

**ATTACHMENT 10: HYDROLOGIC OVERVIEW AND POTENTIAL
IMPACT ASSESSMENT DATED JANUARY 21, 2020**



TO: Matt Allen

FROM: Kear Groundwater
P.O. Box 2601
Santa Barbara, CA 93120-2601

DATE: January 21, 2020

SUBJECT: *Hydrologic Overview and Potential Impact Assessment
5645 Santa Rosa Road, Vicinity Lompoc/Buellton, Santa Barbara County, CA*

Dear Mr. Allen,

This memorandum provides a summary of Kear Groundwater's (KG) hydrogeologic evaluation and review of potential riparian impacts due to groundwater usage for cannabis cultivation by Central Coast Agriculture, LLC (Central Coast) at the 5645 Santa Rosa Road property (APN 083-150-013) along the Santa Ynez River between Buellton and Lompoc, Santa Barbara County. Figure 1 presents the location of the parcel and the shallow alluvial well used for cultivation.

Our objective was to perform a review of available hydrogeologic information and existing on-parcel groundwater resources, as well as to evaluate the potential hydrologic impacts on nearby water quality, aquatic habitat, riparian habitat, wetlands, and springs, as related to the diversion of water associated with cannabis cultivation, in compliance with the State Water Resources Control Board's (SWRCB) Cannabis Cultivation Policy per the California Water Code (Section 13149). SWRCB and the Department of Fish and Wildlife (DFW) may apply these requirements to groundwater extractions (as is the case herein) where determined to be reasonably necessary. For this assessment, we reviewed publicly-available data and gathered site-specific information relating to the surface/subsurface flow regimes along the Santa Ynez River system (including Lake Cachuma releases) and its local fluvial geomorphology, in addition to details on well characteristics/production rates and the intended cultivation operations.

SWRCB defines groundwater as any water found beneath Earth's surface; however, there is a distinction between "percolating groundwater" in a groundwater basin versus groundwater that

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acts as a “subterranean stream” flowing within a known and defined channel.

Based on our review, we conclude that while the existing well extracts from a shallow alluvial aquifer that may be classified as part of the “subterranean stream” of the Santa Ynez River flow system, water usage for cannabis cultivation at 5645 Santa Rosa Road is negligible within the larger flow system and will not “substantially affect instream flows” from the baseline condition.

A summary of our efforts, findings, conclusions, and more detailed recommendations follows.

Existing On-Property Well for Cannabis Cultivation

There is one operational shallow groundwater well used for cannabis cultivation at the 5645 Santa Rosa Road property (Photo 1). The shallow well produces groundwater from unconsolidated sand and gravel alluvial aquifers that are, at least in part, in hydraulic connection with the Santa Ynez River flow system.

Per the available well record (Photo 2), Floyd Wells drilled the shallow alluvial well in 2006 as an 18-inch-diameter borehole to 80 ft bgs. The drillers reportedly equipped the well with a 12-inch-diameter, SDR-21 PVC casing to 80 ft bgs and perforations from 10 to 60 ft. Floyd Wells filled the annular space with an unspecified gravel pack from 80 ft up to 22 ft, followed by the cement sanitary seal from 22 ft up to ground surface, despite the shallow top of perforations (this is a common anomaly as a 22-ft deep conductor casing may have been used). The wellhead elevation is approximately 231 ft AMSL and is about 250 lateral ft at its closest point to the main Santa Ynez River channel (as measured via Google Earth).

The operational capacity and schedule for the well during a typical year is described in the “Cannabis Cultivation Operations and Groundwater Demand” section, below.

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Photo 1. The shallow alluvial water well at 5645 Santa Rosa Road.

Work Investigation Record	
Date <u>8/23/04</u>	Well Site #: _____
<u>Casing Information</u>	
Type: Steel <input type="checkbox"/> PVC <input checked="" type="checkbox"/> Other <input type="checkbox"/>	<u>Borehole</u>
Class/Gage/NSF: <u>SDR 21</u>	Total Depth of Well: <u>80'</u>
ASTM#: _____	Annular Seal Depth: <u>22'</u>
Diameter: <u>12"</u> Total Depth: <u>80'</u>	Well Bore Diameter: <u>18"</u>
<u>Casing Schedule</u>	Sealing Material: <u>6 sack cement</u>
<u>0' - 10' = Blank</u>	Amount: <u>~ 1 yard</u>
<u>10' - 60' = Screen</u>	Method of Pour: <u>Pump</u>
<u>60' - 80' = Blank</u>	Use of Tremie: <u>Yes</u>
_____ = _____	Driller(s): <u>Floyd V. Wells</u>

Photo 2. Shallow alluvial well record.

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Hydrogeologic Overview

The 100.92-total-acre 5645 Santa Rosa Road property is situated within the Santa Ynez Valley, just south of the westward-draining Santa Ynez River between the Santa Rita Hills in the north and the Santa Ynez Mountains in the south (Figure 2 for watershed map). The subject parcel appears to be almost entirely within the delineated Santa Ynez River Valley Groundwater Basin (“Santa Ynez Basin,” California Dept. of Water Resources, Bulletin 118, Basin No. 3-15), excluding the parcel’s higher-elevation, southwestern corner. Specifically, the 5645 Santa Rosa Road property is within the Santa Ynez River Alluvial Corridor/Sub-Basin (SYRAB), between the up-gradient Buellton Uplands Sub-Basin (BUB) and the down-gradient Lompoc sub-basins.

The Santa Ynez Basin is bounded by the Pacific Ocean on the west and by the consolidated/semi-permeable rocks that form the Santa Ynez Mountains to the south, the San Rafael Mountains to the northeast, and the Purisima Hills to the northwest. Groundwater aquifers are stored in unconsolidated alluvial deposits (SYRAB) and in the older sedimentary formations (primarily the semi-consolidated Orcutt Formation, Paso Robles Formation, and Careaga Sandstone, especially where fractured). The SYRAB and the BUB are generally separated by the Santa Ynez River Fault Zone (mapped as a separate limb from the larger Santa Ynez Fault). Local groundwater aquifers around the parcel are principally comprised of the unconsolidated alluvium deposits as well as the secondary fractures of the older bedrock formations.

Santa Barbara County Water Agency’s (SBCWA) Groundwater Basins Status Report (2014), more detailed than SBCWA’s most recent (August 2019) Summary Report, estimates an annual extraction of 1000 acre-ft from the SYRAB with around 90,000 acre-ft usable groundwater in storage (1.11% of total storage extracted annually). At the BUB, the County estimates an annual extraction of 2000 acre-ft with around 154,000 acre-ft usable groundwater in storage (1.30% of total storage extracted annually). An additional 800 acre-ft (annually) of estimated groundwater surplus from the BUB would conceptually recharge the SYRAB as underflow. Other groundwater sub-basins of the larger Santa Ynez Basin include the Santa Ynez Uplands (with 11,000 acre-ft annual extraction and 900,000 acre-ft estimated storage), and the Lompoc

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Uplands/Plain/Terrace Basins (with 28,000 acre-ft annual extraction and 170,000 acre-ft estimated storage).

Groundwater within the SYRAB is managed in accordance subject to water rights agreements (Decision 89-18) so as to protect downstream water rights from Bradbury Dam. Therefore, downstream water levels fluctuate less in response to climate-related trends and more so to water available according to the Decision.

Sustainable Groundwater Management Act

The Sustainable Groundwater Management Act (SGMA) of 2014 is a three-bill package (AB 1739, SB 1168, and SB 1319) that sets the framework for statewide long-term sustainable groundwater management by local authorities. SGMA requires the formation of new groundwater sustainability agencies (GSAs) tasked with assessing the conditions in their local basins and adopting locally-based sustainable management plans. SGMA provides local GSAs with tools and authority to (1) require registration of groundwater wells, (2) measure and manage extractions (including limiting the amount of water pumped by individual well owners), (3) require reports and assess fees, and (4) request revisions of basin boundaries, including establishing new sub-basins. GSAs responsible for high- and medium-priority basins must adopt long-term groundwater sustainability plans (GSPs) by 2022 (or 2020 if in overdraft). Plans will be evaluated every five years. GSAs have until 2040 to achieve groundwater sustainability.

Via the California Statewide Groundwater Elevation Monitoring (CASGEM), the DWR ranks the 204,642-acre Santa Ynez Basin as a medium-priority basin, with some overdraft and groundwater quality impairments as noted impacts. The Santa Ynez Basin has been divided into three management areas, known as the “Eastern Management Area,” “Central Management Area,” and the “Western Management Area.” Each management area will have its own GSP. The 5645 Santa Rosa Road parcel is within the Western Management Area. The Western Management Area GSA includes the Santa Ynez River Water Conservation District (SYRWCD), the SBCWA, the City of Lompoc, Vandenberg Village Community Services District (VVCSD),

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and the Mission Hills Community Services District (MHCS D). The SYRWCD is a public agency formed in 1939 to protect/preserve local water rights/supplies of the Santa Ynez/Lompoc Valleys.

Hydrostratigraphy

The Santa Ynez River Valley is filled in the low-lying basins with Quaternary-aged alluvium of fluvial origin, with sediment derived from the weathering and erosion of the surrounding mountains. Alluvial deposits are comprised of an unconsolidated mixture of gravels, sands, silts, and clays of various thicknesses. Groundwater is stored in coarser-grained aquifers separated by finer-grained aquitards. Alluvium is generally separated into recent, active (Holocene-aged, Qa) and older, dissected (Pleistocene-aged, Qoa) terrace deposits. Alluvial deposits reach a maximum thickness of around 150 ft within the SYRAB before gradually thinning toward the foothills and becoming either too thin or unsaturated for sustained groundwater development.

Around the 5645 Santa Rosa Road parcel, basin fill sediments are unconformably underlain by older, Tertiary-aged sedimentary and volcanic formations, including, from youngest to oldest (all Miocene-aged and marine-deposited) the Monterey Shale (Tm; including its more siliceous lower member, Tml), the Tranquillon Volcanic Formation (Ttb), and the Rincon Shale (Tr). Younger sedimentary units are exposed in the northern foothills of the Santa Ynez Valley and include the Plio-Pleistocene-aged nonmarine (Paso Robles Formation, QTp) and Pliocene-aged marine sediment (Careaga Sandstone, Tca).

Groundwater Recharge and Levels

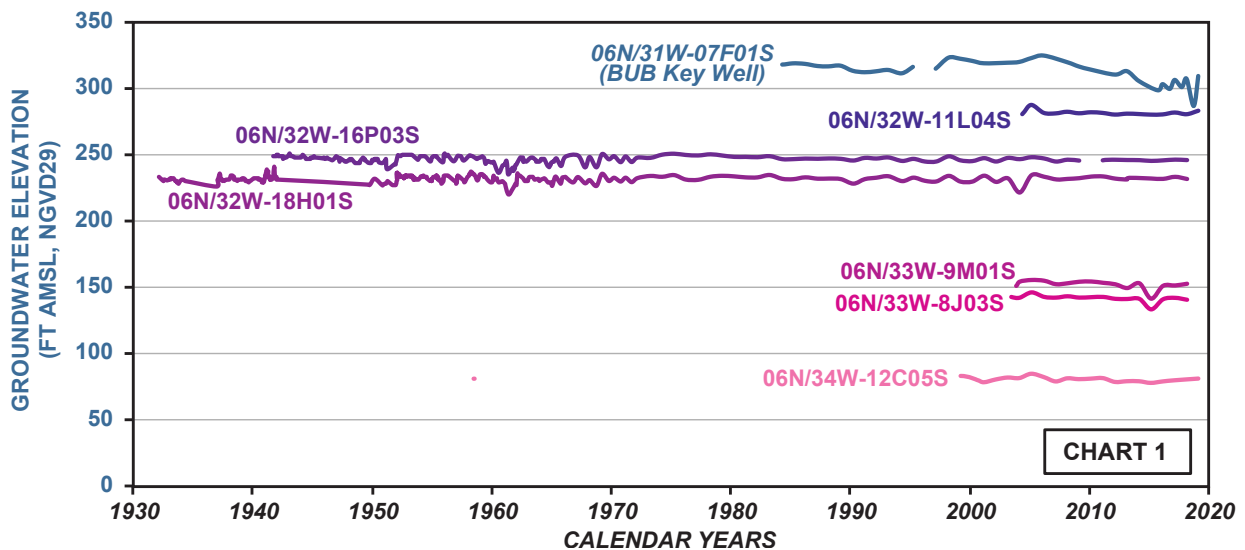
Recharge to local aquifers is derived from percolation of precipitation, irrigation return flow, seepage from streams and rivers, and subsurface inflow. Precipitation at the parcel averages 18 to 20 inches annually but reaches over 30 inches along the nearby ridge tops (Figure 3 for annual rainfall isohyets). Per the Federal Emergency Management Agency's (FEMA) National Flood Hazard Layer (NFHL), the 100-year (1% annual chance) flood hazard zone follows the Santa Ynez River channel and the lower-lying, northern two-thirds (roughly) of the property.

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Surface water moves westward along the Santa Ynez River system before reaching the Lompoc sub-groundwater basins or discharging into the Pacific Ocean. Groundwater flows generally east to west, parallel to the Santa Ynez River flow regime, with some localized water table depressions in high pumping zones (such as by the northern part of the Lompoc Plain with municipal supply wells for the City of Lompoc). Water levels within the Central Management Area have historically remained stable with minimal declines (SBCWA, 2019).

Available hydrographs from local groundwater wells (via the United States Geological Survey’s [USGS] National Well Information System) reflect the fairly stable local water levels over the last many decades (Chart 1; Figure 2 for well locations). Level data are available from 1984 to present at the key well within the BUB, the reportedly 633-ft-deep assigned State Well Number 06N/31W-07F01S. The water level has ranged from as shallow as about 60 ft bgs in 2006 to as deep as about 87 ft bgs during the drought in 2015 (a recent measurement, in October 2018, was nearly 100 ft bgs but is still provisional, and the level recovered back to about 76 ft bgs by March 2019). Along the SYRAB, actively-monitored wells with long-term records include those assigned State Well Numbers 06N/32W-11L04S, -16P03S, -18H01S, 06N/33W-08J03S, -09M01S, and 06N/34W-12C05S, demonstrating historically stable water levels between around 30 and 60 ft bgs with well depths (where reported) as shallow as 50 ft and as deep as 162 ft bgs.



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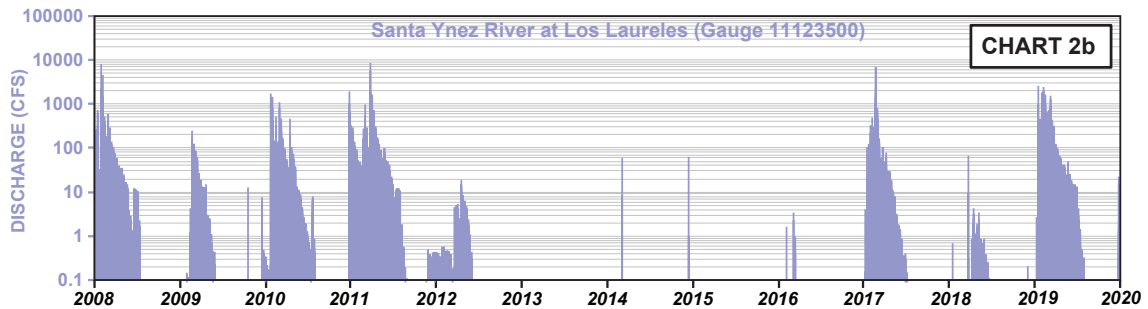
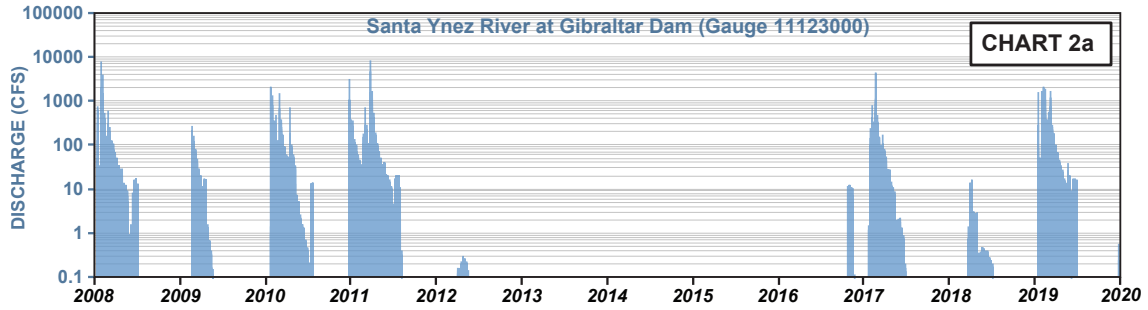


Santa Ynez River Surface Water Flow Regime

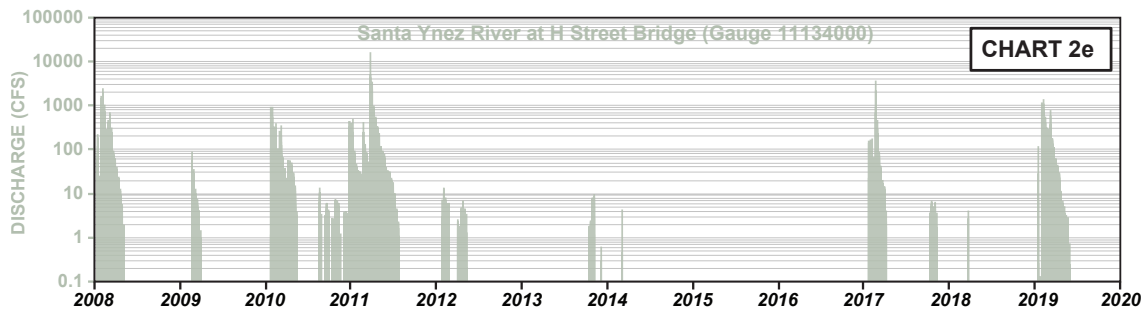
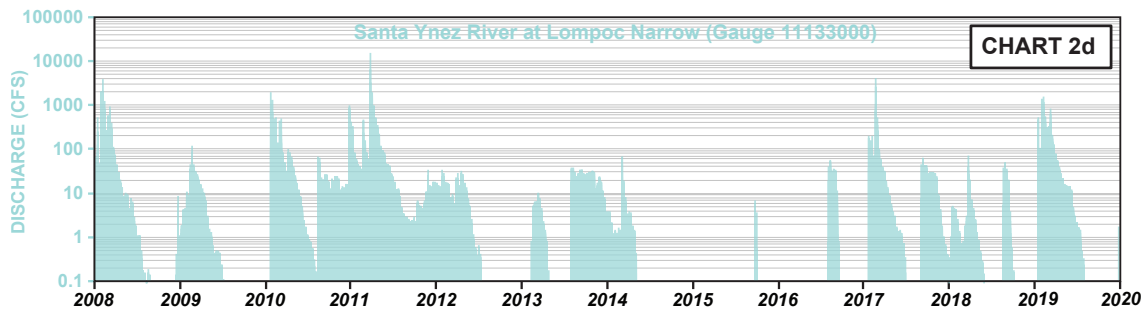
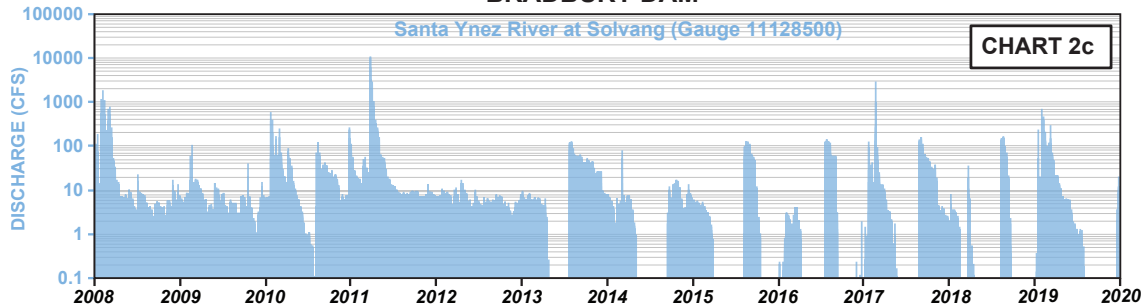
The 92-mile-long Santa Ynez River drains a nearly 900-square-mile area from east to west across the Santa Ynez Valley. Dams impound its flow into reservoirs, largely for water supply purposes, at three locations: from upstream to downstream, Jameson Lake behind Juncal Dam (constructed 1930), Gibraltar Reservoir behind Gibraltar Dam (constructed 1920), and Lake Cachuma behind the Bradbury Dam (constructed 1950-53). Stream discharge along the majority of the Santa Ynez River is controlled by Lake Cachuma operations. Reportedly, the Santa Ynez River had the largest run of steelhead in Southern California prior to dam constructions (CDFW, 2013). Its watershed is generally divided into lower and upper sub-basins relative to the dam.

In addition to numerous precipitation stations, Santa Barbara County's Flood Control District (SBFCD) and the USGS currently maintain automated river/stream gauges within the County (Figure 3 for gauge locations). There are four gauges with continuous/long-term records along the Santa Ynez River: from upstream to downstream, Gibraltar Dam Outflow (USGS 11123000) [Chart 2a], Los Laureles, above Lake Cachuma (USGS 11123500) [Chart 2b], Solvang (USGS 11128500) [Chart 2c], and Lompoc Narrows (USGS 11133000) [Chart 2d]. Each gauge records the stream discharge (flow), water temperature, gauge height, specific conductance, and dissolved oxygen every 15 minutes. Additional daily discharge records are available at other gauges, including at the H Street bridge in Lompoc (USGS 11134000) [Chart 2e]. A stream flow gauge along Santa Rita Valley Creek (USGS 11131700) recorded peak annual streamflows from 1976 to 2006.

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-----BRADBURY DAM-----



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Lake Cachuma Inflows and Outflows

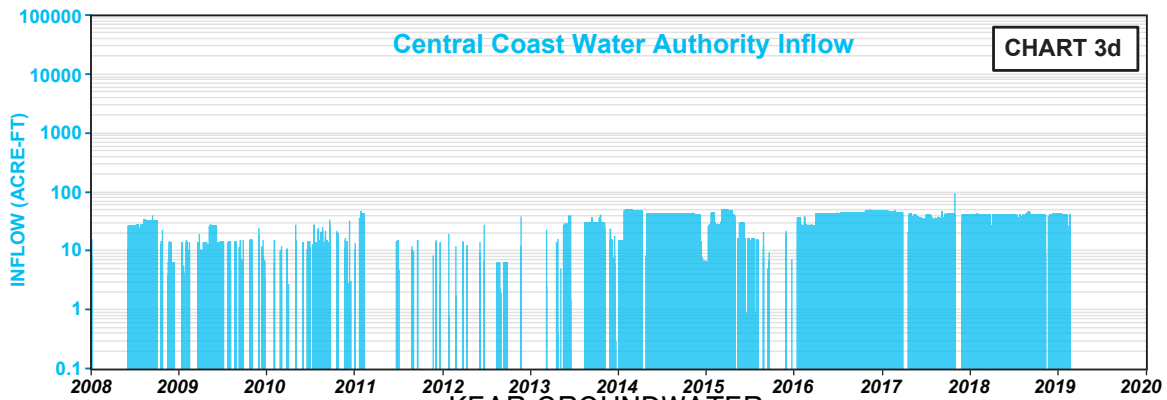
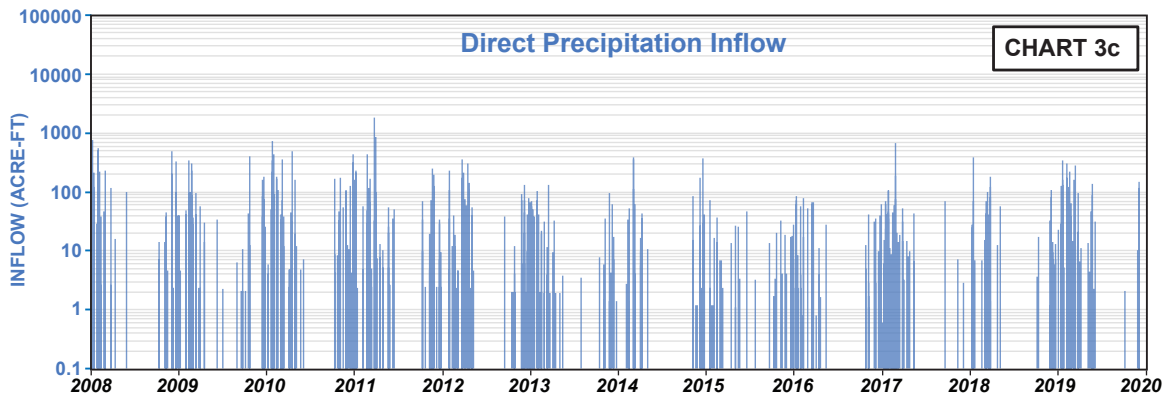
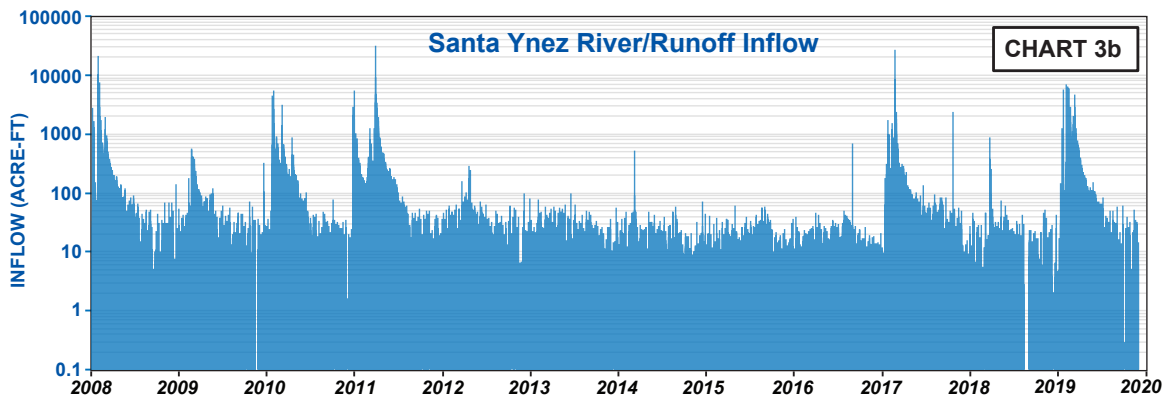
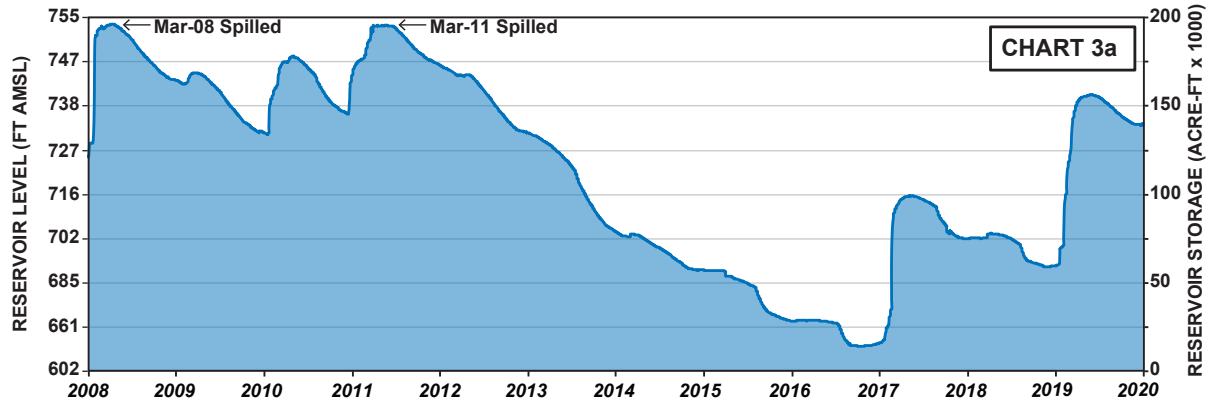
The United States Bureau of Reclamation (USBR) constructed the 279-ft-tall earthen Bradbury Dam between 1950 and 1953, as part of its Cachuma Project to store excess Santa Ynez River discharge. Lake Cachuma filled for the first time by 1958. The reservoir's maximum storage capacity is 193,305 acre-ft (currently around 139,492 acre-ft, or 72.2% filled, up from around 30% filled prior to the previous [2018-2019] wet winter) [Chart 3a]. Approximately 10% of its storage capacity has been lost due to silt accumulation behind the Dam (SBFCD, 2016). At the Dam's base, the Santa Ynez River's elevation is around 560 ft AMSL. The spillway elevation is 753 ft AMSL (actually spills at 750 ft but is surcharged to 753 ft for fish release). A recent (21-Jan-2020) reservoir surface elevation is 733.63 ft AMSL, available via the SBCWA at <http://www.countyofsb.org/uploadedFiles/pwd/Content/Water/Documents/rainfallreport.pdf>.

The USBR provides daily summaries on the reservoir's elevation, storage, inflows, and outflows.

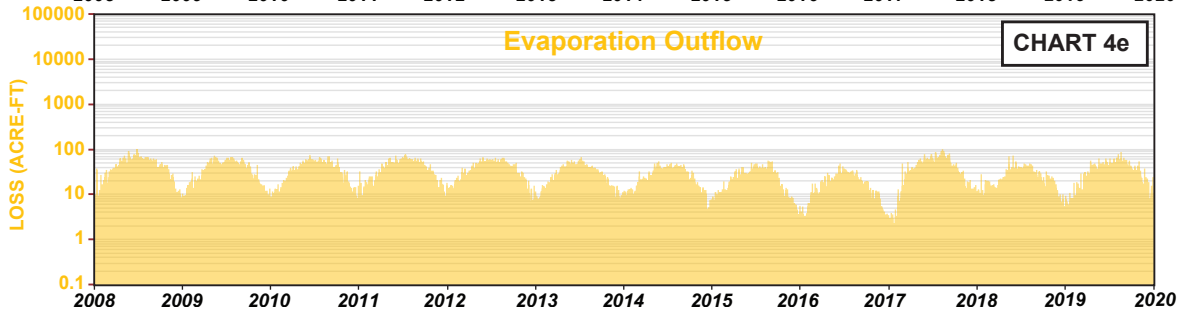
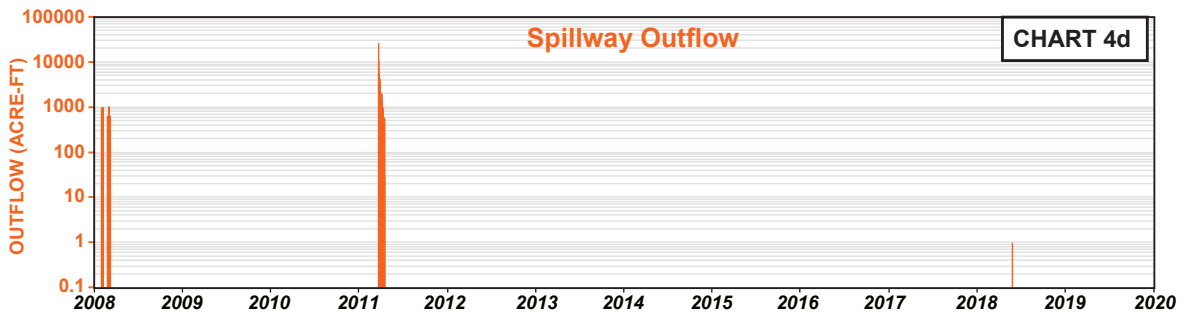
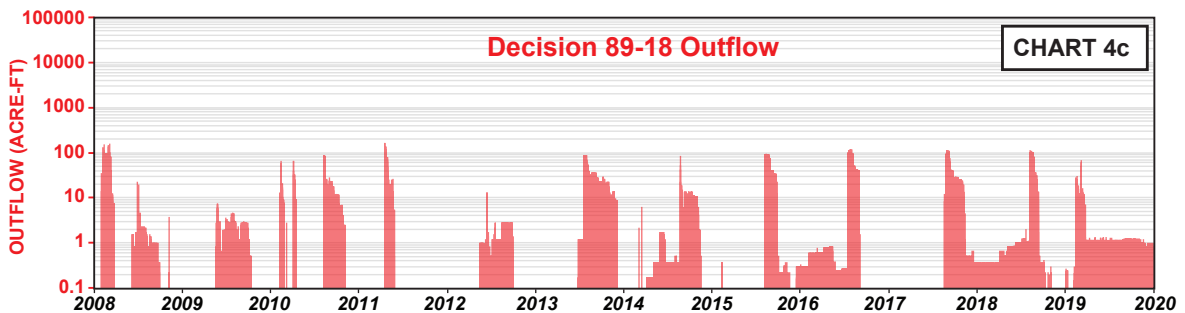
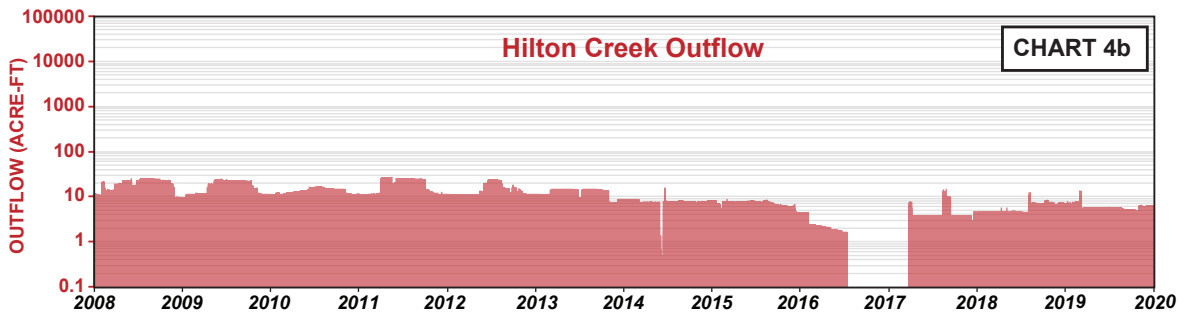
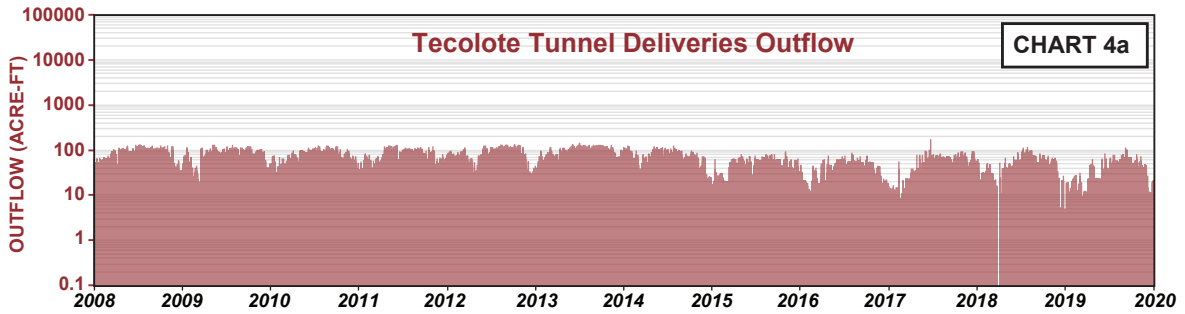
Inflow into Lake Cachuma occurs via (1) the Santa Ynez River runoff [Chart 3b], (2) precipitation directly on the reservoir surface [Chart 3c], and (3) the State Water Project through the Central Coast Water Authority (CCWA) [Chart 3d]. Inflow to the Lake from the River is calculated as the sum of the storage change, releases, and evaporation minus contributions from the CCWA and direct precipitation.

Outflow from Lake Cachuma occurs via (1) the Tecolote Tunnel, for delivery to the Cities of Santa Barbara, Goleta, Montecito, Summerland, and Carpinteria through the South Coast Conduit [Chart 4a], (2) continuously pumped water to Hilton Creek as required by the National Marine Fisheries Service for steelhead trout [Chart 4b], (3) generally annual, late-summer controlled outlet releases from the Tunnel to the Santa Ynez River, including subject to Decision 89-18 [Chart 4c], (4) the spillway when the maximum storage capacity is exceeded (most recently in March 2011) [Chart 4d], and (5) evaporation [Chart 4e]. The region's arid climate results in evaporation losses around 16,000 acre-ft per year (SBFCD, 2016).

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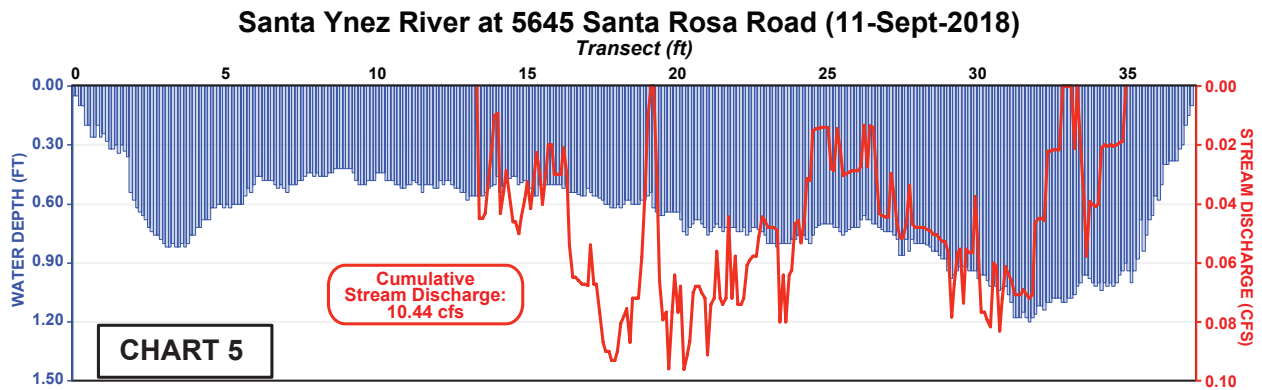
The Santa Ynez River Hydrology Model, first developed by the SBCWA in 1979, estimates the following average annual values for surface water budgets at Lake Cachuma. During the 1918-1993 simulation period, the model estimates a total of 85,768 acre-ft of annual inflows, with 74,171 acre-ft from runoff, 7663 acre-ft from the CCWA, and 3934 acre-ft from direct precipitation. The model estimates 85,672 acre-ft total outflow, with 11,066 acre-ft to evaporation, 35,350 acre-ft to spills/leakage, 23,053 acre-ft to deliveries (not including an additional 2050 acre-ft lost to infiltration along the Tecolote Tunnel), 5819 acre-ft to Decision 89-18 releases, 2721 acre-ft to fish/habitat releases, and finally 7663 net acre-ft to other State Water Project deliveries (City of Solvang Master Plan EIR, 2012).

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Local River Geomorphology

On September 11, 2018, KG measured the stream discharge across an approximately 38-ft-long transect of the Santa Ynez River (Figure 1 for transect location). KG measured the water depth and linear velocity (with a flow probe) at one-tenth-ft increments along the transect, in general agreement with the methods employed by the USGS on open-channel flow measurements. Discharge (in cubic ft per second, cfs) is estimated by multiplying the three parameters together: water depth (ft) x width (ft) x velocity (ft/sec). At the 5645 Santa Rosa Road property on September 11, 2018, KG estimated about 10.44 cfs stream discharge within the Santa Ynez River around 3:30 to 4:30PM (Chart 5), in good general agreement with data from the local USGS stream gage near Solvang (7.5 and 10.6 cfs during the day of September 11, 2018).



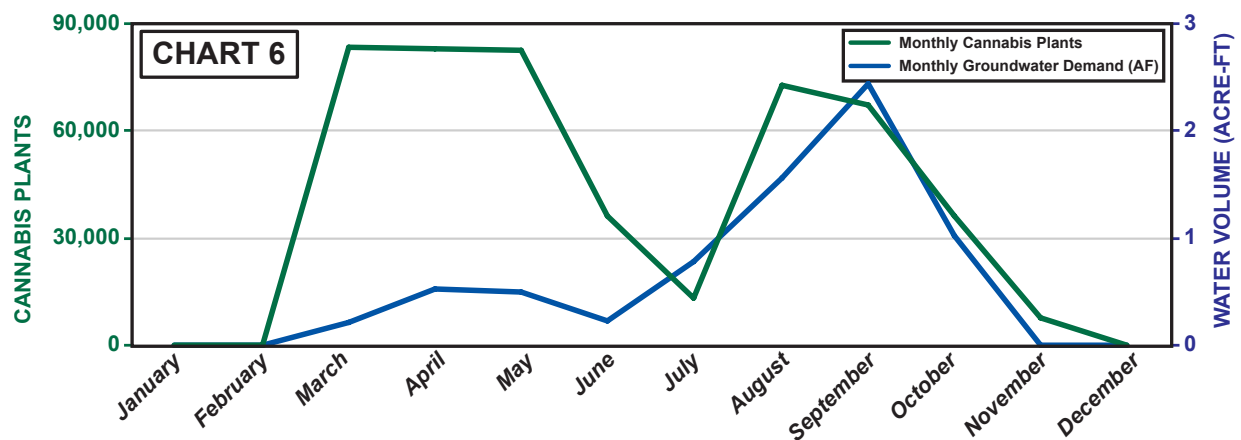
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Cannabis Cultivation Operations and Groundwater Demand

Cannabis is planted from March through November at the 5645 Santa Rosa Road property. Plants are harvested twice a year under outdoor canopies and six times a year under indoor canopies. Groundwater pumping generally occurs in the daytime hours. Plants are primarily irrigated with low-volume drip/micro-sprinkler methods. Per the SWRCB’s Electronic Water Rights Information Management System (eWRIMS), no recordation of surface water diversion exists at the 5645 Santa Rosa Road property.

Chart 6 presents the month-by-month summary of cannabis plants and water demand at 5645 Santa Rosa Road during the 2019 calendar year. The total number of plants peaked in the spring (about 83,000 plants per month in March, April, and May) and late summer (about 73,000 plants in August and 67,500 plants in September), with a mid-summer nadir (about 13,500 plants in July). The total annual demand was about 7.316 acre-ft for cannabis cultivation, entirely supplied as groundwater from the shallow well. The maximum monthly water demand for cannabis cultivation occurred in September with 2.451 acre-ft, which equates to a maximum instantaneous groundwater demand at 5645 Santa Rosa Road of about 18 gpm during that month. Actual operational capacities are higher but for shorter pump durations at the shallow well.



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Conclusions

KG has found that alluvial groundwater extraction for cannabis cultivation at 5645 Santa Rosa Road is unlikely to “substantially affect instream flows” along the local reaches of the Santa Ynez River. This finding is based on:

- (1) the surface flow regime downstream of Bradbury Dam is overwhelmingly controlled by the Decision 89-18 water releases.
- (2) the parcel overlies the Santa Ynez River Alluvial Corridor groundwater sub-basin, where groundwater levels have been historically stable and the SBCWA (2014) recently estimated only 1.11% extracted of the total usable groundwater (about 90,000 acre-ft).
- (3) the 100.92-total-acre parcel covers about 1% of the total surface area of the sub-basin.

Please do not hesitate to contact us with any questions.

Best Regards,

A handwritten signature in black ink, appearing to read 'Jordan Kear'.

Jordan Kear
Principal Hydrogeologist
Professional Geologist No. 6960
California Certified Hydrogeologist No. 749

A handwritten signature in black ink, appearing to read 'Timothy Becker'.

Timothy Becker
Professional Geologist No. 9589

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References

Upson, J.E. and Thomasson, H.G. (1951), Geology and water resources of the Santa Ynez River Basin, Santa Barbara County, California: United States Geological Survey Water-Supply Paper 1107.

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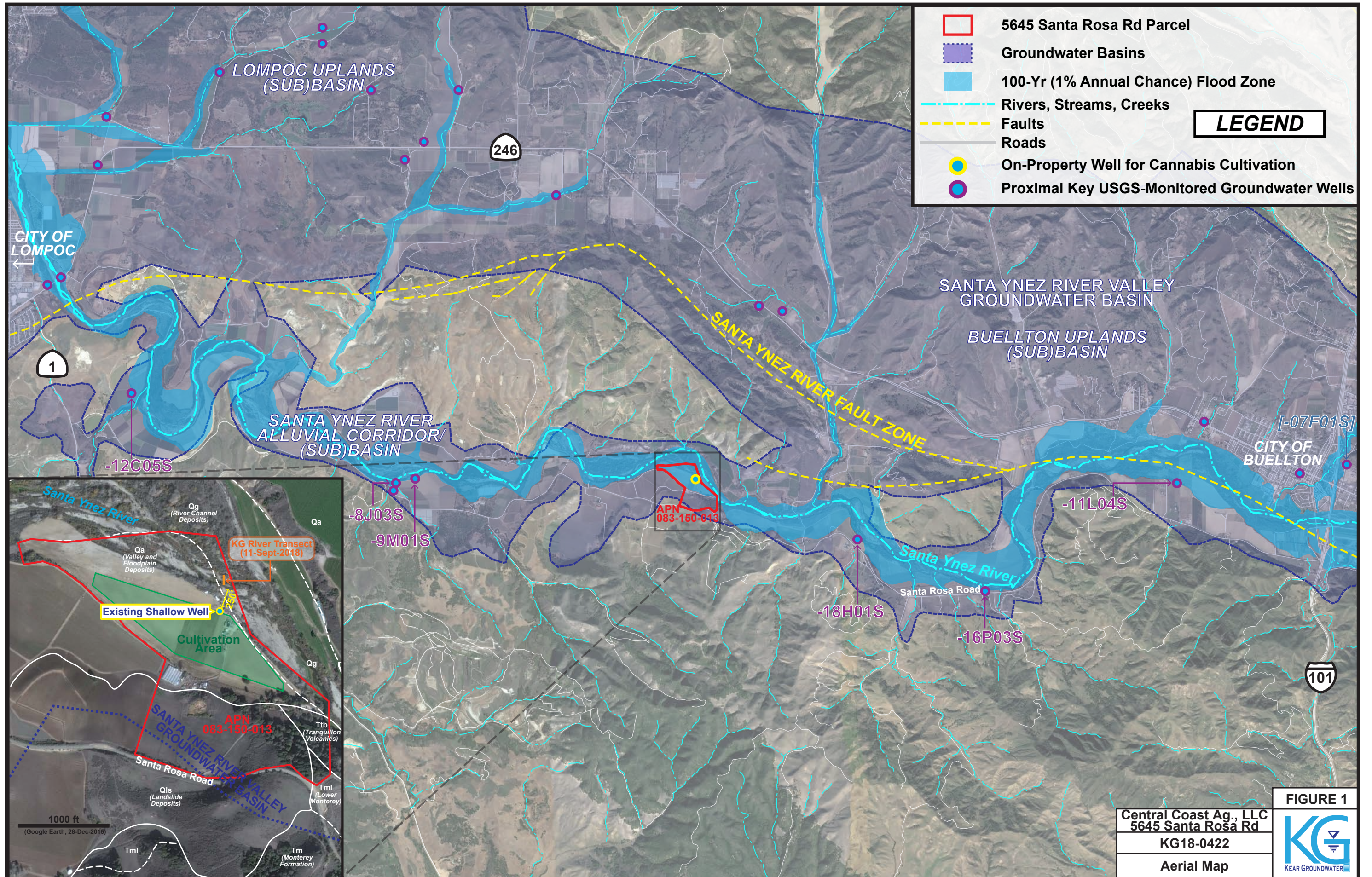
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	5645 Santa Rosa Rd Parcel
	Groundwater Basins
	100-Yr (1% Annual Chance) Flood Zone
	Rivers, Streams, Creeks
	Faults
	Roads
	On-Property Well for Cannabis Cultivation
	Proximal Key USGS-Monitored Groundwater Wells

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FIGURE 1

Central Coast Ag., LLC 5645 Santa Rosa Rd	
KG18-0422	
Aerial Map	

Parcel Lines: SB County
Groundwater Basins: DWR Bulletin 118
Aerial Image: Google Earth (11-Aug-2018)

Streams, Rivers, Creeks: USGS NHD
Flood Zone: FEMA NFHL
Faults: USGS EHP



5645 Santa Rosa Rd Parcel **Reservoirs and Lakes**

Groundwater Basins **Watershed Boundaries**

Santa Ynez Basin Western Management Area

Santa Barbara County Boundary

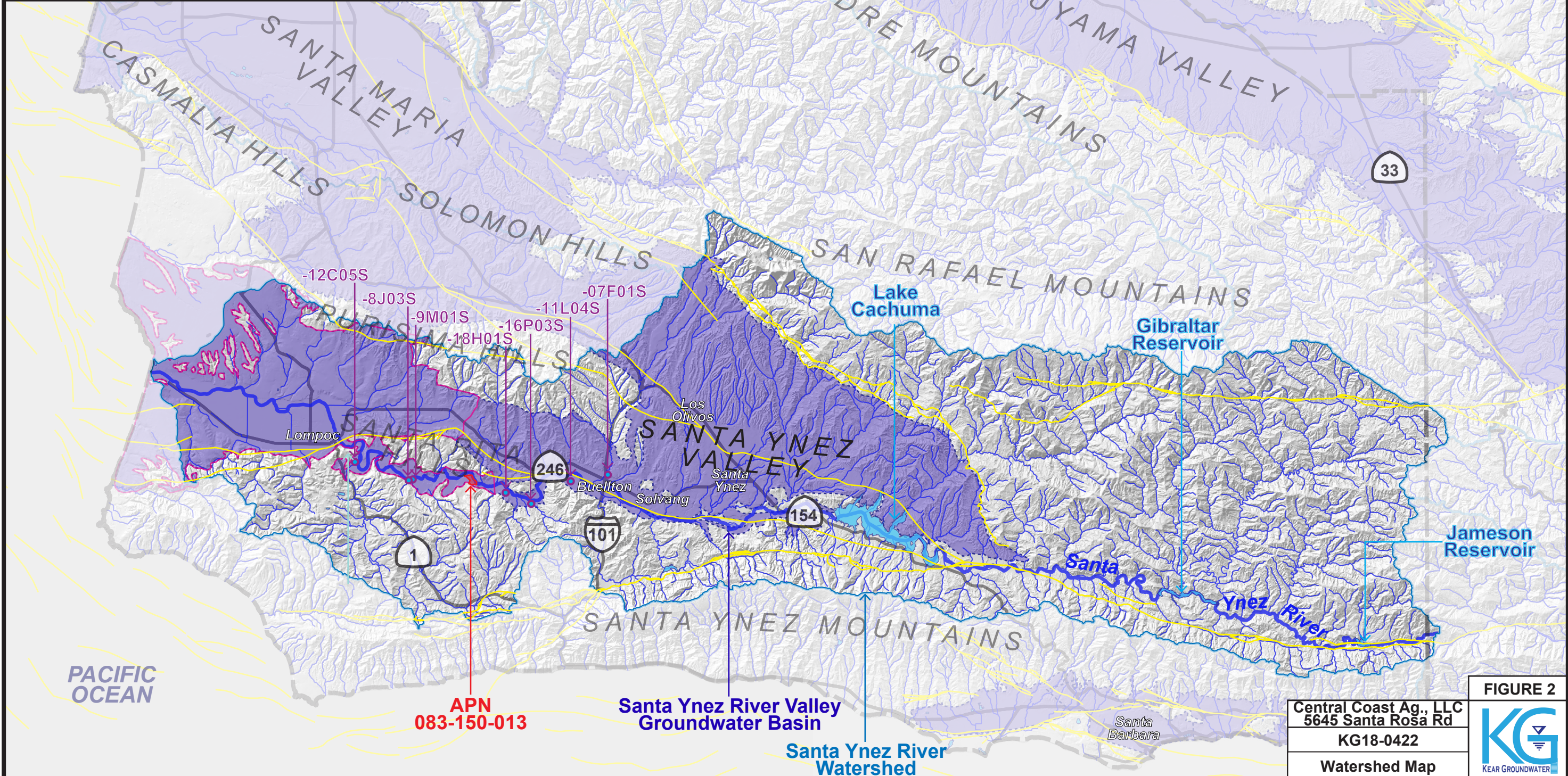
Rivers, Streams, Creeks

Faults

Major Roads

Proximal Key USGS-Monitored Groundwater Wells

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**APN
083-150-013**

**Santa Ynez River Valley
Groundwater Basin**

**Santa Ynez River
Watershed**

FIGURE 2

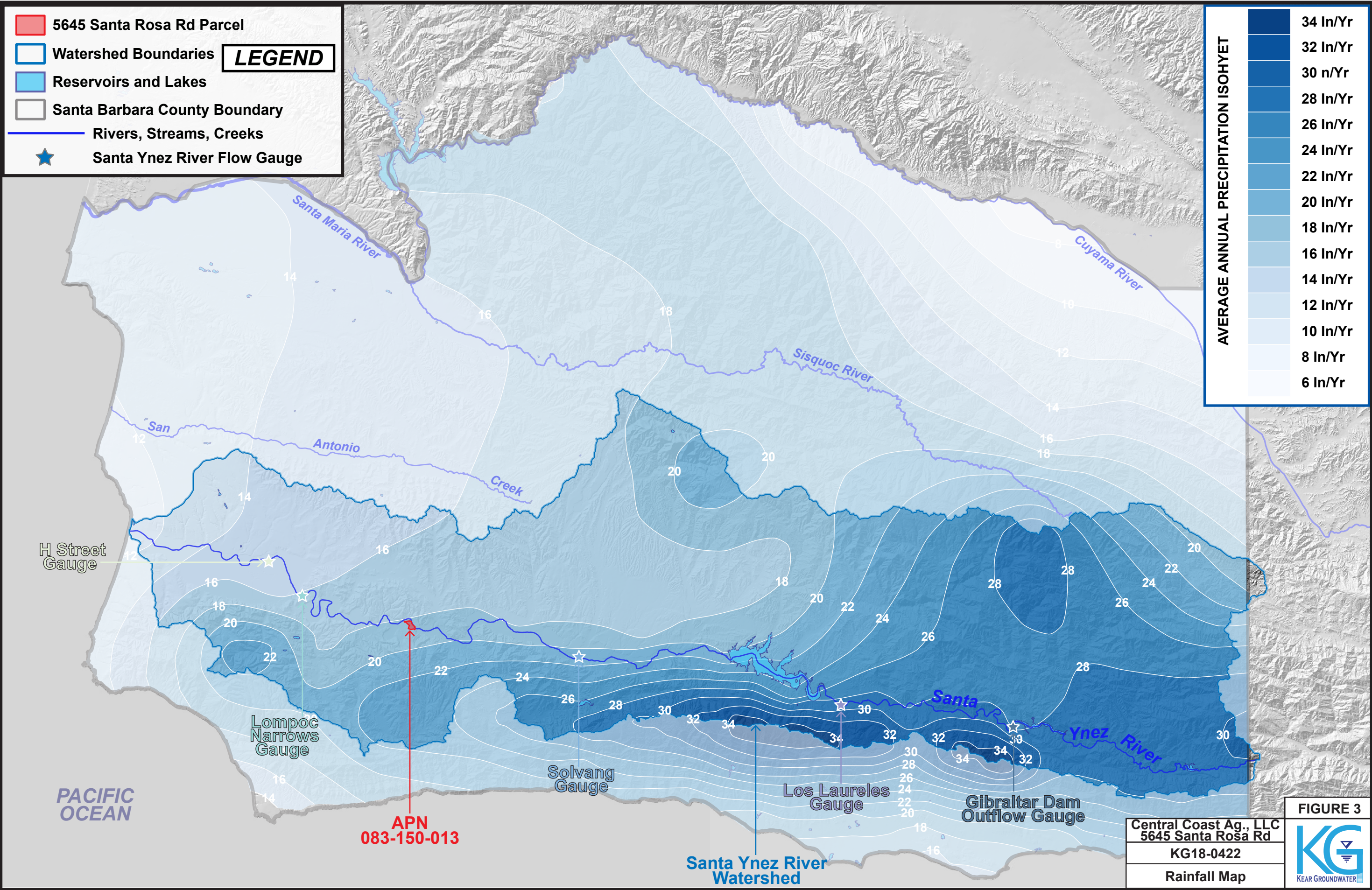
Central Coast Ag., LLC
5645 Santa Rosa Rd
KG18-0422
Watershed Map



Groundwater Basins: DWR Bulletin 118
Shaded Relief: Modified from USGS NED

Watersheds, Waterbodies: USGS NHD/WBD
Major Rivers & Streams: CDFW
Faults: USGS EHP





Rainfall Isohyets: SB County
Shaded Relief: Modified from USGS NED

Watersheds, Waterbodies: USGS NHD/WBD
Major Rivers, Creeks: CDFW
Stream Gauges: USGS

