SECTION 4 – SYSTEM SUPPLIES

4.1 DOCUMENT REQUIREMENTS

4.1.1 UWMP Requirements

- Identify and quantify the existing and planned sources of water available for 2015, 2020, 2025, and 2030. (CWC, 10631(b))
- Indicate whether groundwater is an existing or planned source of water available to the supplier. (CWC, 10631(b))
- Indicate whether a groundwater management plan been adopted by the water supplier or if there is any other specific authorization for groundwater management. Include a copy of the plan or authorization. (CWC, 10631(b)(1))
- Describe the groundwater basin. Indicate whether the groundwater basin is adjudicated? Include a copy of the court order or decree. Describe the amount of groundwater the urban water supplier has the legal right to pump under the order or decree. (CWC, 10631(b)(2))
- For groundwater basins that are not adjudicated, provide information as to whether DWR has identified the basin or basins as overdrafted or has projected that the basin will become overdrafted if present management conditions continue, in the most current official departmental bulletin that characterizes the condition of the groundwater basin, and a detailed description of the efforts being undertaken by the urban water supplier to eliminate the long-term overdraft condition. (CWC, 10631(b)(2))
- Provide a detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years (CWC, 10631(b)(3))
- Provide a detailed description and analysis of the amount and location of groundwater that is projected to be pumped. [Provide projections for 2015, 2020, 2025, and 2030] (CWC,10631(b)(4))
- Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis. 10631(d)
- Include a detailed description of all water supply projects and programs that may be undertaken by the water supplier to address water supply reliability in average, single-dry, and multiple-dry years, excluding demand management programs addressed in (f)(1). Include specific projects, describe water supply impacts, and provide a timeline for each project. (CWC, 10631(h))
- Describe desalinated water project opportunities for long-term supply, including, but not limited to, ocean water, brackish water, and groundwater. (CWC, 10631(i))

- Provide information on recycled water and its potential for use as a water source in the service area of the urban water supplier. Coordinate with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area. (CWC, 10633)
- Describe the wastewater collection and treatment systems in the supplier's service area, including a quantification of the amount of wastewater collected and treated and the methods of wastewater disposal. (CWC, 10633(a))
- Describe the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project. (CWC, 10633(b))
- Describe the recycled water currently being used in the supplier's service area, including, but not limited to, the type, place, and quantity of use. (CWC, 10633(c))
- Describe and quantify the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, indirect potable reuse, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses. (CWC, 10633(d))
- The projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected. (CWC, 10633(e))
- Describe the actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre-feet of recycled water used per year. (CWC,10633(f))
- Provide a plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems, to promote recirculating uses, to facilitate the increased use of treated wastewater that meets recycled water standards, and to overcome any obstacles to achieving that increased use. (CWC, 10633(g))

4.1.2 AWMP Requirements

Water Code §10826 requires that the AWMP:

> "(b) Describe the quantity and quality of water resources of the agricultural water supplier, including all of the following:
>
> (1) Surface water supply.
> (2) Groundwater supply.
> (3) Other water supplies.
> (4) Source water quality monitoring practices.
> (5) Drainage from the water supplier's service area."

The legislation does not specify the mechanisms or level of detail that would satisfy requirements for describing the quantity of water supplies. For each water source type, CADWR encourages agricultural water suppliers to include discussions on origin (there may be multiple origins for a particular water source—for example, groundwater supplies can be obtained from different groundwater basins), customers, and use limitations of each water supply source in either the AWMP Template or the Worksheets provided.

Discuss the potential if possible for the district to obtain or utilize additional water supplies. These supplies could include transfers from another water agency or district, the use of recycled water and desalination of brackish groundwater or drainage water.

If wholesale water supplies are received from another supplier or you provide water to another water user, the AWMP should make note of this. For water obtained from wholesale sources, the agricultural water supplier can include a reference to the wholesalers UWMP/AWMP and a brief summary of the water supply's origin.

The Water Code requires a description of the estimated or calculated quantities of water supplies for each of the three major categories of water supply sources used within the service area (surface water, groundwater, and 'other' water), as well as a description of the estimated or calculated quantities of drainage water leaving the service area. In order to provide a meaningful and consistent basis for water accounting, in accordance with Water Code §10826 (b)(7), the following is suggested:

1. Information is reported using the same year(s) for all descriptions of water resources and uses, including: quantity and quality of water supplies from sources listed under Water Code§10826 (b); quantity and quality of the service area drainage; and, amounts of water used from each source.

2. Provide monthly or bi-monthly water usage data for each water supply source and for the service area drainage.

3. Data for each water supply source and the service area drainage be presented as shown in the Worksheets 20 through 29 or similar format(s). Depending upon the number of locations or complexity of each water supply source or service area drainage outlets, these tables can be expanded or summarized as necessary. For instance, for a particular water supply source, if the same amount of water is available each year and/or each month, it is not necessary to report monthly water supplies for the past five years; although a notation to that effect would be helpful. Conversely, if supplies are more complex (e.g., the service area drainage discharges to two different watersheds), multiple tables are advised.

4. The average year water supply quantities and projects to increase water supplies are described for each water supply.

5. The descriptions note any restrictions or operational constraints associated with the supplier's water supplies, if applicable, for each water supply type.

6. Information on water transfers and exchanges, both short- and long- term agreements and opportunities is provided.

If quantities are estimated, the agricultural water supplier is encouraged to provide justification and documentation of calculations and data used for the estimation(s) in the AWMP.

If special management or usage areas have been identified in Section II of the AWMP, a table or tables with water supply estimates for each water supply source available to each applicable area would further assist in water management planning.

The Water Code requires that the AWMP: *"Include an analysis, based upon available information, of the effect of climate change on future water supplies"* [Water Code §10826 (c)]

4.2 CURRENT WATER SUPPLIES

Casitas MWD relies on surface water and groundwater sources to meet the water demands of the area. The following is a description of each water source, source limitations (physical or political), and water quality for each source. **Table 4-1** summarizes the quantities of water supplies in the Casitas MWD water portfolio for fiscal years 2011-2015. **Table 4-1** indicates that for the period 2011-2015, the Casitas MWD average water supply is 17,293 AF with a range from 14,745 AF (2011) to 20,457 AF (2014). In addition, see **Appendix E Worksheets 30** and **34**, and **Appendix F Tables 6-1, 6-4, and 6-8** for additional details. Each of the current water supply sources are summarized in the following sections.

TABLE 4-1
PAST AND CURRENT WATER SUPPLIES 2011-2015

Water Supply Sources (1)	**2011**	**2012**	**2013**	**2014**	**2015**
Local surface water (Lake Casitas)	14,678	15,233	18,233	20,415	17,339
Local groundwater (Mira Monte Well)	67	232	173	42	54
Imported surface water	0	0	0	0	0
Transfers in or out (2)	0	0	0	0	0
Exchanges in or out	0	0	0	0	0
Recycled water	0	0	0	0	0
Desalination	0	0	0	0	0
Other	0	0	0	0	0
TOTAL	**14,745**	**15,465**	**18,406**	**20,457**	**17,393**

Notes:
(3) Source, CMWD, 2016. All values in AF, rounded. Fiscal years.
(4) Transfer to Carpinteria Valley Water District.

4.2.1 Local Surface Water

4.2.1.1 Introduction

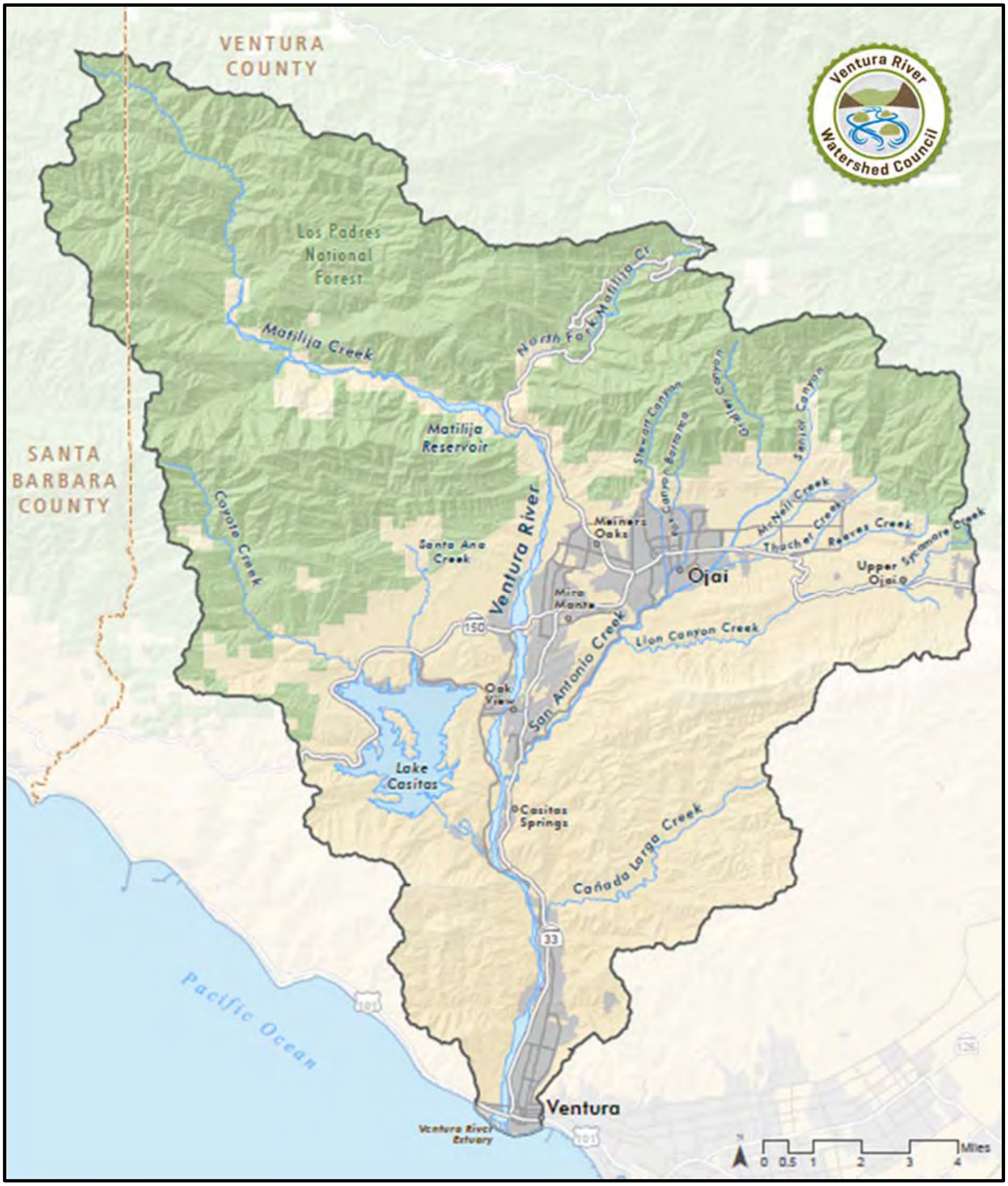
The primary source of water for the Casitas MWD is from the collection and storage of precipitation and runoff from the local Ventura River watersheds. The Ventura River lies within the Transverse Ranges in western Ventura County and a small portion in eastern Santa Barbara County. The watershed encompasses 226 square miles (144,833 acres) and is 33.5 miles long from upper Matilija Canyon to the Pacific Ocean (see **Figure 4-1**). (Walter, 2015) The Ventura River is the watershed's primary waterway. Matilija Creek and the North Fork of Matilija Creek converge to form the Ventura River approximately 15 miles from the Pacific Ocean. Its two principal tributaries are San Antonio Creek from the east and Coyote Creek from the west.

Topography in the watershed is rugged with steep gradients ranging from 40 feet per mile at the mouth to 150 feet per mile at the headwaters. Elevation within the watershed ranges from 6,010 feet above sea level in Matilija Canyon to 0 feet above sea level at the Ventura River estuary. The gradient at Robles dam is 70 feet per mile, at highway 150 is 70 feet/mile, 50 feet/mile at confluence with San Antonio Creek, 40 feet/mile at Foster Park and 40 feet/mile from Foster Park to the ocean. (RWQCB, 2002)

Precipitation in the Ventura River watershed is extremely unpredictable and characterized by long periods of little or no rainfall followed by short periods of intense precipitation with high runoff peaks. Annual average precipitation within the watershed is approximately 14 inches (and 22 inches at Casitas Dam), with a range from 5 to 40 inches. Additional local climate data provided in **Section 2.3**. Groundwater basins composed of alluvial aquifers are highly interconnected with the surface water system and are quickly recharged or depleted, according to surface flow conditions. Additional details regarding the Ventura River groundwater basins are provided in **Section 4.5**.

Flow in the Ventura River fluctuates seasonally and from year to year as is typical with many southern California systems. Annual average flow of the Ventura River is approximately 13,600 acre-feet. The Ventura River is an interrupted stream made up of reaches that flow perennially (Lower Ventura River) with intervening reaches that flow intermittently. From headwaters to the Robles dam, the river is perennial (for a distance of approximately 10 km). The flow is intermittent from Robles Dam to the confluence with San Antonio Creek. Historically, there has been little or no surface flow in the river in the summer between Hollingsworth Ranch (8 miles above estuary) to the former Soper's Ranch (14 miles inland). (RWQCB, 2002) There is a geologic discontinuity at Casitas Springs that causes groundwater to rise and feed a perennial stretch of the surface flow below San Antonio Creek. Surface flows in this reach comes from San Antonio Creek, Live Oaks Acres Creek, small springs and rising groundwater. Between the confluence with San Antonio Creek and Foster Park flow is perennial with some disruption at Foster Park by the groundwater extraction.

FIGURE 4-1
VENTURA RIVER WATERSHED



The Lower Ventura River frequently has a perennial flow to the estuary due to rising groundwater and treated wastewater discharge. Another major influence on habitats is the seasonal and at times catastrophic winter floods that can significantly alter the path of the river channel, topography of the floodplain and delta, and location of estuarine wetlands. Floods that result in extensive damage have occurred about every 12 years. (RWQCB, 2002) The largest flood event between 1929 and 1971 occurred in 1969 and was recorded at 58,000 cfs. Channel migration in 1978 and 1982 also caused damage even with lesser flows. Large floods temporarily remove most of the vegetation, greatly alter topography, and completely redefine the habitats and occurrence of vegetation.

Local watersheds are primarily located in the Los Padres National Forest and lands purchased by the United States for protection of the water quality in Lake Casitas. The watersheds within the Forest area do accommodate a small number of residential homes with individual septic systems and minimal public access for recreation. Casitas MWD has also sought cooperative measures to prevent mining and other water quality impact activities in the Forest watersheds. Water quality from the Coyote and Matilija watersheds is not influenced by industrial or municipal waste discharges.

Developed land (excluding grazing) comprises only about 13 percent of the total land area in the watershed. Agriculture is the dominant land use. Citrus and avocados are the primary irrigated crops grown, and a significant area of land is used for cattle grazing. Conditions in the watershed remain natural and undeveloped, with 57 percent of its land area in protected status. Most of the watershed's primary streams and drainages remain unchannelized.

4.2.1.2 Supply Alternatives

The western portion of Ventura County, California, which includes unincorporated portions of Ventura County, the City of Ojai, and the City San Buenaventura, struggled with water shortage issues in the early to middle 1900's. At the beginning of the 1900's, western Ventura County began to experience growth in agriculture and population. The primary growth areas, the City of Ventura and Ojai Valley, relied on either diverting river flows or groundwater pumping to satisfy water demands. By the 1930's, the local agriculture and cities began to experience drought conditions and question the reliability of their water supplies. Western Ventura County cities and agriculture recognized that local groundwater sources and surface diversions alone were not reliable and were inadequate for both agricultural use and for municipal and industrial purposes. Development of an additional water supply was urgently needed in western Ventura County for stabilization of present agriculture and other economic activities, for new irrigated lands, for new industry, a rapidly expanding population, and for new economic opportunities (USBR *Feasibility Study*, 1954).

In 1933, the State issued Bulletin No. 46, Ventura County Investigation, in response to the filing of applications to appropriate water from the extreme headwaters of Sespe Creek. This plan would import Sespe Creek water by way of a proposed tunnel to the Ventura River watershed. Bulletin No. 46 identified that agriculture within the Ventura River Basin had grown to 4,535 acres. Bulletin No. 46 considered, with the lack of any other data, that the 1892 through 1932 period was assumed to have established a normal or long-time average rainfall and run-off, and that all conclusions as to water supply were made on this assumption. It was further recognized in Bulletin No. 46 that Ventura

County went through two successions of wet and dry cycles, each cycle persisting for approximately twenty years that were evenly divided between a wet or dry period.

The conclusion of Bulletin No. 46 was that the Ventura River Basin would provide ample supply if the City of Ventura had the ability through its facilities to extract water from the Ventura River. Likewise, in the Ojai Valley, use of groundwater appeared to be more than sufficient to meet demand within the Ojai Groundwater Basin. Bulletin No. 46 did recognize that fluctuations in the water table were drastic with wet and dry cycles. However, when the water table was high there was waste by seepage out of the Basin and it was suggested that spreading of water for basin recharge may come about as development increases.

Significance of Bulletin No. 46 was that there appeared to be plenty of water to meet the demands over the course of the study period. Bulletin No. 46 did not address the conditions that were experienced during the two ten-year dry cycles. This may have promoted local action to consider to appropriate additional water supplies from the Sespe Creek, which is in a different watershed and miles away from the Ventura River Basin. Bulletin No. 46 appears to oversimplify the comparison between the average water availability and the average demand for the forty-year period. However, Bulletin No. 46 recommended actions that were developed in the following decade – primarily for more local water source (Matilija Dam) and recharging the Ojai Groundwater Basin during drought conditions.

By 1940, the County of Ventura began a series of reconnaissance and water supply evaluation studies to consider a variety of dam site alternatives to develop a surface water supply on the Ventura River that could buffer the drought and augment groundwater supplies. The drought period of 1944 through 1951 was first responded to by the Ventura County Flood Control District with a joint flood control and water storage-spreading project known as the Matilija Dam Project. The Matilija Dam was erected on the Matilija Creek and completed in 1948. By 1950, with little water stored behind the Matilija Dam and the continuation of drought conditions, the County of Ventura pursued additional investigations through consulting engineers and the State of California, as described in Bulletin No. 12 (California, 1950). Bulletin No. 12 recommended development of surface water supplies to augment the local groundwater basins. Bulletin No. 12 went one step further in viewing the water needs and water quality issues of the entire Ventura County, and by also suggesting water importation from the Colorado River and Feather River (which became the County's interest in the development of the California State Water Project to bring northern California water to southern California). Bulletin 12 states the following:

> "As has been stated, the security of existing developments and economies in Ventura County is threatened by water supply shortages which develop during periods of drought, by perennial lowering of ground water levels, and by the intrusion of sea water into pumped aquifers. Furthermore, the growth and enhancement of the economy of portions of the County have been impeded by the lack of firm water supplies. Elimination of present water resources problems and provision for indicated increased future water requirements of the County will require the development of additional water supplies". (California, 1950, page 3-59)

4.2.1.3 Ventura River Project

In 1952, formation of the Ventura River Municipal Water District (VRMWD; renamed Casitas Municipal Water District in 1971) was quick to follow with a request of the United States Department of Interior, Bureau of Reclamation (USBR) to make a water requirement and water supply study for western Ventura County. The people of the VRMWD had been noting the progress of the Cachuma Project in Santa Barbara County and were pleased with the "know how" handling of the Cachuma Project. By March 1953, VRMWD and USBR entered into a cooperative investigation contract. By the fall of 1953, USBR investigators completed reconnaissance-level studies to determine the approximate long-range water requirements, comparison of the merits of available dam sites, and determination of the river diversion and storage capacity required to meet the long-term water needs of the area. (Bennett, 1967; USBR, 1953) The feasibility study also considered the recreational benefits that the project would have for the area.
The USBR's feasibility report (1953) recognized the need for water supply development, as stated in the following:

1) "Development of an additional firm water supply is urgently needed in the Ventura River Project Area. Although the overall safe yields of the ground-water basins are approximately in balance with the amounts used, maldistribution of the use in relation to the supply now exists. Consequently, additional quantities are needed to serve some areas of insufficient ground-water storage capacity. This situation applies particularly to the developed lands lying around the edge of the Ojai Valley where wells went dry during the recent drought". (USBR, 1953, Page 6)

2) "The City of Ventura is in critical need of additional water supplies under conditions of present development". (USBR, 1953, Page 7)

3) "Ventura County is receiving more than its proportionate share of the present population growth of the State. This is due to its favorable location, agriculture, industrial, and commercial activities, and climatic and scenic attractions. This growth is expected to continue". (USBR, 1953, Page 8)

As an Appendix to the USBR feasibility report (1953), operational studies were developed for the Ventura River Project. In the Water Resources Appendix, the USBR describes the runoff characteristics of the Ventura River Basin as follows:

> "Runoff from stream in the Ventura River Basin is derived almost entirely from rainfall, consequently exhibits the same monthly and seasonal variations as the rainfall. Since there is no accumulation of snow in the watershed, all streams diminish fairly rapidly in flow at the conclusion of the rainfall season. Small summer flows are maintained in the upper reaches of the larger watersheds by springs (Plate 15). Following severe storms, discharge in the Ventura River has been known to increase in a few hours from practically no flow to a rate of thousands of cubic feet per second. Seasonal runoff has varied from a maximum in excess of 400 percent of the mean to a minimum of less than 5 percent of the mean". (USBR, 1953, Page 16)

The USBR summarized the approach to safe-yield for the Ventura River Project (Project) as follows: "In general, for smaller reservoirs the most intense drought is critical, while for larger reservoirs the drought with the greatest product of length times mean deficiency is critical." (USBR, 1954b) The USBR determined in its analysis a safe yield and prediction of future water demands of 28,000 acre-feet annually that would be needed from the supplemental water supply. In the initial sizing of the Project, the USBR considered the Project requirement to provide an adequate water supply during the longest period of drought on record. The USBR determined that a 250,000 acre-foot capacity reservoir was needed to provide this level of annual demand.

The Ventura River Project received overwhelming local support with voters approving to pay for the $6,400,000 cost by a 31 to 1 margin. The Project also received the support of many federal agencies and moved with a sense of urgency to be authorized by Congress, designed, and construction completed by 1959. The Project included a storage reservoir to be filled from erratic stream flows with the capacity to hold water over a period of several dry years; diversion works to divert water into the reservoir, and a conduit system to convey the water to points of use.
The key elements of the Project are Casitas Dam and Reservoir (Lake Casitas), the Robles Diversion and Canal on the Ventura River, and the water distribution system that consist of pipelines, pump plants, storage tanks, and chlorination stations. **Figure 4-2** provides a photo of Lake Casitas with Casitas Dam located in middle left of photo. Since 1959, Casitas MWD has operated and maintained the Project under a repayment contract to the United States and in conformance with the guidelines, standard operating procedures, standards of the USBR. Casitas MWD was granted the perpetual right to use all water that becomes available through the construction and operation of the Project, subject to the satisfaction of vested rights. The Project was to be operated in conjunction with the Matilija Dam water supply.

Construction of the Project was completed in 1959, Lake Casitas filled for the first time in 1978, while demands for water developed to full safe-yield levels by 1990. The safe-yield refers to a 21-year average water demand (currently 20,840 AFY). The late 1980's and early 1990s drought resulted in water demands that exceeded the safe-yield levels temporarily, but due to conservation efforts and some industry changes those levels have rarely been reached again. The Project serves as a primary supply for many direct customers and as a supplemental, or backup supply, for groundwater users during times of drought.

4.2.1.4 Post Construction

The quantity of Project water is dependent on local rainfall and runoff from the Coyote watershed that is upstream of Casitas Dam and the Matilija watershed that is partially diverted from the Ventura River to storage behind Casitas Dam. The Project has been modeled several times in the past to determine a safe-yield of the Project storage, and recently Casitas MWD has considered additional influences on water supply resulting from the Biological Opinion for the Robles Fish Passage and the planning in progress to remove Matilija Dam. According to the peer reviewed Casitas MWD "Water Supply and Use Status Report" (2004), safe-yield of the Project during a 21-year drought period is approximately 20,840 acre-feet.

All water extractions from Lake Casitas are made at Casitas Dam through the intake structure, pipelines, and treated to meet State water quality standards prior to the delivery to the first water customer. Water quality in Lake Casitas is typical for any deep lake. Key water quality issues that are addressed by Casitas MWD are algae blooms resulting in taste and odors, turbidity, dissolved oxygen levels, protection from human contamination and invasive species. Lake Casitas does provide a limited recreational opportunity, but does not allow body contact activities with the waters of Lake Casitas. Casitas MWD manages the recreational aspect of Lake Casitas and provides strict oversight to assure lake water quality is maintained at all times.

FIGURE 4-2
LAKE CASITAS AND CASITAS DAM

On September 28, 1982, the California State Water Resources Control Board issued to Casitas MWD a License for Diversion and Use of Water of the Ventura River and Coyote Creek in Ventura County. License No. 11834 establishes the date of August 16, 1954, as the priority for the water right and the amount of water to which the right is entitled and limited to the amount actually beneficially used for the stated purposes. The total amount of water to be placed to beneficial use (direct diversion plus withdrawal from storage) shall not exceed 28,500 AFY.

The period of 1959 through 1989 was a water use development period during which Casitas MWD made numerous water service connections to serve water to western Ventura County. By 1989, during the third year of a four-year drought period, water demands from Lake Casitas approached and exceeded the safe yield value of Lake Casitas. In 1990, Casitas MWD took specific actions to control the expansion of water use beyond a level experienced in 1989 and further evaluated the safe yield of the Project (CMWD, 1990).

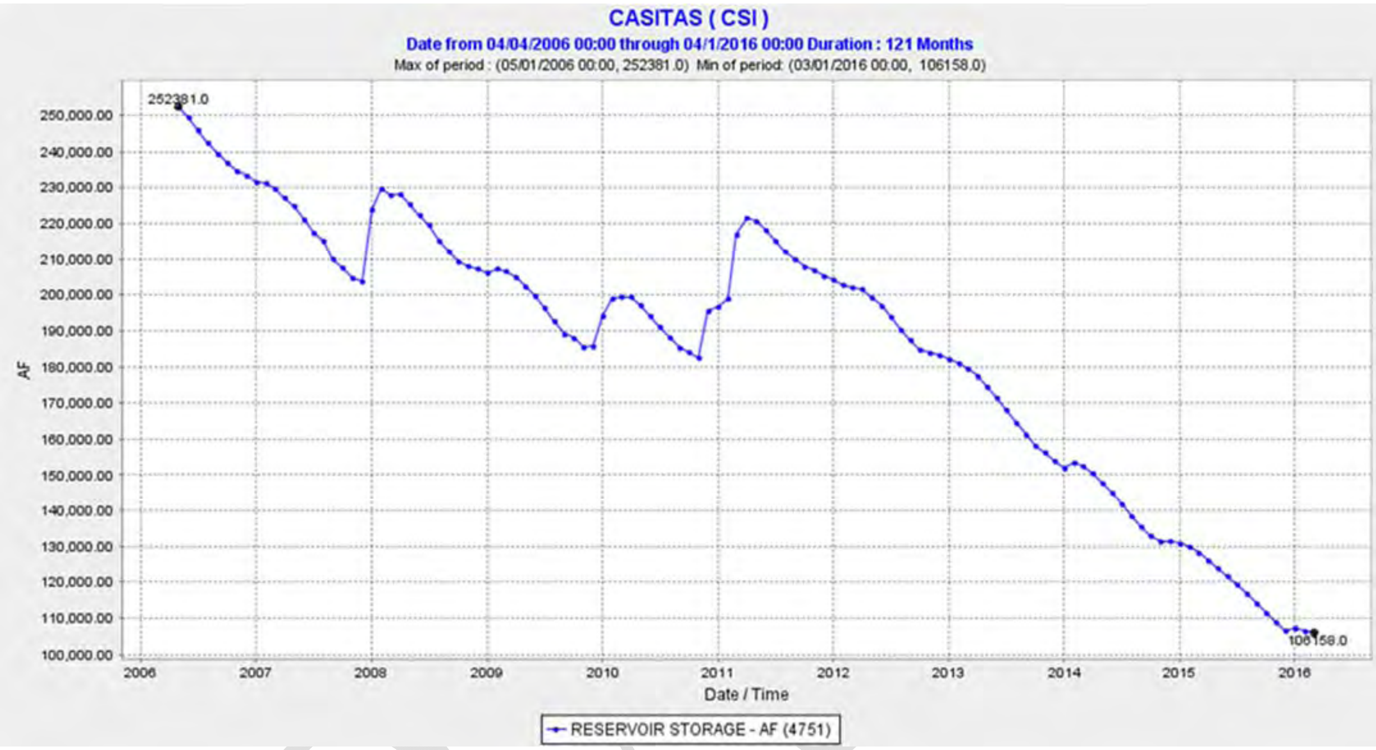
In 2003, Casitas MWD recognized two specific projects, the decommissioning of Matilija Dam and the application of a fish passage at Robles Diversion Dam, that were likely to impact water supply. Casitas MWD proceeded to evaluate the water supply impacts of each project, as described in the 2004 Water Supply and Use Report. The proposed decommissioning of Matilija Dam had gone through several years of study and consideration by federal, state, and local agencies and appeared to be on a rapid track to decommissioning. The storage capacity behind Matilija Dam had diminished by way of collective siltation and was further described as an obstruction to the migration of steelhead trout to the upper reaches of the Matilija Creek. The initial options for natural transport of sediments downstream of Matilija Dam pose a water quality and quantity impact to Casitas MWD's diversions to Lake Casitas. As of 2015, efforts are continuing to find an appropriate project to attain the objectives of decommissioning the dam.

The application of a fish passage facility at Robles Diversion Dam had specific conditions in the Biological Opinion that water be taken from the diversion and provided downstream of the Robles Diversion for steelhead trout migration and passage. The Robles Fish Passage Facility was constructed at Robles Diversion Dam in 2005 and operational in 2006, at which time the full effect of the Biological Opinion became the standard operating procedure for flow at Robles Diversion Dam. The Biological Opinion may be subject to further revision upon determination of scientific data that would support changes to the current Biological Opinion and any such revision may impact diversions to and safe yield of Lake Casitas. Presently, Casitas MWD's "Water Use and Supply Status Report" estimates a 360 AFY water demand excess over safe yield under the current Biological Opinion so any additional impacts on water supply could further strain long term water supplies.

Table 4-1 summarizes the quantities of water supplies in the Casitas MWD water portfolio for fiscal years 2011-2015. **Table 4-1** indicates that for the period 2011-2015 average surface water supplies is 17,180 AF with a range from 14,678 AF (2011) to 20,415 AF (2014). In addition, see **Appendix E Worksheet 30**, and **Appendix F Table 6-8** for additional details.

Figure 4-3 provides a summary of storage for Lake Casitas for the period April 2006 to April 2016. **Figure 4-3** indicates that Lake Casitas storage in April 2006 was 252,381 AF, while storage in April 2016 was 106,158 AF. This represents a reduction of over 146,000 AF over 10 years.

FIGURE 4-3
LAKE CASITAS STORAGE 2006-2016



Casitas MWD has evaluated the reliability of the Lake Casitas water supply and its vulnerability to climatic and seasonal variations in weather, changes in water demands, and changes to water supply operations. "The Water Supply and Use Status Report" (CMWD, 2004) considered the historical hydrology of the Ventura River for the period 1945 through 2003 and historical water demands for the period of 1983 through 2003. A copy of this report is provided in **Appendix H**. The hydrology periods studied provide an extensive drought period, associated with the diminishment of local water supply as illustrated in **Figure 4-4**, followed by a series of wet years that result in the restoration of the Lake Casitas water supply as illustrated by **Figure 4-5**. The Report also reviewed historical water demands to provide an indication of water demand growth and the influence of climate on agricultural water use within Casitas MWD's service area.

The "Water Supply and Use Status Report" (CMWD, 2004) also evaluated the impact to water supplies that could result from federal requirements to release additional water for fisheries and the removal of Matilija Dam from the water system. The change in annual safe yield of the Ventura River Project was calculated to be 1,930 acre-feet per year, providing a resultant safe yield of 20,840 AFY.

FIGURE 4-4
LAKE CASITAS STORAGE MODEL BASED ON THE 1944-1965 DROUGHT PERIOD

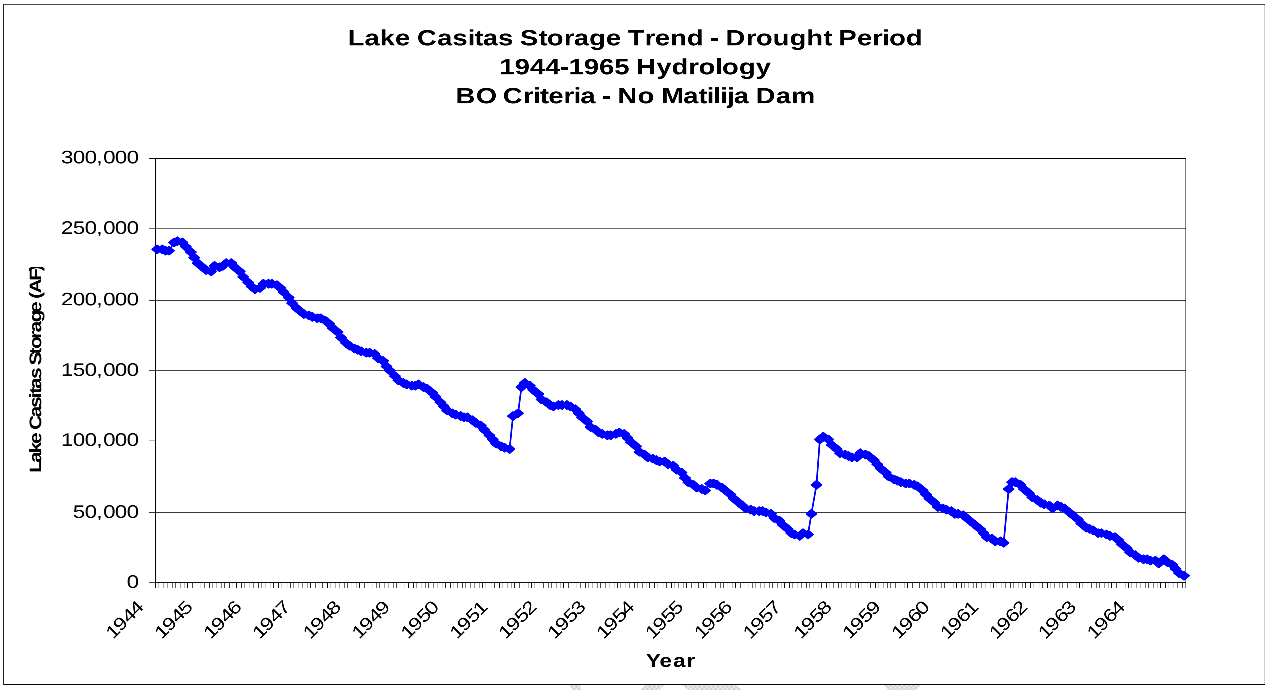
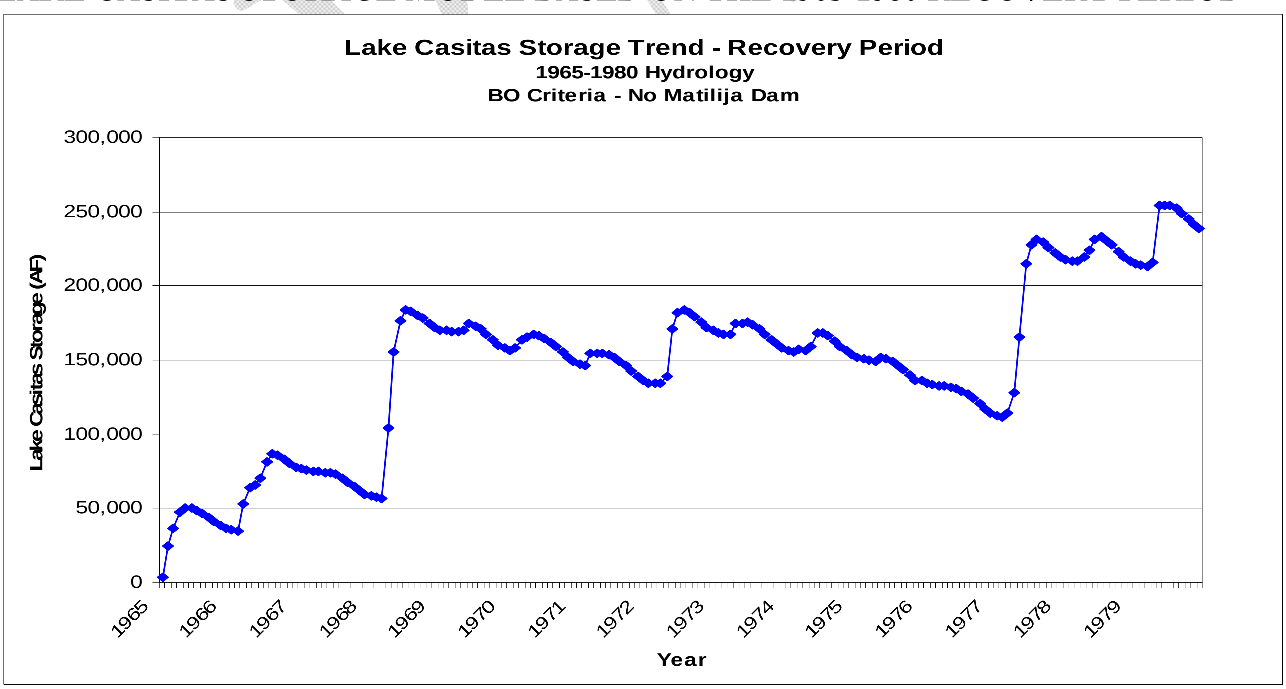


FIGURE 4-5
LAKE CASITAS STORAGE MODEL BASED ON THE 1965-1980 RECOVERY PERIOD



4.2.2 Local Groundwater

In the Ventura River watershed there are three primary alluvial groundwater basins including: Ojai Valley Groundwater Basin/Upper Ojai Groundwater Basin, Upper Ventura River Groundwater Basin, and the Lower Ventura River Groundwater Basin. Each of these basins are summarized below. See **Figure 4-6** for details of the local groundwater basins. Additional details regarding the Ventura River watershed are provided in **Section 2.3** (climate) and **Section 4.3.1** (topography and hydrology).

Casitas MWD is the backup water supply to several groundwater purveyors of the Ventura River and Ojai groundwater basins. The groundwater basins are known to be in a depleted state following periods with multiple years of below average rainfall, as occurred during the 1986 through 1990 period. Once these basins have depleted, water demand shifts from the groundwater basins to the surface water supply of Lake Casitas.

4.2.2.1 Upper Ventura River Groundwater Basin

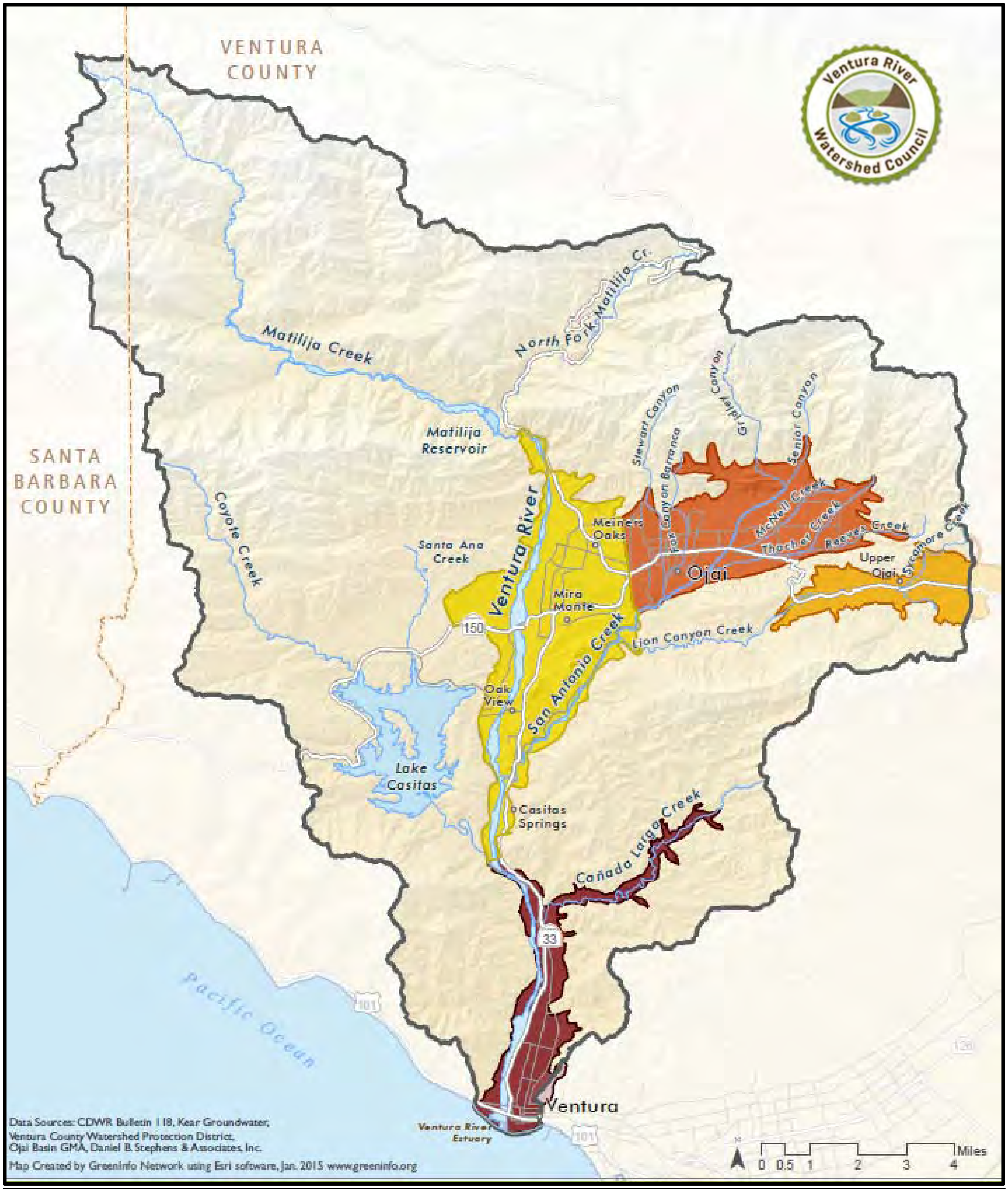
The Upper Ventura River Groundwater Basin (Basin No. 4-3.01) extends from Matilija Dam to Robles Diversion Dam (north to south). The Basin includes approximately 11.6 square miles of area (7,410 acres). (California, 2004). See **Figure 4-6** for details of the local groundwater basins. The Basin is mainly composed of thin alluvial deposits of 5 to 100 feet. Recharge to the Basin is primarily by percolation of flow in the Ventura River and, to a lesser extent, by percolation of rainfall to the valley floor and excess irrigation water.

The Basin depth is extremely limited in some areas, making most wells in this reach of the river under the influence of surface water. Water levels fluctuate seasonally by 5 to 20 feet, but usually recover each year during the winter months. Total storage capacity for this Basin is estimated to be 10,000 to 35,000 AF. Recharge by underflow is estimated to be approximately 3,500 AFY. (California, 2004) There are approximately 291 water supply wells in the Basin; 162 are active wells. (Ventura County, 2015) Average usage above the Robles Dam over the years is approximately 2,800 acre-feet. (CMWD, 1988) A large portion of the extraction within this Basin is for local agricultural customers, only a portion of these customers rely on Casitas MWD in the case of a long term drought.

4.2.2.2 Lower Ventura River Groundwater Basin

The Lower Ventura River Groundwater Basin (Basin No. 4-3.02) is that portion of the Ventura River which extends from Robles Diversion Dam to the Pacific Ocean (north to south). See **Figure 4-6** for details of the local groundwater basins. Area within the Basin is approximately 5,300 acres. Depth to the water bearing unit is 3 to 13 feet below ground surface in the floodplain and deeper as the ground surface elevation increases towards the edge of the basin. (Ventura County, 2015) Total storage capacity for this Basin is estimated to be 264,000 AF. (California, 2004) Recharge by underflow is estimated to be approximately 1,100 AFY.

FIGURE 4-6
VENTURA RIVER GROUNDWATER BASINS



This Basin had an average yield during the period of 1944-1983 of 7,493 acre-feet. (Barnett, 1989) There are approximately 29 water supply wells in the Basin; 14 are active wells. During this historic period, the City of Ventura extracted an average annual yield of 5,506 acre-feet and the other wells between Robles Dam and Foster Park extracted an average annual yield of 1,987 acre-feet. During dry water-years when the full groundwater yield is not available, additional water supply must be obtained from alternate sources such as Lake Casitas. The City of Ventura forecasts extractions from the Ventura River at Foster Park for 2015-2025 years at 6,700 acre-feet per year. (City of Ventura, 2015).

4.2.2.3 Ojai Ground Water Basin

The Ojai Groundwater Basin (Basin No. 4-2) is located in the Ventura River watershed in Ventura County. See **Figure 4-6** for details of the local groundwater basins. The Ojai Basin lies under the City of Ojai and the Ojai Valley's East End. Its surface area is 6,471 acres (10.1 sq. mi.). Source water for the Ojai Basin is local rainfall and runoff that is captured by the alluvium of the Ojai Valley. Thickness of the water-bearing alluvium is as much as 715 feet. During wet periods, artesian conditions or springs can occur in the southwestern part of Ojai Basin when the elevation to which groundwater will naturally rise exceeds the ground surface elevation. The Ojai Basin has a maximum capacity of approximately 70,000 to 85,000AF, with a safe annual year of approximately 5,000 AF. (California, 2004) Note: A groundwater basin's maximum capacity does reflect the amount of available water; much of that water may not be usable or economically recoverable. The Ojai Basin Ground Water Management Agency (OBGMA) was formed in 1992 to protect the Ojai Ground Water Basin.

The Ojai Basin serves a large number of people and agricultural acres. There are approximately 337 water supply wells in the Basin, with 188 of them active. (Ventura County, 2015) Note, the OBGMA states there are 124 active wells in the Basin. (OBGMA, 2014) Wells in the Ojai Basin extract water to meet demands for tree crops (mostly citrus and avocados), residents, and businesses in the City of Ojai and surrounding areas. Water extracted from the Ojai Basin is used by agriculture (54 percent), Golden State Water Company (41 percent; serves potable water to the City of Ojai), and by individual residential and landscape irrigation (5 percent). Some water from the Ojai Basin is also naturally discharged to San Antonio Creek, supplying native habitats and the animals they support, as well as downstream water users. The Ojai Basin is quickly recharged during wet periods, and can be rapidly depleted during periods of drought. Average annual extraction from the Basin for the 10-year period 2003-2012 was 4,984 acre-feet. (OBGMA, 2014). Some water supplied by Casitas MWD, for example excess agriculture and landscape irrigation, also provides indirect recharge to the Basin. See **Appendix I** for a copy of the Groundwater Management Plan for the Basin.

4.2.2.4 CMWD Groundwater Facilities

In response to the additional need for water after the Casitas MWD action of 1990 to curb water use expansion, Casitas MWD re-activated the 300 acre feet per year Mira Monte Well. This well is located in the Upper Ventura River Groundwater Basin. See **Figure 4-6** for details of the local groundwater basins. Water from this well contains levels of nitrate that exceed the maximum contaminate levels established by the State of California. In order to utilize this water, the Casitas MWD blends or dilutes the well water with water from Lake Casitas to reduce the nitrate level to meet drinking water standards. The well produced 54 acre-feet in 2015 and an average of 114 AFY over the period 2011-2015. Casitas MWD anticipates annual production of approximately 300 acre-feet annually for the period 2020-2040 if no unforeseeable conditions arise. See **Tables 4-2** and **4-3** for additional details.

Casitas MWD acquired the Mira Monte Mutual Water Company (MMMWC) in November 1982 along with its Mira Monte Well. The MMMWC had gone out of business and deeded the well to Casitas MWD. The well was known to have high nitrate values. Treatment techniques to make it a stand-alone potable supply are cost prohibitive. Casitas MWD made improvements to blend the high-nitrate well water with Lake Casitas water, reducing the level of nitrate to meet drinking water standards, and amended the domestic water permit with the State Department of Health Services (now Department of Drinking Water). The well has demonstrated an ability to provide approximately 300 acre-feet per year of water supply. The blending process has been subject to interruption, which resulted in occasional shut-downs. The Casitas MWD replaced the pump and electrical motor controls, upgraded communication equipment, and modified monitoring and data reporting.

Table 4-2 summarizes the volume of groundwater extracted by Casitas MWD for fiscal years 2011-2015. **Table 4-2** indicates that for the period 2011-2015 average annual groundwater extracted is 114 AF with a range from 42 AF (2014) to 232 AF (2012). In addition, see **Appendix E Table 6-1 Appendix F Worksheet 34**, and for additional details.

TABLE 4-2
GROUNDWATER PUMPED 2011-2015

Well (AFY)	2011	2012	2013	2014	2015
Mira Monte Well (1)	67	232	173	42	54
Percent of Total Water Supply	0.5	1.5	1.0	0.2	0.3

Notes:
(1) Source, CMWD, 2016. All values in AF, rounded.

4.2.3 Imported Surface Water - State Water Project

4.2.3.1 Project Facilities

The California State Water Project (SWP) is the largest state-built, multi-purpose water project in the country. It was authorized by the California State Legislature in 1959, with the construction of most initial facilities completed by 1973. The SWP is owned by the State of California and operated by the CADWR. The primary purpose of the SWP is to deliver water to 29 urban and agricultural water suppliers in Northern California, San Francisco Bay Area, San Joaquin Valley, Central Coast, and Southern California, including 20 million urban users and 750,000 acres of farmland. Of the contracted water supply, approximately 70 percent goes to urban users and 30 percent goes to agricultural users.

SWP facilities originate in northern California at Lake Oroville on the Feather River. **Figure 4-7** illustrates the location of major SWP facilities. Storage released from Lake Oroville flows into the Feather River, goes downstream to its confluence with the Sacramento River, and then travels into the Sacramento-San Joaquin River Delta (Delta). Water is pumped from the Delta region to contractors in areas north and south of the San Francisco Bay and south of the Delta. SWP deliveries consist solely of untreated water. The SWP system currently consists of 700 miles of canals and pipelines, 33 storage facilities, 21 reservoirs and lakes, 5 hydro-electric power plants, 4 pumping-generating plants, and 20 pumping plants. (CADWR, 2013b)

While some SWP supplies are pumped from the northern Delta into the North Bay Aqueduct, the vast majority of SWP supplies are pumped from the southern Delta into the 444-mile-long California Aqueduct. The California Aqueduct conveys water along the west side of the San Joaquin Valley to Edmonston Pumping Plant, where water is pumped over the Tehachapi Mountains and the aqueduct then divides into the East and West Branches. In addition to delivering water to its contractors, the SWP is operated to improve water quality in the Bay-Delta region, control flood waters, provide recreation, power generation, and environmental enhancement.

4.2.3.2 Reliability

The CADWR "State Water Project Delivery Reliability Report" provides SWP contractors an assessment of the reliability of the SWP component of their overall supplies. “Water delivery reliability” is defined as the annual amount of water that can be expected to be delivered with a certain frequency. Water delivery reliability depends on three general factors: the availability of water, the ability to convey water to the desired point of delivery, and the magnitude of demand for the water. SWP delivery reliability is calculated using computer simulations based on 82 years of historical data. The CADWR Report (CADWR, 2013a) includes "Table A" which provides a projection of potential deliveries of imported surface water for the SWP contractors for the average water year scenario, single dry-year scenario, and multiple dry-year scenario. Table A contract amounts do not reflect actual deliveries a contractor should expect to receive.

The CADWR Report (CADWR, 2013a) also discusses factors having the potential to affect SWP water delivery reliability including the following:

- Restrictions on SWP and Central Valley Project (CVP) operations due to new regulations and legal findings to protect endangered species;
- Climate change and sea level rise, which is altering the hydrologic conditions in the State;
- Vulnerability of Delta levees to failure due to floods and earthquakes;
- Annual snowpack;
- Reservoir capacity.

FIGURE 4-7
STATE WATER PROJECT FACILITIES

Source: CA DWR.

Contractors' requests for SWP water deliveries cannot always be met. In some years there are water shortages and water surpluses in other years. It was thought at the time that the SWP was constructed that the system could deliver about 50 percent of the allocations in a very dry year. Deliveries for the 2003-2012 period averaged 2,226,000 AF (53 percent) for Table A allocations. (CADWR, 2013a) The 2013 Reliability Report provided a projection of CADWR's water delivery reliability of the SWP for the current scenario (year 2013) and future scenario (year 2033). In 2015, SWP contractors received 20 percent of their SWP allocations. (CADWR, 2016) For the period 2006-2015, SWP contractors received an average of 49 percent of their SWP allocations. The last 100 percent allocation, difficult to achieve even in wet years due to pumping restrictions to protect threatened and endangered fish, was in 2006.

The 2013 Reliability Report (CADWR, 2013a) indicated that the SWP, using existing facilities operated under current regulatory and operational constraints and future anticipated conditions, and with all contractors requesting delivery of their full Table A allocations in most years, could deliver 58 percent of Table A allocations on a long-term average basis. However, in a single dry-year (worst case scenario) CADWR estimated delivery of an average of only 11 percent of Table A allocations. In a four- year drought scenario, the CADWR estimated delivery of an average of 31 percent of Table A allocations.

The 2013 Reliability Report (CADWR, 2013a) recognized continuing challenges to the ability of the SWP to deliver full contractual allocations of SWP water. Factors that affect the ability to estimate existing and future SWP water delivery reliability include the following:

- water availability at the source;
- water rights with priority over the SWP;
- climate change;
- regulatory restrictions on SWP exports;
- ongoing environmental and policy planning efforts;
- San Joaquin River/Sacramento River Delta levee failure.

4.2.3.3 Local SWP Entitlement

Three water agencies in western Ventura County have carried the cost for an entitlement to SWP water since 1972. Casitas MWD is the administrator of the Ventura County's 20,000 AFY entitlement of SWP water which is distributed to Casitas MWD, City of Ventura, and United Water Conservation District (5,000, 10,000, and 5,000 AFY, respectively). To date, the City of Ventura and Casitas MWD have not received any of the SWP entitlement into the respective service areas.

4.2.4 Transfers and Exchanges

Given the location of the Casitas MWD service area and the lack of physical connections to other water resources in California, there are limited opportunities for water transfers for Casitas MWD. The two opportunities that Casitas MWD may utilize are described in the following sections.

Water transfers and/or exchanges with other agencies in Ventura County may provide opportunities to shift away from the reliance on Lake Casitas' water during times of depleted water storage in Lake Casitas. The City of Ventura has stated an ability to temporarily decrease purchases of the Casitas MWD water supply, i.e., during extremely low water storage levels at Lake Casitas, and utilize the credits the City has in the Fox Canyon Groundwater Basin. There has been recent (2015) uncertainty as to the availability of these water credits. The City of Ventura also may construct a permanent pipeline to the City of Oxnard to purchase SWP water from Calleguas Municipal Water District. The success of this approach to water transfer would be contingent upon the availability and reliability of other water resources, i.e. State water and local groundwater banks, during an extended drought period. During the last decade, the reliability of the State Water Project has been questioned and work is ongoing to improve reliability of the State Water supply (see **Section 4.4** for additional details on the SWP).

4.2.4.1 Local Groundwater Transfer

In 1985, Casitas MWD made arrangements for an emergency transfer of groundwater from the Ojai Basin to Casitas MWD customers in the Ojai area. There can be conditions in which Lake Casitas is at minimum storage and local aquifers are replenished by a single rainfall event, and the needs of the Ojai area can only be met by inter-agency agreements to utilize the Ojai Basin. Casitas MWD has worked with many of the local groundwater agencies during times of emergencies to provide alternative emergency supplies. The proximity of system interconnections and political decisions make these types of arrangement physically possible. These periods are likely to be short term, or less than six months in duration.

4.2.4.2 Transfer with Carpinteria Valley Water District

Table 4-1 indicates that, for the period 2011 to 2015, Casitas MWD transferred 0 AF to other agencies. In addition, see **Appendix E Worksheet 28** for additional details. Casitas MWD can transfer water to the Carpinteria Valley Water District (CVWD). An 8-inch piped connection exists between the CMWD and CVWD systems. If more flow is required than the capacity of the existing 8-inch pipeline can deliver, as was the case in 1987 to 1991 drought, then an overland pipe could be installed to convey the additional flow. An emergency water exchange agreement remains in place between Casitas MWD and CVWD. This transfer option is considered a limited potential water supply by both agencies.

The Casitas MWD provided an annual average of 7.6 AF to CVWD for Casitas MWD customers for the period 2011-2015. The Casitas MWD transfers the CMWD water for sale to CMWD customers adjacent to the CVWD service area (an area without a CMWD pipeline). Therefore, the Casitas MWD considers this water part of the CMWD annual customer demands and not a transfer.

4.2.5 Desalinated Water

Casitas MWD currently does not produce nor receive desalinated water. **Table 4-1** indicates that Casitas MWD does not currently receive desalinated water.

4.2.6 Recycled Water

Casitas MWD currently does not produce nor receive any recycled water. **Table 4-1** indicates that Casitas MWD does not receive recycled water.

4.3 WATER QUALITY

The Casitas MWD has both surface water and groundwater sources which present very different water quality issues. Surface water comes from Lake Casitas (from the Ventura River watershed) and the groundwater is locally produced via Mira Monte Well. The District meets all water quality requirements of the California Division of Drinking Water (CADDW, formerly Department of Public Health). A copy of a recent Consumer Confidence Report (CCR) is provided in **Appendix J**. Additional details related to water quality are provided in **Appendix E Worksheets 36-39**.

The Marion R. Walker Filtration Plant is a high-rate in-line pressure filtration plant. Features include horizontal pressure filters, continuous real-time monitoring and alarm systems, and the application of chlorine. The filter plant clarifies and reduces turbidity in the water. Silt and other natural materials that are removed from the water are placed in drying beds and later hauled off to the landfill.
The filtration plant also has a pilot plant attached. This is a small-scale treatment plant that simulates the full-scale treatment plant. It is used to evaluate variations in water quality testing and to offer different treatment options.

A significant amount of water drains into the lake from the watershed, or travels over land before entering the rivers or canal that lead to the lake. Because of this Casitas MWD takes steps to preserve the watershed areas. The Ventura River Watershed Boundary encompasses miles of land stretching from the Santa Barbara County/Ventura County line throughout the Las Padres National Forest to the service area boundary in Upper Ojai and south to and through the City of Ventura to Mills Road. The Project Watershed is the area directly around the lake. The Teague Watershed encompasses approximately 3,500 acres of land-most of it adjacent to the recreation area. There is a total of approximately 228 square miles of watershed area throughout the Casitas MWD service area. In order to more closely supervise the quality of your water, the federal government started buying land in 1974 in what is now the Charles M. Teague Open Space Memorial Park (Teague Watershed). This land is being returned to its natural state as permanent open space. Most of the residents have left the area, except for those who have lifetime leases. Activities that could impact the quality of the water in the watershed are strictly prohibited within the Teague Watershed. Because the Teague Watershed is so important to the quality of the Lake Casitas water, a comprehensive inspection is completed every five years to identify and address any potential problems within the watershed.

The Casitas MWD does not anticipate any current or future changes in the surface water and groundwater that would affect water quality.

4.4 PLANNED WATER SUPPLIES 2020-2040

Casitas MWD will continue to rely on surface water and groundwater sources to meet the anticipated water demands of the service area. **Table 4-3** summarizes the quantities of projected water supplies in the Casitas MWD water portfolio for the period 2020-2040. **Table 4-3** indicates that for the period 2020-2040 available water supplies will be 20,840 AFY. Each of the planned water supply sources are summarized in the following sections. See **Appendix E Table 6-9** for additional details.

TABLE 4-3
PLANNED WATER SUPPLIES 2020-2040

Water Supply Sources (1)	**2020**	**2025**	**2030**	**2035**	**2040**
Local surface water (Lake Casitas)	20,540	20,540	20,540	20,540	20,540
Local groundwater (Mira Monte Well)	300	300	300	300	300
Imported surface water	0	0	0	0	0
Transfers in or out (2)	0	0	0	0	0
Exchanges in or out	0	0	0	0	0
Recycled water	0	0	0	0	0
Desalination	0	0	0	0	0
Other	0	0	0	0	0
TOTAL	**20,840**	**20,840**	**20,840**	**20,840**	**20,840**

Notes:
(3) Source, CMWD, 2016. All values in AF, rounded.
(4) Transfer to Carpinteria Valley Water District.

4.4.1 Local Surface Water

Table 4-3 indicates that Casitas MWD anticipates that local surface water from the Lake Casitas will provide an average of approximately 20,540 AFY for the period 2020-2040. Casitas MWD does not anticipate any changes or reductions to the Lake Casitas supply.

4.4.2 Local Groundwater

Casitas MWD anticipates that local while groundwater will provide an average of 300 AFY for the period 2020-2040 (see **Tables 4-3** and **4-4**). Casitas MWD does not anticipate any changes or reductions to the local groundwater supply. **Table 4-4** summarizes the volume of groundwater projected to be extracted by Casitas MWD for the period 2020-2040. **Table 4-3** indicates that for the period 2020-2040 average annual groundwater extracted will be approximately 300 AF. In addition, see **Appendix E Table 6-9** for additional details.

TABLE 4-4
GROUNDWATER PROJECTED TO BE PUMPED 2020-2040

Well (AFY)	2020	2025	2030	2035	2040
Mira Monte Well (1)	300	300	300	300	300
Percent of Total Water Supply	1.4	1.4	1.4	1.4	1.4

Notes:
(1) Source, CMWD, 2016. All values in AF, rounded.

4.4.3 Enhanced Demand Management Programs

Casitas MWD will continue to support the water use allocation program with customer specific allocations (see **Section 6** for details). Casitas MWD will continue to support and expand the best management practices (BMPs) and water conservation measures with all of the customers within the service area. See **Section 7** for details related to existing and future BMPs.

4.4.4 Local Agreements

Casitas MWD could develop a Memorandum of Understanding (MOU) for each local purveyor within the service area. These MOU could provide for the joint participation in programs including but not limited to the following: require a particular type of water waste ordinance be used; require the use of local water reserves before requesting water from Casitas MWD; require participation in a public relations program for water conservation. If an incentive were attached to the program, it may cause other systems to join. Casitas MWD plans to work with other water purveyors to consider a future plan with allocation assignments and surcharges for exceeding allocations.

4.4.5 Transfers and Exchanges

Table 4-4 indicates that, for the period 2020 to 2040, Casitas MWD projects 0 AFY to be transferred to other agencies. See **Appendix E Table 6-9** for additional details. Casitas MWD does not anticipate any changes or reductions to this supply category. Casitas MWD anticipates providing an average of 10 AFY to Carpinteria Valley Water District for CMWD customers (see **Section 4.2.4.2** for details). The Casitas MWD considers this water part of the CMWD annual customer demands and not a transfer.

4.4.6 Imported Surface Water - State Water Project

As previously noted in **Section 4.2.3**, Casitas MWD administers the Ventura County entitlement to SWP water and has contracts with the City of Ventura, and United Water Conservation District (UWCD) to redistribute the 20,000 AF entitlement between these three agencies. The Casitas MWD entitlement to SWP water is 5,000 AF, based on 100 percent allocation of annual scheduled deliveries. As of the date of this Plan, Casitas MWD has not made a physical connection to the SWP that would allow SWP water to reach the Casitas MWD boundary.

Casitas MWD's service area, while holding 5,000 AF of annual SWP entitlement, is not able to receive those annual entitlements due to the lack of any physical connection (pipeline or canal) to the SWP to bring SWP water into the service area. Due to the cost of the physical connection, and cost of SWP water, the service area has not proceeded with the physical connection to the SWP. The Casitas MWD has been involved in several studies to bring SWP water to the service area.

The preferred pipeline project estimated a total cost of $109 million dollars (nearly $200 million dollars in 2016). (CMWD, 1987) Casitas MWD's cost would be a proportion of this overall cost that would be shared with the partnering agencies. For example, if three other major water purveyors were involved with this project, Casitas MWD's cost would be approximately 25 percent of the total. Alternative methods to bring State Water to western Ventura County were also considered in a 1990 Study (CMWD et al, 1990). The alternative methods involved groundwater banking, interagency coordination, water transfers, and exchanges.

4.4.7 Desalinated Water

With population growth and the recent prolonged drought contributing to an increase in Californians' concerns about water scarcity, several communities and industries in California are looking towards desalination plants to convert saline water (e.g., seawater, brackish water or treated wastewater) into fresh water. Currently, there are only four ocean desalination plants actively producing water for municipal purposes (Carlsbad, Sand City, Santa Catalina Island, and San Nicolas Island). A few desalination plants remain idle or are currently being reactivated (i.e., City of Santa Barbara). In addition, there are a few desalination plants that provide water exclusively for commercial and industrial purposes (i.e., Monterey Aquarium and Diablo Canyon Power Plant). Since 2006, only two ocean desalination projects have been built: a small plant in Sand City with a capacity of 0.3 million gallons of water per day, and a much larger 50-million-gallon per day plant in Carlsbad. There are 9 desalination plants proposed to be constructed in California.

Casitas MWD is located approximately 10 miles (headquarters building) inland from the Pacific Ocean coastline of Ventura County, California. This proximity to the Pacific Ocean does provide an opportunity for the Casitas MWD to consider development of desalinated water supplies to supplement surface water supplies and to provide potential increased system reliability, most notably for coastal communities within the Casitas MWD service area. However, for CMWD to move forward with a desalination project a public consensus would need to be developed, followed by a feasibility study to determine whether the project will have a positive cost-benefit result. The City of Ventura and the Rincon beach communities, both customers of Casitas MWD, represent water service areas for which desalination water supplies could possibly be applicable.

There may be opportunities for future joint-agency coordination to build a desalination plant to supplement local surface water and groundwater supplies. The City of Ventura's growth projections and the ability of their water supplies to keep up with growth are two of the driving factors that may lead to desalination plan in the Casitas MWD and City service areas. The production rate and location of a desalination plant would need to be addressed in a feasibility study.

A desalination supply within the coastal communities would not be reliant upon the pumping and transmission pipelines from Casitas MWD, which are susceptible to short-term outages during storm events. Desalination would decrease demand on existing local water supplies. The Casitas MWD may determine that a desalination project would be feasible if a partnership was to be developed with the City of Ventura, land developers of the Rincon service area, local oil companies, or other agency or organization.

The sole source of potable water for the Rincon coastal area is Lake Casitas. Potable water is pumped from the base of Casitas Dam through a single water transmission pipeline to the inland agricultural areas and to coastal communities. There is an increased energy cost in serving this area because water must be pumped up a 900-foot lift. There are water reliability concerns for this area because in the past the main pipeline serving the area has been severed by landslides following a heavy rainstorm, which temporarily left coastal communities and industries without water supply.

Use of desalinated water could aid in offsetting Casitas MWD's reliance on their other available water supplies during drought periods, and allow for their more efficient management. Additionally, use of desalinated water could be used to improve water quality of new and existing potable water supplies. Seawater desalination alternatives potentially available to Casitas MWD include:

- Construct a new seawater desalination facility within or adjacent to the CMWD's service area
- Participate in a local desalination project
- Participate in a desalination facility outside of Ventura County and receive water by exchange.

Currently, Casitas MWD does not plan to prepare a desalination feasibility study, does not plan to construct a desalination treatment plant, nor purchase desalinated water from any agency.

4.4.8 Recycled Water

Casitas MWD currently does not produce nor receive any recycled water. The Casitas MWD has not considered recycled water to meet future water demands. Acceptable uses of recycled water include irrigating crops, parks, and golf courses, as well as water needed for groundwater recharge, industrial processes, power plants, fire-fighting, and other similar uses. Increased use of recycled water for non-potable uses could reduce the Casitas MWD's reliance on Lake Casitas resources and reduce use of local groundwater supplies.

Issues associated with the use of recycled water include:

- Water quality as it relates to the end use; is recycled water suitable for irrigation of agricultural or public park lands, groundwater recharge, or other reuse
- Regulatory requirements associated with the end use and the public's contact with the recycled water
- Cost for additional treatment beyond what the wastewater treatment plant already required to provide

- Casitas MWD has no direct access to recycled water
- Existing environmental demands for recycled water within Ventura River.

The Ojai Valley Sanitary District (OVSD) and the City of Ventura provide wastewater collection and treatment within Casitas MWD's boundaries. The OVSD provides treatment (located on north Ventura Avenue adjacent to the Ventura River) for approximately 3,000 acre-feet per year. The OVSD built a $30,000,000 tertiary treatment upgrade to its existing plant several years ago. The City of Ventura and OVSD have evaluated the potential for recycled water production and sale. (Ventura, 2007; OVSD, 1992) The City of Ventura provides tertiary treatment for approximately 10,000 acre-feet per year at the Ventura Water Reclamation Facility (located at Ventura Harbor adjacent to the Santa Clara River) and has initiated several successful recycling projects.

Wastewater treated by the OVSD is discharged back in the Ventura River for the benefit of the aquatic habitat and the endangered species including but not limited to Southern California Steelhead. Any additional treated water that could be utilized for any other purpose would require the completion of an Environment Impact Report. By agreement for the land use for the Ojai Valley Sanitation Plant, the City of Ventura has retained the first right to claim the OVSD treated effluent water. In addition, it is likely that any recycled water development from the City of Ventura facility will benefit the City of Ventura's water portfolio. There appears to be no other opportunities for Casitas MWD to be directly involved and benefitted by recycled water, given the lack of any other opportunities to acquire recycled water. **Table 4-1** indicates that Casitas MWD does not anticipate the sale of recycled water for the period 2020-2040. See also **Appendix E Tables 6-3 to 6-5** for additional details.

4.5 FUTURE WATER PROJECTS

Casitas MWD currently does not have any specific future infrastructure projects that will develop more water for the system. Casitas MWD plans to utilize the program management of the safe-yield of Lake Casitas to balance water supplies within the Casitas MWD service area, understanding also that water demands placed on Casitas MWD are likely to exceed safe-yield levels during periods of long-term drought. In addition, Casitas MWD anticipates implementation of additional demand management measures to offset an increase in population and reduce inefficient use of water.

There are additional water supply projects that were suggested in the 2010 UWMP that Casitas MWD has implemented and some that are in need of further investigation. Examples of such projects include:

- San Antonio Recharge Basin - project completed.
- Resale water company system retrofit and/or rehabilitation to assist water agencies to rely less on Casitas MWD's water – Casitas MWD has assisted Senior Canyon Mutual Water Company to improve reliability of groundwater resources.
- Renegotiate Agreement with City of Ventura – negotiations are in progress.

- Aggressive CMWD leak detection and repair program –program in progress.
- Excavate the north end of Lake Casitas during low water storage – not implemented, environmental and financial feasibility and justification assessment is needed.

4.6 CLIMATE CHANGE

4.6.1 Introduction

Current climate change projections suggest that California will continue to enjoy a Mediterranean climate with the typical seasonal pattern of relatively cool and wet winters and hot, dry summers. However, climate patterns are different now and may continue to change at an accelerated pace. Increases in global emissions of greenhouse gases are leading to serious consequences for California including, but not limited to, the following: higher air and water temperatures, rising sea levels, increased droughts and floods, decreased amount and duration of state-wide snow pack, and extreme variability in weather patterns. (CADWR, 2013b; CANRA, 2009) These changes are anticipated to intensify over the 20-year planning horizon of this UWMP/AWMP. Even if all emissions of greenhouse gases ceased today, some of these consequences would be unavoidable because of the increase in greenhouse gases recorded over the last 100 years and the fact that the climate system changes slowly. (PPIC, 2011) Many of these climate changes would affect the availability, volume, and quality of California water resources.

4.6.2 Potential Impacts of Climate Change

State and local water resources and water demands may be impacted by climate change via one or more processes including precipitation, air temperature, runoff, sea level change, and flooding. Rainfall variability is expected to increase, leading to more frequent droughts and floods. Runoff from state-wide snowpack may be earlier and less predictable, and precipitation may fall as more rain and less snow. Air temperatures in California are anticipated to increase by 2 to 9 degrees Fahrenheit by the year 2100. (CANRA, 2009) Higher air temperatures may result in more rain and less state-wide snow, diminishing the reserves of water held in the Sierra Nevada snowpack. (CANRA, 2009) Spring runoff from state-wide snowpack is occurring earlier now than it did in the first part of the 20th century. This change in runoff could affect availability of spring and summer state-wide snowmelt from mountain areas, including State Water Project water from the Sacramento Delta and local rivers and streams. Total annual exports from the Delta for State and Federal contractors may also decrease by 20 to 25 percent by the year 2100. (CCCC, 2009)

Sea levels have risen by as much as 7 inches along the California coast over the last century. (CANRA, 2009) According to some estimates, sea level is projected to rise an additional 2 to 5 feet by 2100. (PPIC, 2011; Pacific Institute, 2009; CA RNA, 2009; CAT, 2008) These sea level increases could significantly impact infrastructure within coastal areas and affect quantity and timing of State Water Project water exports from the Sacramento Delta. Effects of sea level rise in the Delta would be two-fold: (1) problems with weak levees protecting the low-lying land, many already below sea level; and (2) increased salinity intrusion from the ocean which could degrade fresh water transfer supplies pumped at the southern edge of the Delta or require more fresh water releases to repel ocean salinity.

In the CADWR Water Plan (CADWR, 2013b), an assessment of the impacts of global climate change on the State's water supply was conducted using a series of computer models based on decades of scientific research. Model results for California indicate a significant likelihood of increased temperature, reduction in Sierra snow depth, early snow melt, and a rise in sea level. These changing hydrological conditions could affect future planning efforts which are typically based on historic conditions. Difficulties in water resources planning that may arise include, but are not limited to, the following:

- hydrological conditions, variability, and extremes that are different than what current water systems were designed to manage.
- changes occurring too rapidly to allow sufficient time and information to permit managers to respond appropriately.
- special efforts or plans to protect against surprises and uncertainties.

As such, CADWR will continue to provide updated results from these models as further research is conducted and information becomes available.

4.6.3 Effects of Climate Change on Agriculture's Water Demand

Climate change may increase daytime and nighttime temperatures and seasonal temperatures. This change may impact the length of the growing season. This general increase in temperatures coupled with greater variability and unpredictability in precipitation is expected to lead to increases in evapotranspiration resulting from warmer seasons; thereby creating an increase in demand for irrigation water and an increase in the year-to-year variability of demand.

Temperate fruit and nut trees such as almonds, pistachios, and apples require adequate winter chill to produce economically viable yields. Increased daytime temperatures daytime, nighttime temperatures, and season temperatures may reduce winter chill hours thereby causing adverse effects on the yield of some crops. Some farmers are beginning to overcome this change by planting trees closer together and using new varieties.

Studies are now underway to prepare farmers for the likely impacts of climate change. Such efforts include breeding varieties of fruit trees which can withstand the decreased winter chill hours, developing tools to aid the crops in coping with insufficient chill, and researching the temperature responses of particular orchard crops to better understand potential long-term effects. However, some solutions such as replanting orchards with altered crop varieties or the installation of aiding tools may not be feasible for many irrigators and may result in additional costs and temporary production losses.

4.6.4 Mitigation and Adaptation

Responding to climate change generally takes two forms: mitigation and adaptation. Mitigation is taking steps to reduce human contribution to the causes of climate change by reducing greenhouse gas (GHG) emissions. Adaptation is the process of responding to the effects of climate change by modifying our systems and behaviors to function in a warmer climate. (CADWR, 2013b)

In the water sector, climate change mitigation is generally achieved by reducing energy use, becoming more efficient with energy use, and/or substituting renewable energy sources in place of fossil fuel based energy sources. Because water requires energy to move, treat, use, heat, and discharge, water conservation is also energy conservation. As each water supplier implements water conservation measures and determines its water conservation targets, it can also calculate conserved energy and GHGs not-emitted as a side benefit. Once a water supplier has calculated the water conserved by a BMP, it is straightforward to convert that volume to conserved energy, and GHGs not-emitted. Additionally, water suppliers may want to focus on implementing water conservation measures that conserve water but do so at a significant decrease in GHG emissions as compared with other measures. (CADWR, 2013b)

Climate change means more than hotter days. Continued warming of the climate system has considerable impact on the operation of most water districts. Snow in the Sierra Nevada provides 65 percent of California's water supply. Predictions indicate that by 2050 the Sierra snowpack will be significantly reduced. Much of the lost snow will fall as rain, which flows quickly down the mountains during winter and cannot be stored in our current water system for use during California's hot, dry summers. The climate is also expected to become more variable, bringing more droughts and floods. Water districts will have to adapt to new, more variable conditions. (CADWR, 2013b)

Principles of climate change adaptation include the following:

- As more mitigation is completed now, the less adaptation we may have to do in the future, because climate impacts could be less severe.
- Mitigation is much less expensive than adaptation.
- Mitigation should happen globally.
- Adaptation must happen locally.
- Adaptation strategies should be implemented according to future conditions, regular assessment and recalibration.
- Some adaptation strategies have benefits that can be realized today.

4.6.5 Local Strategies

As climate change continues to unfold in the coming decades, water agencies, may need to mitigate and adapt to new strategies, which may require reevaluating existing agency missions, policies, regulations, facilities, funding priorities, and other responsibilities. Examples of mitigation and adaptation strategies include, but not limited to, the following:

- Prepare long-term facility and sustainability master plans including specific elements for climate change adaptation.
- Increase ground water recharge using additional surface water.
- Promote additional water use efficiency for urban, commercial, and industrial best management practices.
- Consider investments in infrastructure that promotes adaptation strategies (such as ground water recharge, and recycled water) and existing principal facilities susceptible to impacts of climate change.

Notwithstanding the above strategies for dealing with climate change, the reality is that current environmental regulations place a very high priority on releasing additional water for endangered species and the environment (i.e., Sacramento Delta and Ventura River). There will be more competition for scarce water supplies between people and the environment. Resolving this conflict will be one of the biggest challenges confronting water agencies.

The goal of the Casitas MWD is to manage the available surface water and groundwater resources as efficiently as possible while meeting the requirements of the customers. It is worth noting, however, that the Casitas MWD control over local water supplies is limited; thus management practice changes will need to be adaptive in nature.