

MEETING THE CHALLENGE OF IMPROVING MANAGEMENT OF A SHARED WATER RESOURCE IN THE LOWER COLORADO RIVER BASIN

- A CALIFORNIA EXPERIENCE

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ABSTRACT

Specific entities in Arizona, California, and Nevada, (herein referenced as the Lower Basin states), are entitled to use in the aggregate either more than, an amount equal to, or less than 7.5 million acre-feet (maf) of Colorado River water in a year depending upon a determination to be made by the Secretary of the Interior (Secretary). In 1996, net water diversions from the Colorado River in the Lower Basin states exceeded 7.5 maf for the first time after accounting for unmeasured return flows. Net diversions in the Lower Basin states also exceeded 7.5 maf in 1997. It is projected that net diversions will exceed 7.5 maf in 1998 as well. Although entities in each state are entitled to use a certain yearly apportionment in the aggregate, entities in a Lower Basin state can utilize the unused apportionments of another Lower Basin state, subject to the approval of the Secretary. Also, entities in each state can use surplus Colorado River water when water in excess of 7.5 maf is available, as determined by the Secretary. No doubt, improved management of Colorado River water in each of the Lower Basin states is a challenge and a key element in meeting future demands to ensure economic stability and sustained development. Capital expenditures are necessary to improve water use efficiency by agricultural and urban users, and to facilitate cooperative programs in which agricultural users reduce their use of water to permit urban users to maintain their level of use. For several decades, California has been exploring and implementing a spectrum of programs aimed at improving the management of its water supplies and reducing its dependence on Colorado River water. A brief description of several of these programs is presented. To date, major progress has occurred. Continued cooperative efforts among water agencies are needed for the timely implementation of additional identified water resources management programs to ensure the availability of reliable water supplies of high quality for future generations.

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INTRODUCTION

The allocation and management of Colorado River water is governed by a complex body of laws, court decrees, compacts, contracts, agreements, regulations, and an international treaty collectively known as the "Law of the River." The Colorado River Compact of 1922 divided the Colorado River Basin into Upper and Lower Basins and apportioned 7.5 million acre-feet (maf) of annual use to each basin, and an additional one maf of annual use to the Lower Basin. The Upper Basin states include Colorado, New Mexico, Utah, and Wyoming, while the Lower Basin states include Arizona, California, and Nevada. The 1931 Seven Party Agreement (Agreement) defined California's Colorado River water use priorities (Table 1). The agricultural agencies, namely Palo Verde Irrigation District (Palo Verde), the Yuma Project Reservation Division, Imperial Irrigation District (Imperial), and Coachella Valley Water District (Coachella), (herein referenced as the California Agricultural Agencies) held the first three priorities collectively to use up to 3.85 maf per year under the Agreement while the Metropolitan Water District of Southern California (Metropolitan) holds the fourth and fifth priorities of 1.212 maf per year. Under the Agreement, which has been incorporated in the Secretary of the Interior's (Secretary) water delivery contracts with Metropolitan, Palo Verde, Imperial, and Coachella, Metropolitan holds the right to store up to five maf of water in Lake Mead by reason of reduced diversions. This right has not yet been implemented by the Secretary. The 1964 United States Supreme Court Decree in *Arizona v. California* confirmed basic apportionments for use of 2.8 maf, 4.4 maf, and 0.3 maf per year in Arizona, California, and Nevada, respectively, when 7.5 maf is available.

With increasing utilization of Colorado River water, entities in the Lower Basin states are faced with the challenge of improving their management of Colorado River water to meet present and future water demands. Although entities in each state are entitled to use a certain yearly apportionment in the aggregate, entities in a Lower Basin state can utilize the unused apportionments of another Lower Basin state subject to the approval of the Secretary. Also, entities in each Lower Basin state can use surplus Colorado River water when water in excess of 7.5 maf is available, as determined by the Secretary. To date, the U.S. Bureau of Reclamation (USBR), the agency that manages the allocation and use of Colorado River water in the Lower Basin states for the Secretary, has not implemented criteria for determining when surplus water will be available in the future. In 1996, net water diversions in the Lower Basin states from the Colorado River exceeded 7.5 maf for the first time after accounting for unmeasured return flows. Net diversions in the Lower Basin states also exceeded 7.5 maf in 1997. The USBR projects that 1998 net diversions by entities in the Lower Basin states will exceed 7.5 maf in the aggregate.

Table 1.--Seven Party Agreement Priorities

Priority	Entity	Acre-feet/year
1.	Palo Verde Irrigation District (Valley Lands)	
2.	Yuma Project, Reservation Division	
3a.	Imperial Irrigation District and Coachella Valley Water District	
3b.	Palo Verde Irrigation District (Mesa Lands)	
	Subtotal	3,850,000
4.	Metropolitan Water District	550,000
5.	Metropolitan Water District	662,000
	Subtotal	1,212,000
6a.	Imperial Irrigation District and Coachella Valley Water District	
6b.	Palo Verde Irrigation District (Mesa Lands)	
	Subtotal	300,000
	Total	5,362,000

In December 1996, the other six Colorado River Basin states expressed in writing concern that California agencies appeared to be assuming that the Secretary would continue to approve the use of surplus water for the foreseeable future, allowing entities in California to continue diverting water in excess of California's basic 4.4 maf per year apportionment. They requested that California develop a defined and enforceable plan to reduce its dependence on Colorado River water over its basic apportionment in a way that avoids undue risk of shortage to the other Basin states. Since then, the California agencies have been actively working together to develop a plan (herein referenced as "the California Plan") which would allow California to live within its basic apportionment of Colorado River water when surplus and unused water is not available. A description of the proposed plan is provided below.

Metropolitan, composed of 27 member cities, municipal water districts, and a county water authority, provides about 60 percent of the water used by more than 16 million people in its 5,200-square-mile service area in Southern California (Figure 1). Metropolitan wholesales its water to its 27 member agencies who in turn sell it to their subagencies and/or end users. Metropolitan obtains its water from the Colorado River through the Colorado River Aqueduct which it owns and operates, and from Northern California through the State Water Project owned by the State of California and operated by the California Department of Water Resources. Metropolitan also provides funding to its member agencies to develop

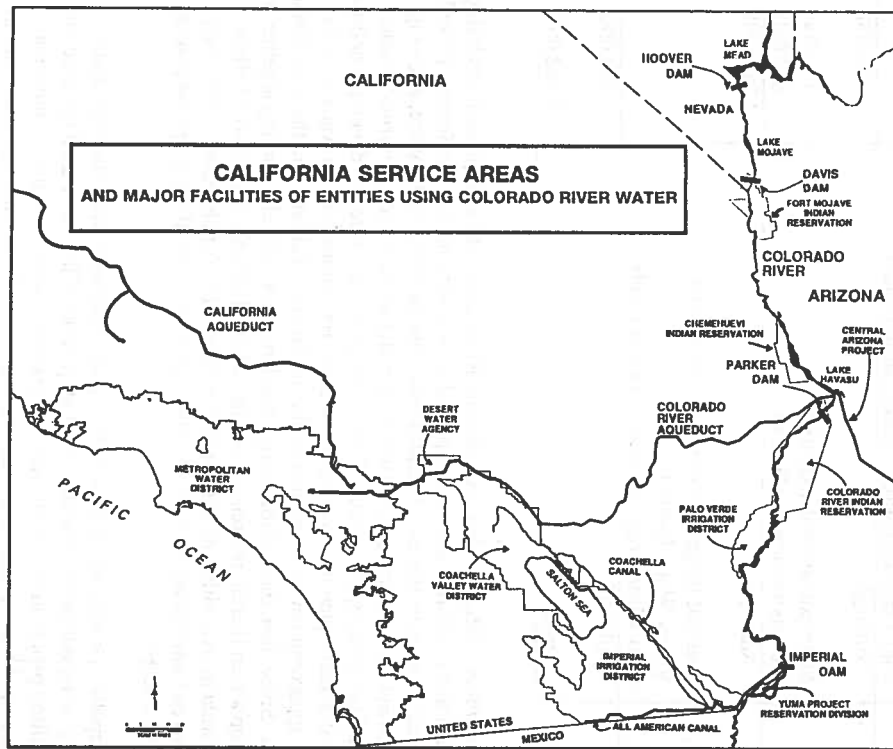


Figure 1.--Location Map of Metropolitan's Service Area and Other Entities Using Colorado River Water

additional local water resources through the recycling of waste water and recovery and treatment of otherwise unusable groundwater. Metropolitan's net diversions from the Colorado River averaged 1.21 maf over the past ten years (1988-97). In a year in which use of Colorado River water in California is limited to 4.4 maf per year and there is no unused water available, Metropolitan's diversions from the Colorado River could be reduced to 657,160 acre-feet per year, i.e. its basic apportionment of 550,000 acre-feet per year plus the water conserved under the Imperial-Metropolitan Water Conservation Program which totals 107,160 acre-feet in 1998, once Metropolitan has exhausted its use of water stored in central Arizona (described below).

Faced with the possibility of future water supply shortages within its service area, Metropolitan has been pursuing a full range of programs, jointly with the California Agricultural Agencies, Arizona, and Nevada, to increase its water supplies and improve its reliability for over a decade. These programs include the Imperial-Metropolitan Water Conservation Program, the Palo Verde Land Fallowing Program, the Arizona Interstate Underground Storage Program, the All American Canal and Coachella Canal lining projects, surface and groundwater storage of Colorado River water in California, and reclaiming agricultural drainage water.

Metropolitan and its 27 member agencies initiated an Integrated Resources Plan (IRP) process in 1993 in an effort to further meet the challenge of improved water management. The process aimed at identifying all water sources, local and imported, available to Metropolitan's service area, and selected a water resources mix which would meet agreed upon reliability, water quality, cost, and environmental criteria.

Some of the guidelines used in the IRP process included 100 percent reliability during a 10 year period (1995 to 2005) even under the worst-case drought, and an untreated water rate not to increase for 10 years. An IRP was adopted in 1996. The IRP targeted increased water conservation, recycling, storage, water transfers, and additional imported supplies to ensure the region's future water supply. Because of changing conditions, new demand projections, updated information from CALFED – the state and federal agencies with management and regulatory responsibility in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary, and with respect to Colorado River supplies, and emerging water transfer opportunities, the IRP is being updated. The planning horizon of the IRP is being extended from 20 years to 50 years. Additional water conservation, recycling, storage, and water transfers will be required to meet future demands.

On the other hand, the California Agricultural Agencies using Colorado River water have approached or exceeded use of 3.85 maf per year recently. Collectively, they provide irrigation water to about 650,000 acres. For the past

10 years (1988-1997), their use averaged 3.78 maf per year and exceeded the amount available to them under the first three priorities in 1989, 1990, 1994, 1995, 1996, and 1997. Their use is projected to exceed 3.85 maf in 1998 as well. Additional water conservation programs are expected to be implemented as one of the key components of the California Plan to reduce the Agricultural Agencies' total net diversions from the Colorado River without negative impacts on the agricultural economy or communities and to make the conserved water available to urban users. However, implementation of these conservation programs is contingent, pursuant to a statement made by the Secretary in December 1997, upon quantification of a baseline volume of beneficially-used water from which savings can be made. Quantification efforts are ongoing.

The California Plan

The California agencies have cooperatively developed a draft "Colorado River Board 4.4 Plan, California's Use of Its Colorado River Allocation" dated December 17, 1997 (herein referenced as the California Plan) aimed at reducing California's reliance on Colorado River water. One of the main premises of said California Plan is transferring the use of 400,000 acre-feet of water in its Phase I from the agricultural users to urban users without causing detrimental impacts in the agricultural service areas and to the other Colorado River Basin states. In April 1998, Imperial and the San Diego County Water Authority (Water Authority) signed an agreement to transfer 200,000 acre-feet per year from Imperial for use in the Water Authority service area for an initial term of 45 years with the option to renew for additional 30 years. Implementation of this agreement is subject to several conditions that need to be met including a satisfactory agreement with Metropolitan, as Metropolitan's facilities are to be used for transporting water to the Authority. In addition, the California Plan recognizes the need for California to enhance its water supply through conjunctive use programs. As mentioned below, opportunities to conjunctively use ground and surface water are being explored using the Arizona Water Bank, the Coachella groundwater basin, and other groundwater basins near the Colorado River Aqueduct. California plans to work with the other Colorado River Basin states and the USBR to develop and implement Lake Mead operating criteria that will make optimum use of the runoff and available storage without exposing the other Basin states to unreasonable risks.

Some of the programs that are a part of the California Plan, as well as Metropolitan's IRP are as follows:

Water Conservation Program with Imperial: Imperial and Metropolitan entered into a water conservation agreement (Conservation Agreement) in December 1988 which became effective in December 1989. The Water Conservation Program (Program) consists of 15 fully implemented projects plus two augmentation

projects completed prior to 1989. Implemented projects include concrete lining of existing irrigation canals, construction of reservoirs and interceptor canals, installation of non-leak gates, system automation, tailwater return systems, 12-hour delivery of irrigation water, and on-farm irrigation water management. The Program is to continue for 35 years into the year 2033 and may be extended by mutual agreement of the parties. Metropolitan provided the necessary funds to construct the 15 projects and verify the projects' water savings. Capital costs totaled approximately \$112 million (\$96 million in 1988 dollars). Indirect costs totaled \$23 million (\$20 million in 1988 dollars). The annual direct costs for 1999 are estimated at \$5.4 million with funding to be provided by Metropolitan. In return, Metropolitan is entitled to divert from the Colorado River a quantity of water equal to the amount of water conserved by the Program. In 1998, a total of 107,160 acre-feet was made available for diversion by Metropolitan. Pending continued verification, this amount is expected to be available to Metropolitan for the duration of the Program.

Test Land Fallowing Program in the Palo Verde Valley: In May 1992, Metropolitan and Palo Verde reached agreement to implement a two-year test land fallowing program which was implemented on August 1, 1992. Under the Program, 20,215 acres of agricultural farm land in Palo Verde (approximately 22 percent of the total agricultural acreage) were fallowed from August 1992 through July 1994 saving 185,978 acre-feet of Colorado River water. Metropolitan compensated participating farmers \$1,240 per acre over the two-year period. Participating farmers paid all applicable taxes on the farm land, water tolls, and land maintenance costs. Fallowed fields were not irrigated for the two-year period and were required to be maintained weed free and managed according to pre-approved management plans to control dust and comply with existing wind erosion regulations. The saved water was stored in Lake Mead up until 1997 when it was released by USBR as a result of flood control operations.

Three surveys of Program participants were conducted during and after the Program, and a fourth survey of the local community was conducted following completion of the Program to evaluate the economic impacts from the Program on participating farmers and the community at large. The Program was not found to have affected overall regional economic performance to any significant degree. City officials and local bank representatives characterized the state of the regional economy during the Program as improved relative to pre-Program conditions. Additionally, the Program was not found to have affected the region's property or sales tax bases, or the provision of governmental services. In fact, the Program provided for timely financial relief to the region's agricultural producers who had been under significant hardship due to a major pest infestation and low prices for key commodities such as alfalfa.

Interstate Underground Storage Program with the Central Arizona Water Conservation District: In October 1992, Metropolitan and the Central Arizona Water Conservation District (CAWCD) executed an agreement for underground storage of Colorado River water in Arizona. Metropolitan and the Southern Nevada Water Authority (SNWA) paid CAWCD the cost associated with storing the water. CAWCD is responsible for the costs of recovery of the water. In December 1994, the agreement was amended to increase program capacity from 100,000 acre-feet to 300,000 acre-feet and extend the time for storage from December 31, 1996 to December 31, 2000. To date, 139,000 acre-feet of Colorado River water has been stored underground. Since USBR made surplus water available from the Colorado River in 1996, Metropolitan and SNWA have the option to recover approximately 90 percent of their shares of this water, 80,909 and 45,455 acre-feet, respectively, in the future.

Advance Delivery Program With Coachella and Desert Water Agency (DWA): Metropolitan holds contracts with Coachella and DWA which provide for Metropolitan to exchange its Colorado River water for those agencies' State Water Project entitlement water on an annual basis. Metropolitan delivers Colorado River water in advance to these agencies for storage in the Upper Coachella Valley groundwater basin. In years when supplies are insufficient, Coachella and DWA may use the stored water. In return, Metropolitan may continue to receive Coachella's and DWA's State Water Project water and suspend deliveries of Colorado River water for recharge while maximizing deliveries of Colorado River water to its service area. As of the end of September 1998, about 285,000 acre-feet of water remained in storage.

Imperial-Water Authority Water Transfer: On April 29, 1998, Imperial and the Water Authority signed a water transfer agreement, one of a number of important components of the California Plan. Under the agreement, Imperial agrees to enter into contracts with landowners in the Imperial Valley to undertake water conservation efforts to reduce their use of Colorado River water, and to transfer up to 200,000 acre-feet per year of this conserved water to the Water Authority for an initial term of 45 years with the option to renew for additional 30 years. The agreement allows for an additional amount of up to 100,000 acre-feet per year of conserved water to be transferred by mutual agreement of the parties. The Water Authority agrees to make payments to Imperial for the conserved water and to make arrangements to transport this water to the Water Authority's service area. The transfer of this conserved water is subject to the fulfillment of a number of conditions including environmental compliance, state and federal approvals, and the Water Authority and Metropolitan reaching a satisfactory agreement. Recently, Metropolitan and the Water Authority reached a 30-year exchange agreement, subject to specific contingencies. Under the agreement, the Water Authority will make up to 200,000 acre-feet of conserved water available to Metropolitan annually and Metropolitan will deliver an equal amount of exchange

water to the Water Authority at a price of \$90 per acre-foot for the first 20 years increased by 1.55 percent for every year after 1998. For years 21 through 30, the price will be equal to \$80 per acre-foot increased by 1.44 percent for every year after 1998.

All American Canal and Coachella Canal Lining Projects: In 1988, Public Law 100-675 authorized the Secretary to concrete line the earthen All American Canal from the vicinity of Pilot Knob to Drop 4 and Coachella Canal from Siphon 7 to Siphon 32. It also authorized the Secretary to enter into a funding agreement, not to exceed 55 years, with one or more of the California contractors who hold a delivery contract for Colorado River water. Such agreement may be renewed if consented to by Imperial and Coachella. If the funding agreement or agreements are not renewed, Imperial and Coachella have to compensate the funding entity(ies) an amount equal to the replacement value of the lining works less depreciation.

In March 1994, the USBR released the Final Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the All American Canal Lining Project preferred alternative, i.e. construction of a parallel concrete-lined canal from Pilot Knob to Drop 3, a length of about 23 miles. In accordance with Public Law 100-675, Metropolitan expressed interest in June 1994 in providing funds for the project in return for the opportunity to utilize an estimated 67,700 acre-feet of conserved water for 55 years. In February 1995, Metropolitan and Imperial executed an agreement relating to the construction of a concrete lined canal parallel to the existing All American Canal (Lining Agreement) under which Imperial would construct the project with funds to be provided by Metropolitan. However, in December 1995, Imperial opted not to extend the Lining Agreement with Metropolitan beyond December 31, 1995.

On January 11, 1994, the USBR released a Draft EIS/EIR for the preferred alternative of lining the Coachella Canal from Siphon 7 to Siphon 32, i.e. construction of a lined canal in the existing cross section while bypassing the canal flow using temporary pipelines. In June 1994, Metropolitan expressed interest in providing funds for the lining of the cost effective sections of the Coachella Canal from Siphon 7 to Siphon 32 in return for the opportunity to utilize the water conserved for 55 years with a right of renewal, all in accordance with Public Law 100-675. However, environmental documentation activities were suspended due to a funding-related issue.

On September 25, 1998, Governor Pete Wilson signed Senate Bill No. 1765 which appropriated \$235 million from the General Fund to assist with the implementation of the California Plan. The sum of \$200 million is to be used to fund the lining of the All American Canal and its Coachella Branch. The remaining \$35 million is to be used to finance the installation of recharge,

extraction, and distribution facilities for groundwater conjunctive use programs necessary to implement the California Plan. Water stored in connection with the groundwater conjunctive use programs are to be for the benefit of Metropolitan's member agencies.

Groundwater Storage of Colorado River Water in California: In years of ample Colorado River water supplies, water could be stored in groundwater aquifers located in the Coachella Valley or along the Colorado River Aqueduct. Metropolitan, in cooperation with Coachella and DWA, is preparing environmental documentation and investigating the feasibility of a groundwater storage program in the Lower Coachella Valley groundwater basin. This program has two components: a transfer of State Water Project water and subsequent exchange for Colorado River water; and a groundwater storage program in the Coachella groundwater basin. Similarly, Metropolitan is preparing environmental documentation and technical studies for the Hayfield/Chuckwalla groundwater storage program. The Hayfield and Chuckwalla groundwater basins are located in the Mojave Desert between Metropolitan's Eagle Mountain and Hinds pumping plants. Under the program, Metropolitan would store approximately 500,000 to 1,000,000 acre-feet of available Colorado River Aqueduct water in these two basins. During years of insufficient supplies, this stored water would be recovered and placed in the Colorado River Aqueduct for use in Metropolitan's service area. Also, Metropolitan, in cooperation with Cadiz Land Company, Inc., is preparing environmental documentation for storing Colorado River water underground in the Cadiz and Fenner Valley groundwater basin. Under the program, Metropolitan would store a minimum of 500,000 acre-feet of Colorado River water in the groundwater basin and purchase a minimum of 1.1 MAF of indigenous groundwater over the 50-year term of the agreement. Metropolitan and Cadiz Land Company would equally share the \$125 to \$150 million design, construction, and implementation costs, with Metropolitan's share contingent upon state legislation which provides funding for Colorado River storage programs. Metropolitan would pay \$90 per acre-foot for Colorado River water cycled through the basin plus a \$5 per acre-foot per year storage fee which would be adjusted for inflation. With respect to the transfer water, Metropolitan would pay a base rate of \$230 per acre-foot which would be adjusted higher or lower according to a price index, minus an appropriate discount rate of five percent to account for Metropolitan's development of the program, plus a water quality fee to recognize the benefit of low total dissolved solids indigenous groundwater. All of these groundwater storage programs are a component of the California Plan.

Reclaiming Agricultural Drainage Water

Each year over one maf of irrigation drainage water in the Imperial and Coachella valleys is discharged into the Salton Sea. A portion of this water, having a salinity of 2,000 to 3,000 milligrams per liter, could be intercepted and treated.

Treated water could be transferred through a pipeline to Metropolitan's Colorado River Aqueduct and used by Metropolitan in its service area or exchanged with Imperial and/or Coachella for a like amount of Colorado River water. Under contract to Metropolitan, Black & Veatch produced a draft feasibility study in July 1997. On September 9, 1997, Metropolitan filed separate applications with the State of California to appropriate water by permit from the Whitewater River and agricultural drains in the vicinity of the Whitewater River (100,000 acre-feet per year), and the Alamo River and agricultural drains in the vicinity of the Alamo River (475,000 acre-feet per year). Metropolitan and Coachella are developing a Facility Plan for the Whitewater Irrigation Water Desalting and Water Reuse Demonstration Project.

SUMMARY

Considerable progress in the implementation of water conservation programs has taken place in California. It is essential that California continue its efforts to implement programs included in the proposed California Plan. This will assure the other six Basin states that California is serious about reducing its use of Colorado River water. This will permit further discussions and negotiations that will result in implementation of criteria for the determination of when surplus water will be available benefiting the Central Arizona Water Conservation District, Southern Nevada Water Authority, and Metropolitan.

With funding now available from the State of California to fund the concrete lining of a portion of the All American and Coachella Canals as well as groundwater storage projects, California is moving closer to implementing its Plan. Similarly, significant progress has been made toward the implementation of the proposed Imperial-Water Authority water transfer. California's determination in moving forward with the implementation of its Plan illustrates its willingness to improve management of this resource which it shares with the other Basin states.