a 33.5-mile course from its headwaters to the Pacific Ocean. Figure 3.1-03 shows the regional topography within the Ventura River Watershed. The Ventura River headwaters are in the San Rafael Ranges and Topatopa Mountains to the north, the Santa Ynez Mountains to the west, and Sulphur Mountain to the east.

The Ventura River Watershed ranges from +6,000 feet (ft) of mountainous terrain in the northern portion of the watershed to sea level at the Ventura River estuary. As shown in Figure 3.1-03, mountains and foothills make up 85% of the watershed, covering most of its northern half and bounding it on the northern, western, and southern sides. Only 15% of the watershed is flat (with a slope of 10% or less). This includes the broad valley floors where most of the residences and farms are concentrated, and the coastal zone (VRWC, 2015).

The watershed has the following three distinct areas that differ in topography, geology, surface and groundwater hydrology, and roles in water resource management (Keller and Capelli, 1992; Fugro West, 1996; Entrix, 2001):

- Mountainous upland areas of the Transverse Ranges above the confluence of the Matilija and the North Fork of the Matilija, which are comprised of steep, rugged topography with narrow valleys and steep streambed gradients.
- Alluvial channel and floodplain areas along Ventura River mainstem below the confluence.
- The Lagoon at the Ventura River mouth along the coastline.

The UVRGB is one of four groundwater basins in the watershed and is the largest of the four basins with a surface area of 9,360 acres, as shown in Figure 3.1-03 (Entrix, 2001). Figure 3.1-04 presents the topography within the UVRGB. Elevations in the UVRGB range from approximately +200 ft above mean sea level (amsl) at the southern boundary to more than +1000 ft amsl along the northwestern boundary. The topographic gradient along the UVRGB is steeper than most groundwater basins and is one of the contributing factors to the rapid down valley groundwater flow that occurs within the Basin.

Figure 3.1-05 presents the main sub-watersheds of the Ventura River Watershed. These sub-watersheds include the Upper Ventura River, Lower Ventura River, Matilija Creek, North Fork Matilija Creek, San Antonio Creek, and Coyote Creek. The mainstem of the Ventura River flows southward approximately 16.2 miles from the confluence of the Matilija Creek and North Fork Matilija Creek to the Pacific Ocean at the Ventura River mouth in the City of Ventura (officially named City of San Buenaventura).

All water in the Ventura River Watershed derives locally from the hydrologic cycle as precipitation, with no water imported from outside the watershed. The watershed is within a Mediterranean-type climatic zone, characterized by a long summer-fall dry season and a cool winter-spring wet season (VRWC, 2015). Rainfall is variable on a seasonal and year-to-year basis, although the watershed tends to experience cycles of wetter and drier years (VRWC, 2015).

Precipitation usually occurs in just a few significant annual storms that occur between November and April (DBSA, 2010a, VRWC, 2015). Snowfall is generally minimal and limited to the upper elevations. Rainfall also varies geographically. Figure 3.1-06 presents the average annual rainfall distribution in the Ventura River Watershed based on the 30-year climate normal from 1981 to 2010 (Flint et al., 2013).

Approximately 40-45 inches of average annual rainfall occur along the northern mountain ridges with only 15 to 25 inches in the lower areas where the UVRGB is located (Tetra Tech, 2009; VRWC, 2015). Figure 3.1-07 shows annual precipitation since 1926 along with the cumulative departure from mean (approximately 21.4 inches for the period of record) for Gauges 020 and 218 within the UVRGB (Figure 3.1-05). As can be seen in Figure 3.1-07, very few years have an average rainfall. The majority of the years (especially in the recent decade) have been drier than average, with the intermittent wet years heavily influencing the average (Leydecker and Grabowsky, 2006; VRWC, 2015). The period from the 1990s to the early 2000s showed the longest stretch of wetter-than-average years, followed by a more than a decade of drier-than-average conditions, including the most recent drought, which began in 2011.

3.1.1.2 Surface Water Bodies [§354.14(d)(5)]

§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.

Surface water flows in the Ventura River Watershed are primarily the result of runoff from precipitation events and, in some areas during dry periods, groundwater discharge and human activities. Figure 3.1-08 shows the major surface water bodies that drain or flow towards the UVRGB, including the mainstem of the Ventura River and associated tributaries. The tributaries include Matilija Creek, North Fork Matilija Creek, San Antonio Creek and Coyote Creek. Flows in the Ventura River, tributaries, and streams are characterized by high spatial and temporal variability. During the wet season, runoff can be "flashy," with sudden rises following the onset of precipitation and relatively rapid declines in streamflow after the rainfall event. Flows can range from near zero to over ten thousand cubic feet per second (cfs) within a few hours during major storms on the mainstem of the Ventura River. During the summer-fall dry season, streamflow at various locations in the watershed is influenced by a complex interaction of factors including precipitation, spring discharges, groundwater levels and pumping, surface water diversions, storage, water supply releases and treated wastewater discharge (Entrix, 2001).

Figure 3.1-08 also shows streamflow hydrographs based on historical gage data for the tributaries and the Ventura River in and around the UVRGB. Table 3.1-01 shows the periods of record and daily flow statistics for pertinent gages on the Ventura River and tributaries.

The Ventura River and its tributaries are characterized by extreme variability. The range between the 5th and 95th percentile daily flows spans two to three orders of magnitudes, with peak flows in thousands of cfs. Average daily flows tend to be 10 times the median daily flows in the Ventura River and tributaries, again indicative of extreme variability. The Matilija Creek, just downstream of Matilija Reservoir, is mostly perennial and is the primary contributors of flows to the Ventura River, upstream of the UVRGB. The North Fork Matilija Creek is also mostly perennial and is the second-largest contributor to flows to the Ventura River, upstream of the UVRGB. Flows are generally lowest in August through October with the highest flow volume occurring in February and March, driven by stormflows. The North Fork Matilija Creek can have very low flows in the late summer and early fall with the highest flows generally in February and March. Matilija Creek and North Fork Matilija Creek merge and become the Ventura River just upstream of the UVRGB boundary.

The Ventura River is perennial in the northern-most reaches within the UVRGB (the Kennedy Area on Figure 3.1-01), but flows decrease as it flows southward towards the Robles Diversion (described in more detail later in this section). Just past the Robles Diversion (at Gage 607) the Ventura River has very low flows (and is often dry) in the summer and early fall months. These dry conditions are typical in the Robles and Santa Ana Areas, except during stormflows in much of the Ventura River. In general, flows are generally highest in the months of January to March and are generally lowest August through October.

San Antonio Creek joins the Ventura River in the southern portion of the UVRGB (in the northern part of the Casitas Springs Area) (Figure 3.1-01). San Antonio Creek tends to be either dry or exhibit very low flows for most of the summer and late fall. Like the other tributaries, flows tend to be highest in March followed by April. The southern reaches of the Ventura River (in the Casitas Springs Area) are typically perennial. Additional discussion on flow conditions in the Ventura River is provided in Sections 3.1.3.2 and 3.2.6.

Coyote Creek joins the Ventura River near the southern Basin Boundary. Flows in this tributary are generally highest in February and March, with low to no flows typically observed from June through November. Casitas Dam is located on Coyote Creek, approximately two miles upstream of the Coyote Creek confluence with the Ventura River.

Flows in the Ventura River at the Foster Park area are generally at their lowest August through October and the River can run dry during dry summer months. Flows in this reach of the Ventura River tend to be highest in February and March. Note that Gage 608 on the Ventura River at Foster Park is downstream of the City of Ventura’s Foster Park Subsurface Dam, wells, and subsurface intake (described in more detail later in this section) that extract water upstream of the gage. Hence, historical flows at Gage 608 have been likely impacted by these extractions.

The Ventura River and tributaries display spatial variability with different reaches being wet or dry during different times of the year. The CDFW and various local water agencies (e.g., MOWD, CMWD, UVRGA, and OBGMA) conduct observations and surveys of the river and stream channels in the Ventura River Watershed. Figure 3.1-09 shows wet, intermittent, and dry reaches of the Ventura River and tributaries within the Ventura River Watershed for spring and late fall of 2016 (Geosyntec and DBSA, 2019).

There are no mapped springs or seeps within the UVRGB; however, rising groundwater in the Casitas Springs Area that discharges to the Ventura River is often referred to as springs, hence the community name Casitas Springs. Several springs and seeps are found in the higher elevation foothills of the Santa Ynez and Topatopa Mountains surrounding the UVRGB (Figure 3.1-08). Seeps and springs are known to contribute to flows in the Matilija Creek, North Fork Matilija Creek (VRWC, 2015), and tributaries to the Ventura River. The seeps and springs are fed by recharge from precipitation along the mountain front, moving through the fractured and weathered bedrock and discharging at lower elevation areas. As such, the seeps and springs likely contribute to winter and spring flows in the tributaries. Since most of the tributaries (apart from Matilija Creek and North Fork Matilija Creek) run dry in the summer; the seeps and springs are not expected to contribute significant flows to these tributaries.

There are three major engineered surface water facilities in the Ventura River Watershed. These include the Matilija Reservoir and Matilija Dam; Casitas Reservoir, including the Robles Diversion and Casitas Dam; and Foster Park, which includes a subsurface dam, subsurface intake, and nearby groundwater extraction wells (Nye wells) used to extract water.

The Matilija Dam is located less than approximately 1 mile upstream of UVRGB. The Matilija Dam was constructed by the Ventura County Flood Control District (VCFCD) in 1947 as a flood control and water supply facility on Matilija Creek. The original storage capacity of Matilija Reservoir was 7,020 acre-feet (AF), but structural modifications necessary to address concrete deterioration and siltation reduced the water storage capacity to less than 500 AF (USBR, 2000; Entrix, 2001). The removal of the dam was authorized in 1998, but removal is still pending.

Casitas Reservoir is the largest reservoir within the watershed. The Casitas Dam was constructed in 1959 by the United States Bureau of Reclamation (USBR), providing a maximum storage capacity of 254,000 AF (Entrix, 2001) with a long-term average demand of 17,500 AF (VRWC, 2015). Water is diverted from the Ventura River via the Robles Diversion and delivered to the reservoir through the Robles Diversion Canal, a concrete-lined 5.4-mile canal (EDAW, 1978). The diversion works consist of a cutoff wall, forebay basin, spillway, fish passage structures, and diversion canal to Casitas Reservoir (CMWD, 2005). Typically, a little less than half of the reservoir supply comes from the Ventura River. Runoff from Coyote and Santa Ana sub-watersheds provides the remainder of its supply (Entrix, 2001). Diversions from Ventura River to Casitas Reservoir are typically from January to March when the river flows are sufficient to meet certain operational regulatory requirements designed to address upstream steelhead migration impediments between the diversion works and just north of the Santa Ana Boulevard bridge. The diversion system has a nominal capacity of 500 cfs (CMWD, 2021). Environmental considerations and physical operating conditions govern operation of the diversion structure under different hydrologic situations. The Biological Opinion (BO) from the National Marine Fisheries Service (adopted in 2004) modified previous requirements for passage of flows for fish habitat. This was further modified during the recent drought to allow increased diversions to the Lake when storage levels in the Lake are low (CMWD, 2021). Within the Migration Period (Jan. 1st to June 30th) outlined in the BO, available flows above 30 cfs up to 500 cfs can be diverted down the Robles Canal, with flows at or below 30 cfs, bypassing the diversion structure and flowing downstream. Additional diversion rules are applied to maintain flows during and after stormflow events within the fish migration season. Outside of the migration period (July 1 to December 31), available flows over 20 cfs up to 500 cfs can be diverted down the Robles Canal.

In addition to the Robles Diversion, there is a privately owned surface water diversion located north of the Robles Diversion (Figure 3.1-08) used for agricultural purposes.

Water from the Lake Casitas Reservoir is the primary water supply for many users in the Basin. Lake Casitas' water is also blended with poorer quality groundwater to improve water quality and extend supplies (VRWC, 2015). The reservoir is carefully managed to maintain supplies during a dry period equivalent to the historical 21-year dry period from 1945 to 1965, the longest dry period on record. While the lake has not yet been put to a "21-year dry period test," it has been a reliable source of water in many multi-year dry periods when numerous wells were dry and there was little flow in the Ventura River (VRWC, 2015).

The Foster Park Subsurface Dam, completed in 1908 by the Ventura County Light and Power Company, is a partial dam extending 973 ft across the Ventura River at a depth ranging between 5 ft to 65 ft with a 300-ft gap on the east side (URS, 2003; USACE, 2004). This partial dam is located just upstream of the boundary between the Upper and Lower Ventura River Groundwater basins. The City of Ventura formerly captured surface flows via a surface diversion. However, this facility has been closed since 2000, due to natural channeling of the Ventura River that has bypassed the structure (Entrix, 2001; VRWC, 2015). The City of Ventura currently extracts water via a subsurface collector consisting of two perforated pipes installed in the subsurface on the upstream side of the dam and several nearby wells (i.e., the "Nye Wells").

3.1.1.3 Imported Water [§354.14(d)(6)]

> **§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.***

Water is not imported to the Ventura River Watershed. Local surface and groundwater sources supply all water demands. CMWD and City of Ventura hold entitlements to the State Water Project; however, there is currently no infrastructure to convey the water into the watershed (VRWC, 2015).

3.1.2 Regional Geology [§354.14(b)(1),(d)(2), and (d)(3)]

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

3.1.2.1 Geologic and Structural Setting [§354.14(b)(1),(d)(2)]

The UVRGB is within the Transverse Ranges geomorphic province, as defined by the California Geological Survey (CGS) Note 36 (CGS, 2002). In general, the faulting and seismicity associated with the Transverse Ranges is the result of the compressional regime associated with the "Big Bend" of the San Andreas Fault Zone. Rocks in this region have been folded into a series of predominantly east-west-trending anticlines and synclines associated with thrust and reverse faults. The Ventura River Watershed is one of the earth's most rapidly uplifting areas, demonstrated by the massive shedding of debris into reservoirs such as Matilija, overturned Cenozoic strata, faulted river terraces, and other indicators of tectonic activity. There is an approximate balance between rate of uplift due to faulting and the rate of Ventura River down-cutting (Rockwell et al., 1984; USBR, 2000), which explains why the young alluvial sediments that comprise the Basin are thin.

Regional crustal shortening due to this compression is largely taken up locally by faults and associated folds in the vicinity of the UVRGB. Major local faults include the Santa Ynez Fault north of the basin, the Arroyo Parida-Santa Ana Fault that bisects the basin, and the Red Mountain-Sulphur Mountain Fault south of the basin (e.g., published geologic maps such as Dibblee, 1987, 1988; and the USGS Earthquake Hazards Program (USGS, 2020). Faulting can offset bedrock and older (deeper) alluvium deposits, potentially form subsurface barriers to water flow, and force groundwater to daylight to ground surface and discharge into surface water channels.

Within this regional setting, the UVRGB extends from just downstream of the confluence of the Matilija Creek and the North Fork Matilija Creek (Ventura River Mile 16.2) to Foster Park (Ventura River Mile 5.9). In the north and west, the UVRGB is bounded by tertiary bedrock outcrops (Figure 3.1-10a). The boundary between the UVRGB and adjacent Ojai Basin is approximately situated between Camp Comfort to the south and Arbolada to the north. South of the Ojai Basin boundary, the UVRGB is bounded by the Arroyo Parida-Santa Ana Fault and bedrock outcrops. The UVRGB is bounded by the Lower Ventura River Groundwater Basin to the south.

Figures 3.1-10a and 3.1-10b show the surface geology and major fault systems within and surrounding the UVRGB (USGS, 2006, 2015). The UVRGB is filled with Quaternary-aged alluvium of largely fluvial origin, with sediment derived from the weathering and erosion of the surrounding mountains. These deposits consist of older late Pleistocene-aged, dissected sediments and younger Holocene-aged sediments. Active sedimentation occurs as stream-channel deposits of sand and gravel, such as along Ventura River and its tributary creeks; alluvial fan deposits of gravel; and floodplain alluvium of clay, silt, sand, and gravel (e.g., Dibblee, 1987, 1988).

The UVRGB extends as a north-south trending narrow and shallow erosional trough, filled with young alluvium deposited by the Ventura River between Camino Cielo Road in the north and the United States Geological Survey (USGS) gauging station at Casitas Vista Bridge in the south. The young alluvial deposits are highly permeable (hydraulic conductivity as high as approximately 3,500 feet per day) and have relatively high storage coefficients (specific yield as high as approximately 14%). North of approximately Highway 150, the young alluvial deposits are typically underlain by older alluvium that has significantly lower permeability and water storage capabilities. South of approximately Highway 150 the Ventura River may has eroded completely through the older alluvium deposits and the young alluvial deposits are in direct contact with the bedrock (as evidenced from the bedrock outcrops along the edges of the river floodplain).

The eastern portion of the UVRGB extends east from the Ventura River encompassing the communities of Meiners Oaks and Mira Monte and is underlain by older alluvium deposits that are generally above the water table and various bedrock formations which have limited hydraulic connectivity with the Ventura River. Many wells in the Mira Monte – Meiners Oaks Area may be screened in the Ojai Conglomerate, a bedrock formation that has low permeability and water storage capability (for example, the yield of a relatively new municipal well in this area is only approximately 50 gallons per minute). The “Terrace” areas west of the Ventura River is also underlain by older alluvium that is uplifted above the regional water table and, hence, is largely hydraulically disconnected from the principal aquifer of the Basin. Wells in the Terrace Area appear to generally draw water from the underlying Sepse Formation.

The relatively young (Holocene- to late Pleistocene-aged) surficial sediments unconformably overlie older Pleistocene- and Tertiary-aged consolidated sedimentary rocks (discussed in more detail in Section 3.1.3.1 and shown on cross-sections in Figures 3.1-16 through 3.1-18). The older bedrock units consist of sedimentary rocks of dominantly marine deposition, which are exposed to ground surface in the mountainous regions that surround the basins (e.g., Dibblee, 1987; USGS, 2006, 2015).

From oldest to youngest, these units include (USGS, 2015):

- Eocene-aged Juncal Formation (Tj), Matilija Sandstone (Tma), Cozy Dell Shale (Tcd), and Coldwater Sandstone (Tcw).

- Eocene- to Oligocene-aged and terrestrially deposited Sespe Formation (Tsp).
- Miocene-aged Vaqueros Sandstone (Tvq), Rincon Shale (Tr), and Monterey Shale (Tm).
- Pleistocene Ojai Conglomerate and Casitas Formation.

While less-permeable bedrock formations contribute to the UVRGB hydrologic system by funneling tributary surface water flows (SWRCB, 1956, revised) and possibly through groundwater flow from the fractured and weathered formations into the alluvium (DBSA, 2010a). It is noted that the Ojai Conglomerate and Casitas Formation may be partly correlative with older alluvial deposits and difficult to distinguish in the subsurface; some wells drilled in the Mira Monte / Meiners Oaks Area appear to be partially or wholly screened in these units (USGS, 2015).

Due to the complexity of the geologic setting and different research goals, there are some differences in the geologic mapping within the basin. Figure 3.1-11 shows a comparison of the surface geology from USGS (2005) and a more recent, detailed geologic investigation in the central part of the basin (USGS, 2015). Primary differences were related to the bedrock outcrops in and around the Ventura River in the southern Robles Area. Local field reconnaissance and mapping conducted in March 2020 indicated that the USGS [2015] surface geology was more consistent with observed field conditions (J. Kear, email communication, March 15, 2020). Overall, the bedrock outcrops shown in the northeast and western boundary of the Ventura River floodplain (USGS, 2015) were confirmed; however, no evidence was found of the bedrock outcrops within the Ventura River floodplain shown by USGS (2005). The outcrop areas confirmed and not observed in the 2020 mapping are indicated on Figure 3.1-11.

A series of east-west trending reverse faults cross the Basin along which bedrock units are uplifted and affect the aquifer thickness and groundwater flow, as described further in Section 3.1.3.1.2 (Figure 3.2-03).

Soil Characteristics [§354.14 (d)(3)]

Figure 3.1-12 presents the soil hydrologic group map based on the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Soil Survey Geographic Database (USDA, 2020). The soil hydrologic group is an assessment of soil infiltration rates that is determined by the water-transmitting properties of the soil, including the hydraulic conductivity and percentage of clays in the soil, relative to sands and gravels. Soils are assigned to one of the following four groups according to the rate of water infiltration when the soils are not protected by vegetation, are saturated, and receive precipitation from long-duration storms.

- *Group A*. Soils having a high infiltration rate (low runoff potential); consisting of deep, well-drained to excessively drained sands or gravelly sands.
- *Group B*. Soils having a moderate infiltration rate; consisting of moderately deep or deep, moderately well-drained or well-drained soils that have moderately fine texture to moderately coarse texture.
- *Group C*. Soils having a slow infiltration rate; consisting of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture.

- *Group D*. Soils having a very slow infiltration rate (high runoff potential); consisting of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material.

In general, the group correlates with the hydraulic conductivity of the underlying geologic units, with the higher soil hydraulic conductivity zones (Group A) corresponding to alluvium along active channels or to sandstone-dominated bedrock formations and some stream terrace deposits (Group B), and the lower soil hydraulic conductivity zones corresponding to the colluvium and older alluvial deposits (Group C) and siltstone/shale-dominated bedrock formations (Groups C and D).

Figure 3.1-12 shows that soils within the Ventura River floodplain north of the Santa Ana Boulevard bridge primarily consist of Group A soils; which consist of deep, well-drained to excessively drained sands or gravelly sands of a high infiltration rate. Soils outside of the flood plain are primarily Group C soils consisting of a layer which impedes the downward movement of water or are of moderately fine texture/fine texture with a low infiltration rate. There are two small areas in the UVRGB that are of Group D, consisting of clays at or near the surface with a very slow infiltration rate and high runoff potential. These areas are associated with older alluvium, which are associated with Group C soils elsewhere in the Basin.

The Ventura River Watershed is considered to have some of the highest sediment yields in the United States. Its steep topography in the headwaters produces most of the sediment supplied to the river through mass-wasting processes (USBR, 2000; Entrix 2001). There is a relationship between wet/dry cycles and flood, fires, sediment transport and other factors within the watershed. Wildfires are believed to have a large impact on sediment production in the watershed by increasing the erodibility of hillslopes (Entrix, 2001) and can have short- and long-term impacts on water supplies, including increasing treatment costs, diminishing reservoir capacity, and the need for alternative supplies (Smith et al., 2011).

Historically, moderate wildfires have occurred once every 10 years on average, and extreme wildfires have occurred every 20 years within the Ventura River Watershed (VRWC, 2015). The Thomas Fire, which burned over 280,000 acres (about 440 square miles) between December 4, 2017, and January 12, 2018, was the largest fire in state history at that time. The fire burned 80% of the watershed (VCRCD, 2018) as shown in Figure 3.1-13. The debris (ash and fine-grained sediment) eroded from intense but short-duration rain events after the fire have likely had a near-term impact on the soil infiltration rates and the runoff, recharge, and water quality characteristics of the watershed by clogging the sands and gravels along the channel bottom and limiting percolation/recharge. Given the history of wildfires in the watershed and the fact that the UVRGB had high percolation rates before the Thomas Fire, demonstrate that high-flow events erode and remove the fines and redeposit coarse materials, returning the basin to prior conditions. Therefore, fires are not anticipated to have a long-term impact the Basin.

3.1.3 Principal Aquifers and Aquitards [§354.14(b)(4)(A)]

§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.

Bulletin 118 defines a “groundwater basin” as an alluvial aquifer or a stacked series of alluvial aquifers with reasonably well-defined boundaries in a lateral direction and a definable bottom. Rock or sediments with very low permeability or a geologic structure such as a fault act as lateral basin boundaries that significantly impede groundwater flow. Bottom boundaries include rock or sediments of very low permeability if no alluvial aquifers occur below those sediments within the basin (DWR, 2016).

Bulletin 118 defines an “aquifer” as a body of rock or sediment that yields significant or economic amounts of groundwater to wells or springs. The GSP Emergency Regulations define a “Principal Aquifer” as aquifers or aquifer systems that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems. One principal aquifer, consisting of the Holocene and Pleistocene alluvial deposits within the basin boundary, is currently recognized in the UVRGB (DWR, 2016). The bedrock formations that underlie the aquifer (such as the Sespe Formation, Rincon Shale, and Monterey Formation) have low permeability and are not known to yield significant amounts of groundwater within the UVRGB but may be sufficient for limited domestic supplies. The Ojai Conglomerate is identified by USGS (2015) as a bedrock unit but is also described as possibly being partially correlative with the “older alluvial deposits”, although no “older alluvial deposits” are mapped by USGS (2015) in the and immediately surrounding the Basin. The yield of a relatively new municipal well completed in the Ojai Conglomerate is only approximately 50 gallons per minute, indicating the low permeability of this formation. Because the current basin boundary includes a large area where the water table exists within the Ojai Conglomeration (below the mapped alluvium units), the Ojai Conglomerate is included in the definition of the principal aquifer for the purposes of this GSP. UVRGA may revisit this issue in the future and may seek a future basin boundary modification to remove the portion of the Basin where the water table occurs within the Ojai Conglomerate.

3.1.3.1 Physical Properties of the Aquifers and Aquitards

3.1.3.1.1 Basin Boundary (Vertical and Lateral Extent of Basin) [§354.14(b)(2),(b)(3),(b)(4)(B), and (c)]

§ 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.

(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.

The UVRGB extends as a north-south trending narrow trough, from the formation of the Ventura River near the confluence of Matilija Creek and North Fork Matilija Creek, to the Coyote Creek confluence with the Ventura River at the Foster Park (partial) Underground Dam, and south to the basin boundary at the USGS gaging station at Casitas Vista Bridge. The UVRGB also extends east of the river corridor beneath the communities of Meiners Oaks and Mira Monte toward the Ojai Basin (a.k.a. the “Mira Monte / Meiners Oaks Area”). The Mira Monte / Meiners Oaks Area is quite different from the main part of the Basin located along the Ventura River in that the water table is generally below the base of the alluvium and instead occurs in bedrock units Ojai Conglomerate and Sespe Formation. The Basin also extends west of the river corridor near Highway 150 into the “Terrace” Area, which has older alluvium that is uplifted above the regional water table and separated from the remainder of the Basin by bedrock outcrops in the western bank of the Ventura River. Hence, the Terraces Area is largely hydraulically disconnected from the principal aquifer of the Basin. Wells in the Terraces Area appear to generally draw water from the underlying Sepse Formation.

The original basin boundary of the UVRGB was delineated in Bulletin 118 in 2003 (DWR, 2003). The boundary was modified (Kear, 2016) and approved by DWR in 2016. As shown in Figure 3.1-03, the UVRGB (Basin No. 4-3.01, Department of Water Resources, Bulletin 118) is bounded by the Lower Ventura River Groundwater Basin (No. 4-3.02) on the south, by the Ojai Valley Groundwater Basin (No. 4-2) on the east, and elsewhere by the uplifted bedrock formations of the Santa Ynez Mountains (VRWC, 2015). The lateral extent of the UVRGB is defined as follows:

- The northern and southern boundaries correspond to uplifted bedrock and thin to non-existent alluvium (see surface geology in Figures 3.1-10a and 3.1-10b and cross-section A-A’ shown in Figures 3.1-16 and 3.1-17).
- The eastern boundary with the Ojai basin is located approximately between Camp Comfort to the south and Arbolada to the north. This eastern boundary corresponds to a recognized groundwater and surface water divide (SGD, 1992; VCFCD, 1971; Kear, 2016) and a bedrock high. Evaluation of the geologic maps and other data during GSP development suggests that that significant areas of alluvium along the eastern boundary near Meiners Oaks may lie above the water table due to shallow Sespe Formation. This may be the subject of a future basin boundary modification (Figure 3.1-14).
- Between the Ojai Basin Boundary and the Ventura River, the UVRGB is bounded by the east-west trending Arroyo Parida-Santa Ana Fault, which has uplifted and juxtaposed bedrock against the alluvial deposits of the Basin to the north. Evaluation of the geologic maps and other data during GSP development suggests that that significant areas of alluvium in the community of Mira Monte lie above the water table and instead occurs within the Ojai Conglomerate (youngest bedrock formation in the region), which is exposed in this area (Figures 3.1-10b and 3.2-03). A future basin boundary modification may be pursued to remove this area from the basin boundary (Figure 3.1-14).
- The western boundary generally corresponds to bedrock outcrops. The western basin boundary in the “Terraces” area is an approximation of the Sespe Formation subcrop beneath elevated alluvium in this area (see surface geology in Figures 3.1-10a and 3.1-10b and cross-section B-B’ shown in Figures 3.1-16 and 3.1-18). Evaluation of the geologic maps during GSP development suggests that a more appropriate location of this boundary may be at the western bank of the Ventura River, where USGS (2015) has mapped Sespe Formation outcrops in the wall of the river bank (Figure 3.1-10b). This may be the subject of a future basin boundary modification (Figure 3.1-14).

The UVRGB boundaries cross four significant surface water entry and exit points, including Camino Cielo Bridge just downstream of the confluence of the Matilija and North Fork Matilija Creek in the north part of UVRGB, Coyote Creek in the southwest, San Antonio Creek on the southeast, and Casitas Vista Bridge on the Ventura River in the south (Kear, 2016).

The water-bearing units within the Ventura River system consist of unconsolidated to semi-consolidated sediments of Holocene and Pleistocene age. The aquifer materials overlie low-permeability consolidated bedrock formations described in Section 3.1.2.1 and 3.1.3, representing the effective base of the Basin. As discussed in Section 3.1.3, the Ojai Conglomerate, identified by USGS (2015) as a bedrock unit, is treated as alluvium because USGS (2015) describes it as possibly being partially correlative with the “older alluvial deposits”, although no “older alluvial deposits” are mapped by USGS (2015) in and immediately surrounding the Basin. UVRGA may revisit this issue in the future and may seek a future basin boundary modification to remove the portion of the Basin where the water table occurs within the Ojai Conglomerate due to its low permeability. Based on the foregoing, the vertical extent, or bottom of the Basin, is considered to be the contact between alluvium or Ojai Conglomerate and the various tertiary bedrock formations (Figures 3.1-15, 3.1-17, and 3.1-18). Preliminary estimates of bedrock elevations were obtained from a regional modeling study for the Ventura River Watershed being performed pursuant to the California Water Action Plan (Ventura River Instream Flow Program) (DBSA, 2020). The regional bedrock elevation mapping was refined by incorporating high resolution ground surface elevation (Light Detection and Ranging - LIDAR) data and additional subsurface data from well construction records and studies not considered or interpreted differently by Daniel B. Stephens & Associates (DBSA). These studies include those by Fugro (2002, 2015), hydrogeologic investigations and studies (Hopkins, 2007; VCFCD, 1971; Entrix, 2001), published cross-sections (Fugro, 2002; Entrix, 2001), and basin-specific surface geology information (USGS, 2005, 2015). The bedrock surface was further refined during the numerical modeling as described in Appendix F.

The bottom of the Basin within the UVRGB is shown on Figure 3.1-15. The approximate area of exposed and/or shallow Ojai Conglomerate is indicated on this and other figures. Figure 3.1-15 shows the corresponding basin thickness. Note, the basin thickness shown in Figure 3.1-15 includes the Ojai Conglomerate deposits, which were initially characterized as alluvium in 2005 (USGS) and then as bedrock in 2015 (USGS). As such, much of the alluvium thickness in the Mira Monte/Meiners Oaks Area consists of the Ojai Conglomerate, which is consolidated and has a much lower permeability and yield compared to the unconsolidated principal alluvial aquifer. Two cross-sections were created to show the variation in topography, alluvium thickness, and bedrock elevations within the UVRGB along the Ventura River and in an east-west direction across the “Terraces Area,” river corridor, and Southern Mira Monte/Meiners Oaks Area. Figure 3.1-16 shows the locations of these cross-sections in relation to the surface geology, faults (from USGS, 2015), Ventura River and major tributaries, and highways. The location of select wells used to refine the stratigraphy within the UVRGB are also shown. Figures 3.1-18 and 3.1-19 present the north-south and east-west, respectively, cross-sections of the UVRGB.

As can be seen on cross-section A-A’ (north-south, Figure 3.1-18), the younger (Holocene-age) alluvium deposited by the Ventura River overlies the older (Pleistocene-age) alluvium, which overlies bedrock north of the Villanova Fault. The younger alluvium deposits are interpreted to be relatively thin, ranging from a few feet to perhaps approximately 50 ft within the Ventura River floodplain (differentiation of younger and older alluvium using available data is generally not possible). The maximum total thickness of alluvium along the Ventura River is approximately 180 feet between the Robles Diversion and an unnamed fault to the south. Cross-section B-B’ (east-west, Figure 3.1-19) crosses the Ventura River near Highway 150. As shown in the cross-section, younger alluvium is absent west and east of the Ventura River. Older alluvium west of the Ventura River in the Terrace Area is separated from the alluvium east of the Ventura River west bank by bedrock. Older alluvium east of the Ventura River overlies Ojai Conglomerate. The water table in relation to the basin thickness is shown on Figure 3.2-03 and discussed in Section 3.2.

The thickness of aquifer materials varies along the river due to interplay of faulting and erosion/deposition by the Ventura River. Along the Upper Ventura River, the water-bearing units increase in thickness downstream of the confluence of Matilija Creek and North Fork Matilija Creek, with a maximum depth of more than 180 ft in the Robles Area. The depth to bedrock increases sharply south of the Kennedy Area into the Robles Area. This has an impact on the (unconfined) water levels that tend to be much deeper in the Robles Area, leading to surface water percolation and greater frequency of dry river conditions in much of this area. Faulting has uplifted bedrock in certain areas (as evidenced by bedrock outcrops along the unnamed fault in the central part of the Robles and Mira Monte/Meiners Oaks Areas). In these areas, alluvium is thinner because the uplift is causing the Ventura River to erode through its prior deposits faster to maintain the surface water flow gradient. South of the Arroyo Parida-Santa Ana fault and Villanova Faults, alluvium thickness beneath the Ventura River floodplain ranges from about 65 ft in the Mira Monte Area to 45 to 60 ft in the Foster Park Area. Small changes in bedrock elevations and lateral extents in the Santa Ana and Casitas Springs Areas (for example near the Santa Ana Boulevard bridge and the San Antonio confluence), likely influence the groundwater flow system in these areas.

3.1.3.1.2 Groundwater Flow Barriers [§354.14(b)(4)(C) and (c)]

§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:*

(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.

A series of east-west trending reverse faults cross the Basin along which bedrock units are uplifted affecting the aquifer thickness and groundwater flow (Figures 3.1-10a and b). The effect of faulting on erosion and deposition by the Ventura River has resulted in generally thicker alluvium north of Santa Ana Blvd. and generally thinner alluvium near Santa Ana Blvd and to the south (Figure 3.1-18). During periods of low water table conditions (i.e., dry conditions), the alluvial aquifer can become completely desaturated near Santa Ana Blvd, temporarily disconnecting the upper 2/3 and lower 1/3 of the Basin (Figure 3.2-03). An unnamed fault located north of Highway 150 uplifts the Sepse Formation significantly reducing alluvium thickness locally and causing an abrupt narrowing of the Ventura River channel near Meiners Oaks. This feature subdivides the area north of the Highway 150 into two groundwater storage areas along the Ventura River, which can become hydraulically disconnected during low water table conditions (Figure 3.2-03). During periods of high groundwater levels, the reduced alluvium thickness near the fault can cause groundwater to temporarily discharge to the Ventura River channel. This also occurs near the Arroyo Parida – Santa Ana Fault.

Within the UVRGB, groundwater is believed to be predominantly unconfined. There is no evidence of regional aquitards restricting vertical flows within the UVRGB. Semi-confined conditions may exist locally (in the deeper portion of the basin) depending on water levels and the presence of clay-rich and fine-grained overbank deposits forming lower-permeability caps (confining units) over the more permeable and older channel deposits (Fugro Consultants, 2002; Cardno-Entrix, 2012).

3.1.3.1.3 Hydraulic Properties [§354.14(b)(4)(B)]

§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.***

Holocene and Pleistocene alluvium deposits and the Ojai Conglomerate comprise the single principal aquifer in the UVRGB. The younger and older alluvium likely have different hydraulic and storage properties, with the younger alluvium having higher permeability and storativity and the older, more consolidated alluvium having lower permeability and storativity. The variable properties combined with the depth and lateral extent of the alluvium and variable groundwater levels has a significant impact on groundwater flow and the productivity of the aquifer in different areas within the UVRGB and at different times.

The ability of an aquifer to transmit and store water is characterized by aquifer parameters, including hydraulic conductivity, transmissivity, specific yield, and storativity. Hydraulic conductivity is a measure of an aquifer's capacity to transmit water. It is defined as rate of flow under a unit hydraulic gradient through a unit cross-sectional area of an aquifer.

Aquifer transmissivity is the rate of flow under a unit hydraulic gradient through unit width of aquifer of given saturated thickness. It is the product of the hydraulic conductivity and aquifer thickness. More transmissive aquifers produce groundwater at higher rates to wells. Storativity is a dimensionless measure of a volume of water that is discharged from an aquifer, per unit area of the aquifer, per unit reduction in hydraulic head. In an unconfined aquifer like the UVRGB, the small effect of rock and fluid compressibilities is neglected, and therefore storativity is essentially equivalent to specific yield. Specific yield is the volume of water that will drain under the force of gravity from unit bulk volume of the aquifer.

The most reliable estimates of these parameters are obtained through long-term controlled aquifer or pumping tests (greater than 24 hours) with groundwater level monitoring in nearby non-pumping wells. Estimates may also be obtained through short-term pumping tests and literature values based on soil types and well driller logs. Within the UVRGB alluvial deposits, the aquifer is comprised of sand, gravel, cobbles, boulders, silt, and clay; often with interstratified, lenticular, and discontinuous sediment units. Sedimentary structures include channel-fill deposits, point bars, and overbank deposits. As a result of these complex depositional features, aquifer parameters can vary greatly over short distances.

Within the UVRGB, limited data is available for estimates of transmissivity from long-term aquifer tests. The data also shows a wide range in estimates across different aquifer/pump tests. Some of the variability may be driven by changes in saturated thickness (due to variable groundwater level conditions over time), impacting transmissivity estimates in the unconfined aquifer.

Figure 3.1-20 shows the location and range in values of transmissivities estimates from long-term aquifer tests. Figure 3.1-21 shows the locations and range in values of transmissivities estimated from specific capacity tests (specific capacities were converted to transmissivity using a conversion factor of 1,500 gallons per day/gallons per minute [gpd/gpm] corresponding to unconfined aquifers, based on Driscoll [1986]).

Transmissivity estimates in the Robles Area range from 1,299,000 gpd/ft (Kear, 2012) in the central part of the Robles Area to 15,000 gpd/ft to 75,000 gpd/ft (Kear, 2012, Kear, 2018a) in the southern part of the Robles Area. Given unconfined conditions, these transmissivities are dependent on water level conditions and the saturated thickness of the alluvium during the aquifer/pump tests; hence, the effective transmissivities may vary over time depending on water level conditions. The transmissivity estimates will also be dependent on the relative saturated thickness of the younger and (deeper and more consolidated) older alluvium that the wells are screened in, with lower transmissivities indicative of wells screened in more of the older alluvium deposits. Assuming a nominal saturated thickness of 50 ft (representative of water level conditions in the area – see Figure 3.2-03), the transmissivity range (15,000 gpd/ft to 1,299,000 gpd/ft) translates to a hydraulic conductivity range of 40 ft/d to 3,500 ft/d.

Transmissivity estimates in the Mira Monte/Meiners Oaks Area are much lower – in the range of 4,000 gpd/ft to 6,000 gpd/ft – indicating that the older alluvium (e.g., the Ojai Conglomerate) in this area is more consolidated and less permeable compared to the younger alluvium within the River floodplain, or perhaps wells are screened wholly or in part within the Ojai Conglomerate bedrock unit. Assuming a nominal saturated thickness of 200 ft (representative of water level conditions in the area – see Figure 3.2-04), the transmissivity range translates to a hydraulic conductivity range of approximately 2 ft/d to 4 ft/d.

Transmissivity estimates in the Casitas Springs Area are in the range of 13,500 gpd/ft to approximately 850,000 gpd/ft (Hopkins, 2007; Fugro 2002). Assuming a nominal saturated thickness of 50 ft (representative of water level conditions in the area – see Figure 3.2-03), the transmissivity range translates to a hydraulic conductivity range of approximately 360 ft/d to 2,300 ft/d. As with the other transmissivity estimates, the alluvium thickness and water levels influence specific capacities/transmissivity estimates in the Casitas Springs Area, due to unconfined conditions leading to both spatial and temporal variability in these estimates.

The transmissivity estimates from aquifer and specific capacity tests were used to derive preliminary estimates of hydraulic conductivities for the UVRGB numerical model. The model consists of two layers: the shallow, more permeable alluvium along the Ventura River floodplain; and the underlying deeper, more consolidated, lower permeability alluvium (inclusive of the Ojai Conglomerate bedrock unit) across the Basin. Conductivities for both model layers were calibrated to match simulated and observed water levels and streamflows (Appendix F). Figure 3.1-22 shows the vertically averaged hydraulic conductivity distribution for the two model layers. Calibrated hydraulic conductivities range from 1 ft/d (representative of the low-permeability Ojai Conglomerate in the Mira Monte/Meiners Oaks Area) to 5000 ft/d (representative of the high-permeability young alluvium in the Ventura River floodplain).

The average specific yield of the UVRGB as a whole has been historically estimated at 8% (SWRCB, 1956). Specific yield estimates (equivalent to storativity under unconfined conditions) were also compiled from previous studies, as well as pump and aquifer tests conducted within the basin. VCFCD (1971) divided the UVRGB into zones and estimated specific yields based on the lithology in each area. Figure 3.1-23 shows the specific yield estimates from VCFCD (1971), along with estimates from aquifer tests. In general, the specific yield within the Ventura River floodplain (with younger alluvium overlying the older alluvium) tends to be higher, ranging from 7% to 14%, with higher values seen in the Kennedy, Santa Ana, and Casita

Springs areas, where younger alluvium contributes to more of the alluvium thickness (Figure 3.1-19). Specific yields in the Mira Monte/Meiners Oaks Area are much lower, ranging from 3% to 6%, owing to the more consolidated and less permeable nature of the older alluvium in this area. Specific yields were calibrated during the numerical modeling phase (Appendix F), to better match simulated and observed water-level fluctuations. Figure 3.1-24 shows the calibrated specific yields (vertically averaged across both layers, based on relative layer thickness) for the UVRGB numerical model. Calibrated specific yields range from 10% to 20%.

3.1.3.2 Groundwater Recharge and Discharge Areas [§354.14(d)(4)]

§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.*

The UVRGB is unconfined and has an open and direct relationship with the precipitation and surface water of the Ventura River and tributaries crossing the Basin (EDAW, 1978; VCFCD, 1971; Entrix, 2001; DBSA, 2006; Tetra Tech, 2009; Hopkins, 2010; DBSA, 2010a; VRWC, 2015). Owing to the unconfined conditions, groundwater recharge occurs throughout the basin in response to infiltration of precipitation; and, where applicable, percolation of tributary flows, return flows from applied waters, septic system leachate, and water distribution system losses. The primary source of recharge in the UVRGB is percolation of surface water; thus, the primary recharge area in the basin is that portion of the Basin where the Ventura River is typically a losing stream. Figure 3.1-25 shows the primary areas for surface water recharge and discharges within the UVRGB. Figure 3.1-25 also shows typical hydrologic conditions of the Upper Ventura River, as these are linked to the recharge and discharge areas. As shown on the figure, the primary area of recharge from surface water runs along the Ventura River in the Kennedy Area, Robles Area, and much of the Santa Ana Area. The primary groundwater discharge area of the UVRGB is coincident with those portions of the Basin where the Ventura River is more typically a gaining stream and phreatophytes are prevalent. The conditions exist in the Casitas Springs Area, where rising groundwater contributes to surface water flow in the Ventura River and is consumed by evaporation and transpiration by phreatophytes (plants that draw water from near the groundwater table).

Surface and groundwater flows, along with associated recharge and discharge processes operative within each hydrogeologic area, are described below.

- **Kennedy Area** - The Kennedy Area stretches from the Ventura River headwaters past the Matilija Reservoir down to a "Kennedy Narrows," where bedrock constricts the lateral and vertical extent of the alluvium. Flow is typically perennial along this section, and it is generally a losing reach where the Ventura River recharges the UVRGB (Entrix, 2001; VRWC, 2015). Hence, the primary recharge processes in this area are along the Ventura River and its tributaries. Primary discharge processes in this area are pumping and evapotranspiration from phreatophytes (VRWC, 2015).
- **Robles Area** - The Robles Area extends from Kennedy Narrows to the Arroyo Parida-Santa Ana Fault (see Figure 3.1-10a and 3.1-01). The primary recharge process in this area is intermittent (and highly variable) percolation from the Ventura River (and tributaries) Primary discharge

process in this area is groundwater pumping and rising groundwater to the Ventura River during periods of high groundwater levels. The Robles Diversion Facility is located within this area, where it diverts a significant portion of surface water to Lake Casitas. Bedrock elevations and alluvium thickness changes dramatically as the Ventura River emerges from the Kennedy Narrows and enters the Robles Area. While the alluvium thickness is approximately 30-80 ft in the Kennedy Area, it can be more than 180 ft in the deepest part of the Robles Area. The gradient of the Ventura River flattens, resulting in the deposition of boulders, cobbles and sediments that have eroded from upstream. Water rapidly filters through these coarse sediments into the aquifer. Streamflow rapidly percolates in the upstream sections in the Robles Area, and this section of the Ventura River has intermittent flow. In low to moderate rainfall years, the surface water quickly disappears into the underlying aquifer following a storm, recharging the UVRGB. The extent of the dry conditions depends on the magnitude of the previous rainy season, underlying storage conditions, and time of year (VRWC, 2015) and can extend from approximately Kennedy Canyon to San Antonio Creek. Modeled groundwater levels suggest that the Ventura River is generally disconnected from the water table in the Robles Area.

- **Mira Monte/Meiners Oaks Area** - the Mira Monte/Meiners Oaks Area receives recharge from precipitation and percolation of tributary flows, return flows from applied waters (landscape and agricultural irrigation), septic system leachate, and water distribution system losses. Groundwater pumping is the primary discharge process in this area.
- **Santa Ana Area** - The primary recharge process in the Santa Ana Area is intermittent (and variable) recharge from the Ventura River. Primary discharge processes in this area are groundwater discharge to the Ventura River, groundwater pumping, evaporation, and phreatophyte transpiration (VRWC, 2015). The river channel narrows and the alluvium thins in this area notably in the Santa Ana Area, as compared to the Robles Area to the north. the Ventura River is intermittent in the Santa Ana Area (VRWC, 2015).
- **Casitas Springs Area** - The Casitas Springs Area extends from just north of the confluence of Ventura River with San Antonio Creek to Foster Park and encompasses the lower portion of the Basin that generally has perennial surface water flow. Primary discharge processes in this area include groundwater discharge to the Ventura River, groundwater pumping, evaporation, and phreatophyte transpiration (VRWC, 2015). With exception to multi-year droughts, this section of the river generally flows year-round, receiving water from San Antonio Creek along with groundwater discharge to the Ventura River from the UVRGB principal aquifer. This may be referred to as the "live [wet] reach" (VRWC, 2015), although it is noted that small reaches of the Ventura River in this area do exhibit no flow at times when the remainder of the area has flow. The area may also receive recharge from fractured bedrock seepage fed by Lake Casitas (DBSA, 2010a).

As noted in Section 3.1.1.2 there are no mapped seeps or springs within the UVRGB. Adjacent seeps and springs along the tributaries of the Ventura River are shown in Figure 3.1-08. As discussed in Section 3.1.1.2, the seeps and springs discharge water that percolates and moves through the fractured and weathered bedrock after rain events. As such, the seeps and springs are expected to contribute to the stormflows and baseflows in the tributaries during winter and spring months. Given that most of the tributaries (except Matilija Creek and North Fork Matilija Creek) are seasonal in nature, and run dry during the summer and fall, the seeps and springs are not expected to contribute significant quantities of water during these periods. Wetlands within the UVRGB correspond to areas of shallow and/or rising groundwater in the perennial reaches of the River. These wetland areas (including in-channel riverine habitat) have been mapped by The Nature Conservancy and are shown in Figure 3.2-14.

3.1.3.3 Water Quality [§354.14(b)(4)(D)]

§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.

Groundwater Chemistry

Major ion water chemistry data from 39 wells and three surface water monitoring stations was compiled from available references and analyzed to assess general water chemistry characteristics of the groundwater and surface water in different parts of the basin. Figure 3.1-26 shows Piper diagrams (Piper, 1944) with major ion chemistry from groundwater wells in the six hydrogeologic areas and surface water monitoring stations. The cluster of data points shown in the first Piper diagram are aggregated to show general zones for each area on the diagram below. General mineral characteristics for different types of water and geologies are summarized below:

- Calcium is associated with minerals in igneous rocks (e.g. chain silicate pyroxenes, amphibole, and feldspars [albite and anorthite]) rocks, sedimentary rocks (i.e., carbonate), and other silicate minerals in metamorphic rocks (Hem, 1985).
- Sodium is also associated with feldspars (Hem, 1985).
- Chloride is associated with evaporites and marine water (Hem, 1985).
- Sulfate is associated with minerals (e.g., pyrites, gypsum) in igneous rocks and sedimentary rocks (i.e., shale) (Hem, 1985).
- Bicarbonate waters are indicative of atmospherically recharged meteoric water interacting with the soil and shallow bedrock (Frape et al., 2003; Hagmaier, 1971).

Overall, the groundwater and surface water in the UVRGB are a mixture of calcium-sulfate and calcium-bicarbonate waters.. Water of more calcium-sulfate type is expected to be attributed to wells where groundwater has had a higher degree of interaction with gypsum in evaporites or shale or mudstone, while water of more calcium-bicarbonate type is expected to be attributed to more direct (i.e., atmospheric) recharge.

The Mira Monte/Meiners Oaks Area wells show greater variability in the relative ratios of cations (e.g., sodium) and anions (e.g., bicarbonate, sulfate and chloride). Wells with higher sodium and chloride are deeper and represent older groundwater that is targeted by wells in this area, while wells with relatively higher ratios of bicarbonate are those nearest the River (i.e., young groundwater) and relatively shallow. Groundwater in the Kennedy, Robles, and Casitas Springs areas has similar major ion chemistry that is similar to that of Ventura River and Matilija Creek, indicating a primary source of recharge is percolation of surface water flows. The major ion chemistry of most groundwater samples from the Santa Ana Area overlaps with the Kennedy Area, Robles Area, and Casitas Springs Area patterns. However the major ion chemistry of a few samples from the Santa Ana Area overlaps with the Mira Monte/Meiners Oaks ion pattern, suggesting that some of the groundwater in the Santa Ana Area may be underflow from the Mira Monte/Meiners Oaks Area. A few of the Santa Ana Area samples are enriched in sulfate, indicating that these samples may have been collected from wells that produce groundwater from a bedrock formation. Groundwater from the well in the Terraces Area has a sodium-chloride type (and total dissolved solids [TDS] >5,000 milligrams per liter [mg/L]), which is representative of older groundwater. Given the relatively unique water type of this well in the Terraces Area, the geochemistry suggests this area has a low degree of hydraulically connectivity with the remainder of the UVRGB.

Groundwater Quality

The UVRGB has historically maintained generally good water quality. The Regional Water Quality Control Board's Basin Plan also establishes groundwater quality "objectives" as "the allowable limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area" (RWQCB-LA, 2019). The groundwater quality objectives are shown in the Table 3.1-02.

Figures 3.1-26 and 3.1-27 show median concentrations for nitrate (as N) calculated over data available from 1969 to 2019 (long-term) and data available from 2008 to 2019 (recent), respectively. Chemographs for select wells with good temporal data coverage are shown for each hydrogeologic area. Wells with median nitrate higher than the water quality objective (10 mg/L as N) are shown in red and labeled. Nitrate concentrations in the Mira Monte/Meiners Oaks Area tend to be the highest, with several wells showing historical and recent nitrates above the water quality objective. Some wells in the Robles Area also show elevated nitrate levels, though these have typically been below the water quality objective. Some of these wells (e.g., 04N23W16C08S) show higher nitrate concentrations during the recent drought (2012-2016), when there was less recharge from fresher quality surface water. Elevated nitrate concentrations in groundwater have been found in areas of Tico Road and Mira Monte, as well as the northern portion of the Robles Area, where several sources including equestrian facilities, fertilizing operations, and septic systems may contribute to the nutrient loading in these areas (DBSA, 2010b). Nitrate concentrations in the Kennedy, Santa Ana, and Casita Springs areas tend to be low and well below the water quality objective. Note that there is sparse data available in recent years in the Santa Ana Area.

Previous investigations have reported that TDS concentrations from public supply wells within the Basin range from about from 500 to 1240 mg/L, with an average of about 700 mg/L (DWR, 2003). Figures 3.1-29 and 3.1-30 show median concentrations for TDS calculated for the long-term (1969-2019) and recent (2008-2019) period of record, respectively. A few wells have median TDS concentrations above the water quality objective, with several wells showing concentrations just below to the water quality objective with a few exceedances in the past. TDS concentrations appear to increase during extended dry periods when there is less recharge of fresher quality surface water.

Figures 3.1-31 and 3.1-32 show median concentrations for sulfate calculated for the long-term (1969-2019) and recent (2008-2019) period of record, respectively. Most wells were below the water quality objective, though several wells had concentrations just below the water quality objective. In general, the lowest observed concentrations are in the Mira Monte/Meiners Oaks Area. Since bedrock contributions are the primary source of sulfates in the water, the relatively lower concentrations in the Mira Monte/Meiners Oaks Area are indicative of older water that has not flowed over or through (fractured) bedrock.

Figures 3.1-33 and 3.1-34 show median concentrations for chloride calculated for the long-term (1969-2019) and recent (2008–2019) period of record, respectively. With one exception, chloride concentrations in the Basin are below the water quality objective, with the concentrations generally less than 50 mg/L near Ventura River and slightly higher concentrations in the Mira Monte/Meiners Oaks Area. Compared to the basin-wide trends, well 04N23W15B01S stands out as an anomaly and showed chloride concentrations consistently above the water quality objective of 100 mg/L, though with limited data coverage. This well does not have sufficient data in recent years to calculate trends from 2008-2017.

Figures 3.1-35 and 3.1-36 show median concentrations for boron calculated for the long-term (1969-2019) and recent (2008-2019) period of record, respectively. Boron concentrations tend to be highest in the Kennedy Area with notably lower concentrations elsewhere in the Basin that are generally below the water quality objective. Higher concentrations in the Kennedy Area are related to geologic sources to surface flows (primarily in the Matilija Creek) upstream of the basin (DWR, 1933; DWR, 1956; DWR, 1959).

Appendix N contains chemographs for all wells shown on Figures 3.1-27 to 3.1-36.

3.1.3.4 Primary Beneficial Uses [§354.14(b)(4)(E)]

§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.

The primary groundwater uses in the UVRGB include municipal, agricultural, domestic, and environmental, including groundwater-dependent ecosystems (GDEs). Additional information on groundwater-dependent ecosystems is provided in Section 3.2.7. Figure 3.1-37 shows the beneficial uses associated with the wells in the UVRGB and the average amount of pumping associated with the different groundwater wells. Irrigation and public supply comprise most of the use, while there are also a number of domestic wells that supply homes and limited irrigation.

The majority of the groundwater pumped from the basin is for municipal use. The three water districts in the basin, CMWD, MOWD, and VRWD, and two mutual water companies pump groundwater for potable supply primarily to residential and commercial properties in the UVRGB. CMWD operates one well located in the Mira Monte Area. MOWD is a small water district where groundwater is MOWD's primary water supply source, although CMWD surface water is purchased during droughts due to decreased well yields. MOWD has wells north of the Robles Diversion in the Kennedy Area and in the upper part of the basin between the Highway 150 Bridge and the Robles Diversion (VRWC, 2015). VRWD also has wells between the Highway 150 Bridge and Robles Diversion and operates similarly to MOWD, although VRWD more consistently purchases surface water from CMWD. These two water districts serve the communities of Meiners Oaks, Mira Monte, Oak View, and Casitas Springs (VRWC, 2015).

The City of Ventura purchases surface water from CMWD for resale and pumps groundwater from three wells, and their subsurface collector at their Foster Park facilities to supply, in part, residents and business within the City, located south of UVRGB.

UVRGA estimated 2017 pumping from these municipal entities for its initial groundwater extraction fee to be 4,004 AF (UVRGA, 2020). It is noted that some of the water produced by some of the water districts is delivered to agricultural users. Casitas Mutual Water Company and Tico Mutual Water Company pump small quantities of groundwater to supply to small public water systems located within the Basin (UVRGA, 2020).

The second largest group of groundwater pumpers in the Basin is agricultural. UVRGA identified nine agricultural groundwater pumpers, some with multiple wells, who pumped groundwater in 2017 (UVRGA, 2020). The estimated groundwater pumping by these agricultural entities in 2017 was 352 AF (UVRGA, 2020). The estimated pumping was later revised down to 337 AF following a fee protest by one of the agricultural pumpers. Historically, 28% of the groundwater pumped from agricultural wells has been used within the Basin; the remainder is exported to agricultural land located outside of the Basin. Many agricultural users, primarily relying on groundwater, have connection to CMWD for backup water (VRWC, 2015).

UVRGA identified 101 active or presumed active domestic wells for the year 2017 (UVRGA, 2020). These domestic wells are believed to be de minimis extractors, with an estimated groundwater production rate of 2 AF year or less (UVRGA, 2020). Based on these assumptions, total domestic pumping in 2017 is estimated to have been less than 200 AF/yr. The status of domestic wells is not well understood due to the very limited participation by domestic well owners during the GSP development process. UVRGA intends to further investigate the status of the domestic wells following GSP adoption.

Environmental beneficial uses of groundwater include the riparian and aquatic GDEs in the SGMA.

Two riparian GDE units were identified in the Basin: (1) South Santa Ana GDE Unit and (2) Foster Park GDE Unit (Figure 3.2-15). The riparian GDE units consist primarily of mixed hardwood and wetland habitats that are federally designated critical habitat for multiple species and support a number of other special status species.

Five Aquatic GDE areas were identified in areas of the Basin, although only two were determined to be susceptible to potential significant and unreasonable effect related to depletion of interconnected surface water by groundwater extractions. These two areas are the (1) Confluence Aquatic Habitat Area and (2) Foster Park Aquatic Habitat Area (Figure 3.2-16). The Confluence Habitat Area occurs in the southern portion of the Basin near the confluence of the Ventura River with San Antonio Creek. This habitat area is characterized by upwelling groundwater and inflow from San Antonio Creek. The Confluence Habitat Area includes federally designated critical habitat for steelhead and California red-legged frog and provides important habitat for two-striped garter snake, southwestern pond turtle, and Pacific lamprey. The Foster Park Habitat Area occurs in the southernmost portion of the Basin. Stream flow in the Foster Park Habitat Area is generally considered perennial. During dry seasons, much of the flow is the result of groundwater discharge to the Ventura River. The Foster Park Habitat Area has been studied by various investigators including consultants, federal and state resource agencies, and local public agencies. The Foster Park Habitat Area includes federally designated critical habitat for steelhead and provides suitable habitat for special status aquatic species including:

- Spawning and rearing habitat for steelhead;
- Breeding, rearing, and dispersal/migratory habitat for California red-legged frog;
- Foraging and dispersal habitat for two striped garter snake;
- Feeding, nesting, and basking habitat for southwestern pond turtle; and
- Pacific lamprey spawning corridor and potentially spawning and rearing.

3.1.4 Data Gaps and Uncertainty [§354.14(b)(5)]

> **§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.***

The discussion of data gaps and uncertainty within the HCM of UVRGB is provided below, organized according to the HCM elements listed in the GSP Emergency Regulations.

Topography [§354.14(d)(1)]

No data gaps or significant uncertainties were identified.

Surface Water Bodies [§354.14(d)(5)]

The primary surface water body in the UVRGB is the Ventura River, which is also a significant source of recharge to and discharge from the basin (Section 3.1.3.2). As discussed in Section 3.1.1.2, runoff and tributary flows are important contributions to flows in the Ventura River. Flows in the Ventura River and tributaries are also characterized by a high degree of spatial and temporal variability (Section 3.1.1.2). Streamflow data is available for the Matilija Creek (gage 602/602B), North Fork Matilija Creek (gage 604), and San Antonio Creek tributaries (gage 605/605A) (Figure 3.1-08). However, other tributaries are either ungauged or do not have recent flow data (example, gage 601 on the Coyote Creek) and have been estimated (Appendix F). These tributary contributions can be significant during stormflows. However, most of the stormflows simply pass through UVRGB, so this is not considered a significant data gap or uncertainty. Nonetheless, the Ventura Watershed numerical model being developed by the SWRCB as part of the Ventura River Instream Flow Program may be used to update estimates of ungagged runoff and tributary flow in the future (DBSA, 2020).

Streamflow data along the Ventura River are available at the 607 gage (located just downgradient of the Robles Diversion) and the Foster Park station (gage 608). While continuous and recent streamflow data is available from the Foster Park station, data from gage 607 was not available past 2017 due to delays in reporting by CMWD. This is not considered a significant data gap or uncertainty. These data will be incorporated into the modeling when CMWD publishes.

Flow conditions in the Ventura River are characterized by a high degree of spatial and temporal variability, with the River often ceasing to flow in summer and fall in the Robles and Santa Ana areas and with different reaches of the Ventura River losing or gaining to the aquifer (Section 3.1.1.2 and 3.1.3.2). Ventura River flow conditions have been mapped historically by CMWD and UVRGA (Figures 3.2-12 and 3.2-13) and this was used as qualitative information during model calibration (Appendix F). However, due to the lack of streamflow gages between the Robles Diversion and the Foster Park station, there remains some uncertainty in quantifiable streamflows and streamflow depletions in the stretches of the Ventura River between the Robles Diversion and the Foster Park gage. Additional streamflow gages along the Ventura River would improve the understanding and refine the modeling of streamflows and surface-water/groundwater interactions within the UVRGB.

Imported Water [§354.14(d)(6)]

No data gaps or significant uncertainties were identified.

Regional Geology and Structural Setting [§354.14(b)(1), (d)(2)]

No data gaps or significant uncertainties were identified.

Soil Characteristics [§354.14(d)(3)]

No data gaps or significant uncertainties were identified.

Vertical and Lateral Extent [§354.14(b)(2),(b)(3), (c)]

No significant data gaps or uncertainties were identified with respect to the lateral or vertical extent of the Basin.

Groundwater Flow Barriers [§354.14(b)(4)(C) and (c)]

No significant data gaps or uncertainties were identified with respect to lateral groundwater flow barriers in the Basin.

Formation Names and Hydraulic Properties [§354.14(b)(4)(A), (b)(4)(B)]

As noted in Section 3.1.3.1, a few aquifer tests have been reported in the literature. The best available information for aquifer and aquitard hydraulic properties in the UVRGB is from the calibrated numerical flow model (Appendix F). Use of model-derived hydraulic properties values is considered appropriate and, therefore, the lack of aquifer tests results is not considered a significant data gap or uncertainty at this time. Going forward, UVRGA will work with well owners in the Basin to conduct aquifer tests when such opportunities arise, such as when new or replacement wells are constructed. Additional wells and aquifer tests closer to the Ventura River will help refine the estimates of hydraulic properties within the River floodplain.

Groundwater Recharge and Discharge Areas [§354.14(d)(4)]

Groundwater recharge and discharge in the UVRGB is dominated by surface-water/groundwater interactions, which are characterized by high spatio-temporal variability. The numerical model was calibrated to available streamflow and groundwater elevation data. The model also incorporated qualitative information from the Ventura River flow condition mapping conducted by CMWD and UVRGA (3.2-12 and 3.2-13). However, the lack of streamflow measurements and groundwater elevations near the Ventura River contribute to the uncertainty in characterizing and quantifying surface-water/groundwater interactions (in turn, recharge and discharge) along the Ventura River.

Water Quality [§354.14(b)(4)(D)]

The northern two-thirds of the Mira Monte/Meiners Oaks Area has sparse groundwater quality data. However, there is very little groundwater production in this Area (and much of the area has shallow our outcropping bedrock), so this is not considered to be a significant data gap or uncertainty in the HCM.

The Santa Ana Area has no currently active groundwater quality monitoring sites. This data gap is addressed in proposed actions discussed in Section 5, Monitoring Networks.

Primary Beneficial Uses [§354.14(b)(4)(E)]

No data gaps or significant uncertainties were identified.

3.2 Groundwater Conditions [§354.16]

3.2.1 Groundwater Elevations [§354.16(a)]

3.2.1.1 Groundwater Elevation Contours [§354.16(a)(1)]

> **§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.***

Generally, groundwater flow is from a northern to southern direction, following the surface drainage and the topographic gradient of the basin. Groundwater levels in the UVRGB fluctuate seasonally with the highest water levels occurring in the winter to early spring and the lowest levels occurring in fall or winter (i.e., until the first significant runoff event). The general flow direction and the seasonal changes in water levels are illustrated in Figures 3.2-01 and 3.2-02, which show simulated water level contours (from the calibrated numerical model) during the wet season (March 2019) and dry (September 2016) seasons, based on water level measurements in wells across the basin.

Groundwater elevations span from approximately 900 ft in the northern portion of the basin to 190 ft in the southerly portion at the downstream end of Ventura River during both the wet (March 2019) and dry (September 2016) seasons. The water level contours indicate a general north-to-south gradient, under both wet and dry conditions. In the Mira Monte/Meiners Oaks Area, groundwater levels are highest in elevation along the northeast boundary and decline in a southeasterly direction towards the Ventura River Basin, indicating a southeasterly groundwater flow from the Mira Monte/Meiners Oaks Area towards south Robles Area and Santa Ana Area; however, the magnitude of this flow is small due to the low hydraulic conductivity of the water-bearing units in the Mira Monte/Meiners Oaks Area. The west-to-east contours in the south Robles and the Mira Monte/Meiners Oaks Area are driven by low water levels at a single well (04N23W15D02S) and may not be indicative of regional flows. In general, the data are limited in the Mira Monte/Meiners Oaks Area, and structural control on groundwater flow from faulting and folding are not well understood.

The water level contours indicate minimal east-to-west flows from the Robles Area to the Mira Monte/Meiners Oaks Area, consistent with groundwater chemistry data (Section 3.1.3.3), which indicates older deeper groundwater in the Mira Monte/Meiners Oaks Area. In general, water levels in the Robles Area, Santa Ana Area, and western portions of the Mira Monte/Meiners Oaks Area tend to be 20 to 50 ft lower in the dry season.

Figure 3.2-03 shows the high and low water levels (same periods as those shown on Figures 3.2-01 and 3.2-02) on north-south cross-section A-A’ (along the Ventura River) shown in Figure 3.1-18 and 3.1-19. The cross-section shows the shallow water table in the Kennedy and Casitas Spring areas, where the Ventura River has perennially wet reaches. In the Robles and Santa Ana areas, the groundwater table tends to be well below the riverbed under dry conditions. Under dry conditions, the north-to-south flow can be impeded by areas where bedrock is shallow and alluvium thickness is limited, as evident from the discontinuous saturated zones in different sections of the basin. Under wet conditions, the water levels in much of the Robles Area and portions of the Santa Ana Area are below the riverbed, indicating that the Ventura River would typically be losing. This also shows that that the surface water is not interconnected with groundwater in these areas (except perhaps temporarily during and immediately following periods of high recharge rates), even under wet conditions. The groundwater levels are known to daylight upstream of the San Antonio Creek, where groundwater discharges to the gaining reach of the Ventura River.

Figure 3.2-04 shows the high and low water levels on the east-west cross-section B-B’ (across the Ventura River), also shown in Figure 3.1-17 and 3.1-19. From west to east, the cross-section spans the Terrace, Robles and the Mira Monte/Meiners Oaks Areas. The cross-sections show the general east-to-west gradient in the eastern part of the Mira Monte/Meiners Oaks Area. The gradient is relatively flat from the western part of the Mira Monte/Meiners Oaks Area to the Robles Area. Figures 3.2-01 and 3.2-02 show that the groundwater flow is predominantly north to south in this area. Under both wet and dry conditions, the groundwater levels are well below the riverbed. Thus, even under wet conditions groundwater is expected to be disconnected from the Ventura River in this area. The Terrace Area to the west is hydraulically separated from the Robles Area by bedrock outcrops of the Sespe Formation.

Based on the groundwater level data, a regional gradient of approximately 660 ft across the roughly 48,000 ft of linear length of the Basin corresponds to a north-south hydraulic gradient of approximately 0.014 ft/ft. Regional vertical gradients are not expected given unconfined conditions. Vertical gradients may exist between the alluvium and the bedrock, but no paired wells screened in the bedrock and alluvial exist to estimate this gradient.

3.2.1.2 Groundwater Elevation Hydrographs [§354.16(a)(2)]

§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.

The thinness of the aquifer, high permeability, large north-south topographic gradient, and intimate interconnection between groundwater and surface water causes UVRGB to behave materially differently than most groundwater basins in the State. The Basin groundwater levels and storage trends closely mimic surface water flows, with groundwater levels and storage exhibiting large and rapid fluctuations relative to the total saturated thickness and total groundwater storage – more so than perhaps any other groundwater basin in the State. During non-drought periods, the Basin fills up on the order of two out of every three years and significant surface water base flow is sustained by rising groundwater in the lower southern part of the Basin. During droughts, much of the Basin groundwater storage drains out naturally to the Ventura River within the first few years causing a significant decrease in Ventura River base flow in the lower part of the Basin.

Figure 3.2-05 shows hydrographs from key wells (wells that collectively provide good spatial and temporal coverage across the UVRGB) in different hydrologic areas throughout the UVRGB. The hydrographs show the temporal trends in groundwater levels. In general, groundwater levels do not display significant long-term temporal trends. Water level declines are seen during the droughts of the late 1980s and the 2010s (when historical lows were observed); however, the water levels rebound rapidly in the wet years that follow. Groundwater levels in the Kennedy Area are relatively flat, as this Area has limited storage and much of the surface recharge may be rejected when the aquifer is full in this Area.

The temporal variability in groundwater levels is much more pronounced in the Robles and Santa Ana Areas, where groundwater is recharged by the Ventura River and groundwater levels are below ground surface and respond much more strongly to recharge events. Groundwater levels are much more muted in the eastern part of the Mira Monte/Meiners Oaks Area, which is relatively isolated from direct recharge from the Ventura River. Groundwater fluctuations in the Casitas Springs Area are also relatively muted, since (a) the groundwater discharges to the Ventura River under high water level conditions and (b) much of areal recharge is rejected due to the relatively high water-levels and limited storage capacity in the area.

Figure 3.2-06 shows select hydrographs from north to south combined on a single graph to demonstrate the regional north-south hydraulic gradient. This figure also shows Ventura River surface water flows at Gauge 608 located at Foster Park (Figure 3.1-08). In addition, Figure 3.2-07 shows water level measurements for the period from 2017 to 2020 from a network of water wells across the UVRGB that have been equipped with continuous temperature and water-level data loggers by UVRGA. These hydrographs show the general north-to-south hydraulic gradient and the seasonal groundwater level trends. Groundwater levels at all these wells are relatively stable with seasonal fluctuations during relatively wet periods. Long-term, chronic declines in groundwater levels have not been observed in the Basin. Instead, the Basin cyclically fills and drains over a relatively short period of time, on the order of a few years. During prolonged dry conditions (for example, from 2012 to 2016) groundwater levels decline but rebound again in the wet period that follows.

Appendix K contains hydrographs for all wells with observed water levels in the UVRGB.

The numerical model was used to estimate pumping impacts on historical (2005 – 2019) groundwater levels. This was done by comparing simulated groundwater levels from the calibrated historical simulation with groundwater levels from an alternative historical simulation *without* any groundwater pumping (all other recharge/discharge processes were kept the same as the calibrated historical model). The difference in groundwater levels is indicative of pumping impacts on groundwater levels from historical pumping in the basin. Appendix G shows groundwater levels for several wells in the UVRGB for the historical simulations with and without pumping. For each well, the difference in groundwater levels between the two simulations is also plotted. Model results show the following:

- In the Kennedy Area there are little to no pumping impacts during the wet months when the Ventura River is flowing. This is because during these conditions, groundwater is connected to (and receiving ongoing recharge from) the River; hence, pumping leads to minimal drawdown in the aquifer. During drier conditions (for example, the 2012 – 2016 drought), when there is less flow in the Ventura River, groundwater can get disconnected from the River, and pumping leads to drawdowns as the water pumped comes from aquifer storage. Simulated drawdowns range from 5 - 10 ft in the summer/fall months during the drought years in the Kennedy Area.
- In the Robles Area, groundwater is almost always disconnected from the Ventura River. Moreover, the River in this Area often runs dry in the summer and fall months. Hence, pumping in the Robles Area leads to drawdowns in the aquifer, even in the wetter years. Less drawdowns are seen in wet winter months, when the aquifer is being recharged by river percolation. More drawdown is observed during dry months, especially for the drought years (2012 – 2016), with the highest simulated drawdown more than 13 ft (in 2014).
- The Santa Ana Area has similar behavior as the Robles Area, with drawdowns seen in both wet and dry years. However, in the Santa Ana Area there are minimal drawdowns simulated in the wet winter months, when the Ventura River is flowing and groundwater is being recharged by river percolation.
- The Casitas Springs Area is where the groundwater table is mostly connected to (and discharging to) the Ventura River. Hence, pumping leads to minimal drawdown during such conditions. The exception is during the drought years (2012 – 2016), when groundwater can get disconnected from the Ventura River and pumping can lead to drawdowns of more than 13 ft during the dry fall months, when there is minimal flow in the River.

3.2.2 Change in Storage [§354.16(b)]

§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.

Long-term groundwater storage trends in the UVRGB are characterized by very rapid cyclical draining and filling of most of the total Basin storage volume over a relatively the short period of time, on the order of a few years. This is in stark contrast with most Basins in the State, in which the range of storage change is small compared to the total basin storage and storage changes are more gradual over time. Another unique feature of the UVRGB is the fact that groundwater storage trends are dominated by interaction with surface water –typically, the Basin fills completely in years with Ventura River flow that exceeds 50% of the long-term mean annual flow (see Section 4.4.3.1) and the Basin drains rapidly and naturally to the Ventura River in the lower part of the Basin within multiple years of dry conditions. Groundwater discharge to the Ventura River is significantly larger than groundwater extraction except during droughts (e.g., Figure 3.3-02). During non-drought periods, the Basin fills frequently on the order of 2 out of every 3 years and significant surface water base flow is sustained by rising groundwater levels in the southern part of the Basin. During droughts, most of the Basin storage discharges to the Ventura River during the first few years and groundwater-supplied surface water base flow in the southern part of the Basin declines (Figure 3.3-02). In addition, groundwater extraction becomes a larger outflow component than groundwater discharge to the Ventura River. It is during droughts when groundwater storage is already low due to natural drainage that further reductions of groundwater storage by groundwater extraction can potentially cause conditions that may lead to undesirable results (see Sections 4.4.1, 4.5.1, and 4.9.1).

A wide range of storage capacities have been reported for the UVRGB. These range from 14,000 AF (EDAW, 1978) to potentially as high as about 35,000 AF (DWR, 2003; VCFCD, 1971). The numerical model (calibrated to observed water levels from 2005 to 2019) was used to estimate the change in groundwater storage. Figure 3.2-08 shows the annual and cumulative change in groundwater storage from 2006 to 2019 between seasonal high groundwater conditions with groundwater use and water year type. As can be seen from the figure, storage is intrinsically linked to water level conditions, in turn driven by precipitation and flows in the Ventura River. Long-term, chronic declines in groundwater storage have not been observed in the Basin. Instead, the Basin cyclically fills and drains over a relatively short period of time, on the order of a few years. During prolonged dry conditions (for example, from 2012 to 2016) groundwater levels decline but rapidly rebound in the following wet period.

3.2.3 Seawater Intrusion [§354.16(c)]

§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:*

(c) *Seawater intrusion conditions in the basin, including maps and cross-sections of the seawater intrusion front for each principal aquifer.*

The UVRGB is an inland groundwater basin, with no connection to the ocean. As demonstrated by Figure 3.1-03, the southern boundary of the UVRGB is almost 6 miles inland from the Pacific Ocean. Moreover, the base of the bedrock along the southern boundary (also the lowest point in the basin) is approximately 160 ft above mean sea level (Figure 3.1-15). This is above any predictions of sea-level rise (maximum of 5 to 6 ft by 2100 [DWR, 2015]) along the California coast. Chloride concentrations in the groundwater are almost all below 100 mg/L (Figure 3.1-32). Hence, there is neither any indication of seawater intrusion into the UVRGB, nor is it physically possible based on the Basin setting. Hence, seawater intrusion is not a historical or future consideration for the UVRGB.

3.2.4 Groundwater Quality Impacts [§354.16(d)]

§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

Groundwater supplies of the UVRGB are important for drinking and irrigation uses and aquatic ecosystems within the Basin and downstream of the Basin. Groundwater in the Basin is generally of good enough quality for drinking and irrigating, though groundwater is regularly monitored and sometimes needs to be blended with water from other sources to meet drinking water quality standards and address naturally occurring dissolved boron (VRWC, 2015). In general, due to the unconfined conditions of the groundwater, the quality of the groundwater in the UVRGB is heavily influenced by (a) the quality and quantity of surface water runoff that recharges the groundwater basin, (b) leaching of nutrients from fertilizers and manure, and (c) percolation of return flows from applied waters and septic system leachate.

Section 3.1.3.3 discussed historical and current groundwater quality trends in the UVRGB. Table 3.1-02 in Section 3.1.3.3 shows the groundwater and surface water quality objectives ("allowable limits or levels of water quality constituents or characteristics…established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area") for the UVRGB based on the Regional Water Quality Control Board's Basin Plan (RWQCB-LA, 2019).

Nitrate is the primary groundwater quality concern in the UVRGB. Nitrate is a nutrient that is naturally present at low concentrations in groundwater. High concentrations of groundwater nitrate generally occur as a result of human activities such as the application of fertilizer for agriculture, concentrated livestock operations, and septic system discharges (VRWC, 2015; USGS, 2011; RWQCB-LA, 2012). High concentrations of nitrate in drinking water can adversely affect human health, particularly the health of infants (Montrella and Belitz, 2009).

The drinking water regulatory benchmark for nitrate, called the maximum contaminant level (MCL), is 10 mg/L as N (equivalent to 45 mg/L as NO_3). Two wells, located in the Mira Monte/Meiners Oaks Area, show Nitrates above the MCL with median concentrations between 11 mg/L and 15 mg/L (Figures 3.1-24 and 3.1-25). The vast majority of the remaining wells in the Basin have median concentrations below 5 mg/L, indicating that nitrate is not a widespread issue with respect to drinking water beneficial uses in the UVRGB. Nitrate in groundwater can also affect biological activity (and potential beneficial use) in surface water bodies that receive groundwater discharge. As such, while nitrate levels of up to 10 mg/L as N are acceptable based on drinking water standards, the water quality objective for total Nitrogen in the Ventura River within the UVRGB, as defined in the RWQCB Basin Plan (RWQCB-LA, 2019), is 5 mg/L (Nitrate-N + Nitrite+N). Nitrate concentrations in groundwater along the gaining portions of the Ventura River (Casitas Springs Area and southern portion of the Santa Ana Area) are generally lower than the RWQCB Basin Plan water quality objective of 5 mg/L (Figures 3.1-24 and 3.1-25).

In the UVRGB, concentrations of TDS are generally below the RWQCB water quality objective of 800 mg/L (same for groundwater and surface water), with a relatively small number of wells at or just below the water quality objective, indicating TDS is a localized issue in a limited number of wells and is not a widespread issue of concern with respect to beneficial uses in the UVRGB (Figures 3.1-27 and 3.1-28).

Concentrations of sulfate (Figures 3.1-29 and 3.1-30) and boron (Figures 3.1-33 and 3.1-34) are elevated in areas along the river floodplain (especially in the Kennedy Area) that receive recharge from runoff and tributaries flowing over geologic formations that contribute these minerals. Elevated boron, which originates from geologic sources contributing to surface flows (primarily in Matilija Creek) (DWR, 1933; DWR, 1956; DWR, 1959) flowing into the Kennedy Area is of concern for agricultural use of groundwater. While, boron is essential in small amounts for the growth of many plants, it is extremely toxic to most plants in higher concentration, with the limits of tolerance for most irrigated crops ranging from 0.5 to 2.0 ppm (DWR, 1933, 1956, 1959). Boron and sulfate concentrations are typically below the respective surface water quality objectives in wells within or upstream of areas with discharging groundwater (Santa Ana and Casitas Springs areas). Hence, boron and sulfate are not a cause of concern for beneficial use of interconnected surface waters.

Chloride is below the groundwater quality objective (100 mg/L) in almost all wells in the UVRGB (Figures 3.1-31 and 3.1-32) and below the surface water quality objective (60 mg/L) in wells within or upstream of areas with discharging groundwater (Santa Ana and Casitas Springs areas). Hence, chloride is not a cause of concern for beneficial use of groundwater or interconnected surface waters.

The California Water Boards Groundwater Ambient Monitoring and Assessment (GAMA) Groundwater Information System was reviewed to evaluate groundwater contamination in the Upper Ventura River Groundwater Area Groundwater Basin/GSA Boundary. The review found three regulatory sites that had shallow contamination of gasoline hydrocarbons, which are now all closed. Figure 3.2-09 shows the location and status of these environmental sites. These are (a) T0611100821 CalTrans Ojai, a site of a gasoline leak, the potential media of concern being soil, and the case was closed as June 11, 2010; (b) T0611100697 Gabriel's Property, an Auto Repair/Car Sales site with three leaking underground storage tanks (LUSTs), a soil vapor extraction (SVE) system operated from May 2007-January 2009, and the case was closed 8/9/2015; (c) T0611100412 VCO Road Maintenance, a fueling station site where a LUST was remediated using an SVE system that began operating in 2005, and the case was closed on May 7, 2012. No indication of regional groundwater contamination plumes was found in this data review.

3.2.5 Land Subsidence [§354.16(e)]

§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:*

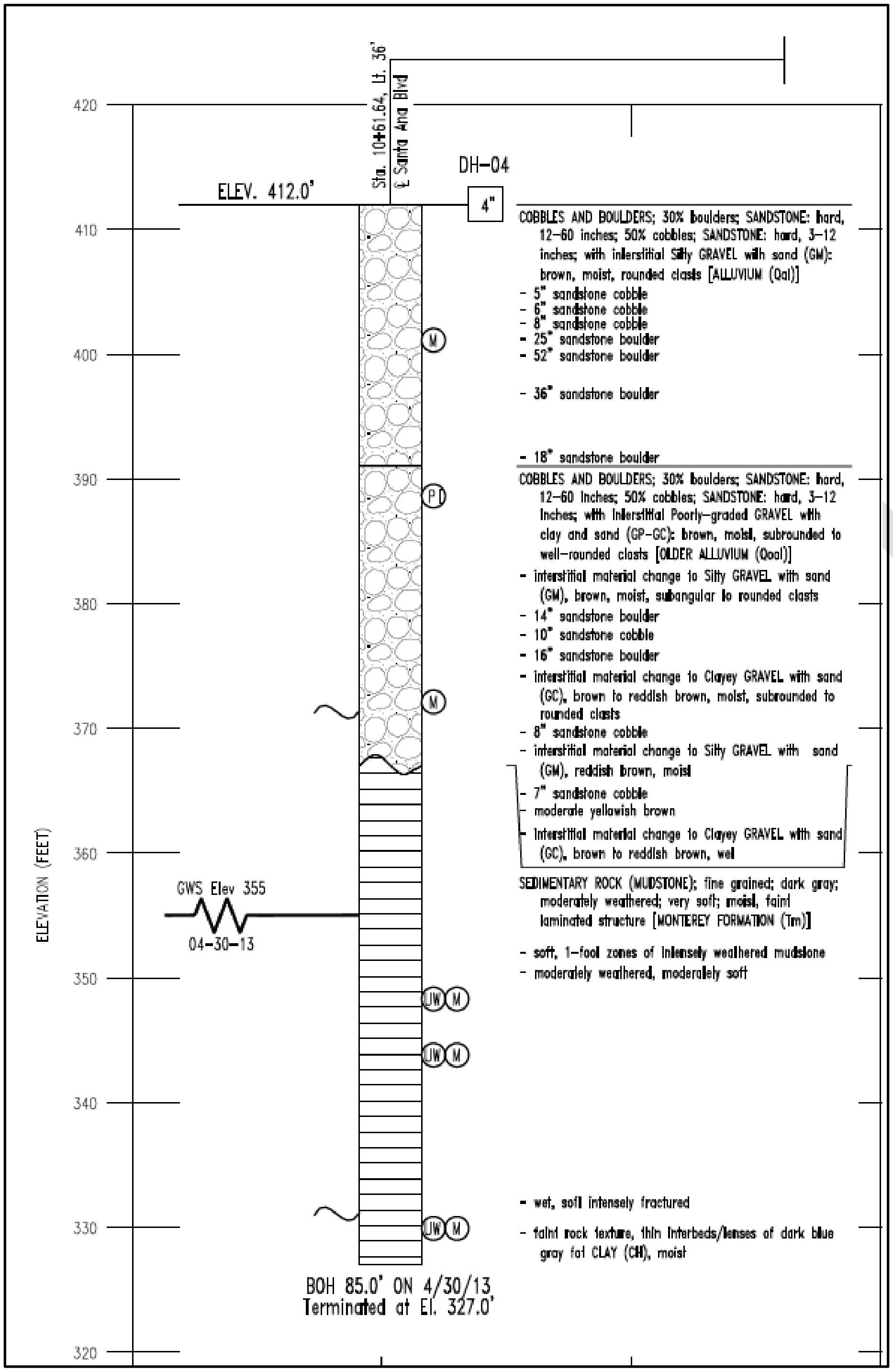
(e) *The extent, cumulative total, and annual rate of land subsidence, including maps depicting total subsidence, utilizing data available from the Department, as specified in Section 353.2, or the best available information.*

DWR provides land surface displacement data on their SGMA Data Viewer Web-based geographic information system (GIS) viewer (DWR, 2020a) to aide GSAs in evaluation of subsidence in groundwater basins. The DWR data includes estimated land surface displacement estimates for the UVRGB based on interferometric synthetic aperture radar (InSAR) measurements for the period from June 13, 2015, through September 19, 2019 (TRE Altamira, Inc., 2020). This land surface displacement dataset was downloaded and reviewed. The reported cumulative vertical displacement from the InSAR measurements during the 2015 to 2019 study period were consistently below 0.4 inches (equivalent to less than 0.1 inches/year or 9 millimeters[mm]/year over the measurement period). The data accuracy report for the InSAR data (Towill, 2020) states that "InSAR data accurately models change in ground elevation to an accuracy tested to be 16 mm at 95% confidence." Hence, the InSAR-based annual land surface displacement rate of 9 mm (0.1 inches) was well below the accuracy range of 16 mm (0.63 inches). This indicates that the reported land surface displacement is within the range of uncertainty of the InSAR data, and that there is no indication of land subsidence due to groundwater withdrawal within the UVRGB.

Significant and unreasonable land subsidence in the UVRGB is not considered possible for multiple reasons. First, the aquifer is thin, thereby limiting the total compaction that could occur, regardless of its makeup. Second, the aquifer materials are not susceptible to compaction because they lack significant amounts of fine-grained materials susceptible to compaction with declining groundwater levels. The portion of UVRGB located along the Ventura River consists of thin alluvial deposits of varying ages that are predominantly coarse-grained and have little clay that could compact under low groundwater levels (see example boring log below) (USGS, 2015). USGS (2015) describes the alluvial units of the Basin as follows:

- Younger alluvium: Poorly consolidated silt, sand, and gravel deposits.
- Intermediate alluvial deposits: Weakly consolidated gravel and lesser sand and silt.
- Older alluvial deposits: Moderately consolidated stratified sand, gravel, conglomerate, and breccia with rare interbeds of clay, silt, and mudstone.

The general lack of clay is evident in the descriptions of the alluvial materials. An example boring log is provided below for further context.



Example bore log from Fugro, 2015.

In the Mira Monte / Meiners Oaks Area the water table occurs within the Ojai Conglomerate and Sespe Formation. The Ojai Conglomerate is a moderately to well consolidated conglomerate and gravel, sandstone, and sand, with subordinate siltstone and silt (USGS, 2015). The Sespe Formation consists of consolidated sandstone and mudstone. Neither of these formations are considered susceptible to land subsidence caused by groundwater withdrawal.

The Terrace Area is underlain by the moderately consolidated older alluvial deposits (described above) and the wells in this area appear to draw from the underlying Sespe Formation. Neither of these formations are considered susceptible to land subsidence caused by groundwater withdrawal.

Another reason for the extremely limited subsidence potential is the fact that the alluvium has very limited potential for groundwater levels to fall below historically low levels. Long-term groundwater level (described in detail Section 3.2.1.1 and 3.2.1.2) data show that the water levels go up and down based on streamflow and recharge conditions with no evidence of long-term groundwater level declines. Groundwater levels rebound extremely rapidly following drought conditions. Due to the relatively low-permeability bedrock unit that underlies the alluvium, water levels cannot fall much below historical lows before the alluvium becomes completely unsaturated, thereby reducing the risk of exceedance of pre-consolidation stresses in the deepest portions of the aquifer.

Lastly, no historical reports indicating land subsidence in the UVRGB have been found through a comprehensive literature review.

Based on the foregoing, UVRGA has concluded there is little to no potential for significant and unreasonable land subsidence caused by groundwater withdrawals in the Basin.

3.2.6 Interconnected Surface Water Systems [§354.16(f)]

§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.*

Figure 3.2-10 shows a schematic of groundwater surface-water interactions under different surface water and groundwater conditions. Whether a river reach receives water from the aquifer (gaining reach) or loses water to the aquifer (losing reach) depends on the relationship between the water level in the stream and the groundwater level in the nearby aquifer. Surface water elevations in gaining reaches are below groundwater levels, allowing groundwater to discharge into the stream (top left diagram on Figure 3.2-10). Conversely, surface water levels in losing reaches are above the groundwater levels in the underlying aquifer; and, consequently, the water in the stream infiltrates into the aquifer, as shown in the top right and bottom diagrams of Figure 3.2-10. If the groundwater levels are below the stream, then the infiltration rate from the stream to the groundwater system is constant (independent of groundwater levels) and the aquifer is disconnected from the surface water (bottom left diagram on Figure 3.2-10).

The Ventura River within the UVRGB is characterized by complex surface water and groundwater interactions with significant variability in space and time. Section 3.1.3.2 discusses how the reaches of the Ventura River within the UBRGB hydrogeologic areas typically exhibit gaining and losing characteristics. Figure 3.2-11 shows the flow conditions of the Ventura River with general areas where the river is generally losing or gaining and whether it is expected to be connected or disconnected with the water table. The CMWD and UVRGA (Kear, 2020a) have mapped the latitudinal limits of Ventura River flows along different sections of the river from through frequent field reconnaissance and ground positioning system (GPS) mapping. Figures 3.2-12 and 3.2-13 collectively show the extents of the wet, intermittent, and dry reaches of the Ventura River from 2009 through 2019.

Figures 3.2-11 to 3.2-13 show that the Ventura River is perennially wet in the Kennedy Area (north of the Robles Diversion), where it typically loses water to the groundwater system. Groundwater levels in well 05N23W33B03S near the Ventura River channel (Figure 3.2-05) range from 810 to 790 ft amsl. Ground surface elevations along the Ventura River channel near this well are approximately 810 ft amsl in this area (Figure 3.1-04 and 3.2-03). Similarly, groundwater levels in well 05N23W33G01S (approximately 700 ft south of 05N23W33B03S) range from 800 to 790 ft, with ground surface elevations along the Ventura River channel near the well approximately 800 ft. Hence, it is expected that the Ventura River is connected to the groundwater system during high water level conditions in areas where the streambed is below the groundwater elevations. During low groundwater level conditions, the Ventura River may still percolate and recharge the groundwater system but may no longer be connected depending on local the groundwater levels and streambed elevations. The Kennedy Area has limited groundwater storage and the recharged groundwater flows rapidly downgradient into the Robles Area. Due to the sudden drop in bedrock elevations past the Kennedy Narrows, groundwater elevations drop correspondingly in the Robles Area. Consequently, surface flows form the Kennedy Area rapidly infiltrate into the groundwater in the Robles Area. The Ventura River within the Robles Area is mostly dry south of the Robles Diversion, except under stormflow conditions, when flows in the Ventura River exceed the infiltration rate along the riverbed. Observed groundwater levels are well below ground surface (Figures 3.2-03 and 3.2-05), indicating that the groundwater system is disconnected from the Ventura River in the Robles Area, even during high groundwater level conditions; however, there is the possibility that the Ventura River and the water table are transiently and briefly connected in the Robles Area. During high groundwater level conditions (typically after big storms), groundwater can get connected to some segments of the Ventura River intermittently for brief periods of time; however, as water levels decline the water table in the Robles Area gets disconnected from the Ventura River (Appendix F).

In the northern part of the Santa Ana Area, the Ventura River is still predominantly dry and losing when wet. The groundwater/surface-water interconnection in this Area is likely transient and spatially variable, depending on the relative elevations of the streambed and groundwater levels.

Groundwater and the Ventura River are generally connected, and surface water flow is generally perennial in the Casitas Springs Area, although some intervening dry stretches exist within this area. The Ventura River gains water from San Antonio Creek at the San Antonio Creek confluence. Upstream and downstream of this confluence, bedrock is shallow, and the lateral extent of the alluvium is also restricted (Figure 3.1-10a and 3.1-10b), the groundwater daylights and begins discharging to the Ventura River in the northern part of the Casitas Springs Area.

The numerical model was used to estimate historical interconnected surface water (ISW) depletions of the Ventura River. This was done by comparing streamflows under the calibrated historical period with streamflows from an alternative historical simulation *without* any groundwater pumping (all other recharge/discharge processes were kept the same as the calibrated historical model). The difference in streamflows is indicative of ISW depletions due to groundwater pumping in the basin. Appendix H shows streamflow depletions at select locations along the Ventura River. Table 3.2-01 summarizes flow and depletions for these locations. Model results show that there are little to no depletions in the Robles and Santa Ana Areas as flows are dominated by stormflows in the winter and spring (hence, not significantly impacted by groundwater pumping). ISW depletions in the Casitas Springs Area (near the Confluence with San Antonio Creek and at the Foster Park gauge), range from 1 to 7 cfs, depending on the time of the year and water level conditions.

It is important to note that there are two different types of ISW depletion that can potentially affect beneficial uses - direct and indirect depletion. Direct depletion occurs when the cone of depression from drawdown due to pumping wells near the Ventura River depletes the surface water flow. Direct depletion is primarily associated will the City of Ventura pumping wells and subsurface intake located in Foster Park. Indirect depletion is caused by wells located away from the Ventura River that do not have cones of depression that intersect the Ventura River, rather they are capturing groundwater flow that would otherwise have discharged to the surface water system subsequently at a downstream location. This type of indirect depletion manifests during the dry seasons and droughts in the Casitas Springs Area and causes the Ventura River base flow to be lower and/or to decline faster that it would otherwise absent the indirect depletion. Removing groundwater from storage also increases percolation during subsequent periods of storm flow, causing a decrease in stream flow in downstream areas. This latter effect is realized during storm events, and therefore does not have a significant effect on beneficial uses (see spikes on "Simulated Depletion" graphs in Appendix H).

3.2.7 Groundwater Dependent Ecosystems [§354.16(g)]

§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.

3.2.7.1 Potential Groundwater Dependent Ecosystems

This section describes the current best available information concerning potential groundwater dependent ecosystems in the Basin. This understanding is primarily informed by regional information collected from sources including (1) The Nature Conservancy (TNC) and DWR statewide database of indicators of groundwater dependent ecosystems (iGDEs) and supporting data and documentation, 2) descriptions of vegetation alliances from the USDA's Classification and Assessment with Landsat of Visible Ecological Groupings (CALVEG) which generally correspond with the Natural Communities Commonly Associated with Groundwater (NCCAG) classifications discussed below and 3) the Ventura River Watershed Management Plan, (4) review of available reports and studies, (5) review of aerial photos, and (6) consultation with local biologists having extensive experience working thin the Basin. Ecosystem and vegetation species data specific to the UVRGB is limited. However, where possible, effort was made to provide information specific to the UVRGB (Figure 3.2-14). This GSP divides GDEs into two groups: (1) Riparian GDEs, which are associated with the chronic lowering of groundwater levels sustainability indicator and (2) Aquatic GDEs, which are associated with the depletions of interconnected surface water sustainability indicator.

3.2.7.2 Identified Groundwater Dependent Ecosystems

The following subsections describe the identified GDEs in the Basin that resulted from screening of the potential GDEs. Details concerning the evaluations that were performed to identify GDEs is provided in Appendices I and J.

3.2.7.2.1 Riparian Groundwater Dependent Ecosystems

As summarized in the Riparian GDE Assessment Memo (Appendix I), the basin was subdivided into eight areas to screen and evaluate potential riparian GDEs. The following is a brief summary of the areas screened out in Appendix I:

Kennedy Area: Riparian mixed hardwood species near the northern basin boundary in the Kennedy Area were determined to be surface water dependent, due to the perennial surface water flow entering the Basin. Coast Live Oaks in the southern portion of the Kennedy Area appear to be sustained by irrigation return flows from the orchard located above. The remainder of the Kennedy Area is mapped by NCAAG as Riversidian Alluvial Scrub and Scalebroom. Biologists on the UVRGA GSP Development Team confirmed the NCAAG Riversidian Alluvial Scrub and Scalebroom classifications are representative of the dominant species in this area. They also concluded that these dominant species are unlikely to be groundwater dependent based on their plant biology, known locations of occurrence in other regions, and comparison of rooting depths with groundwater level data and model generated water table contours.

Robles Area: The Robles Area is mapped by NCAAG as Riversidian Alluvial Scrub and Scalebroom. Biologists on the UVRGA GSP Development Team confirmed the NCAAG Riversidian Alluvial Scrub and Scalebroom classifications are representative of the dominant species in this area. They also concluded that these dominant species are unlikely to be groundwater dependent based on their plant biology, known locations of occurrence in other regions, and comparison of rooting depths with groundwater level data and model generated water table contours.

Mira Monte / Meiners Oaks and Terrace Areas: The Mira Monte / Meiners Oaks and Terrace Areas have localized patches of Coast Live Oaks mapped by NCCAG. Some occurrences of Coast Live Oaks were screened out based on comparison of rooting depths with groundwater level data and model generated water table contours. The remaining occurrences of Coast Live Oaks were reviewed by the GSP Development Team and eliminated due to the lack of alluvial groundwater where the trees are located. The Coast Live Oaks in these areas are sustained by shallow perched groundwater, bedrock groundwater, or surface water in the associated drainages. In other words, pumping in the UVRGB cannot impact these trees.

Two potential riparian GDE units were confirmed as groundwater dependent and are considered further in the GSP: (1) South Santa Ana GDE Unit and (2) Foster Park GDE Unit (Figure 3.2-15).

The South Santa Ana Riparian GDE Unit consists primarily of riparian mixed hardwood along the river channel and adjacent slopes and areas of wetland habitat within and adjacent to the Ventura River (Figure 3). The unit contains federally designated critical habitat for the southwestern willow flycatcher, California red-legged frog, and southern California Distinct Population Segment (DPS) steelhead. Nine special-status fish and wildlife species are known or have potential to occur within the South Santa Ana Riparian GDE

Unit. The Draft Riparian GDE Assessment Memo lists each of these species and communities, as well as their status, potential to occur, and riparian GDE association.

The South Santa Ana GDE Unit was determined to have high ecological value based on the following characteristics:

- Contains federally designated critical habitat for the California red-legged frog, the southwestern willow flycatcher, and southern California DPS steelhead;
- Provides habitat for a relatively large number of special status species;
- Contains mixed riparian hardwood, coast live oak, and wetland vegetation communities, which support many native terrestrial and aquatic wildlife species; and
- Located along a reach of the Ventura River with generally perennial flows discharged from groundwater.

The Foster Park Riparian GDE Unit consists primarily of riparian mixed hardwood in the east and south and coast live oak in the north and west, with several small wetland areas scattered throughout (Figure 3.2-15). The unit contains federally designated critical habitat for the southwestern willow flycatcher and southern California DPS steelhead. Nine special-status terrestrial and aquatic wildlife species are known or have potential to occur within the Foster Park Riparian GDE Unit. There are no special-status plant species with potential to occur within the Foster Park GDE Unit. The Draft Riparian GDE Assessment Memo lists each of these species, as well as their status, potential to occur within the GDE unit, and GDE association were identified and characterized for consideration.

The Foster Park GDE Unit was determined to have high ecological value based on the following characteristics:

- Contains federally designated critical habitat for the southwestern willow flycatcher and southern California distinct population segment (DPS) steelhead;
- Provides habitat for a relatively large number of special status species;
- Contains mixed riparian hardwood, coast live oak, and wetland vegetation communities, which support many native terrestrial and aquatic wildlife species; and
- Located along a gaining reach of the Ventura River with perennial flows discharged from groundwater.

Potential effects on the riparian GDE units were assessed by reviewing available historical groundwater level data and remote sensing data (i.e., Normalized Difference Vegetation Index (NDVI) and Normalized Difference Moisture Index (NDMI)). Details concerning the analysis are provided in the Draft Riparian GDE Assessment Memo (Appendix I). In summary, it was concluded that riparian plant communities have experienced stress during periods of low groundwater levels historically, such as the drought of the 2010s. However, the available data show that the riparian GDEs rebound following drought periods without a noticeable change in the predominant plant species. It was concluded that if groundwater levels were to remain chronically low for an extended period (beyond that seen in the historic dataset), pumping within the basin could exacerbate the stress on these communities and could potentially cause permanent or prolonged impacts to the GDEs, which may be significant and unreasonable.

3.2.7.2.1 Aquatic Groundwater Dependent Ecosystems

As summarized in the Aquatic GDE Assessment Memo (Appendix J), two types of aquatic GDEs were identified within the UVRGB: Critical Riffles and Habitat Areas. A critical riffle for a river system is an area that can limit passage for migration of steelhead and can create bottlenecks for fish as they move upstream during low flow conditions. Riffles are reaches of swift, turbulent water with gravel, cobble, boulder, or bedrock substrates. Cobbles and boulders often emerge within riffles during low flow periods (Normandeau, 2015). Depletion of interconnected surface water within critical riffles has the potential to preclude or delay upstream migration and can potentially cause fish stranding or mortality. “Habitat areas” are portions of the Ventura River that provide steelhead and other aquatic species with refuge, rearing, and spawning or breeding habitat required for survival and/or reproduction. These areas are generally comprised of several physical elements such as glides, runs, and pools, providing adequate connection and structure for various lifecycle activities.

Five aquatic GDEs were identified within the UVRGB: the South Robles Critical Riffle, the South Santa Ana Critical Riffle, the North Robles Habitat Area, the Confluence Habitat Area, and the Foster Park Habitat Area (Figure 3.2-16; Appendix J). Details concerning of these Aquatic GDEs and their importance for aquatic species within the UVRGB are described in (Appendix J).

As summarized in the Aquatic GDE Assessment Memo (Appendix J) and Section 4.9.1, the aquatic GDE were screened to determine which areas may be subject to potential significant and unreasonable effects of depletions of interconnected surface water in the Basin. Three areas were screened out due to the very low simulated depletion rates (see depletion rates reported for the Robles Critical Riffle, Santa Ana Critical Riffle, and Robles Aquatic Habitat Area included in Table 4.9-01). Two aquatic GDEs were identified for consideration: (1) Confluence Aquatic Habitat Area and (2) Foster Park Aquatic Habitat Area (Figure 3.2-16). These aquatic GDEs are described briefly below and in further detail in Appendix J.

The Confluence Habitat Area occurs in the southern portion of the Basin near the confluence of the Ventura River with San Antonio Creek (Figure 3.2-16). This habitat area is characterized by cool upwelling groundwater and inflow from San Antonio Creek. The Confluence Habitat Area also includes federally designated critical habitat for steelhead and California red-legged frog. The Confluence Habitat Area also provides important habitat for two-striped garter snake, southwestern pond turtle, and Pacific lamprey. San Antonio Creek provides important spawning and rearing habitat for steelhead and fish must pass through the confluence area to reach this tributary of the Ventura River. One notable pool within the confluence area contains water even during periods of drought when many other portions of the river go dry.

The Foster Park Habitat Area occurs in the southernmost portion of the Basin (Figure 1). Stream flow in the Foster Park Habitat Area is generally considered perennial. During dry seasons, much of the flow is the result of groundwater discharge to the Ventura River. The Foster Park Habitat Area has been studied by various investigators including consultants, federal and state resource agencies, and local public agencies. The Foster Park Habitat Area provides suitable habitat for special status aquatic species including:

- Spawning and rearing habitat for steelhead;
- Breeding, rearing, and dispersal/migratory habitat for California red-legged frog;

- Foraging and dispersal habitat for two striped garter snake;
- Feeding, nesting, and basking habitat for southwestern pond turtle; and
- Pacific lamprey spawning corridor and potentially spawning and rearing.

Images showing examples of vegetation and habitats, and a drawing of steelhead trout are shown on Figure 3.2-17.

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.*

This section presents the estimated water budgets for the UVRGB, including information required by the SGMA Regulations and information that is important for developing an effective plan to achieve sustainable groundwater management. In accordance with the SGMA Regulations §354.18, the GSP must include a water budget for the basin that provides an accounting and assessment of the total annual volume of surface water and groundwater entering and leaving the basin, including historical, current, and projected water budget conditions, and the change in the volume of water stored. Water budgets must be reported in graphical and tabular formats, where applicable. A description of each water budget term and data sources is provided in the "Water Budget Components" subsection below and the historical, current, and projected (future) quantitative water budgets for UVRGB are also presented below in Subsections 3.3.1, 3.3.2, and 3.3.3, respectively.

The remainder of this section provides an overview of the approach to the calculation of the historical water budget as well as key surface-water and groundwater budget components.

Water Budget Overview

The groundwater flow model was used to quantify water budgets for the historical, current, and projected conditions, including the evaluation of uncertainty due to climate change (Appendix F). As required by SGMA, potential effects of land use change and population growth were evaluated for the projected water budget. It was concluded that these factors are not anticipated to have a material impact on future water demand and the water budgets for the Basin because of land use policies and ordinances that greatly limit the potential for material growth in the Basin. The projected water budget provides a baseline against which effects of climate change are compared to evaluate uncertainty. The water budget results indicate that climate change is not anticipated to have a significant effect on the projected future surface water and groundwater budgets for the Basin.

The total surface water inflows to the Basin (including direct runoff within the Basin) are characterized by high variability and constitute the major water source for the basin. Most of the surface water inflows leave the basin at the southernmost end of the UVRGB. The Ventura River is characterized by highly dynamic surface-groundwater interactions. In general, river reaches north of the Casitas Springs Area tend to be losing or intermittent, with the reaches in the Casitas Springs areas mostly gaining (except during very dry conditions with low groundwater levels). Exchanges with the Ventura River (percolation into the Basin and spring-fed surface water flow) comprise the largest components of the groundwater budget. Recharge from infiltration of precipitation, M&I return flows, agricultural irrigation return flows and septic system leachate) provided relatively much less input to the Basin. Groundwater extractions (pumping) and evapotranspiration from are other groundwater outflow components but are typically much smaller than natural groundwater discharge to the Ventura River.

Water Budget Components

In accordance with GSP Emergency Regulations §354.18(e), UVRGA relied up on the best available information and best available science to quantify the water budget for the basin to provide an understanding of historical and projected hydrology, water demand, water supply, land use, population, climate change, groundwater-surface water interaction, and subsurface groundwater flow. The numerical flow model (Appendix F) used for quantifying the water budget is based on available hydrogeologic and land use data from the past several decades, previous studies of Basin hydrogeologic conditions, and an earlier version of a regional model (DBSA, 2020). The numerical model gives insight into how the complex hydrologic processes are operating in the Basin and is considered the best tool currently available for estimating the quantities of most of the water-budget components.

Estimates and projections made with the numerical model have uncertainty due to limitations in available data and limitations from assumptions made to develop the models (Appendix F). Uncertainty was considered when using the water budgets during the planning process by accounting for impacts from climate change on the water budget components.

In accordance with GSP Emergency Regulations § 354.18(d), UVRGA utilized the following required information provided DWR or other data of comparable quality, to develop the water budget:

- Historical water budget information for mean annual temperature, mean annual precipitation, water year type, and land use;
- Current water budget information for temperature, water year type, evapotranspiration, and land use; and

- Projected water budget information for population, population growth, and climate change. Although mentioned in the regulations, sea level rise is not applicable to this Basin.

Precipitation is not a direct groundwater or surface water budget component. However, precipitation is an important parameter that strongly influences several groundwater and surface water budget components directly or indirectly, such as groundwater recharge and surface water flows in streams. Data sources are provided in Table 3.3-01.

Qualitative descriptions of each component of the water budgets, together with explanations of data sources for each component, are described below:

- **Surface water entering and leaving Upper Ventura River Groundwater Subbasin:** Surface water enters the UVRGB via the Ventura River and its major tributaries (San Antonio Creek and Coyote Creek) and leaves the UVRGB via the Robles Diversion Canal and the Ventura River at the southern boundary, as shown on Figure 3.1-08. More detail regarding characteristics and sources of data are discussed in Section 3.1.1.2 and summarized on Table 3.3-01. How these surface-water components are incorporated in the water budget is provided below:
  - ***Inflows to Ventura River:*** Surface-water flows in the Ventura River enter at the northern boundary via Matilija Creek and the North Fork Matilija Creek (Figure 3.1-02, collectively termed Matilija Creek Inflows). Stream gages for Matilija Creek inflows are located upstream of the Ventura River (Figure 3.1-08, gages 602 & 604).
  - ***San Antonio Creek:*** Surface-water flows in the San Antonio Creek enter UVRGB at the eastern boundary toward the south of the basin (Figure 3.1-08). The primary data sources for surface-water flows in the San Antonio Creek is a stream gage (gage 605) located near the basin boundary.
  - ***Subbasin ungaged tributaries (including Coyote Creek):*** Surface-water flows in the Coyote Creek enter the UVRGB at the western boundary near the southern end of the basin, downstream from the San Antonio Creek entry point (Figure 3.1-08). Other small ungaged tributaries contribute runoff and consequent baseflow to the Ventura River throughout the length of the Ventura River at various points (see Section 3.3.1). The list of tributaries included are Cozy Dell Canyon & McDonald Canyon, Happy Valley Drain, Live Oak Creek, Mirror Lake Drain, Oak View Drain, Rice Canyon & Wills Canyon, and Kennedy Canyon (Figure 3.1-08). Surface flows in these nine tributaries most likely occur during and immediately following moderate to heavy rainfall events, typically in winter and spring. Some of this stormflow may infiltrate the low permeability sediments of the alluvial deposits within the UVRGB, but rates are uncertain and are ultimately estimated using the groundwater model (Appendix F). Considering that the surface water entering the Upper Ventura River via these ungaged tributaries consist chiefly of storm flows, which are conveyed rapidly across the basin in narrow channels, they are not expected to interact significantly with groundwater in UVRGB, and evapotranspiration (ET) of these surface flows is not included in the model. Rates of recharge resulting from these flows were estimated from precipitation data and input to the numerical flow model, as discussed later in this section and in Appendix F.

- ***Direct runoff to Ventura River:*** Direct runoff is calculated for the area directly adjacent to the main river using the curve number method based on precipitation from precipitation gage 20 located in the basin (Appendix F).
- ***Surface water diversions:*** The two main operations diverting water consist of the Robles Diversion and a privately operated infiltration gallery (Figure 3.1-08). Surface-water flows in the Robles Diversion Canal leave the UVRGB at the western boundary of the basin (Figure 3.1-08). The data source for surface-water flows in the Robles Diversion Canal is CMWD's annual reports.
- ***Outflows from Ventura River:*** The Upper Ventura River flows out of the UVRGB directly to the Lower Ventura River Basin at the southernmost boundary. Outflows from the Upper Ventura River are estimated using the streamflow component of the numerical model. Model outflows were calibrated to the USGS gage 608 at the Casitas Vista Road Bridge (Figure 3.1-08).

- **Inflow to the groundwater system by water source type:** The UVRGA groundwater system is primarily fed by the Ventura River inflows, but recharge serves as an important component. Data sources for the groundwater components are summarized in Table 3.3-01 and are described below.

  - **Recharge to the groundwater system**: Precipitation, runoff, or other indirect sources of recharge that infiltrate to the underlying aquifer are collectively defined as recharge. The sources of recharge known to occur in UVRGB are described in Section 3.1.3.2 of this GSP. Recharge is subject to temporal and spatial variability, and details regarding how recharge rates were estimated for input to the groundwater model (Appendix F) for the region are summarized as follows:
    - Infiltration of precipitation: Infiltration of precipitation recharges the alluvial aquifer in the UVRGB. Monthly recharge rates from the California Basin Characterization Model (BCM) (Flint et al., 2013) were utilized to calculate infiltration of precipitation for the groundwater model (Appendix F).
    - Agricultural return flows: Farmers apply irrigation water to meet evaporation, transpiration, and salt-leaching requirements on their fields when rainfall is insufficient to meet those demands, with the goal of maintaining acceptable crop yields. The salt-leaching requirement is the percentage of "excess" irrigation water required to control salt concentrations in the root zone of agricultural fields. Water applied to meet the leaching requirement is assumed to flow past the root zone to recharge the underlying aquifer or perched zone. Agricultural return flows were applied to the groundwater model assuming a constant crop demand of 2 AF/yr with a constant loss rate of 20% (Appendix F).
    - Municipal and Industrial (M&I) return flows: Water used for residential, municipal, and industrial irrigation is another component of recharge to the groundwater. In the numerical flow model, M&I return flows are equal to 20 percent of total outdoor M&I water use. Outdoor water use is assumed to be 50% of water service applied to the basin (Appendix F).
    - Water distribution system losses: To account for losses from water distribution pipelines, it was assumed that system losses were equal to 4% of total water service

applied to the basin. These losses are applied as an additional component of recharge to the UVRGB.

  - Septic system leachate: Septic system leachate was estimated for parcels identified to contain a septic system based on indoor water usage estimates. It was assumed that all indoor water usage on parcels with septic systems contributed to recharge via the septic system.

- ***Stream Percolation***: The Upper Ventura River is known to have both gaining and losing reaches (Section 3.1.3.2; Figure 3.1-25), and in losing reaches there is percolation from the stream into the aquifer. Stream percolation is calculated by the groundwater model (Appendix F) and is dependent on the difference between river stage and groundwater elevations in the alluvial aquifer, as well as the physical characteristics of the riverbed (width and slope). Groundwater discharge from the alluvial aquifer to the Upper Ventura River is also calculated by the model based on these factors.

- ***Groundwater underflow****:* Groundwater underflow into and out of UVRGB alluvial aquifer does not occur at the boundaries with the adjacent basins. The bedrock along the northern boundary is relatively shallow, and there is very little groundwater underflow (especially compared to the surface flows in the Ventura River) along this boundary. The boundary between UVRGB and the Ojai Basin consists of a hydraulic divide and a bedrock high, which by definition means little to no groundwater underflow occurs across this boundary. The boundary between UVRGB and San Antonio Creek Basin consists of the low-permeability Arroyo Parida – Santa Ana fault zones, which constrains the quantity of groundwater that can flow between the two basins (see Sections 3.1.3.1.1 and 3.2.1.1).

- Outflows from the groundwater system: The separate groundwater outflow components are described below, and data sources are summarized in Table 3.3-01.

  - **Evapotranspiration from phreatophytes (ET):** ET of groundwater occurs where the water table is present at shallow depths. In the UVRGB, such conditions occur in and adjacent to the Ventura River where phreatophytes are present. ET rates in these areas are computed by the groundwater model based on computed groundwater elevations and estimates of the other parameters that control ET (ET, surface elevation, extinction (rooting) depth, and maximum ET rate; Appendix F).

  - **Groundwater extraction:** Historical groundwater extractions in UVRGB are discussed below in Section 3.3.1. Extraction (pumping) data for water supply wells in UVRGB consist of pumping records for 133 known active wells. 80% of the pumping is known to be for M&I supply, 16% of the extraction is used for agriculture, 3% is used by private *de minimus* users, and 1% is used by domestic mutual water companies (MWCs).

  - **Groundwater discharge to surface water**: As described in Sections 3.1.3.2 and 3.2.6, groundwater discharge from the alluvial aquifer may contribute to the perennial flow observed during most years in the Ventura River in the southern area of UVRGB. Similar to stream-channel recharge described above, groundwater discharge to the Ventura River is calculated by the numerical flow model and is dependent on the difference between river stage and groundwater elevations in the underlying alluvial aquifer, as well as the width and slope of the riverbed (Appendix F).

- ***Shallow groundwater drainage to the east***: Groundwater leaves the basin as a minor component of the groundwater budget as discharge to ephemeral streams on the eastern portion of the basin and are calculated by the groundwater model (Appendix F). This is in a limited area at the eastern edge of the Basin (Mira Monte/Miners Oaks area) where the bedrock is very shallow and overlain by the Ojai Conglomerate, and permeability is relatively low.
- ***Subsurface groundwater outflow***: Similar to subsurface groundwater inflow, subsurface groundwater outflow does not occur from UVRGB to the adjacent basins. Bedrock is relatively shallow and is known to outcrop along the southern boundary near the Ventura River. Thus, outflow from the basin is primarily in the form of surface water, with little to no groundwater underflow leaving the basin.

- **Change in the annual volume of groundwater in storage between seasonal high conditions:** Annual changes in the volume of groundwater in storage in UVRGB reflect imbalances between inflows and outflows. In years when inflow (recharge) exceeds outflow (discharge), the volume of groundwater in storage increases which manifests as a rise in groundwater levels in wells. Conversely, when outflows exceed inflows, the volume of groundwater in storage in an aquifer decreases (referred to in this GSP as “groundwater released from storage”), and declining groundwater levels are observed in wells. Groundwater storage cannot be directly measured; rather it can only be estimated using measured or modeled groundwater levels and knowledge of the basin geometry and subsurface hydraulic properties or directly form the water balance output of the numerical model. The numerical model is used to report storage change values in this GSP.

Water Year Types

GSP Emergency Regulations §354.18(b)(6) requires presentation of the water year type associated with annual water budget terms. GSP Emergency Regulation §351(an) defines “Water year type” as the “classification provided by the Department to assess the amount of annual precipitation in a basin.” DWR provided a "Water Year Type" designation for each water year (from 1931 through 2018) for the entire Ventura River watershed (HUC 18070101). The DWR based their designation system on spatially averaged rainfall throughout the Ventura River watershed in a given year and the previous year, relative to the 30-year moving average rainfall amounts for the region (DWR, 2021). DWR released the water year type dataset in 2021 (DWR, 2021). The Groundwater Sustainability Planning process and the Numerical Model development was underway by then (Appendix F). As such, the GSP and the numerical model had to make determinations for water year types for both historical and future conditions. For the GSP and the numerical model, water year types were classified based on total annual precipitation (from VCWPD rainfall gage 20B) for a given water year compared to long-term historical precipitation trends from precipitation gages within the basin (Section 3.1.1.1 and Figure 3.1-07). Years with rainfall less than the 33rd percentile of the long-term annual precipitation records were classified as “dry” years. Years when rainfall was greater than the 66th percentile were classified to as “wet” years. Years when annual rainfall was between the 33rd and 66th percentiles are referred to as “normal” years. These quantitative breakpoints for defining dry, normal, and wet years correlate well with periods of increasing, approximately stable, and decreasing groundwater elevations in UVRGB, as described subsequently in this section.

The dry, wet, and normal classification was compared to DWR's water year type for water years 2006 to 2018 (the period made available be DWR). Table 3.3-02 compares the water year types for the UVRGB GSP and the DWR water year types. DWR has more water year categories, compared to the classification used for the GSP. In general, the water year types are consistent (2008 is classified as a dry year by DWR; however, it had above average annual precipitation - approximately 24 in) as seen in Figure 3.1-07 and was classified as a normal year in the GSP). Since, the GSP water year classifications were based on basin-specific data and were available for the planning and groundwater modeling in the required timeframe, they are used in the GSP, when presenting water budget information.

3.3.1 Historical Water Budget [§354.18(c)(2)(B)]

> **§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 SGMA Regulations require that historical water budget information be evaluated to assess aquifer response to water supply and demand trends as well as evaluate reliability of past surface water supply deliveries. Sub-section 3.3.1.1 presents historical demands, supplies, and the reliability of surface water deliveries. The subsequent sections 3.3.1.2 and 3.3.1.3 present the quantitative historical and surface water budgets. The regulations specify that historical surface water and groundwater budgets be based on a minimum of 10 years of historical data. Water years 2006 through 2016 were selected to represent the historical water budget. Water year 2006 is the first complete water year included in the historical calibrated numerical flow model (Appendix F), which is the primary source of information for several key water-budget components estimated for UVRGB. The historical period is long enough to cover a range of water year types, hydrologic conditions, as well as demands and supply variations in the basin including the historic 2012-2015 drought. Section 3.3.1.4 discusses impact of historical conditions on basin operations.

3.3.1.1 Historical Demands, Supplies, and Reliability of Surface Water Deliveries

> **§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.*

Water demands in the UVRGB consist of M&I, agricultural, and domestic demands, which are met by a mix of groundwater extractions and surface water deliveries. Water demands within the UVRGB were estimated as part of the return flow calculations for the numerical flow model (Appendix F) and are based on agricultural land-use and VRWD, CMWD, and MOWD consumption data (Table 3.3-05). Groundwater supplies were calculated based on historical pumping in the basin and accounting for groundwater deliveries to areas outside of the Basin. CMWD does not report water demands and deliveries to specific areas within its service area, such as the UVRGB. Thus, historical CMWD surface-water deliveries to UVRGB were estimated by subtracting total groundwater supplies from total demand within the UVRGB. The historical demand and supply calculations are summarized below.

Historical Demands

- **Municipal and Industrial (M&I) Demands:** VRWD, CMWD, and MOWD are the three water service providers that deliver M&I water in the UVRGB. Water demands for their service areas were estimated as follows:
  - VRWD and MOWD: Historical water delivery data for VRWD and MOWD from 2005 to 2019 was provided by the districts. M&I water demand for their service area within the UVRGB was estimated by multiply total water deliveries by the percentage of the districts' service areas within the UVRGB.
  - CMWD: Data for CMWD's deliveries to UVRGB were not available. Since most of CMWD's service area is outside the UVRGB boundary, it was difficult to estimate CMWD's M&I water deliveries within the UVRGB boundary. It was assumed that VRWD's per acreage M&I water deliveries was representative of M&I water demand in CMWD's retail service area within the Basin. Hence, VRWD M&I water deliveries per acre was applied to CMWD's service area within the UVRGB, to estimate M&I demands within CMWD's retail service area within the Basin.
- **Agricultural Demands:** Agricultural demand was assumed to be 2 acre-feet/acre/year based on UVRGA Board Members' survey of groundwater extractions within the UVRGB (UVRGA, 2020). Agricultural water demand was estimated by multiplying the per acreage water use rate by the total agricultural acreage within the UVRGB. Agricultural acreage was estimated using agricultural parcel data from the Ventura Agricultural Commissioner with adjustments made using areal imagery
- **Domestic Demands:** Domestic water demands were estimated by assuming domestic wells in the basin were providing a *de minimis* amount (2 acre-feet/year) of water for domestic use.

Historical Supplies

- **Municipal and Industrial (M&I) Groundwater Supplies:** VRWD, CMWD, and MOWD pump groundwater within the basin to meet M&I demands. Groundwater pumping for the water districts were compiled based on reported data (details on pumping estimates for UVRGB are in Appendix F). A fraction (based on the proportion of their respective service areas inside UVRGB) of VRWD and MOWD total groundwater extractions were estimated to be used for demands within the basin. All of CMWD's groundwater pumping was assumed to meet local demands (within the UVRGB). Note that the City of Ventura pumps groundwater from the UVRGB but exports all this water to meet demands *outside* the UVRGB. Hence, City of Ventura pumping was not included as part of UVRGB groundwater supplies to meet demands within the Basin. Historically, it is estimated that 19% of total M&I pumping is used to meet demands within the basin.

- **Agricultural Groundwater Supplies:** Groundwater pumping from agricultural wells located within the Basin is used to meet agricultural demands both inside and outside the UVRGB. Agricultural groundwater supplies within the Basin were estimated determining the areas irrigated by each agricultural well and comparing those areas to the Basin boundary. The irrigation areas were identified by the UVRGA Ad Hoc Stakeholder Engagement Committee based on their conversations with the well owners. Details on how groundwater pumping was estimated for the Basin can be found in the Numerical Model Documentation (Appendix F). Historically, it is estimated that 28% of total agricultural groundwater pumping is used to meet demands within the basin. The remainder was used to irrigate crops located outside of the Basin.
- **Domestic Groundwater Supplies:** Domestic water supplies were estimated by assuming domestic wells in the basin were providing a *de minimis* amount (2 acre-feet/year) of water for domestic use. All domestic demand was assumed to be met by domestic wells.
- **M&I Surface-Water Supplies:** M&I surface-water supplies (water deliveries by CMWD) were estimated by taking the difference between M&I demands and M&I groundwater supplies. Thus, M&I demands not satisfied by M&I groundwater supplies, were assumed to be met by M&I surface-water supplies.
- **Agricultural Surface-Water Supplies**: Agricultural demands not satisfied by agricultural groundwater supplies, was assumed to be met by surface-water deliveries from CMWD. Thus, agricultural surface-water supplies were estimated by taking the difference between agricultural demands and agricultural groundwater supplies.

Table 3.3-03 shows the different demand and supply components for the UVRGB.

Reliability of Historical Surface Water Deliveries

Surface water supplies within the UVRGB are sourced from Lake Casitas which receives diversions from the Ventura River and runoff from the watershed surrounding the reservoir. Water is treated and delivered through CMWD retail purveyors (principally MOWD and VRWD) and directly to customers in CMWD's retail service area.. CMWD is not able to track water deliveries specifically within the UVRGB boundary because the Basin bisects the numerous pressure zones. Therefore, surface water supplies to the Basin were estimated by subtracting all other water supplies used in the Basin from the total estimated water demand for the Basin.. Table 3.3-03 shows the estimated surface-water deliveries for the UVRGB.

GSP Emergency Regulations §354.18(c)(2)(A) requires 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. Reliability of CMWD surface water deliveries to UVRGB was evaluated by inspecting the overall reliability of CMWD system deliveries for the entire CMWD service area. Table 3.3-04 shows the planned (compiled from the 2005, 2010, and 2015 CMWD Urban Water Management Plans) and actual surface-water deliveries for all of CMWD's service area (of which UVRGB is a portion). Table 3.3-04 shows that except for a few years, actual surface-water deliveries were less than planned deliveries, indicating that actual water demands were (in general) less than the planned supplies from the reservoir. For much of the historical period, demands were simply less than projected and the surface water supply was considered reliable as it was less than the safe yield of the reservoir. A 2004 Water Supply and Use Report (CMWD, 2004) quantified the safe yield for the reservoir to be 20,540 AF/yr based on a 21-year critically dry period – down from the original 28,000 AF/yr safe yield planned by the USBR in

1954. The 20,540 AF/yr safe yield was used in the 2005, 2010, and 2015 urban water management plans. As the drought beginning in 2012 progressed, demands decreased due to voluntary and mandatory conservation measures implemented by CMWD and its retail purveyors. These measures were implemented proactively to extend the supplies of Lake Casitas. More recently, the reservoir safe yield has been re-assessed to be 10,660 AF/yr for Lake Casitas (now called “safe demand”), as discussed in Sections 3.3.2 and 3.3.3.2. Overall, UVRGB has not faced surface water shortages historically (although conservation measures have been implemented under drought conditions to extend supplies).

3.3.1.2 Historical Surface Water Budget

§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:*

(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.

Surface water flows in the Ventura River Watershed are primarily the result of runoff from precipitation events, and the primary surface water feature in the UVRGB is the Ventura River (Figure 3.1-02). Section 3.1.1.2 provides details on the surface water within the UVRGB. The mainstem of the Ventura River is fed by the Matilija Creek and North Fork Matilija Creek at the northernmost (upgradient) end of the UVRGB. Table 3.3-05 and Figure 3.3-01 quantify the historical surface water budget components and indicate that inflows from the Matilija and North Fork Matilija Creeks and the ungaged tributaries make up the largest component of surface water inflows to the basin. The total surface water inflows (including direct runoff) to the basin are characterized by high variability and are the major water source for the basin. The average total inflow is approximately 38,800 AF/yr over the historical period, ranging from 2,900 to 113,100 AF/yr.

Most of the surface water inflows leave the basin at the southernmost end of the UVRGB (downgradient of the San Antonio and Coyote Creek tributaries) and are accounted for in the Stream Outflows term. Stream outflows make up 83% of the total inflows on average. In the dry years of 2007 and 2013, stream outflows exceeded total surface water inflows by an average of 3,100 AF/yr.

The Ventura River is characterized by highly dynamic surface-groundwater interactions, which is discussed in detail in Section 3.2.6. In general, river reaches north of the Casitas Springs Area tend to be losing or intermittent with the reaches in the Casitas Springs Area mostly gaining (except during very dry conditions with low groundwater levels) (Figure 3.1-25 and Figure 3.2-10). Using the values from Table 3.3-05, some simple ranges and calculations provide the following summary:

- The average surface water loss from percolation in net losing reaches of the ventura River is approximately 12,600 AF/yr (with a range from 2,200 AF/yr to 25,100 AF/yr) over the historical period.

- The average amount of groundwater contributions to the river in net gaining reaches of the Ventura River is approximately 8,500 AF/yr (with a range from 400 AF/yr to 18,600 AF/yr) over the historical period.
- The net surface-groundwater interaction for the Upper Ventura River is computed by taking the net of stream percolation and groundwater contributions to the stream. On average, the result is a net exchange of approximately 4,100 AF/yr from the river to the aquifer. Only in the dry years of 2007 and 2013 was there a net gain to the river with a contribution of 3,100 and 2,800 AF/yr from the aquifer in 2007 and 2013, respectively.

3.3.1.3 Historical Groundwater Budget

§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:*

(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.

Table 3.3-06 and Figure 3.3-02 quantify the historical groundwater budget components for UVRGB, of which exchanges with the Ventura River comprise the largest components. Excluding losses from the Ventura River, the total recharge (the sum of infiltration of precipitation, M&I return flows, agricultural irrigation return flows and septic system leachate) provided relatively much less input to the Basin. Groundwater extractions (pumping) and ET from the shallow alluvial aquifer are other key groundwater outflow components. Losses owed to the shallow groundwater drainage to the east is relatively minor. Based on simple calculations and ranges on Table 3.3-06, the historical values for the groundwater budget components are summarized below:

- **Recharge from precipitation:** Precipitation usually occurs in just a few significant annual storms that occur between November and April (Section 3.1.1.1). The natural recharge from precipitation ranged from 0 to approximately 2,200 AF/yr with an average of approximately 520 AF/yr.
- **Return flows:** Owing to unconfined conditions of the UVRGB, groundwater recharge occurs through percolation of return flows from agriculture, outdoor residential use, distribution losses, and septic losses, and were estimated using land-use and water use information (Section 3.1.3.2). Return flows ranged from approximately 350 AF/yr to 580 AF/yr with an average of approximately 480 AF/yr.
- **Groundwater extractions:** Groundwater is extracted in the basin for agricultural, municipal and industrial (M&I), and domestic use, and is described for each hydrogeologic area within the UVRGB in Section 3.1.3.2. Since many groundwater users also rely on surface water, groundwater extractions can be variable depending on surface water availability. Total

groundwater extractions in the basin ranged from 3,100 AF/yr to 6,200 AF/yr with an average of approximately 5,000 AF/yr.

- **ET:** Groundwater is lost to riparian vegetation within the Ventura River corridor in the Kennedy and Casitas Springs Hydrogeologic areas (Section 3.1.3.2), where groundwater levels are shallow and plant roots are directly in contact with groundwater. ET losses can vary depending on rooting depth, evapotranspiration rate, and depth to groundwater and were calculated using the groundwater model. Evapotranspiration losses ranged from 660 AF/yr to 1,800 AF/yr with an average of 1,200 AF/yr.
- **Surface water** can be either an inflow to the aquifer or an outflow from the aquifer depending on location in the Basin and antecedent hydrologic conditions (positive, representing inflow, to negative, representing outflows), as shown on Figure 3.3-02.
- **Groundwater Exchange with Ventura River:** Figure 3.3-02 and Table 3.3-06 show that surface-groundwater interactions are highly dynamic in the UVRGB. The average gain from river percolation from net losing reaches of the Ventura River is approximately 12,600 AF/yr (with a range from 2,200 AF/yr to 25,100 AF/yr) over the historical period. The average amount of groundwater loss to the river in net gaining reaches of the Ventura River is approximately 8,500 AF/yr (with a range from 400 AF/yr to almost 19,000 AF/yr) over the historical period. Thus, on average the net exchange of water between the groundwater and surface water systems was approximately 4,000 AF of surface water percolation from the Ventura River into the alluvial aquifer in UVRGB. During normal and wet years, net recharge from the Ventura River to the aquifer ranged between 5,400 and 11,000 AF/yr. During dry years (with low surface flows) the net exchange can be a net increase in stream flow from the groundwater system, as seen in the with two dry years (2007 and 2013) observing an average net discharge from the aquifer to the river of approximately 3,000 AF/yr.

  Groundwater Storage: In response to the annual variability in inflows and outflows to the groundwater system in UVRGB, the volume of groundwater in storage in the basin has increased or decreased, reflected in rising and falling groundwater elevations measured in wells (Sections 3.2.1.2 and 3.2.2; Figure 3.3-03). In wet and most average years, groundwater inflows (e.g., Ventura River stream percolation) often exceeded outflows (e.g., groundwater discharge to the river), resulting in rising groundwater levels and adding to the volume of groundwater in storage in the basin. The Basin has a limited storage capacity, and once groundwater levels along and near the Ventura River reach groundwater surface, any additional recharge from the River is rejected and storage cannot increase further in that area. In subsequent drier years, outflows from extractions, evapotranspiration, and losses to the Ventura River may exceed inflows from the River and recharge leading to falling groundwater levels and reduction in storage. Overall, due to the limited storage capacity in the basin, any storage losses during dry years are quickly replenished in wet or normal years. Furthermore, the overall historical groundwater budget trend shows a negative change in storage during dry years and positive change in storage during wet and normal years (except 2006). The average change in groundwater in storage was approximately 1,900 acre-ft/yr (AF/yr) for the historical period, primarily due to the drought conditions from 2012 – 2016.

3.3.1.4 Impact of Historical Conditions on Basin Operations [§354.18(c)(2)(C)]

§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:

(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.

GSP Emergency Regulations §354.18(c)(2)(C) requires a description of how historical water budget conditions have impacted the ability of UVRGA to operate that Basin within sustainable yield. The estimated sustainable yield for UVRGA is provided in Section 3.3.4. Prior to adoption of this GSP, UVRGA has had neither the regulatory authority nor the technical justification to "operate the basin within sustainable yield." Thus, GSP Emergency Regulations §354.18(c)(2)(C) appears inapplicable to the UVRGB. However, the impacts of historical conditions can provide insight into what challenges UVRGA may have faced had it existed historically and with authority to manage the Basin.

Review of the historical water budgets indicates that a small amount of declining groundwater storage occurred on average (1,900 AF/yr) during the historical period. period. However, the historical period is short and is not hydrologically balanced; therefore, it cannot be concluded that the sustainable yield of the Basin was exceeded during the historical period.

The conjunctive use of surface water from Lake Casitas and groundwater is a key reason why the Basin has not historically experienced undesirable results for the sustainability indicators.

3.3.2 Current Water Budget [§354.18(c)(1)]

§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.

The SGMA Regulations require that the current surface water and groundwater budget be based on the most recent hydrology, water supply, water demand, and land use information. Water year 2019 is the last complete water year included in the numerical model (Appendix F). Water years 2017 through 2019 were selected to represent the current water budget, as they are representative of recent water-use trends and groundwater conditions in UVRGB. The current water budget period corresponds to a period of wet and dry annual precipitation, with an average that is within about 5% of the entire historical record average annual precipitation. It should also be noted that the current water budget period was preceded by an exceptional drought that occurred in the region from 2012 through 2016. As a result of the antecedent groundwater conditions caused by the drought (i.e., record- or near-record-low groundwater elevations at most wells in UVRGB and adjacent basins), combined with below-average rainfall during water year 2018, estimated volumes for some of the water budget components during the current period are different than they were during the historical period. Furthermore, the current water budget period is made of two wet years out of three, whereas the historical budget only has three wet years out of 11. The current water demand, supply, surface water budget, and groundwater budget are described below:

Current Demand, Supply, and Reliability of Surface Water Deliveries

Table 3.3-04 includes information for current (based on 2017 - 2019) UVRGB demand and supplies. Table 3.3-05 shows information for actual and planned CMWD deliveries to their service area (of which UVRGB is a portion) during the current period. As can be seen from Table 3.3-05 water deliveries from Lake Casitas for the current period (2017 - 2019) are much lower than for the historical period (2006 – 2016), reflecting increased conservation within the CMWD service area. The current safe yield (also referred to as “safe demand”) for Lake Casitas is 10,660 AF/yr. Average CMWD deliveries for the current period are close to the 10,660 AF/yr safe demand.

Current Surface Water Budget

As mentioned in the introductory paragraph above, the current water budget reflects greater prevalence of wet years as compared to the historical water budget; however, the same degree of variability is observed. The current surface water budget is more representative of historical conditions prior to the 2012-2016 drought. As can be observed on Table 3.3-05 and Figure 3.3-01, additional calculations provide summary comparisons between the current and historical surface water budgets:

- The largest inflows for the current surface water budget are the Matilija Creeks and subbasin tributaries, which is consistent with the historical surface water budget.
- The current total surface water inflow (including direct runoff) ranges from 12,600 AF/yr to 125,900 AF/yr versus 2,900 AF/yr to 113,100 AF/yr for the historical.
- Stream outflows average 56,100 AF/yr, which is almost double in comparison to the historical average (29,800 AF/yr); however, the current average stream outflows make up 76% of the total inflows, which is consistent with the historical (77%).
- Average stream diversions increase by 3,700 AF/yr (66% increase in comparison to the historical), but the relative percentage of inflows diverted (13%) is consistent with the historical (15%).

The current water budget begins after a historically dry period where groundwater levels were low. Combining dry antecedent conditions with greater inflows translated to a net exchange of surface water to the aquifer of approximately 10,000 AF/yr compared to the historical average net loss of 4,000 AF/yr. This indicates the recovery of the Basin aquifer during the wet years following the historical drought conditions from 2012–2016.

Current Groundwater Budget

Average annual volumes of groundwater estimated to comprise each component of the current water budget are quantified in Table 3.3-06 and Figure 3.3-02. Following are key aspects of the current groundwater budget and notable differences compared to the historical groundwater budget, based on simple calculations and ranges taken from Table 3.3-06:

- As a result of above-average annual rainfall during the current groundwater-budget period, the average current total recharge rates of approximately 1,500 AF/yr are nearly triple in comparison to the historical average (500 AF/yr). Due to the 2012-2016 drought, the historical trend of recharge rates was declining following the 2011 water year, while the current rates have recovered.
- Greater streamflow resulted in the current average net percolation from the Ventura River into the alluvial aquifer of 10,000 AF/yr as compared to the historical average of 4,000 AF/yr. 2017 observed the highest net recharge of any year between the current and historical water budgets likely due to greater-than-average streamflow and very low groundwater levels following the 2012-2016 drought. Consistent with the HCM (Section 3.1.1), the trends in the streamflow percolation follow the same trends as the recharge from precipitation data.
- Slightly less ET outflows occurred during the current water budget period (average of 1,000 AF/yr) compared to the historical period (average of 1,200 AF/yr).
- Average annual groundwater extraction rates (pumping from wells) were slightly lower in the current period (4,400 AF/yr) than in the historical period (5,000 AF/yr).
- The maximum increase in storage (11,400 AF/yr) for the combined current and historical groundwater budget occurred in 2017, which reflects the recovery of the aquifer following the 2012-2016 drought. Increased recharge and stream percolation for the current groundwater budget resulted in an average increase in storage (6,200 AF/yr) compared to the previous 2012-2016 drought period (average decrease of 3,500 AF/yr).

3.3.3 Projected Water Budget

SGMA Regulations require the development of a future surface water and groundwater budget to estimate future baseline conditions of supply, demand, and aquifer response to GSP implementation. The future water budget provides a baseline against which effects of climate change are compared. This section describes the methods used to estimate the projected water budgets for UVRGB, provides a quantitative estimate for each projected water-budget component, and evaluates uncertainty in the projected water budget by considering potential effects of future DWR-recommended climate-change scenarios. The DWR's climate change scenarios could result in changes to inflows and outflows in UVRGB compared to the "baseline" future water-budget.

3.3.3.1 Projected Water Budget Calculation Methods [§354.18(d)(1),(d)(2),(d)(3),(e), and (f)]

§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.*

The projected water budget for UVRGB was developed using the same tools and methods as the historical and current water budgets, including use of the numerical flow model (Appendix F), modified to incorporate projections of future hydrology and demand, as described in the following subsections.

3.3.3.1.1 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.*

In accordance with GSP Emergency Regulations Section 354.18 (c)(3)(A), the future water budget was based on 50 years of historical precipitation, evapotranspiration, and streamflow information. The predictive numerical model used to estimate the projected water budget is based on 50 years of historical precipitation, evapotranspiration, and streamflow data from the period (water year) 1970-2019. The selected historical period is representative of the long-term hydrologic variability in the basin and is the best available information for groundwater sustainability planning purposes. This period starts after the dams were constructed, after much of the development in the watershed occurred, and includes the 1985 Wheeler and 2017 Thomas fires. The 1970-2019 period includes several wet-dry cycles and has an overall near average precipitation, as evidenced by the similar starting and ending values on the cumulative departure from mean annual precipitation line (Figure 3.1-07).

The projected baseline hydrology was based on historical records from basin-specific precipitation gauges, ET station, and streamflow data from the Upper Ventura River and its major contributing tributaries (including San Antonio Creek and Coyote Creek). Future scenarios of hydrologic uncertainty associated with climate change were assessed with the 2030 and 2070 climate change scenarios, described below.

Uncertainty in future hydrology associated with potential climate change was evaluated by applying DWR (2018) precipitation, ET, and streamflow change factors from their 2030 and 2070 central-tendency scenarios to the historic precipitation, ET, and streamflow records for the UVRGB. Climate change factors were incorporated into historical baseline hydrology based on DWR (2018) guidance. Additional details on how future projections (incorporating climate change) of precipitation, ET, streamflow, recharge, return flows, and pumping were developed are provided in the Numerical Model Documentation (Appendix F).

3.3.3.2 Projected Water Demand, Supply, and Reliability of Surface Water Deliveries [§354.18(c)(3)(B), (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:*

(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.*

GSP Emergency Regulations §354.18(c)(3)(B) require use of the most recent land use, evapotranspiration, and crop coefficient information as the baseline condition for estimating future water demand and as a baseline condition used to evaluate future scenarios of water demand uncertainty associated with projected changes in local land use planning.

For the purpose of developing a projected water budget for UVRGB, baseline future water demand in the Basin was accounted for in the numerical flow model (Appendix F) using current (most recent) land use information, agricultural and M&I water-use trends, and assumptions regarding future climatic conditions (including rainfall and ET).

Projected Demands

- **Projected Agricultural Demands**: Future agricultural demands assumed 2 acre-foot per acre of water demand for all crop-covered area in the basin, recommended by the UC Agricultural Cooperative expert, as documented in the Ad Hoc Funding Committee's extraction estimate memorandum. Agricultural demand is expected to increase due to higher temperatures (and corresponding higher evaporative demands) due to climate-change. To account for future increased temperatures due to climate change, the future annual irrigation demands were scaled by a factor representing the average annual increase (over the projected period of 50 years) in future ET (calculated from ET climate-change factors provided by DWR). The average ET climate change factor for the 2030's was 1.04 (increase of 4.24%) and for the 2070s was 1.09 (increase of 8.97%); hence irrigation demand was increased by the corresponding factors to account for higher ET uptake (demand) of irrigation water.

- **Projected Municipal and Industrial Demands:** Municipal and industrial demands were estimated based upon the assumptions used to determine return flow contributions to recharge (Appendix F). Water usage rates from VRWD, which delivers M&I water and has its service area mostly within the UVRGB, was used as a basis to estimate future M&I water demands across the entire Basin. VRWD was used to estimate M&I demands with CMWD and MOWD retail areas because VRWD serves very little water to agriculture. During dry years, the water usage applied was kept equivalent to the average Ventura River Water District residential usage from 2015-2020 (to reflect expected conservation during future dry periods). For the non-dry years, the water usage applied was made equivalent to 85% of the average demand from 1985-2009 to reflect the effect of expected permanent conservation by water users in the region. The 85% reduction to the 1985-2009 constituted some long-term conservation measures for non-drought years. The VRWD per area water usage rate (for dry and non-dry years) was multiplied by total retail service area of all M&I providers (CMWD, MOWD, and VRWD) within the UVRGB to give the total M&I demands in the UVRGB. Projected baseline water demands are assumed to be approximately 1,900 AF/yr, with non-dry water year demands of 2,100 AF/yr and dry water year demands of 1,500 AF/yr. Climate change scenario M&I demands are projected to increase due to increased outdoor water usage from increased evaporative demand. The 2030s and 2070s climate-change M&I demands are expected to increase by 2% and 5%, respectively. M&I demand makes up 81% of historical demands and in all projected scenarios is expected to decrease as compared to the historical M&I demand.

- **Domestic Demands:** Future domestic demands were assumed to remain constant and equal to historical domestic demands.

- **Land Use and Population Change Effects on Water Demand:** Population growth and land use changes are not expected to drive increased demand in the future. As described in Section 2.2.3, changes in land use that could have a significant impact on groundwater demand are not expected for the foreseeable future due to land use ordinances and policies. Future change in agricultural and domestic water demand due to land use change is not expected for the UVRGB because most of the agricultural and undeveloped land in the basin lies with the County's SOAR boundaries (Figure 2.2-01). The County's SOAR initiative requires a majority vote of the people to rezone unincorporated open space, agricultural or rural land for development. The initiative is currently approved through 2050. The existence of the SOAR makes it very unlikely that a material change in land use that would affect the GSP analysis will occur during the baseline projection period. Because agricultural land is not expected to convert to other uses, it is assumed that there is little potential for new development and that agricultural activities will continue. Given the historical preponderance of permanent crops, it is assumed that there will not be a significant change in cropping either. The above-listed assumptions and conclusion can be re-visited during the required five-year GSP updates. Population projections within CWMDs retail service area suggest population growth will be small and, therefore, will not likely have material impact on water demand (Table 3.3-07).

Projected Supplies

- **Projected groundwater supplies:** Projected M&I and agricultural groundwater extractions for the basin were determined for the predictive numerical model scenarios. Details on how future groundwater pumping was estimated for the Basin can be found in the Numerical Model Documentation (Appendix F). Climate change was incorporated into future projections of agricultural groundwater pumping by scaling pumping by future (climate change impacted) precipitation projections. Climate change was incorporated into Future M&I groundwater pumping by having different M&I pumping amounts for drought conditions based on future (climate change impacted). Groundwater supplies for the UVRGB were estimated by apportioning future agricultural and M&I pumping volumes based on the agricultural parcels or M&I service areas within the UVRGB boundary. Future domestic supplies were assumed to remain constant and equal to historical domestic supplies.
- **Projected surface-water supplies:** Projected surface water supply was calculated by taking the difference between total basin-wide demand and groundwater supplies for the basin for the respective scenario, using similar methodology as for historical surface-water supplies (Section 3.3.1.1).

Projected demands and supplies by category and source for the baseline, 2030, and 2070 climate change scenarios are shown on Tables 3.3-08 through 3.3-10.

Reliability of Projected Surface Water Supply

Projected surface water supply for all scenarios are on average less than the historical surface water supplies. UVRGB projected baseline surface-water supplies range from 1,200 to 1,700 AF/yr with a long-term average of 1,500 AFY. This is less than the historical supplies (which range from 2,200 to 1,200 AF/yr with an average of 1,700 AF/yr), reflecting anticipated permanent water conservation by water users in the Basin. Overall, the baseline projected surface water supplies are nearly 200 AF/yr less than the historical period, indicating decreased reliance on surface water deliveries.

As discussed in Section 3.3.2, Lake Casitas current “safe demand” is estimated to be 10,660 AF/yr (CWRP report). The CMWD CWRP indicates a 5,160 AF supply gap between the reservoir safe demand and projected demands for the overall CMWD service area. However, CMWD’s draft CWRP includes projects planned for implementation over the next decade to bridge the gap between “safe demand” and projected demands for Lake Casitas surface water supplies. This includes conservation measures to reduce future demands and projects to generate new water supplies. As such, with the planned future projects and conservation measures in CMWD's CWRP, surface-water deliveries to UVRGB are anticipated to be reliable through the 20-year GSP implementation period

3.3.3.3 . Projected Water Budget

The projected surface water and groundwater budgets are presented in the following subsections below:

Projected Surface Water Budget

Average annual volumes for each component of the projected baseline surface-water budget in UVRGB are quantified in Table 3.3-11 and Figure 3.3-04. Following are salient results of the modeled baseline projected surface-water budget, with comparison to the historical and current water budgets (shown on Tables 3.3-02 and 3.3-01):

- The largest components of inflows and outflows for the baseline projected surface water budget are the Matilija Creek and subbasin tributaries, consistent with the combined historical and current surface water budgets.
- Average total surface water inflows are 83,500 AF/yr compared to the combined historical and current period (46,600 AF/yr).
- Stream outflows average 67,000 AF/yr compared to the combined historical and current 35,400 AF/yr.
- The average net surface water - groundwater exchange is 5,500 AF/yr to the aquifer, which is consistent with the combined historical and current period of 5,300 AF/yr.
- As was described in Section 3.3.3.1.1 of this GSP, the projected surface-water budget was also modeled under two climate-change scenarios (2030 and 2070) in accordance with DWR guidance §354.18(c)(3)(C). Projected surface-water-budget components under the 2030 climate-change scenario are summarized in Table 3.3-11 and graphically illustrated on Figure 3.3-05. Projected surface-water-budget components under the 2070 climate-change scenario are summarized in Table 3.3-12 and graphically illustrated on Figure 3.3-06. The effect of the simulated climate-change scenarios on the projected surface-water-budget components is small; the largest change in long-term average projected inflows is less than 3 percent (increase) compared to baseline surface-water budget inflows.

Projected Groundwater Budget

Average annual volumes of groundwater that comprise each component of the baseline projected groundwater budget for the alluvial aquifer are quantified in Table 3.3-13 and Figure 3.3-07. The following are salient results of modeling the baseline projected groundwater budget, with a comparison to the historical and current groundwater budgets (shown on Tables 3.3-03 and 3.3-02):

- **Recharge to the groundwater system:** Owing mostly to the difference in recharge from precipitation (1,570 AF/yr vs. 740 AF/yr; Table 3.3-13), the baseline predictive average total recharge is 68% greater (~800 AF/yr) than the combined historical and current period average total recharge. This is due to the hydrology of the historical period being made up of more dry years than the hydrology the baseline predictive model.

- Groundwater extractions: Total projected baseline groundwater extractions in the basin ranged from approximately 3,200 AF/yr to 6,800 AF/yr with an average of approximately 5,600 AF/yr.
- **Groundwater/Surface Water Interaction:** The magnitude of groundwater/surface-water interaction in the Upper Ventura River during the baseline projected groundwater budget period is similar compared to the historical and current periods.
- **Groundwater Released from Storage:** The net volume of groundwater released from storage during the baseline projected groundwater budget period is approximately 200 AF/yr on average, meaning a small amount of groundwater is projected to be added to storage (associated with rising groundwater levels). This is compared with an average of 142 AF/yr of groundwater storage loss during the combined historical and current period.
- Differences in the remaining projected baseline groundwater budget components compared to historical and current groundwater budget components are modest to negligible, as can be seen by comparing Table 3.3-13 and Figure 3.3-07 to Table 3.3-03 and Figure 3.3-02.

As was described in Section 3.3.3.1.2 of this GSP, the projected groundwater budget was also modeled under two climate change scenarios (2030 and 2070) in accordance with DWR (2018) guidance. Projected groundwater budget components under the 2030 climate-change scenario are summarized in Table 3.3-14 and Figure 3.3-08. Projected groundwater budget components under the 2070 climate-change scenario are summarized in Table 3.3-15 and Figure 3.3-09. The effect of the simulated climate-change scenarios on the projected groundwater budget components is small; the largest relative change is in the average change in storage term for the 2070 climate-change scenario which is 12% more than the baseline. The 2030 climate-change scenario average change in storage term is 3.5% less than baseline. The climate change scenarios net stream percolation and net groundwater discharge to stream terms are 3 to 8% less than the baseline scenario. The simulated effects of climate change on other groundwater budget components are smaller, ranging from less than 1 percent to a few percent. It should be noted that existing cyclical climate phenomena, such as the El Nino/Southern Oscillation (ENSO) and Pacific Decadal Oscillation (PDO), have historically had a greater effect on groundwater budget components in UVRGB than the projected effects of the 2030 and 2070 climate-change scenarios. In other words, the effects of existing climate cycles (ENSO and PDO) likely will have greater impacts on future groundwater conditions in UVRGB than the longer-term climate change assumptions recommended by DWR to evaluate potential uncertainty in the projected water budget.

3.3.4 Overdraft Assessment and Sustainable Yield Estimate [§354.18(b)(7)]

§354.18 Water Budget.

(b) *The water budget shall quantify the following, either through direct measurements or estimates based on data:*

(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.*

(7) *An estimate of sustainable yield for the basin.*

Overdraft Assessment

GSP Emergency Regulations §354.18(b)(5) requires quantification of overdraft over a period of years during which water year and water supply conditions approximate average conditions if overdraft conditions exist.

Bulletin 118, Update 2003 (DWR, 2003) describes groundwater overdraft as: "The condition of a groundwater basin or subbasin in which the amount of water withdrawn by pumping exceeds the amount of water that recharges the basin over a period of years, during which the water supply conditions approximate average conditions. Overdraft can be characterized by groundwater levels that decline over a period of years and never fully recover, even in wet years. If overdraft continues for a number of years, significant adverse impacts may occur, including increased extraction costs, costs of well deepening or replacement, land subsidence, water quality degradation, and environmental impacts."

The water budget results do not indicate and overdraft condition in the Basin currently or in the future. Groundwater levels have not been observed to decline over a period of years and without fully recovering. Numerical model results for the projected water budget indicate that groundwater levels will continue to fully recovery following droughts.

Sustainable Yield

GSP Emergency Regulations § 354.18(b)(7) requires an estimate of the sustainable yield for the basin. Water Code Section 10721(w) defines "Sustainable yield" 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.

Modeling results for the future projection periods indicate that the projected inflow and outflows will be approximately balanced during the 20-year GSP implementation period even with climate change considered. Therefore, an estimate of the sustainable yield is the modeled projected groundwater extractions minus the modeled surface water depletions to cause potential undesirable results for the depletions of interconnected surface water sustainability indicator (i.e., approximately 5,500 to 5,600 acre-feet per year, depending on climate change assumptions). However, there are two very important caveats to the sustainable yield estimate. First, it is noted that more groundwater could be extracted during wet periods without causing undesirable results because the Ventura River can readily recharge more water into the Basin. Second, undesirable results could occur during dry periods even if the sustainable yield is not exceeded on average over a long-term period of average hydrologic conditions. This is because the Basin has a very small amount of groundwater storage which naturally drains rapidly to the Ventura River, which is not the case in almost every other groundwater basin in the State of California. Thus, the concept of a sustainable yield over a long-term average period is not very relevant to the UVRGB.

4.0 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.*

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