DRAFT TECHNICAL MEMORANDUM

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TO:	**CMA GSA**	DATE:	**February 2021**
FROM:	**Stetson Engineers**	JOB NO:	**2711-03**
RE:	DRAFT **Central Management Area Groundwater Conditions**		

INTRODUCTION

This Memorandum describes groundwater conditions within the Central Management Area (CMA) of the Santa Ynez River Valley Groundwater Basin, herein referred to as the "Basin." The Sustainable Groundwater Management Act (SGMA) requires the Groundwater Sustainability Plan include "a description of current and historical groundwater conditions in the basin"[1] as presented in this Groundwater Conditions Technical Memorandum (Memorandum). As required by SGMA, the Basin setting is summarized in the following three related technical memoranda:

1. Hydrogeologic Conceptual Model
2. Groundwater Conditions
3. Water Budget

The Hydrogeologic Conceptual Model characterizes the CMA extent and management areas, subareas, topography, geology, principal groundwater aquifers, and primary sources, uses, and users of groundwater. This Groundwater Conditions Technical Memorandum presents the available data evaluated, provides an assessment of current CMA groundwater conditions as observed in the period 2015-2020, and describes historical conditions using available data from the period 1924 through 2020. The Water Budget Technical Memorandum will quantify groundwater flows into and out of the CMA, including natural conditions (precipitation, groundwater flow, etc.) and human-made conditions (dam releases, groundwater pumping, etc.).

In accordance with SGMA, groundwater sustainability is determined from historical trends, water year type, current groundwater conditions, and projected water use in the Basin. Groundwater use and management within the CMA is determined unsustainable if available data indicate "significant and unreasonable" effects caused by groundwater conditions based on six sustainability indicators specified in the regulations. Accordingly, as required by SGMA, the

[1] 23 CCR 354.16.

following indicators were evaluated within the CMA to document their past and current conditions and support future development of related Sustainable Management Criteria (SMC).

1. Chronic lowering of groundwater levels
2. Reduction of groundwater storage
3. Degraded groundwater quality
4. Seawater intrusion
5. Land Subsidence
6. Depletion of interconnected surface water

The remainder of this Memorandum presents results from the review and evaluation of available data for the CMA. If the data indicate undesirable results may be occurring, or have the potential to occur, the CMA Groundwater Sustainability Agency (GSA) Committee, with input from the Citizen Advisory Group and the public, shall establish SMC thresholds for the relevant sustainability indicators. The SMC thresholds determine when effects are considered "significant and unreasonable," and can be utilized by the CMA GSA Committee to define sustainability.

The SMC thresholds and definitions for undesirable results will be memorialized in a separate Technical Memorandum. Following establishment of SMC thresholds, projects and management actions will be identified as needed in subsequent technical studies to mitigate undesirable results, if any are occurring, and facilitate sustainable groundwater management within the CMA portion of the Basin.

This Memorandum is organized as follows.

- *Section 1. Groundwater Elevation.* This section evaluates the first of the six sustainability indicators, chronic lowering of groundwater levels, and can provide a framework to evaluate some or all of the remaining sustainability indicators. This section includes groundwater elevation data and hydrographs, groundwater flow directions and maps, lateral and vertical groundwater gradients, regional groundwater pumping patterns, and changes in groundwater elevations over time.

- *Section 2. Groundwater Storage.* This section evaluates the second sustainability indicator, reduction of groundwater storage. It includes data on changes in groundwater storage data over the available period of record (roughly 1980–2020).

- *Section 3. Water Quality.* This section addresses, degraded groundwater quality. Beneficial uses are described, and suitability of water quality for each is discussed. Areas of known groundwater contamination and existing contaminant plumes are documented. Water Quality conditions for recent water years 2015-2018 were evaluated using published water quality objectives for groundwater.

- *Section 4. Seawater Intrusion.* The CMA is an inland management area of the Basin and is not directly connected to the Pacific Ocean and therefore, seawater intrusion is not an applicable sustainability indicator for establishing sustainable management criteria for the CMA.

- *Section 5. Land Subsidence.* This section addresses the rate and extent of land subsidence. The section includes available data related to current and historical ground surface elevations, potential for subsidence, and summarizes historical extent, cumulative total, and annual rate of detected land subsidence within the CMA.

- *Section 6. Interconnected Surface Water and Groundwater Dependent Ecosystems.* This section addresses depletion of interconnected surface water. It identifies potential interconnected surface waters, evaluates potential depletions of those waters, and describes the general relationships between surface water, groundwater, and depletions to potential Groundwater Dependent Ecosystems within the CMA.

LIST OF ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
Basin	Santa Ynez River Valley Groundwater Basin
CMA	Central Management Area
DDT	dichloro-diphenyl-trichloroethane
GDE	Groundwater Dependent Ecosystem
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
HCM	Hydrogeologic Conceptual Model
InSAR	Interferometric Synthetic Aperture Radar
mg/L	milligrams per liter
SGMA	Sustainable Groundwater Management Act
SMCL	secondary maximum contaminant level
SWRCB	State Water Resources Control Board
USGS	United States Geological Survey
WMA	Western Management Area
µg/L	micrograms per liter

APPENDICES

APPENDIX A	HISTORICAL WELL HYDROGRAPHS.
APPENDIX B	Dudek. 2020. *Land Subsidence, West and Central Management Areas – Santa Ynez River Valley Groundwater Basin.* October 30, 2020.

1 GROUNDWATER ELEVATION

This section addresses the first of the six sustainability indicators, chronic lowering of groundwater levels. Groundwater elevation data, lateral and vertical groundwater gradients, inferred groundwater flow directions, maps showing lines of equal groundwater elevations (contours), regional groundwater pumping patterns, and graphical changes in groundwater elevations over time (hydrographs) are described and evaluated in the following subsections. These descriptions include both historical seasonal and longer-term trends, and documentation of current conditions in the CMA. This section also provides a framework for data presentation and reporting on the five remaining sustainability indicators.

1.1 GROUNDWATER ELEVATION DATA

Groundwater data were made available by the CMA Groundwater Sustainability Agency (GSA) member agencies. The data are collected by the agencies to monitor and manage their respective groundwater jurisdictions. Data provided by the CMA GSA member agencies include groundwater well names and/or identifying labels, groundwater well locations, static groundwater elevation data, and groundwater pumping or production data. Four sources of groundwater elevation data made available for this evaluation are summarized in **Table 1-1**.

TABLE 1-1
CMA GROUNDWATER ELEVATION DATA SOURCES

Type	Summary	Description
Monthly	City of Buellton	Static groundwater level elevation measurements provided by the City of Buellton.
Monthly	United States Bureau of Reclamation (USBR)	Groundwater level data reported in the USBR Cachuma project monthly reports. The vertical datum of the source data was converted from National Geodetic Vertical Datum of 1929 (NGVD29) to North American Vertical Datum of 1988 (NAVD88).[1]
Semiannual	United States Geological Survey (USGS) National Water Information System (NWIS)	Groundwater level data available from the USGS NWIS (entire Santa Ynez Valley).
Semiannual	County of Santa Barbara	Groundwater level data collected by the County of Santa Barbara.

Note: [1] 23 CCR 352.4 requires that groundwater elevations be reported in NAVD88. Vertical datum is the zero-elevation from which all other elevations are referenced. In the Basin, depending on location, the difference between NGVD29 and NAVD88 is approximately 2.5–2.6 feet.

The groundwater elevation data were previously incorporated into the Data Management System as described in the Data Management Plan. The Data Management System was utilized to evaluate these data and prepare groundwater elevation hydrographs for the principal groundwater aquifers within the CMA based on well depth, well-casing perforated intervals, geologic conditions, and measured water level responses to recharge and pumping.

1.2 Groundwater Elevation Contour Maps

In accordance with the Sustainable Groundwater Management Act (SGMA), "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"[2] are to be prepared for the CMA. Contours were developed for those portions of the CMA having sufficient number and distribution of groundwater wells. Groundwater elevation contour maps for seasonal high (spring 2020) and seasonal low (fall 2019) conditions within the CMA are included as **Figures 1-1** and **1-2**.

As described in the companion Hydrogeologic Conceptual Model (HCM) Technical Memorandum, the CMA has two principal aquifers, the Upper Aquifer and Lower Aquifer, whose names are derived from the regional aquifer system in the Lompoc Plain subarea of the WMA where both aquifers are located.

- Upper Aquifer consists primarily of older and younger alluvial deposits and river gravels of the Santa Ynez River and Orcutt Sand.,
- Lower Aquifer consists of Careaga Sandstone and the Paso Robles Formation in a broad syncline structure.

As described in the HCM Technical Memorandum, the Buellton Upland subarea topography is relatively rugged terrain. As a result of this there are few wells drilled, and even fewer that participate in the current monitoring program. Groundwater elevation contours were developed for areas adjacent with active groundwater monitoring.

1.2.1 Seasonal High and Seasonal Low Groundwater Elevation Contour Maps

Seasonal High – Spring 2020

Seasonal high groundwater elevations represented by Spring 2020 measurements are presented on **Figure 1-1**. Shown on this map are the locations of wells with groundwater monitoring data, color-coded to identify wells with screened intervals within the Upper Aquifer and wells screened within the Lower Aquifer.

[2] 23 CCR 354.1(a)(1).

Upper Aquifer seasonal high groundwater elevations were available at wells located across the Santa Ynez Alluvium subarea and one well in the Buellton Upland. The groundwater elevation data were used to calculate groundwater gradient and flow direction inferred from the contours. In the Upper Aquifer, groundwater generally flows from east to west, in alignment with the Santa Ynez River channel. Groundwater flow in the Upper Aquifer in the Buellton Upland generally flows north to south from higher elevation to lower elevation.

The spring 2020 data was insufficient to create a Lower Aquifer contour map for the CMA. Previous studies (Upson and Thomasson, 195l) have suggested that in the Santa Ynez Alluvium subarea, the Lower Aquifer may be at a slightly higher pressure than the Upper aquifer, indicating an upward vertical gradient from the Lower Aquifer to the Upper Aquifer. However, recent water levels in 2020 indicate water levels in the Lower Aquifer are about 2 to 3 feet lower than the Upper Aquifer within the City of Buellton.

Seasonal Low – Fall 2019

Seasonal low groundwater levels are represented by Fall 2019 groundwater elevations, and contours based on available data from wells located across the Santa Ynez Alluvium and Buellton Upland are shown on **Figure 1-2.** Fall 2019 Upper Aquifer and Lower Aquifer groundwater elevation data are slightly lower in elevation with respect to the Spring 2020 seasonal high; however, horizontal flow directions and vertical gradients are consistent with the Spring 2020 conditions described above.

1.2.2 Evaluation of Seasonal High and Low

As expected, seasonal low Upper Aquifer groundwater elevations measured in Fall 2019 are generally lower than those measured in Spring 2020. Seasonal differences in water levels in the CMA for both the Upper and Lower Aquifers can range from 1 to 10 feet depending upon the particular well.

1.3 GROUNDWATER HYDROGRAPHS

SGMA requires preparation of "hydrographs depicting long term groundwater elevations, historical highs and lows, and hydraulic gradients between principal aquifers."[3] Hydrographs using data from select CMA wells are shown on **Figure 1-3**. Hydrographs were also prepared for other wells located within the CMA but are not shown on **Figure 1-3** because of their relatively short period lengths or limited value to assess CMA groundwater because of their locations. The hydrographs for these additional wells are provided in Appendix A, and are generally organized from west to east within each CMA subarea.

[3] 23 CCR 354.1(a)(2).

The wells shown on **Figure 1-3** were utilized to prepare representative hydrographs for the CMA subareas. The colors of hydrograph data points correspond to their data source noted in the figures and described in Section 1.1, “Groundwater Elevation Data.” The hydrographs show the measured groundwater elevation on the left y-axis (vertical axis) and the corresponding depth to groundwater on the right y-axis. Grid lines depicting Calendar Year are provided at the top x-axis (horizontal axis) and the bottom x-axis shows the Water Year which spans October through September, annually. Vertical columns for the water year are colored to represent water year index based on precipitation (wet, dry/critically dry, or above/below normal).

The following subsections discuss the hydrograph data presented in **Figures 1-4AB** through **1-5AD**. In general, the hydrograph data show visible but slight increases in groundwater elevations during the relatively wet 1990-2000 period and decreases in groundwater elevations during the relatively dry 2005-2020 period.

1.3.1 Buellton Upland

The Buellton Upland aquifer consists of an Upper Aquifer of Orcutt Sand and local alluvium, and a Lower Aquifer of Paso Robles Formation and Careaga Sand. Groundwater hydrographs for wells located in the Santa Rosa Creek drainage (**Figure 1-3)** are presented below.

Well 7N/32W-31M1 (**Figure 1-4A**) represents conditions in the Upper Aquifer. Measurements represent the seasonal high, so seasonal variation is not defined. Long-term trends indicate groundwater levels increased from 1970 through about 1985, decreased to about 1991, increased to about 2002, and have gone down since then. During the early period of the 2012-2018 drought, water levels declined by 24 feet in one year.

Well 7N/33W-36J1 (**Figure 1-4B**) represents conditions in the Lower Aquifer. Measurements represent the seasonal high, so seasonal variation is not defined. Long-term trends indicate groundwater levels declined from the 1940s through 1970, increased from 1970 through about 1985, decreased to about 1991, increased to about 2002, and have declined slightly since then. During the 2012-2018 drought, water levels declined by 11 feet over the course of seven years.

Wells in the Upper and Lower Aquifers along Santa Rosa Creek indicate that groundwater levels are higher in the Upper Aquifer by as much as 30 to 40 feet during the years 1975 through 2012, likely indicating perched groundwater conditions in the Upper Aquifer in this reach.

1.3.2 Santa Ynez River Alluvium

As discussed in the HCM, the Santa Ynez River Alluvium Upper Aquifer is considered part of the subflow of the river, which is regulated by the SWRCB. Because subflow is considered surface water, the Santa Ynez River Alluvial Upper Aquifer deposits upstream of the Lompoc Narrows would not be classified as a principal aquifer or managed by a GSP under SGMA. The hydrograph for wells screened within this subflow of the Santa Ynez River, well 6N/32W-17J2 (**Figure 1-5A**) and 6N/31W-17D1 (**Figure 1-5B**), indicates water level elevations are relatively stable to slightly declining, following periods of prolonged drought in the late 1990s and late 2010s. Long-term trends are relatively flat, likely as a result of recharge from the Santa Ynez River. The stability of the water levels is indicative of that the river stage effectively controls the ground-water level (Upson and Thompson, 1951). Seasonal variations up to 4 feet are typically observed annually. These seasonal and longer-term trends are determined primarily by managed releases from Cachuma Reservoir and extractions of the subsurface water from wells in the river alluvium.

As discussed in the HCM, the Santa Ynez River Alluvium Lower Aquifer exists near the City of Buellton as part of the Santa Rita syncline in the reach from the EMA/CMA boundary to the Buellton Bend. Well 6N/32W-12K1/2 (**Figure 1-5C**) and Well 6N/31W-7F1 (**Figure 1-5D**) are deep wells perforated in the Careaga formation that represents long-term conditions of the Lower Aquifer. Well 6N/32W-12K1/2 (**Figure 1-5C**) indicates seasonal variations up to 10 feet are typically observed annually. Water levels in both wells declined 6 to 9 feet during the period 1985-1992. Water levels then increased by 8 to 12 feet from the mid-1990s to the mid-2000s. After 2005 and 2006, water levels declined by 26 to 27 feet by year 2016. This period has the largest water level decline that has been observed historically in the CMA. However, water levels have since increased by 12 to 17 feet during the period 2017 to 2020, and water levels in Well 6N/32W-12K1/2 have now recovered to 1982 water level conditions (**Figure 1-5C).**

Wells in the Upper and Lower Aquifers near the City of Buellton indicate that groundwater level elevations are typically very similar. However, during droughts water levels in the less permeable Lower Aquifer tend to drop quicker and have lower water levels than the Upper Aquifer, which are sustained by water rights releases from Cachuma Reservoir and recharge from the Santa Ynez River.

2 GROUNDWATER STORAGE

This section addresses the second sustainability indicator, reduction of groundwater storage. In the CMA, the change in groundwater storage in the Basin was evaluated in this technical memorandum with respect to baseline conditions established in 1982, using data reported annually by the SYRWCD (Stetson, 2020). Groundwater storage data for the CMA is evaluated and the cumulative changes in groundwater storage over time are discussed below. In accordance with SGMA, the section also includes "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."[4] Graphs were created for the CMA subareas that show changes to groundwater in storage since the established baseline (1982) and are included as **Figure 2-1**. Groundwater storage under future scenarios will be analyzed and refined with the groundwater budget and groundwater model being developed for the GSP.

2.1 CUMULATIVE CHANGE IN GROUNDWATER STORAGE

Accumulated change of groundwater in storage for the CMA is shown on **Figure 2-1** in acre-feet (AF). This annual and cumulative change in the volume of groundwater in storage is from the annual groundwater reports produced by the SYRWCD (Stetson, 2020). From 1982 through 2018, the data indicate a net increase of groundwater storage in the CMA of about 900 AF. This increase equals 24 acre-feet of change per year on average and is very close to no net change over the 38-year period.

The annual reporting of changes in groundwater storage (Stetson, 2020) is based on changes in groundwater levels in representative monitoring wells. For the Santa Ynez River Alluvium subflow, the United States Bureau of Reclamation (USBR), in connection with SWRCB Order No. 2019-148, determines on a monthly basis the quantity of dewatered storage in the subflow of the Santa Ynez River. The District uses a similar methodology with representative monitoring wells to estimate the changes in groundwater storage for the Buellton Upland (Stetson, 2020).

2.2 CLASSIFICATION OF WET AND DRY YEARS

The four wettest water years (water-year defined as October through September, annually) based on precipitation in the period of record at Buellton Fire Station (Water Year 1955-2020)[5] are WY 1995 (34.26 inches), WY 1983 (39.03 inches), WY 2005 (39.57 inches), and WY 1998 (41.56 inches. The four driest water years in the period of record based on precipitation correspond to WY 2015 (6.94 inches), WY 1989 (6.79 inches), WY 2007 (6.30 inches), and WY 2014 (5.87 inches).

[4] 23 CCR 354.16(b).
[5] Buellton Fire Station, Gauge 233, Santa Barbara County Flood Control & Water Conservation District.

To characterize all water years as either wet, above/below normal, or dry/critically dry as shown on **Figure 2-2**, the Salsipuedes Creek streamflow gauge (U.S. Geological Survey [USGS] gauge 11132500) was selected as a proxy to classify each water year. The Salsipuedes Creek streamflow gauge represents a 47.1-square-mile[6] drainage area with long period of record in the Lower Santa Ynez River watershed. The 79-year dataset for the gauge spans 1942 through 2020 and represents unimpeded runoff due to the absence of upstream water diversion and storage.

Discharge in acre-feet per year for Salsipuedes Creek gauge is shown on **Figure 2-3** for the period of record. The data are presented as a power law distribution, meaning the highest recorded flows in acre-feet have occurred in a minority of the total years recorded. Classification into a water year type followed the State Water Resources Control Board order WR 2019-0148 methodology. Years were classified based on the rank in the period of record in one of five categories: “critically dry” (bottom 20 percentile), “dry” (20th to 40th percentile), “below normal (40th to 60th percentile), “above normal” (60th to 80th percentile), and “wet” (80th to 100th percentile).

Using the robust dataset from the Salsipuedes Creek gauge (**Figure 2-2**) the period of record was classified as wet, above/below normal, or dry/critically dry. The cumulative departure from mean graph at the bottom indicates that the period 1995–2006 was relatively wet, while the period 2012–2018 has been relatively dry.

2.3 Groundwater Use and Effects on Storage

Total annual reported groundwater use for the Buellton Upland is compared to cumulative groundwater storage loss on **Figure 2-4**. The groundwater uses totaled on **Figure 2-4** show that groundwater use in the Buellton Upland gradually increased from 1995 through 2007. Groundwater use increased in the period 2008 through 2015. Following 2015 through 2019 (current), groundwater use has declined. Cumulative groundwater storage loss indicates that effects of both hydrologic periods and groundwater use. For example, before the dry period of 2012-2018, the groundwater storage decreased with increased groundwater use. Conversely, during the wet period 1995-2016 and after above-normal water year 2017, groundwater storage increased.

[6] USGS NWIS (2020) USGS 11132500 SALSIPUEDES C NR LOMPOC CA

3 WATER QUALITY

In accordance with SGMA, "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"[7] are described in this section. Water quality objectives vary depending on the beneficial use and users of groundwater being evaluated. To determine existing or future potential water quality issues within the CMA, the beneficial uses of groundwater must first be established.

This section is divided as follows:

- *Section 3.1, Beneficial Uses.* This subsection describes the various beneficial uses for groundwater within the Basin and provides context for water quality objectives for those beneficial uses.

- *Section 3.2, Suitability for Beneficial Use*, includes discussion of major beneficial uses.

- *Section 3.3, Existing Groundwater Contamination Sites and Plumes.* This section describes the known existing groundwater contaminant sites and plumes that are currently managed by other State of California regulatory bodies responsible for protecting groundwater quality and quantity.

- *Section 3.4, Recent Groundwater Quality,* includes data for selected major diffuse or natural constituents for the period water year 2015 through 2018.

3.1 BENEFICIAL USES

The Central Coast Basin Water Quality Control Plan herein referred to as the Central Coast Basin Plan (Central Coast Regional Water Quality Control Board [CCRWQCB], 2019), which includes the SYRGB, identifies 18 beneficial uses of surface and groundwater in the Santa Ynez River basin below Cachuma Reservoir (CCRWQCB, 2019 Table 2-1), which are briefly listed and described below.

The following four beneficial categories apply to both groundwater and surface water in the CMA.

- Municipal and Domestic Supply (**MUN**). Uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply.

[7] 23 CCR §354.16 (d)

- Agricultural Supply (**AGR**). Uses of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.

- Industrial Process Supply (**PROC**). Uses of water for industrial activities that depend primarily on water quality (i.e., waters used for manufacturing, food processing, etc.).

- Industrial Service Supply (**IND**). Uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well repressurization.

For surface water, the 2019 Basin Plan has identified an additional 14 beneficial uses in the SYRVGB below Cachuma Reservoir[8]. The importance of groundwater quality on these beneficial uses depends on the discharge of groundwater to surface water which is described further in Section 6.

3.1.1 Median Groundwater Quality Objectives

The Central Coast Regional Water Quality Control Board (CCRWQCB) 2019 Basin Plan includes median groundwater objectives for several major water quality constituents specifically for portions of the CMA. These are shown in **Table 3-1** along with the secondary maximum contaminant levels (SMCL), a national federal drinking water standard for guidance regarding water for potential public supply. These “objectives are intended to serve as a water quality baseline for evaluating water quality management in the basin” (CCRWQCB, 2019) and represent an average value in each subarea.

TABLE 3-1
MEDIAN GROUNDWATER OBJECTIVES IN MG/L FOR THE CENTRAL MANAGEMENT AREA

Basin/Subarea	Salinity as Total Dissolved Solids (TDS)	Chloride (Cl)	Sulfate (SO_4^{2-})	Boron (B)	Sodium (Na)	Nitrogen (N)
Buellton Upland	1,500	150	700	0.5	100	1
Santa Ynez River Alluvium	1,500	150	700	0.5	100	1
SMCL	*500*	*250*	*250*	-	-	-

Note: The 2019 Basin Plan values shown are for “Santa Rita” subarea, which also includes the Santa Rita Upland.

[8] See “Table 2-1. Identified Uses of Inland Surface Waters (continued)”, page 20, 2019 Basin Plan

3.2 Suitability for Beneficial Use

Groundwater quality in the CMA is suitable for potable and agricultural uses. Key water quality parameters in the CMA in relation to the primary beneficial uses and primary users are summarized below.

3.2.1 Municipal Supply

Municipal supply is the best documented water quality in the CMA, as all public water systems of significant size are required to collect and report water quality to the State Water Resources Control Board (SWRCB) as part of the Safe Drinking Water Information System. Because the major public water systems treat the groundwater in the CMA, like the City of Buellton, the majority of the water quality issues are constituents likely related to the distribution system and do not indicate general groundwater quality impairing this beneficial use. The exception is elevated levels of arsenic in water samples collected by the Bobcat Springs Mutual Water Company, located in the Buellton Upland, and reported to the SWRCB in 2009.

3.2.2 Agricultural Supply

Agricultural beneficial use is the primary beneficial use in the CMA. Different crops have different sensitivities to water quality constituents, and water quality is one of many considerations in terms of crop selection. Section 5.2 of the HCM identified major crops in the CMA as including wine grapes, dry beans, and walnuts. These include crops that are sensitive to high total dissolved solids (TDS), chloride, and boron. Agricultural water is generally untreated before use; however, poor water quality (high TDS) often can be mitigated by increased water application (increased leaching fraction).

Historical water quality in the CMA was reviewed relative to the 2019 Basin Plan general water quality objectives for agricultural water use. Constituents with historical measurements exceeding objectives for agriculture through large areas of the CMA were boron, fluoride, and manganese. Boron was detected in samples above the irrigation reference value of 0.75 milligrams per liter (mg/L) in wells throughout the Santa Ynez River Alluvium, and in one sample collected in the Buellton Upland along Santa Rosa Creek. Fluoride was detected in a sample above the recommended 2.0 mg/L livestock reference value and above the 1.0 mg/L irrigation reference value in several samples collected in the CMA, one along Santa Rosa Creek in the Buellton Upland, and in several samples collected downstream of the Buellton Bend in the Santa Ynez River Alluvium. Manganese was detected in collected samples above the 0.2 mg/L irrigation recommendation value in several wells in the Santa Ynez River Alluvium.

3.2.3 Domestic Supply

Impaired beneficial use for domestic supply was reviewed using the SWRCB Needs Analysis GAMA Tool. This tool identifies the location of domestic wells by section and indicates if groundwater is adversely affected by nitrate, arsenic, hexavalent chromium, perchlorate, 1,2,3-trichloropropane, and uranium. Unlike municipal supply, domestic supply is less likely to involve water treatment and so groundwater quality is more likely to have a direct negative impact on this beneficial use. Domestic suppliers are not required to take and submit water quality samples.

In the CMA, levels of nitrate in collected samples exceeded recommended values in both the Buellton Upland along Santa Rosa creek, and the Santa Ynez River Alluvium downstream of the City of Buellton to the Buellton Bend. Detected levels of arsenic only occurred in sections in the eastern Buellton Upland, and portions of the Santa Ynez River Alluvium just east of the City of Buellton at concentrations below action levels. Concentrations of hexavalent chromium, perchlorate, 1,2,3-trichloropropane, and uranium in collected samples from the CMA were below action levels.

3.3 Groundwater Contamination Sites and Plumes

Publicly available databases maintained by various State of California regulatory agencies, including the State Water Resources Control Board GeoTracker GAMA site[9], and the California Department of Toxic Substances Control EnviroStor site[10] were reviewed and evaluated. In accordance with SGMA, the available data were used to identify sites that could potentially affect groundwater quality within the CMA.

Identification of existing groundwater contamination sites are mapped on **Figure 3-1** and the historical extents of contaminant plumes in groundwater are mapped on **Figure 3-2**. These sites are regulated and under the oversight authority of their respective State of California agencies responsible for ensuring the contamination is mitigated in-place and directing appropriate actions to protect groundwater quantity and quality. The SGMA requires that sustainable groundwater management not influence plume migration and negatively influence groundwater quality. Hence, discussion of these sites is for information purposes, and all management, monitoring, compliance and reporting activities related to these sites remain under their respective State of California agencies.

A summary of the identified sites within the CMA is provided in **Table 3-2.** Contamination sites within the City of Buellton are located along Highway 246 and Avenue of the Flags and are

[9] https://geotracker.waterboards.ca.gov/
[10] https://www.envirostor.dtsc.ca.gov/public/

likely related to leaking underground storage tanks (LUST) sites (**Figure 3-2**).[11] Contamination at Ballard Canyon Road at the CMA/EMA boundary appears to be related to heavy metals[12]. Although these sites have multiple contaminants of concern, they are currently considered compliant with applicable regulatory orders and the contaminants are being effectively monitored and managed in place or remediated to reduce future potential to impair groundwater quality.

TABLE 3-2
COUNT OF POTENTIAL POINT SOURCES OF GROUNDWATER CONTAMINATION SHOWN ON FIGURE 3-1 BY CMA SUBAREA

Basin/Subarea	SWRCB Cleanup Program		LUST Cleanup		Military Cleanup		DTSC Cleanup		Total	
	Open	Total	Open	Total	Open	Total	Open	Total	Open	Total
Buellton Upland	0	1	0	2	0	0	0	0	0	3
Santa Ynez River Alluvium	1	4	1	21	0	0	0	0	2	25
Total	1	5	1	23	0	0	0	0	2	28

Note: LUST = leaking underground storage tank; DTSC = Department of Toxic Substances Control.

3.4 Current Groundwater Quality (2015-2018)

The distribution and concentration of selected naturally occurring or diffuse groundwater constituents are discussed in the following subsections. The constituents in this section correspond to the same constituents used for the 2019 Basin Plan groundwater quality objectives (**Table 3-1**). Averages for the recent 4-year period of water years 2015 through 2018 are shown. Water quality data was primarily evaluated from three primary data compilation sources:

- Water Quality Portal, a cooperative service from USGS, the U.S. Environmental Protection Agency, and the National Water Quality Monitoring Council, which in addition to these federal sources includes some state, tribal, and local data. This is the primary source for USGS water quality data. Water quality data collected by the Santa Barbara County Water Agency is submitted to the USGS and included here.

[11] Groundwater contamination associated with these locations includes benzene, methyl-tert-butyl ether, tert-butyl alcohol, tetrachloroethene, xylenes (total), ethylbenzene, naphthalene, toluene, and 1,2 dichloroethane.
[12] Elevated concentrations of antimony, cadmium, selenium, thallium, arsenic, and manganese have been found at this location, as well as vinyl chloride, cis-1,2 dichloroethylene, and di phthalate (2-ethylhexyl).

- Safe Drinking Water Information System, which is a compilation service from SWRCB that compiles mandated water quality reports from California public water systems. Public water systems include the CMA agency member the City of Buellton.

- Irrigated Lands Regulatory Program (ILRP), an SWRCB program that tracks discharges from irrigated agricultural lands. Participants submit water quality sampling results for selected constituents. The IRLP is made available through the Safe Drinking Water Information System GeoTracker GAMA website.

The Data Management System, described in the Data Management Plan, was configured to automatically update the database with data from these three sources of water quality data. The sections below provide a snapshot of current groundwater conditions in the CMA, based on the best available data from January 1, 2015, through 2018. The spatial distribution of water quality is assessed using maps, and average concentrations are compared to the 2019 Basin Plan water quality objectives and summarized in tables.

3.4.1 Salinity (Total Dissolved Solids)

Salinity, as measured by total dissolved solids (TDS), is the dry mass of constituents dissolved in a given volume of water. There are two measurements of salinity: TDS, which is a measurement of the total mass of the mineral constituents dissolved in the water, and electrical conductivity, which is a measurement of the conductivity of the solution of water and dissolved minerals.

The Secondary Maximum Contaminant Level (SMCL) includes a recommended standard of 500 mg/L, an upper limit of 1,000 mg/L, and a short-term limit of 1,500 mg/L (SWRCB 2017). The 2019 Basin Plan for irrigation does not provide a TDS guidance for salinity. Crops in the CMA sensitive to salinity are beans, and strawberries (Hanson 2006).

Average concentrations of TDS in groundwater samples collected during water years 2015–2018 for 108 measurements at 34 wells in the CMA are shown on **Figure 3-3**. A summary of the data is provided in **Table 3-3**. As shown in **Table 3-3**, the average constituent concentrations in samples collected in the CMA were below the 2019 Basin Plan Water Quality Objective (WQO). Concentrations of chloride were lower in the Buellton Upland compared to the Santa Ynez River Alluvium. The highest salinity was measured in samples collected in the western portions of the Santa Ynez River Alluvium (**Figure 3-3**).

TABLE 3-3
SUMMARY OF SALINITY AS TOTAL DISSOLVED SOLIDS (TDS) IN THE CMA DURING WATER YEARS 2015–2018

Subarea	TDS Average (mg/L)	TDS Minimum (mg/L)	TDS Maximum (mg/L)	TDS WQO (mg/L)	Wells Below WQO (count)	Wells Above WQO (count)
Buellton Upland	379	180	640	1,500	7	0
SYR Alluvium	1,042	460	1,770	1,500	26	1

3.4.2 Chloride

Chloride (Cl^-) is a mineral anion and a major water quality constituent in natural systems. Chloride is characteristically retained in solution through most of the processes that tend to separate out other ions (Hem 1985). The circulation of chloride ions in the hydrologic cycle is largely through physical processes. For example, chloride is a chemical indicator commonly used to evaluate seawater intrusion, as high chloride concentrations are characteristic of seawater and it remains dissolved in solution in most surface water conditions (see Section 4, Seawater Intrusion).

For general municipal and domestic beneficial uses the SMCL is a recommended standard of 250 mg/L, an upper limit of 500 mg/L, and a short-term limit of 600 mg/L. For agricultural beneficial use, the 2019 Basin Plan indicates chloride levels that exceed 106 mg/L cause increasing problems for crop irrigation. Crops grown in the CMA sensitive to chloride in irrigation water include strawberries (tolerance of 100–180 mg/L) (Hanson et al. 2006).

Average concentrations of chloride in samples collected during water years 2015–2018 for 105 measurements at 34 wells are shown on **Figure 3-4**, and a summary of the data is provided in **Table 3-4**. The average concentration in samples from almost all wells were below the 2019 Basin Plan WQO.

TABLE 3-4
SUMMARY OF CHLORIDE (CL^-) CONCENTRATIONS IN THE CMA DURING WATER YEARS 2015–2018.

Subarea	Cl^- Average (mg/L)	Cl^- Minimum (mg/L)	Cl^- Maximum (mg/L)	Cl^- WQO (mg/L)	Wells Below WQO (count)	Wells Above WQO (count)
Buellton Upland	58	31	95	150	7	0
SYR Alluvium	100	2	210	150	26	1

3.4.3 Sulfate

Sulfate (SO_4^{2-}) is a naturally occurring anion and a major water quality constituent. The SMCL includes a recommended standard of 250 mg/L, an upper limit of 500 mg/L, and a short-term limit of 600 mg/L. The 2019 Basin Plan does not indicate a specific sulfate guideline for irrigation water.

Average sulfate groundwater concentrations during water years 2015–2018 for 108 measurements at 34 wells in the CMA are shown on **Figure 3-5**, and a summary of the data is provided in **Table 3-5**. Average concentrations in sampled wells were below the 2019 Basin Plan WQO. Concentrations of sulfate in collected samples were lowest in the Buellton Upland and higher in the Santa Ynez River Alluvium.

TABLE 3-5
SUMMARY OF SULFATE CONCENTRATIONS IN THE CMA DURING WATER YEARS 2015–2018

Subarea	SO_4^{2-} Average (mg/L)	SO_4^{2-} Minimum (mg/L)	SO_4^{2-} Maximum (mg/L)	SO_4^{2-} WQO (mg/L)	Wells Below WQO (count)	Wells Above WQO (count)
Buellton Upland	77	14	220	700	7	0
SYR Alluvium	34	1	763	700	27	0

3.4.4 Boron

Boron (B) is a trace water quality constituent, and plants have specific tolerance limits for boron concentrations in irrigation water. The 2019 Basin Plan's general guidance regarding boron toxicity from irrigation water increases from 500 to 2,000 micrograms per liter (μg/L). Crops in the CMA considered sensitive to boron are beans (750–1,000 μg/L), grapes (500–750 μg/L), strawberries (750–1,000 μg/L), and walnuts (500–750 μg/L) (Hanson et al. 2006). Concentrations above 10,000 μg/L may be toxic to fish.

Concentrations of boron detected in groundwater samples during water years 2015–2018 in the CMA are shown on **Figure 3-6**, and a summary of the data is provided in **Table 3-6**. Concentrations of boron in groundwater samples collected during other periods are below 500 μg/L objective in the Buellton Upland, and concentrations of boron in half the samples collected in Santa Ynez River Alluvium exceeded the 500 μg/L objective.

TABLE 3-6
SUMMARY OF BORON CONCENTRATIONS IN THE CMA DURING WATER YEARS 2015–2018

Subarea	B Average (µg/L)	B Minimum (µg/L)	B Maximum (µg/L)	B WQO (µg/L)	Wells Below WQO (count)	Wells Above WQO (count)
Buellton Upland	-	-	-	500	0	0
SYR Alluvium	475	470	480	500	1	0

Note: Non-Detect (ND) Values are Treated as Zero in Calculations.

3.4.5 Sodium

Sodium (Na^+) is a mineral cation and a major water quality constituent in natural systems. The 2019 Basin Plan indicates the primary concern for sodium in irrigation water is the sodium absorption ratio (SAR). The sodium absorption ratio is the relative concentration of sodium to calcium and magnesium and is managed to maintain soil permeability.

Average concentrations of sodium collected in 105 samples from 33 locations in the CMA during water years 2015–2018 are shown on **Figure 3-7**, and a summary of the data is provided in **Table 3-7**. The average concentrations in most wells were below the 2019 Basin Plan WQO. Sodium concentrations were generally lower in the Buellton Upland. The highest concentrations were in samples from wells located in the Santa Ynez River Alluvium.

TABLE 3-7
SUMMARY OF SODIUM CONCENTRATIONS IN THE CMA DURING WATER YEARS 2015–2018

Subarea	Na^+ Average (mg/L)	Na^+ Minimum (mg/L)	Na^+ Maximum (mg/L)	Na^+ WQO (mg/L)	Wells Below WQO (count)	Wells Above WQO (count)
Buellton Upland	41	27	69	100	7	0
SYR Alluvium	103	16	399	100	17	9

3.4.6 Nitrate

Nitrogen is the primary atmospheric gas, however its presence in water is related to the breakdown of organic waste. Total nitrogen in groundwater is the sum of organic nitrogen and the three inorganic forms: nitrate (NO_3^-), nitrite (NO_2^-), and ammonia (NH_4^-). These forms are ubiquitous in nature and come from fixation by microbes in soil and water and by lightning. Sources for high concentrations in water sources include fertilizers, animal and human waste streams, and explosives. Nitrogen and phosphorus are key for life and are found in many fertilizers.

The maximum contaminant limit (MCL) and public health goal is 10 mg/L for combined nitrate plus nitrite as nitrogen (Banks et al. 2018). The 2019 Basin Plan indicates increasing problems for irrigation of sensitive crops if nitrate as nitrogen is between 5 and 30 mg/L, and problems for livestock watering if nitrate plus nitrite as nitrogen exceeds 100 mg/L.

Nitrate concentrations are reported either as nitrate (the full mass of the nitrate anion), or as nitrogen (the mass of the nitrogen). For this study all values have been converted to nitrate as nitrogen. The best available data and coverage for nitrogen within the CMA for recent years is from ILRP, which measures and reports combined nitrate-nitrite values. In the CMA, measurements of nitrate concentrations are significantly greater than nitrite, so combined nitrate-nitrite are approximately equal to nitrate alone.

Average concentrations of nitrate in 126 groundwater samples collected at 34 locations during water years 2015-2018 are shown on **Figure 3-8**, and a summary of the data is provided in **Table 3-8**. High nitrate concentrations are found throughout the CMA. The lowest concentrations of nitrate are measured in samples from wells located in the Santa Ynez River Alluvium.

TABLE 3-8
SUMMARY OF NITRATE AS NITROGEN IN IN THE CMA DURING WATER YEARS 2015–2018

Subarea	NO_3 as N Average (mg/L)	NO_3 as N Minimum (mg/L)	NO_3 as N Maximum (mg/L)	NO_3-NO_2 as N WQO (mg/L)	Wells Below WQO (count)	Wells Above WQO (count)
Buellton Upland	3.489	100	34.200	1	3	10
SYR Alluvium	5.781	ND	239.000	1	15	17

3.4.7 Historical Trends

Historical water quality trends in the CMA have been analyzed with available historical data from 1980 to present in California's Groundwater Ambient Monitoring Assessment (GAMA) program (Haas et al. 2019). Mixed trends were noted in the CMA for the identified constituents in the 2019 Basin Plan (TDS, sulfate, and nitrate) and no trends for additional constituents (arsenic, hexavalent chromium, iron and manganese)[13]. The mixed nature of these trends is most likely to various natural and manmade sources (Haas et al. 2019).

These baseline water quality data are provided as a snapshot of current conditions. The responsibility of regulating water quality lies with other existing agencies and programs, and a goal of the CMA GSP will be to not significantly and unreasonably influence existing (background) water quality conditions as part of GSP implementation (which will be discussed further under Sustainable Management Criteria, SMCs). Hence, future groundwater management

[13] Figures 20-26 (Haas et al. 2019)

actions implemented by the CMA will not adversely affect groundwater quality, nor will they interfere with other agencies objectives or responsibility to manage, maintain, or improve water quality.

4 SEAWATER INTRUSION

The CMA is an inland management area of the Basin and is not directly connected to the Pacific Ocean and therefore, seawater intrusion is not an applicable sustainability indicator for establishing sustainable management criteria for the CMA.

Seawater intrusion in the Basin will be assessed in the Western Management Area (WMA), which borders the Pacific Ocean. If available data suggest seawater intrusion is occurring in the WMA, overall Basin-wide management strategies may be identified and implemented in the WMA and/or the CMA and/or the EMA to limit the hypothetical potential for increased seawater intrusion in the WMA.

5 LAND SUBSIDENCE

The fifth sustainability indicator, land subsidence, is evaluated within the CMA in this section. SGMA requires evaluation of the "extent, cumulative total, and annual rate of land subsidence, including maps depicting total subsidence,"[14] with the overall goal of avoiding the undesirable result of "significant and unreasonable land subsidence that substantially interferes with surface land uses" as a result of changing groundwater conditions throughout the Basin.[15] Land subsidence is not an issue of concern in the CMA as discussed in more detail below.

Land subsidence may result from tectonic forces or the extraction of oil, gas and water. Land subsidence resulting from groundwater use and aquifer deformation (the action or process of changing in shape or distorting, especially through the application of pressure) may be of two kinds: *elastic or inelastic.*

Elastic deformation occurs from the compression and expansion of sediments due to pore pressure changes that occur with fluctuations in groundwater elevations (Borchers and Carpenter 2014). Therefore, elastic deformation may be cyclical in nature corresponding to seasonal groundwater recharge or groundwater discharge or extraction. Elastic deformation does not result in permanent loss of pore space or land subsidence.

Inelastic deformation may result in irreversible land subsidence and is commonly related to groundwater discharge or extraction from fine-grained sediments within clay or silt aquitards (Borchers and Carpenter 2014). Permanent land subsidence related to groundwater withdrawal generally occurs in an aquifer when groundwater elevations and changes in groundwater storage consistently decrease falling below historical seasonal and longer-term ranges. The resulting combination of increased pressure from the weight of the overlying sediments (overburden stress) and reduction in hydraulic pressure within the aquifer (pore pressure) essentially squeezes the water out of the compressible clay beds within the aquifer system. This type of deformation is irreversible and represents a permanent loss in aquifer storage.

[14] 23 CCR §354.16(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.

[15] CA WAT §10721(x)(5). Significant and unreasonable land subsidence that substantially interferes with surface land uses.

5.1 Geologic Setting

The companion HCM introduces the geologic setting, units, and extents, which are discussed relative to their potential influence on land subsidence. Generally, fine-grained sediments are susceptible to inelastic deformation. Inelastic compaction of coarse-grained sediment is usually negligible (Borchers and Carpenter 2014). The principal aquifers of the CMA and WMA are primarily coarser material and not subject to a significant risk of land subsidence. Previous studies of well logs in the regional aquifers in the Basin indicate 40 to 70 percent coarse grained material in the Upper Aquifer deposits (HCI, 1997).

5.1.1 Tectonic Movement

Tectonic movement is a potential source for land surface elevation changes within the CMA. The Basin is within the Transverse Range geomorphic province of California, a tectonically active region of California. Rapid uplift is occurring in places within the Transverse Range, such as in the Santa Ynez Mountains, where uplift is estimated at approximately 2 millimeters per year (Hammond et al. 2018). Likewise, in tectonically active areas where uplift is occurring, subsidence may also be observed in response to fault motion. However, this type of subsidence is not influenced by groundwater use or water resource management actions in the CMA.

5.2 Historical Records

There is little or no documentation of physical evidence of subsidence such as well casing failure, infrastructure disruption, or earth fissures within the CMA. The risk of future significant impacts is low because long-term groundwater levels have been mostly static.

The Caltrans (District 5), Department of Water Resources (DWR), and Santa Ynez River Water Conservation District have not observed or reported infrastructure failures due to land subsidence within the Basin for the past 100 years (Appendix B, Dudek, 2020). John Brady of the Central Coast Water Authority (CCWA) engineering department reported that since the 27-mile long CCWA pipeline (see HCM tech memo Figure 4-6 for reference) was built in 1990, there have been no triggers of the isolation valves and in his opinion, that there has been no groundwater related land subsidence in the area (Appendix B, Dudek, 2020).

5.3 Remote Sensing Data

Remote sensing data from InSAR (Interferometric Synthetic Aperture Radar) for January 2015 through September 2019 is available. Over this time period, land surface elevation changes have ranged from an estimated increase of 0.5 inch to a decrease of 0.5 inch (**Figure 5-1**). The elevation changes mapped in **Figure 5-1** indicate that about a third of the area in the CMA actually increased in elevation. The area that increased in elevation includes the area around the City of Buellton and along the Santa Ynez River, which are the areas with the most groundwater pumping, which is further evidence that land subsidence is currently not a problem in the CMA. Appendix B includes detailed maps of the remote sensing dataset.

6 INTERCONNECTED SURFACE WATER AND GROUNDWATER DEPENDENT ECOSYSTEMS

The sixth sustainability indicator, depletion of interconnected surface water, is addressed in this section. The various beneficial uses of surface water and groundwater are presented in Section 3 and include various natural environments that rely on surface water and groundwater.

In accordance with SGMA, "interconnected surface water" is defined as "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" (DWR 2016). In this section, surface waters within the CMA that potentially meet this definition are identified. In addition, SGMA requires Groundwater Dependent Ecosystems (GDEs) be identified as part of the description of groundwater conditions. GDEs are ecological communities or species that depend on groundwater emerging from aquifers or rely on groundwater occurring near the ground surface. Hence, GDEs are considered and discussed below because they could be influenced by chronic lowering of groundwater levels (second sustainability indicator) and depletions of interconnected surface water.

6.1 CURRENT SURFACE WATER CONDITIONS

In the CMA, the Santa Ynez River is gaged at several locations (**Figure 6-1**) which shows river flows through the CMA have a strong seasonal pattern (**Figure 6-2**). The USGS Solvang Gage (ID No. 11128500) measures the flow of Santa Ynez River entering into the CMA. **Table 6-1** indicates that the gaged flows into the CMA entirely ceased during 13 of the past 20 years.

Santa Ynez River flows in the CMA are substantially influenced by upstream dam and reservoir operations. Surface flows will exist during water rights releases as described in the HCM (Section 4.3). Water rights releases are typically made during the months of July through October when flows at Buellton would otherwise not exist. In addition, during above-normal and wet year types, flow targets ranging from 5 to 48 cfs are to be maintained at the Solvang gage for endangered steelhead by the U. S. Bureau of Reclamation according to SWRCB Order 2019-148 (see HCM Section 4.3).

6.2 INTERCONNECTED SURFACE WATER FOR THE SANTA YNEZ RIVER

The Santa Ynez River Alluvium lays unconformably on or beside either the non-water bearing sediments of the consolidated Monterey Shale and Sisquoc Formations or the low permeability Careaga Formation. Because the underflow of the Santa Ynez River is considered part of the surface water flowing in a known and definite channel, there is no interconnected surface water in the CMA. The Santa Ynez River surface water and underflows are regulated by the SWRCB for the reach of the Santa Ynez River in the CMA and will not be administered under SGMA.

Diversions from the Upper Aquifer of the Santa Ynez River Alluvium are subject to SWRCB regulation which considers it the same as surface water. As described in the HCM, the Upper Aquifer is recharged from the surface water of the river.

TABLE 6-1
ANNUAL MINIMUM GAGED FLOWS OF THE SANTA YNEZ RIVER IN THE CMA

Water Year	Minimum Flow at Solvang (USGS Gage 11128500) cubic-feet/second	Minimum Flow at Lompoc Narrows (USGS Gage 11133000) cubic-feet/second	Spill from Cachuma Reservoir acre-feet/year	Hydrologic Year Type[1]
2001	3.2	1.3	112,313	Wet
2002	0	0	0	Dry
2003	0	0	0	Below Normal
2004	0	0	0	Dry
2005	3.07	1.5	260,078	Wet
2006	2.7	0.5	62,869	Above Normal
2007	0	0	0	Critical
2008	0.67	0	22,994	Above Normal
2009	1.02	0	0	Dry
2010	0	0	0	Below Normal
2011	4.71	1.8	85,755	Wet
2012	1.3	0	0	Dry
2013	0	0	0	Critical
2014	0	0	0	Critical
2015	0	0	0	Critical
2016	0	0	0	Dry
2017	0	0	0	Above Normal
2018	0	0	0	Dry
2019	0	0	0	Above Normal
2020	0	0	0	Below Normal

Note: [1] Based on Hydrologic Year Type Classification in SWRCB Order 2019-0148, based on Lake Cachuma inflow, which also correspond to the classification using Salsipuedes Creek gauge. Water Year 2010 is classified Below Normal in the lower watershed (Salsipuedes Creek gauge) and Above Normal in the upper watershed (Lake Cachuma inflow).

Cachuma Inflow acre-feet/year (afy)	Classification
<4,550 afy	Critical
4,551 - 15,366 afy	Dry
15,367 - 33,707 afy	Below Normal
33,708 - 117,842 afy	Above Normal
>117,842 afy	Wet

6.3 Interconnected Surface Water for Tributaries to the Santa Ynez River

All tributaries within the CMA (Figure 6-1) are ephemeral. As shown on **Figure 6-2**, Zaca Creek, the largest CMA tributary, has no measurable flow during half of the period of record. Most flow occurs in wet and above normal years between February to March, with no flow between June to November. This indicates these tributaries are "completely depleted" during part of the year and do not meet the SGMA definition for interconnected surface water. As shown in the HCM (HCM Figure 5-2) there are no identified springs associated with these tributaries.

6.4 Groundwater Dependent Ecosystems in the Central Management Area

SGMA defines GDEs as "ecological communities of species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface" (DWR 2016). In some settings, groundwater can be critical to sustaining springs, wetlands, and perennial flow (baseflow) in streams, as well as to sustaining vegetation such as phreatophytes that directly tap groundwater through their root systems.

Mapping of California Department of Water Resources' Natural Communities Commonly Associated with Groundwater dataset indicates the vast majority of GDEs within the CMA are located along the Santa Ynez River (HCM Figure 5-2). The recent SWRCB Order 2019-148 states (pg. 2):

> The Santa Ynez River provides habitat for the Southern California Distinct Population Segment (DPS) of steelhead trout (Oncorhynchus mykiss) (steelhead), which is listed as an endangered species under the federal Endangered Species Act (ESA). (16 U.S.C. §§ 1531-1544.) The Cachuma Project has adversely affected the steelhead fishery by blocking access to the majority of suitable spawning and rearing habitat upstream, and by modifying flows in the mainstem of the lower Santa Ynez River (mainstem) below Bradbury Dam to the point that the survival of the species is uncertain. (E.g., NOAA-12, p. 6.) Currently, Reclamation operates and maintains Bradbury Dam on the Santa Ynez River in accordance with a Biological Opinion issued by the National Marine Fisheries Service (NMFS) on September 11, 2000 (2000 Biological Opinion) pursuant to section 7 of the federal ESA. (16 U.S.C. § 1536.)

SWRCB Order 2019-148 requires additional releases from Cachuma Reservoir beyond the 2000 Biological Opinion (NMFS 2000) to protect steelhead. In addition to the endangered steelhead trout species, riparian habitat along the lower Santa Ynez River also supports a great diversity of aquatic non-fish and terrestrial wildlife species (SWRCB 2019).

Historical impacts to GDEs along the Santa Ynez River were evaluated as part of the SWRCB Cachuma Project Water Rights hearings (Jones and Stokes 2000). The SWRCB Final Environmental Impact Report (SWRCB 2011) summarized the findings as follows:

> Jones & Stokes (2000) observed that, even in dry years, groundwater levels in the basin remained less than 10 feet below the channel thalweg along most of the river and remained at relatively constant depths below the ground surface on the banks of the river. The groundwater has been maintained at depths suitable to support mature phreatophytic plants (such as willows and cottonwoods), in combination with winter flows. Jones & Stokes (2000) concluded that the operations of the Cachuma Project since 1973 have not altered groundwater conditions in a manner that adversely affects riparian vegetation.

Based on this study by Jones and Stokes (2000), GDEs located along the Santa Ynez River are not currently considered vulnerable due to groundwater pumping in the Upper Aquifer, due in part to water rights releases under the SWRCB Order for the Cachuma Project (currently Order 2019-0148) and the resulting stable groundwater levels.

Additional potential GDEs have been mapped by the California Department of Water Resources, the California Department of Fish and Wildlife, and The Nature Conservancy along the tributaries of the CMA (HCM Figure 5-2), including the ephemeral tributaries in the Buellton Upland north of the Santa Ynez River, including Dry Creek, Santa Rosa Creek, Canada de Palos Blancos, and Canada de Laguna Creek, and Zaca Creek. These potential GDEs will be screened to determine if a continuous saturated zone exists between groundwater levels of the principal aquifers using the groundwater model being developed for the CMA as part of GSP implementation.

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