Casitas Municipal Water District
WATER RESOURCES COMMITTEE
Baggerly/Spandrio

May 19, 2020 – 10:00 A.M.

This meeting will be held via teleconference
To attend the meeting please call
(888) 788-0099 or (877) 853-5247
Enter Meeting ID 634 789 006#

Agenda

1. Roll Call
2. Public Comments
3. Board Comments.
4. Manager Comments.
5. Comprehensive Water Resources Plan Status Update.

Right to be heard: Members of the public have a right to address the Board directly on any item of interest to the public which is within the subject matter jurisdiction of the Board. The request to be heard should be made immediately before the Board's consideration of the item. No action shall be taken on any item not appearing on the agenda unless the action is otherwise authorized by subdivision (b) of ¶54954.2 of the Government Code.
If you require special accommodations for attendance at or participation in this meeting, please notify our office in advance (805) 649-2251, ext. 113. (Govt. Code Sections 65954.1 and 54954.2(a). Please be advised that members of the Board of Directors of Casitas who are not members of this standing committee may attend the committee meeting referred to above only in the capacity of observers, and may not otherwise take part in the meeting. (Govt. Code Section 54952.2(c)(6)

CASITAS MUNICIPAL WATER DISTRICT
MEMORANDUM

TO: WATER RESOURCES COMMITTEE

FROM: MICHAEL FLOOD, GENERAL MANAGER

SUBJECT: COMPREHENSIVE WATER RESOURCES PLAN STATUS UPDATE

DATE: 05/19/20

RECOMMENDATION:

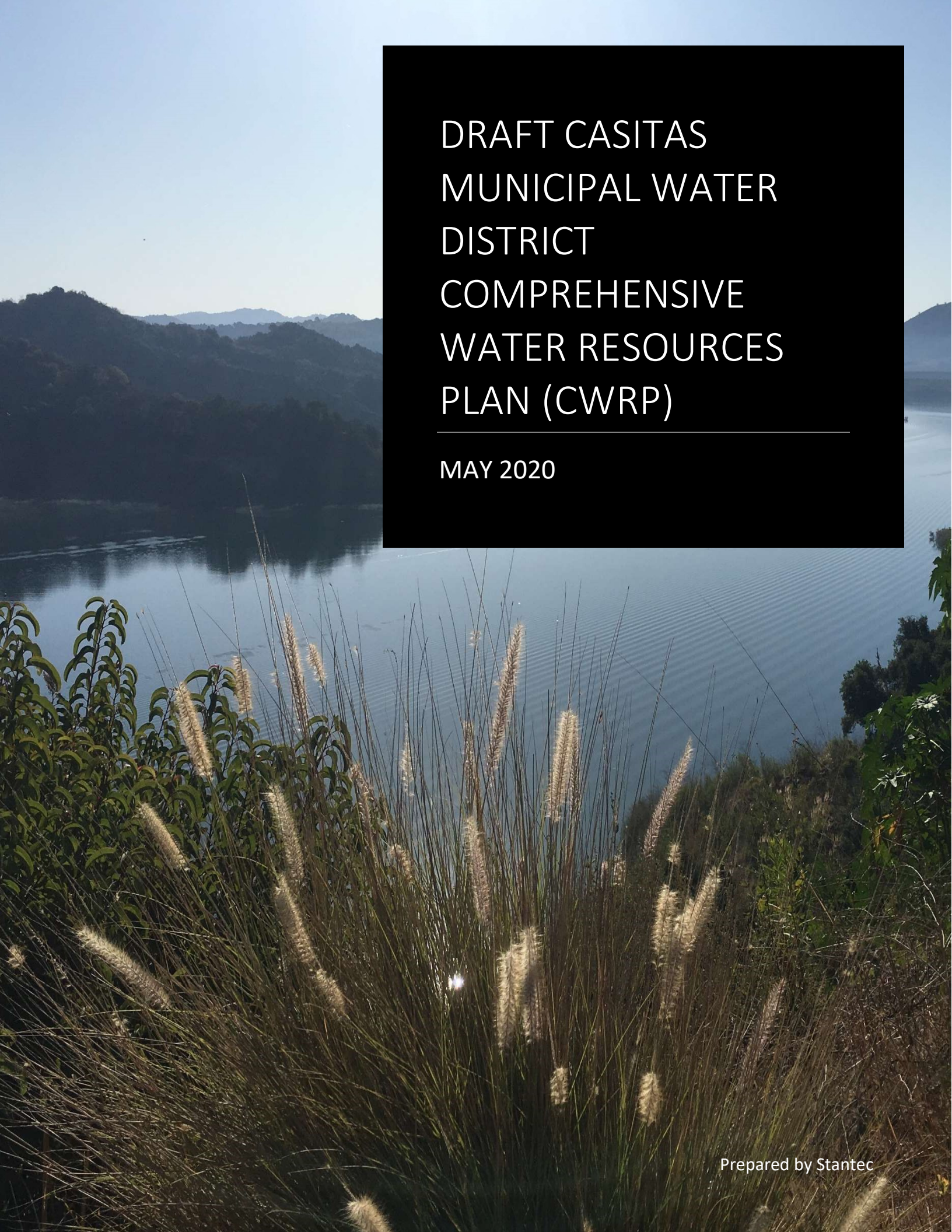
It is recommended the Water Resources Committee receive an update on the status of the Comprehensive Water Resources Plan.

BACKGROUND AND DISCUSSION:

The Board of Directors authorized a consulting services agreement with Stantec in January 2019 to prepare the Comprehensive Water Resources Plan. A draft report (excluding appendices) is attached for review and comment by the Water Resources Committee.

The contents of the draft report are based on input from the Board Workshop held on February 8, 2020, and input received during 12 previous Water Resources Committee meetings.

Staff will discuss the status of draft report and appendices, as well as the proposed schedule for the public comment period.



DRAFT CASITAS MUNICIPAL WATER DISTRICT COMPREHENSIVE WATER RESOURCES PLAN (CWRP)

MAY 2020

Prepared by Stantec

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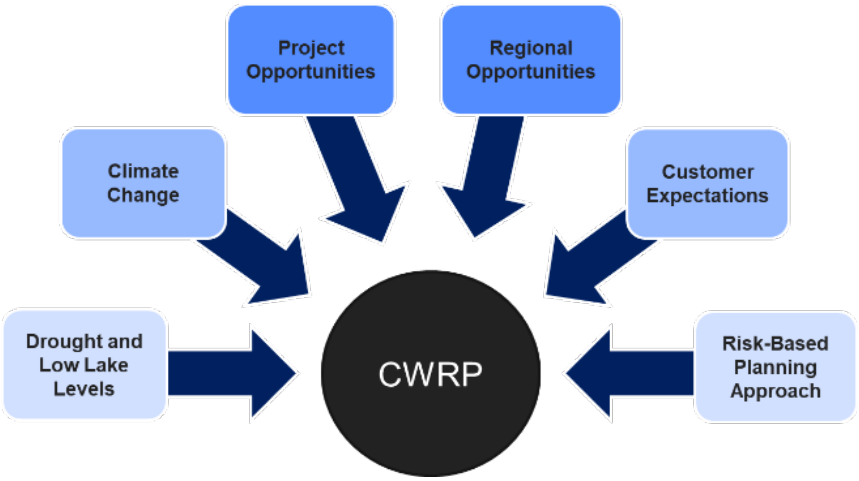
Abbreviations

AF	acre-foot/acre-feet
AFY	acre-foot per year/acre-feet per year
C	Conservation (Project Alternatives category)
Casitas or District	Casitas Municipal Water District
Calleguas	Calleguas Municipal Water District
CIMIS	California Irrigation Management Information System
DCF	Delta Conveyance Facility
CWRP	Comprehensive Water Resources Plan
GSWC	Golden State Water Company
GW	Groundwater (Project Alternatives category)
HOBO	Matilija Deep Aquifer, Horizontal Bore
MO	Maintenance and Operation (Project Alternatives category)
O&M	Operation and Maintenance
OBGMA	Ojai Basin Groundwater Management Agency
OVSD	Ojai Valley Sanitary District
SWP	State Water Project
UVRGA	Upper Ventura River Groundwater Agency
UWMP	Urban Water Management Plan
VRBO	Matilija Deep Aquifer, Vertical Bore
WEAP	Water Efficiency and Allocation Program

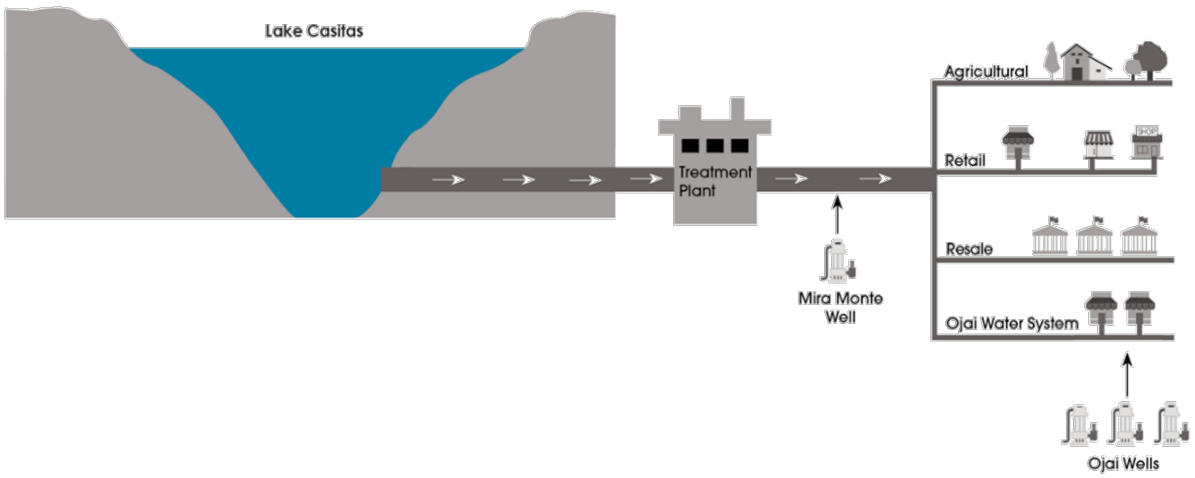
Executive Summary

THE CASITAS MUNICIPAL WATER DISRICT COMPREHENSIVE WATER RESOURCES PLAN (CWRP) presents a strategy for addressing current and future water supply challenges, risks, and opportunities to meet the needs of Casitas Municipal Water District (Casitas) customers. The CWRP is based on a review of a wide range of available options and strategies, and consists of an adaptive approach to providing a reliable and sustainable water supply for Casitas.

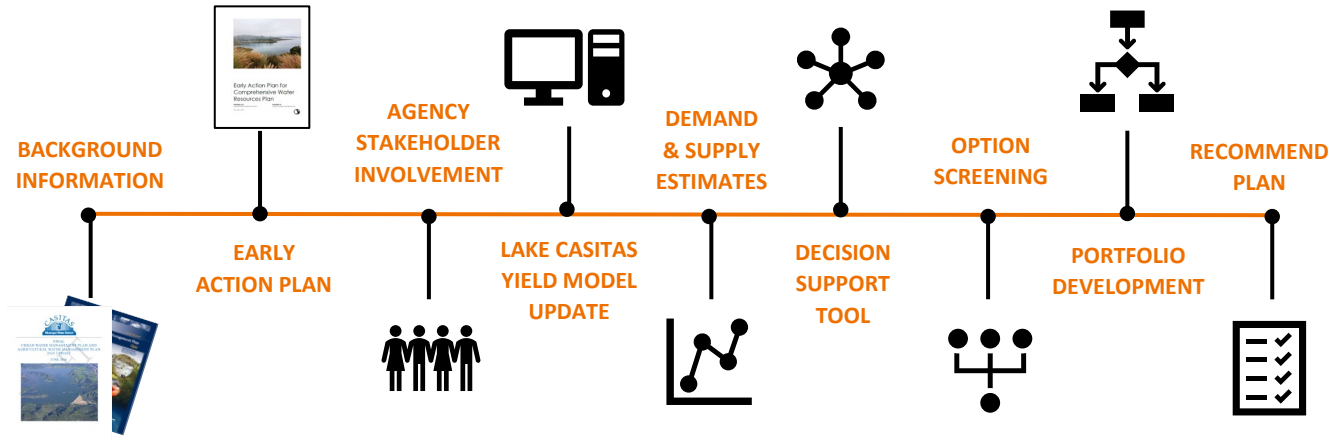
PROJECT DRIVERS. The CWRP was prepared in response to several important drivers based on recent events, anticipated future conditions, near-term opportunities, and customer expectations.



CASITAS MUNICIPAL WATER DISTRICT SYSTEM. Casitas serves water to four categories of customers: retail residential and commercial, agricultural, resale (i.e., through water delivery contracts), and Ojai Water System customers that were previously served by Golden State Water Company. The Casitas System is primarily supplied by Lake Casitas, and has one well (Mira Monte well in the Upper Ventura Groundwater Basin). The Ojai System is supplied primarily by groundwater wells in the Ojai Groundwater Basin, and receives supplemental water from Lake Casitas via the Casitas System. These surface and groundwater resources are all dependent on rainfall and runoff in the Ventura River watershed.



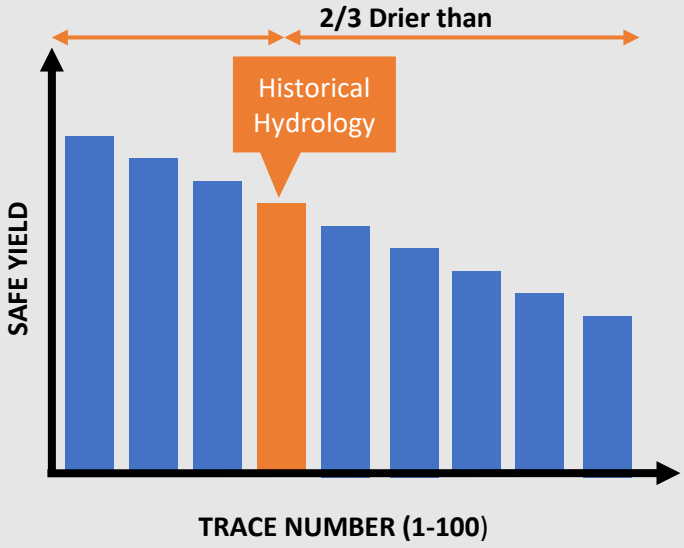
PROJECT APPROACH. The CWRP was developed using a systematic approach based on industry practices for risk-based planning, new and updated analytical tools, and stakeholder input. Stakeholder input was received through two stakeholder workshops, 12 Water Resources Committee meetings which were open to the public, and one Board workshop.



FUTURE DEMAND. Future 2040 water demand was estimated using a combination of past estimates and analysis of recent water use. Casitas System and Ojai Water System estimated demands are lower than previous estimates and reflect recent water use patterns from the last several years.

16,000 AFY	2,350 AFY
Casitas System 2040 Demand	Ojai Water System 2040 Demand

CLIMATE VARIABILITY. Operation of Lake Casitas was simulated for **100 future hydrologic conditions** (hydrologic traces) developed based on reshuffled historical hydrology and an adjustment for the impact of future climate change in Ventura County. The results showed there is a 67% chance that projected future hydrology will be drier than historical hydrology.



LAKE CASITAS MODELING. Lake Casitas is the primary source of supply for Casitas Municipal Water District. Yield estimates for Lake Casitas were developed using a computer model to simulates all inflows and outflows on a monthly time step for a 74-year period (1945-2018). Lake Casitas annual yield for water supply planning was based on the concept of safe demand. This is the largest base demand – i.e., the customer demand when the Lake is full – that could be met in every year when demand reductions are applied during periods of low lake levels in accordance with the Casitas Water Efficiency and Allocation Policy. A minimum allowable lake storage level was set at 20,000 AF (8.5% of active storage) to provide a buffer against unforeseen emergency conditions.

AVAILABLE WATER SUPPLY. The safe demand from Lake Casitas was evaluated based on a minimum storage of 20,000 AF and a climate-adjusted risk-based hydrology approach. The safe demand that could be delivered for 95 of the 100 synthetic hydrologic traces is 10,660 AFY; this was adopted as the Lake Casitas yield for the CWRP. The Mira Monte Well capacity based on recent experience is 180 AFY. The available supply for the Ojai Water System is estimated to be 2,325 AFY (1,800 AFY from groundwater wells and an average of 525 AFY from the Casitas System).

Future Available Supply

10,660 AFY

Lake Casitas Safe Demand

180 AFY

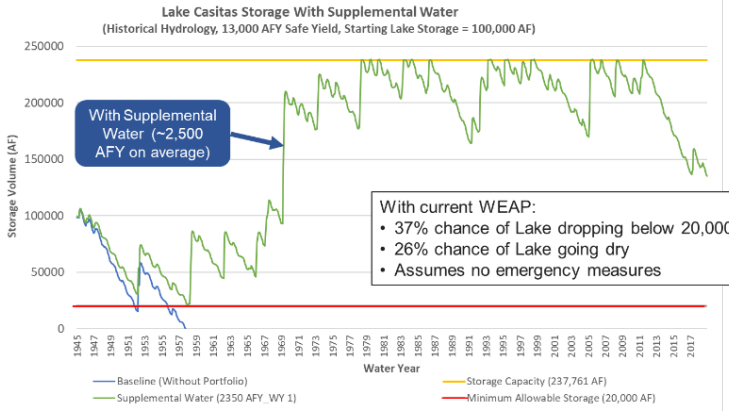
Mira Monte Well Capacity

2,325 AFY

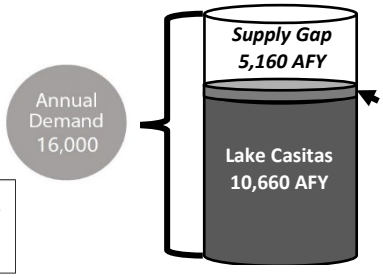
Ojai Water System Available Supply

FUTURE WATER SUPPLY GAPS. The **long-term supply gap** is the difference between estimated 2040 demand and available supply from all current sources. This gap is about 5,200 AFY for the Casitas System; there is no significant gap for the Ojai Water System.

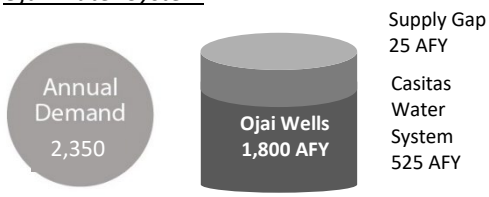
The **short-term supply gap** is based on mitigating the risk of Lake Casitas dropping to critically low levels as a result of extended drought. Modeling showed a supplemental supply of 2,500 AFY would adequately mitigate that risk.

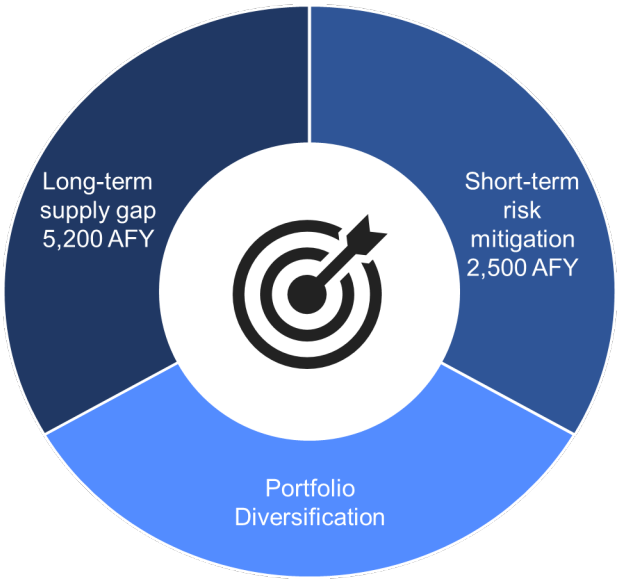


Casitas Water System



Ojai Water System

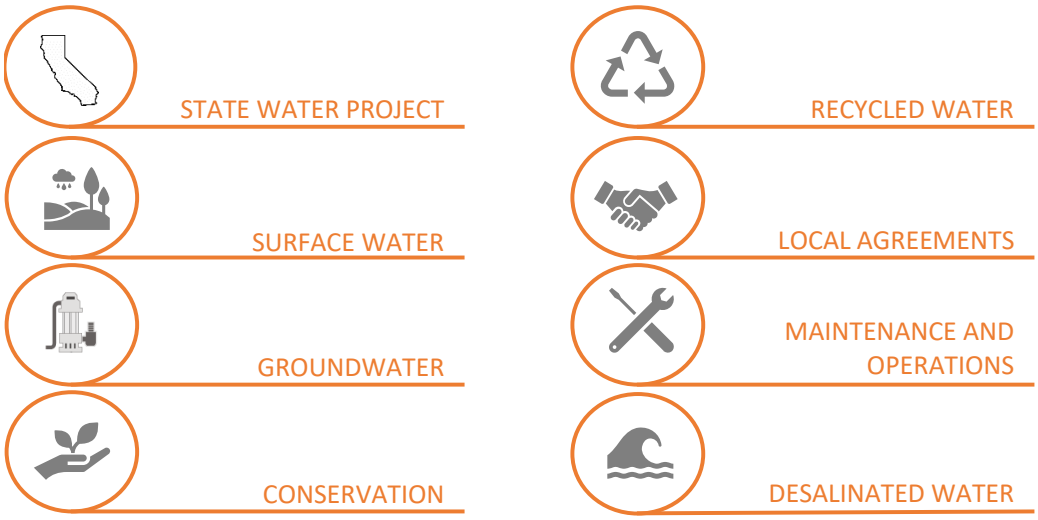




SUMMARY OF WATER NEEDS AND CWRP GOALS

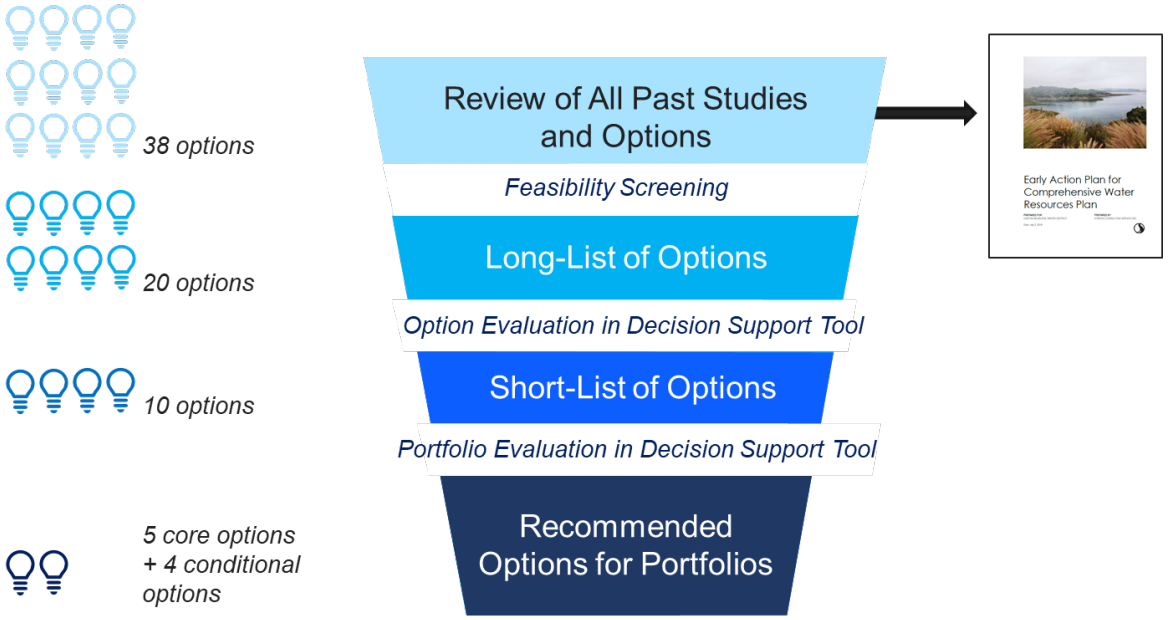
- Comparison of future water demand and future supply determined an average annual long-term water supply gap of 5,200 AFY.
- The current low storage level in Lake Casitas is a concern if the current drought continues; this can be mitigated by delivering 2,500 AFY of supplemental water to the Lake every year.
- All current Casitas supplies originate in the Ventura River watershed; diversifying the water portfolio with outside supplies will improve resilience and sustainability of the Casitas Water System.

WATER SUPPLY OPTIONS. A comprehensive range of structural/non-structural, surface/groundwater, and local/imported water options were considered to address future water supply needs.



WATER SUPPLY OPTIONS ANALYSIS. A thorough and deliberate process was used to evaluate potential water supply options to address the CWRP goals. Over **30 structural and non-structural projects** and programs were evaluated using a decision support tool based on **technical, economic, environmental, and social criteria**. The most feasible options were selected for further analysis and for combining into comprehensive water supply portfolios.

Over 30 projects were evaluated.



PLANNING POLICIES

- Supply and Demand Estimates
- Minimum Allowable Lake Storage
- Risk Based Planning

PORTFOLIO OF PROJECTS

- Local Options
- Supplemental Water Options
- Conditional Options

NEW AND UPDATED PROGRAMS

- Water Conservation Plan
- WEAP Policy Updates
- Supplemental Water Integration Plan

RECOMMENDED PLAN

The recommended plan consists of a coordinated set of planning policies, projects, and new and updated programs.

PLANNING POLICIES. Casitas has adopted new policies for water supply planning.

- CWRP supply and demand estimates will be used for **future planning**.
- The minimum operating volume in Lake Casitas during normal operations will be **20,000 acre-feet** (8.5% of active storage).
- Adequate average annual supply will be developed to **meet 95% of anticipated future hydrologic conditions**. Emergency measures will be implemented during more extreme conditions.

PORTFOLIO OF PROJECTS. The recommended portfolio of projects includes both local and supplemental water options. Two local projects will maximize yield from Ventura River water resources. Two regional interconnections to State Water Project infrastructure – one in Ventura and one in Santa Barbara County – will allow access to Casitas' current State Water Project contracted supply, as well as other supplemental water sources such as City of Santa Barbara desalinated water or in-lieu transfers with Ventura. Conditional options will be tracked in case one or more of the recommended projects cannot be implemented as planned. The capital cost of the recommended plan projects is **$155 million,** which would likely need to be funded by non-rate revenue sources such as bonds or grants. Local projects are recommended to be completed in 2 years, the Ventura-Santa Barbara Interconnection is recommended to be completed in 5 years, and the Casitas-Calleguas Interconnection and other supplemental water acquisitions are recommended to be completed in 10 years.

LOCAL, NEAR TERM, NO-REGRETS OPTIONS

1. GW 08 – Ojai Basin Well Rehabilitation and Replacement
2. MO 08 – Robles Fish Screen Improvements

PREFERRED SUPPLEMENTAL WATER OPTIONS

1. SWP 03 - Ventura-Santa Barbara Interconnection
2. SWP 04 – Casitas-Calleguas Interconnection
3. SWP 05/DW 01 Supplemental Water

CONDITIONAL OPTIONS – TRACK ONLY

1. C 01 – Demand Management 5%-10%
2. MO 01 – Watershed Management/Arundo Removal
3. GW 01 – Matilija Deep Formation Wells
4. SWP 05/DW 01 – Additional Supplemental Water Options

NEW AND UPDATED PROGRAMS. It is recommended that Casitas: (1) Develop a Water Conservation Plan to maintain current low customer water use. (2) Update the existing Water Efficiency and Allocation Program to include emergency operations and revised drought stages corresponding to lake levels. (3) Prepare a Supplemental Water Integration Plan to integrate State Water Project water and other supplemental sources into the Casitas Water System.

Section 1 Introduction

The Casitas Comprehensive Water Resources Plan (CWRP) presents a strategy for addressing current and future water supply challenges, risks and opportunities to meet the needs of all Casitas Municipal Water District customers. The CWRP considers water supply needs based on risks, threats and challenges, then develops water supply solutions based on individual options, broader strategies, and immediate opportunities (see **Figure 1-1Error! Reference source not found.**). This report describes the approach used to develop the CWRP, and the elements of the recommended plan. The focus of the report is on justification for selection of the projects, programs and policies making up the recommended water supply strategy, and on outlining considerations in implementing the recommended actions. The majority of the documentation for the detailed technical studies that support the development of the plan (e.g., future demand estimates, water supply modeling, alternative evaluation) is presented in technical appendices to the CWRP Report.

Figure 1-1: *CWRP Links Water Supply Needs and Solutions*

1.1 The Casitas System

The CWRP is a plan for meeting future water needs for all customers of the District using all water supply resources currently available to the District as well as potential new sources. This includes customers and facilities of the Ojai Water System, which was acquired by the District from Golden State Water Company (GSWC) in 2017. Casitas serves water to the following four categories of customers.

- Agricultural customers
- Retail residential and commercial customers
- Resale customers (i.e., other water providers with whom Casitas has a water delivery contract)
- Ojai Water System customers

Current water supplies are provided by three local sources: Lake Casitas, Mira Monte Well, and the Ojai Wellfield. These surface and groundwater resources are all dependent on rainfall and runoff in the Ventura River watershed. Water from Lake Casitas is treated at the District water treatment plant and delivered to retail, agricultural and resale customers, as well as Ojai Water System customers. Water from the Mira Monte Well is blended with treated Lake Casitas Water. Water supplies from the Ojai

Wellfield can only be used within the Ojai Water System based on current Ojai Groundwater Basin regulations. **Figure 1-2**. is an overview of the Casitas system.

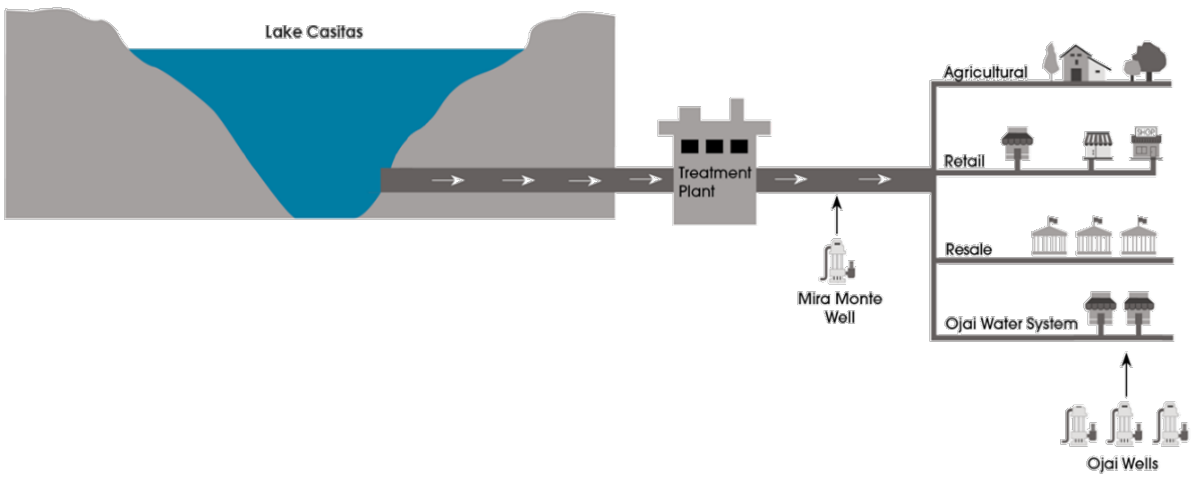


***Figure 1-2**. Casitas Water System Overview*

1.2 Project Objectives and Drivers

Casitas Municipal Water District developed this CWRP to identify, analyze, and prioritize strategies for providing a reliable water supply to meet the future water needs of Casitas' retail and contract (resale) customers. The objective was to lay out a strategic plan for addressing current and future water supply needs through a combination of effective policies, projects and programs with the support of the local community.

The CWRP was prepared in response to the recent extended drought in California, which resulted in historic low storage levels in Lake Casitas, the primary local water supply source. It was driven by concerns over supply reliability in the face of possible future climate change, and expectations of customers who had borne the brunt of several years of aggressive water use reductions. Casitas is facing important decisions on local projects and large, expensive regional projects, and needed a rational approach for assessing its options. In addition, the CWRP marks a new approach to water supply planning that embraces risk and uncertainty, including an updated analysis of the available yield from Lake Casitas that incorporates the impacts of future climate variability.

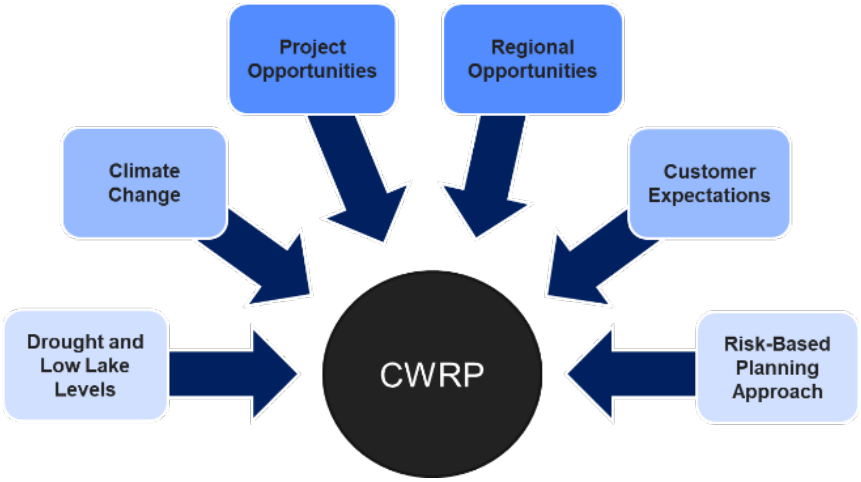


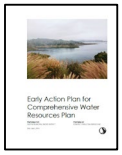
***Figure 1-3**: Drivers for Preparing the Comprehensive Water Resources Plan*

Figure 1-3 highlights the drivers for preparing the Comprehensive Water Resources Plan.

1.3 Overview of the CWRP Process

The process used to develop the CWRP was deliberate, rigorous, and transparent. It incorporated principles of risk-based water supply planning currently being adopted widely throughout the water resources planning and management industry (Water Research Foundation, 2016). The primary steps in the CWRP planning process (shown in **Figure 1-4**) are briefly described below.

BACKGROUND INFORMATION - Collected and reviewed previous plans and project reports related to potential water supply options for Casitas and the surrounding region; identified potentially feasible options to be included in the CWRP alternative evaluation phase.



AGENCY STAKEHOLDER INVOVLEMENT - Engaged stakeholders across a broad range of public and private interest groups to determine their key issues and preferences for the types of solutions to be considered in the CWRP.

DEMAND & SUPPLY ESTIMATES - Adopted estimates of water demand in the Casitas service area for use in CWRP planning and calculated new Lake Casitas yield estimates based on a risk-based approach that accounts for hydrologic variability and climate change.

OPTIONS SCREENING - Evaluated and screened a long-list of potentially feasible water supply options using the Decision Support Tool to identify options suitable for including in water supply portfolios.

RECOMMENDED PLAN - Selected a preferred portfolio consisting of near-term and no-regrets projects, imported water options, and conditional projects that would be required if the recommended projects could not be implemented or generated less supply than planned; identified water supply planning policies to be adopted and programs to be developed or updated.

EARLY ACTION PLAN - Identified projects that could be implemented by Casitas within 12 months to respond to serious concerns over low water levels in Lake Casitas due to the extended drought of the 2000s.

LAKE CASITAS YIELD MODEL DEVELOPMENT - Updated a previous water supply model of Lake Casitas to reflect current conditions and incorporate functionality for risk-based planning analyses.

DECISION SUPPORT TOOL - Developed a spreadsheet tool to evaluate and prioritize water supply options and portfolios (collections of options) based on weighted technical, environmental, social, and cost criteria selected by the District.

PORTFOLIO DEVELOPMENT - Combined feasible options into portfolios of local and imported water projects, programs and policies that satisfied the short- and long-term goals of the CWRP.

Figure 1-4: Overview of the CWRP Process

Section 2 Stakeholder Involvement

As part of the CWRP, a stakeholder engagement program was created and implemented. Stakeholders included community members, local officials, water agencies (federal, state, and local), agricultural users, environmental groups, nongovernmental organizations, major water users, and other stakeholders to discuss the challenges and opportunities for water supply reliability within the region. The stakeholder involvement process and input are described in more detail in Appendix B – Stakeholder Engagement Documentation TM.

A comprehensive key stakeholder database was created in collaboration with Casitas and local elected officials that represent the Casitas Water System service area. The stakeholder engagement strategy included a mixture of various digital and in-person engagement tactics with the following goals:

- **Facilitate stakeholder meetings** to gather input on community priorities for water supply projects
- **Build trust** in the engagement process among key stakeholders and the communities served by the District by providing regular and ongoing progress updates
- **Organize and document** the feedback received throughout the process

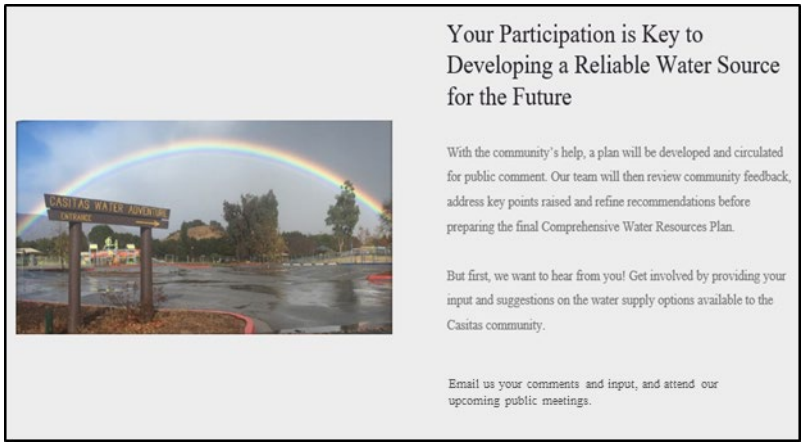
80 Stakeholders from **50 Organizations** were engaged.

Two stakeholder workshops were held in July 2019 in Oak View, CA. These workshops were used to engage stakeholders in a collaborative discussion around water supply concerns within the region. There were several recurring themes during these discussions which included the following:

- Importance of communication with elected officials
- Environmental concerns
- Identifying cost-effective solutions that work
- Impact of water shortages on residents and businesses
- Navigating a complex web of multiple water agencies
- Risks of reliance only on a local water source
- Importance of stable water price and sustainability

Key feedback regarding future water supplies and planning strategies included:

1. Diversify the Casitas Water supply portfolio.
2. Evaluate the State Water Project (SWP) alternatives since Casitas has an existing contract for SWP water, and has been paying for its share of the SWP costs since 1963.



A webpage example from Casitas' Microwebsite.

3. Implement regional solutions that could be mutually beneficial to other water providers in the region.

Monthly CWRP updates were provided to the Casitas Water Resources Committee (WRC), which consists of two Casitas Board members. These meetings were open to the public and were attended by Casitas staff and the CWRP consulting team. CWRP updates were provided at 12 WRC meetings over the course of the project. At these meetings the WRC provided project direction in a number of important areas, including alternatives to be studied, approaches to incorporating climate variability, alternative evaluation criteria, supply and demand estimates, and the recommended plan.

During preparation of the draft CWRP report a Board workshop was held to brief the entire Board on the study process and the draft recommendations. This meeting was open to the public.

Section 3 Demand Analysis

Future water demands were estimated for the Casitas Municipal Water District service area, which includes the Casitas Water System and the Ojai Water System. The CWRP water demand analysis is described in detail in Appendix C – Water Demand Estimate for Casitas Municipal Water District Technical Memorandum.

The analysis treated the Casitas Water System separately from the Ojai Water System because the potential sources of supply to the two areas are different. Demands in areas served by the Casitas system are primarily met by water supplied by Lake Casitas, with a small supply from the Mira Monte Well located in the Upper Ventura River Groundwater Basin. Demands in the Ojai Water System are met primarily by Ojai Groundwater basin wells and supplemented by Casitas Water System as needed.

In this report, water demand refers to water that must be delivered to the Casitas water treatment plant or produced by Ojai Groundwater Basin wells. It thus accounts for both the customer uses and losses in water delivery systems. This is termed “production” water demand as distinguished from “consumption” water demand which captures only customer use “at the tap” and not water delivery system losses. The connection between Casitas sources and demand centers is summarized in **Figure 3-1**.

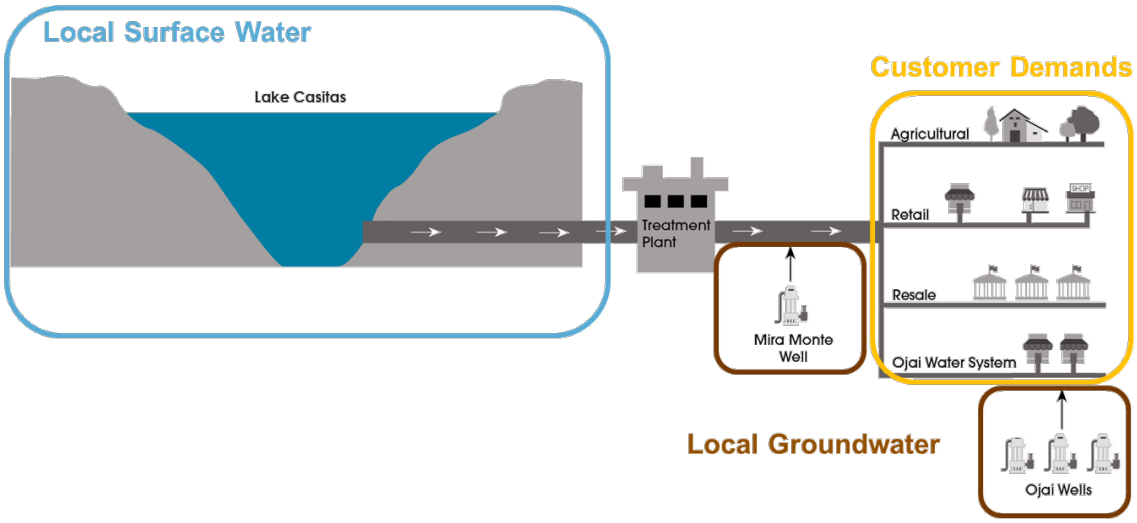


Figure 3-1: *Connection Between Casitas Sources and Demand Centers*

The CWRP was based on future water demands representing estimated conditions in 2040. For both the Casitas Water System and the Ojai Water System, future demands were estimated based on an average of the most recent published Urban Water Management Plan (UWMP) demand forecast and an extrapolation from recent historical demand data (**Figure 3-2**). This approach allowed for incorporation of the influence of the recent severe drought and corresponding long-term water use reductions by Casitas customers.

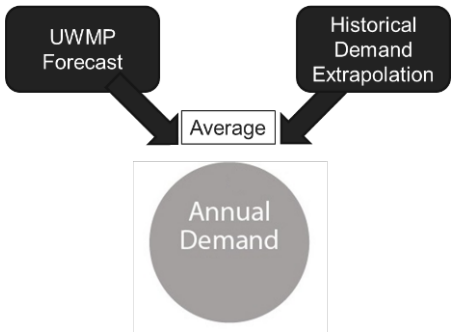


Figure 3-2: *Method for Estimating Future Demand for CWRP*

3.1 Casitas Water System Future Demands

The 2016 Casitas Municipal Water District Urban Water Management Plan (Casitas 2016) reported a 2020 water demand of 17,200 acre-feet per year (AFY) and a 2040 water demand estimate of 17,500 AFY for the Casitas Water System, including all residential, commercial, agricultural, and resale customers. This demand estimate was based on Ventura County population estimates, which forecasted essentially no growth in the Casitas service area over the planning period. Casitas water demand in the past five years has been considerably lower than 17,500 AFY, reflecting the willingness of Casitas customers to modify water use practices in response to the drought. Although some rebound in demand may occur in future years, much of the water savings are likely permanent due to structural changes such as conversion of turf to xeriscape landscaping and replacement of old fixtures and appliances with water-efficient fixtures and appliances. Casitas staff felt it was reasonable to assume a permanent savings of 10% from the 2016 UWMP forecast. Thus, the effective Casitas UWMP demand estimate used in the CWRP analysis was 15,750 AFY.

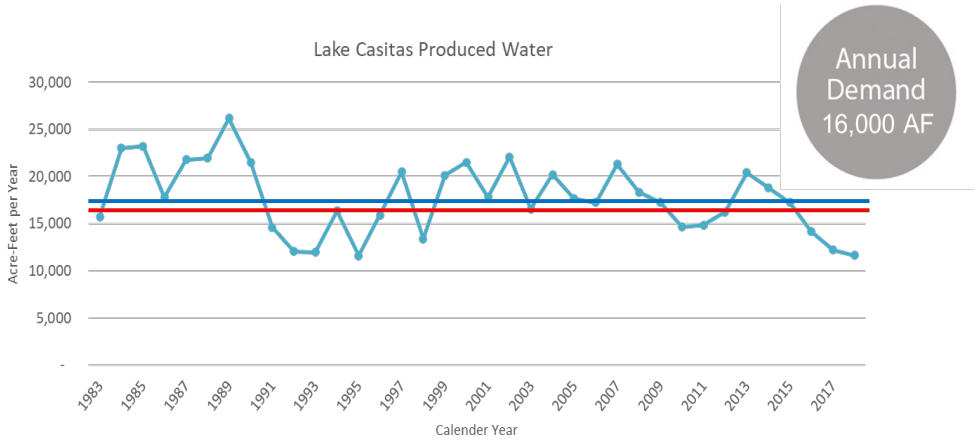


Figure 3-3: *Casitas System Historical Water Production and 2040 Water Demand Forecast*

Recent historical water use data was also analyzed as part of the water demand forecast approach. Data for produced water from Lake Casitas and the Mira Monte Well was averaged over the past 8 years. This average of 15,860 AFY was increased by 300 AFY based on the increase in the UWMP demand forecast between 2020 and 2040, resulting in a historical extrapolation of 16,160 AFY.

For purposes of the CWRP, the assumed 2040 demand was the average of the adjusted 2016 UWMP estimate and the historical extrapolation, which was rounded to 16,000 AFY (**Figure 3-3**). Because population is not expected to increase in the study area based on Ventura County growth studies, this water demand estimate should be valid for years past 2040.

3.2 Ojai Water System Future Demands

The most recent UWMP for the Ojai Water System is the 2010 Golden State Water Company UWMP. That report had a future water use estimate for 2035 of 2,570 AFY. This included effects of assumed population growth and reduction in per capita use due to conservation measures.

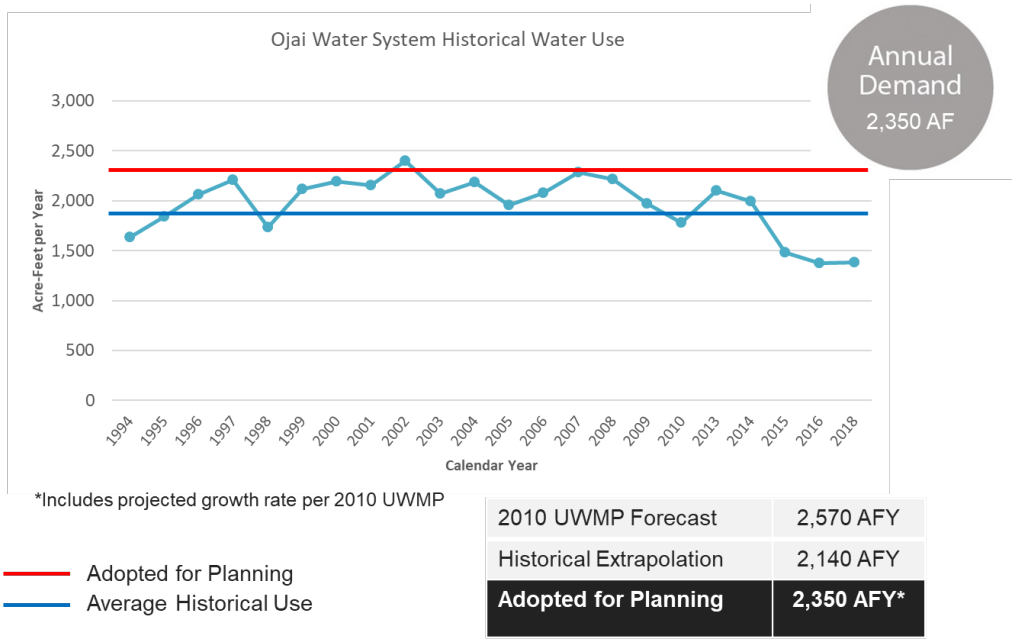


Figure 3-4: Ojai Water System Historical Water Production and 2040 Water Demand Forecast

Historical water consumption in the Ojai Water System service area over the past 5 years has averaged 1,560 AFY. Adjusting for future growth assumed in the UWMP and water system losses, the 2040 water demand estimate based on extrapolation of recent historical data is 2,140 AFY.

The CWRP adopted the average of the UWMP estimate and the historical extrapolation, or 2,350 AFY. Because Ventura County forecasts little growth in Ojai Valley, the estimated demand of 2,350 AFY should be a valid estimate for future years beyond 2040 (**Figure 3-4**). The Ojai Water System demand includes demand met from Ojai Basin wells, which produced an average of 1,360 AFY over the past 8 years, and water purchased from Casitas.

3.3 CWRP Demand Summary

Future water demands adopted for CWRP planning are summarized in **Table 3-1**. When combining the Casitas Water System and Ojai Water System demands, it is necessary to account for the portion of Ojai Water System demands met from the Casitas Water System, so this volume of water is not double counted. On average Casitas has supplied 525 AFY to Ojai, which represents about 20% of Ojai's

demand. Adjusting for this shared volume of water, the total estimated 2040 demand for the Casitas service area is 17,825 AFY.

Table 3-1: *Summary of Future Water Demands Adopted for CWRP*

DEMAND PARAMETER	CASITAS SYSTEM	OJAI WATER SYSTEM	TOTAL
UWMP 2040 Forecast (AFY)	15,750	2,570	-
Historical Extrapolation (AFY)	16,200	2,140	-
Adopted for CWRP (AFY)	16,000	2,350	18,350
Ojai Demand Included in Casitas Demand (AFY)	-	-	525
Net Casitas Municipal Water District Demand (AFY)	-	-	17,825

Section 4 Water Supply Analysis

This section describes the components of the analysis performed to estimate the long-term water supply available for the Casitas Water System and the Ojai Water System. The Casitas System water supply was estimated using a simulation model of Lake Casitas; the Ojai Water System supply was estimated based on past production of Ojai Groundwater Basin wells. A detailed description of the water supply and modeling analysis is provided in Appendix D – Lake Casitas Water Supply Analysis Technical Memorandum.

4.1 Casitas System Water Supply Analysis

The analysis of available water supply to the portion of the Casitas service area served from Lake Casitas (called the Casitas System herein) was performed using the Lake Casitas Yield Model. Casitas developed the first version of this simulation model for Lake Casitas in 2004. This model was used by Casitas in the past to estimate the safe yield for Lake Casitas based on historical hydrology from 1945 to 2004.

The Lake Casitas Yield Model simulates lake inflows, outflows, and operations. The setting for the model is shown in **Figure 4-1.**. Key inputs are direct inflows to the lake from Coyote Creek and Santa Ana Creek, and diversions from the Ventura River at the Robles Diversion. Key outflows are water releases to meet water supply needs and evaporation. The model is a set of Excel spreadsheets, and is described in detail in the Casitas Water Supply and Use Report (Casitas, 2004).

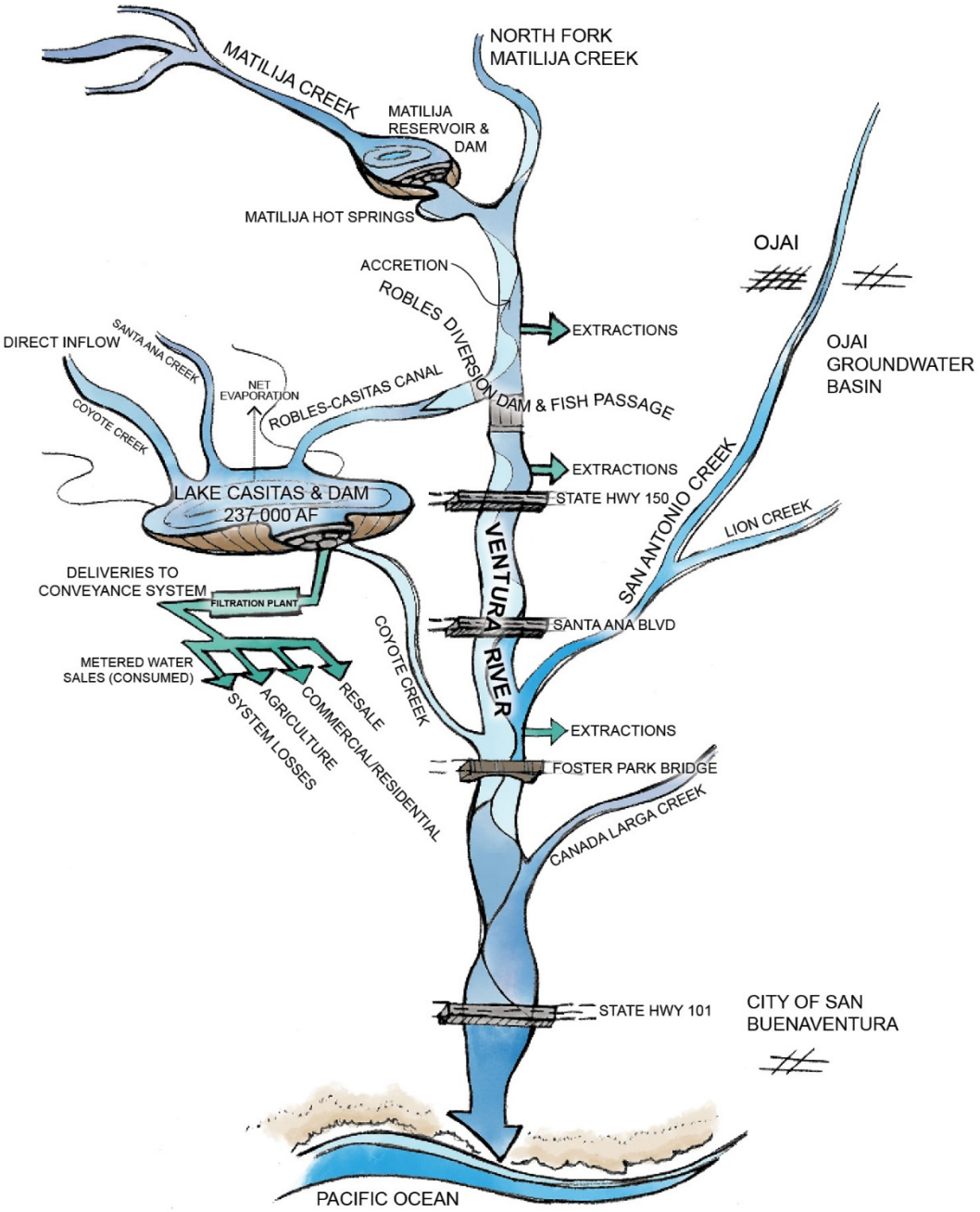


***Figure 4-1**. Schematic representation of Lake Casitas Yield Model setting*

4.1.1 Casitas Yield Model Update

The Lake Casitas Yield Model was updated for the CWRP (**Figure 4-2**) by making the following improvements:

- Extended the model to a 74-year period of record through 2018; this captured the recent California drought.
- Incorporated the 2003 Biological Opinion Operating Criteria for steelhead trout into the simulation of the Robles Diversion Structure; this reduced the volume of water diverted into Lake Casitas in the model during most conditions.
- Updated the Lake Casitas reservoir elevation-area-capacity table based on the recent 2017 bathymetric survey; this reduced the maximum capacity of the Lake from the original volume of 254,000 AF to 237,761 AF.

The updates to the Lake Casitas Yield Model reduced the estimated safe yield of the Lake from 20,540 AFY to 17,460 AFY. This is a significant reduction of 15% in the estimated safe yield just from updating the model.

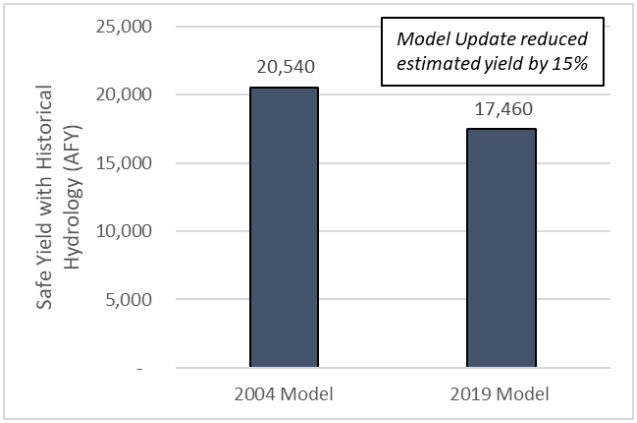


***Figure 4-2**: Impact of 2019 Updates on Lake Casitas Yield Model Safe Yield Estimates for Historical Hydrologic Data*

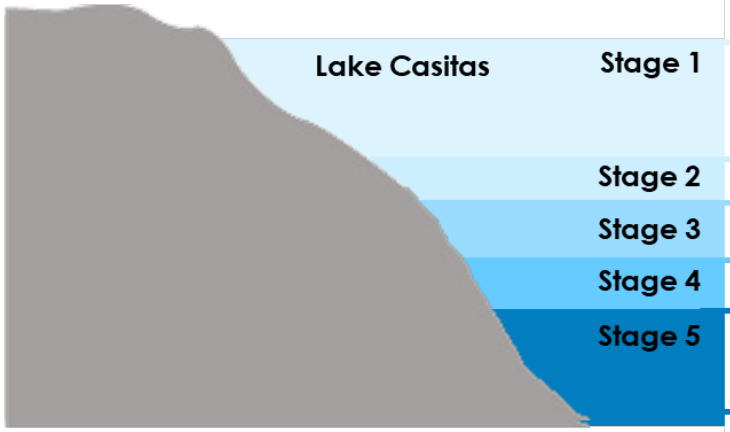
The next step in the Lake Casitas yield analysis for the CWRP incorporated new planning policies adopted by the Casitas Board during the CWRP process. These policies and their effect on the Lake Casitas yield analysis are described in the following sections.

4.1.2 Incorporation of the WEAP Policy and the Concept of Safe Demand

SAFE YIELD – the **largest amount of water** that can be drawn from Lake Casitas every year in the period of record, without storage dropping below the minimum allowable storage level

SAFE DEMAND – the **largest amount of water** that can be drawn from Lake Casitas every year in the period of record **when demand is reduced based on Lake level according to the WEAP policy**, without storage dropping below the minimum allowable storage level

The Casitas Water Efficiency and Allocation Program (WEAP) was first developed in 1992 as a strategy for managing demand in response to periods of low supply from Lake Casitas. The most recent revision of the WEAP is dated May 2018. The WEAP establishes water use allocations for each Casitas customer based on either 80% of actual use in FY 1989-90 or actual use in FY 2012-13, whichever was less. When Casitas acquired the GSWC system, Ojai customers' allocations were based on estimates of structures and landscaped area on each parcel. The WEAP also defines five Lake Casitas storage stages and provides guidelines for setting lower allocations when storage volumes in Lake Casitas are below certain levels (**Figure 4-3**). The Casitas Board declares the WEAP stage based on lake storage, anticipated runoff in coming months, input from the community, and other factors.



	Lake Storage (AF)	Lake Storage (% of Capacity)	Allocation Reduction (%)
Stage 1	237,761	100%	0%
Stage 2	118,881	50%	20%
Stage 3	95,104	40%	30%
Stage 4	71,328	30%	40%
Stage 5	59,440	25%	50%
	950 AF	0%	

Figure 4-3: *Lake Casitas WEAP Stages*

NEW SAFE DEMAND POLICY: Lake Casitas **long-term yield** is based on the concept of **safe demand**, in which customer demands are reduced in dry periods when lake levels are low, consistent with the current WEAP guidelines.

Because Board declarations of WEAP stages are intended to reduce customer demands, and because Casitas customers have responded positively to shortage declarations and reduced their water use in the past, the Lake Casitas yield analysis was changed to reflect reduced water demands consistent with the WEAP target demands at each lake stage. That is, as the lake level dropped during dry periods in the simulation, the total water demand was set to not exceed the target demand in the WEAP policy. The largest base demand – i.e., the demand when the Lake is full – that could be met in every year when the WEAP reductions are applied for low lake levels was referred to as the "safe demand". The safe demand was used in the CWRP to represent the long-term annual yield from Lake Casitas.

4.1.3 Minimum Allowable Storage Level in Lake Casitas

Past Lake Casitas yield estimates were based on simulations that allowed the Lake storage to be drawn down to the dead pool level, which is approximately 950 AF (0%). This provides no buffer for emergency conditions. As part of the CWRP, the Lake Casitas operation policy was changed to establish a minimum allowable storage level below which the Lake would not be drawn down during normal operations (**Figure 4-4**). The volume of water below the minimum allowable storage would be reserved for emergency conditions beyond the planning assumptions in the CWRP, e.g., more severe droughts or outages of critical infrastructure such as the Robles Diversion.

NEW MINIMUM ALLOWABLE STORAGE POLICY: Lake Casitas will be managed to maintain a **minimum allowable storage volume of 20,000 AF** in all periods of normal operation. A plan will be developed for emergency conditions when the Lake falls below 20,000 AF.

Casitas set the minimum allowable storage volume at 20,000 AF. Excluding the dead pool, this provides about 19,000 AF of emergency storage. This volume is equivalent to 1.1 years of future Casitas Water System demand, or 1.4 years of the WEAP Stage 5 demand. In all Lake simulations of safe yield or safe demand, the goal was to **maintain lake storage above 20,000 AF at all times**. Calculations of the water supply gap described later in this report were based on maintaining a minimum allowable storage of 20,000 AF.

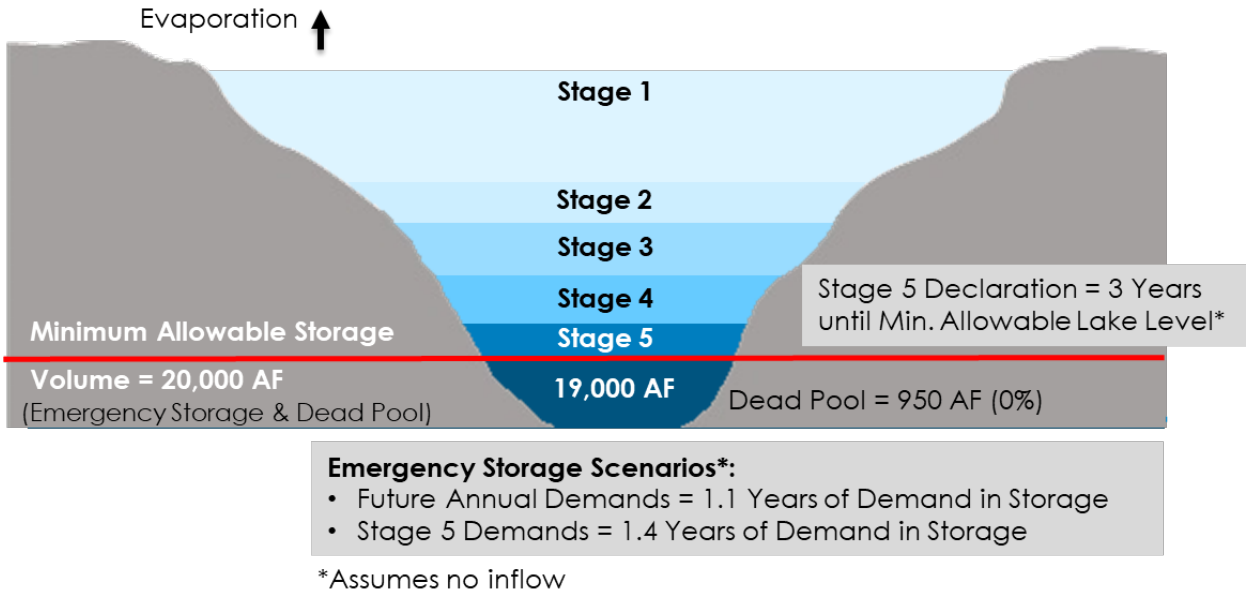


Figure 4-4: *Minimum Allowable Lake Level*

4.1.4 Climate Variability and Climate Change Analysis

Estimates of future Lake Casitas yield account for climate variability (annual variation in climate and streamflow based on historical records) and climate change (shift in temperature and precipitation due to global climate drivers).

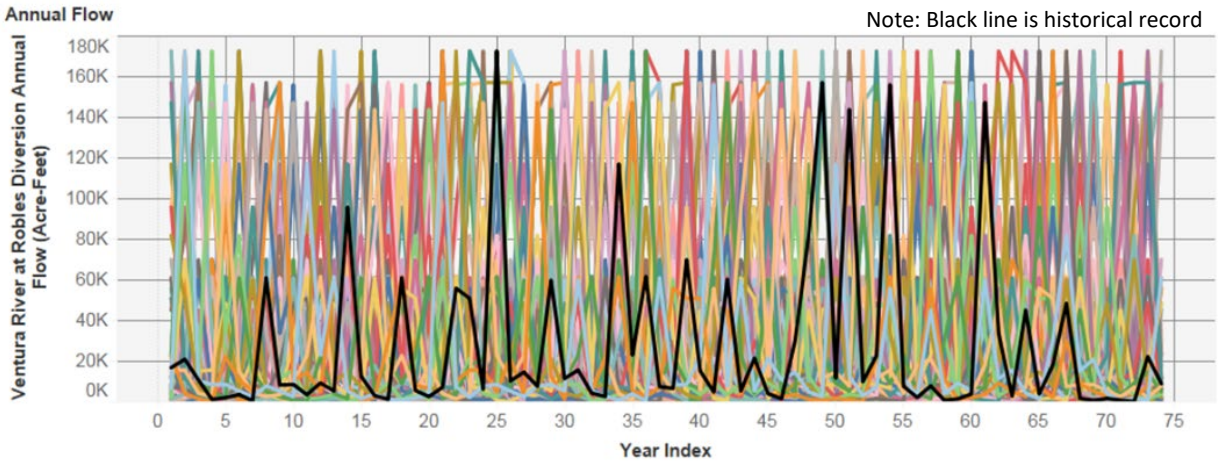


Figure 4-5: *Plot of 100 74-year Monthly Time Series for Ventura River Streamflow at Robles Diversion, Based on Historical Record*

Natural hydrologic variability was incorporated into the Lake Casitas yield analysis by generating one hundred 74-year hydrologic datasets (traces) derived from the historical dataset and having the same basic statistics (e.g., standard deviation and serial correlation of annual streamflows) as the historical record (**Figure 4-5**). Annual historical natural inflows to the lake and Ventura River streamflows at the Robles Diversion structure were reshuffled 100 times, maintaining the long-term serial correlation between annual streamflows. Monthly distribution of flows within each year was unchanged. The result was 100 hydrologic datasets that were used as input for the Lake Casitas Yield Model.

Downscaled climate change information for Ventura County (Western Regional Climate Center, 2019) was used to adjust Lake Casitas yield estimates for potential future changes in climate conditions (temperature and precipitation). Key findings for Ventura County climate change include:

- ***Increased*** average temperature
- ***Increased*** maximum temperatures by 3-5 degrees F
- ***Increased and/or decreased*** average annual precipitation
- ***Increased*** number of dry days (3-4 per year)
- ***Increased*** precipitation intensity; wettest 5% of days will contribute 10% more to annual precipitation
- ***Increased*** evapotranspiration by 2.5 to 6.5 inches/year, with highest increases in inland areas
- ***Decreased*** runoff production (conversion of rainfall to runoff)

Some potential climate change conditions could decrease Lake Casitas inflow and others could increase it. These effects were assumed to generally compensate for each other. Increased evaporation of six inches/year was found to reduce the Lake Casitas safe yield for historical inflow hydrology by

4.3 percent. This factor was applied to results of yield simulations to account for potential future climate change.

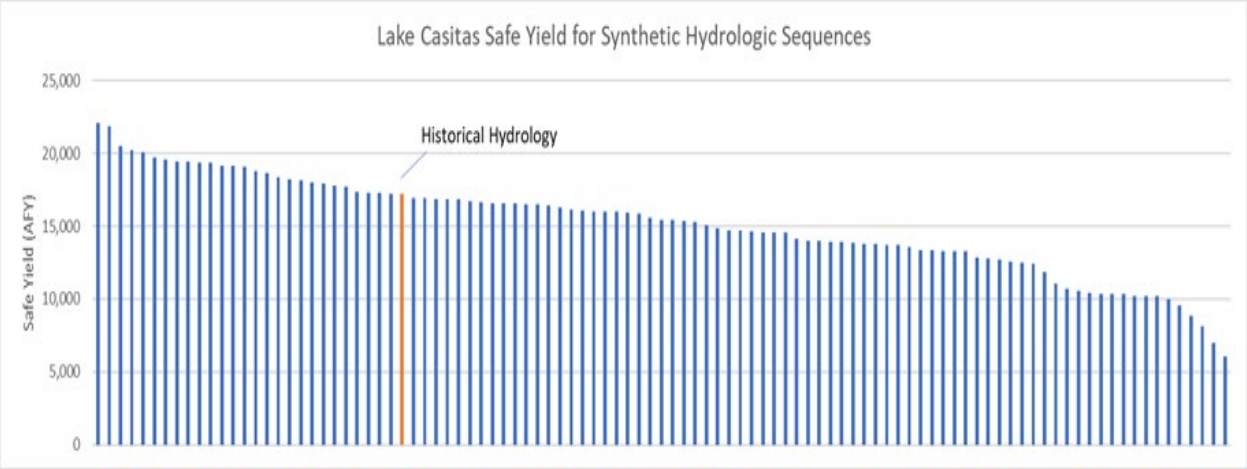


***Figure 4-6**: Lake Casitas Safe Yield for Synthetic Hydrologic Sequences*

Of the 100 synthetic hydrologic traces generated for the CWRP, about two-thirds result in lower Lake Casitas safe yield than the historical hydrology (**Figure 4-6**). This persistence toward drier conditions has a significant effect on the reliable yield the Lake could supply in the future.

4.1.5 Reliability Analysis

The 100 synthetic hydrology traces were used to develop safe demand estimates with different reliabilities. The 2019 Lake Casitas Yield Model was used to simulate the safe yield and safe demand (maximum annual withdrawal when demands are reduced according to WEAP policy) for each of the 100 traces. Results are shown in **Figure 4-7** and **Table 4-1**: Lake Casitas Safe Demand and indicate the percentage of potential future hydrologic conditions for which the given safe demand could be met.

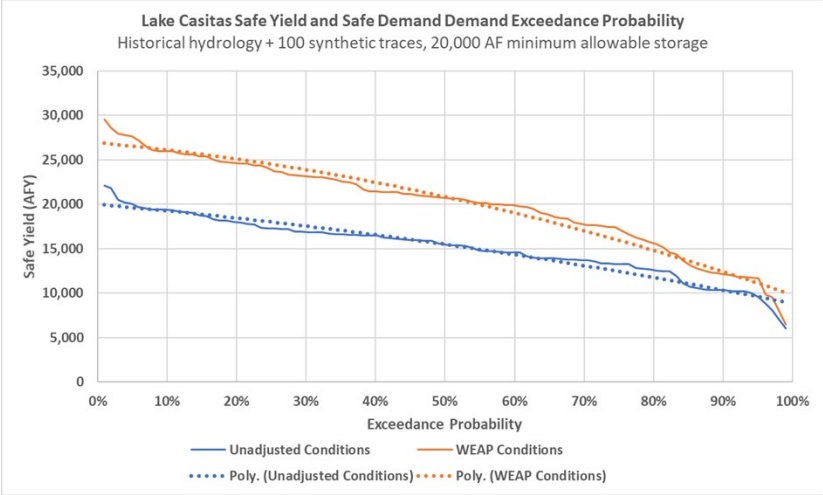


***Figure 4-7**: Lake Casitas Safe Demand Exceedance Probability Analysis*
(Safe yield shown in blue; safe demand shown in orange.)

Casitas considered the reliability results and determined that developing supplies to produce safe demand to meet all future hydrologic conditions would be very expensive and unnecessary with the adopted minimum allowable storage in Lake Casitas of 20,000 AF. The Board selected a reliability of 95% to balance a conservative approach to water supply planning against prudent financial planning. When the climate change adjustment described previously was applied, the 95% reliable safe demand from Lake Casitas used for the CWRP was 10,660 AFY.

Table 4-1: Lake Casitas Safe Demand (AFY)

RELIABILITY	SAFE DEMAND WITHOUT CLIMATE CHANGE ADJUSTMENT (AFY)	SAFE DEMAND WITH CLIMATE CHANGE ADJUSTMENT (AFY)
90%	12,420	11,890
95%	11,140	10,660
99%	10,090	9,650

Note: 100 hydrologic traces, application of WEAP demand reductions for low lake levels, minimum allowable storage of 20,000 AF

NEW RELIABILITY POLICY: Lake Casitas safe demand used for planning will be based on a **reliability of 95%**.

There is a 95% chance that in the future we will be able to support a base demand of 10,660 AFY from Lake Casitas under our current WEAP policy with our current supplies and a 20,000 AF minimum allowable storage pool.

4.2 Water Supply Needs Analysis

Future water supply needs were based on three factors:

1. The **water supply gap** (difference between future annual demand and available annual supply)
2. The **immediate risk of shortages** due to the current low storage volume in Lake Casitas after the extended California drought
3. The desire for a more **diversified water supply portfolio** to better prepare for future uncertainty

4.2.1 Water Supply Gap Analysis

The future water supply gap was estimated separately for the Casitas System and the Ojai water System.

Casitas Water System

The CWRP adopted an average annual demand for the Casitas system of 16,000 AFY (see Section 3, **Casitas Water System Future Demands**). The available annual supply is the sum of the Lake Casitas 95% reliable safe yield of 10,660 AFY and the Mira Monte Well[1] yield of 180 AFY. The Mira Monte Well is located in the Upper Ventura River Groundwater Basin, which is managed by the Upper Ventura River Groundwater Agency (UVRGA). The resulting long-term

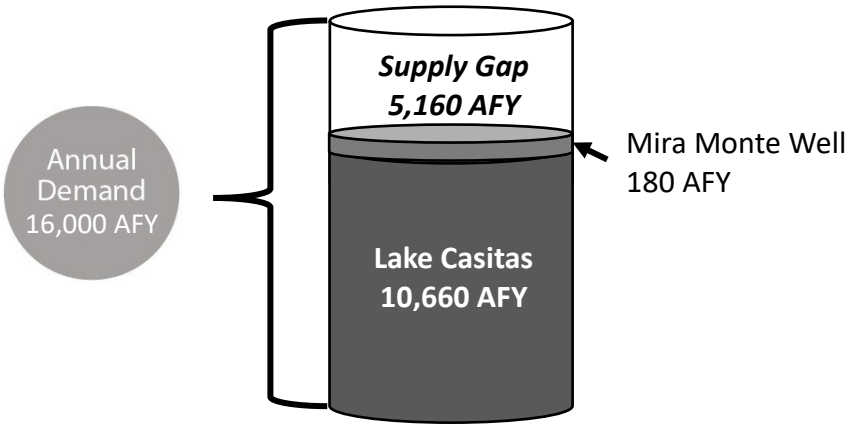


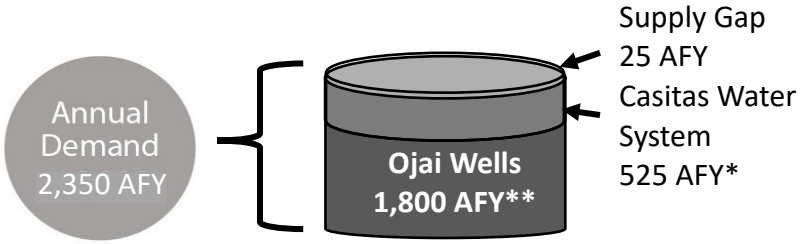
Figure 4-8: Casitas System Water Supply Gap

[1] The Mira Monte Well is located in the Upper Ventura River Groundwater Basin, which is managed by the Upper Ventura River Groundwater Agency (UVRGA).

water supply gap for the Casitas system is 5,160 AFY (rounded to 5,200 AFY), as depicted in **Error! Reference source not found.**.

Ojai Water System

The Ojai Water System average annual future demand for the CWRP is 2,350 AFY (see Section 3, **Ojai Water System Future Demands**). The available supply for the Ojai Water System is estimated to be 2,325 AFY (1,800 AFY from groundwater wells[2] and an average of 525 AFY from the Casitas System (based on historical deliveries)). The groundwater wells are in the Ojai Basin, which is managed by the Ojai Basin Groundwater Management Agency (OBGMA). The resulting gap of 25 AFY was assumed to be within the accuracy of the supply and demand analyses, and could be met with a small additional delivery from the Casitas System if needed (**Figure 4-9**).



*Typical historical value; included in demand on Lake Casitas System
** Assumed safe yield from current well system. Permitted production = 4,404 AFY.

***Figure 4-9**: Ojai Water System Water Supply Gap*

Table 4-2 summarizes the water supply gap in both the Casitas and Ojai Water Systems.

***Table 4-2**: Summary of Water Supply Gap Analysis*

WATER SYSTEM	AVERAGE ANNUAL FUTURE DEMAND (AFY)	AVERAGE ANNUAL SUPPLY (AFY)	ASSUMED WATER SUPPLY GAP (AFY)	COMMENTS
Casitas System	16,000	10,840	5,200	Rounded from 5,160
Ojai Water System	2,350	2,325	0	Negligible; could be met from Casitas System

[2] The Ojai system groundwater wells are in the Ojai Basin, which is managed by the Ojai Basin Groundwater Management Agency. Assumed safe yield is 1,800 AFY, and Casitas has a permitted capacity of up to 4,404 AFY.

4.2.2 Immediate Risk of Shortages

At the beginning of the CWRP study the Lake Casitas storage was about 78,000 AF, which triggered a Stage 3 declaration and caused concern for Casitas water managers and the community. Although the Lake had recovered to about 100,000 by late 2019, concern of future shortages remained if the drought were to continue.

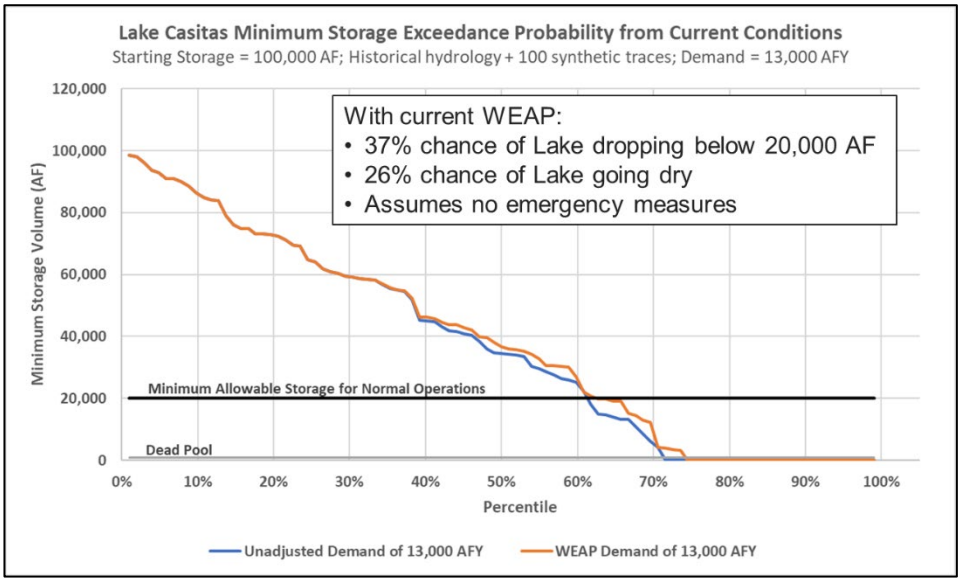


***Figure 4-10**: Exceedance Probability of Lake Casitas Minimum Storage Occurring At Least Once Over the Simulation Period for 100 Hydrologic Traces with Starting Lake Storage of 100,000 AF*

The risk of critically low Lake levels was investigated by simulating Lake Casitas operation for the 100 synthetic hydrologic traces and historical hydrology with a demand of 13,000 AFY. This demand is higher than the 2019 observed demand but lower than the long-term estimate of 16,000 AFY. The Lake Casitas risk shortage analysis is described in Appendix E – Analysis of the Risk of Lake Casitas Being Drawn Down to the Minimum Pool Level. Thirty-seven percent (37%) of the 100 hydrologic traces caused the Lake to fall to the 20,000 AF minimum storage level, and 26% of the traces caused the Lake to fall to the dead pool level (**Figure 4-10**). This assumed no emergency measures would be taken.

This level of risk prompted development of a CWRP objective to take steps to secure a new water supply in the near term in the event the recent drought continues. Simulations with different constant annual volumes of supplemental water showed that 2,500 AFY provides reasonable protection against critically low Lake levels in the next decade (**Figure**

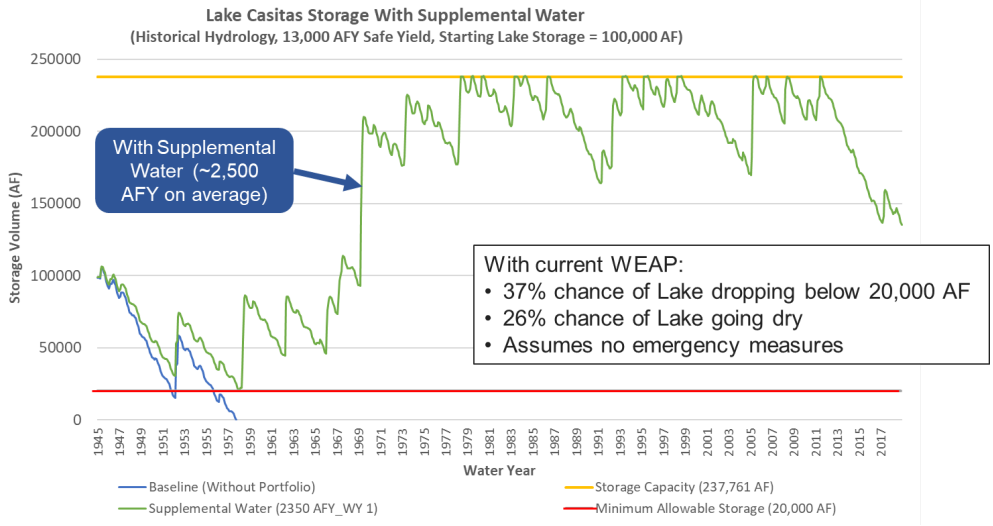


***Figure 4-11**: Plot of Lake Casitas Storage for Historical Hydrology with Addition of 2,500 AFY of Supplemental Water in Every Year*

4-11). The CWRP goal was to add 2,500 AFY of new supply in 5 years.

4.2.3 Portfolio Diversification

All existing Casitas surface and groundwater supplies for both the Casitas System and Ojai Water System originate in the local Ventura River watershed. This places Casitas at risk from droughts or emergencies that affect the local watershed. A strategy to address this risk is to diversify the Casitas water supply portfolios. Diversification involves adding supplies from sources other than the local watershed, e.g., the State Water Project, desalinated seawater, water imported from an adjacent watershed (**Figure 4-12**). The CWRP adopted a goal of diversifying the Casitas water supply portfolio, since a desire for portfolio diversification was one of the main themes from the stakeholder engagement process.

BENEFITS OF WATER SUPPLY DIVERSIFICATION

- Improve reliability during shortage periods
- Provide flexibility in system operations
- Forge regional partnerships

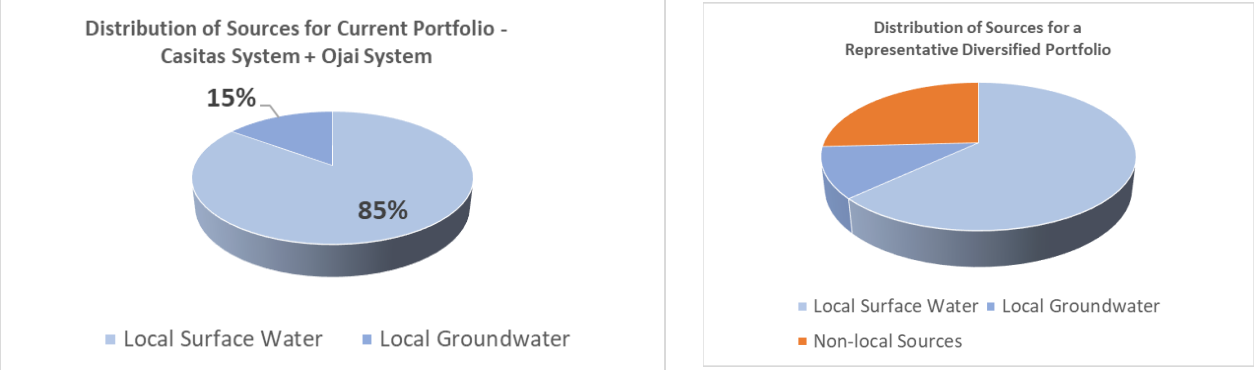


Figure 4-12: Conceptual Representation of a Diversified Portfolio

4.2.4 Water Supply Planning Goals

As a result of the water needs assessment, the Board adopted goals for long-term water supply augmentation, short-term risk mitigation, and portfolio diversification (**Figure 4-13**). These goals were the basis for investigating potential water supply options and developing future water supply portfolios.

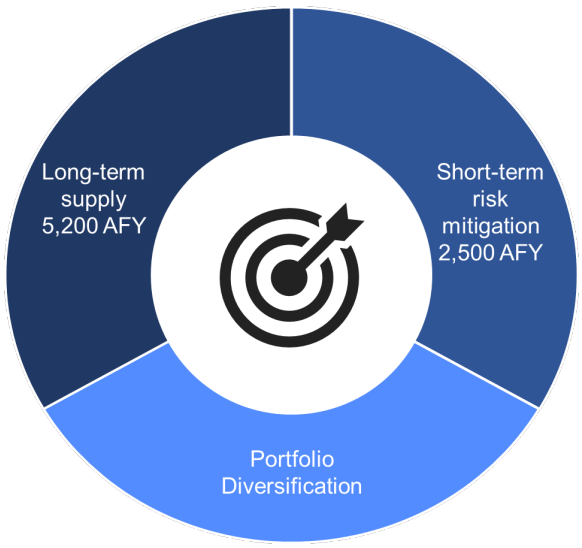


Figure 4-13: Summary of CWRP Planning Goals

Section 5 Water Supply Options Analysis

Potential strategies to address the CWRP goals were developed by first identifying all potential supply options, then screening those to select the most feasible options, and finally combining those feasible options into portfolios that satisfied the CWRP goals. This section describes the process used to select feasible water supply options, which is depicted in **Figure 5-1**.

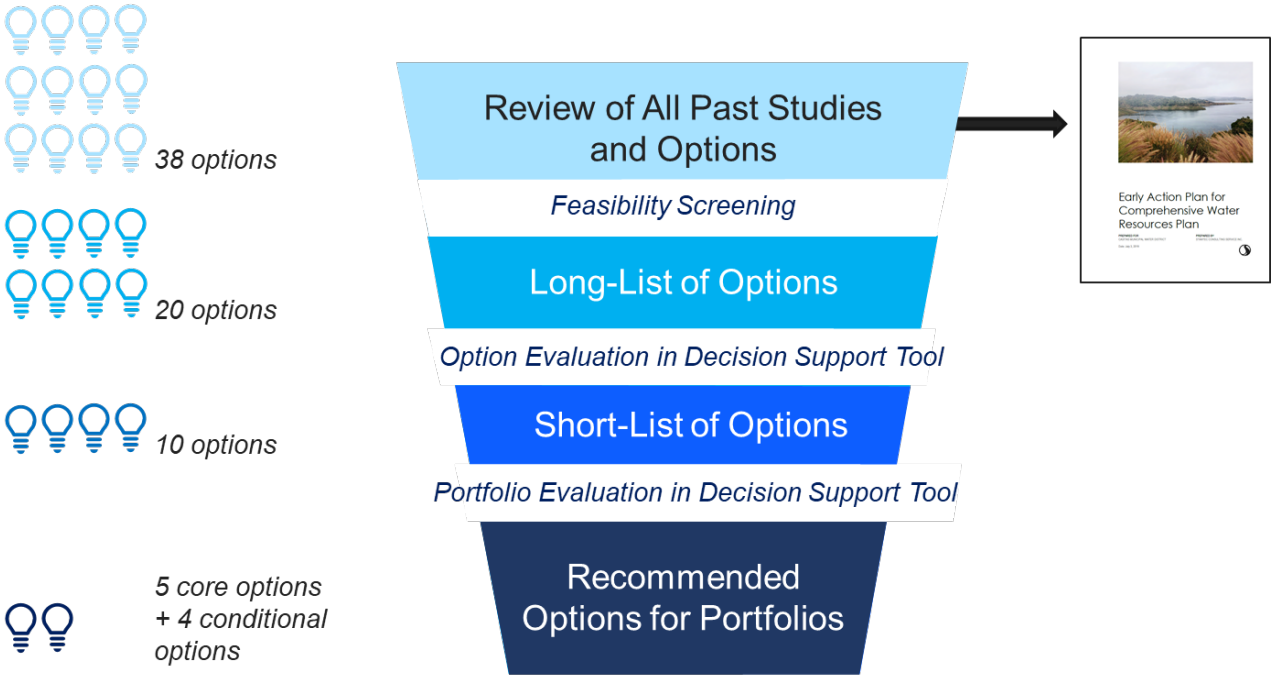


***Figure 5-1**: Water Supply Option Screening and Evaluation Process*

5.1 Water Supply Options Considered

An extensive list of water supply options was prepared by reviewing past water supply planning reports and identifying options considered previously. This included planning reports by Casitas and other agencies, including the recent Casitas Water Security Project analysis (WREA et al, 2016). This process is described in the Background Information Technical Memorandum (Appendix A). Other concepts were added by the project team, and a list of projects suitable for consideration in the CWRP was developed. This list is shown on the next page, with water supply options categorized based on the project type and water source.

STATE WATER PROJECT

SWP 01 Transfers via City of Ventura State Water Project Interconnect and Casitas-Ventura State Water Project Interconnection
SWP 02 Calleguas Emergency Interconnection with Casitas
SWP 03 Ventura-Santa Barbara Counties Interconnection
SWP 04 Casitas-Calleguas Interconnection
SWP 05 City of Ventura Supplemental Water or In-Lieu

RECYCLED WATER

RW 01 Recycled Water from Ojai Valley Sanitary District (OVSD)
RW 02 Scalping Plant on OVSD Collector Main for Re-Use at Ojai Valley Inn
RW 03 Secondary Reclaimed Water to the Ojai Valley
RW 04 Tertiary Reclaimed Water to Rincon Orchards
RW 05 Spray Field in Canada Larga
SW 06 Ojai East Septic Collection, Package Treatment, Recharge

SURFACE WATER

SW 01 San Antonio Creek Spreading Basin Rehabilitation
SW 02 Debris Basin "Enhanced" Percolation
SW 03 Matilija Dam Groundwater/Surface Water
SW 04 Expansion of Robles Canal
SW 05 Construction of a New Dam Upstream of Lake Casitas
SW 06 Robles Forebay Restoration

LOCAL AGREEMENTS

LA 01 Ojai Basin Groundwater Management Agency (OBGMA) Co-operation Agreement (Inter-basin) with Upper Ventura River Groundwater Basin Sustainability Agency
LA 02 Conjunctive Use Agreement with OBGMA

GROUNDWATER

GW 01 Matilija Formation Deep Wells (VRBO, HOBO)
GW 02 Abandoned Wells and Inspection Program
GW 03 Data Collection and Storage
GW 04 Renovate Senior Canyon Mutual Water Company Horizontal Well
GW 05 Continuous Groundwater Level and Quality Monitoring in Ventura River Watershed
GW 06 Ojai Basin Desalter Project
GW 07 Santa Ana Road Underground Stream
GW 08 Well Improvements in Ojai Groundwater Basin

MAINTENANCE AND OPERATIONS

MO 01 Environmental/Habitat Modification
MO 02 Ventura River Watershed Infrastructure Improvements
MO 03 Fire Hydrant and Dead-End Flush Re-Use
MO 04 Resale Water Company System Retrofit/Rehabilitation
MO 05 Casitas Leak Detection and Repair Program
MO 06 Sediment Removal at North End of Lake Casitas
MO 07 Pipeline from Matilija Chlorinator to Hot Springs
MO 08 Robles Diversion Fish Passage Improvements

WATER CONSERVATION

C 01 Conservation/Enhanced Demand Management Programs

DESALINATED WATER

DW 01 Desalinated Water from City of Santa Barbara
DW 02 Casitas Desalinated Water Plant
DW 03 Ventura County Regional Desalinated Water Plant

5.2 Water Supply Options Screening

A Decision Support Tool was developed to allow Casitas to evaluate, compare and screen water supply options. The Decision Support Tool implements a multi-criteria weighted scoring approach to standardize the process for assessing options. Development and application of the Decision Support Tool for the CWRP are described in the Decision Support Tool Documentation Technical Memorandum (Appendix F).

Casitas staff and the Water Resources Committee selected the individual criteria and criteria weights for evaluating water supply options. Criteria were selected in technical, cost, environmental, and social categories. Different criteria weights were explored to test possible outcomes with different stakeholder group preferences (e.g., higher weights for environmental or cost criteria). In the weighting scheme adopted by Casitas the technical and cost categories were given the most importance (highest weights) in the multi-criteria scoring process. The evaluation criteria and the assigned weights are shown in **Table 5-1**.

Table 5-1: *Decision Support Tool Criteria and Weights for Evaluating Water Supply Options*

CRITERIA CATEGORY	INDIVIDUAL CRITERIA	CRITERIA WEIGHTS	CATEGORY WEIGHTS
Technical	Annual Yield	15%	30%
	Technical Feasibility	5%	
	Reliability	5%	
	Time to Implement	5%	
	Phased Construction	-	
Cost	Construction Cost	15%	30%
	O&M Cost	5%	
	Overall Cost Effectiveness	10%	
Environmental	Water Quality	10%	25%
	Permitting and Regulatory Constraints	8%	
	Energy Efficiency	7%	
Social	Casitas Control	5%	15%
	Stakeholder Support	5%	
	Regional and Ancillary Benefits	5%	

Each of the potentially feasible water supply options was evaluated using the Decision Support Tool. Results are shown in **Figure 5-2**, which ranks the options from most preferred (highest score) to least preferred (lowest score). The top 10 scoring options were selected for building portfolios. Since the feasibility of the Matilija Deep Wells option is not fully understood, this option was also included in further portfolio analysis. Selected water supply options are described in the following subsections.

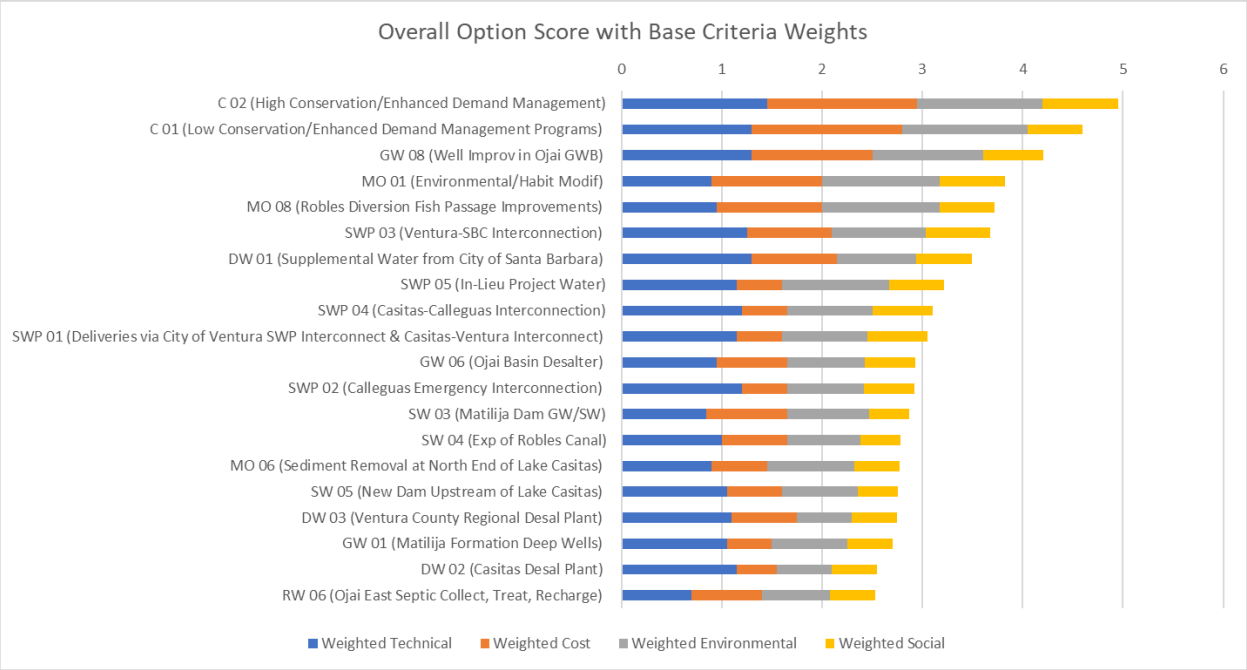


***Figure 5-2**: Decision Support Tool Scoring of Water Supply Options Using Base Weights Selected by Casitas*

Note: High scores denote best performance relative to the evaluation criteria

5.3 Local Water Supply Options

Water supply options to be used in forming portfolios were divided into two groups: Local Options that derive their supply from the Ventura River watershed, and Supplemental Water Options that derive their supply from outside the Ventura River watershed. The Local Options adopted for the CWRP portfolios are listed in **Table 5-2** in the order in which they were ranked in the Decision Support Tool. Detailed descriptions of the Local Options follow the table.

Table 5-2: Summary of Local Options Carried forward to Portfolio Analyses

LOCAL OPTION	BRIEF DESCRIPTION	ESTIMATED AVERAGE ANNUAL YIELD (AFY)	ESTIMATED CAPITAL COST
C 01 / C 02 - Enhanced Conservation/Demand Management	Conservation and demand management practices above and beyond those currently implemented by Casitas and its resale customers. Could include increased rebates, education and outreach, or other conservation incentives. Two levels: 5% savings (C 01) and 10% savings (C 02) compared to planned water use. Can be implemented immediately.	800 – 1,600	$80k - $170k (Grants may be available)
GW 08 - Ojai Basin Well Improvements	Rehabilitation or replacement of existing wells to recover original design yield. Can be implemented in one year.	500	$1.5M
MO 01 - Watershed Management (Arundo removal)	Casitas participation in regional efforts to manage watershed conditions upstream of Lake Casitas to increase runoff. Example: Arundo removal. Can be implemented immediately but benefits will not be realized for several years.	300	-
MO 08 - Robles Diversion Fish Screen Improvements	Improvements to Robles Diversion fish screen to allow more efficient operation and increased diversions to Lake Casitas. Can be implemented immediately.	350	$500K to $10M
GW 01 - Matilija Formation Deep Wells (VRBO, HOBO)	Wells to recover water from the Matilija Deep Aquifer. Horizontal Bore (HRBO) and Vertical Bore (VRBO) options have been considered. Pilot tests are needed to confirm well yields and long-term supply. Significant uncertainty around project feasibility.	Unknown – requires further study	Unknown – requires further study

C 01/C 02 – Conservation/Enhanced Demand Management Programs

Casitas has a long history of implementing conservation policies and demand management measures (DMMs). These policies and DMMs are remarkably effective in reducing water demand during drought periods. During the most recent drought, Casitas customers reduced their water use by about 40%, and over 9,000 AFY of water was saved in 2019 compared with pre-drought demands 2013. In response to the recent drought, Casitas implemented its Water Efficiency Allocation Program, and overuse penalties were implemented as part of the allocation program under the more severe stages of drought. As of April 2019, the State of California declared the drought over, but Casitas has remained in a Stage 3 declaration due to conditions in the local watershed.

Even in non-drought periods, Casitas has a long-standing commitment to water use efficiency. Casitas was a signatory to the Memorandum of Understanding with the California Urban Water Conservation Council, which is now known as the California Water Efficiency Partnership (CalWEP). Some of the programs implemented by the Casitas water conservation section include:

- Water surveys available to all customers
- Free water saving devices including low flow showerheads, faucet aerators, toilet flappers, shower timers, etc.
- Washing machine and toilet rebates through partnership with CalWEP
- Turf removal rebates (previous regional grant funded program)
- System water loss audits and leak detection and repair
- Smart Irrigation Controller rebates
- Agricultural and hobby farm rebates for implementing water efficiency recommendations
- California Irrigation Management Information System (CIMIS) stations
- Outreach using social media
- Water Conservation Demonstration Garden at District Headquarters
- Public education and community outreach through banners newsletters, bill inserts, workshops, tours, etc.
- Water waste investigations (and enforcement of adopted ordinance prohibiting waste of water)

The State has also adopted several initiatives to increase conservation such as the Water Conservation Act of 2009 and, more recently, the Making Conservation a Way of Life legislation passed in 2018. In accordance with State guidelines, Casitas prepares an Urban Water Management Plan every five years, which outlines demand management programs and demonstrates water use efficiency consistent with State policy.

While some of the water savings achieved during the recent drought are expected to be permanent, customers may return to previous behaviors as the pressure to conserve in direct response to an ongoing drought is relaxed. The CWRP assumes that demands will rebound, but will remain 10 percent lower than previously planned UWMP demands (refer to **Section 3** for a description of planned long=term demands).

Option C 01/C 02 consists of implementing additional demand measures to drive average water use even lower on a long-term basis. For the CWRP, two levels of additional demand reduction were considered: 5% and 10% below the average annual demands of 16,000 AFY for the Casitas System and 2,350 AFY for the Ojai Valley System. **Figure 5-3** shows recent historical demands, the CWRP planned demand, and a 10% additional conservation scenario. Specific methods or programs to achieve these reduction have not been specified, but would be part of the Water Conservation Plan proposed as a CWRP recommended program. It is anticipated this program, in addition to measures targeting municipal uses, would include incentives to help promote agricultural water efficiency and ensure the Casitas resale entities continue to aggressively promote conservation among their customers.

The estimated cost of additional demand management was based on the cost of the current Casitas conservation program, which is about $170,000/year excluding salaries and other costs. Gaining an additional permanent 5% savings was assumed to require an increased spending of 50% ($85,000/year); additional permanent 10% savings was assumed to require additional spending of 100% ($170,000/year).

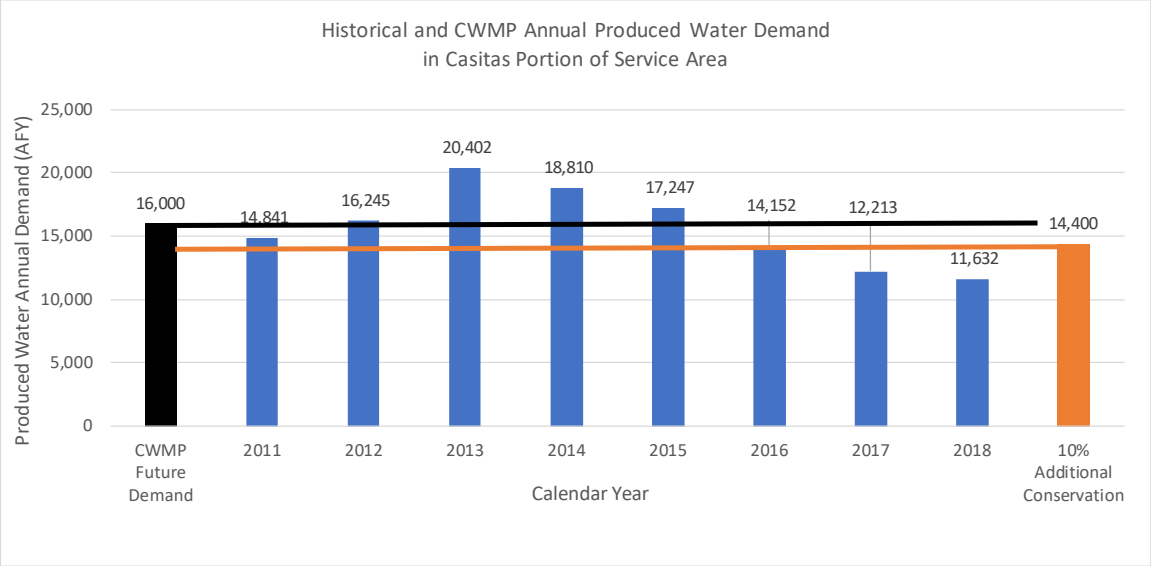


***Figure 5-3**: Historical and CWRP Annual Produced Water Demand in Casitas Service Area Compared to 10% Conservation Option*

GW 08 – Well Improvements in Ojai Groundwater Basin

Casitas acquired GSWC's Ojai Water System in June 2017. Included in the acquisition were six groundwater production wells consisting of the Mutual #4, Mutual #5, Mutual #6, San Antonio #3, San Antonio #4, and the Gorham well.

***Figure 5-4.** Ojai Wellfield Location*

Casitas operates these wells on two parcels located on either side of San Antonio Creek, south of Grand Avenue, as shown in **Figure 5-4.**. The wells range in age from 6 to 47 years old and produce between 70 and 250 gallons per minute (gpm).

Since the acquisition of the wells from Golden State in 2017, Casitas has performed multiple studies on the wellfield with the intent of characterizing the condition of the wells, quantifying interference between the wells, and identifying projects that could be undertaken to improve the production and operation of the existing wells. These studies identified several projects specific to the Ojai Wellfield. Respective locations from the wells can be found in Error! Reference source not found., the Ojai Well Assessment Report (Pueblo Water Resources, 2018). The anticipated yield is approximately 500 AFY.

MO 01 – Environmental/Habitat Modifications

The Environmental/Habitat Modification project consists of activities to reduce the amount of a major water-consuming plant in the Casitas service area and contributing watershed, *Arundo donax* (*Arundo*). Turfgrass is also considered a major water consuming plant, but to a considerably lesser extent and is part of regular conservation measures. Therefore, this project focuses only on removal of *Arundo*.

Arundo is an invasive species with very high water consumption; the rate of water loss is estimated at approximately six times more than that of the native riparian vegetation. Estimates of *Arundo* water use vary between 1 and 48 AFY/acre, with a reasonable estimate of 24 AFY/acre water use (California Invasive Plant Council, 2011). *Arundo* removal and replacement with native riparian plants reduces evapotranspiration losses and results in net savings of approximately 20 AFY per acre of *Arundo* removed. This improves recharge to the groundwater basin as well as helps to keep the river alluvium more saturated.

Arundo removal and replacement with native species can vary in cost based on method of removal. Methods meeting all County requirements has a cost of approximately $20,000 per acre, and other methods could cost as much as $579,000 per acre (Ventura County Watershed Protection District, 2010; WREA & KG, 2016). However, *Arundo* removal is not permanent and ongoing management programs are required to control this invasive species. The Ventura River Watershed Council has included an Arundo-Free Watershed Campaign as one of their top six priority projects per the 2015 Ventura River Watershed Management Plan.

For purposes of the CWRP, this project was assumed to remove 45 acres of *Arundo* per year for an annual average water savings of 300 AFY. Actual increase in supply accruing to the Casitas system would be very difficult to document. If implemented as a water supply project, Casitas would not be responsible for managing *Arundo* removal activities. Casitas would participate with the Ventura County Watershed Protection District and other agencies involved in watershed management projects.

MO 08 – Robles Diversion Fish Passage Improvements

In order to augment the natural inflow to Lake Casitas, Casitas operates the Robles Diversion Dam along the Ventura River. The facility is shown in **Figure 5-5.**. The Robles Diversion Dam diverts water to the Robles Diversion Canal, which in turn feeds Lake Casitas. Due to the Biological Opinion from the National Marine Fisheries Service regarding the endangered steelhead trout, Casitas was required to install and operate a fish screen at the Robles Diversion Dam. After the installation of the fish screen in

Figure 5-5. *Robles Diversion Fish Screen (MKN Associates, 2019)*

2004, the Robles Diversion no longer could divert the maximum design flows into Lake Casitas due to restrictions in the Biological Opinion and due to frequent clogging and blockage of the fish screens by debris in the river, especially during high flows. The existing cleaning equipment cannot keep up with the debris loading, which limits the amount of water diverted into the Robles Diversion Canal. This is especially problematic after wildfires in the tributary watershed such as the recent Thomas Fire when the sediment and debris load significantly increased. The existing operations reduce the flow through the screens or shut the diversion down in order to perform manual cleaning, both of which significantly reduce the amount of flow diverted to the lake during storm runoff.

To optimize the operation of the Robles Diversion Dam and maximize the intake of the diversion structure into the Robles Diversion Canal, several alternatives were proposed in the Robles Diversion Fish Screen Alternatives Feasibility Study (MKN Associates, 2019):

- Improve the existing brush system.
- Replace the vertical wedge-wire screens with horizontal wedge-wire screens to improve cleaning efficiency
- Install a fixed manifold back-spray system to work in tandem with an improved brush system.
- Replace the existing fixed screen system with a traveling screen.
- Reduce the load on the existing screen system by suppling the fish ladder auxiliary flow separately from the screened v-channel flow. This is intended to be used in combination with Alternative 1.

The costs range from $30,000 to $12M depending on the alternative and selected components. Pilot studies are being performed to determine the preferred alternative. The CWRP assumes a cost of $3 million for a mid-range alternative.

The additional yield that would be captured after implementing Robles fish screen improvements was estimated by improving the efficiency of the Robles Diversion in the Lake Casitas Yield Model. Results indicated an improvement in average annual yield of 350 AFY based on a 10% increase in overall diversion efficiency (i.e., the percentage of legally available diversions that can be physically diverted from the Ventura River to Lake Casitas).

GW 01 – Matilija Formation Deep Wells

The Matilija Formation Deep Wells project consists of the construction of one or more deep water wells in the Matilija sandstone. This formation contains groundwater that recharged over very long time periods. The project includes the exploration of both horizontal (HOBO) and vertical (VRBO) wells and allows for drought-period production of groundwater directly to Casitas' water transmission system and/or the Robles Canal. Production capacity and long-term yield is currently unknown and would require a pilot project to estimate.

This is a potential resource with incomplete information on geologic characteristics, well feasibility, and other factors. Casitas contracted a team of professionals to provide a peer review of the feasibility of the proposed project. While findings were promising in some cases, further analysis is required. In addition, the District will need to understand the water rights associated with this water source and the impacts to the overlying landowners.

5.4 Supplemental Water Supply Options

Supplemental water supply options develop water from sources outside the Ventura River watershed. The primary supplemental water supply option is connection to the California State Water Project.

5.4.1 State Water Project Overview

According to the California Department of Water Resources (DWR), California's State Water Project (SWP) was constructed in the 1960s and 1970s to supply water to more than 27 million people and 750,000 acres of farmland. Planned, constructed, and operated by DWR, the SWP is one of the world's largest water, power, and conveyance systems. In the past decade it has conveyed an annual average of 2.9 million acre-feet of water. The SWP relies on a delivery system of reservoirs, aqueducts, power plants, and pumping plants that extend more than 700 miles (California Department of Water Resources, 2015). The SWP allows the movement of water from northern to southern California and the ability to exchange water with SWP contractors throughout the state. The SWP also provides flood control, power generation, recreation and environmental benefits to the State of California. The SWP primary water delivery facilities are shown in **Figure 5-6**.

In 1963, the Ventura County Flood Control District (VCFCD) contracted with the State of California for 20,000 AFY of water from the SWP. In 1971, the VCFCD assigned the administration of the Water Supply Contract to Casitas for the three agencies. Casitas' contractual share is 5,000 AFY, the City of Ventura has 10,000 AFY and United Water Conservation District (UWCD) has 5,000 AFY. To date the infrastructure is not in place to deliver the contractual share to Casitas and the City of Ventura. UWCD can access SWP through Lake Piru. Infrastructure requirements are being evaluated from agencies currently receiving SWP water from north and south of Ventura County.

To the north of Ventura County, the SWP serves Santa Barbara County through the Coastal Branch Aqueduct and a 42-mile long Central Coast Water Authority pipeline shown in Error! Reference source not found. (California Department of Water Resources, 2012). This pipeline allows for the SWP to deliver water to Lake Cachuma for conveyance to South Santa Barbara County agencies via Tecolote Tunnel and the South Coast Conduit, which extend as far south as Carpinteria Reservoir. This allows for opportunities to be explored for delivering SWP to Casitas.

Figure 1-1 Names and Locations of Primary Water Delivery Facilities, December 31, 2012

Figure 5-6 State Water Project Primary Water Delivery Facilities (California Department of Water Resources, 2015)

To the south of Ventura County, the Metropolitan Water District of Southern California (MWD) is a regional wholesaler that provides water to 26 member public agencies (The Metropolitan Water District of Southern California, 2020). MWD imports water from both the SWP and the Colorado River Aqueduct. Calleguas Municipal Water District (Calleguas) is a member agency of MWD and receives their SWP water through a complex delivery system. Water delivered to Calleguas is treated by MWD at the Joseph Jensen Filtration Plant in Granada Hills. Once SWP water reaches Calleguas via the East Portal Facility in Chatsworth, it is distributed through the potable water distribution system (Figure 5-8), stored in Lake Bard, or injected into the Fox Canyon aquifer. (Calleguas Municipal Water District, 2015).

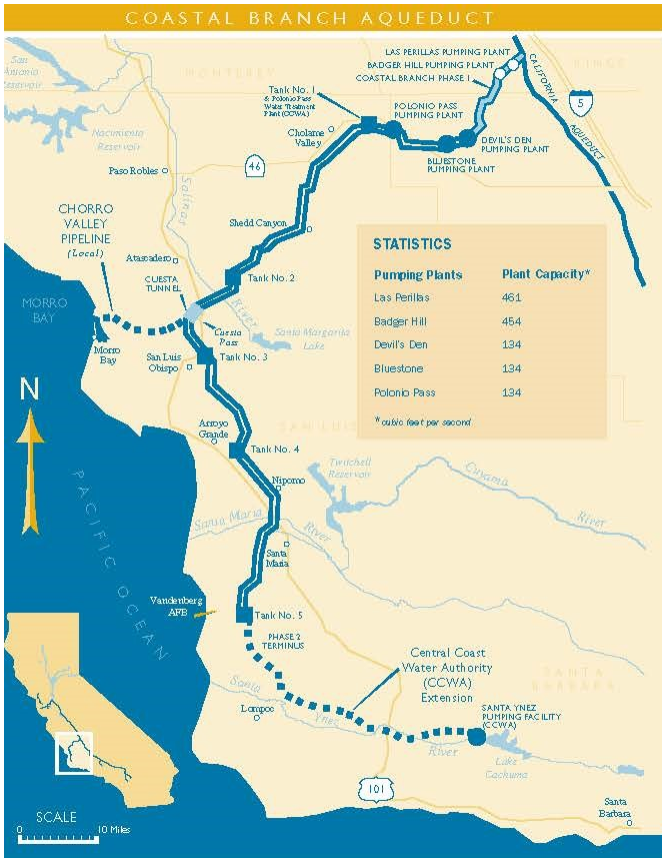


Figure 5-7 *State Water Project Coastal Branch Aqueduct (The Metropolitan Water District of Southern California, 2020)*

Figure 5-8 *Calleguas Municipal Water District Potable Water Distribution System (Calleguas Municipal Water District, 2015)*

5.4.2 Casitas State Water Project Options

While Casitas' water has historically come from local supplies, Casitas has contracted and paid the fixed contractual costs for the full allocation of 5,000 AFY of imported water from the SWP. The contracted amount of up to 5,000 AFY is referred to "Table A" water, which is a table in the contract referring to the maximum amount to be delivered. Imported water has not been supplied to Casitas due to lack of local conveyance infrastructure to deliver the water.

Supplemental Water Options include projects that give Casitas access to supplies from outside the Ventura River watershed. **Table 5-3** lists the Supplemental Water Options considered for the CWRP. They include connections to existing and proposed water infrastructure in either the Ventura area or Santa Barbara County to provide access to State Water Project water and other sources.

Average annual yields of State Water Project options were based on State Water Project system modeling performed by the State of California and the Casitas State Water Project Table A contract amount of up to 5,000 AFY. Due to hydrologic variability and complex operational criteria, the State has estimated the average long-term Table A yield to State Water Project contractors is 62% of the Table A amount (Department of Water Resources, 2018). This estimate of future reliability is slightly about the same as the historical Table A deliveries for 2000-2019 shown in Figure 5-9. The average allocation in the last ten years has been reduced due to extreme drought and environmental restrictions. For the Casitas Table A amount of 5,000 AFY, 62% reliability translates to a long-term average SWP yield of 3,100 AFY. These estimates assume the Delta Conveyance Facility (DCF) is completed as currently proposed. If the DCF is not completed, or if Casitas chooses not to participate in DCF funding, the long-term reliability of its State Water Project deliveries would be reduced to about 40% for an average annual yield to Casitas about 2,000 AFY.

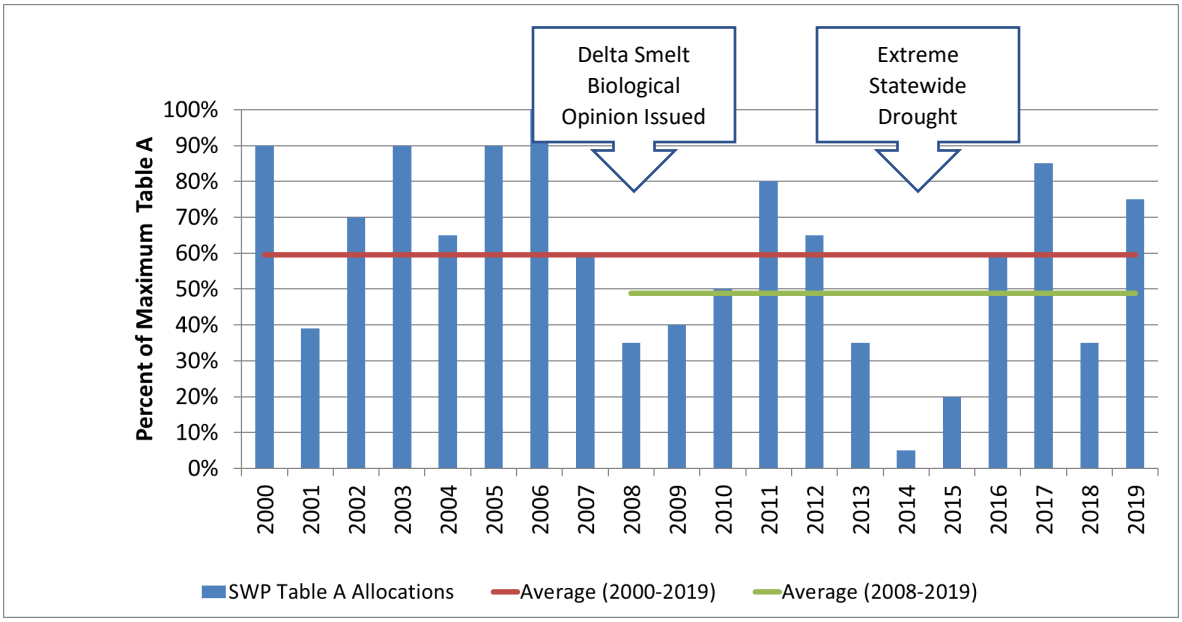


***Figure 5-9**: Historical SWP Table A Deliveries, 2000-2019*

***Table 5-3**: Summary of Supplemental Water Options Carried Forward to Portfolio Analyses*

SUPPLEMENTAL WATER OPTIONS	BRIEF DESCRIPTION	ESTIMATED CAPACITY (AFY)	ESTIMATED AVERAGE ANNUAL YIELD (AFY)	ESTIMATED CAPITAL COST
SWP 01 - Deliveries via City of Ventura State Water Project Interconnect and Casitas-Ventura State Water Project Interconnection	State Water Project water delivered from Calleguas Municipal Water District to the City of Ventura through a proposed 30-inch pipeline. The City of Ventura will make upgrades to their distribution system to allow State Water Project water to reach the west side of Ventura where Casitas will construct a 10 cfs pump station to distribute into the Casitas water system.	2,000	2,000	$33M
SWP 03 -Ventura-Santa Barbara Counties Interconnection	State Water Project water delivered from the Carpinteria Valley Water District to Casitas through a proposed 16-inch interconnection pipeline and two pump stations.	2,000	2,000	$14.5M
SWP 04 - Casitas-Calleguas Interconnection	State Water Project water delivered from Calleguas Municipal Water District through the City of Ventura through a proposed 36-inch pipeline to allow State Water Project water to reach the west side of Ventura where Casitas will construct a 30 cfs pump station to distribute into the Casitas water system.	5,000	3,100*	$136M
SWP 05 - City of Ventura Supplemental or In-Lieu Water	After the implementation of SWP 01 or parts of SWP 04, Casitas would have ability to use the infrastructure to access other supplemental water sources, such as in-lieu transfer of State Water Project water with the City of Ventura to offset their demands from Lake Casitas.	2,000	2,000	Cost for SWP 04 makes this option possible
DW 01 - Supplemental Water or Desalinated Water from City of Santa Barbara	After the implementation of SWP 03, Casitas would have the ability to use the infrastructure to access other supplemental water sources such as City of Santa Barbara desalinated water or other future supplemental sources.	2,000	2,000	Cost for SWP 03 makes this option possible

*Average annual yield limited to Casitas Table A allocation for State Water Project

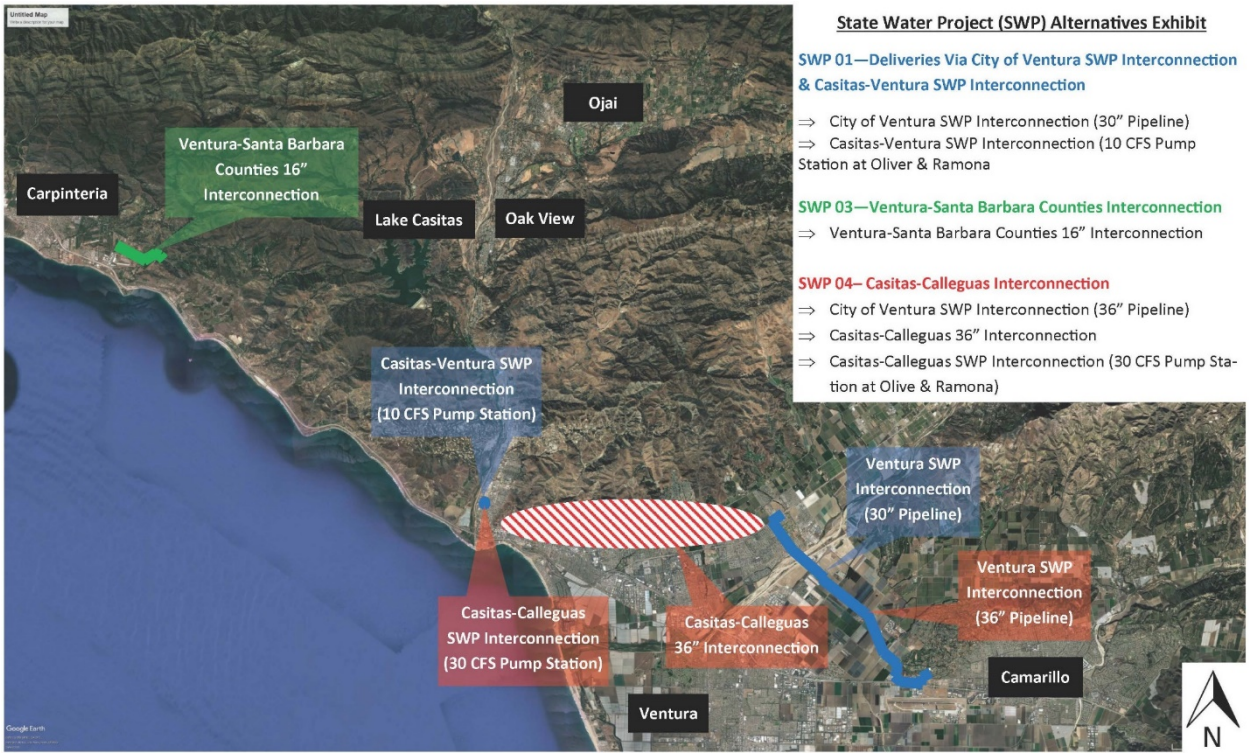


Figure 5-10 *Casitas State Water Project Interconnection Options*

SWP 01 – Deliveries Via City of Ventura State Water Project Interconnection & Casitas-Ventura State Water Project Interconnection

This State Water Project alternative, referred to as the Deliveries via City of Ventura State Water Project Interconnection and Casitas-Ventura State Water Project Interconnection, involves the combination of two projects (1) the Ventura State Water Project Interconnection and (2) the Casitas-Ventura State Water Project Interconnection. The first project involves the City of Ventura and other partner agencies including Casitas designing and constructing a 36-inch bi-directional pipeline to connect Calleguas Municipal Water District (Calleugas) and the City of Ventura. Casitas has shared in the cost of the City of Ventura's State Water Interconnection Alignment Study and Environmental Impact Report. The interconnection would allow for the delivery of SWP water to be wheeled through Calleguas and allow for in-lieu use of water by the City of Ventura, which reduces the use of water in Lake Casitas. The City of Ventura would also upgrade their existing infrastructure to allow for the delivery of SWP water to reach the west side of their distribution system and ultimately to a proposed Casitas pump station and the second phase of the project. This second phase of the project involves Casitas constructing a 10 cubic feet per second (cfs) pump station at Olive Street and Ramona Street in the City of Ventura. In early 2019, Casitas retained an engineering firm to prepare the Casitas-Ventura State Water Project Interconnection Preliminary Design and investigate how to convey water from the west side of Ventura to connect to Casitas' transmission pipelines near Foster Park, to supplement water supply from Lake Casitas. The Casitas-Ventura State Water Project Interconnection would be dependent on the City of Ventura's State Water Interconnection Project being completed.

This project would give Casitas access to its SWP Table A allocation as well as Article 21 surplus water when available. The Department of Water Resources (2018) estimates a long-term average of a total of 50,000 AFY of Article 21 water would be available to SWP contractors. Because Article 21 water is not available in all years and the amount available to Casitas is uncertain, it is not considered a reliable source of water for the CWRP. Option SWP 01 would also allow Casitas to enter into contracts with the City of Ventura for future surplus water based on some of their future water projects.

SWP 03 – Ventura-Santa Barbara Counties Interconnection

This State Water Project alternative, referred to as the Ventura-Santa Barbara Counties Interconnection, involves a bi-directional potable water pipeline to connect with Carpinteria Valley Water District (CVWD) to allow for Casitas to receive SWP water via two proposed booster pump stations and minor treatment facilities. Preliminary design is complete and involves a high-capacity and high-pressure 8,000 linear feet pipeline to connect the transmission mains between the CVWD system and the Casitas water distribution system.

State Water would be delivered through facilities owned by various entities, including California DWR, Central Coast Water Authority, Bureau of Reclamation (Lake Cachuma and South Coast Conduit), City of Santa Barbara (treatment plant), and Carpinteria Valley Water District pipelines. Therefore, several wheeling agreements would be necessary.

The Casitas SWP Table A contract amount is 5,000 AFY. However, the SWP annual allocations are typically less due to hydrologic variability and complexity of operations. Analyses by the California Department of Water Resources (Department of Water Resources, 2018) estimate future long-term Table A deliveries to be 62% of the Table A contract amount. Operational modeling results provided in the report appendix for each State Water contractor show the Central Coast Branch SWP supplies have a long-term average of about 61% of the contracted Table A amount. This estimate assumed construction of the Delta Conveyance Facility (DCF), which would address some of the existing and future hydrologic and regulatory constraints to SWP operations. Infrastructure being contemplated for SWP 03 would be capable of delivering 2,000 AFY to Casitas (40% of Table A). For the CWRP the long-term average SWP yield from this connection was assumed to be 2,000 AFY.

This project would give Casitas access to its SWP Table A allocation as well as Article 21 surplus water when available. The Department of Water Resources (2018) estimates a long-term average of a total of 50,000 AFY of Article 21 water would be available to SWP contractors. Because Article 21 water is not available in all years and the amount available to Casitas is uncertain, it is not considered a reliable source of water for the CWRP. Option SWP 03 would also allow Casitas to enter into contracts with Santa Barbara County entities for surplus water or water produced from the Santa Barbara seawater desalination plant.

It is estimated the Ventura-Santa Barbara Counties Interconnection could be constructed in 3-5 years.

SWP 04 – Casitas-Calleguas Interconnection

This State Water Project alternative, referred to as the Casitas-Calleguas Interconnection, involves a bi-directional potable water pipeline through Ventura to connect with Calleguas Municipal Water District (Calleguas) to allow Casitas to receive SWP water via new booster pump stations and minor treatment facilities. In addition to delivering its SWP Table A allocation and Article 21 surplus water when available,

the interconnection would create opportunities for Casitas to consider agreements with other water entities in the Ventura/Oxnard area for exchange or other cooperative water management strategies. The interconnection would also allow Calleguas to receive water from Lake Casitas during emergencies.

State Water would be delivered through facilities owned by various entities, including California DWR, Metropolitan Water District of Southern California, Calleguas, and the City of Ventura. Therefore, several agreements would be necessary.

The Casitas-Calleguas Interconnection makes use of Ventura's proposed SWP facilities, either as planned or through required upgrades to increase capacity. Thus, this option requires coordination and cost-sharing with Ventura to accomplish its SWP connection. Casitas is actively engaged in this project with Ventura at this time.

It is estimated the Casitas-Calleguas Interconnection would be constructed in a 5- to 10-year timeframe.

SWP 05/DW 01 – Supplemental Water

This alternative involves access to supplemental water from a variety of possible sources through SWP 03 and SWP 04 infrastructure. Planned pipeline capacity in connections to Ventura or Santa Barbara County would be sized for maximum deliveries of SWP water. In non-peak delivery months and in years when the State Water Table A allocation is less than the full contract amount, these pipelines would not be operated at capacity and could be used to convey water from other sources such as supplemental water purchases and water transfers. Examples of possible supplemental water sources that could be delivered using SWP connection infrastructure are briefly described below.

Article 21 Water from SWP. Article 21 water is SWP water that is not used by State Water contractors and is made available for purchase by other State Water contractors. The Department of Water Resources (2018) indicates the long-term annual average of Article 21 water available for the SWP system is 50,000 AFY. Casitas could choose to purchase Article 21 water to supplement its Table A deliveries if needed and convey that water through the same SWP connection infrastructure.

In-lieu Water Transfers with Ventura. Casitas has shared in the cost of the City of Ventura's SWP Interconnection Alignment Study and Environmental Impact Report. The City of Ventura's Interconnection Project allows for in-lieu use of State Water by the City of Ventura, which reduces the use of water in Lake Casitas.

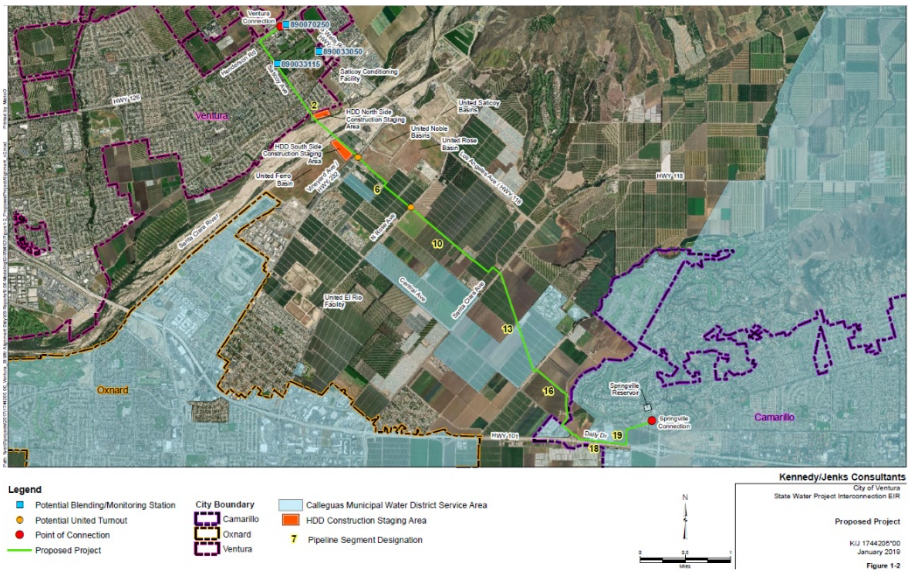


Figure 5-11. Proposed Ventura SWP Interconnection Alignment

Santa Barbara Desalination and Other Regional Supplies. The City of Santa Barbara reactivated its desalination plant in late 2017. The Desalination Plant has a full build-out capacity of 10,000 AFY but is currently operating around 3,125 AFY. Desalinated water or other supplies conveyed through regional facilities could potentially be provided to the Casitas service area through the proposed Ventura-Santa Barbara Counties Interconnection facilities and reduce the demand on Lake Casitas.

These are just examples of possible supplemental water sources in addition to SWP supplies. Once the SWP delivery infrastructure is in place, Casitas will have the ability to explore several possible supplemental supply or water transfer opportunities. Some may become part of Casitas' annual water portfolio, while others may be viewed as short-term emergency supplies.

Section 6 Portfolio Development and Ranking

Water supply options were combined in different ways to meet the three CWRP objectives for long-term augmentation supply, short-term mitigation supply, and portfolio diversification. Three portfolio strategies were applied: Local Focus Portfolios that emphasized more Local Options; Diversification Portfolios that emphasized more Supplemental Water Options; and Balanced Portfolios that used a balanced blend of the other two strategies. As a sensitivity analysis, some portfolios were evaluated assuming the proposed Delta Conveyance Facility (DCF) Project is not constructed by the State of California. This assumption lowers both the yield and the cost of portfolios with supplemental water derived from State Water Project options. Because only a few Supplemental Water Options were available for portfolios, and only one could be implemented in time to meet the short-term mitigation objective (SWP 03 – Ventura-Santa Barbara Counties Connection), most portfolios were comprised of similar projects.

The Decision Support Tool was used to rank portfolios using the same criteria and weights as were used to rank water supply options. Portfolio scores were computed as the sum of the product of the score of each individual option in the portfolio multiplied by the fraction of the total portfolio yield provided by that option. Portfolio scoring and ranking is shown in **Figure 6-1**. Options included in the top portfolios were incorporated into the recommended long-term strategic water supply plan, described in **Section 7**.

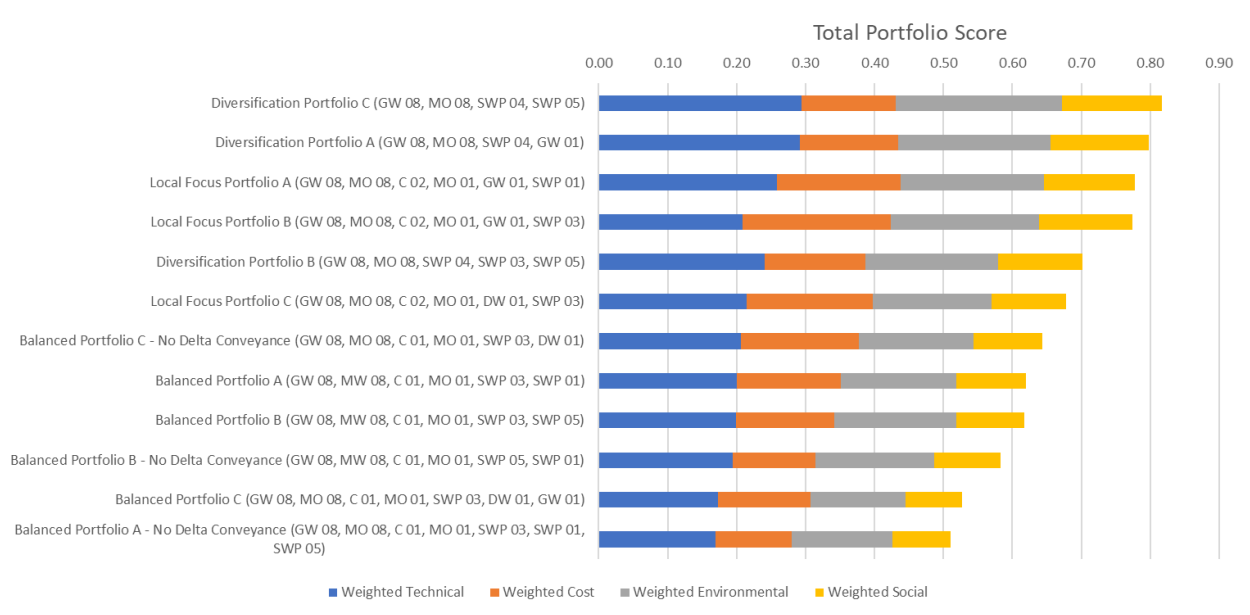


***Figure 6-1**: Decision Support Tool Scoring of Portfolios*

Section 7 Recommended Plan

The CWRP recommended plan consists of three types of components: new planning policies, a portfolio of new water supply projects, and new and updated programs. Each group of recommendations is described in this section.

PLANNING POLICIES

- Supply and Demand Estimates
- Minimum Allowable Lake Storage
- Risk Based Planning

PORTFOLIO OF PROJECTS

- Local Options
- Supplemental Water Options
- Conditional Options

NEW AND UPDATED PROGRAMS

- Water Conservation Plan
- WEAP Policy Update
- Supplemental Water Integration Plan

7.1 Planning Policies

The CWRP recommended plan includes several new policies that should become part of the District's approach to future water supply planning. These policies will assure Casitas has a robust risk-based approach to meeting future water supply and demand conditions. Recommended new policies are depicted in **Figure 7-1** and listed below. Adoption of these policies was assumed for development of the portfolio of projects included in the recommended plan and is recommended as the basis for future planning documents such as the 2020 Urban Water Management Plan and Casitas System Master Plan.

- **Future Annual Demand:** The Casitas System forecasted 2040 water demand is 16,000 AFY, reduced from the previous estimate of 17,500 AFY.
- **Future Hydrology:** The hydrology used for estimating Lake Casitas yield is 100 synthetic traces based on the statistics of the observed historical hydrology to incorporate uncertainty around future climate variability, rather than historical hydrology alone.
- **Safe Demand from Lake Casitas:** Lake Casitas yield for water supply planning is based on the concept of safe demand, in which Casitas System demand is reduced as Lake storage falls in accordance with the target demands in the WEAP policy. Previous plans were based on an estimate of safe yield, in which demands were assumed to be constant every year.
- **Reliability of Lake Casitas Supply:** The 95% reliable safe demand with an adjustment for climate change is adopted as the Lake Casitas yield for supply and water needs analyses. The 95% reliable safe demand for Lake Casitas is 10,660 AFY, compared to the previous safe yield (100% reliable) estimate of 20,440 AFY.
- **Minimum Allowable Storage:** The minimum storage volume allowed in Lake Casitas for non-emergency operations is 20,000 AF, rather than the dead pool storage of 950 AF.

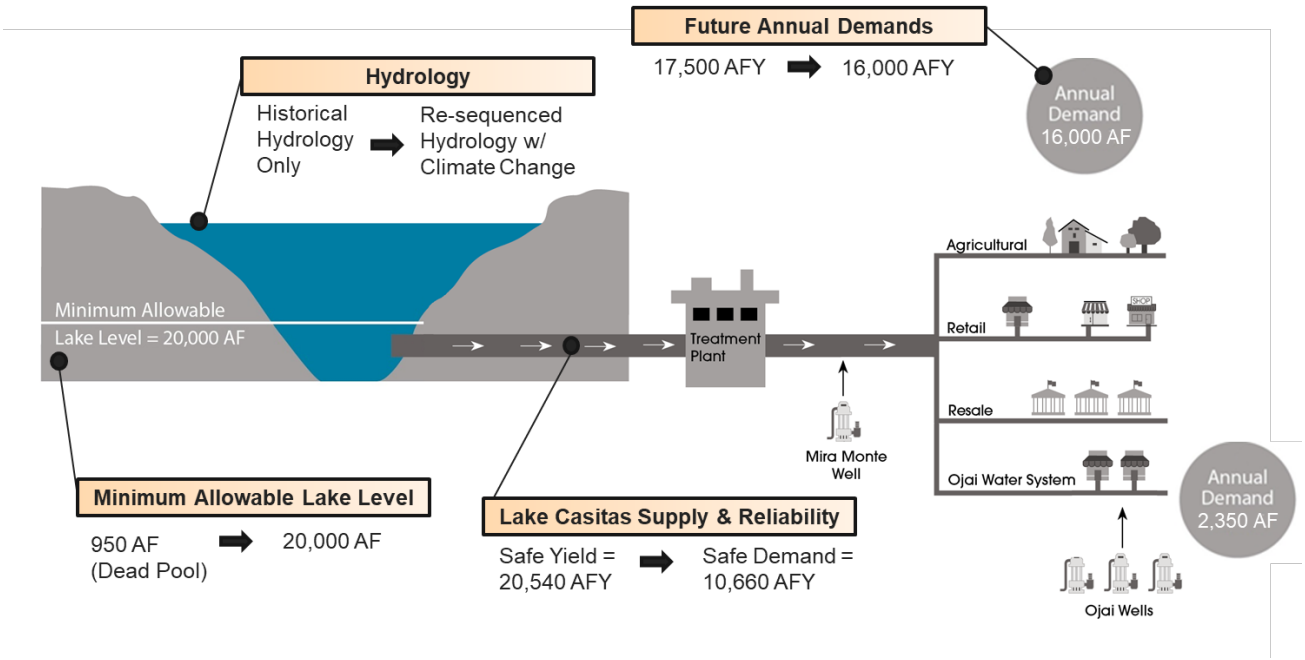


Figure 7-1: Graphical summary of new and revised planning policies

7.2 Portfolio of Projects

The recommended portfolio of projects satisfies the goals of the CWRP. It is a best-fit blend of the portfolios evaluated in the previous section. It provides at least 5,200 AFY of long-term supply, at least 2,500 AFY of additional supply within 5 years to address immediate risk, and diversifies the Casitas portfolio (**Figure 7-2**).

Projects were classified in one of three categories.

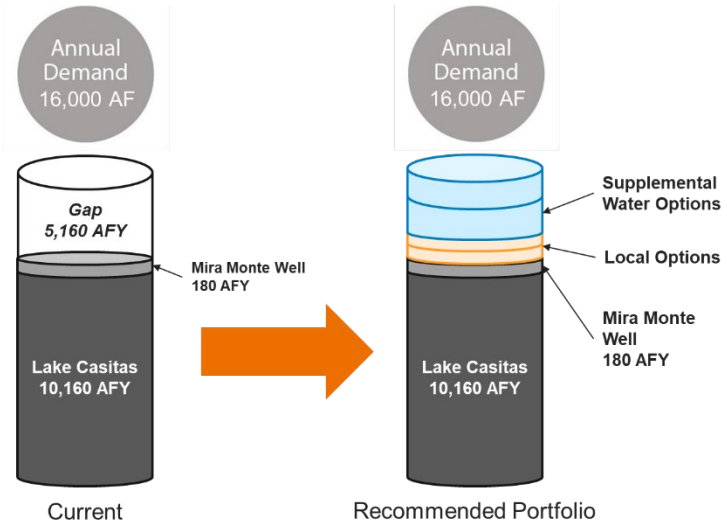


Figure 7-2: Summary of recommended portfolio components

LOCAL NEAR-TERM, NO-REGRET OPTIONS are recommended for implementation as part of the plan

PREFERRED SUPPLEMENTAL WATER OPTIONS are recommended for implementation as part of the plan

CONDITIONAL OPTIONS should be tracked for possible implementation later if one or more of the recommended options cannot be implemented or produces less average annual yield than planned

7.2.1 Meet Long-Term Supply Gap of 5,200 AFY

The options from the top scoring portfolio "Diversification Portfolio C" (Section 6) are recommended for implementation. The options included in the top portfolio are:

- GW 08 – Ojai Basin Well Rehabilitation and Replacement (500 AFY average annual supply)
- MO 08 – Robles Fish Screen Improvements (350 AFY average annual supply)
- SWP 04 – Casitas-Calleguas Interconnection (up to 3,100 AFY average annual supply)
- SWP 05 – Supplemental Water (up to 1,250 AFY average annual supply)

Some SWP 04 facilities provide an opportunity to also implement SWP 01 (in-lieu deliveries). This could be considered for a phased implementation approach. However, SWP 04 cannot be implemented within 5 years so it does not help address the 2,500 AFY near-term goal.

7.2.2 Meet Short-Term Risk Mitigation of 2,500 AFY

While the options in the top portfolio meet the long-term goal of an additional 5,200 AFY of supply, the Casitas-Calleguas interconnection is expected to take 5-10 years to construct. In order to meet the CWRP goal of 2,500 AFY supply in the near term, Casitas should pursue implementation of the following options, which have a shorter implementation timeline:

- SWP 03 – Ventura-Santa Barbara Interconnection (3,100 AFY average annual supply when combined with SWP 04)
- DW 01 – Supplemental Water (1,250 AFY average annual supply when combined with SWP 05)

The Ventura-Santa Barbara Interconnection meets all three of the CWRP goals. By building interconnections to the north (Santa Barbara) and to the south (Callegaus), Casitas would have increased opportunities for regional partnerships, improved reliability during emergencies, and operational flexibility. Once SWP 03 is constructed, Casitas would have the opportunity for supplemental water (Option DW 01).

7.2.3 Portfolio Diversification

The recommended portfolio of projects meets the goal for diversifying the Casitas water supplies. Based on the average annual yield available from each source of supply, 26% of the future portfolio is comprised of non-Ventura River watershed sources, as shown in **Figure 7-3**.

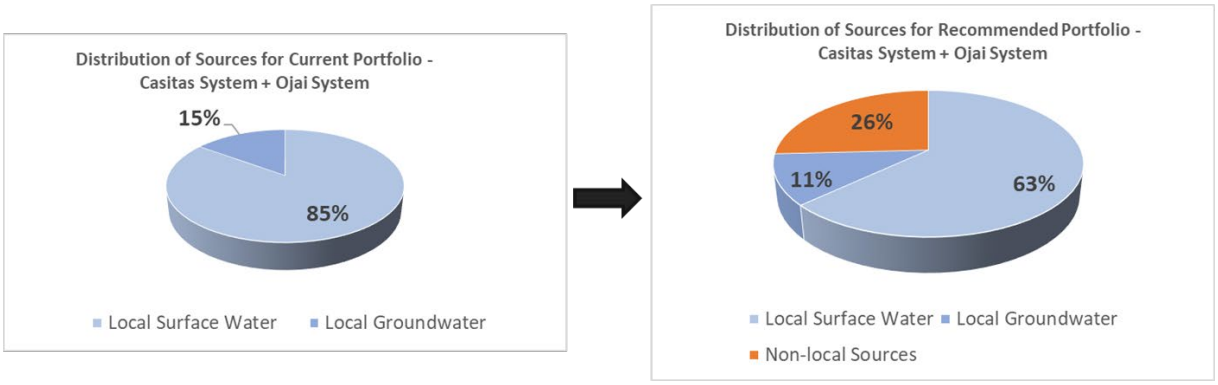


***Figure 7-3**: Conversion of Current All-Local Supply Portfolio to a Diversified Portfolio*

7.2.4 Adaptive Management with Conditional Options

Conditional options would be tracked and implemented only if one of the local or supplemental water options either could not be implemented as planned or delivered less average annual yield than planned. The following options were in the top 5 portfolios, and should be tracked and implemented as needed.

- Matilija Formation Deep Wells (VRBO or HOBO): Due to many uncertainties surrounding this option, it was included in the Conditional Options category until additional studies are performed to further define its feasibility.

- Watershed Management/*Arundo* Removal: Because the benefits of this option would be difficult to quantify for Casitas, this option is considered conditional. Other governmental and non-profit agencies are currently implementing *Arundo* removal in the Ventura River watershed, and Casitas could form partnerships and provide funding for enhanced programs implemented by others (e.g. Ventura County Watershed Protection District) that would prioritize watershed management efforts in the Lake Casitas watershed.

- Additional Demand Management: Because the CWRP planning policies already include a 10% demand reduction compared to the most recent UWMP, the long-term supply gap was addressed through developing new water supply projects and additional demand management was recommended as a conditional strategy. It is recommended that Casitas develop a Water Conservation Plan to evaluate the potential savings and cost effectiveness of various conservation measures.

- Additional Supplemental Water: The supplemental water option involves access to water through SWP 03 and SWP 04 infrastructure via in-lieu transfers from Ventura or other supplies such as desalinated water from the City of Santa Barbara. The recommended plan includes 1,250 AFY of supplemental water on an average annual basis to meet the requirement for 5,200 AFY of additional average annual supply. As a conditional option, Casitas could pursue more supplemental water as needed for droughts and emergencies.

In addition to monitoring performance of the recommended local and supplemental water options, tracking of these conditional options may include activities such as performing preliminary feasibility studies, revisiting cost estimates, or exploring interagency partnerships.

7.2.5 Summary of Recommended Portfolio

Figure 7-4 summarizes the Local Options, Supplemental Water Options, and Conditional Options comprising the CWRP recommended portfolio.

Local, near term, no-regrets options	Preferred supplemental water options
1. **GW 08** - Ojai Basin Well Rehabilitation and Replacement (500 AFY) 2. **MO 08** - Robles Fish Screen Improvements (350 AFY)	1. **SWP 03** – Ventura-Santa Barbara Interconnection* 2. **SWP 04** – Casitas-Calleguas Interconnection* 3. **SWP 05/DW 01** Supplemental Water (1,250 AFY)

Conditional options – track only
1. **C 01** – Demand Management: 5%-10% (800-1,600 AFY) 2. **MO 01** – Watershed Management/Arundo Removal (300 AFY) 3. **GW 01** – Matilija Deep Formation Wells (Unknown) 4. **SWP 05/DW 01** – Supplemental Water Options (up to 4,000 AFY)

*Combined average annual yield of SWP 03 and SWP 04 is 3,100 AFY

***Figure 7-4**: Water Supply Options in the Recommended Portfolio*

Figure 7-5 depicts how the options in the recommended portfolio align with the three CWRP goals. Only option SWP 03 Ventura – Santa Barbara County Interconnection addresses all three CWRP goals.

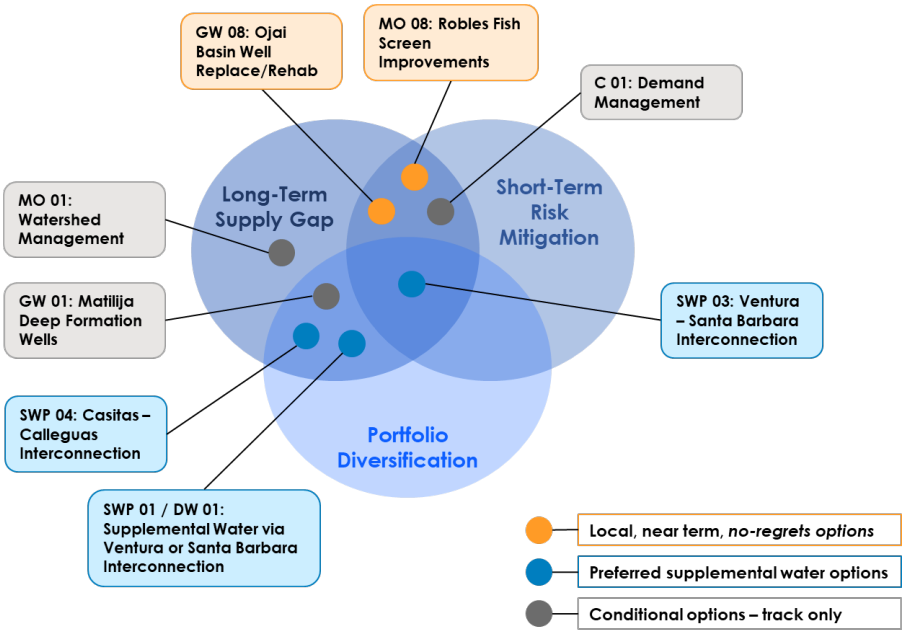


***Figure 7-5**: Correlation between Recommended Options and CWRP Goals*

7.2.6 Verification of Recommended Portfolio

The recommended portfolio was tested in the Lake Casitas Yield Model by simulating additional yield from the recommended projects come online in the following years:

- Ojai well rehabilitation – Year 1

- Robles fish screen improvements – Year 1
- Ventura-Santa Barbara County Interconnection – Year 5
- Casitas-Calleguas Interconnection with additional supplemental water – Year 10

Figure 7-6 shows the performance of the Lake with historical hydrology, and **Figure 7-7** shows the performance of the Lake with dry hydrologic trace from among the 100 synthetic traces. In both cases Lake Casitas would have gone dry without the additional water projects, and with the projects the Lake can be effectively maintained above the minimum allowable storage level of 20,000 AF.

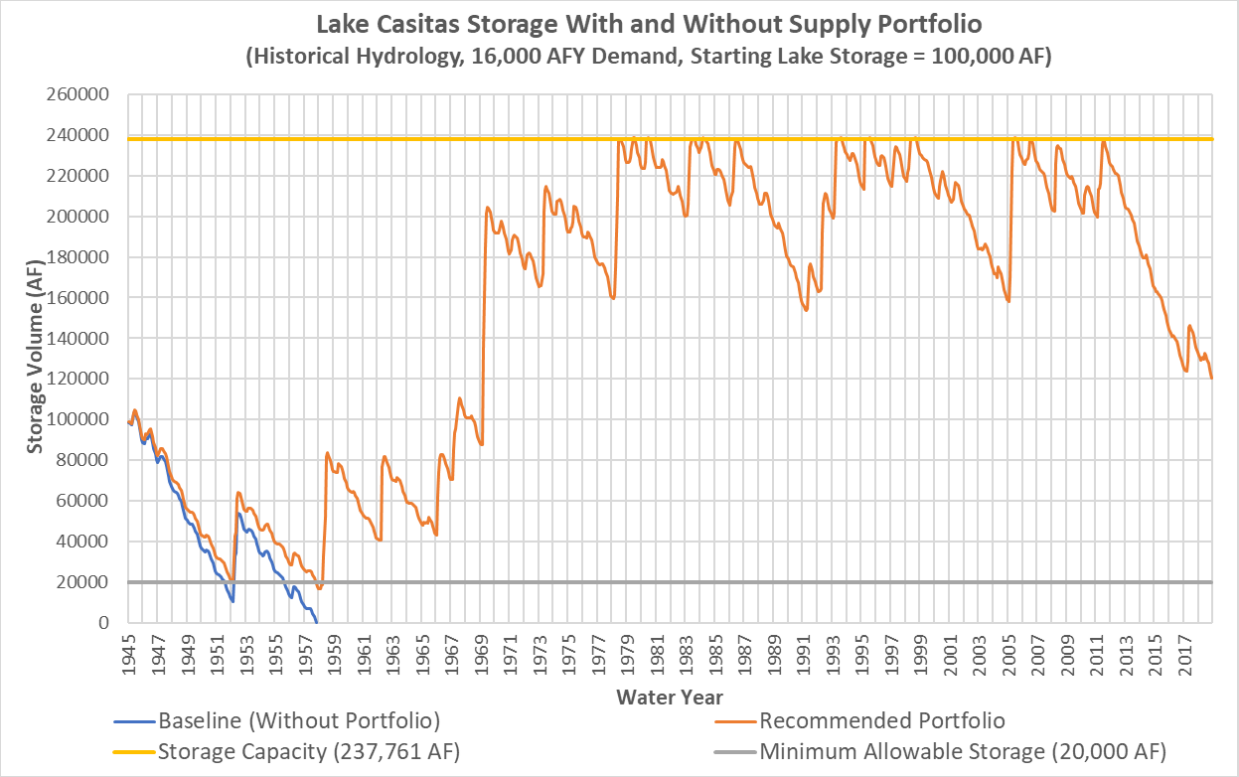


***Figure 7-6** Lake Casitas Storage Volume for Historical Hydrology with and without Recommended Portfolio Projects*

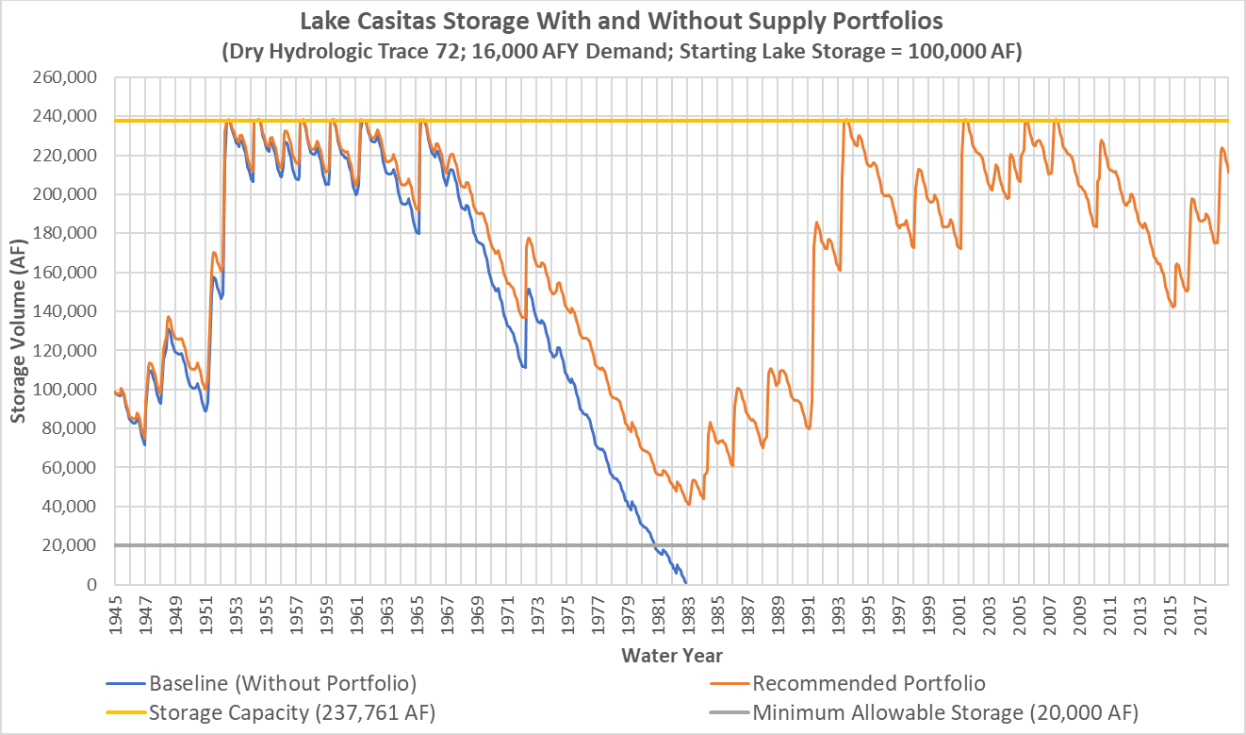


***Figure 7-7**: Lake Casitas Storage Volume for Dry Hydrologic Trace 72 with and without Recommended Portfolio Projects*

7.3 New and Updated Programs

The recommended plan includes developing and implementing new or updated programs in three important areas:

- Updated Water Conservation Plan
- Updated Water Efficiency and Allocation Program
- New Supplemental Water Integration Program

These programs are described in the following sections.

7.3.1 Water Conservation Plan

It is recommended Casitas develop a Water Conservation Plan, which would be a planning document to:

1. Evaluate existing and potential future ongoing conservation measures (e.g. various rebate programs could be evaluated for cost effectiveness),
2. Assure conservation programs are consistent with State requirements such as Making Conservation a Way of Life legislation, and
3. Outline demand strategies (such as the WEAP) to be employed in response to potential future supply shortages during droughts or emergencies.

The Water Conservation Plan should identify demand management measures that would provide for the CWRP planned demand (which was reduced from previous planned UWMP demands), as well as the conditional option for additional 5-10% conservation on average. Development of the Water

Conservation Plan should be coordinated closely with the planned 2020 update to the Casitas Urban Water Management Plan.

7.3.2 Updated Water Efficiency and Allocation Program

The Water Efficiency and Allocation Program establishes water use allocations for each Casitas customer and provides guidelines for setting lower allocations when storage volumes in Lake Casitas are below certain levels. Based on the new policies recommended in the CWRP, Casitas should update the WEAP to:

- Improve clarity in how allocations are set and when and how reduced allocations are triggered;
- Be more conservative in specifying when stages are declared and management actions are triggered; and
- Align WEAP allocations and target allocation reductions with current customer use patterns.

Because of the current low Lake Casitas storage volume, adopting an interim revised WEAP may be prudent while a more comprehensive update with its associated policies is being developed. Considerations for interim and permanent updates to the WEAP are briefly described below. Updating the WEAP is a separate programmatic action from this CWRP.

Factors to be included in the Updated Water Efficiency and Allocation Program

- Interim policies to address near-term risk of low Lake levels
- Review of water allocation in light of current water use rates
- Determine acceptable frequency of being in each WEAP stage
- Adopt management strategies for periods of critically low Lake levels

Interim WEAP Policies

Lake Casitas is currently less than half full (around 100,000 AF in January 2020) and is at risk of being drawn down to critical levels if the next few years are dry or have below normal runoff. A strategy for managing this risk is to adopt interim guidelines for setting Lake Casitas stages that are more conservative than the current WEAP stages. In simple terms this could involve "shifting the stages up" such that Stages 2-5 would be declared at higher lake storage levels. "Shifting the levels up" on an interim basis would provide a more conservative lake management framework until the lake recovers or a permanent WEAP update can be adopted.

The current WEAP does not have provisions for management actions to be taken when the lake is well below 25% full. Stage 5 applies when lake storage is between 25% full (59,440 AF) and dead pool (950 AF). Casitas managers would benefit from having interim policies in place in case the lake falls to critical levels below 59,440 AF to minimize the risk of the lake falling to the CWRP minimum allowable storage level of 20,000 AF.

Permanent WEAP Update

An update of the WEAP could involve the following steps.

- **Consider establishing new water allocations based on current use rates**. Customer use in the Casitas service area changed dramatically as a result of the recent California drought. While some of these changes may not be permanent, others may be permanent due to structural

changes (e.g., removal of turfgrass and replacement with xeriscape). Water allocations should be benchmarked to current use patterns in the Casitas service area.

- **Determine acceptable frequency of being in different WEAP stages**. The "other side of the coin" of having conservative lake storage stages in the WEAP policy is that the Board would be declaring Stage 2 or greater conditions with greater frequency. Customers have a limit to their tolerance for being asked to conserve. Casitas will need to gauge public perception on this topic when the WEAP is updated.
- **Adopt management practices for critically low Lake Casitas storage periods.** Additional demand management strategies are necessary for Board and Staff to manage the system during critical periods when the lake is below 25% full. In addition, emergency strategies for demand management or supply augmentation should be defined during extreme dry periods more severe than conditions assumed for the CWRP when lake storage falls below the minimum allowable storage volume of 20,000 AF.

7.3.3 Supplemental Water Integration Plan

Prior to delivery of water to the Casitas system from new outside sources, a "Supplemental Water Integration Plan" should be prepared. This plan should lay out the technical, operational, and financial aspects of introducing new water sources to the Casitas service area. The following components should be included in this plan.

Factors to be included in the Supplemental Water Integration Plan

- Criteria for importing supplemental water
- Integration of different water quality
- Preliminary infrastructure designs and costs
- Operation plan with new interconnections
- Financial plan and rate study

Criteria for importing supplemental water. Simulations of the Lake Casitas system with the recommended portfolio conducted for the CWRP include taking supplemental water from connections to Ventura and/or Santa Barbara State Water Project facilities in every year of operation. However, when Lake Casitas is already full or close to full, supplemental water would not be needed. There may be other situations in which State Water Project water or other supplemental supplies would not be purchased by Casitas. Because these resources are significantly more expensive than any local sources, they should be imported judiciously. Therefore, an operational plan is needed to specify the criteria (e.g., Lake Casitas storage, recent and anticipated Lake inflows, current system demands, anticipated yields from other supply sources) under which imported water would be purchased through the Ventura or Santa Barbara SWP connections. The plan should also define criteria for the distribution of SWP and supplemental water purchases from each connection after both are implemented (that is, how much SWP water to take through the Ventura connection, how much SWP water to take through the Santa Barbara connection, etc.).

Integration of different quality water. Water delivered through SWP connections, whether from Casitas' SWP allocation or other supplemental sources, would be different quality than water currently used by Casitas from Lake Casitas and the local groundwater basin. Because these supplies are treated water, it is assumed they would be delivered to the Casitas distribution system rather than to Lake Casitas. An assessment is needed of the potential effects of new supplies on the Casitas distribution system and characteristics of water delivered to Casitas customers.

Preliminary infrastructure designs and costs. Preliminary designs are needed for infrastructure required to accomplish the proposed connections to Ventura and Santa Barbara SWP facilities. Some of those preliminary designs are completed or are currently in progress; other components still need to be evaluated. Preliminary designs should be used to support refined cost estimates for required facilities.

Financial plan and rate study. An outline is needed for the recommended financial strategy to support construction and operation of the proposed SWP connections. Capital and Operation and Maintenance (O&M) costs should be considered. O&M costs differ between the Ventura and Santa Barbara connections due to different pumping requirements and different lengths of conveyance. In addition, the cost of SWP water is higher through the Santa Barbara connection (about $2,500/AF) than the Ventura connection (about $1,200 to $1,500/AF) because different SWP facilities are involved. Ultimately a new rate study is needed to allocate costs of the SWP connections and supplemental water supplies to Casitas' retail (municipal and industrial), agricultural and resale customers.

7.4 Stakeholder Feedback Addressed in the Plan

The CWRP recommended plan addresses the key stakeholder issues raised during the outreach process, and also addresses many of the secondary issues identified in stakeholder meetings. The key and secondary stakeholder issues and how they are addressed in the recommended plan are summarized in **Table 7-1**.

***Table 7-1**: Stakeholder Issues Proposed Resolutions per the CWRP*

Stakeholder Issue	How Issue is Addressed in the Plan
Key Issues	
Diversify the Casitas water supply portfolio	The recommended plan includes 26% of non-local supply on an average annual basis.
Evaluate State Water Project alternatives	Five SWP options were considered in the CWRP studies, and two were included in the recommended plan.
Implement regional solutions that could be mutually beneficial to other water providers	The recommended plan includes interconnections with Ventura and Santa Barbara County, which provide Casitas access to its SWP water and also create possibilities for water trades and acquisition of supplemental water supplies from regional entities.
Secondary Issues	
Environmental concerns	The Robles fish passage improvement project will maintain environmental flows in the Ventura River while improving the ability of Casitas to make its legally allowed diversions. The conditional watershed management/Arundo removal project would help manage the spread of invasive species in the Ventura River watershed.
Water price	Local options are cost effective but do not provide much additional supply. Supplemental water options are more expensive, and include cost of infrastructure as well as cost of water. Cost of water can be managed by only taking supplemental supplies when needed. Casitas will be performing a separate rate study to assess the impact of planned improvements on costs and rates.

Stakeholder Issue	How Issue is Addressed in the Plan
Key Issues	
Water sustainability	The recommended plan substantially improves the sustainability of Casitas' supply portfolio by stretching local supplies and adding supplemental supplies from multiple sources.

Section 8 Implementation of Recommended Plan

The CWRP includes an overall implementation schedule to assist Casitas in implementing the plan recommendations. The implementation schedule is phased over the next ten years and described in more detail in this section.

8.1 Cost Estimates for Recommended Water Supply Options

Table 8-1 lists the estimated capital costs of all project options in the recommended portfolio. Capital cost estimates were based on previous planning information developed by Casitas, supplemented by additional conceptual cost studies performed for the CWRP. This is described in more detail in Appendix A – Background Information Technical Memorandum and Appendix G – Water Supply Options Selected for Additional Analysis. These costs would likely need to be funded by non-rate revenue such as bonds or grants. Refer to Appendix H for potential funding options. It is recommended Casitas perform a rate study to evaluate impacts of projected operational costs.

Table 8-1: Capital Costs of Project Options in the Recommended Portfolio

Project Option	Approximate Capital Cost	Long Term Average Annual Yield (AFY)
GW 08 – Well Improvements in Ojai Groundwater Basin	$1,500,000	500
MO 08 – Robles Diversion Fish Passage	$3,000,000	350
SWP 03 – Ventura-Santa Barbara Counties Interconnection	$14,500,000	2,000*
SWP 04 – Casitas – Calleguas Interconnection	$136,000,000	3,100*
SWP 05/DW 01 Supplemental Water (via SWP Connections)	Included in State Water Project project alternatives	1,250
Total Portfolio	**$155,000,000**	**5,200**

*SWP average annual supply with DCF from Casitas Table A allocation for all SWP connections is 3,100 AFY

8.2 Phased Portfolio Implementation

Projects in the recommended portfolios can be phased based on the minimum anticipated time required for permitting, design and construction. Proposed project phasing is described below.

- Year 1-2 – Ojai well rehabilitation and minor Robles fish screen improvements not needing permitting
- Year 2-5 – Ventura-Santa Barbara County Interconnection and complete Robles fish screen improvements needing permitting
- Year 5-10 – Casitas-Calleguas Interconnection and additional supplemental water

With the current low storage volume in Lake Casitas the District should adopt this aggressive implementation schedule. If the next several years are wet years and the Lake recovers, the Interconnection projects could be implemented on a more extended schedule.

Table 8-2 summarizes the overall implementation timeline for the policies, projects and programs in the recommended plan. Key activities are described for the first 2 years, the first 5 years, and the first 10 years of the plan. Because key projects are regional and involve coordination with other water agencies, activities associated with those projects may need to shifted earlier or later to align with the needs of the other agencies. In addition, unique opportunities may arise that would cause implementation priorities to shift.

***Table 8-2**: Overall Implementation Timeline for Recommended Plan*

Timeframe	Policy Implementation	Project Implementation	Program Implementation
2020-2022	• If Lake Casitas level does not recover, adopt Interim WEAP Policy • Use new demand and supply forecasts in UWMP update • Adopt 20,000 AF minimum allowable storage for Lake management	• Complete Ojai Basin well rehabilitation and replacement • Complete minor Robles Diversion fish screen improvements not needed permitting • Coordinate with Ventura and Santa Barbara County on interconnections • Design and permitting of Ventura-Santa Barbara Interconnection	• Update WEAP based on new policies • Prepare Water Conservation Plan
2022-2025		• Complete final Robles Diversion fish screen improvements needing permitting • Complete Ventura-Santa Barbara County Interconnection by 2026 • Participate in Ventura SWP connection • Perform pilot testing for Matilija Formation Deep Well alternatives (Conditional Option)	• Prepare Supplemental Water Integration Plan • Explore options for in-lieu trades with Ventura SWP water (Conditional Option)
2026-2030		• Design and permitting of Casitas portions of Casitas-Calleguas Interconnection • Complete Casitas-Calleguas Interconnection by 2036 • Implement watershed management project or other options if other projects do not provide planned yield (Conditional Option) • Enter into contracts for supplemental water from Ventura and/or Santa Barbara County if not already done	• Implement additional demand management measures if other projects do not provide planned yield (Conditional Option)

Casitas Municipal Water District Comprehensive Water Resources Plan - Recommended Plan Implementation Schedule

TASK	Year 1 (2020)				Year 2 (2021)				Year 3 (2022)				Year 4 (2023)				Year 5 (2024)				Year 6 (2025)				Year 7 (2026)				Year 8 (2027)				Year 9 (2028)				Year 10 (2029)				Year 11 (2030)			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
GW 08 - Ojai Well Rehabilitation																																											
Construction																																											
MO 08 - Robles Fish Screen Improvements (Minor Modification does not need permitting)																																											
Minor Modification																																											
Construction/Implementation																																											
MO 08 - Robles Fish Screen Improvements (Major modification needs permitting)																																											
Prototype Testing																																											
Preliminary Design																																											
CEQA																																											
Permitting																																											
Design																																											
Construction																																											
SWP 03 - Ventura-Santa Barbara County Interconnection																																											
Preliminary Design																																											
CEQA																																											
Permitting																																											
Design																																											
Construction																																											
SWP - O4 Casitas-Calleguas Interconnection																																											
Preliminary Design/Alignment Study																																											
CEQA																																											
Permitting																																											
Design																																											
Construction																																											
SWP 05/DW 01 - Supplemental Water																																											
Planning																																											
Contract Negotiations																																											
GW 01 - Matilija Wells (Conditional Option)																																											
Perform pilot testing for well																																											

Figure 8-1 Recommended Plan Implementation Schedule

Planning, permitting, and design of major water projects can require many years, particularly when state and federal environmental permits or coordination are involved. Thus, these activities need to be started early to assure the projects are online when needed. The SWP options involve obtaining outside funding in the form of bonds or loans for construction; however, planning, permitting and design can be initiated early so the projects are 'shovel-ready' for construction when funds become available.

Figure 8-1 is a conceptual schedule for the anticipated timing of planning/permitting, design and construction for the water supply options in the recommended plan. Conditional Options are included because due diligence will be required on those options in case they are needed in the future.

Some of the recommended water supply options have unique implementation challenges. These are briefly highlighted below.

GW 08 – Well Improvements in Ojai Groundwater Basin – No unique challenges affect implementation of this water supply option. Casitas was making progress on the planned groundwater well improvements as the CWRP was being prepared, and is on track to complete the planned improvements within the next two years.

MO 08 – Robles Diversion Fish Passage Modifications – Minor improvements to improve the existing brush/screen system of the Robles diversion structure to optimize the operation of the Robles Diversion Dam can be accomplished within current regulatory approvals and are scheduled to be completed by 2021. The more comprehensive modification alternative cleaning system will require more time for prototyping, regulatory agency coordination, design and implementation.

SWP 03 – Ventura-Santa Barbara Counties Interconnection – Casitas is coordinating with CVWD on design and permitting of the interconnection to allow delivery of State Water and other supplemental water. No significant permitting challenges are anticipated for this option. Casitas is currently planning to pursue bonds to finance construction of SWP 03 and SWP 04, the two SWP interconnections. Implementation will be dependent on securing those bonds.

SWP 04 – Casitas-Calleguas Interconnection - This is the major new facility in the CWRP, and by far the most expensive water supply option. This alternative involves Casitas designing and constructing a crosstown interconnection pipeline to connect the Ventura State Water Project Interconnection pipeline to the Casitas-Ventura State Water Project Interconnection pump station. The proposed interconnection pipeline would be sized to allow for Casitas to receive their full allocation of 5,000 AF each year. Casitas will begin with an alternative study to determine potential alignments for this project.

SWP 05/DW 01 – Supplemental Water via SWP Interconnections – The timing of deliveries of supplemental water is dependent on completion of the proposed SWP interconnection infrastructure, either to Ventura or to Santa Barbara County (SWP 04 or SWP 03). However, coordination with those entities on terms of water supply agreements could take several months or years and should begin well before the facilities are scheduled to be online. Of particular importance will be agreement on schedules of when supplemental water deliveries could be requested by Casitas, the source water comprising those deliveries (as that may affect the quality of water delivered to Casitas), and pricing structures.

Section 9 References

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