

# ANNUAL REPORT FOR CALENDAR YEAR 2015

# FOX CANYON GROUNDWATER MANAGEMENT AGENCY ANNUAL REPORT FOR CALENDAR YEAR 2015

2015 Board of Directors	<u>Representing</u>	Alternate Directors
Steve Bennett	County Board of Supervisors	John Zaragoza
David Borchard	Agricultural & Farm Interests	David Schwabauer
Charlotte Craven (Vice Chair)	Incorporated Cities	Neal Andrews
Lynn Maulhardt (Chair)	United Water Conservation District	Robert Eranio
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# 1.0 EXECUTIVE SUMMARY

This 2015 Annual Report provides background on the formation and operations of the Fox Canyon Groundwater Management Agency (FCGMA or Agency); a description of groundwater basin geology and hydrogeology, climatic conditions, and condition of the groundwater basins including water-level and water-quality monitoring; and highlights Agency actions and accomplishments in 2015.

The statewide drought persisted through 2015, which was the fifth consecutive year (2011 through 2015) of below-average rainfall. The 2015 average-annual rainfall within the Agency boundaries was 5.72 inches, 41% of the long-term average of 13.80 inches (1985 through 2015). The 2015 average evapotranspiration of 51.29 inches was close to the long-term average of 51.34 inches (1997 through 2015).

Groundwater levels generally declined in the western half of the Agency between Fall 2014 and Fall 2015. In the Upper Aquifer System (UAS), Fall 2015 water levels were below sea level in the Oxnard Plain Basin and most of the Oxnard Forebay and Pleasant Valley basins. In the Lower Aquifer System (LAS), Fall 2015 water levels were below sea level in the Oxnard Plain Basin and most of the Oxnard Forebay, Pleasant Valley, and West Las Posas basins. None of the 16 water-level Basin Management Objectives (BMOs) in the Oxnard Plain and Pleasant Valley basins were met. Of the 36 water-quality BMOs for chloride, nitrate and total dissolved solids (TDS) monitored in 2015, 15 were met, 19 were not met, and data were unavailable for two.

The below average rainfall and declining groundwater levels in 2015 led to the continuance of Emergency Ordinance E. Ordinance E was designed to reduce groundwater extractions by reducing groundwater extraction allocations stepwise, with an ultimate goal of 20% reduction from the Agency 10 year (2003 to 2012) average extractions of 127,187 acre-feet per year<sup>1</sup>. With the adoption of Ordinance E, the annual allocation systems were replaced or modified for Municipal and Industrial (M&I) and Agricultural (AG) well operators.

Groundwater extractions are self-reported to the Agency by well owners or operators. Reported extractions in 2015 totaled 142,039 acre-feet (AF) as of October 11, 2016. This represents a 12% increase above the Ordinance E baseline, but is less than reported 1991, 2009, 2013 and 2014. Reported AG extraction was 109,381 AF, up from 106,579 AF in 2014; reported M&I extraction was 32,483 AF, down from 42,797 AF in 2014; and reported Domestic extraction was 175 AF, down from 363 AF in 2014. The extractions by user type and percent of 2015 total extractions are AG 77%, M&I 23%, and Domestic 0.1%.

In response to the Sustainable Groundwater Management Act, the Agency elected to become the Groundwater Sustainability Agency (GSA) for the portions of the four groundwater basins identified by the State of California Department of Water Resources that are within the Agency boundaries.

The body of this Annual Report along with the attached tables and figures provide a more detailed description of actions and activities that occurred during 2015.

<sup>&</sup>lt;sup>1</sup> Revised 10-year average of reported groundwater extractions for period 2003 to 2012 (as of November 22, 2016) includes extractions reported since adoption of Emergency Ordinance E on April 11, 2014.

# 2.0 PURPOSE OF THE REPORT

The Fox Canyon Groundwater Management Agency Act [AB-2995], §502, requires that "*The agency prepare annually or receive from its member agencies reports on groundwater and supplemental water supplies and conditions in the territory of the agency, including groundwater management and conjunctive use objectives and a plan for implementation of those objectives.*" The purpose of this report is to fulfill that obligation. In addition, this report summarizes the Agency's background and natural setting of lands within the Agency's jurisdiction, and presents a synopsis of the technical and administrative groundwater-resource management activities for 2015. Since the Agency's fiscal year is not concurrent with the calendar year or technical reporting year, this report includes only a brief summary of financial activities. Fiscal data covering the first reporting period of 2015 are in the *Fiscal Year 2014-15 Year-End Actual Budget Performance Report* presented to the Board of Directors in September 2015.

# 3.0 AGENCY OVERVIEW

### 3.1 Introduction

The FCGMA is a public agency tasked with managing groundwater resources in the southwestern portion of Ventura County, California (see Figure 1 – *Fox Canyon Groundwater Management Agency Boundary*). The FCGMA is an independent State "Special District," separate from the County of Ventura or any city government, with jurisdiction over all lands lying above the Fox Canyon aquifer (California Water Code, CWC, Appendix 121, §102). The Agency was created in 1982 by the California Legislature via the Fox Canyon Groundwater Management Agency Act [AB-2995] for the express purposes of regulating, conserving, managing, and controlling the use and extraction of groundwater to help preserve resources, and to counter seawater intrusion beneath the Oxnard Plain. Groundwater resources within the boundary of the Agency are used by the cities of Ventura, Oxnard, Port Hueneme, Camarillo, and Moorpark, along with the unincorporated communities of Saticoy, El Rio, Somis, Moorpark Home Acres, Nyeland Acres, and Montalvo. The Agency is funded solely by fees paid by those who extract groundwater within the Agency's boundaries. These extraction fees are used by the Agency to administer and manage local underlying groundwater resources within several aquifers.

### 3.2 Origin and History of the Fox Canyon Groundwater Management Agency

The unique geographic and geologic characteristics of Southern California have created a significant and valuable groundwater resource in the near-coastal and inland valley portions of Ventura County. Winter storms associated with the warm Mediterranean climate move inland from the Pacific Ocean and drop precipitation over the region, with greater amounts generally falling in the first quarter of the year (January-February-March) than during the last quarter (October-November-December). The topography and geology of the area allow surface runoff and groundwater to flow south and westward towards the coastal Oxnard Plain. Groundwater beneath the Oxnard Plain is contained in several aquifers that are primarily bounded by upland and recharge areas to the north and east; the relatively impermeable rocks of the Santa Monica Mountains to the south and southeast; and the Pacific Ocean to the west and southwest.

Although the early indigenous people primarily relied on natural springs and available surface water, European settlers beginning in the early to mid-1800s recognized groundwater as a reliable resource. Beginning with shallow hand-dug (mostly windmill-driven) wells, the groundwater supply was developed to create one of the most prolific agricultural regions in California. In 2014, groundwater resources supported agricultural products in Ventura County estimated to be valued at more than \$2.1 billion (*Ventura County's Crop & Livestock Report 2014*). The Ventura County Agricultural Commissioner's Office, *2015 Crop & Livestock Report* should be available in late 2016.



Figure 1 - Fox Canyon Groundwater Management Agency Boundary

The Agency was created by the State of California (legislative branch) in response to local and persistent overuse of groundwater resources resulting in declining groundwater levels coupled with increasing poor quality of water drawn from wells (especially in the southern part of the Oxnard Plain) first recognized in the early 1940's (DWR, 1954). Prior to the creation of the Agency, the California State Water Resources Control Board (SWRCB) directed United Water Conservation District (UWCD) and Ventura County to develop a Groundwater Management Plan for the purpose of controlling extractions, and balancing water supply and demand in both the upper aquifer system (UAS) and lower aquifer system (LAS) as a condition to a State grant for the Seawater Intrusion Abatement Project. Due to continuing overdraft by groundwater users and resulting seawater intrusion into aquifers beneath the Oxnard Plain, the FCGMA Act (AB-2995, Imbrecht) was passed on September 13, 1982, and became effective January 1, 1983. The Act (enabling legislation) is now contained in the State Water Code Appendix, Chapter 121 et seg. As directed by Article 2, §202 of that enabling legislation, the boundary of the FCGMA was established by Resolution of the Ventura County Board of Supervisors (VCBOS, 1982) on December 21, 1982, and became effective by recordation in the Ventura County Office of the Recorder (VCOR) on January 1, 1983. The boundary has been revised and legally re-recorded in 1996 and again in 2002 to reflect updated knowledge of the aquifer both geographically and to reflect subsequent hydrologic findings (VCOR, 1996; VCOR, 2002).

### 3.3 Mission Statement

The original State legislation created the FCGMA to manage groundwater in both overdrafted and potentially seawater-intruded areas within Ventura County. The prime objectives and purposes of the Agency are to preserve groundwater resources for agricultural, municipal, and industrial uses in the best interests of the public and the common benefit of all water users (FCGMA et al., 2007). Protection of water quality and quantity along with maintenance of long-term water supply are included in those goals and objectives. In 2006, the Agency formally adopted the following mission statement:

"The Fox Canyon Groundwater Management Agency (Agency), established by the State Legislature in 1982, is charged with the preservation and management of groundwater resources within the areas or lands overlying the Fox Canyon aquifer for the common benefit of the public and all agricultural, municipal and industrial users."

### 3.4 Agency Operations and Personnel

The Agency is directed by an elected five (5) member Board of Directors, and staffed by technical and administrative personnel provided by the Ventura County Watershed Protection District (Table 1 – Summary of FCGMA Personnel for Calendar Year 2015, as of the end of the year).

As required by its enabling legislation, the Agency Board of Directors is composed of one member from each of the following four stakeholder groups:

- The Ventura County Board of Supervisors
- The United Water Conservation District (UWCD) Board of Directors
- The City Councils of the five incorporated cities that partially or totally overlie the Fox Canyon Aquifer:
  - 1. Ventura
  - 2. Oxnard
  - 3. Camarillo
  - 4. Port Hueneme, and
  - 5. Moorpark.

NAMES	AFFILIATION	CONTACT NUMBER
DIRECTORS		
Steve Bennett	Ventura County Board of Supervisors	(805) 654-2703
David Borchard	Representing the Farming Interests	(805) 485-3525
Charlotte Craven (Vice Chair)	Representing the Five Cities within the Agency	(805) 482-4730
Lynn Maulhardt (Chair)	Representing the United Water Conservation District	(805) 485-5728
Eugene F. West	Representing the Small Water Districts within the Agency	(805) 388-5887
ALTERNATE DIRECTORS		
Neil Andrews	Cities	(805) 654-7827
Robert Eranio	United Water Conservation District	(805) 482-2001
David Schwabauer	Farmers	(805) 432-9375
Andrew Waters	Small Water Districts	(805) 526-9323
John Zaragosa	Representing the Ventura County Board of Supervisors	(805) 654-2613
NAMES	TITLE	CONTACT NUMBER
STAFF		
Alberto Boada	Agency Legal Counsel	(805) 654-2578
Tammy Butterworth	Agency Deputy Clerk of the Board	(805) 654-2002
Tully Clifford, P.E.	Director, Watershed Protection District	(805) 654-2040
Mandi Freitas	Administrative Assistant	(805) 645-1372
Gerhardt Hubner, P.G.	WPD, Deputy Director, Water & Environmental Resources	(805) 654-5051
Jessica Kam	Clerk of the Board	(805) 654-2014
Jeff Pratt, P.E.	Agency Executive Officer	(805) 654-2073
Kathleen Riedel, C.E.G.	Groundwater Specialist	(805) 654-2954

Notes:

1. Table lists active Board Members. Alternates and Staff at the end of 2015.

- The seven<sup>2</sup> existing mutual water companies and special districts within the Agency, as identified in AB-2995. They include the governing boards of the following mutual water companies and special districts not governed by the County of Board of Supervisors, which are engaged in water activities, and whose territory at least in part overlies the territory of the Agency:
  - 1. Alta Mutual Water Company,
  - 2. Pleasant Valley County Water District,

<sup>&</sup>lt;sup>2</sup> An eighth mutual water company or special district, Anacapa Mutual Water Company, active at the passage of the enabling legislation (AB-2995), is no longer in existence.

- 3. Berylwood Mutual Water Company,
- 4. Calleguas Municipal Water District (CMWD),
- 5. Camrosa County Water District,
- 6. Zone Mutual Water Company, and
- 7. Del Norte Mutual Water Company.

These four stakeholder groups select the fifth Board Member from a list of at least five candidates nominated by the Ventura County Farm Bureau and Ventura County Agricultural Association acting jointly. This fifth member must reside in, and be "actively and primarily engaged in agriculture" within the territory of the Agency. The requirement "actively and primarily engaged in agriculture" means that farm members must derive at least 75% of their income from agriculture.

Five Alternate Board members are selected according to the same criteria and serve in the absence of the primary Board members. All Board members serve a two-year term, unless reappointed. In 2007, the Board offset the terms of the City Council and the Agricultural representatives from the remaining three representatives by one year to ensure continuity of Agency operations and to prevent a complete turnover of all Agency Directors at the same time.

There was a change in the Members of the Board of Directors during 2015. Eugene West replaced Dr. Michael Kelley. There were no changes in Alternate Directors.

The Board normally conducts monthly public meetings with additional public input received through various stakeholder-based committees. During 2015, there were ten (10) FCGMA Board meetings, four (4) Special Board meetings, and one (1) Fiscal Committee meeting.

The personnel, technical, financial, and legal needs of the Agency are provided under contract with the Ventura County Watershed Protection District and the Office of the County Counsel. The UWCD and CMWD provide additional technical resources to the Agency as needed. UWCD is a public wholesale and retail water agency that administers groundwater basin management activities in the Santa Clara River Valley and northern and central Oxnard Plain. CMWD is a public wholesale water agency that provides groundwater basin management activities in the Las Posas basins. In accordance with the enabling legislation, the Agency is not authorized to involve itself in activities normally undertaken by member agencies. Such activities include the construction, operation, and maintenance of capital facilities. Many facilities, such as dams, spreading grounds, pipelines, flood control structures, and surface water diversions are operated by UWCD, CMWD, Camrosa Municipal Water District, and other member agencies both inside and outside the Agency boundary.

There was a notable staff change in mid-November of 2015. Rick Viergutz, Groundwater Manager, left the Agency; this staff position was not filled during 2015.

# 4.0 NATURAL SETTING

### 4.1 Location and Geographic Description of the FCGMA

The Agency boundary encompasses a northeast-southwest oriented, wedge-shaped area of 183 square miles that widens to the west and is bounded to the north by the Santa Clara River and South Mountain. To the east, the Agency boundary is defined by uplifted Tertiary and Quaternary-age consolidated rocks north and east of the City of Moorpark. The southern edge of the Agency is bounded by the Bailey Fault and the uplifted Santa Monica Mountains (Dibblee, 1990). The western and southwestern boundaries are geographically limited by the Pacific Ocean coastline.

The eastern portion of the FCGMA bifurcates into two separate lobes east of the City of Camarillo. The longer northern lobe, which includes the Las Posas Valley, terminates east of the City of Moorpark near the central portion of the Happy Camp Syncline (Dibblee, 1992b and 1992c). The furthest eastern extent of the Agency terminates in the County's Happy Camp Canyon Regional Park northeast of the City of Moorpark. The shorter southern lobe, which includes the western portion of Pleasant Valley, terminates approximately one-third of the distance into the Santa Rosa Valley (Dibblee, 1990). These two valleys widen to the west and merge near the City of Camarillo to encompass the broader Oxnard Plain where the majority of groundwater extractions occur within the Agency. The Santa Clara River Valley intersects with the northeastern portion of the Oxnard Plain near the unincorporated area of Saticoy. The northern boundary of the Agency turns west-southwest across from South Mountain just north of the Santa Clara River at Saticoy, then parallels the river's course westward all the way to the Pacific Ocean. This latter stage of Santa Clara River flow is generally parallel to the Oak Ridge Fault System, which also constitutes much of the northern Agency boundary line. Southwest of the City of San Buenaventura, the boundary crosses back to the south bank of the river just east of the Pacific Ocean.

### 4.2 Climate: Rainfall and Evapotranspiration

Groundwater extracted from the FCGMA aquifers is primarily used for agriculture; therefore, the volume of groundwater extracted in any given year is strongly influenced by rainfall and evapotranspiration (ETo). In general, lower than average rainfall and higher than average ETo result in greater than average groundwater extractions.

The amount of rainfall reported for the Agency for calendar year 2015 is an average of data collected at the five County of Ventura rainfall stations (Sta. 032A, 126A, 190, 175A, and 259)<sup>3</sup>. Based on past Agency rainfall totals and the 2015 average rainfall total of 5.72 inches, the long-term average rainfall for the period of 1985 to 2015 is 13.80 inches. Annual rainfall has been below the long-term average since 2011 (12.12 inches in 2011; 8.66 inches in 2012; 3.49 inches in 2013; 10.05 inches in 2014; and 5.72 inches in 2015). The 2015 average precipitation totals were 3.95 inches in January through June (69%) and 1.77 inches in July through December (31%) for an annual total of 5.72 inches.

The Agency's 2015 ETo value is an average of data collected at three California Irrigation Management Information System (CIMIS) stations (Sta. 152 - Camarillo, Sta. 156 - Oxnard, and Sta. 217 – Moorpark). The 2015 three-station average ETo was 51.29 inches. The average annual ETo value for 2015 was slightly (0.1%) below the 51.34 inch long-term average (1997 through 2015).

# 5.0 **GROUNDWATER**

### 5.1 Geology and Hydrogeology of the FCGMA

The FCGMA is located near the western margin of the Transverse Ranges Geologic Province in Southern California. This geologic province is characterized by east-west oriented mountain ranges separated by valleys, faults, and basins. East-west trending folds and faults are common throughout the province and their surface expression is evident at many locations within the FCGMA boundary (Figure 2 – *Major Hydrologic Features and Groundwater Basins within the FCGMA*). The water-bearing sediments that comprise the valley fill and alluvial plains within the FCGMA consist of significantly deep unconsolidated and semi-consolidated sediments that range from Pliocene to recent (Holocene) time in geologic age. The geologic formations from oldest to youngest include the Plio-Pleistocene-age Santa Barbara Formation

<sup>&</sup>lt;sup>3</sup> Data used are identified by County of Ventura as preliminary as final data were not available at the time that this report was prepared. Rainfall data collected at Camarillo Airport rainfall station (VC Sta. 259) were not available for December, so the December value used is an average of four instead of five rainfall stations.

![](_page_11_Figure_1.jpeg)

Figure 2 - Major Hydrogeologic Features and Groundwater Basins within the FCGMA

(includes the Grimes Canyon aquifer), the Pleistocene-age San Pedro Formation (contains the Fox Canyon aquifer), and semi-consolidated and unconsolidated sediments of Upper-Pleistocene and recent (Holocene) ages (Hueneme, Mugu, Oxnard, and perched aquifers). Local and regional unconformities (i.e., gaps in the geologic sedimentation record caused by uplift and subsequent erosion) occur between each of these formations (DWR, 1976).

The topography in the eastern portion of the FCGMA consists of narrow steep-sided canyons that open into the broader east-west trending Las Posas Valley and Pleasant Valley areas. Moderate relief (typically 300 to 1,500 feet difference) between the bordering mountain highlands and the westward-sloping valley floors is typical of the area. The canyons and valley floors are partially filled by colluvium, unconsolidated fluvial sediments, and coalesced alluvial fans (also called a bajada or compound alluvial fan) comprised of material eroded from the surrounding uplifted Tertiary and Quaternary-aged sedimentary rocks. The alluvial deposits in the eastern portion of the Agency are typically less than 600 feet in thickness, and most such layers thin out in close proximity to surface exposures of bedrock. In the western portion of the FCGMA, the topography primarily consists of the broad alluvial Oxnard Plain. The Oxnard Plain gently slopes to the southwest and continues beneath the Pacific Ocean. All of the semi-consolidated rocks comprising the various freshwater aquifers crop out (are exposed) beneath the ocean, and during periods of positive offshore pressure gradients, groundwater discharges have been documented in this offshore area (Izbicki, 1992, 1996a, 1996b). The thickness of the collective usable aquifer zones beneath the Oxnard Plain is typically greater than 1,200 feet.

Two main drainages lie within the boundaries of the FCGMA. The Santa Clara River originates in the San Gabriel Mountains several miles east of Ventura County (in central Los Angeles County) and flows westward through the Santa Clara River Valley, which lies north and northeast of the FCGMA. The Santa Clara River intersects the northwestern boundary of the FCGMA near the unincorporated area of Saticoy. The Santa Clara River supplies recharge to aquifers in the western third of the FCGMA by direct infiltration through the streambed, and infiltration of diverted river water in percolation ponds. A large man-made drop structure owned and operated by UWCD called the Vern Freeman Diversion extends across the river and diverts river water via channels to off-stream percolation ponds in the porous Oxnard Forebay Groundwater Basin. A majority of the river flows occur during runoff periods associated with winter storms, and this muddy, turbid water is difficult to capture and too silt-laden to be of any practical use for direct groundwater recharge. Calleguas Creek lies near the southern and southeastern boundaries of the FCGMA, and carries water during high-runoff periods, as well as nearly continuous discharge from upstream wastewater treatment plants in Simi Valley, Moorpark, Thousand Oaks, and Camarillo, and dewatering operations in Simi Valley. Additional water is contributed to these streams by irrigation return flows and urban runoff. The Conejo Creek Diversion facility exists on a tributary to Calleguas Creek and surface water diverted from this location primarily supplements agricultural groundwater extractions in the Pleasant Valley area south of the City of Camarillo. Some Conejo Creek water also helps to add irrigation supply to the western end of the Santa Rosa Valley portion of eastern Camarillo. Although there are a number of small private reservoirs and County Watershed Protection District (WPD) stormwater retention basins, there are no major surface-water lakes or reservoirs within the FCGMA boundary used for water supply needs.

Seven groundwater basins lie wholly or partially within the FCGMA:

- 1. Arroyo Santa Rosa Basin,
- 2. East Las Posas Basin,
- 3. Oxnard Forebay Basin,
- 4. Oxnard Plain Basin,
- 5. Pleasant Valley Basin,
- 6. South Las Posas Basin, and

### 7. West Las Posas Basin.<sup>4</sup>

Each basin has significant groundwater resources with unique physical and water quality characteristics (Izbicki et al., 2005). Descriptions of the physical, hydrogeological, and water quality characteristics of each of these groundwater basins are more thoroughly described in the 2007 FCGMA Groundwater Management Plan (GMP).

There are six named aquifers in the FCGMA boundaries. From deepest to shallowest these are: (1) the Grimes Canyon aquifer, (2) the Fox Canyon aquifer, (3) the Hueneme aquifer, (4) the Mugu aquifer, (5) the Oxnard aquifer, and (6) the perched or semi-perched zone (DWR, 1976). These aquifers are grouped into a Lower Aquifer System (LAS) [Grimes Canyon, Fox Canyon, and Hueneme aquifers], and the Upper Aquifer System (UAS) [Mugu and Oxnard aquifers]. The semi-perched zone is considered by some to be separate from the UAS because it is only locally extensive and of poorer quality than the deeper, more geographically extensive aquifers (Turner, 1975).

Faulting has significantly affected the local Tertiary and Quaternary-aged geologic formations and the hydrogeology within the FCGMA reflects that. Significant faults that occur within or near the margins of the Agency include the Oak Ridge fault, the Berylwood fault, the Somis fault, the Springville fault, the Simi-Santa Rosa fault zone (includes Santa Rosa fault, Northern Simi fault, Southern Simi fault), the Camarillo fault, the Wright Road fault, the Epworth fault, and the Bailey fault. Although the general groundwater flow direction in FCGMA aquifers is to the southwest, faults and other structural features may form partial or complete barriers to groundwater flow, or cause local variability in flow direction.

A comprehensive hydrologic and geologic study that includes areas within the FCGMA boundary was prepared by Hanson and Koczot (2003). Groundwater models are currently being developed by UWCD and CMWD, which will include the basins within the Agency boundary with the exception of the Arroyo Santa Rosa Basin.

### 5.2 Groundwater Resource Management

The FCGMA's enabling legislation (CWC, Appendix 121) established the ability of the FCGMA to perform groundwater management activities including, but not limited to, registration of extraction facilities (wells), control of groundwater extractions, regulation of extraction facility construction, prosecution of legal actions against unreasonable use of water resources, imposition of reasonable operating regulations, and collection of fees. Through this legislation and a series of ordinances the FCGMA has developed a groundwater record management system to record well facility owner/operator information; to collect and record extraction data; to regulate groundwater extraction through the application of an annual allocation system; to assign credits as an incentive for non-use of allocations and/or for direct replenishment actions; to collect civil penalties and surcharges for overuse of groundwater; and to collect groundwater extraction fees to fund the Agency.

There were four specific groundwater allocation methods used by the FCGMA during 2015 (see the FCGMA Ordinance Code, and Emergency Ordinance E for additional information). Allocation types include Historical Allocation (HA), Baseline Allocation (BA), Temporary Extraction Allocation (TEA) and Efficiency Allocation utilizing an Irrigation Allowance Index (IAI) method. The type of allocation available depends

<sup>&</sup>lt;sup>4</sup> Historic references have segregated the southeastern portion of the Oxnard Plain into a separate basin identified as the Mugu Forebay Basin. This Basin is not shown in Figure 2 because like the Agency's Groundwater Management Plan, this document considers these areas as a single groundwater basin, the Oxnard Plain Basin. Data and discussions included in this annual report treat all rainfall, extraction, and credit information from both the Oxnard Plain Pressure Basin and the Mugu Forebay Basin as one single basin.

upon the use of the groundwater and the history of land. The allocation system by user type is as follows: adjusted HA (AHA)<sup>5</sup> and BA for domestic users; TEA for municipal/industrial; and IAI for agricultural users.

Extraction wells are grouped by use into three type categories: Agricultural (AG), Municipal & Industrial (M&I), and Domestic (DOM). The definition of each type is specified in the Ordinance Code.

 <u>Agricultural Extraction Facility</u>: "a facility whose groundwater is used on lands in the production of plant crops or livestock for market, and uses incidental thereto." During 2015, all agricultural well operators reported extractions using a reduced IAI (Figure 3 – FCGMA Annual Irrigation Allowance Index Applications). Conservation credits were not available for use during the year. Based on selfreported extraction data, in 2015, agricultural extraction facilities were responsible for approximately 77% of the reported groundwater extracted within the Agency (Table 2).

![](_page_14_Figure_4.jpeg)

Figure 3 - FCGMA Annual Irrigation Allowance Index Application

<sup>&</sup>lt;sup>5</sup> Adjusted Historic Allocation (AHA) is Historical Allocation (HA) reduced by the current reduction factor, which was 25% in 2015.

# Table 2 - Summary of Reported Groundwater Extractions and Well Use-Type within the FCGMA for Calendar Year 2015<sup>2</sup>

Groundwater Basin	Groundwater Use-Type	Total Reported Groundwater Extractions for 2015 (AF/Year) <sup>2</sup>	Percent of Individual Groundwater Basin Extractions	Portion of 2015 Groundwater Extractions (%)	Total Number of Wells <sup>4</sup>	Active Wells in Basin <sup>5</sup> (by use type)	Active Wells in Basin by Use (%)
Arrovo Santa							
Rosa	Basin Total	1,254	100%	0.9%	21	8	38.1%
-	Agricultural	1,254	100.0%	0.9%	20	8	38.1%
	Domestic	0	0.0%	0.0%	1	0	0.0%
	M & I	0	0.0%	0.0%	0	0	0.0%
					e meneration.	100406200	
East Las Posas	Basin Total	22,700	100%	16.0%	225	120	53.3%
	Agricultural	20,644	90.9%	14.5%	161	90	40.0%
	Domestic	24	0.1%	0.0%	22	10	4.4%
	M & I	2,032	9.0%	1.4%	42	20	8.9%
Oxnard Plain							
Forebay	Basin Total	19,540	100%	13.8%	154	70	45.5%
	Agricultural	7,628	39.0%	5.4%	78	39	25.3%
	Domestic	9	0.0%	0.0%	11	4	2.6%
	M & I	11,903	60.9%	8.4%	65	27	17.5%
Oxnard Plain <sup>3</sup>	Basin Total	63,515 51.646	100%	44.7% 36.4%	628 427	291	46.3%
	Domestic	74	01%	0.1%	427	46	7 3%
	M & I	11 795	18.6%	8.3%	111	34	5.4%
	IN G I	11,755	10.0 %	0.570		54	5.470
Pleasant Valley	Basin Total	20.105	100%	14.2%	171	56	32.7%
	Agricultural	15,309	76.1%	10.8%	119	36	21.1%
	Domestic	41	0.2%	0.0%	37	12	7.0%
	M & I	4,755	23.6%	3.3%	15	8	4.7%
South Las							
Posas	Basin Total	1.846	100%	1.3%	48	16	33.3%
	Agricultural	1.765	95.6%	1.2%	36	13	27.1%
	Domestic	1	0.1%	0.0%	4	1	2.1%
	M & I	81	4.4%	0.1%	8	2	4.2%
	[						
West Las Posas	Basin Total	13,080	100%	9.2%	99	53	53.5%
	Agricultural	11,135	85.1%	7.8%	74	40	40.4%
	Domestic	27	0.2%	0.0%	8	4	4.0%
	M & I	1,918	14.7%	1.4%	17	9	9.1%
	2015 Totals	142,039	100%	100%	1,346	614	46%

Notes:

AF = Acre-feet; 1 acre-foot equals 325,851 gallons

M & I - Municipal and Industrial

1. Table provides data on reported groundwater extractions, however approximately 3% of the well operator accounts were not reported.

2. Groundwater extractions are reported twice a year. Extractions are listed by basin and reported usage of the well.

3. Oxnard Plain Basin includes area formerly identified as Mugu Forebay Groundwater Basin.

4. Total number of wells ever registered with the FCGMA in each basin (included inactive and destroyed wells).

5. Wells reported as being used in each basin during 2015.

- Municipal and Industrial (M&I) Extraction Facility: an extraction facility operated by an M&I User ("a person or other entity that used or uses water for any purpose other than agricultural irrigation") or an M&I Provider (a "person (or entity) which provides water for domestic, industrial, commercial, or fire protection purposes within the Agency Boundary"). During 2015 M&I Well Operators reported extractions using TEA; conservation credits could not be used to reduce surcharges and no conservation credits were earned on unused AHA. Based on self-reported extraction data, in 2015, M&I facilities were responsible for approximately 23% of the reported groundwater extracted within the Agency.
- <u>Domestic Extraction Facility</u>: "a domestic extraction facility supplies a single family dwelling on one acre or less, with no income producing operations." During 2015, domestic well operators reported extractions using AHA and BA. Conservation credits could not be used. Typically, domestic users are responsible for a nominal pumping amount (less than 1%) of the total groundwater extracted within the Agency during any given calendar year. Based on self-reported

extraction data, in 2015, domestic facilities were responsible for approximately 0.1% of the reported groundwater extracted within the Agency.

All extraction facility (well) operators are required to report their groundwater extraction on a semi-annual basis using an Agency provided Semi-Annual Extraction Statement (SAES). For 2015, the M&I and Domestic Operators reporting periods were January 1 through June 30 (-01 Period), and July 1 through December 31 (-02 Period). For Agricultural Operators, the reporting periods were January 1 through July 31 (-01 Period or Crop Year 2014/15 - 02) and August 1 through December 31 (-02 Period or Crop Year 2015/16 - 01). Each completed SAES lists all wells under a particular operator code, any available allocations, the reported groundwater extraction (acre-feet) for each well, and the specific allocation method used to calculate the permitted groundwater extraction. Based on the groundwater extraction reported, each operator is required by the Ordinance Code to calculate the extraction charge due, plus any surcharges, interest, or late penalties associated with their user account, and then remit payment to the FCGMA along with the completed SAES form.

### 5.3 Groundwater Extractions <sup>6</sup>

Groundwater extractions are self-reported to the Agency by the well owners or operators. At the time that this report was prepared, three (3) percent of the user accounts had not reported.

For the calendar year 2015, total groundwater extractions reported to the FCGMA were 142,039 acre-feet<sup>7</sup> (AF). The total annual reported groundwater extractions were 13% above the long-term average of 126,046 AF (1991 to 2014). Annual extraction data is presented in Table 3 – *Summary of Reported Extractions within the FCGMA Since 1983*, and in Figure 4 - 2015 Annual Rainfall and Reported Groundwater Extractions in the FCGMA. Table 4 – Comparison of Year 2014 Groundwater Extractions to Historic Reported Groundwater Extractions in the FCGMA and Table 5 – 2015 FCGMA Allocations vs. Extractions by Account Primary Basin and Use Type provide more detail.

### 5.3.1 Groundwater Use in the FCGMA

Self-reported extraction data for 2015 (see Table 2) indicate there were 437 active agricultural wells, 100 active M&I wells, and 77 active domestic wells. Based on the 2015 reported extractions, approximately 77% of groundwater use was for agriculture and roughly 23% for municipal uses. Agricultural operators collectively reported 109,381 AF of extractions (up from 106,579 AF in 2014). M&I operators reported 32,483 AF of extractions (down from 42,797 AF in 2014). The reported annual extraction by Domestic Well Operators was approximately 175 AF compared to 363 AF in 2014. It should be noted that Domestic<sup>8</sup> Well Operators are not required to use flowmeters to report groundwater extraction, providing the Ordinance Code criteria are met. Total domestic annual extractions are not considered a significant percentage (0.12%) in the annual groundwater total use within the Agency.

The FCGMA extraction data provide the ratio of groundwater use to use-type in each basin (Table 2 and Figure 5). The basins have been classified based on primary groundwater use during 2015: agricultural use; agricultural mixed-use; or M&I mixed-use.

<sup>&</sup>lt;sup>6</sup> Tables 2, 3, 4 and 5 provide data on reported groundwater extractions. In 2015, approximately 3% of the operators did not report their extractions.

<sup>&</sup>lt;sup>7</sup> One acre-foot (AF) equals 325,851 U.S. gallons at Standard Temperature and Pressure (STP).

<sup>&</sup>lt;sup>8</sup> Wells for domestic use, serving a single-family residence, on a parcel of one acre or less, with no moneymaking operation on the site, are not required to use a flowmeter.

Table 3 - Summary of Reported Extractions within the FCGMA Since 1983

Calendar Year	-01 Period Extractions [in AFY] <sup>1,2,3</sup>	-02 Period Extractions [in AFY] <sup>1,2,3</sup>	Total Annual Extractions [in AFY] <sup>1,2,3</sup>	Historical Allocation Reduction Percent <sup>4</sup>
2015	71,411	70,628	142,039	25%
2014	85,233	65,731	150,965	25%
2013	64,598	88,741	153,339	25%
2012	59,864	75,290	135,154	25%
2011	54,331	65,835	120,166	25%
2010	54,852	71,479	126,331	25%
2009	63,036	82,972	146,008	20%
2008	63,695	75,360	139,055	15%
2007	59,604	77,337	136,941	15%
2006	43,655	69,457	113,113	15%
2005	41,692	64,906	106,597	15%
2004	59,357	70,805	130,161	15%
2003	46,122	69,540	115,662	15%
2002	61,642	70,515	132,158	15%
2001	43,703	58,497	102,200	15%
2000	48,203	75,022	123,225	15%
1999	49,659	81,130	130,788	10%
1998	37,316	68,530	105,846	10%
1997	63,322	70,014	133,335	10%
1996	45,907	57,636	103,543	10%
1995	42,028	61,738	103,766	10%
1994	60,484	77,720	138,205	5%
1993	45,574	73,274	118,849	5%
1992	44,589	70,636	115,225	5%
1991	61,638	82,843	144,481	0%
1990	79,074	99,262	178,336	0%
1989	78,301	100,251	178,553	NA
1988	73,102	87,909	161,010	NA
1987	82,682	82,586	165,268	NA
1986	57,585	84,137	141,722	NA
1985	78,339	84,281	162,620	NA
1984	36,377	35,506	71,883	NA
1983	285	28,984	29,269	NA
Totals =	1.857,260	2.398.554	4,255,813	

#### Notes:

One acre-foot equals 325,851 gallons, AFY = Acre-feet per year

1. Table provides data on reported groundwater extractions. For 2015, extractions from approximately 3% of operator accounts were not reported (as of October 2016).

2. Starting in 2014, reporting periods are: (-01) January 1 - June 30, and (-02) July 1 - December 31 for Domestic, and M&I Operators; (-01) January 1 - July 31, and (-02) August 1 - December 31 for Agricultural Operators.

3. Data for 1983 and 1984 provided by UWCD. Data determined to be incomplete due to low extraction values and low number of registered operators compared to proceeding years.

4. Reductions stipulated by FCGMA Ordinance and Resolutions.

![](_page_18_Figure_1.jpeg)

![](_page_18_Figure_2.jpeg)

[1] - Measured calendar year rainfall is the average of weather station annual recorded precipitation. Six stations used between 1991 - 2006, and five between 2007-2015. County gauges used for 1985-1990 and 2013-15.

# Table 4 - Comparison of Year 2015 Reported Groundwater Extractions<sup>1</sup> to Historic Reported Groundwater Extractions in the FCGMA

	Annual Extractior (AF/Year) <sup>2</sup>	ı	Ex -(	traction for 1 Periods AF/Period) <sup>2</sup>	Extraction for -02 Periods (AF/Period) <sup>2</sup>
2015 Reported Extractions	142,039			71,411	70,628
Average Reported Extractions <sup>3</sup> (1991 - 2014)	126,046	2014 is year di compa to prev	s first irect irisons vious	54,171	71,875
Comparison of Current Year (2015) Reported Extractions to Average Reported Extractions (1991 - 2014) <sup>3</sup> (reported as %)	113%	01 and period possib is due report period change	l 02 s not le. This to ing es <sup>2</sup>	132%	98%
Rank Comparing Current Year Extraction to Annual Extractions (1991 - 2014)	21st out of 25th h year	ighest	_,	24	12

#### Notes:

AF = acre-feet; (one acre-foot equals 325,851 gallons)

1. Approximately 3% of the well operators had not reported as of October 2016.

2. Starting in 2014, reporting periods are: (-01) January 1 - June 30; and (-02) July1 - December 31 for Domestic, and Municipal

and Industrial Operators; (-01) January 1 - July 31; and (-02) August 1 - December 31 for Agricultural Operators.

3. Average reported Agency-wide groundwater extractions per period and year from 1991 through 2014.

Groundwater Basin	Primary Use Type for	Historical Allocation (for all wells in each basin) <sup>2</sup>	Adjusted Historical Allocation	Baseline Allocations	AHA <sup>3</sup> (AF) + Baseline Allocations	2015 Total Available Domestic Allocation <sup>4</sup>	M&I Temporary Extraction Allocation for 2015 <sup>5</sup>	2015 Irrigation Efficiency Allocations <sup>6</sup>	2015 Reported Extractions by Primary Type per Groundwater
	Account <sup>1</sup>	(AF)	(AHA) <sup>3</sup> (AF)	(AF)	(AF)	(AF)	(AF)	(AF)	Basin (AF) <sup>7</sup>
Arroyo Santa Rosa (ASR)	AG	846	635	0	635	NA	NA	1,122	1,254
	DOM	0	0	0	0	0	NA	NA	0
	M&I	0	0	0	0	NA	0	NA	0
East Las Posas (ELP)	AG	13,557	9,088	312	9,399	NA	NA	19,822	20,644
	DOM	137	91	52	143	143	NA	NA	24
	M&I	3,004	1,999	55	2,054	NA	4,321	NA	2,032
Oxnard Plain Forebay (FOR)	AG	9,669	6,899	2	6,901	NA	NA	7,373	7,628
	DOM	545	195	17	212	212	NA	AN	6
	M&I	19,456	14,068	201	14,269	NA	13,327	NA	11,903
Oxnard Plain Basin (OXP)	AG	60,800	44,046	64	44,110	AN	NA	42,100	51,646
	DOM	2,775	2,009	92	2,101	2,101	NA	AN	74
	M&I	12,296	17,270	2,171	19,440	NA	12,863	NA	11,795
Pleasant Valley (PV)	AG	16,124	12,027	7	12,034	NA	NA	10,164	15,309
	DOM	540	394	21	415	415	NA	AN	41
	M&I	5,271	4,872	1,383	6,254	NA	4,703	NA	4,755
South Las Posas (SLP)	AG	1,563	1,172	42	1,214	NA	NA	1,757	1,765
	DOM	0	0	0	0	0	NA	NA	ł
	M&I	541	392	0	392	NA	55	NA	81
West Las Posas (WLP)	AG	10,833	8,518	25	8,543	NA	NA	10,038	11,135
	DOM	12	8	16	24	24	NA	AN	27
	M&I	1,675	1,370	465	1,836	NA	3,560	NA	1,918
Totals		159,648	125,051	4,924	129,975	2,895	38,828	92,375	142,039
NOTES: (totals or subtotals may not be	exact due to ro	unding); NA means	not applicable						
1) Although some wells and accounts ser	rve more than o	ne use type, the ma	in (or primary) use	type for the accou	nt (Combination Coc	le or "CombCode") i	is listed.		
2) Total includes Historical Allocation (H <sup>A</sup>	<ul> <li>A) as averaged a</li> </ul>	after the 1985-1989	Base Period along	with any adjustme	ents and before any s	scheduled reduction	s.		

Table 5 - 2015 FCGMA Allocations vs. Extractions by Account Primary Basin and Use-Type

3) Total includes Historical Allocation (HA) as averaged after the 1985-1989 Base Period along with any adjustments and <u>after</u> any scheduled reductions. The current scheduled reduction reduces Historic Allocations by 25%. The Adjusted Historic Allocation (AHA) presented is here is per operator account primary use and primary basin.
4) The Historical Allocation plus any adjustments minus scheduled reductions, plus any Baseline Allocation.

5) Temporary Extraction Allocations apply to M&I Operators only. It is an average of 2003 to 2012 reported groundwater extractions, unless a variance has been granted.

6) Agricultural Irrigation Allowance Index (I.A.I.) allocations are for filed applications covering both 2015-1 and 2015-2.
7) Total reported groundwater extractions.

![](_page_20_Figure_1.jpeg)

![](_page_20_Figure_2.jpeg)

### 5.3.2 Groundwater Use and Extraction by Basin

The majority of groundwater extractions occur within the Oxnard Plain Basin. The primary use of the extracted groundwater is for agriculture. Additional detail regarding groundwater use by basin is presented in Figure 5 – 2015 Ratio of Reported Groundwater Extractions by Basin.

- 5.3.2.1 Arroyo Santa Rosa (ASR): The Arroyo Santa Rosa is an agricultural-use basin as groundwater is primarily used for agricultural demand. All (100%) of the reported groundwater extractions (1,254 AF) were reported as used for agricultural purposes.
- 5.3.2.2 East Las Posas (ELP): The East Las Posas Basin is an agricultural-use basin, as groundwater is primarily used for agricultural demand. Reported use of the 22,700 AF of groundwater extracted was 90.9% Agricultural (20,644 acre-feet), 0.1% Domestic (24 AF), and 9.0% M&I (2,032 AF).
- 5.3.2.3 Oxnard Plain Forebay (FOR): The Oxnard Forebay Basin is an M&I mixed-use basin as groundwater is primarily used for M&I demand and a lesser amount to agricultural extraction and only nominal volumes to domestic demands. Reported use of the 19,540 AF of groundwater extracted was 39.0% Agricultural (7,628 AF), 0.0% Domestic (9 AF), and 60.9% M&I (11,903 AF).
- 5.3.2.4 Oxnard Plain Basin (OXP): The Oxnard Plain Basin is an agricultural mixed-use basin. Significant groundwater extractions are by both agricultural and M&I operators with relatively little domestic extraction. Reported use of the 63,515 AF of groundwater extracted was 81.3% Agricultural (51,646 AF), 0.1% Domestic (74 AF), and 18.6% M&I (11,795 AF).
- 5.3.2.5 Pleasant Valley Basin (PVB): The Pleasant Valley Basin is an agricultural mixed-use basin. Significant groundwater extractions are by both agricultural and M&I operators with relatively little domestic extraction. Reported use of the 20,105 AF of groundwater extracted was 76.1% Agricultural (15,309 AF), 0.2% Domestic (41 AF), and 23.6% M&I (4,755 AF).
- 5.3.2.6 South Las Posas Basin (SLP): The South Las Posas Basin is an agricultural-use basin as groundwater is primarily used for agricultural demand. Reported use of the 1,846 AF of groundwater extracted was 95.6% Agricultural (1,765 AF), 0.1% Domestic (1 AF), and 4.4% M&I (81 AF).
- 5.3.2.7 West Las Posas Basin (WLP): The West Las Posas Basin is an agricultural-use basin as groundwater is primarily used for agricultural demand. Reported use of the 13,080 AF of groundwater extracted was 85.1% Agricultural (11,135 AF), 0.2% Domestic (27 AF), and 14.7% M&I (1,918 AF).

### 5.4 Health of the Basins

The GMP establishes BMOs (quantitative groundwater quantity and quality targets) used to measure and evaluate the "health" of the basins and the potential effectiveness of various groundwater management strategies. BMOs are specific to each of the groundwater basins within the FCGMA. The current program is described in the 2007 Update to the FCGMA GMP and is comprised of monitoring 26 wells/monitoring points. For coastal groundwater basins, a critical BMO is maintaining groundwater levels at elevations high enough to prevent or minimize intrusion by seawater. Sixteen wells along the coast have concurrent BMOs for water levels and chloride. In inland areas, water quality BMOs have been established to monitor potential impacts to the drinking water supply, water supply for irrigation of crops, and to meet the California Regional Water Quality Control Board Basin Plan Objectives. Ten inland wells have concurrent BMOs of either chloride/TDS, nitrate/TDS, or nitrate/chloride. The 2015 BMO Report Cards were presented to the Board during the September 28, 2016, FCGMA Board Meeting. The 2015 BMO Report Cards are included as Appendix B.

### 5.4.1 Groundwater Levels

During 2015, Agency staff prepared water-level surface maps for the Upper Aquifer System (UAS) and Lower Aquifer System (LAS) using Fall 2014 groundwater data collected by the County of Ventura, United Water Conservation District (UWCD), Calleguas Municipal Water District (CMWD), and others. Initial contouring was generated using ESRI's ArcMap GIS software, with manual adjustments made to better reflect expected edge-of-basin conditions. The maps prepared are consistent in aerial extent, display of data collection points, contour intervals, and geographic reference information with those prepared in 2013 (Fall 1972 to Fall 2012, even years only), 2014 (Fall 2013), and 2015 (Fall 2014). The maps were submitted to the FCGMA Groundwater Sustainability Plan Technical Advisory Group (TAG) for review and comment prior to being presented to the FCGMA Board. The Fall 2015 potentiometric surface maps (prepared in 2016) are presented in Appendix C.

Groundwater levels generally declined within the Agency boundaries between Fall 2014 and Fall 2015. In the UAS, water levels in Fall 2015 were below sea level in the Oxnard Plain Basin and most of the Oxnard Forebay and Pleasant Valley basins. In the LAS, water levels in Fall 2015 were below sea level in the Oxnard Plain Basin and most of the Oxnard Forebay, Pleasant Valley, and West Las Posas basins. None of the sixteen BMOs for water levels in the Oxnard Plain and Pleasant Valley basins were met.

### 5.4.2 Groundwater Quality

Water quality is presented in this section by basin and is relative to the BMO criteria established in the 2007 Update of the FCGMA GMP. Of the 36 water-quality BMOs monitored for chloride, nitrate, and TDS in 2015, 15 were met, 19 were not met, and no data were available for two. The BMO Report Cards for 2015 are included in this report as Appendix B. The BMO Report cards include maps indicating the BMO monitoring well locations and the associated objectives. A summary of the water quality conditions relative to the BMOs in each basin is presented below.

- 5.4.2.1 **Arroyo Santa Rosa (ASR):** BMOs have been established for nitrate and chloride in the Arroyo Santa Rosa Basin to protect groundwater quality for potable and irrigation uses. Monitoring is conducted at two wells located in the south-central portion of the basin. At both locations, the average nitrate concentrations in samples collected exceeded the BMO of 45 mg/L<sup>9</sup> (the Maximum Contaminant Level for drinking water), detected at 49 mg/L and 80 mg/L. The average chloride concentrations were below the BMO of 150 mg/L, detected at 141 mg/L and 147 mg/L. Nitrate concentrations have decreased from approximately 62 mg/L to 49 mg/L during the five-year period 2011 through 2015. However, nitrate concentrations have been increasing from approximately 60 mg/L to 80 mg/L over the past five years. Chloride concentrations have generally increased over the five-year period 2011 through 2015, fluctuating above and below the BMO at both well locations.
- 5.4.2.2 **East Las Posas (ELP):** The East Las Posas Basin has BMOs for chloride and TDS at three well locations to protect groundwater quality for potable and irrigation uses. The wells are located in the southwestern portion of the basin. Data were available for two of the three locations. Based on an average of the analytical results, chloride and TDS BMOs were exceeded at the two sample locations. Chloride and TDS concentrations over the five-year period 2011 through 2015 have fluctuated with in a limited range (approximately 150 to 200 mg/L for chloride, and 1,200 mg/L to 1,600 mg/L for TDS).

<sup>&</sup>lt;sup>9</sup> mg/L = milligrams per liter, generally equivalent to parts per million.

- 5.4.2.3 **Oxnard Plain Forebay (FOR):** The Forebay has BMOs at two locations in the central portion of the basin for nitrate and TDS to protect groundwater quality for potable and irrigation uses. Average nitrate concentrations exceeded the BMO of 22.5 mg/L, detected at 27 mg/L and 60 mg/L. Average TDS concentrations were above and below the BMO of less than 1,200 mg/L. At west central location, the BMO was exceeded by 63 mg/L. At the east central location, the average concentration was below the BMO by 127 mg/L. During the five-year period of 2011 through 2015, the average nitrate and TDS concentrations have increased at both locations.
- 5.4.2.4 **Oxnard Plain Basin (OXP):** The basin has water-level and chloride-concentration BMOs for both the UAS and LAS. The primary focus and function of the BMOs are protection of the aquifers against seawater intrusion. None of the water-level BMOs in the basin were met in 2015. Chloride concentration BMOs are monitored at nine locations in the UAS, and at five locations in the LAS. These BMOs monitor saline intrusion (chloride is a direct indicator of intrusion). The chloride BMOs were generally not met near Port Hueneme and Pt. Mugu in either the UAS and LAS. Measured chloride concentrations in the UAS have generally been stable at six of the nine BMO locations. The five-year trend in chloride concentrations at the Pt. Mugu nested wells have both increased and decreased. Chloride concentrations have generally been stable at the monitoring locations (north coastal, inland, and one aquifer zone in the Point Mugu area).
- 5.4.2.5 **Pleasant Valley Basin (PVB):** The basin has water level and chloride concentration BMOs designed to detect migration of saline groundwater from coastal areas, and from lateral and underlying sources. There are two monitoring locations in the western portion of the basin. Neither water-level BMO was met in 2015. The chloride concentration in the sample collected at the monitoring location near the southwestern corner of the basin was detected at 107 mg/L, below the BMO of less than 150 mg/L. The chloride BMO was exceeded in a sample collected at the other monitoring location in the west-central portion of the basin, detected at 166 mg/L. During the five-year period 2011 through 2015, water levels have declined at both locations. Chloride concentrations have fluctuated above and below the BMO at the west-central monitoring location and remained below the BMO at the monitoring well near the southwestern corner of the basin.
- 5.4.2.6 **South Las Posas Basin (SLP):** The basin has BMOs for chloride and TDS to protect groundwater quality for potable and irrigation uses. The designated BMO well, located in the north-central portion of the basin, has been abandoned and no data were available for 2015. A nearby well, which has monitoring data available back to 2009, was selected as a temporary replacement. Based on averages of chloride and TDS concentrations, the chloride BMO (160 mg/L) and TDS BMO (less than 1,500 mg/L) were met. During the five-year period 2011 through 2015, chloride concentrations have been stable at the temporary replacement BMO location, while TDS average concentrations have slightly decreased.
- 5.4.2.7 West Las Posas Basin (WLP): The basin has BMOs for chloride and TDS to protect groundwater quality for potable and irrigation uses. Monitoring is performed at two wells located in the southeastern portion of the basin. Based on averages of chloride and TDS concentrations, the chloride and TDS BMOs were met at both BMO well locations. During the five-year period 2011 through 2015, chloride and nitrate concentrations have been stable at both locations.

### 6.0 FCGMA PROGRAMS

### 6.1 Permitting and Registration of Wells

As of year-end 2015, there were 1,346 wells identified by State Well Numbers within the Agency boundaries: 614 wells reported as active; 302 wells listed as inactive; 422 wells destroyed; and 8

permanent monitoring or cathodic protection wells. On an ongoing basis, Agency staff registers new wells permitted by the County of Ventura<sup>10</sup> and/or by the City of Oxnard. The status of existing wells is regularly updated based on information reported by the well owners or operators.

The continuation of the moratorium on issuance of permits for new extraction facilities imposed by Emergency Ordinance E has resulted in a decrease in FCGMA well permit activity. Emergency Ordinance E allows for certain exceptions to the moratorium. Agency staff processed five groundwater-extraction well permit applications for new extraction facilities, which are to serve as replacement or backup wells. All applications are verified for compliance with the Ordinance Code.

The FCGMA Ordinance Code requires registration of all groundwater extraction facilities in addition to semi-annual reporting of extraction volumes and payment of extraction fees. Agency staff mailed 27 Well Registration Packets and processed well registration documents.

### 6.2 Flowmeter Calibration Program

The FCGMA Ordinance Code requires the use of flowmeters for all extraction facilities except inactive wells<sup>11</sup> and exempt well operators<sup>12</sup>. The use of accurate flowmeters for reporting groundwater extractions is critical to the Agency for a number of reasons. First, it provides a relatively uniform and equitable method of reporting for all stakeholders. Second, it increases the efficiency of data management. Third, it allows Agency staff to analyze the extraction and use of the groundwater resources to help make meaningful recommendations to the Board.

Flowmeters have been required on non-exempt extraction facilities since July 1, 1994, following the adoption of Ordinance No. 3.1 on July 28, 1993. The current groundwater metering program was officially launched via a revision of Chapter 3.0 in Ordinance 8.1 (July 2005), and the initial passage of Resolution No. 2006-01 (adopted in March 2006). The initial groundwater-flowmeter-calibration program began in earnest in 2007 and continued into 2009. Resolution No. 2008-04 (adopted May 2008) replaced the original Resolution No. 2006-01 to clarify the methods and rules governing the meter-calibration program; Resolution No. 2008-04 was again revised on September 24, 2008. A third round of Agency-wide flowmeter-calibration testing was initiated in 2014. Staff continued to enforce flowmeter-calibration requirements throughout 2015.

Of the 1,346 State Well Numbers listed in the FCGMA database, 614 (46%) were actively being used in 2015. In the past, well extractions were reported using water flowmeters, electrical power meters, or a consumptive-use method that estimated annual water-use volume for domestic or farm use based on number of people in a home, or estimated from the number of irrigated acres and crop. Because of a concerted effort by the Agency, the only known wells within the FCGMA that still use consumptive use methods to report extractions are domestic wells that qualify for an exemption from flowmeter requirements. Per Agency records, four wells were exempt from the flowmeter requirement based on use. At the end of 2015, 152 flowmeters were due for calibration and calibration test data were current for approximately 531 flowmeters. The Agency took the following actions in 2015 to increase the effectiveness of the flowmeter program, which helped increase the compliance rate for calibrated Agricultural, and M&I, and Domestic well flowmeters:

<sup>&</sup>lt;sup>10</sup> Refers to wells permitted in accordance with the County of Ventura Ordinance No. 4184. All permitting in accordance with this ordinance is performed by the Ventura County Watershed Protection District. The City of Oxnard is the only other entity in Ventura County that issues water well permits.

<sup>&</sup>lt;sup>11</sup> An inactive well is a well that conforms to the County Water Well Ordinance requirements for an active well, but is being held in an idle status in case of future need. Idle status means the well is pumped no more than 8 hours during any 12-month period.

<sup>&</sup>lt;sup>12</sup>Exempt well operators are well operators operating extraction facilities supplying a single-family dwelling on one acre or less, with no income producing operations.

- Mailed 171 Initial Notices for testing of flowmeters associated with non-exempt wells, and
- Mailed 49 Notices of Violation.

### 6.3 FCGMA Groundwater Management Plan

The GMP identifies a series of short- and long-term groundwater-management projects and strategies designed to address the imbalance between water supply and demand. The following summarizes the progress made in 2015 in implementing the GMP projects and strategies:

- South Las Posas Pump/Treat (pump-poor quality water and blend/ treat it) Ventura County Water Works District No. 1 Moorpark Desalter Project is moving forward. Agency staff reviewed Groundwater modeling report and prepared a comment letter.
- Development of Brackish Groundwater in the Pleasant Valley The City of Camarillo continued studies towards development of the brackish groundwater in the Pleasant Valley Basin. Agency staff reviewed and commented on the Recirculated Draft Environmental Impact Report, the Environmental Impact Report, and the Monitoring and Contingency Plan.
- Continuation of the 25% Pumping Reduction applied to domestic well operators. Under Emergency Ordinance E, allocation systems for agricultural, and municipal and industrial well operators were modified to further reduce groundwater extractions.
- Verification of Extraction Reporting (verify accuracy of reporting) For Calendar Year 2015, utilizing the FCGMA Online Software, the Agency sent approximately 867 Semi-Annual Groundwater Extraction Statements, keyed in data received, and followed-up with non-reporters. Forty-nine (49) non-reporter accounts (missing semi-annual extraction statement filings) were resolved. One hundred and seventy six (176) Notices of Violations (81 First, 66 Second and 29 Third) were sent to non-reporters.
- Separate Strategies for Each Basin The Agency elected to become the Groundwater Sustainability Agency (GSA) for each of the Department of Water Resources (DWR) groundwater basins within the FCGMA boundary in response to the Sustainable Groundwater Management Act. The Agency began the effort to develop Groundwater Sustainability Plans (GSPs) for each of the basins.
- Irrigation Efficiency Implemented the Emergency Ordinance E modified Irrigation Allowance program for agricultural well operators.
- Additional Water Conservation To further reduce groundwater extractions during the current drought, the allocation systems associated with Emergency Ordinance E were implemented during calendar year 2015.

### 6.3.1 Credit Programs

There are a number of different groundwater extraction credit programs. They are listed below.

- 6.3.1.1 Conservation Credits: In the past, well owners or operators with Historical Allocation would take advantage of this credit system by not using the full AHA associated with their wells. The credits granted under this system are called Conservation Credits to designate that they were earned by not pumping the full allocation. The Conservation Credit program has been suspended while Emergency Ordinance E is in effect.
- 6.3.1.2 Injection Credits: Operators that recharge aquifers within the FCGMA boundaries through direct injection of "foreign water," as defined in the Agency's Ordinance Code, earn Injection Credits (in acre-feet) (also known as storage credits). During 2015, the FCGMA received and approved two

Injection Credit requests. CMWD injected approximately 703 AF of water into the East Las Posas Basin. UWCD injected approximately 29 AF into the Oxnard Forebay Basin.

- 6.3.1.3 In-Lieu Credits: The In-Lieu Credit Program provides for the transfer of credit from the user of foreign water to the supplier in the amount of one acre-foot for each acre-foot of delivered water for direct use by the user. The water represented by the credits transferred is not available for use in the year the credit is accrued. During 2015, the FCGMA processed and approved three In-Lieu Credit transfers (approximately 433 AF).
- 6.3.1.4 Supplemental Municipal and Industrial (M&I) Water Program Credits: The Supplemental M&I Water Program allows for the transfer of credits (Conejo Credits) when Pleasant Valley County Water District (PVCWD) takes delivery of water from Conejo Creek instead of extracting groundwater. The surface water is diverted via the Conejo Creek Diversion constructed to enhance groundwater storage by allowing surface water, normally lost to the Ocean, to be used prior to and instead of extracting groundwater. Camrosa Water District (Camrosa) operates the Conejo Creek Diversion. In accordance with Resolution No. 2014-01, Conejo Credits are transferred from PVCWD to Camrosa. The Conejo Credits are used by Camrosa to offset surcharges for excess groundwater extractions. During 2015, there were two Supplemental M&I credit transfers, which totaled approximately 2,355 AF.
- 6.3.1.5 . Credit Transfers: Conservation credits were not transferred in 2015.

The accumulation of credits represents a long-term resource management challenge for the Agency and its stakeholders. However, while Emergency Ordinance E is in effect, Conservation Credits cannot be earned or used.

### 7.0 AGENCY ACTIONS FOR CALENDAR YEAR 2015

### 7.1 Significant Agency Actions

### 7.1.1 Adopted Changes to the Ordinance Code

On January 9, 2015, the FCGMA Board adopted an amendment to the Ordinance Code (Ordinance 8.8). The amendment clarifies the rules for calculation and assessment of surcharges for exceeding an Irrigation Allowance Index of 1.0 and imposes an Agency-wide cap on agricultural water application. The amended Ordinance Code is included in Appendix A.

### 7.1.2 Implementation of Emergency Ordinance E

On April 11, 2014, the FCGMA Board of Directors adopted Emergency Ordinance E to address declining groundwater levels: "An Emergency Ordinance Limiting Extractions from Groundwater Extractions Facilities, Suspending Use of Credits and Prohibiting Construction of Any Groundwater Extraction Facility and/or the Issuance of Any Permit Therefor." This action followed the Governor of California proclaiming a state of emergency on January 17, 2014, because of the continued drought. Emergency Ordinance E remained in effect through 2015 due to the continuing drought. The following actions were completed or were in review during 2015:

- Article 2. Reduction of Groundwater Extractions: Granted five (5) variances to Temporary Extraction Allocation (TEA), denied one (1) variance, and Board denied two (2) variance appeals.
- Article 4. Prohibition on New Extraction Facilities: Board granted one (1) exception.
- Irrigation Allowance Index (for 2015 portion of Crop Years 2014/15 and 2015/16):
  - Pro-rating of water use Application revised

- Fallow land irrigation allowance for lands that grew irrigated crops in the twelve months prior to August 1, 2014, but have subsequently been fallowed or are growing a non-irrigated crop – Process developed and implemented.
- Public outreach Developed training videos and held training sessions and workshop, and technical and Growers' Group meetings.

### 7.1.2 Adopted Resolutions

The FCGMA Board of Directors adopted five Resolutions during calendar year 2015 (Appendix A):

- Resolution No. 2015-01: "A Resolution electing to be the Groundwater Sustainability Agency for the Arroyo Santa Rosa Valley, (West, South, East) Las Posas Valley, Oxnard Forebay, Oxnard Plain, and Pleasant Valley Basins within the boundaries of the Fox Canyon Groundwater Management Agency,"
- Resolution No. 2015-02: "A Resolution specifying requirements for establishing an Annual Efficiency Allocation by Operators that Supply Groundwater for Agricultural Use by Others;"
- Resolution No. 2015-03: "Fox Canyon Groundwater Management Agency honoring Dr. Michael Kelley;"
- Resolution No. 2015-04: "A Resolution imposing a fee on groundwater extractions to fund the costs of a Groundwater Sustainability Program;" and
- Resolution No. 2015-05: "Adopting the 2014 Integrated Regional Water Management Plan prepared by the Watersheds Coalition of Ventura County and authorizing the Executive Officer of the FCGMA to file a CEQA Notice of Exemption."

### 7.1.3 Implementation of Sustainable Groundwater Management Act

On January 9, 2015, FCGMA accepted the responsibility of becoming the Groundwater Sustainability Agency (GSA) for those portions of the four California State Department of Water Resources (DWR) groundwater basins, which are within the FCGMA boundary by adopting Resolution No. 2015-01. Actions taken during 2015 include:

- Filed Notice of Intent to become Groundwater Sustainability Agency;
- Adopted process for Groundwater Sustainability Plan development;
- Formed a Technical Advisory Group (TAG) and held six (6) meetings;
- Developed a stakeholder process;
- Hired consultant to develop four (4) Groundwater Sustainability Plans;
- Adopted objectives associated with seawater intrusion, migration of poor quality water, land subsidence, and pumping trough depressions;
- Approved a cost share agreement with Calleguas Municipal Water District (CMWD) to fund the completion of the Las Posas Basin Replacement Water Study; and
- Requested the County of Ventura Apply for Proposition 1 Sustainable Groundwater Planning Grant to Develop Groundwater Sustainability Plans for Oxnard and Pleasant Valley basins.

### 7.2 Project Reviews Performed in 2015

Agency Staff reviews and comments on submitted documents (draft to final) which are associated with proposed groundwater projects, including modeling reports, monitoring and contingency plans, and environmental documents. Project reviews conducted in 2015 included:

- Camrosa Water District proposed well: Draft Environmental Impact Report
- City of Camarillo Desalter Project: Recirculated Draft Environmental Impact Report; Environmental Impact Report; and Monitoring and Contingency Plan
- Bell Ranch Desalter Project: Draft Groundwater Yield Analysis for a Desalter Facility
- County of Ventura Waterworks District No. 1 Desalter Project: Moorpark Desalter Groundwater Modeling Report
- Pleasant Valley Mutual Water Company Desalter Project: Notice of Intent to Adopt a Mitigated Negative Declaration for Proposed Desalter.
- Calleguas Municipal Water District: Las Posas Conjunctive Use Study.

At times, Agency staff provides formal comments on proposed projects within the Agency jurisdiction to the County of Ventura Planning Department as part of CEQA review. In 2015, Agency staff provided approximately five project reviews to the County of Ventura Planning Department. Typically, proposed development projects are reviewed to identify the following groundwater-related issues: changes to the well ownership/operator; property-use changes that may affect or impact FCGMA extraction allocations; changes to land or crops; potential short- or long-term impacts to water quality and/or water quantity; alterations or modifications in well status; changes to water distribution systems; and construction of structures that might impair infiltration of water to FCGMA aquifers. Projects may be approved with no further action needed, or approved with conditions and/or modifications based in part on potential impacts to the FCGMA groundwater resources.

### 7.3 Other Activities Performed in 2015

The Agency performed and completed the following additional activities during 2015:

- Completed a seven-step process for developing measures to assure long-term sustainable groundwater management. A list of possible solutions to the issues of concern, with advantages and disadvantages identified, was approved.
- Prepared the 2014 Annual Report, including Fall Water Level Maps (Lower and Upper Aquifer Systems) and 2014 Annual Basin Management Objective Report Card.
- Processed applications for Historical Allocation, and/or Baseline Allocation:
  - Approved Two (2) Ag to M&I Allocation Transfers
  - Denied two (2) baseline allocation applications
- Informational updates:
  - o Ventura County Wastewater District No. 1 Moorpark Desalter Project
  - City of Camarillo's North Pleasant Valley Desalter Project
  - Las Posas Conjunctive Use Study Results
  - Proposed Las Posas Groundwater Pumping Allocation System
  - Proof of Concept for a Smart Metering Network Program
- To improve stakeholder outreach and communication, staff attended stakeholder and Las Posas User Group meetings, and continued mailing of Semi-Annual Newsletters.

• Upgrades to FCGMA Online Software – Significant enhancements completed including the Sustainability Fee adopted by Board in September (Resolution No. 2015-04).

## 8.0 FINANCIAL STATUS OF THE AGENCY FOR 2015

The FCGMA's fiscal year begins July 1 and ends on June 30 of the following calendar year. Accordingly, the financial status information contained in this 2015 Annual Report covers the Fiscal Year period beginning July 1, 2014 and ending on June 30, 2015. Fiscal administration and oversight of the Agency's financial transactions is performed by Agency management in consultation with the Fiscal Services Section, Central Services Department, of the Ventura County Public Works Agency pursuant to an existing and ongoing contractual arrangement between the Agency and the County of Ventura.

Quarterly and year-end budget-to-actual performance reports are presented to the FCGMA Board of Directors for their information, review, and where necessary, adjustment. The information below highlights key fiscal performance metrics reported by Agency management during the 2014-15 Fiscal Year period.

### 8.1 Fiscal Year End Report June 30, 2015

- FCGMA revenues received in 2014-15 totaled \$866,639; an amount that reflected a \$749,882 or 46% decrease versus 2013-14 adjusted actual revenues received.
- FCGMA expenditures incurred in 2014-15 totaled \$1,074,242; an amount that reflected a \$116,371, or 12% increase above 2013-14 adjusted actual expenditures incurred by the Agency.

### 8.2 Financial Audits

Pursuant to Government Code § 26909, the audit requirements applicable to FCGMA are in the *Minimum Audit Requirements and Reporting Guidelines* for California Special Districts, as published by the Division of Accounting and Reporting, Office of the State Controller. Essentially, the minimum requirements reflect Generally Accepted Auditing Standards (GAAS), as described in the American Institute of Certified Public Accountants publication, *Audits of State and Local Governmental Units*.

Under GAAS, the FCGMA, which is a special purpose governmental agency engaged in the preservation and management groundwater resources for the common benefit within its boundary, is required to prepare its financial statements in an enterprise format. The FCGMA is funded primarily through user extraction charges (set at \$6.00 per acre-foot), a *Sustainability Fee* (\$4.00 acre-foot implemented during the second half of the year in accordance with Board adopted Resolution No. 2015-04), and is operated on a cash-accounting basis. The only other income to the Agency is from surcharge fees, civil penalties, and accumulated interest earnings on Agency funds on deposit with the County Treasurer's Pooled Investment Fund.

In 2015, the 2013-2014 biennial financial audit was completed. The Auditors' report was presented at the June 24, 2015 Board meeting and can be viewed on the Agency website: <u>www.fcgma.org.</u>

The FCGMA biennial financial audit for fiscal years ended June 30, 2015, and June 30, 2016, is scheduled to begin in October 2016. Results of the biennial financial audit will be presented to the FCGMA Board in early 2017.

### 9.0 REFERENCES

- California Department of Water Resources (DWR), 1954. Seawater Intrusion: Oxnard Plain of Ventura County: Bulletin No. 63-1, 59 pp., Sacramento.
- DWR, 1976. *Planned Utilization of Water Resources Ventura County, California*: Bulletin 104-8, Sacramento, CA.
- California Water Code (CWC). Appendix 121, Articles 1-11, Section 102 et seq., Chaptered 1982.
- Dibblee, Thomas W., 1990. *Geologic Map of the Camarillo and Newbury Park Quadrangles, Ventura County, California*. H. E. Ehrenspeck ed. Dibblee Geologic Foundation, Santa Barbara, CA.
- Dibblee, Thomas W., 1992a. *Geologic Map of the Saticoy Quadrangle, Ventura County, California*. H. E. Ehrenspeck ed. Dibblee Geologic Foundation, Santa Barbara, CA.
- Dibblee, Thomas W., 1992b. *Geologic Map of the Simi Quadrangle, Ventura County, California*. H. E. Ehrenspeck ed. Dibblee Geologic Foundation, Santa Barbara, CA.
- Dibblee, Thomas W., 1992c. *Geologic Map of the Moorpark Quadrangle, Ventura County, California*. H. E. Ehrenspeck ed. Dibblee Geologic Foundation, Santa Barbara, CA.
- FCGMA, United Water Conservation District (UWCD), and Calleguas Municipal Water District (CMWD), 2007. 2007 Update to the Fox Canyon Groundwater Management Agency Groundwater Management Plan, County of Ventura Public Works Agency, Ventura, CA.
- Hanson, R.T., Martin, P., Koczot, K M., 2003. Simulation of ground-water/surface-water flow in the Santa Clara Calleguas basin, California: U.S. Geological Survey Water-Resources Investigation Report 02-4136, 214 p.
- Izbicki, John A., 1992, Sources of Chloride in Ground Water of the Oxnard Plain, California, Prince, K.R. and Johnson A.I., eds., Regional aquifer systems of the United States-Aquifers of the Far East: American Water Resources Association Monograph Series, no.16, p.5-14.
- Izbicki, John A. 1996a. Seawater Intrusion in a Coastal California Aquifer. U.S. Geological Survey, 1996.
- Izbicki, John A. 1996b. Source, Movement, and Age of Ground Water in a Coastal California Aquifer. U.S. Geological Survey, 1996.
- Izbicki, John A., Allen H. Christensen, Mark W. Newhouse, and George R. Aiken. 2005. *Inorganic, isotopic, and organic composition of high-chloride water from wells in a coastal southern California aquifer.* Applied Geochemistry: Elsevier Ltd.
- Turner, J. M., 1975. Aquifer Delineation in the Oxnard-Calleguas area, Ventura County, in Compilation of Technical Information Records for the Ventura County Cooperative Investigation, California Department of Water Resources, 28p.
- Ventura County Office of Agricultural Commissioner, 2015. Ventura County's Crop & Livestock Report 2014: Camarillo, California.
- Ventura County Board of Supervisor's (VCBOS), 1982. Item 32, Document # 431, *Minutes of December 21, 1982 Meeting*.

Ventura County Office of County Recorder (VCOR), 1996. Document 96-106221.

Ventura County Office of County Recorder (VCOR), 2002. Document 200201140010960.