The Regional Urban Water Management Plan for the Metropolitan Water District of Southern California

October 1995

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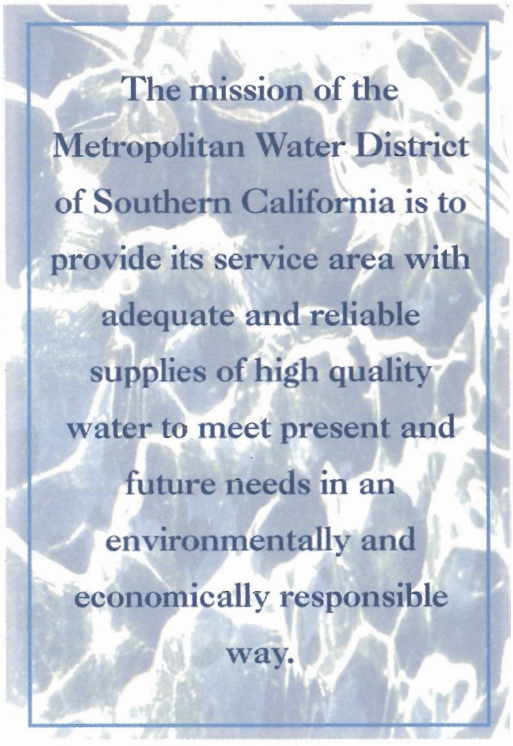

October 1995

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

REGIONAL URBAN WATER MANAGEMENT PLAN

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LIST OF ACRONYMS

AB	Assembly Bill
ADF	Areias Dairy Farm
AF	acre feet
AFY	alternative flushing device
AFY	acre feet per year
AWWA	American Water Works Association
BMPs	Best Management Practices
CAWCD	Central Arizona Water Conservation District
CBO	community-based organizations
CEQA	California Environmental Quality Act
CII	commercial, industrial, and institutional
CIMIS	California Irrigation Management Information System
CIP	capital improvement program
CMC	connection maintenance charge
CRA	Colorado River Aqueduct
CSP	Cooperative Storage Program
CUWCC	California Urban Water Conservation Council
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CVWD	Coachella Valley Water District
DBP	disinfection by-products
DHS	California Department of Health Services
DMP	Drought Management Plan
DSM	demand-side management
DVR	Domenigoni Valley Reservoir
DWA	Desert Water Authority
DWR	California Department of Water Resources
EIR	environmental impact report
EIS	environmental impact statement
EPA	U. S. Environmental Protection Agency
ESWTR	enhanced surface water treatment rule
FAME	First African Methodist Episcopal Church
gdp	gallons per day
GIS	Geographic Information System
GPCD	gallons per capita per day
GRP	Groundwater Recovery Program
HAA	haloacetic acids

LIST OF ACRONYMS (Continued)

IICP	Incremental Interruption and Conservation Plan
IID	Imperial Irrigation District
IWR-MAIN	U.S. Army Corps of Engineers' Institute for Water Resources Municipal and Industrial Needs
IRP	Integrated Resources Planning
ITRC	Irrigation Training and Research Center
LPP	Local Projects Program
M&I	municipal and industrial
MAF	million acre feet
MAFY	million acre feet per year
MELA	Mothers of East Los Angeles
Metropolitan	Metropolitan Water District of Southern California
MCL	maximum contamination level
mg/l	milligrams per liter
µg/l	micrograms per liter
MOU	Memorandum of Understanding Regarding Urban Water Conservation in California
MWDFORE	Metropolitan Water District of Southern California short-run demand forecasting software
MWD-MAIN	IWR-MAIN modified for Metropolitan's service area
NDC	new demand charge
NEPA	National Environmental Policy Act
O&M	operations and maintenance
pCi/l	picocuries per liter
PSA	public service announcements
PVID	Palo Verde Irrigation District
RCPG	SCAG's Regional Comprehensive Plan and Guide
RTS	readiness-to-serve
RWQCB	Regional Water Quality Control Board
SANDAG	San Diego Association of Governments
SCAG	Southern California Association of Governments
SCCWG	Southern California Conservation Work Group
SCE	Southern California Edison
SDCWA	San Diego County Water Authority
SDWA	Safe Drinking Water Act
SNWA	Southern Nevada Water Authority
SSS	Seasonal Storage Service
SWP	State Water Project

LIST OF ACRONYMS (Continued)

SWRCB	State Water Resources Control Board
SWTR	surface water treatment rule
TCR	total coliform rule
TDS	total dissolved solids
THM	trihalomethanes
WSDM Plan	Water Supply and Drought Management Plan
TOC	total organic carbon
ULF	ultra-low-flush
VOC	volatile organic compounds

I. INTRODUCTION

URBAN WATER MANAGEMENT PLANNING ACT

This report has been prepared in response to Water Code Sections 10610 through 10656 of the Urban Water Management Planning Act (Act), which were added by Statute 1983, Chapter 1009, and became effective on January 1, 1984. This Act, which was Assembly Bill (AB) Number 797, requires that "every urban water supplier providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually prepare and adopt, in accordance with prescribed requirements, an urban water management plan." The Act requires urban water suppliers to prepare plans that describe and evaluate reasonable and practical efficient water uses, reclamation, and conservation activities. These plans must be filed with the California Department of Water Resources (DWR) every five years. Urban water management plans are due to DWR by December 31, 1995.

Since its passage in 1983, several amendments have been added to the Act, the most recent being in 1994. Some of the amendments provided for additional emphasis on metering, drought contingency planning, and recycling/reclamation. The process of refining the Act continues in 1995 as efforts are being made to further develop and clarify various aspects of the Act.

The Metropolitan Water District of Southern California (Metropolitan) prepared urban water management plans in 1985 and 1990, even though Metropolitan, as a wholesaler of water, was not legally required to do so at that time. The Act was changed in 1990 to also require wholesale providers of water to prepare urban water management plans. This 1995 Regional Urban Water Management Plan (Plan) is an update of the 1990 Plan, and it includes a number of changes in Metropolitan's water planning and management activities. For example, Metropolitan has been integrally involved in the promotion and implementation of urban conservation Best Management Practices that were established in the 1991 *Memorandum of Understanding Regarding Urban Water Conservation in California (MOU),* and it has initiated an innovative and comprehensive Integrated Resource Planning process.

As with Metropolitan's previous plans, the specific activities being undertaken by member agencies are not explicitly discussed, unless they relate to one of Metropolitan's water demand or supply management programs. Presumably, these activities will be discussed in the plans developed by each member agency, and information from this Plan will likely be used by many of the local water suppliers as they prepare their own plans. Elements of this Plan do not necessarily have to be adopted by the urban water suppliers or the public agencies directly providing retail water because participation in any regional planning activity is voluntary (pursuant to Water Code Section 10620). By law, an urban water supplier that provides water *indirectly* (such as Metropolitan) may not

include planning elements in its water management plan that would be applicable to agencies that provide water *directly* without the consent of those agencies.

The Metropolitan Water District of Southern California

Formation and Purpose

Metropolitan is a public agency organized in 1928 by a vote of the electorates of 13 Southern California cities. The agency was enabled by the adoption of the original Metropolitan Water District Act (Metropolitan Act) by the California Legislature "for the purpose of developing, storing, and distributing water" to the residents of Southern California.

The first function of Metropolitan was building the Colorado River Aqueduct to import water from the Colorado River. Delivery of water from the Colorado River began in the early 1940s, and this imported water supplemented the local water of the original 13 Southern California member cities. In 1972, Metropolitan started receiving water supplies from the State Water Project to meet growing water demands in its service area. Metropolitan currently imports water from these same two sources: (1) the Colorado River water via the Colorado River Aqueduct and (2) the State Water Project via the California Aqueduct.

As defined by the Metropolitan Act, Metropolitan's primary purpose is to develop, store, and distribute water at wholesale rates to its member public agencies for domestic and municipal uses. The Metropolitan Act also allows Metropolitan to sell additional water, if available, for other beneficial uses.

The Metropolitan Act also enabled Metropolitan to levy property taxes within its service area, establish water rates, impose a water standby or service availability charge, incur bonded indebtedness, issue notes and short-term revenue certificates, and exercise the power of eminent domain for the purpose of acquiring property. Metropolitan's Board of Directors is authorized to establish terms and conditions under which additional areas may be annexed to Metropolitan (except for annexations to its existing original 13 member agencies and to 5 city member agencies of the San Diego County Water Authority). Prior to 1978 and the adoption of Proposition 13, annexation charges were collected through special ad valorem taxes. Since 1978, a cash fee has been charged for each new annexation.

Metropolitan is authorized to develop hydroelectric generating facilities both in and out of the state to generate electrical power for the waterworks. This electrical power may be used by Metropolitan, or it may be sold or exchanged with other government agencies and retail suppliers of electric energy. Metropolitan is authorized to finance such hydroelectric generating facilities through the issuance of water revenue bonds or electric revenue bonds (or notes in anticipation thereof).

Service Area

The service area of Metropolitan includes the Southern California coastal plain. It extends about 200 miles along the Pacific Ocean from the city of Oxnard on the north to the Mexican border on the south, and it reaches 70 miles inland

from the coast (Figure I-1). The total area served by Metropolitan is 5,154 square miles (or approximately 5 percent of the state's land area). The service area includes portions of Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura counties. Table I-1 shows that although only 13 percent of the land area of the 6 Southern California counties is within Metropolitan's service area, nearly 90 percent of the population of those counties reside within Metropolitan's boundaries.

Population growth within Metropolitan's geographic service area is the major factor affecting water demands. The potential for future expansion of the service area is limited. The most likely potential for expansion is the annexation of *"islands"* in western Riverside and San Diego counties that are surrounded by areas within Metropolitan, annexation of the remaining part of the Oxnard Plain in southern Ventura County, and minor expansion on Metropolitan's eastern boundary in San Diego County. These areas will likely be annexed as they are urbanized. Collectively, the potential annexations amount to approximately 2 percent of the area presently within Metropolitan.

TABLE I-1

1994 AREA AND POPULATION IN THE SIX COUNTIES OF METROPOLITAN'S SERVICE AREA

County	Total County	In MWD Service Area	Percent in MWD
Land Area (square miles)			
Los Angeles	4,080	1,394	34
Orange	786	698	88
Riverside	7,249	1,049	14
San Bernardino	20,154	242	1
San Diego	4,314	1,420	33
Ventura	1,865	350	19
Total	**38,448**	**5,153**	**13**
Population (in thousands)			
Los Angeles	9,231	8,470	92
Orange	2,597	2,597	100
Riverside	1,357	969	71
San Bernardino	1,592	623	39
San Diego	2,688	2,613	97
Ventura	708	477	67
Total	**18,173**	**15,748**	**87**

Source: California Department of Finance, County Assessors Office, and Metropolitan-developed statistics.

Member Agencies

Metropolitan is composed of 27 member agencies, including 14 cities, 12 municipal water districts, and 1 county water authority. Since Metropolitan was formed in 1928, there have been annexations of new agencies to Metropolitan's service area. However, there have been no additional annexations of agencies since 1972. Metropolitan's member agencies serve residents in more than 145 cities and 94 unincorporated communities. The member agencies of Metropolitan, as well as the cities and communities within the member agencies, are shown in Table I-2. Figure I-1 also shows the geographical area served by these member agencies.

Member agencies receive water from Metropolitan at various delivery points on its system and pay for such water at uniform rates for each class of service established by the Board. To aid in planning future water needs, member agencies advise the General Manager annually (in December of each year) of how much water they anticipate they will need during the next five years. Charges for water delivered are invoiced monthly and are usually paid by the end of the second month following delivery.

As a water wholesaler, Metropolitan has no retail customers. It provides treated and untreated water directly to its member agencies. Metropolitan's 27 member agencies deliver to their customers a combination of local groundwater, surface water, reclaimed water, and water purchased from Metropolitan. For some member agencies, Metropolitan supplies all the water used within that agency's service area, while others obtain varying amounts of water from Metropolitan to supplement local supplies. Currently, Metropolitan provides between 50 and 60 percent of the water supply needs of its service area. Later sections of this Plan provide information on local water supplies of the member agencies.

Some member agencies provide retail water service, while others are the local wholesaler of Metropolitan's supplies. As shown on Table I-3, 15 member agencies provide retail service to customers, 10 provide only wholesale service, and 2 provide a combination of both. Throughout Metropolitan's service area, there are approximately 250 retail water supply agencies directly serving the population. Agencies that provide water to more than 3,000 customers or that supply more than 3,000 acre-feet of water annually will be preparing their own Urban Water Management Plans.

Board of Directors and Management Team

Metropolitan's Board of Directors currently consists of 51 directors. The directors are not compensated by Metropolitan for their service. The Board consists of at least one representative from each member agency, with each agency's assessed valuation determining their additional representation and voting rights. The Board administers its policies through the Metropolitan Water District Administrative Code (Administrative Code), which was adopted by the Board in 1977. The Administrative Code is periodically amended to reflect new policies or changes in existing policies that occur from time to time. The policies established by the Board of Directors are subject to all applicable laws and regulations. The management of Metropolitan is under the direction of its General Manager, who serves at the discretion of the Board, as does Metropolitan's Auditor and General Counsel.

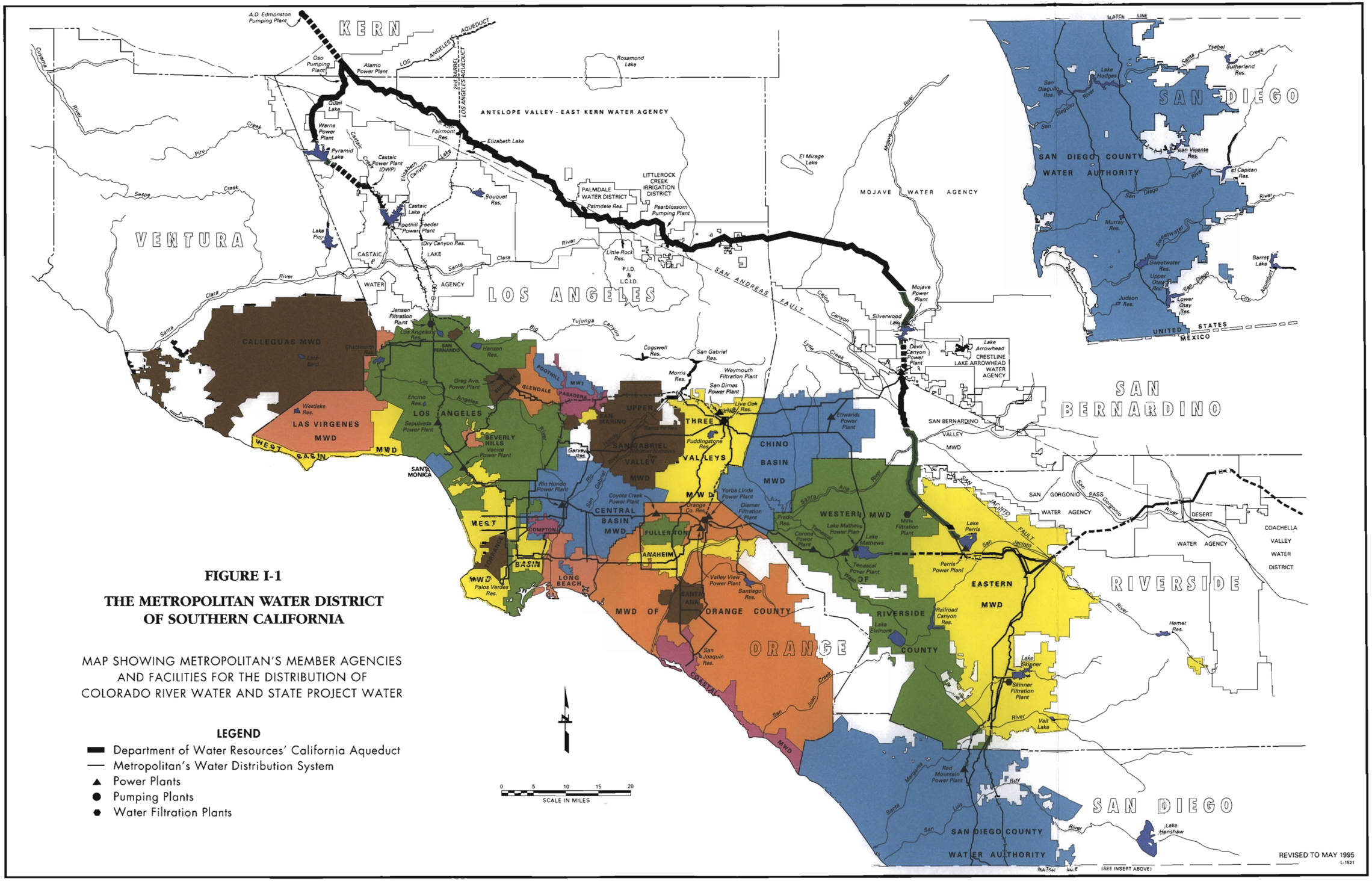

FIGURE I-1

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

MAP SHOWING METROPOLITAN'S MEMBER AGENCIES AND FACILITIES FOR THE DISTRIBUTION OF COLORADO RIVER WATER AND STATE PROJECT WATER

LEGEND

- Department of Water Resources' California Aqueduct
- Metropolitan's Water Distribution System
- Power Plants
- Pumping Plants
- Water Filtration Plants

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TABLE I-2

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

MUNICIPAL WATER DISTRICTS (12)

Calleguas
Central Basin
Chino Basin
Coastal
Eastern
Foothill
Las Virgenes
Orange County
Three Valleys
West Basin
Upper San Gabriel Valley
Western

MEMBER CITIES (14)

Anaheim
Beverly Hills
Burbank
Compton
Fullerton
Glendale
Long Beach
Los Angeles
Pasadena
San Fernando
San Marino
Santa Ana
Santa Monica
Torrance

SAN DIEGO COUNTY WATER AUTHORITY

Cities Within Member Agencies

Calleguas MWD
Camarillo
Camarillo Heights*
Fairview*
Las Posas Valley*
Moorpark*
Oak Park*
Oxnard
Santa Rosa Valley*
Simi Valley
Thousand Oaks

Central Basin MWD
Artesia
Bell
Bellflower
Bell Gardens
Cerritos
Commerce
Cudahy
Downey
East Compton*
East La Mirada*
East Los Angeles*
Florence*
Graham*
Hawaiian Gardens
Huntington Park
La Habra Heights
Lakewood
Los Nietos*
La Mirada
Lynwood
Maywood
Montebello
Norwalk
Paramount
Pico Rivera
Santa Fe Springs
Signal Hill
South Gate
South Whittier*
Vernon
Walnut Park*
West Compton*
West Whittier*
Whittier
Willowbrook*.

Chino Basin
Chino
Chino Hills
Fontana
Montclair
Ontario
Rancho Cucamonga
Upland

Coastal MWD
Capistrano Beach*
Corona del Mar
Costa Mesa
Dana Point*
Laguna Beach

Coastal MWD (cont.)
Newport Beach
San Clemente
South Laguna*

Eastern MWD
East Hemet*
Good Hope*
Hemet
Homeland*
Lakeview-Nuevo*
Mead Valley*
Moreno Valley*
Murrieta Hot Springs*
Perris
Quail Valley*
Romoland*
San Jacinto
Sun City*
Sunnymead*
Temecula
Valle Vista*
Winchester*

Foothill MWD
Altadena*
La Canada
La Crescenta*
Montrose*

Las Virgenes MWD
Agoura Hills
Calabasas*
Chatsworth Lake Manor*
Hidden Hills
Malibu Lake*
Monte Nido
Westlake Village

MWD of Orange County
Brea
Buena Park
Cypress
El Toro*
Fountain Valley
Garden Grove
Huntington Beach
Irvine
Laguna Hills*
Laguna Niguel*
La Habra
La Palma
Los Alamitos
Mission Viejo
Orange
Placentia
Rossmoor*
San Juan Capistrano
Seal Beach
Stanton
Tustin
Tustin Foothills*
Villa Park
Westminster
Yorba Linda

Three Valleys MWD
Charter Oak*
Claremont
Covina Knolls*
Diamond Bar
Glendora
Industry
La Verne
Pomona
Rowland Heights*
San Dimas
So. San Jose Hills*
Walnut

Upper San Gabriel Valley MWD
Arcadia
Avocado Heights*
Baldwin Heights*
Bradbury
Citrus*
Covina
Duarte
El Monte
Hacienda Heights*
Irwindale
La Puente
Mayflower Village*
Monrovia*
Rosemead
San Gabriel
South El Monte
South Pasadena
South San Gabriel*
Temple City
Valinda*
West Covina
West Puente Valley*

West Basin MWD
Alondra Park*
Angeles Mesa*
Carson
Culver City
Del Aire*
El Nido-Clifton*
El Segundo
Gardena
Hawthorne
Inglewood
Ladera Heights*
Lawndale
Lennox*
Lomita
Malibu*
Manhattan Beach
Marina del Rey*
Palos Verdes Estates
Point Dume*
Rancho Palos Verdes
Redondo Beach
Rolling Hills
Rolling Hills Estates
Ross Sexton*
Topanga Canyon*
Victor

West Basin MWD (cont.)
View Park*
West Athens*
West Carson*
West Hollywood
Westmost
Windsor Hills*
National Military Home*
Wiseburn

Western MWD of Riverside County
Bedford Heights*
Corona
Eagle Valley*
El Sobrante*
Green River*
Lake Elsinore
Norco
Riverside
Temescal
Woodcrest*
March A.F.B*

San Diego CWA
Alpine*
Bonita*
Camp Pendleton*
Cardiff-by-the-Sea*
Carlsbad
Casa De Oro*
Castle Park*
Chula Vista
Del Mar
El Cajon
Encinitas
Escondido
Fallbrook*
Lakeside*
La Mesa
Lemon Grove
Leucadia*
Mount Helix*
National City
Oceanside
Otay*
Poway
Rainbow*
Ramona*
Rancho Santa Fe*
San Diego
San Marcos
Santee
Solana Beach
Spring Valley*
Valley Center*
Vista

*Denotes Unincorporated Areas

TABLE I-3

TYPE OF WATER SERVICE PROVIDED BY METROPOLITAN'S MEMBER AGENCIES

Member Agency	Retail or Wholesale
Los Angeles County	
Beverly Hills	Retail
Burbank	Retail
Central Basin MWD	Wholesale
Compton	Retail
Foothill MWD	Wholesale
Glendale	Retail
Las Virgenes MWD	Retail
Long Beach	Retail
Los Angeles	Retail
Pasadena	Retail
San Fernando	Retail
San Marino	Retail
Santa Monica	Retail
Three Valleys MWD	Wholesale
Torrance	Retail
Upper San Gabriel MWD	Wholesale
West Basin MWD	Wholesale
Orange County	
Anaheim	Retail
Coastal MWD	Wholesale
Fullerton	Retail
MWD of Orange County	Wholesale
Santa Ana	Retail
Riverside	
Eastern MWD	Retail & Wholesale
Western MWD	Retail & Wholesale
San Bernardino County	
Chino Basin MWD	Wholesale
Ventura County	
Calleguas MWD	Wholesale
San Diego County	
San Diego County Water Authority	Wholesale

Mission

In 1992, the Metropolitan Board of Directors adopted as their mission "to provide its service area with adequate and reliable supplies of high-quality water to meet present and future needs in an environmentally and economically responsible way." The Board adopted goals that further define Metropolitan's mission and set forth specific parameters for achieving a reliable supply of high-quality water. In 1993, Metropolitan prepared a preliminary *Strategic Plan* that charts a course for fulfilling the mission of Metropolitan as a steward of the region's water resources. The preliminary *Strategic Plan* was based on several key commitments:

- To provide an adequate and reliable supply of high-quality water to meet present and future needs;
- To collaboratively develop and implement with member agencies adequate and cost-effective supplies of high-quality water through an Integrated Resources Planning process that effectively balances local and imported water supply opportunities and regional financial affordability;
- To increase management productivity and reduce operational costs;
- To create a covenant with the Board that outlines level of service and expected achievements, including timetables, against which management performance can be compared and evaluated;
- To review and update the *Strategic Plan* in conjunction with the annual budget process.

The implementation of the preliminary *Strategic Plan* will be developed in several separate documents including the *Long Range Finance Plan,* the *Integrated Resource Plan,* the *System Overview Study,* the *Capital Improvements Plan,* the *Information Systems Strategic Plan,* the *Annual Operating Plan,* and the three-year rolling and annual budgets. The development of many of these implementation plans is ongoing.

Integrated Resources Planning

Of the many commitments that emerged from the preliminary *Strategic Plan,* the decision to undertake an Integrated Resources Planning (IRP) process has had a significant influence upon the region's collective understanding of the relationships among local resource development, imported supplies, and conservation. Much of the information included in this report has been developed and refined through the IRP process, which solicited substantial input from Metropolitan's member agencies, other water resource agencies, and interested stakeholders from the environmental, business, and agricultural communities.

While conjunctive use of imported and local water supplies has occurred in the service area since the formation of Metropolitan, the IRP process represents the first comprehensive evaluation of alternative regional water resource strategies. Through the IRP, Metropolitan has attempted to promote and support a regional consensus regarding the most cost-effective and desirable levels of local water resources development, imported water supplies, and conservation needed to achieve regional reliability goals.

Metropolitan's commitment to the IRP process is based upon the belief that a unified and coordinated approach to water resources planning among all water providers is necessary to meet the region's future water needs in a cost-effective and equitable manner. At one time, Metropolitan could accomplish its mission through largely unilateral actions that supplemented local supplies with water imported from outside the region. Today, coordinated efforts among Metropolitan, its member agencies, and other water providers are essential to realizing the benefits of a program that combines conservation with the development of all potential sources of supply–local groundwater, reclaimed water, desalinated seawater, as well as the imported supplies provided by Metropolitan.

Metropolitan launched its IRP process in July 1993. Consensus-building efforts relied upon a series of monthly planning workshops, three regional *assemblies* involving water officials from throughout the service area, as well as a series of public forums open to participation by interested individuals representing the environmental, business, and agricultural communities.

Initially, the process focused on the widest feasible range of alternatives (or *resource mixes*) that could meet the region's reliability goals—from a strategy heavily emphasizing the development of imported supplies to a strategy almost exclusively focusing on local resource development.

Evaluation criteria were established that addressed long-term reliability, total cost, risk (expressed in terms of both feasibility and practicability of the resource alternatives), public acceptability, equity, flexibility, and environmental considerations. By June 1994, it was agreed that the best resource combination was an *intermediate* mix of local and imported supplies, which provided the

greatest diversity, adaptability, and flexibility, while protecting the environment and ensuring high water quality throughout the region.

Following the decision to pursue an intermediate resource investment strategy, additional analysis and dialogue focused on optimizing the intermediate mix and developing the most cost-effective combination of resource development and demand-side management. In March 1995, a *Preferred Resource Mix* was selected, establishing agreed-upon *targets* for conservation, local resource development, and imported supplies. The Preferred Resource Mix and its water resource targets were subsequently adopted by Metropolitan's Board in June, 1995. This preferred approach has served as the starting point for continued planning at both the regional and local levels. It is understood that the planning process is both iterative and ongoing. As future events unfold, it is expected that the Preferred Resource Mix will be further modified and refined.

At present, Metropolitan's Board has committed to providing for all the wholesale water demands of its member agencies, except during the most severe droughts. At those times, say one year in 50, Metropolitan would deliver no less than 80 percent of the imported water needed to meet wholesale demands within its service area, with the difference made up by rationing or voluntary conservation measures.

The reliability of water service to the retail customer is based on both imported and local water deliveries. Metropolitan's delivery of imported water currently meets 50 to 60 percent of total regional demand. If this trend continues, Metropolitan's reliability goals would allow member agencies and water retailers to deliver, on average, no less than 90 percent of the water needed to meet the retail demands of the region.

As the following report illustrates, Metropolitan intends to achieve its reliability objective through a collaborative effort with its member agencies and other water providers using the approach of the Preferred Resource Mix. The IRP process will meet this objective through both a short- and long-term approach. In the short-term, Metropolitan's Board will revise and adopt policies on its Water Management Programs, including the adoption of 5-year yield and expenditure targets for each resource. In the long-term, Metropolitan will use the IRP framework to establish the region's water resource plan by continually adjusting the Preferred Resource Mix in accordance with changing economic, demographic, and water supply conditions. The IRP process has successfully established the framework for that joint effort and provides the foundation for much of the material that follows.

Public Hearing

On August 21, 1995 Metropolitan held a public hearing to receive comments on the Regional Urban Water Management Plan. This meeting was advertised in the Los Angeles Times, the San Diego Union-Tribune, and the Thousand Oaks Star. During the meeting, a representative of the Southern California Chapter of American Society of Landscape Architects commented on the Regional Urban Water

Management Plan. Their comments were submitted in writing. Additional comments were received from member agencies and all comments were taken into consideration in the preparation of the final report. Comments submitted in writing and Metropolitan's response to them are incorporated into Appendix C.

Format of this Report

The chapters in this report correspond to the outline presented in the Urban Water Management Planning Act, specifically Sections 10631, 10632, and 10633 (see Appendix A for a copy of the Act). The elements set forth in Section 10631 are required to be included in all plans. Those set forth in Section 10632 are required to be included in all plans that are "projecting a future use which indicates a need for expanded or additional water supplies." Section 10633 requires a discussion of the impacts of implementing the alternative management practices discussed in Sections 10631 and 10632.

The first two chapters following this Introduction describe water use in Metropolitan's service area and demand management (conservation) programs. Water supplies and water supply management programs are described in Chapters IV and V, respectively. Chapter VI describes Metropolitan's pricing and rate structures, and Metropolitan's drought management efforts are described in Chapter VII. This report concludes with a description of Metropolitan's ongoing Integrated Resource Planning (IRP) process. The individual chapters corresponding with the specific provisions of the Act are noted below:

Chapter II. Water Demands

Section 10631: (a) past, current, and projected potable and recycled water use; (l) water savings from conservation measures by user group.

Chapter III. Demand-Side Management (Conservation) and Public Affairs Programs

Section 10631: (b) conservation and reclamation measures currently adopted and being practiced; (c) alternative conservation measures; (d) schedule of implementation; (g) methods to evaluate effectiveness of measures; (h) describes steps necessary to implement proposed actions; (i) findings, actions, and planning relating to water conservation measures; (j) actions and planning to eliminate nonrecirculation water systems and encourage recirculation systems; (k) enforcement of conservation measures; and (m) community involvement.

Section 10632: (a5) incentives to alter water use practices; (a6) public information and education programs; and (b) current conservation measures in practice.

Chapter IV. Water Supplies

Section 10631: (b1) reclamation measures currently adopted and being practiced. Section 10632: (a1) recycled water.

Chapter V. Water Supply Management Programs

Section 10631: (a1) recycled water and (b1) reclamation measures currently adopted and being practiced.

Section 10632: (a1) recycled water; (a2) exchanges and transfers of water on a short-term or long-term basis; and (a3) management of peak demands.

Chapter VI. Pricing and Rate Structures

Section 10632: (a7) changes in pricing, rate structures, and regulations.

Chapter VII. Short-Term Drought Management

Section 10631: (e) provide an urban water shortage contingency plan.

Chapter VIII. Integrated Resources Plan

Section 10631: (f) frequency and magnitude of supply deficiencies.

Section 10632: projection of future water demands and supplies and an evaluation of alternatives.

II. WATER DEMANDS

Water use in Metropolitan's service area is related to economic, demographic, and climatic factors. Southern California experienced dramatic economic growth during the 1970s and 1980s. In the early 1990s, however, the rate of economic growth declined due to the severity and duration of the recent recession. The Southern California economy only recently began to experience economic recovery. The recession in California was led by declines in the manufacturing sector, particularly in the defense and aerospace industries. Statewide job losses during the recession were concentrated in Southern California, which accounted for almost 75 percent of California's total job losses from 1991 to early 1993.

Water facilities are part of the region's infrastructure system in the same way that electrical power, natural gas, waste treatment, and other utilities are considered infrastructure. Therefore, development of an appropriate and adequate water supply infrastructure is dependent on the anticipated level of growth for the region. Economic growth in Southern California depends on national and international economic factors (e.g., interest rates, unemployment, capital spending trends), as well as regional population and job growth trends. Population, housing, and employment growth in Metropolitan's service area are assumed to occur at levels projected by the following regional planning agencies: the Southern California Association of Governments (SCAG) and the San Diego Association of Governments (SANDAG). SCAG is responsible for developing the *Regional Growth Management Plan and Guide* for the counties of Imperial (which is not part of Metropolitan's service area), Los Angeles, Orange, Riverside, San Bernardino, and Ventura. SANDAG performs the same responsibility for San Diego County.

Metropolitan has been integrally involved in the development of SCAG's *Regional Comprehensive Plan and Guide* (RCPG), which has 14 integrated elements: growth management, regional mobility, housing, air quality, economic development, energy, hazardous waste management, solid waste management, open space and conservation, water resources, water quality, finance, human resources, and an implementation element. To facilitate this integrated regional planning effort, Metropolitan prepared the *Water Resources Element* for Metropolitan's service area. It focuses on current and future water supply and conservation to meet the water needs of the SCAG region, and was incorporated into SCAG's RCPG.

The SCAG and SANDAG demographic projections are also being used by the cities (municipal governments) and counties within Metropolitan's service area for their planning purposes: i.e., federal programs related to regional planning for transportation, wastewater treatment plant capacity, and compliance with air quality standards. For these reasons, Metropolitan also uses the SCAG and SANDAG demographic and economic projections to estimate future water demands and infrastructure requirements.

Demographic Trends in Southern California

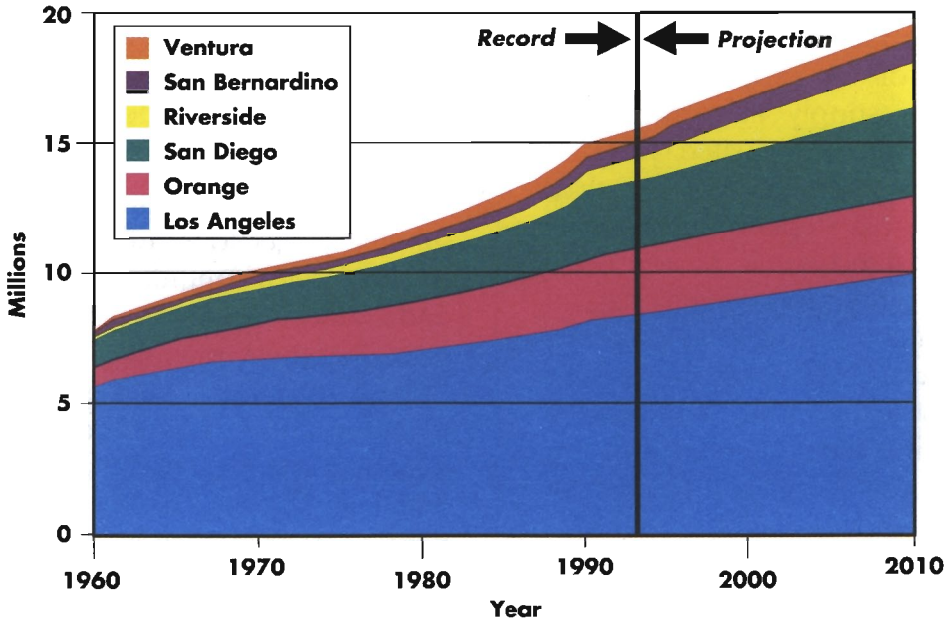
Population Growth

The population of Metropolitan's service area was approximately 14.9 million people in 1990 and 15.7 million people in 1994. This represents about 50 percent of the state's population. Annual growth rates in the past have varied, from about 200,000 annually in the 1970s and early-to-mid-1980s to about 300,000 to 350,000 annually in the late 1980s. Most recently, Metropolitan's population increased by about 200,000 annually from 1990 to 1994. The historic and projected population growth is shown in Figure II-1.

Table II-1 contains information on the population of each of Metropolitan's member agencies in 1990 and 1994, with totals by county. Los Angeles County contains the largest portion (54 percent in 1994) of the population within Metropolitan's service area. The most populated cities within Metropolitan's service area are Los Angeles (largest city in the state), San Diego (second largest in the state), Long Beach, Anaheim, and Riverside. Between 1990 and 1994, the largest population increases have occurred in the city of Los Angeles and in the service area of the Municipal Water District of Orange County. Over the same time period, the water service areas of Eastern Municipal Water District and Chino Basin Water District have experienced the fastest rates of growth.

FIGURE II-1

POPULATION IN METROPOLITAN'S SERVICE AREA



Note: Population projection from SCAG-GMP & SANDAG Series 8.

TABLE II-1

METROPOLITAN'S MEMBER AGENCY POPULATION

Member Agency	1990 Population	Percent of Total	1994 Population	Percent of Total	Percent Change 1990-94
Beverly Hills	68,000	0.5	68,300	0.4	0.4
Burbank	93,700	0.6	98,200	0.6	4.8
Central Basin MWD	1,404,400	9.4	1,428,100	9.1	1.7
Compton	78,800	0.5	79,700	0.5	1.1
Foothill MWD	82,800	0.6	84,400	0.5	1.9
Glendale	168,700	1.1	173,600	1.1	2.9
Las Virgenes MWD	61,000	0.4	65,300	0.4	7.0
Long Beach	423,700	2.8	434,000	2.8	2.4
Los Angeles	3,527,100	23.6	3,649,600	23.2	3.5
Pasadena	131,600	0.9	134,600	0.9	2.3
San Fernando	22,200	0.1	22,600	0.1	1.8
San Marino	13,000	0.1	13,000	0.1	0.0
Santa Monica	87,200	0.6	91,000	0.6	4.4
Three Valleys MWD	475,100	3.2	488,500	3.1	2.8
Torrance	122,600	0.8	124,200	0.8	1.3
Upper San Gabriel MWD	787,100	5.3	805,700	5.1	2.4
West Basin MWD	693,200	4.6	709,200	4.5	2.3
Los Angeles County Total	**8,240,200**	**55.2**	**8,470,000**	**53.8**	**2.8**
Anaheim	268,700	1.8	297,000	1.9	10.5
Coastal MWD	203,200	1.4	220,500	1.4	8.5
Fullerton	110,500	0.7	115,300	0.7	4.3
MWD of Orange County	1,532,900	10.3	1,654,500	10.5	7.9
Santa Ana	295,400	2.0	309,200	2.0	4.7
Orange County Total	**2,410,700**	**16.1**	**2,596,500**	**16.5**	**7.7**
Eastern MWD	324,300	2.2	395,500	2.5	22.0
Western MWD	515,000	3.4	573,900	3.6	11.4
Riverside County Total	**839,300**	**5.6**	**969,400**	**6.2**	**15.5**
Chino Basin	553,300	3.7	622,600	4.0	12.5
San Bernardino County Total	**553,300**	**3.7**	**622,600**	**4.0**	**12.5**
San Diego CWA	2,439,300	16.3	2,612,700	16.6	7.1
San Diego County Total	**2,439,300**	**16.3**	**2,612,700**	**16.6**	**7.1**
Calleguas MWD	450,300	3.0	476,800	3.0	5.9
Ventura County Total	450,300	3.0	476,800	3.0	5.9
Total MWD	**14,933,100**	**100.0**	**15,748,000**	**100.0**	**5.5**

Source: California Department of Finance and Metropolitan-developed statistics. Includes only those portions of counties served by Metropolitan.

Population projections for the region indicate an increase from 15.7 million in 1994 to about 19.5 million by 2010, or an increase of approximately 3.8 million, which averages out to be an increase of about 240,000 per year.

Projected population by county within Metropolitan's service area is shown in Table II-2. Although Riverside and San Bernardino counties are growing faster than the rest of Metropolitan's service area, Los Angeles County will comprise almost 40 percent of the expected population growth between 1994 and 2010 due to its relative size.

Housing and Service Area Expansion

SCAG and SANDAG forecast steady growth in residential housing in all six counties within Metropolitan's service area. The total occupied housing stock (Table II-2) is expected to increase by about 1.3 million units, from 5.2 million in 1994 to about 6.5 million units by the year 2010, an average rate of about 80,000 annually. This represents an increase of about 25 percent from 1994 to 2010. Multifamily housing units are expected to increase at a faster rate (29 percent increase between 1994-2010) than the single-family housing units (22 percent increase). The household occupancy size (total population divided by total occupied dwelling units) in Metropolitan's service area is expected to remain at about three persons per household from 1994 to 2010.

Industrial and Commercial Activities

Southern California accounts for a significant portion of the state's economy, accounting for approximately 60 percent of the state's jobs and income. In 1993, total personal income in Southern California was estimated to be $383 billion.

Table II-3 summarizes the projections of commercial/institutional and industrial employment in Metropolitan's service area. The number of people employed in commerce and industry is expected to increase from 6.2 million in 1994 to about 9.6 million in 2010. This increase of about 57 percent is greater than the projected population (24 percent) and housing growth (25 percent), suggesting that a greater proportion of the population will be employed over time. A net increase in jobs from 1994 to 2010 is forecast for the commercial and institutional sector, which will increase by about 62 percent. Employment in the industrial sector is expected to increase by 27 percent between 1994 and 2010. However, during this same period, the composition of employment in Southern California is expected to see an increase in the *share* of service jobs, while manufacturing's employment *share* declines slightly.

Employment growth will not occur at the same rate across the six counties (Table II-3). Over the 16-year period 1994-2010, the greatest employment increases are expected to occur in Los Angeles County (with over 1.7 million additional jobs expected). Relative to existing employment, Riverside and Ventura counties are expected to have the fastest rates of growth (81 and 78 percent, respectively), followed by Orange County (68 percent), and San Diego, San Bernardino, and Los Angeles counties (60, 56, and 49 percent, respectively).

Regional Water Use Characteristics

Historical water use in Metropolitan's service area has increased from 2.8 million acre-feet (MAF) in 1970 to 3.0 MAF in 1980 and to 4.0 MAF in 1990 (Figure II-2).

TABLE II-2

POPULATION AND HOUSING TRENDS
IN METROPOLITAN'S SERVICE AREA
1994-2010 (In Thousands)

County	1994	2000	2010	Percent Change 1994-2010
Population				
Los Angeles	8,470	8,996	9,908	17
Orange	2,597	2,838	3,067	18
Riverside	969	1,331	1,797	85
San Bernardino	623	724	865	39
San Diego	2,613	2,927	3,306	27
Ventura	477	563	607	27
Total MWD	15,748	17,380	19,550	24
Single-family housing units				
Los Angeles	1,372	1,410	1,499	9
Orange	473	515	539	14
Riverside	244	337	469	92
San Bernardino	130	148	172	32
San Diego	554	618	700	26
Ventura	102	119	136	33
Total MWD	2,875	3,147	3,515	22
Multifamily housing units				
Los Angeles	1,441	1,560	1,765	23
Orange	407	461	518	27
Riverside	63	85	120	90
San Bernardino	55	67	90	63
San Diego	335	383	470	40
Ventura	44	52	65	47
Total MWD	2,345	2,610	3,027	29
Total occupied housing units				
Los Angeles	2,813	2,970	3,264	16
Orange	880	976	1,057	20
Riverside	307	422	588	92
San Bernardino	185	215	262	42
San Diego	889	1,002	1,170	32
Ventura	146	172	200	37
Total MWD	5,220	5,756	6,542	25
Persons per household				
Los Angeles	3.01	3.03	3.04	1
Orange	2.95	2.91	2.90	-2
Riverside	3.15	3.16	3.05	-3
San Bernardino	3.37	3.37	3.30	-2
San Diego	2.94	2.92	2.83	-4
Ventura	3.27	3.28	3.03	-7
Total MWD	3.02	3.02	2.99	-1

Sources: Data for 1994 estimated from California Department of Finance statistics and SCAG/SANDAG data. Projection data from SCAG 1993 *Regional Comprehensive Plan and Guide* (June 1994) and SANDAG *Preliminary Series 8 Forecasts* (September 1993).

TABLE II-3

EMPLOYMENT TRENDS IN METROPOLITAN'S SERVICE AREA
(In Thousands)

County	1994	2000	2010	Percent Change 1994-2010
Commercial employment				
Los Angeles	2,875	3,904	4,448	55
Orange	919	1,351	1,620	76
Riverside	254	315	477	88
San Bernardino	183	219	304	66
San Diego	795	1,149	1,293	63
Ventura	118	168	217	84
Total MWD	5,144	7,106	8,358	62
Industrial employment				
Los Angeles	607	783	753	24
Orange	206	267	267	30
Riverside	32	33	41	29
San Bernardino	37	35	41	10
San Diego	106	147	151	42
Ventura	19	24	27	40
Total MWD	1,007	1,289	1,280	27
Total employment				
Los Angeles	3,482	4,687	5,201	49
Orange	1,125	1,618	1,887	68
Riverside	286	348	518	81
San Bernardino	220	254	344	56
San Diego	901	1,296	1,444	60
Ventura	137	192	243	78
Total MWD	6,151	8,395	9,638	57

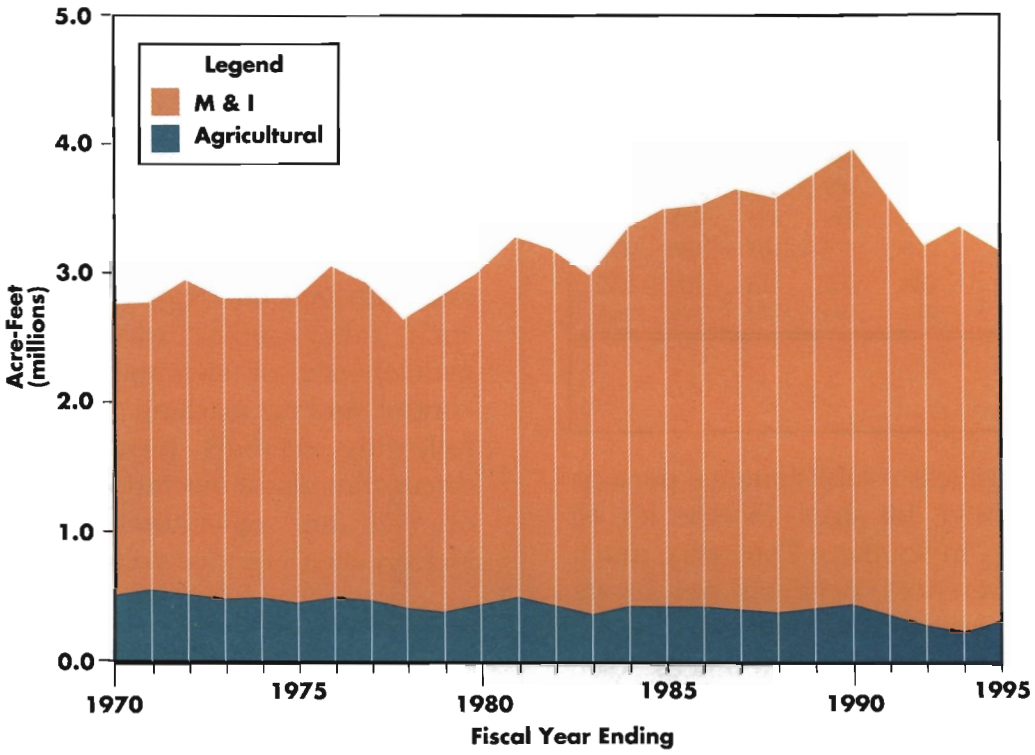
Source: SCAG 1993 *Regional Comprehensive Plan and Guide* (June 1994) and SANDAG *Preliminary Series 8 Forecasts* (September 1993).

Due to the recession, wet weather, and lingering drought impacts, water use declined to 3.4 MAF in 1993 and 3.2 MAF in 1994. Of the 3.2 MAF used in 1994, 3.0 MAF (91 percent) were used for municipal and industrial purposes (M&I) and 0.2 MAF (9 percent) were used for agricultural purposes. The relative share of M&I water use to total water use has been increasing over time as agricultural water use has declined due to urbanization and market factors, including the price of water. Agricultural water use accounted for 19 percent of total regional water demand in 1970, 14 percent in 1980, 11 percent in 1990, and 9 percent in 1994.

As shown in Figure II-2, regional use decreased during the statewide drought of 1976-77 as a result of drought-related water conservation efforts. It declined further in 1978, a year of above average precipitation, largely because of less outdoor water uses. In 1979, water use returned to historic trends with the

FIGURE II-2

TOTAL WATER USE IN METROPOLITAN'S SERVICE AREA



return of normal weather and water supply conditions. However, with above-average rainfall in the early 1980s, water use declined substantially again; and then it increased significantly in the late 1980s with the return of below-average rainfall patterns. Most recently, water demand has again fallen below its historic normal trend as a result of drought rationing in the beginning of the 1990s, the economic recession, and the cooler and wetter weather experienced in 1992 and 1993. These trends can also be observed in the 1990 to 1994 measurements of municipal and industrial per capita water use (Table II-4). An examination of the county per capita water use in Table II-4 reveals that water use varies widely between counties.

It should be noted that per capita water use does not really express the amount of water used by an individual, because it includes all categories of urban water use (residential, commercial, industrial, firefighting and other). Furthermore, per capita water use is not a measurement of water use efficiency. A number of factors affect per capita water use, including the relative share of residential versus nonresidential water use in an area, the number and type of housing units, number of employees,

TABLE II-4

MUNICIPAL AND INDUSTRIAL PER CAPITA WATER USE (Gallons per person per day)

County	1990	1991	1992	1993	1994
Los Angeles	195	177	155	162	140
Orange	240	220	192	211	202
Riverside	252	289	231	210	222
San Bernardino	297	249	273	225	220
San Diego	218	177	165	188	175
Ventura	228	203	174	186	178
Total MWD	214	194	172	180	165

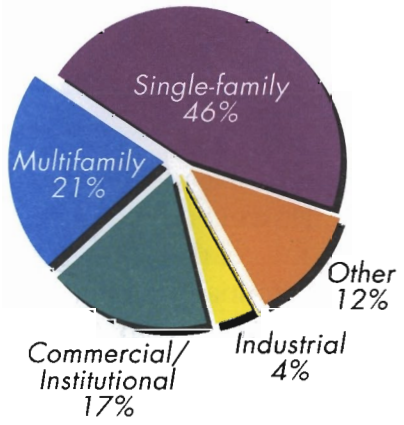
types of business establishments, persons per household, lot sizes, income levels, and climate. In Southern California, much of the differences between per capita water use among the counties can be attributed to climate differences (see Figure II-4). The counties with the greatest M&I per capita water use are the inland counties of Riverside and San Bernardino. The areas of Metropolitan's service area that lie along the coastal plain (Los Angeles, Orange, and Ventura counties) have lower M&I per capita water use.

It is currently estimated that about 67 percent of the M&I use in Metropolitan's service area is for residential purposes (Figure II-3). The commercial/institutional water use sector accounts for about 17 percent of total urban water demands, and the industrial (manufacturing) sector accounts for about 4 percent. The remaining *other* component of urban water use accounts for about 12 percent of total water demands and includes the irrigation of public areas (e.g., highway medians), firefighting, line cleaning, and distribution system losses.

Based on water demand studies conducted by Metropolitan, it is estimated that, on average, about 72 percent of the water used in Southern California is for indoor water needs, including domestic use in homes and businesses, as well as process water needs for business and industries. Therefore, it is estimated that less than one-third (28 percent) of total M&I water is used for outdoor purposes, including the irrigation of urban landscapes (25 percent), cooling in commercial and industrial buildings (2 percent), and such other minor outdoor uses as maintenance of swimming pools, dust control, and car washing (2 percent). The following sections provide additional discussions about the various components of M&I and agricultural water use in Metropolitan's service area.

FIGURE II-3

MUNICIPAL AND INDUSTRIAL WATER USE



Residential Water Use

Although single-family homes account for about 55 percent of the total occupied housing stock, they account for about 68 percent of total residential water demands. This is because, on a per housing unit basis, single-family households tend

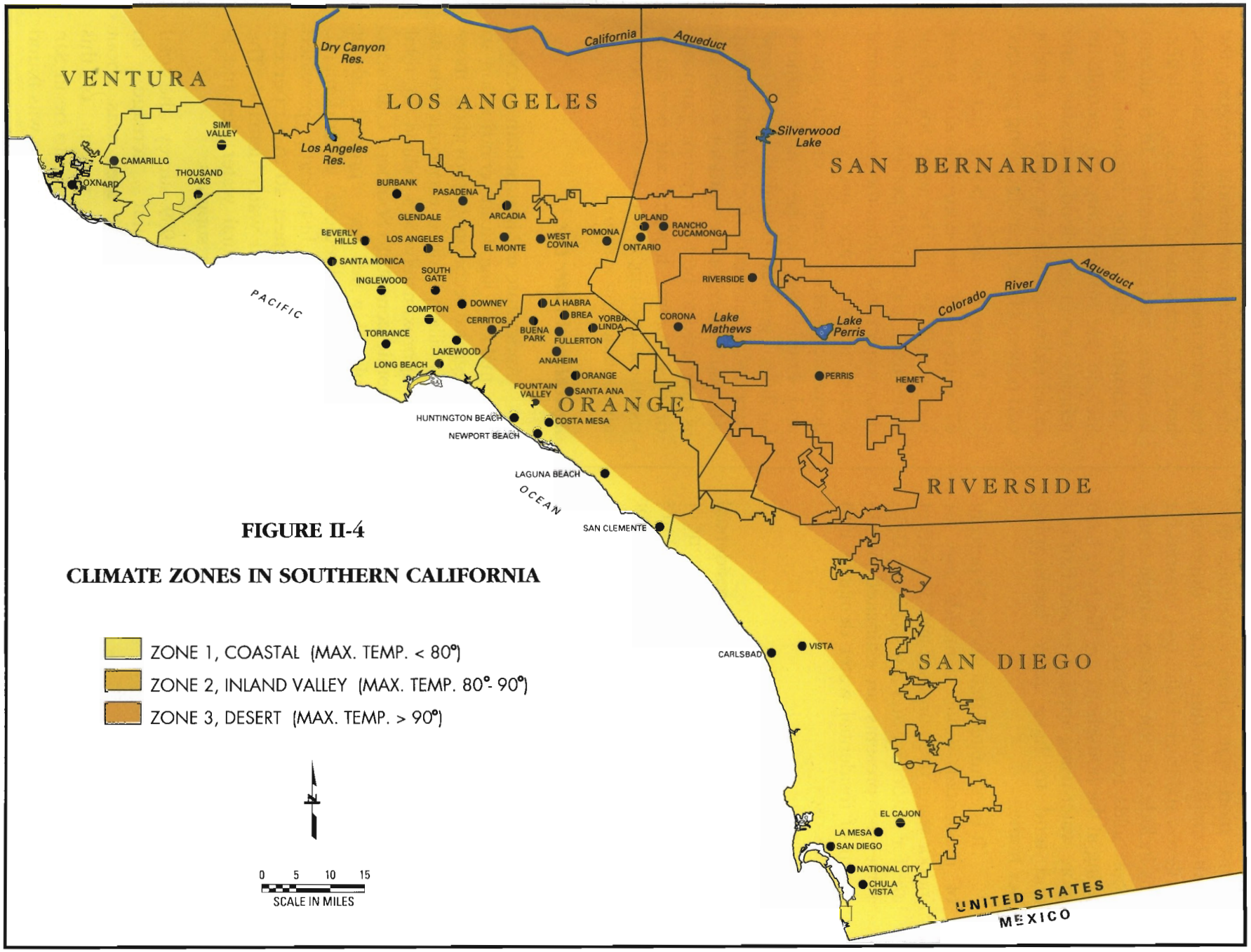


FIGURE II-4

CLIMATE ZONES IN SOUTHERN CALIFORNIA

to use more water than households in a multifamily structure (e.g., duplexes, triplexes, apartment buildings). Reasons for this include that, on average, single-family households tend to have more persons living in the household, are likely to have more water-using appliances and fixtures, and tend to have more landscaping per home.

It is estimated that about 70 percent of residential water demands are for indoor water use purposes and 30 percent are for outdoor water uses (Figure II-5). Table II-5 presents an estimated breakdown of residential water demands into various uses.

Nonresidential Water Use

As mentioned above, nonresidential water use represents about 21 percent of the total M&I demands in Metropolitan's service area. This nonresidential sector represents water that is used by businesses, services, government, institutions (such as hospitals and schools), and industrial (or manufacturing) establishments. Within the commercial/institutional category, the top water users include schools, hospitals, hotels, amusement parks, colleges, laundries, and restaurants. In Southern California, the major industrial users include electronics, aircraft, petroleum refining, beverages, food processing, and other industries that use water as a major component of the manufacturing process.

Figure II-5 also shows that about 67 percent of the nonresidential water use is estimated to be used for indoor water uses, and that 33 percent is for outdoor water uses. Within the nonresidential sector, indoor water use can include domestic/sanitary needs of customers and employees, kitchen and laundry facilities, general cleaning needs, and process water needs for manufacturing. Although much of the outdoor water use is estimated to be for irrigation purposes or dust control, a significant portion is used for cooling, such as water-cooled air-conditioning systems.

TABLE II-5

RESIDENTIAL WATER USE PURPOSES

	Percent of Annual Residential Use
Indoor use	70%
Toilets	25%
Showers/baths	20%
Washing machines	13%
Faucets	9%
Dishwashers	2%
Outdoor use	30%
Lawn/garden irrigation	27%
Swimming pools	2%
Car washing	1%
Air conditioning	<1%

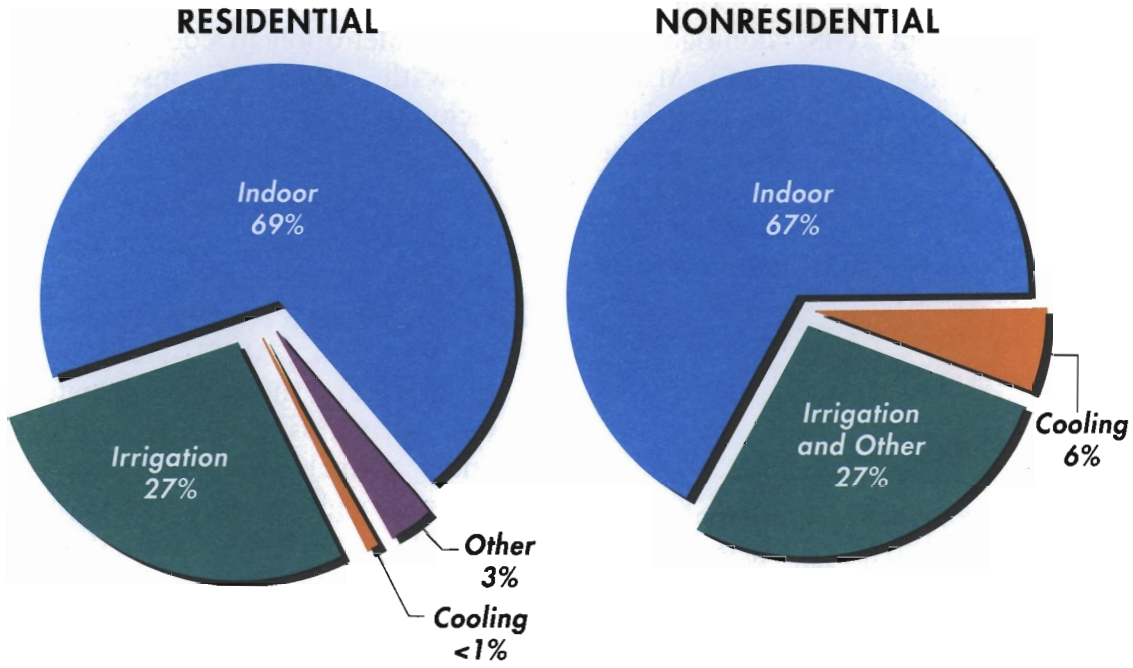
Agricultural Water Use

Agriculture in Metropolitan's service area makes a significant contribution to the regional economy, providing more than $4 billion in direct economic benefits and approximately $15 billion in total economic benefits to Southern California. Agricultural water use represents about 9 percent of total regional water demand. Metropolitan has historically provided water supplies to meet 40 to 50 percent of total agricultural water demand. The remaining agricultural water demand is met by local water supplies.

Based on a 1989 survey, the total irrigated agricultural acreage in Metropolitan's service area was about 186,000 acres. Thirty percent of this irrigated acreage was found to be in San Diego County, and 32 percent was found

FIGURE II-5

WATER USE CATEGORIES



to be in Riverside County. Of the total acreage, 59 percent was estimated to be for tree crops (citrus and avocados), 18 percent for row crops (vegetables and strawberries), 17 percent for dairy products, and 6 percent for nursery products. For the most part, crops grown in the area (especially in the areas utilizing the higher-cost Metropolitan water supplies) are limited to higher-value crops such as nursery stock, strawberries, avocados, and specialty crops.

Projected Water Demands

To project M&I water demands, Metropolitan uses a version of the IWR-MAIN Water Use Forecasting System. IWR-MAIN was originally developed for the U.S. Army Corps of Engineers' Institute for Water Resources and was later modified to reflect water use trends in Metropolitan's service area (MWD-MAIN). MWD-MAIN uses projections of demographic and economic data provided by the regional planning agencies (SCAG and SANDAG) to produce estimates of residential, commercial/industrial, and other water use.

In forecasting residential water demands, the MWD-MAIN System takes into consideration population, housing mix, household occupancy, household income, weather conditions, and the implementation of conservation measures. In the case of commercial and industrial water use, the projected demands are a function of employment in the numerous types of commercial, institutional, and manufacturing establishments, as well as water/wastewater prices and conservation practices.

Because the MWD-MAIN Water Use Forecasting System uses demographic characteristics as the basis for preparing water demand projections, Metropolitan has also developed a Geographic Information System (GIS) demographic tool for preparing inputs into MWD-MAIN. With this demographic tool, land use and demographic data can be retrieved for various geographies. Currently overlaid with this demographic tool is 1990 Census data, 1990 land use data, and demographic projections prepared by the SCAG and SANDAG planning agencies.

Projected Water Use

The projected municipal and industrial demands in Metropolitan's service area were generated by incorporating the projection of long-term demographics (population, housing, and employment) from adopted regional growth management plans provided by SCAG and SANDAG into the water demand models used by MWD-MAIN. For the current projections of water demands, Metropolitan uses demographic and economic projections contained in the Growth Management Element of the 1993 *Regional Comprehensive Plan and Guide* (RCPG) developed by SCAG (adopted in June 1994) and the *Preliminary Series 8 Forecasts* issued by SANDAG (September 1993).

In addition to accounting for future demographic trends, Metropolitan's water demand forecasts also incorporate current and future water demand management (conservation) efforts. In 1991, Metropolitan signed a *Memorandum of Understanding Regarding Urban Water Conservation in California* (MOU). The MOU commits Metropolitan to implement a number of long-term water conservation measures, referred to as Best Management Practices (BMPs). (A more detailed discussion of Metropolitan's efforts at implementing the BMPs is presented in Chapter III). Being fully committed to the implementation of the BMPs, Metropolitan's demand projections show the effects of conservation BMPs, including projected changes in the price of water.

The water demand forecast results (Table II-6) show that municipal and industrial water demands are projected to increase from 3.2 million acre-feet (MAF) in 1994 to 4.2 MAF in 2010, or about 31 percent. (The 1994 estimate reflects water demands as they would have been under normal weather conditions during a non-drought period.) These projections reflect total M&I water demands in Metropolitan's service area, including those that are met by Metropolitan water deliveries and local water supplies. Between 1994 and 2010, single-family residential water use is expected to increase by 22 percent, while multifamily water use is expected to increase by 27 percent. This trend generally follows the projection of single-family and multi-family housing units shown in Table II-2. Similarly, commercial water use between 1994 and 2010 is expected to increase by 60 percent. Industrial water use, however, is expected to increase by only 18 percent. Water use projections for the commercial and industrial sector generally follow the employment projections shown in Table II-3.

The water demand is not expected to increase uniformly across counties. Following the pattern of the demographic projections, the greatest increase in M&I water demands is expected to occur in Los Angeles, Riverside, and San Diego counties. The largest absolute increase in water demands is expected to occur in

Los Angeles County, an increase of 307,000 AFY between 1994 and 2010. Relative to current water demands, water demands in Riverside County are expected to increase at the fastest rate (85 percent between 1994 and 2010). The counties with the smallest percent increases in population are also projected to experience the smallest percent increase in water demand (Los Angeles and Orange counties).

As mentioned earlier, the water demand forecasts account for water savings resulting from ongoing and continuing implementation of Best Management Practices. The total M&I water demand projections show 10 percent savings (from 1980 usage levels) resulting from Best Management Practices and pricing policies in 1994, 12 percent savings in 2000, and 15 percent savings in 2010.

Trends in Future Urban Water Use

The total water use in Metropolitan's service area is expected to grow because of continuing increases in population and employment in Southern California. However, the growth in water demand may be lower or higher than the rate of population growth, depending on a number of factors.

Table II-7 shows the water use factors that are the *result* of the econometric water demand forecasts presented in Table II-6. The information presented in this table highlights the fact that water demand forecasts are not solely a function of population, housing, and employment increases/decreases. Average rates of water use (in gallons per capita per day, gallons per housing unit per day, or gallons per employee per day) are also expected to change over time. Even without the impacts of water conservation, the average rates of water use can change over time because of changing demographic and economic characteristics. For example, changes in housing mix (single-family versus multifamily), employment mix (within the nonresidential sector), income, persons per household, and other factors affect rates of water use.

As shown in Table II-7, M&I per capita water use in Metropolitan's service area is expected to increase from an average of 182 gallons per capita per day (GPCD) in 1994 to 192 GPCD in 2010 (under normal weather conditions). If not for the expected water conservation savings, per capita water use would increase at an even faster rate. The following sections describe some of the forces that affect average rates of water use and are expected to further modify future water demands.

Trends Causing Increases in Average Rate of Water Use

Several trends will tend to increase the average rate of water use in the future (e.g., a gross per capita use measured as the total water use divided by total population). These include the following:

(1) *Increased household income.* Increases in income will lead to home improvement investments. These expenditures often include water-using appliances and installations (e.g., additional landscaping and cooling systems). Increases in real income may also translate to larger lot sizes with greater landscape watering requirements.

(2) *Geographic growth differentials.* The climate in Metropolitan's service area ranges from moderate throughout the year in the coastal areas to hot and dry summers in the

Table II-6

PROJECTED MUNICIPAL AND INDUSTRIAL WATER DEMAND WITH CONSERVATION[1] 1994-2010

Sector/ County	1994 Demand w/Consv. (MAFY)	1994 % Consv. Savings[2]	2000 Demand w/Consv. (MAFY)	2000 % Consv. Savings[2]	2010 Demand w/Consv. (MAFY)	2010 % Consv. Savings[2]	Percent Change 1994-2010
Single-family							
Los Angeles	0.667	-13	0.662	-16	0.704	-18	6
Orange	0.264	-12	0.285	-15	0.289	-18	9
Riverside	0.150	-10	0.211	-12	0.291	-15	94
San Bernardino	0.075	-9	0.085	-12	0.099	-16	33
San Diego	0.248	-12	0.281	-13	0.331	-17	33
Ventura	0.054	-11	0.062	-14	0.067	-18	25
Total MWD	1.457	-12	1.587	-14	1.782	-17	22
Multifamily							
Los Angeles	0.398	-11	0.420	-14	0.467	-19	18
Orange	0.132	-12	0.148	-14	0.161	-18	22
Riverside	0.021	-11	0.029	-14	0.042	-15	99
San Bernardino	0.020	-10	0.025	-13	0.033	-16	62
San Diego	0.098	-11	0.111	-13	0.140	-15	44
Ventura	0.018	-11	0.021	-14	0.025	-17	41
Total MWD	0.686	-11	0.754	-14	0.868	-18	27
Commercial							
Los Angeles	0.279	-7	0.379	-9	0.431	-11	54
Orange	0.099	-10	0.147	-11	0.171	-14	74
Riverside	0.039	-12	0.048	-13	0.067	-15	72
San Bernardino	0.036	-8	0.041	-10	0.053	-13	47
San Diego	0.085	-10	0.118	-10	0.136	-13	59
Ventura	0.014	-10	0.019	-11	0.024	-15	72
Total MWD	0.552	-8	0.752	-10	0.881	-13	60
Industrial							
Los Angeles	0.081	-4	0.101	-6	0.092	-8	14
Orange	0.028	-6	0.037	-7	0.035	-9	25
Riverside	0.008	-9	0.008	-10	0.009	-11	19
San Bernardino	0.011	-5	0.010	-7	0.011	-9	2
San Diego	0.012	-7	0.016	-8	0.017	-10	45
Ventura	0.003	-7	0.004	-8	0.004	-11	16
Total MWD	0.143	-5	0.176	-6	0.168	-8	18

(Continued)

Table II-6 (Continued)

PROJECTED MUNICIPAL AND INDUSTRIAL WATER DEMAND WITH CONSERVATION[1] 1994-2010

Sector/ County	1994 Demand w/Consv. (MAFY)	1994 % Consv. Savings[2]	2000 Demand w/Consv. (MAFY)	2000 % Consv. Savings[2]	2010 Demand w/Consv. (MAFY)	2010 % Consv. Savings[2]	Percent Change 1994-2010
Other							
Los Angeles	0.148	-1	0.167	-1	0.186	-2	26
Orange	0.057	-2	0.068	-3	0.073	-5	28
Riverside	0.040	-5	0.053	-10	0.068	-19	70
San Bernardino	0.038	-2	0.043	-4	0.052	-8	39
San Diego	0.078	-5	0.085	-13	0.101	-16	30
Ventura	0.012	0	0.015	0	0.017	0	46
Total MWD	0.372	-2	0.430	-5	0.498	-9	34
Total M&I							
Los Angeles	1.573	-10	1.729	-12	1.880	-15	20
Orange	0.579	-10	0.685	-12	0.729	-15	26
Riverside	0.257	-10	0.348	-12	0.476	-15	85
San Bernardino	0.179	-7	0.204	-10	0.248	-13	38
San Diego	0.521	-11	0.612	-12	0.726	-16	39
Ventura	0.100	-10	0.121	-12	0.137	-15	37
Total MWD	3.210	-10	3.699	-12	4.197	-15	31

[1] The demands shown in Table II-6 reflect normal weather conditions. Because of relatively wet/cool weather in 1992 and 1993, actual 1994 M&I demands were approximately 200,000 AF lower than the normal deliveries shown in the table.

[2] Conservation savings is a percentage of water demand without conservation.

inland areas. Generally, the region can be divided into three broad zones, as previously shown in Figure II-4. Moving inland across these zones, daily maximum summer temperatures increase from 70-80 degrees at the coast to 105-110 degrees in the inland areas. Also, annual rainfall ranges from 12 inches per year along the coast to about 5 inches per year in the hotter inland areas of Riverside and San Bernardino counties. The coastal plain and interior valley areas, which contain the major portion of the population, average 10 inches of annual rainfall. An increasing proportion of residential and commercial growth is occurring in the hot, inland valley sections of Metropolitan's service area, such as San Bernardino and Riverside counties, and that requires more water for landscaping and cooling. Similarly, the inland areas of Los Angeles, Orange, San Diego, and Ventura counties are experiencing faster growth rates than the coastal

TABLE II-7

RESULTING WATER DEMAND FACTORS[1]

Sector/County	With Conservation Savings 1994	2000	2010	Sector/County	With Conservation Savings 1994	2000	2010
Population (gallons per capita per day)				**Commercial (gallons per employee per day)**			
Los Angeles	166	172	169	Los Angeles	87	88	88
Orange	199	215	212	Orange	96	96	93
Riverside	237	234	237	Riverside	138	133	126
San Bernardino	257	251	256	San Bernardino	174	166	157
San Diego	178	187	196	San Diego	79	79	77
Ventura	187	192	201	Ventura	105	102	97
Total MWD	182	190	192	Total MWD	96	95	94
Single-family (gallons per housing unit per day)				**Industrial (gallons per employee per day)**			
Los Angeles	434	426	425	Los Angeles	119	117	111
Orange	498	487	472	Orange	121	121	115
Riverside	548	551	556	Riverside	210	206	194
San Bernardino	513	513	521	San Bernardino	265	262	248
San Diego	400	401	394	San Diego	100	99	96
Ventura	471	456	442	Ventura	145	138	120
Total MWD	453	450	449	Total MWD	126	123	117
Multifamily (gallons per housing unit per day)							
Los Angeles	246	244	239				
Orange	289	283	274				
Riverside	297	299	312				
San Bernardino	332	329	335				
San Diego	260	256	249				
Ventura	357	349	341				
Total MWD	261	259	255				

[1] Demand factors assume normal weather conditions.

areas. These trends will cause average rates of water use to increase over time across the overall service area.

(3) *An increasing regional per capita product.* The demographic projections indicate that a greater portion of the population will be employed in the coming decades, causing the gross regional product to grow faster than population, and thereby causing per capita rates of water use to increase.

(4) *Decreasing household size.* Between 1970 and 1990, the average household size in Southern California decreased. Although this trend is slowing (between 1994 and 2010 the average household size is only expected to decrease from 3.02 to 2.99 individuals per household), the result is that more housing units will be built per capita. This trend will result in slight increases in per capita water use.

(5) *Employment mix.* In some areas of Southern California, employment within the commercial/institutional sector is shifting to activities with higher per employee use–hotels, amusements, hospitals. Within the commercial sector, this can cause increases in overall per employee use and can cause increases in per capita use. However, as noted below, some changes in employment mix can also cause decreases in water use rates.

Trends Causing Decrease in Average Rate of Water Use

Several trends are expected to decrease the average rate of water use (i.e., gross per capita use) in Metropolitan's service area. The major influences in this category are described as follows:

(1) *An increasing share of multifamily housing units in the total housing stock.* Because multifamily structures share landscaping and swimming pools and generally have fewer persons per household and fewer water-using appliances (e.g., washing machines or dishwashers), the average water use is lower than in detached single-family residences. In 1994, housing units in multifamily structures represented about 45 percent of the housing stock and are expected to account for approximately 46 percent in 2010. Even this slight change in the share of housing mix between single-family and multifamily units will have an impact on average residential water use.

(2) *Employment mix.* The distribution of employment and economic activities is constantly changing, thus affecting the use of water in the commercial and manufacturing sectors. As employment shifts from the relatively water-intensive manufacturing sector to the less water-intensive commercial/institutional sector, per capita water use will decline.

(3) *Plumbing codes.* The use of water-efficient fixtures is required by California law and the 1992 National Energy Policy Act. New construction and remodeling must meet the water efficiency standards for toilets, showerheads, faucets, and urinals. As newer building stock is added to the existing stock, average rates of water use will decrease.

(4) *Conservation programs.* Reductions in water use will result from the implementation of Best Management Practices (BMPs) contained in the MOU signed by Metropolitan and most member agencies in 1991 such as (a) residential retrofit programs induced by Metropolitan's Conservation Credits Program, (b) the expansion of ongoing leak detection and repair programs conducted by retail agencies, and (c) landscaping water efficiency measures, including education about water practices and low water-using plants.

(5) *Changes in retail prices.* Price increases (in real terms) provide incentives to consumers to use water more efficiently. Water demand studies conducted by Metropolitan indicate that during the 1980-92 period, residential (single-family) customers in Southern California decreased their average water use by 0.185 percent for each 1.0 percent increase in the marginal

price of water (net of inflation). An average reduction of 0.157 percent per 1.0 percent increase in price was found in all other types of residential housing. Business and industry showed the lowest response–a 0.106 percent reduction for a 1.0 percent increase in price.

The water-use factors shown in Table II-7 account for these influences on the average rates of water use over time.

Summary

Table II-6 and II-7 provide projections of water demands and average rates of water use to the year 2010, which was the planning horizon of demographic data projections by SCAG and SANDAG. For its own planning needs, Metropolitan extrapolated SCAG and SANDAG demographic projections to the year 2020. Table II-8 provides a summary of total regional water demands (M&I and agricultural) to the year 2020. The water demand forecast results show that M&I water demands are projected to increase from 3.21 MAF in 1994 (as would have occurred under normal weather, non-drought conditions) to 4.68 MAF in 2020 (46 percent increase). However, because of urbanization, market competition, and the increasing cost of water, current agricultural water use is projected to decrease to 0.28 MAF in 2020 (a 9 percent decrease from 1994).

Total regional water demands in Metropolitan's service area are expected to be about 4.96 MAF by the year 2020. By that time, therefore, water demands in the service area will be 1.44 MAF greater than they would have been in 1994 under normal weather conditions. Figure II-6 presents both the historical and projected M&I per capita water use trends and shows the substantial impact of the implementation of Best Management Practices.

TABLE II-8

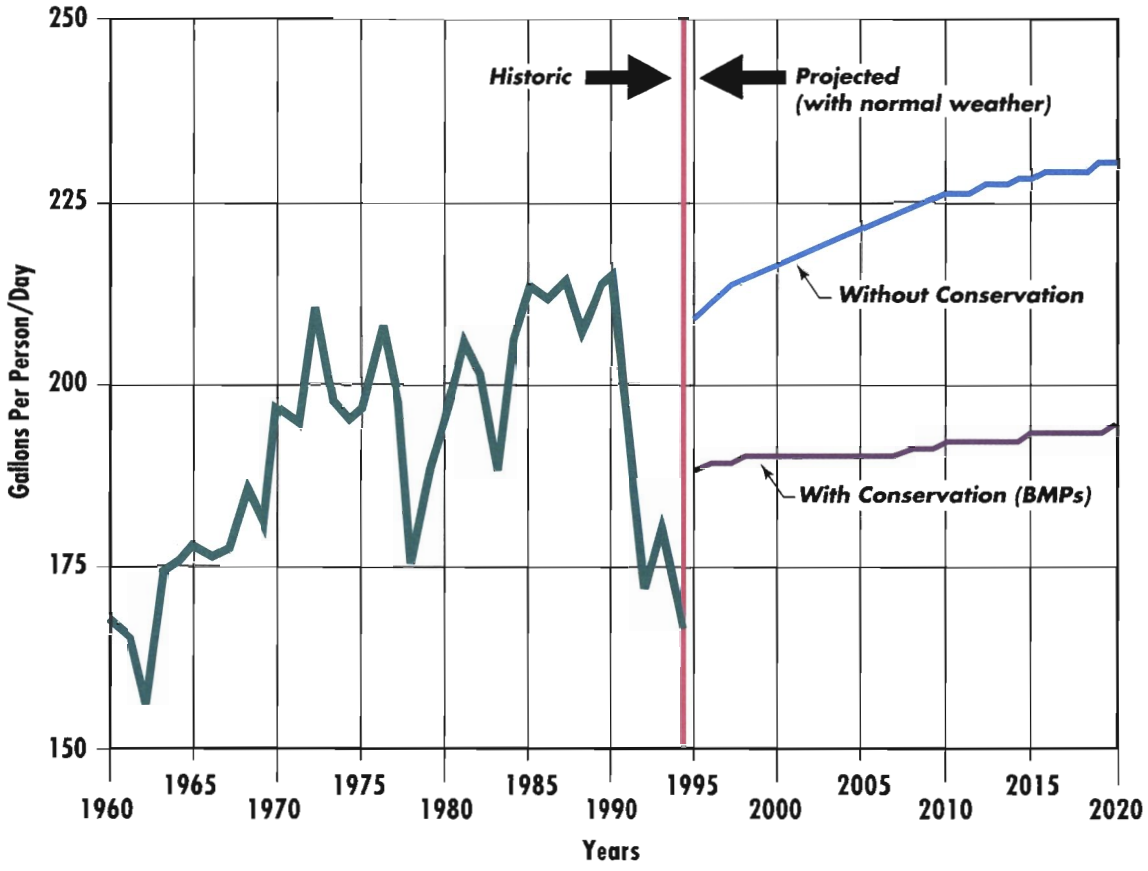
PROJECTED REGIONAL WATER DEMANDS WITH CONSERVATION (MAFY)[1]

Sector/County	1994	2000	2010	2020
Municipal and industrial				
Los Angeles	1.573	1.729	1.880	2.012
Orange	0.579	0.685	0.729	0.781
Riverside	0.257	0.348	0.476	0.604
San Bernardino	0.179	0.204	0.248	0.301
San Diego	0.521	0.612	0.726	0.825
Ventura	0.100	0.121	0.137	0.155
Total MWD	3.210	3.699	4.197	4.679
Agricultural				
Los Angeles	0.003	0.003	0.003	0.003
Orange	0.028	0.027	0.021	0.017
Riverside	0.125	0.124	0.121	0.111
San Bernardino	0.030	0.030	0.026	0.025
San Diego	0.100	0.110	0.110	0.105
Ventura	0.018	0.016	0.016	0.016
Total MWD	0.303	0.309	0.297	0.277
Total regional demands				
Los Angeles	1.576	1.732	1.883	2.015
Orange	0.607	0.712	0.751	0.799
Riverside	0.382	0.472	0.597	0.715
San Bernardino	0.209	0.234	0.274	0.326
San Diego	0.621	0.722	0.836	0.930
Ventura	0.118	0.137	0.153	0.171
Total MWD	3.513	4.009	4.494	4.956

[1] Projected demand reflects the effects of the Best Management Practices and normal weather conditions.

FIGURE II-6

URBAN PER CAPITA WATER USE



III. DEMAND-SIDE MANAGEMENT (CONSERVATION) AND PUBLIC AFFAIRS PROGRAMS

METROPOLITAN'S COMMITMENT TO CONSERVATION

Metropolitan recognizes water conservation as a priority in any water resource strategy developed for the region. An important part of what has come to be known as *demand-side management* (DSM), water conservation has taken on a key role in the management of scarce water resources. Through its innovative DSM programs, Metropolitan has achieved national recognition for integrating water conservation programs into short-term and long-term water resource planning.

Metropolitan has demonstrated its commitment to conservation by signing the *Memorandum of Understanding (MOU) Regarding Urban Water Conservation Best Management Practices (BMPs).* Participating urban water agencies have committed to use *good faith efforts* to implement the BMPs (proven cost-effective water conservation measures), to develop new cost-effective practices, and to initiate these practices as they become feasible.

Long-Term Program Goal

The long-term goal of Metropolitan's water conservation program is to achieve and maintain a high level of water use efficiency in Metropolitan's service area. The specific objectives include:

- Elimination of wasteful practices in water use;
- Development of information on both current and potential conservation practices;
- Timely implementation of conservation practices.

The following section provides a detailed description of the major components of Metropolitan's conservation program.

Major Components of Conservation Program

The four major components of Metropolitan's water conservation program include:

(1) Active participation in the evolving statewide implementation of Best Management Practices;

(2) Water conservation research and development to define the reliable yield from existing conservation programs, to improve the design and targeting of future programs, and to hasten the development of new conservation technologies and measures;

(3) Economic and financial incentives to encourage efficient use of water in Metropolitan's service area;

(4) Public information and education activities to spread knowledge of water and techniques for its efficient use.

Metropolitan's involvement in the statewide implementation of BMPs helps to achieve consensus on what can and

should be achieved through DSM programs. The water conservation research and development program uses Metropolitan's resources to develop and evaluate the technical, economic, and social effects of alternative conservation techniques and management practices. The economic and financial incentives include (1) programs aimed at providing financial assistance to member agencies undertaking conservation projects and (2) the design and implementation of wholesale rates to encourage conservation and the efficient use of existing water supplies. The fourth component, public information and education, informs water users in Southern California about the importance of water conservation and provides them with details on methods for achieving conservation in households and businesses.

Conservation Best Management Practices

In September 1991, Metropolitan and other California water agencies, together with the environmental community and other public interest groups, signed a landmark document, the *Memorandum of Understanding (MOU) Regarding Urban Water Conservation Best Management Practices.* Table III-1, taken from the first page of the MOU, lists the policy issues that motivated this consensus process. BMPs are conservation practices that are established and considered to be cost effective. The specific set of BMPs agreed to in this consensus process is listed in Table III-2.

The MOU describes an evolving process that is important for improving the management of water resources in California. Furthermore, it allows for improvements in the definitions of Best Management Practices as the state of knowledge improves. Metropolitan is committed to the implementation of the current BMPs, the development of better information about how water may be conserved in a resource-preserving cost-effective manner, and development of better water management practices. In addition, there are a number of Potential BMPs (PBMPs) that are under study for possible future statewide implementation (see Table III-3).

As part of the MOU, the California Urban Water Conservation Council (CUWCC) was created to monitor, guide, and assist signatories in implementing the BMPs. Metropolitan has been an active participant in the Council and its subcommittees. The Council approved and adopted a methodology for calculating water savings for BMP Number 16 based on Metropolitan research on the water savings of more than 25,000 households that participated in ultra-low-flush toilet programs in Los Angeles and Santa Monica. The Council, with Metropolitan participation, is also sponsoring research into conservation-related issues. One recent example was the CUWCC report titled *Setting Urban Water Rates for Efficiency and Conservation: A Discussion of the Issues.*

Metropolitan's Conservation Research Program

The importance given to demand-side alternatives in overall water supply planning requires that conservation programs establish how much water savings can be expected. Metropolitan has subjected its programs to rigorous scrutiny. This scrutiny helps assess *reliable*

TABLE III-1

MEMORANDUM OF UNDERSTANDING (MOU)
REGARDING URBAN WATER CONSERVATION IN CALIFORNIA

No.	Recitals
1.	The signatories to this MOU recognize that California's economy, quality of life, and environment depend in large part upon the water resources of the State. The signatories also recognize the need to provide reliable urban water supplies and to protect the environment. Increasing demands for urban, agricultural, and environmental water uses call for conservation resources. Many organizations and groups in California have an interest in urban water conservation, and this MOU is intended to gain much needed consensus on a complex issue.
2.	The urban water conservation practices included in this MOU (referred to as "Best Management Practices" or "BMPs") are intended to reduce long-term demands from what they would have been without implementation of these practices and are in addition to programs which may be instituted during occasional water supply shortages.
3.	The combination of BMPs and urban growth, unless properly accounted for in water management planning, could make reductions in urban demands during short-term emergencies such as droughts or earthquakes more difficult to achieve. However, notwithstanding such difficulties, the signatory water suppliers will carry out the urban water conservation BMP process as described in this MOU.
4.	The signatories recognize that means other than urban water conservation may be needed to provide long-term reliability for urban water suppliers and long-term protection of the environment. However, the signatories may have differing views on what additional measures might be appropriate to provide for these needs. Accordingly, the MOU is not intended to address these issues.
5.	A major benefit of the MOU is to conserve water which could be used for the protection of streams, wetlands and estuaries, and/or urban water supply reliability. This MOU leaves to other forums the issue of how conserved water will be used.
6.	It is the intent of this MOU that individual signatory water suppliers (1) develop comprehensive conservation BMP programs using sound economic criteria and (2) consider water conservation on an equal basis with other water management options.
7.	It is recognized that present urban water use throughout the State varies according to many factors including, but not limited to, climate, types of housing and landscaping, amounts and kinds of commercial, industrial and recreational development, and the extent to which conservation measures have already been implemented. It is further recognized that many of the BMPs identified in Exhibit 1 to this MOU have already been implemented in some areas and that even with broader employment of BMPs, future urban water use will continue to vary from area to area. Therefore, this MOU is not intended to establish uniform per capita water use allotments throughout the urban areas of the State. This MOU is also not intended to limit the amount or types of conservation a water supplier can pursue or to limit a water supplier's more rapid implementation of BMPs.
8.	It is recognized that projections of future water demand should include estimates of anticipated demand reductions due to changes in the real price of water.

TABLE III-2

BEST MANAGEMENT PRACTICES

No.	Practices
1.	Interior and exterior water audits and incentive programs for single-family residential, multifamily residential, and governmental/ institutional customers
2.	Plumbing - new and retrofit:
	a. Enforcement of requirements of ultra-low-flush toilets in all new construction beginning January 1, 1992
	b. Support of State and Federal legislation prohibiting sale of toilets using more than 1.6 gallons per flush
	c. Plumbing retrofit
3.	Distribution system water audits, leak detection and repair
4.	Metering with commodity rates for all new connections and retrofit of existing connections
5.	Large landscape water audits and incentives
6.	Landscape water conservation requirements for new and existing commercial, industrial, institutional, governmental, and multifamily developments
7.	Public information
8.	School education
9.	Commercial and industrial water conservation
10.	New commercial and industrial water use review
11.	Conservation pricing
12.	Landscape water conservation for new and existing single-family homes
13.	Water waste prohibition
14.	Water conservation coordinator
15.	Financial incentives
16.	Ultra-low-flush toilet replacement

TABLE III-3

POTENTIAL BEST MANAGEMENT PRACTICES

No.	Practices
1.	Rate structures and other economic incentives and disincentives to encourage water conservation This the the top priority PBMP to be studied. Such studies should include seasonal rates; increasing block rates; connection fee discounts; grant or loan programs to help finance conservation projects; financial incentives to change landscapes; variable hookup fees tied to landscaping; and interruptible water service to large industrial, commercial or public customers. Studies on this PBMP will be initiated within 12 months from the initial signing of the MOU. At least one of these studies will include a pilot project on incentives to encourage landscape water conservation
2.	Efficiency standards for water using appliances and irrigation devices
3.	Replacement of existing water using appliances (except toilets and showerheads whose replacements are incorporated as best management practices) and irrigation devices
4.	Retrofit of existing car washes
5.	Graywater use
6.	Distribution system pressure regulation
7.	Water supplier billing records broken down by customer class (E.G., residential, commercial, industrial)
8.	Swimming pool and spa conservation including covers to reduce evaporation
9.	Restrictions or prohibitions on devices that use evaporation to cool exterior spaces
10.	Point-of-use water heaters, recirculating hot water systems and hot water pipe insulation
11.	Efficiency standards for new industrial and commercial processes

yield and cost-effectiveness, and it provides the basis for recommending program design changes. Metropolitan's conservation research program has supported primary research to establish the actual water savings attained by DSM programs and to better integrate estimated savings into its planning process. Table III-4 provides a listing of Metropolitan-supported impact evaluations of conservation programs in the Metropolitan service area. To take advantage of the experiences of water utilities around the United States and Canada in implementing and evaluating urban water conservation programs, Metropolitan co-sponsored the development of an annotated bibliography of water conservation programs. This study, *Urban Water Conservation Programs–An Annotated Bibliography,* provides the lessons learned for the design, implementation, and evaluation of 75 conservation programs.

To improve the ability of other agencies to plan and evaluate conservation programs, Metropolitan participated in the development of a procedures manual, *Evaluating Urban Water Conservation Programs*. This manual provides practical guidance on the methods used to evaluate the effectiveness of conservation measures as per Section 10631(g) of the Urban Water Management Planning Act. This manual has been adopted by American Water Works Association (AWWA) as an official document of the water industry. In addition, Metropolitan has also conducted a series of workshops for its agencies and subagencies to disseminate this work and attain broader understanding of conservation planning and evaluation. The workshop, entitled *Evaluating Urban Water Conservation Programs,* will continue to be offered periodically. The associated workbook and materials are available to member agencies and have been used in national conferences on conservation program planning and evaluation. Metropolitan is also co-participating in the CUWCC-originated project to develop more specific guidelines and recommendations for conducting cost-effectiveness analyses of BMPs. This work is expected to be completed in 1995.

The Metropolitan research program includes an ongoing effort to estimate total water conservation savings in Metropolitan's service area. Using the short-run demand forecasting software MWDFORE, Metropolitan staff produce estimates of conservation savings for a set of representative water agencies on a real-time basis. These estimates control for population growth and changes in climate to permit continuous monitoring of conservation savings in Metropolitan's service area.

Metropolitan's research program (1) empirically examines the impact of individual conservation programs, (2) improves the understanding of appropriate evaluation methods for conservation, and (3) empirically estimates the total level of ongoing conservation in the Metropolitan service area. A solid understanding of the accomplishments of conservation efforts permits improved program design, allows better allocation of conservation resources, and establishes DSM programs as a reliable water source. If existing conservation and the potential to conserve water cannot be quantified, then DSM cannot be relied on to help meet future water demand.

TABLE III-4

RECENT EVALUATIONS OF CONSERVATION PROGRAMS

Title	Contents	Published	Water Savings
Public Facilities Retrofit Program	Impact evaluation of a ULF toilet retrofit program in public buildings in the city of San Diego.	December 1994	76.8 gpd per public ULF toilet
Residential Home Audit Program	Impact evaluation of a single-family home audit program in the city of San Diego. Addresses issues of persistence of water savings, targeted marketing, and program design.	December 1994	18 gpd per single-family household
Ultra-Low-Flush Toilet Programs	Continues the impact evaluation of ULF toilet rebate programs in Los Angeles and Santa Monica. Measures water savings from a community-based organization run ULF toilet program, a public school retrofit program, and early results from ULF toilet replacement in commercial sites. Includes a cost-benefit analysis from the perspective of the water agency, the customer, and society.	November 1994	22.1 gpd per single-family ULF toilet 40.3 gpd per multifamily ULF toilet 73.6 gpd per commercial ULF toilet 45.1 gpd per COB toilet
Plumbing Retrofit Programs as a Best Management Practice: Choosing a Policy Estimate of Water Savings	Conducts an empirical review and analysis of 27 documented impact evaluations of plumbing retrofit programs (e.g., showerheads and toilet displacement devices) that were performed across the United States and Canada.	October 1994	Provides a method to extrapolate
Evaluation of the City of Pasadena Multi-Unit Dwelling Retrofit Program	Impact evaluation of a retrofit kit distribution targeted to multiunit dwellings in the city of Pasadena.	June 1994	42.35 gpd per retrofit kit
Analysis of Water Savings from the LITEBILL Program	Impact evaluation of a retrofit kit distribution program targeted to single-family residences in the city of Pasadena. Enacts and assesses different analytic methods for measuring water savings.	February 1993	14.0 gpd per installing household
Analysis of Water Savings from the San Diego Phase I Retrofit Program	Impact evaluation of a retrofit kit distribution targeted to single family residences and multifamily dwellings with less than five living units per building in the City of San Diego.	February 1993	10.7 gpd per installing household
A Model-Based Evaluation of the IRWD Residential Retrofit and Survey Water Conservation Programs	Impact evaluation of a retrofit kit distribution program and a home survey program in the Irvine Ranch Water District.	August 1992	32-44 gpd per household survey (first four months) 9-11 gpd per low flow showerhead
The Conserving Effect of Ultra Low Flush Toilet Rebate Programs	Summary report of impact evaluation of first-year participants in ULF toilet rebate programs in Los Angeles and Santa Monica.	June 1992	28 gpd per single-family ULF toilet 44 gpd per multifamily ULF toilet
Mapping the Conserving Effect of Ultra Low Flush Toilets	Provides a method for extrapolating the conserving potential of ULF toilets to other service areas. Based on data from the impact evaluation of ULF toilet rebate programs.	June 1992	Provides a method to extrapolate
Alternative Flushing and Retrofit Devices for the Toilet	An engineering assessment of alternative flushing and retrofit devices (AFDs) designed for the retrofit of existing toilets. The report considers the potential savings, the functional efficiency of the retrofitted toilet, and the effectiveness of the device.	June 1992	1.4 gallons per flush Maximum savings from AFD
A Model-Based Evaluation of the Westchester Water Conservation Program	Impact evaluation of a retrofit kit distribution program in the Westchester area of Los Angeles.	January 1991	11.4 gpd per single-family household

METROPOLITAN'S CONSERVATION CREDITS PROGRAM

Since its inception in 1988, Metropolitan's Conservation Credits Program has driven much of the regional conservation effort by providing financial support to member agencies and subagencies. This program authorizes the General Manager to subsidize approved projects from member agencies and subagencies to undertake conservation projects. Metropolitan currently pays $154 per acre-foot for demonstrable water savings up to one-half of the cost of each qualifying conservation project. (A variation of this policy provides funding for ultra-low-flush-toilet programs at a flat rate of $60 per ULF toilet.)

In order to qualify for the Conservation Credits Program, a conservation project must:

(1) Have demonstrable water savings.

(2) Reduce demands on Metropolitan.

(3) Be technically sound.

(4) Have local support.

(5) Require Metropolitan's participation to make the project financially and economically feasible.

Proposals from the member agencies are considered on a case-by-case basis, leading to an agreement with the appropriate member agencies and subagencies. Metropolitan provides technical support to its member agencies in designing conservation programs. Agreements costing more than $250,000 in funding require approval of Metropolitan's Board of Directors. Appendix B documents the Conservation Credits programs funded to date by Metropolitan. The Conservation Credits Program serves as a primary vehicle for implementing water conservation projects in Metropolitan's service area.

Water conservation provides both local and regional benefits. The local benefits include reduced sewer loadings, reduced use of electricity and natural gas for heating water, reduced water distribution costs, and increased service reliability. Regional water supply benefits include reduced cost of aqueduct pumping, potential savings in treatment and distribution costs, and the possibility of deferring or eliminating capital improvement/expansion costs. However, in some cases, the local benefits of conservation may not offset total project costs, which would include direct project costs such as new staffing and hardware, as well as administrative overhead, the cost of managing any revenue shortfall by retail water purveyors, and other factors. In such cases, the Conservation Credits Program provides financial incentives for the implementation of conservation programs and allows sharing costs between local entities and Metropolitan.

A particular project may have special benefits for Metropolitan other than the water savings. Such benefits could include technology development, important research results, protection of a vital resource, or securing a one-time opportunity to achieve efficiency gains versus a permanent loss if the project is not implemented. These benefits are considered in the Conservation Credits Program decision process.

Metropolitan's Board of Directors periodically reviews the effectiveness of the program and adjusts the economic and/or financial incentives to encourage and reflect the actual conservation benefits to the region. The effectiveness of the program depends on the type of conservation projects and the number of

proposals submitted by member agencies and subagencies. In the future, Metropolitan may consider alternative financing to assist in complete implementation of Best Management Practices.

Implementation of Best Management Practices

The Conservation Credits Program and other conservation programs implemented by Metropolitan's member agencies are the result of a concerted effort to implement Best Management Practices. In keeping with Metropolitan's philosophy of service to its member agencies and to facilitate implementation of Best Management Practices, Metropolitan has committed a significant portion of its conservation staff to assisting its member agencies. The Metropolitan staff of regional representatives provide technical assistance in the design, implementation, and evaluation of conservation programs. This agency assistance is a significant component of Metropolitan's commitment to conservation and is vital to overcoming the practical problems of implementing BMPs.

Four different areas of BMP implementation are discussed in the following sections–residential programs, commercial/industrial/institutional programs, the landscape conservation program, and the Southern California Water/Energy Conservation Partnership.

Residential Programs

A key component of water conservation efforts in Metropolitan's service area is the effort to retrofit residences with ultra-low-flush (ULF) toilets and low-flow showerheads. By the end of fiscal year 1994-95, residential plumbing retrofit program commitments will total 890,000 ULF toilets and more than 3 million low-flow showerheads. These residential retrofits cost Metropolitan and its member agencies in excess of $115 million, primarily in rebates to customers, and they represent annual water savings of more than 44,000 acre-feet. These substantial, long-term regional savings do not require customers to change their water use habits.

ULF Toilet Retrofit Programs

Metropolitan and its member agencies and subagencies offer numerous ULF toilet programs based on several different marketing approaches. On average, daily water savings are 30 gallons for single-family residences and 44 gallons for multifamily residences for the first toilet replaced. These averages are based on Metropolitan-sponsored studies of programs in Santa Monica and Los Angeles, and the methodology used to determine the savings has been accepted by the CUWCC for use in BMP analysis.

Traditionally, rebates have been the primary incentive used by water agencies to promote residential ULF toilet retrofit programs. More recently, community-based organizations have been recruited to distribute ULF toilets while raising funds to aid their communities. This has been a highly successful alternative marketing approach.

ULF Toilet Distribution Program

Implementation of the ULF toilet BMP in Metropolitan's service area was initiated ahead of the BMP schedule. Metropolitan and its member agencies began to implement this conservation

measure aggressively three years prior to the July 1, 1993, target date. In fiscal year 1994-95, approximately $30 million was committed to the ULF toilet program, with one-half coming from Metropolitan and a similar amount from member agencies and subagencies. That level of commitment continues today.

In order to address the special needs of low-income communities, Metropolitan and its member agencies and subagencies have implemented an innovative marketing strategy utilizing the special capabilities of community-based organizations (CBOs). Under this strategy, CBOs are commissioned to market and distribute ULF toilets at no charge to the residents within their local sphere of influence. Metropolitan and the participating member agency subsidize the ULF toilet purchase, the development of marketing aids for the CBOs, the training of CBO personnel, and the supervision of the entire CBO program. For their efforts, CBOs are compensated at a rate of either $15 or $25 per ULF toilet, based on their level of involvement in the process. The CBO program generally works as follows:

(1) One or more CBOs are selected for participation in the program by Metropolitan, the participating member agency, and Metropolitan's implementation contractor.

(2) Metropolitan's implementation contractor trains CBO personnel to market and distribute ULF toilets in their community. The implementation contractor purchases ULF toilets in truckload quantities and warehouses those toilets at its facilities. The contractor provides the CBO with all marketing materials, training, and the ULF toilets for distribution.

(3) CBO personnel market the program on a door-to-door basis in their community and arrange for distribution of ULF toilets to interested, qualified residents.

(4) The CBO receives the used (replaced) toilet from the resident and verification that the new ULF toilet has been installed. CBO personnel destroy the used toilet to assure that it cannot be reused. The implementation contractor arranges for the disposal and recycling of the destroyed toilets. The destroyed toilets are ground up by the recycling contractor and used as roadbed aggregate.

The evolution of the CBO distribution concept began in 1992 when Metropolitan's current implementation contractor, in cooperation with the Los Angeles Department of Water and Power and Central Basin Municipal Water District, undertook a demonstration project to evaluate the feasibility of distributing ULF toilets through inner city CBOs. This successful project, using the Mothers of East Los Angeles (MELA) as the distribution vehicle, attracted the attention of Metropolitan and others in the field of water conservation. As a consequence of the concept's success, nine previously unemployed local residents were employed on the project.

In late 1992, an ambitious pilot program, patterned after the demonstration project, was undertaken by Metropolitan and member agencies. The pilot program was designed to expand the concept significantly, and by June 1994, the program had grown to encompass 17 CBOs employing a combined staff of more than 100 persons. Through February 1995, about 186,000 ULF toilets

had been distributed through the CBO program at a total cost of approximately $26 million.

During this same period, CBOs earned about $4 million for their efforts, enabling them to employ and train full-time staff and fund critically needed community programs. Such programs include college scholarships, immunization clinics, job training, graffiti removal, and child-care support. Table III-5 lists the CBOs that have participated in the program since October 1992, together with their individual cumulative earnings from the program.

Some of the CBOs have adapted their program participation to special one-time community fund-raising events. For example, local high schools and senior citizens' groups have promoted special weekend ULF toilet distribution events for their constituencies and local neighborhoods. For their efforts in marketing and distributing ULF toilets, they receive $15 per toilet replaced. The schools are thus able to raise significantly more money in a weekend event than they otherwise could through the more traditional fund-raising activities (e.g., car washes, candy and magazine sales, etc.). To date, $372,000 has been raised for 41 high schools in the Los Angeles metropolitan region.

Water-Wise Program

In June 1992, Metropolitan concluded its highly successful Water-Wise Program, which was enacted as a drought emergency response measure. Under this program, 1.6 million low-flow showerheads were distributed to 900,000 homes throughout Metropolitan's service area. In addition, some member agencies and subagencies conducted separate showerhead retrofit programs independent of the Water-Wise Program. The combined effect of the different programs was the distribution of more than 3 million showerheads, resulting in estimated water savings of more than 21,000 acre-feet per year.

The Water-Wise Program involved business leaders, retailers, employers, business organizations, volunteer groups, environmental organizations, and minority business and community groups all working together toward the goal of reducing water consumption.

Water Hunt Program

With so many showerheads already distributed through the Water-Wise Program, any continuing showerhead program must be more selective in targeting households. Metropolitan developed the Water Hunt Program to offer member agencies and subagencies a way to distribute low-flow showerheads only to households that need them. Minimal agency staff time is required because a consultant handles program implementation.

The Water Hunt Program combines water conservation education with the distribution of low-flow showerheads in a low-cost package program. In the Water Hunt Program, schoolchildren from kindergarten to grade six conduct home water audits with the help of a treasure-hunt-style map. By following the directions on the map, the students can find water waste in the home and determine if low-flow showerheads or toilet-displacement devices are needed. The students then return the Water Hunt audits to the classroom, and receive low-flow showerheads and toilet-displacement devices as needed.

TABLE III-5

COMMUNITY-BASED ORGANIZATION (CBO) ULF TOILET PROGRAMS

Name of CBO	Member Agency	Number of Toilets Distributed (As of 2/28/95)	Money Earned by CBO (As of 2/28/95)
Mothers of East LA (MELA)	Los Angeles Dept. of Water and Power and Central Basin MWD	43,714	$1,092,850
First African Methodist Episcopal Church (FAME)	Los Angeles Dept. of Water and Power and West Basin MWD	58,783	$1,469,575
High Schools	5 Agencies	25,095	$372,120
Keeping The World at Peace	Los Angeles Dept. of Water and Power	15,814	$395,350
Korean Youth Community Center	Los Angeles Dept. of Water and Power	6,314	$157,850
Oakwood United	Los Angeles Dept. of Water and Power	5482	$137,050
Iglesia Poder Del Dios	Los Angeles Dept. of Water and Power	9,115	$227,875
ExPERT	ExPERT (not restricted to a single member agency)	1417	$35,425
Water Wise	Los Angeles Dept. of Water and Power	306	$7,650
Holy Trinity AME Church	Long Beach	1,001	$25,025
Senior Citizens Center	Eastern MWD	654	$8,010
Boy Scout Troop Construction Trades Explorers Post #2067	Upper San Gabriel Valley MWD	1001	$25,000
Metropolitan Area Advisory Committee	SDCWA- Sweetwater Authority	7,711	$170,317
Center for Employment Training	SDCWA- City of Escondido	2,424	$60,600
Triple Crown	SDCWA- City of San Diego	4,470	$111,875
Orange County Community Development Council	MWDOC - Southern California Water Company	965	$14,280
Stanton Boys and Girls Club	MWDOC - Southern California Water Company	256	$3,765
Stanton Community Development Council	MWDOC - Southern California Water Company	1,281	$32,025
Covina Lions	Upper San Gabriel Valley MWD	351	$5,265
Total		186,154	$4,351,907

Commercial/Industrial/Institutional Programs

Commercial, industrial, and institutional (CII) water users account for approximately 21 percent of the water used in Metropolitan's service area. Many of these customers can substantially reduce their water use, but developing a conservation program to reach this diverse group represents a distinct marketing challenge. The wide range of CII customers includes large oil refineries on the coast, hairdressers in Beverly Hills, a paper mill in Pomona, and all office buildings in Metropolitan's service area.

Although water may only be a small fraction of a business's operating expense, conservation measures can be cost-effective and easily implemented. One primary metal manufacturer, for example, was able to reduce water use by 67 percent. This translated into 83 million gallons, or 255 acre-feet of water savings per year. Examples of more moderate water savings are common, with payback periods of one to two years.

Metropolitan works closely with its member agencies and subagencies to develop comprehensive CII programs that can assist retail water users. The CII program continues to expand as new needs are identified. Current program elements include a variety of training opportunities, a full range of water use surveys, and customized CII program layouts for retail water agencies.

Training is available to assist agency staff in providing their CII conservation services. Conservation Coordinator Training is a one-day course that assists agency staff in planning and marketing CII programs within its service area. A subsequent course is the Hands-On Training Class that teaches agency staff members how to conduct an on-site water use survey.

Metropolitan also offers seminars for retail CII customers. One example of this is the Cooling Tower Seminar that teaches techniques for improving the process efficiency of cooling towers. Since cooling towers account for about one-third of water use in the CII sector, efficiency improvements can save significant amounts of water. Other workshops and seminars are targeted to specific audiences such as hospitals, hotels, or chief executive officers.

Surveying an individual customer's water use is the basic means of identifying CII water savings opportunities. A report provided to the customer explains the recommended conservation measures and their simple payback periods. The different types of water use surveys are intern surveys, agency staff surveys, scoping surveys, and water management studies. The level of report detail varies according to the site being evaluated.

An intern survey or agency staff survey is appropriate for facilities with fairly straightforward water users such as offices, hotels, and restaurants. A scoping survey is used for more complicated water users, such as industrial laundries, and is conducted by a consulting engineer under contract to Metropolitan. A water management study is also conducted by a consulting engineer and is used to analyze highly complex water applications, such as oil refineries.

Metropolitan provides a CII program layout to its member agencies and subagencies. Metropolitan reviews a retail agency's customer database and helps the agency target the market it wants to reach with a CII program. After the appropriate

level of survey is identified for each targeted customer, a three-year CII plan is developed for the retail agency. This program layout becomes a road map for planning and budgeting.

Metropolitan also develops various pilot studies to evaluate potential new program opportunities. The cost-effectiveness of water audit and leak detection in water distribution systems programs is one pilot program now being evaluated. Other pilot programs include new technology assessment and water survey (audit) software development.

The CII program is designed to help water agencies reach out to the business community to help CII customers use water more efficiently. Metropolitan financially supports the CII program under the criteria of the Conservation Credits Program, paying the lesser of half the cost of the program or $154 per acre-foot of water saved.

Landscape Conservation Program

The goal of the landscape program is to allow people to enjoy beautiful landscapes that do not consume more water that is necessary and to encourage lifestyle choices and activites that reflect the Metropolitan slogan "Use Water Wisely. It's a Way of Life". In an effort to reach this goal, Metropolitan has promoted landscape water budgeting similar to that described in the State Model Water Efficient Landscape Ordinance (AB 325), and it has encouraged member agencies and cities to support education programs that promote water efficient xeriscaping principles. Metropolitan has also actively sought the participation of organizations and members of the green industry in the development and implementation of policies, goals, and actions for landscape water conservation.

Although landscaping accounts for about 25 percent of the water used in Metropolitan's service area, less is known about the effectiveness of landscape-conservation programs than other forms of conservation. More than other conservation programs, however, the landscape program depends both on technological advances and on changing the way that people use water. For these reasons, the landscape program consists of education, research, and pilot programs.

Education Programs

Landscape audits and other landscaping programs have a major public education component. Metropolitan offered a course to teach landscape managers and irrigators how to evaluate current landscape practices and how to use California Irrigation Management Information System (CIMIS). CIMIS is a network of 89 weather stations statewide, with 12 stations in Metropolitan's service area, that are linked to a California Department of Water Resources host computer. Managers of large landscape areas, such as golf courses, parks, and cemeteries, use the CIMIS to set their irrigation schedules. The course has been taught for the last five years through a network of cooperative extension horticulturists with the University of California at Riverside. Over the last 5 years, 1,700 individuals have taken part in this program.

Metropolitan is also offering a series of workshops through the Irrigation Association, an organization that includes leading irrigation equipment manufacturers, dealers, and consultants. These workshops are designed to train water conservation coordinators to create and manage databases of landscape professionals.

The Irrigation Training and Research Center (ITRC), run by California Polytechnic State University at San Luis Obispo, is conducting a special landscape irrigation management course sponsored by Metropolitan. The course, known as Protector del Agua, comprises a series of three-hour classes aimed at professional gardeners and other landscape maintenance personnel. The initial class focused on basic water management principles. Twenty classes were conducted in 1994. Five additional classes are being developed on setting controllers, irrigation system electrical and hydrologic repair, and irrigation scheduling. Trailers equipped with training support materials permit the classes to be offered anywhere throughout Metropolitan's service area. The course is offered in both English and Spanish.

In addition, Metropolitan sponsors a comprehensive two-day course offered by ITRC that permit attendees to achieve certification as landscape water auditors.

Research Programs

Topics of current research projects include both new technologies and drought tolerance of plant materials. One current Metropolitan project is investigating the minimum water requirements of both turf and mixed plantings. The effects of low water use on the appearance of the plants are also being evaluated.

A program to field test moisture sensors that are currently on the market is investigating the potential to make automatic irrigation systems more efficient. Another program is planned to study the effects of various system adjustments and changes in irrigation scheduling, combined with improved maintenance.

Pilot Programs

The California Water Conservation in Landscaping Act, AB325, requires cities to implement a landscape water conservation ordinance. Cities have the option of enacting ordinances suitable for their needs; if no local ordinance is passed, then a standard ordinance written by the state is used. For example, the Otay Water District adopted an ordinance that calls for establishing a water budget based on the amount of landscape area and the reference evapotranspiration rate. Businesses that exceed their budgets pay a steeply increasing water rate based on how many consecutive months they have overwatered. The Otay Water District will assist its customers in determining why their use is excessive. Penalty refunds are made after a period of compliance is met.

Because many cities are already overwhelmed with state and federal requirements, Metropolitan is helping fund a Circuit Rider in Central Basin Municipal Water District and West Basin Metropolitan Water District. The Circuit Rider provides landscape expertise to assist cities in determining how to comply with AB325 and how to make the ordinance work for them. This is being done on a pilot program basis.

Other pilot programs are the San Diego Large Turf Water Audit Program and the Centralized Computer-Controlled Irrigation System Retrofit. These programs focus on new techniques for improving the efficiency of water use for landscaping. Assessing the long-term water-saving effects of landscape audits is an issue to be studied.

The landscape program is currently focused on developing the information needed to identify and implement cost-effective methods of meeting landscape

conservation BMPs. The emphasis on residential and large-turf audits will continue, as will more research into ways to reduce the time and effort needed for efficient irrigation scheduling. Although the intention is to identify technological advances that will reduce the need for behavioral changes, there will still be a need for education to help people change their attitudes toward landscape irrigation.

Southern California Water/Energy Conservation Partnership

Conserving water also conserves energy. Recognizing this, a number of utilities have formed the Southern California Water/Energy Conservation Partnership (Partnership), including:

(1) Metropolitan Water District of Southern California

(2) Southern California Edison

(3) Southern California Gas Company

(4) Los Angeles Department of Water and Power

(5) Anaheim Public Utilities Department

(6) City of Burbank Public Service Department

(7) City of Glendale Public Service Department

(8) Pasadena Water and Power Department

(9) Municipal Water District of Orange County

(10) County Sanitation Districts of Orange County

(11) Central Basin Municipal Water District

(12) West Basin Municipal Water District

(13) City of Santa Monica

(14) Upper San Gabriel Valley Municipal Water District

Metropolitan and these regional utilities are working to implement joint conservation programs to save both water and energy while minimizing duplication of effort.

As an example of this cooperation, the Partnership initiated a pilot project to distribute ULF toilets in Stanton and Placentia. The project is sponsored by Metropolitan, Southern California Edison Company, Municipal Water District of Orange County, and Southern California Water Company.

The Partnership will be promoting the use of horizontal-axis washing machines as a specific example of a product that can save both energy and water without any added effort from the consumer.

The Partnership has participated in a number of activities to reach out to the general public, including the Los Angeles County Fair in Pomona, the Southern California Home and Garden Show in Anaheim, the Edison Energy Show in Long Beach, and the Eco Expo at the Los Angeles Convention Center. At these exhibits, user-friendly computers print personalized lists of drought-resistant plants keyed to specific areas in Southern California.

Literature distributed by the Partnership includes Conservation Connection, which is a commercial and industrial newsletter, and a series of brochures called *Efficient Appliances Plus* that includes information on water conservation as well as gas and electrical appliances.

PUBLIC AFFAIRS SERVICES

Metropolitan continues to develop and implement public affairs programs that teach and encourage the community how to use water efficiently. Through this information program, Metropolitan has adapted to both drought and nondrought conditions by emphasizing the benefits of water conservation during times of emergency and times of *normal* water use. Metropolitan provides innovative programs that show residents how to conserve water by changing their water behavior and by using water-efficient appliances and fixtures.

Metropolitan pursues five programs to take the conservation message to the homes, schools, and workplaces in the community. Metropolitan also carries out a research program to evaluate the efficacy of these public relations and educational programs. These evaluation programs guide the public affairs staff in implementing and designing future public affairs programs.

Metropolitan's public affairs program includes:

(1) Publications

(2) Education programs

(3) Community relations

(4) Legislative and liaison activities

(5) Mass-media campaigns

These programs are designed to encourage consumers to integrate conservation measures into their daily lives. Public information campaigns and the related education programs will continue to be an important part of Metropolitan's water management and conservation efforts. The following sections describe the programs in more detail.

Publications

Metropolitan distributes brochures to encourage water conservation as a way of life in Southern California. Metropolitan also publishes two quarterly, award-winning full-color periodicals titled *Aqueduct 2000* and *Focus on Water.* Metropolitan also distributes *People,* an internal periodical for employees and retirees.

Metropolitan collects water-related literature from state and federal agencies and from professional organizations such as the American Water Works Association. Metropolitan also assists in the design and implementation of conservation literature. For example, four different brochures were produced to support drought media campaigns in the early 1990s. These included *How Much Water Does Your Lawn Really Need?, Surviving the Drought, New Drip Irrigation,* and *Unthirsty 100.* Metropolitan also produced two Spanish translations of a greywater brochure and *The Top Ten Tips for Saving Water.* Table III-6 provides a more complete roster of literature distributed by Metropolitan. Although Metropolitan, as a water wholesaler, is not the prime contact for retail customers, Metropolitan makes this information available to member agencies and to the general public.

Educational Programs

Metropolitan's kindergarten through high school education program includes traditional classroom curricula, as well as inspection trips of filtration plants, awards recognizing excellent water projects at the Los Angeles County Science Fair, special assembly programs, and the Environmental Education Fair's Nature Bowl Competition. Metropolitan also provides mini-grants and staff support for

TABLE III-6

METROPOLITAN'S PERIODICALS AND BROCHURES

No.	Titles and Comments
1.*	Aqueduct 2000–Flagship magazine for Metropolitan
2.*	A Taste of Quality
3.	Drink, Cook, Blend
4.*	Annual Water Quality Report
5.*	Water for Southern California–Just updated
6.*	Domenigoni Valley Reservoir, Project Brochures–Newest publications
7.	Water Treatment Following Nature's Lead
8.	A Journey Down the Colorado River Aqueduct
9.	Inland Feeder Project Brochure
10.*	The Top Ten Tips for Saving Water
11.*	Direct Line–Monthly Board Meeting Briefing
12.	Focus On Water
13.	The Story of Drinking Water (AWWA document)
14.	The Guzzler Gang
15.	Drinking Water and Lead
16.*	Pacesetters–The Board of Directors
17.	A Homeowner's Guide to Garden and Lawn Water Savings
18.	How to Have a Green Garden in a Dry State
19.	Recycling for Today and Tomorrow
20.*	Annual Report (Blue Book)–Most comprehensive
21.	Annual Financial Report
22.	1984 Environmental Report
23.*	MWD Fact Sheet–Most requested publication
24.*	Filtration Plants

* Most requested literature.

water conservation programs in the schools. Table III-7 lists the educational programs of the Metropolitan Water District. Films and slides are integrated into these programs. Table III-8 provides a list of films and slide shows currently in use. The following describes some of the educational programs in detail.

School Curricula

Since 1983, nearly 2.7 million students have received classroom materials from Metropolitan. Of the nearly 3,300 elementary schools and high schools in agency districts, 2,500 schools have participated in Metropolitan educational programs. In the elementary schools, the curricula are designed to support existing science, social science, and reading programs. In high schools, the materials are designed to supplement government, chemistry, physical science, economics, biology, and health classes. In addition to the class materials, Metropolitan staff have personally spoken to classes and school assemblies. These speaking engagements proved to be an efficient way of presenting conservation materials to large bodies of students and teachers.

TABLE III-7

STUDENT AND TEACHER PARTICIPATION IN MWD EDUCATIONAL PROGRAMS AND SERVICES

Activity	Programs
Elementary education	• All About Water • Admiral Splash • Water Ways • California Smith, Water Investigator • Think Earth • Geography of Water
High school	• Water Quality • Water Highways • Water Trade-Off • Water Politics
Assembly presentations	• Hands-on Demonstrations • Classroom Speaking Engagements
Publicity programs	• Water Awareness Month Kit • Waterthon--5K run • County Science Fairs
Awareness building	• Career Days and Outreach Programs • Mini-Grant Programs for K-12 • Pen Pal and Mentoring Programs
Teacher institutes	• Water Politics Summer Institute • World of Water

Teacher Seminars

In addition to the classroom materials, Metropolitan has hosted a number of teacher seminars. The World of Water included the following elementary school curriculum: All About Water, Admiral Splash, and California Smith. At the Water Politics Summer Institute, Metropolitan conducted a four-day seminar for school teachers to introduce the new high school unit, Water Politics. Approximately 30 educators met Metropolitan board member Alf Brandt and General Manager John Wodraska. These seminars have allowed Metropolitan staff and school professionals to present and review materials in depth, as well as offer college credit.

Business-Education Partnership Activities

Metropolitan is developing ties with schools on three levels. *First,* Metropolitan is encouraging disadvantaged students in ethnically diverse schools through mentoring and pen pal programs. For example, Compton's Rosecrans Elementary School and Pasadena's Cleveland Elementary School participate

TABLE III-8
EDUCATIONAL VIDEOS AND SLIDE SHOWS

No.	Title	Contents
1.	California Water Story	Traces history of water use in California.
2.	The Colorado: Portrait of a River	Scenic film of the Colorado River.
3.	The Day the Water Stopped	Mini-adventure emphasizing difficulty of bringing water into Southern California.
4.	Gardening California Style	Horticulture film showing xeriscape plantings.
5.	The Guzzler Gang	Cartoon showing children how to conserve water.
6.	Noah Water to Waste	Richard Simmons offers a refreshing look at water conservation.
7.	The Story of the Colorado River Aqueduct	Tells the story of the construction of the Colorado Aqueduct. The film makes good use of historical footage. A good overview of water use in California.
8.	Water Follies: A Soak Opera	An award winning cartoon about the uses and abuses of water in the home.
9.	Without Water	A humorous film about how we take water for granted in our homes.
10.	Your Water, Your Future	Illustration of California's supply and demand for water.

through the pen pal programs. Ninety-three Metropolitan employees write letters and send holiday cards to students throughout the year. At the high school level, Metropolitan employees in the Mentor Program built supportive relationships with twenty-four students at Jefferson High School during the 1993-94 school year. These students were also invited to two Career Shadow Days to learn more about career opportunities at Metropolitan.

A *second* type of activity involves environmental programs in the schools. The Business-Education Partnership supports the Water-Wise and the In Concert with the Environment programs. Jefferson High School, in South Central Los Angeles, received $12,000 to support student efforts to replace high water use toilets with ultra-low-flush toilets in their community. Through the In Concert Partnership among high schools, Metropolitan has supported training and materials for student-operated water and energy audits of homes.

In a *third* business-education partnership, Metropolitan's Mini-Grant

awarded grants ranging from $100 to $500 encouraging teachers and students (K-12) to develop water education projects. Also, Metropolitan staff helped the Los Angeles Education Partnership by reviewing and allocating grants to student-proposed conservation projects. Metropolitan also sponsored Concerned Citizens of South Central Los Angeles, and Metropolitan staff participated in the first Annual Youth Environmental Education and Career Day at Jefferson High School.

Other Programs

Metropolitan continues to explore more innovative ways to acquaint the public with water conservation. The following are some other programs that have been implemented since 1990.

Metropolitan designs and distributes a yearly conservation-themed wall calendar for use in classrooms throughout the service area. Each month of the calendar highlights an elementary student's artwork selected and submitted by member and subagencies.

A fifth-grade curriculum under development will teach about use of water in pre-Columbian, Native American, colonial, and western expansion times. The new program will support history and geography classes through the use of maps, activities, and illustrated materials.

Sixth-grade students in communities neighboring the Domenigoni Valley Reservoir Project are taking part in a program involving field trips and class instruction to learn more about paleontological and archaeological discoveries and the new reservoir. Third-grade classes in the Temecula, San Jacinto, Romoland, Murrieta, Menifee, and Hemet school districts are participating in the Santa Rosa Plateau Environmental Education Program.

The Think Earth Environmental Program Consortium distributed Think Earth programs to 4,251 teachers of grades K-6 in ten counties. The materials were well received, and the consortium is considering the use of computer networks in the high schools to expand the program. The program helps schools create and maintain active environmental clubs.

Metropolitan publishes Splash for elementary schools (circulation of 14,000 educators) and *The Wave* for high-school teachers (circulation 6,000). *The Wave* newsletter received an Award of Excellence from the International Association of Business Communicators (IABC) at the District Six Silver Anvil Awards Program in its first year.

Metropolitan's education program coordinated the design of the Vista Del Lago Visitors Center, the development of the center's activities, and the installation of Metropolitan's exhibit on water delivery and water quality. Metropolitan's education staff is working with California Department of Water Resources staff to develop pre- and post-visit packets for the schools who will visit the site.

Community Relations

In addition to the school programs, Metropolitan strives to help the public understand the importance of its infrastructure projects and water conservation through a community relations program that includes inspection trips, speaker's bureaus, and special events.

Inspection Trips

Metropolitan conducts inspection trips of its own facilities and of state facilities such as the California Aqueduct. These inspection trips show local residents and community leaders how Metropolitan

is working to assure reliable supplies and high-quality water for Los Angeles and its surrounding communities. The inspection trips also emphasize the importance of conservation as a way of life and not just a response to periodic droughts.

Speakers Bureau

Metropolitan maintains a speakers bureau staffed by employee volunteers. Since 1985, these volunteers have given presentations to more than 30,000 people. While the subject matter of the presentations covers a wide range of water issues, the members of the speakers bureau frequently include a conservation message as part of their presentation. During the recent drought, the speakers bureau was giving as many as 75 presentations per week. Metropolitan provided its employee volunteers with training sessions and a workbook. The workbook included materials about water supply and demands and the issues concerning conservation. The representatives were also given instructions on how to deal sensitively with the public.

Public Events

Since 1990, Water Awareness Week has been Water Awareness Month (May). Teachers who requested materials were given packets to help their students organize games and exercises emphasizing the importance of water conservation. Part of this May event included the Waterthon, a five-kilometer run that helped publicize Water Awareness Month. Students also participated in a poster contest with the slogan *Use Water Wisely, It's a Way of Life.* Metropolitan staff selected winners who were used for Metropolitan's 1995 calendar. Metropolitan used public events such as the Nature Bowl that was held during the Environmental Education Fair at the Los Angeles County Arboretum. Thirty elementary schools took part in this quiz-show-style event that had an audience of about 4,500. In 1995 and the coming years, Water Awareness Days will be sponsored by five ball parks. Water bottles and conservation materials will be distributed to attendees. Metropolitan is also sponsoring 10K Walk/Run days to bring more public attention to water conservation. In 1995, Metropolitan is spreading the message of *Use Water Wisely, It's a Way of Life* through business partnerships that distribute posters and bulletins in their workplaces. Essay contests are also sponsored to nominate Water Winners in the business, agricultural, nursery, and citizen sectors. Winners are given certificates recognizing their efforts.

Liaison Activities and Legislation

Metropolitan maintains close ties to its member agencies. In addition to the monthly Member Agency Managers Meeting, Metropolitan staff meets and coordinates efforts with the Southern California Conservation Work Group (SCCWG). SCCWG members are conservation coordinators from Metropolitan's member agencies and subagencies.

Metropolitan also works closely with the professional societies involved with water supply and conservation, such as the Association of California Water Agencies, the American Water Works Association, the Southern California Water Committee, the California Department of Water Resources, and the Office of Water Conservation Advisory Committee.

Metropolitan reviews and supports local, state, and federal legislation that will promote effective water conservation. For

example, the staff have worked closely with 12 congressional members on the federal Safe Drinking Water Act. They have also helped explain Metropolitan concerns to state and federal legislators on Bay/Delta Issues. In addition to the existing Sacramento Public Affairs office, Metropolitan opened a Washington, D.C., Government Affairs office in 1995.

Metropolitan has government relations representatives assigned to regions such as the high-growth Riverside County, where legislators and community leaders need information about the Inland Feeder and Domenigoni Valley Reservoir, and the San Gabriel Valley, where the Metropolitan staff are working with state and local officials concerned about the Azusa Landfill and related groundwater contamination issues. Metropolitan is also reaching out to non-traditional support groups such as community-based organizations, including the Mothers of East Los Angeles and First African Methodist Episcopal Church (FAME) Renaissance.

Media Campaigns

The mass-media program has recently included two public-media conservation campaigns. The first $4.3 million campaign conducted during 1991-92 used radio, television, newspapers, billboards, and conservation packets to press the case for conservation during a drought. The second campaign (costing $117,000) took place during the spring of 1993 and was designed to thank the public for its cooperation during the drought. It stressed the importance of making conservation a way of life. In nondrought years, mass-media programs on radio or television are aired by local stations as public-service announcements (PSA). Metropolitan developed 10-, 30-, and 60-second bilingual announcements to remind the community to *Use Water Wisely, It's a Way of Life.*

Metropolitan has reviewed the influence its radio, television, pamphlets, brochures, newsletters, and educational programs have on the public. Empirical research on the success of Metropolitan's large education and marketing programs underlined the importance of the community's willingness to install and use conservation devices. A Metropolitan study titled *The Conservation Media Campaign of 1989 and 1990: Trends in Conservation Behavior* (1993) looked for changes the 1989 and 1990 media campaigns had on the public's conservation behavior, advertising awareness, perceptions of their household water use, and drought awareness. Though this type of research may not definitively prove the cost-effectiveness of advertising campaigns, it can document their impact and provide marketing information about the demographics of the population that responds to public information programs. The researchers found an important tie between home ownership and a greater concern over the use of resources and the protection of investments in a home and community. By evaluating the impact of a media campaign and improving the understanding of the target audience, this research can improve the ability of Metropolitan to communicate its conservation message.

Summary

As the benefits of water conservation have become more recognized and accepted, new approaches, fresh ideas, and opportunities have arisen to meet the challenge of the Southern California market. Some of the innovations include:

- Alternative-financing opportunities for water conservation programs, such as shared-savings plans using repayment schedules based on the savings achieved by implementing conservation measures;
- Water agency loans and partnerships with household-lending institutions;
- Partnerships with electrical utilities to provide classroom curricula and self-audit programs;
- Research and implementation of new technologies, such as the horizontal-axis washing machine;
- Opportunities to work with nontraditional partners, such as community-based organizations, businesses, and environmental groups.

Metropolitan has a variety of conservation programs available to assist its member agencies and subagencies, both financially and in program development. It is possible to implement these programs in a cost-effective manner and to help the community at the same time. This is particularly well demonstrated by the CBO ULF toilet programs. Metropolitan works closely with its member agencies to assure that the programs are designed to meet the particular needs of their service areas. By covering residential, commercial/industrial/institutional, and landscape programs, Metropolitan provides access to a full range of conservation programs.

Metropolitan is faced with the challenge of providing a reliable source of water for an expanding population in Southern California. Conservation plays an important role in planning to reliably meet future water demand. By making wiser use of water, the need for new sources of supply can be lessened. Metropolitan's commitment to conservation, as expressed in its demand-side management programs, is aimed at achieving wiser use of our scarce water resources.

Through the Integrated Resource Planning (IRP) process that is discussed in Chapter VIII, Metropolitan reaffirmed the need to adopt a leadership and partnership role with its member agencies and subagencies in local water management. The Southern California water community has consented that Metropolitan should adhere to the following principles when establishing its water conservation programs. These principles are not listed in order of priority, as they need to be taken into account as a whole (and in conjunction with the guiding principles identified for the local water supply management programs shown at the end of Chapter V).

- Regional benefits of conservation projects should be measured by (1) a reduction in capital investments due to a deferral and/or down-sizing of regional infrastructure; (2) a reduction in operation and maintenance expenditures needed for treatment and distribution of imported water; and (3) a reduction in expenditures associated with developing alternative regional supplies.
- Metropolitan's investments for conservation projects should not exceed the regional benefits measured over the life of the project(s).
- Conservation pricing, financial incentives, and drought allocation methodologies should encourage the achievement of conservation goals.
- Conservation project savings must be verifiable and consistent in order to qualify for continuing investment.

- Metropolitan's investment in conservation projects should reflect equity among the member agencies.
- Future water shortage allocations should recognize the implementation of conservation programs.
- Metropolitan's participation in conservation incentives should not cause large fluctuations in Metropolitan's water rates.
- Recognizing that conservation occurs at the consumer level, the local water purveyors should lead the development and implementation of conservation measures.
- Public/private partnerships to achieve conservation goals should be included among conservation program measures.

IV. WATER SUPPLIES

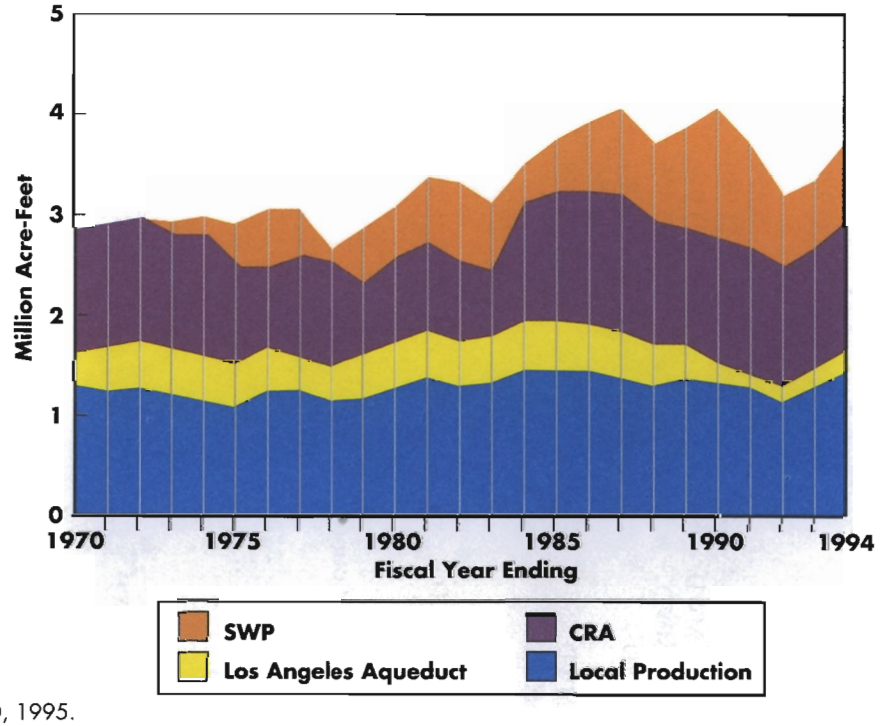
Water used in Metropolitan's service area comes from various sources. These sources are local (local groundwater, surface water, and reclaimed wastewater) and imported (Colorado River, State Water Project (SWP), and Owens Valley/ Mono Basin). Local sources meet about 36 percent of the water needs in Metropolitan's service area, while imported sources supply the remaining 64 percent.

Metropolitan provides imported water supplies that meet about 58 percent of the region's water needs; these supplies are received from Metropolitan's Colorado River Aqueduct (CRA) and the SWP's California Aqueduct. In addition, the city of Los Angeles imports water from the eastern Sierra Nevada through the Los Angeles Aqueducts and this water currently meets about 6 percent of the region's water needs. Metropolitan's service area and the three major aqueducts used to import water into the area are shown in Figure IV-2. The historical use of the various local and imported supplies within Metropolitan's service area is shown in Figure IV-1.

Table IV-1 shows the quantities of water used by member agencies from local and imported supplies during fiscal

FIGURE IV-1

SOURCES OF WATER SUPPLY IN THE METROPOLITAN SERVICE AREA



Source: MWD, 1995.

TABLE IV-1

WATER USE BY METROPOLITAN'S MEMBER AGENCIES
Fiscal Year 1993–1994 (Acre-Feet)

Member Agency	Local Production[1]	Direct Deliveries	Replenishment Deliveries[2]	Total Deliveries	Total Water Use	MWD Deliveries in Percent of Total Use
Anaheim	43,420	23,533	0	23,533	66,953	35
Beverly Hills	0	13,014	0	13,014	13,014	100
Burbank	5,359	19,975	0	19,975	25,334	79
Calleguas MWD	21,988	83,737	855	84,592	105,725	80
Central Basin MWD	144,042	93,186	24,129	117,315	237,228	49
Chino Basin MWD	135,405	48,085	8,859	56,944	183,490	31
Coastal MWD	8,684	38,874	0	38,874	47,558	82
Compton	3,956	5,190	0	5,190	9,146	57
Eastern MWD	90,848	46,475	0	46,475	137,323	34
Foothill MWD	5,758	9,026	94	9,120	14,784	62
Fullerton	19,893	10,648	0	10,648	30,541	35
Glendale	2,106	27,275	0	27,275	29,381	93
Las Virgenes MWD	1,254	18,367	0	18,367	19,621	94
Long Beach	13,023	58,552	0	58,552	71,575	82
Los Angeles[3]	243,865	309,529	0	309,529	553,394	56
MWD of Orange County	212,745	206,297	78,521	284,818	419,042	68
Pasadena	4,126	18,772	0	18,772	22,898	82
San Diego CWA	126,974	404,163	0	404,163	531,137	76
San Fernando	2,642	799	0	799	3,441	23
San Marino	5,304	1,637	0	1,637	6,941	24
Santa Ana	26,262	20,501	0	20,501	46,763	44
Santa Monica	9,355	4,735	0	4,735	14,090	34
Three Valleys MWD	60,708	59,424	2,000	61,424	120,132	51
Torrance	8,929	20,754	0	20,754	29,683	70
Upper San Gabriel Valley MWD	150,923	7,645	27,123	34,768	158,568	22
West Basin MWD	32,548	152,638	21,958	174,596	185,186	94
Western MWD of Riverside Co.	228,536	50,858	0	50,858	279,394	18
Total	**1,608,655**	**1,753,689**	**163,539**	**1,917,228**	**3,362,344**	**57**

[1] Includes local groundwater production, surface water diversions, and the use of reclaimed water.
[2] Replenishment deliveries benefit other member agencies in the same groundwater basin; the use of replenishment water is included in total water production.
[3] Includes Los Angeles Aqueduct supplies of 213,222 acre-feet.

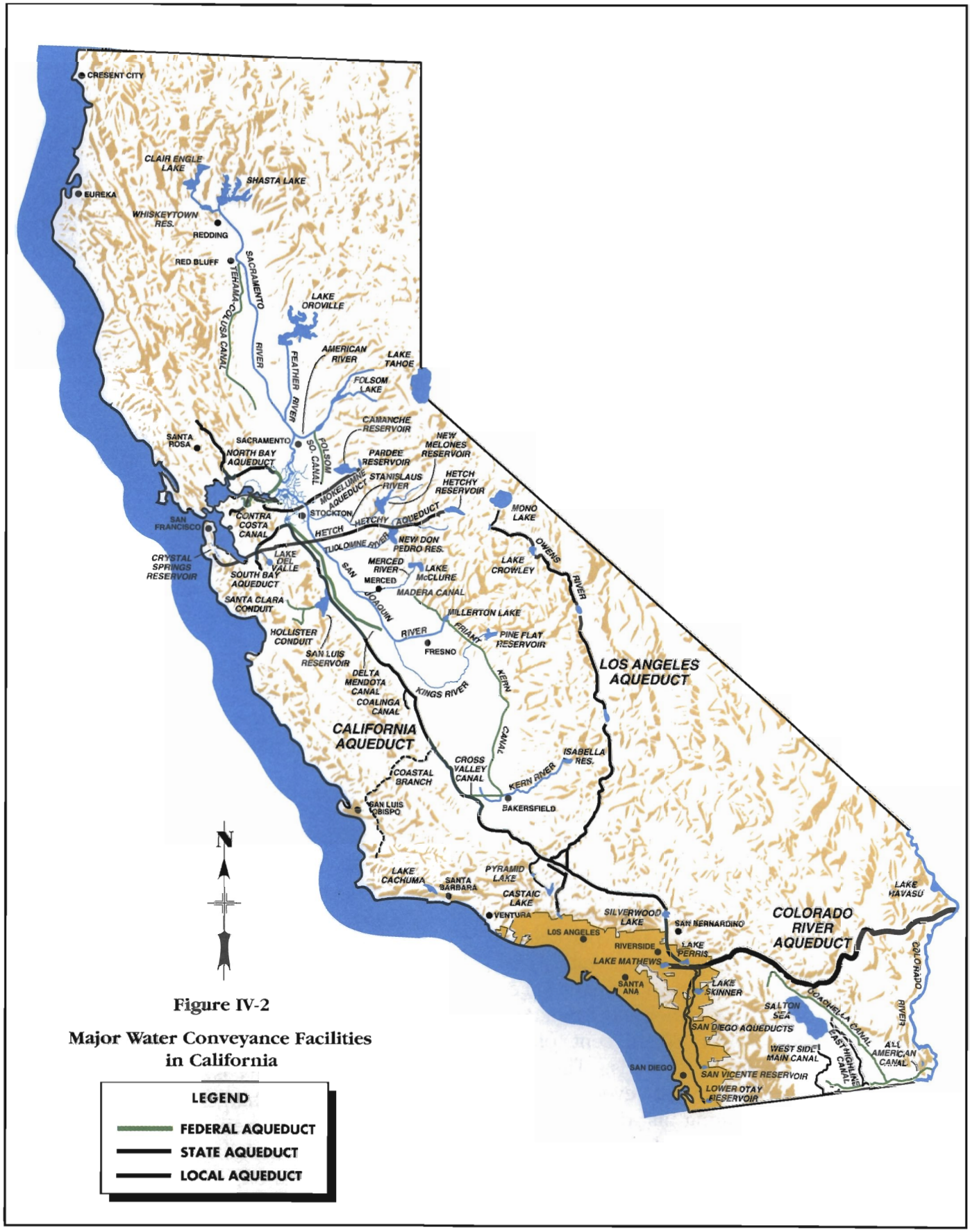


Figure IV-2

Major Water Conveyance Facilities in California

year 1993-94. Metropolitan's largest water customers are the San Diego County Water Authority (21 percent of Metropolitan's supplies in 1993-94), the city of Los Angeles (16 percent), and the Municipal Water District of Orange County (15 percent). The reliance on Metropolitan's water supplies varies by agency. For example, in 1993-94, Western MWD of Riverside County received only 18 percent of its total water supply from Metropolitan, while Beverly Hills and West Basin MWD received 100 percent. However, this relative share of local and imported supplies varies from year to year based on supply and demand conditions.

This chapter describes the current regional water supplies (local and imported) and the projections of water availability from the existing water sources. In addition to existing water supplies available to Metropolitan and its member agencies, potential additions to Metropolitan's current water supply sources are presented. The chapter concludes by addressing the quality of water supplies.

Local Water Supplies

Local sources of water available to the region include surface water, groundwater, and reclaimed water. Some of the major river systems in Southern California have been developed into systems of dams, flood control channels, and percolation ponds for supplying local water and recharging groundwater basins. For example, the San Gabriel and Santa Ana rivers capture over 80 percent of all runoff in their watersheds. The Los Angeles River system, however, is not as efficient in capturing its runoff. In its upper reaches, which make up 25 percent of the watershed, most runoff is captured with recharge facilities. But in its lower reaches, comprising the other 75 percent of the watershed, the river and its tributaries are lined and there are no recharge facilities. The Santa Clara River in Ventura County is outside of Metropolitan's service area, but it replenishes groundwater basins which are used by water agencies within Metropolitan's service area. Other rivers in Metropolitan's service area, such as the Santa Margarita and San Luis Rey, are essentially natural systems. Local supplies fluctuate in response to variations in rainfall. During prolonged periods of below-normal rainfall, local water supplies decrease. Conversely, prolonged periods of above-normal rainfall increase local supplies. The sources of groundwater basin replenishment are local precipitation and runoff from the coastal ranges, and artificial recharge with imported water supplies. In addition to runoff, reclaimed water is an increasingly important source of water for the region. Reclaimed water is also used to replenish groundwater basins, subject to approval by the California Department of Health Services and the Regional Water Quality Control Board.

Major Groundwater Basins

Groundwater sources account for about 90 percent of the natural local water supplies. These supplies are found in many basins throughout the Southern California region and provide an annual average total production ranging from 1.2 to 1.4 MAFY. The majority of the groundwater yield comes from natural recharge. The location of the major groundwater basins is shown in Figure IV-3. Natural recharge of groundwater basins is accomplished through the natural percolation of rainfall and stream runoff. In addition, runoff in certain areas is

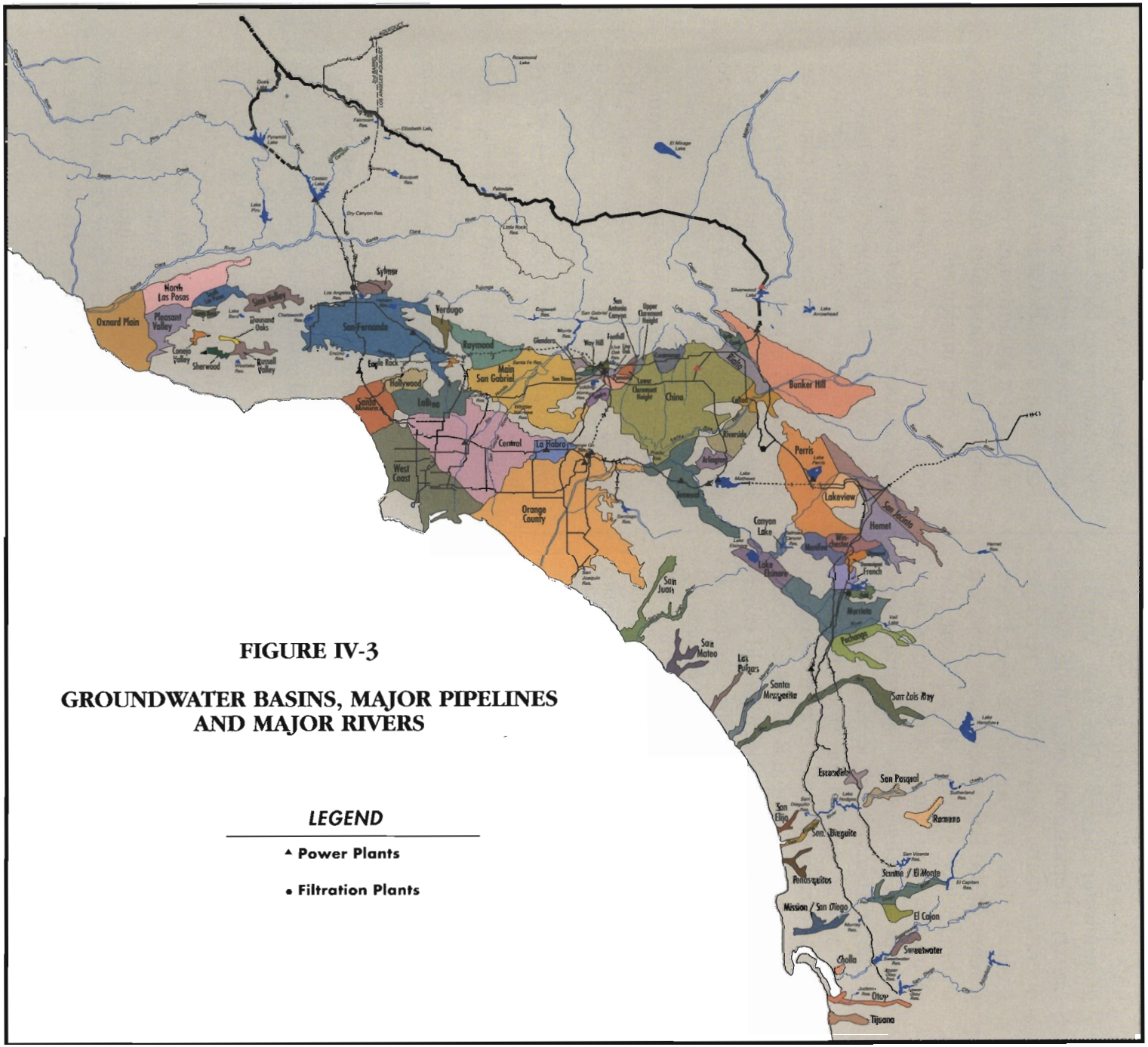


FIGURE IV-3

GROUNDWATER BASINS, MAJOR PIPELINES AND MAJOR RIVERS

LEGEND

▲ Power Plants

• Filtration Plants

retained in flood control reservoirs constructed in major drainage areas and released into spreading basins or ponds for additional percolation into the groundwater basins. The Los Angeles County Department of Public Works operates many groundwater recharge facilities that are located at the upper reaches of the Los Angeles River and San Gabriel River systems. In addition, the Orange County Water District operates a system of diversion structures and recharge basins along the Santa Ana River that capture most of the storm runoff as well as reclaimed water from reclamation facilities in Riverside and San Bernardino counties. This water, which would otherwise flow into the Pacific Ocean, is allowed to percolate into the underlying aquifers and is later pumped for local use. Groundwater basins are also recharged with imported supplies and reclaimed water either by percolation in spreading basins or by injection.

Almost all major groundwater basins in Southern California are either adjudicated or managed by special districts or agencies. Eight adjudicated basins in the region include Raymond Basin, Central Basin, West Coast Basin, Main San Gabriel Basin, Upper Los Angeles River System, Chino Basin, Cucamonga Basin, and San Bernardino Basin. North Orange County groundwater is managed by the Orange County Water District, and portions of the southern Ventura County groundwater reserves are managed by the Fox Canyon Groundwater Management Agency.

When the safe yield of the basin or other groundwater management criteria are being exceeded, extractions are limited or replenishment is provided using imported supplies. In general, basin management plans include protection from seawater intrusion, water quality deterioration, and excessive lowering of water levels. The Groundwater Management Act (Assembly Bill 3030, 1992) authorizes local water agencies that provide water service–and whose water service area includes a groundwater basin or part of a groundwater basin that is not subject to groundwater management–to adopt and implement a groundwater management plan. An agency that adopts a resolution of intention to adopt a groundwater management plan has two years to prepare the plan. Upon adopting a groundwater management plan, the local agency is authorized to impose fees and assessments for the purpose of groundwater management, subject to certain exceptions.

Climatic conditions impact groundwater storage. Drought conditions in the late 1980s and early 1990s caused a significant reduction in water stored in groundwater basins. Figure IV-4 shows the changes in local groundwater storage (about 1 MAF) over the past several years. Rainfall patterns shown in Figure IV-5 correspond to the changes in groundwater storage.

Major River Systems and Reservoirs

Local surface water resources consist of runoff captured in storage reservoirs, which is held for later direct use, and diversions from streams for direct delivery to local water systems. Currently, 24 major reservoirs are owned and operated by local water agencies (Figure IV-6). The major reservoirs and their capacities are listed in Table IV-2. These reservoirs provide a storage capacity of 707,000 AF.

The historic average yield of these local surface supplies, from reservoir releases and stream diversions, is about

FIGURE IV-4

GROUNDWATER STORAGE TRENDS RELATIVE TO 1974 LEVEL

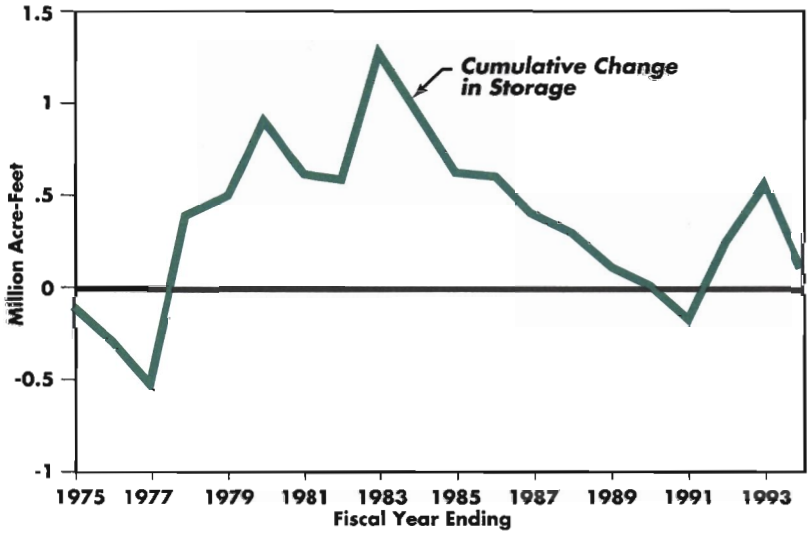
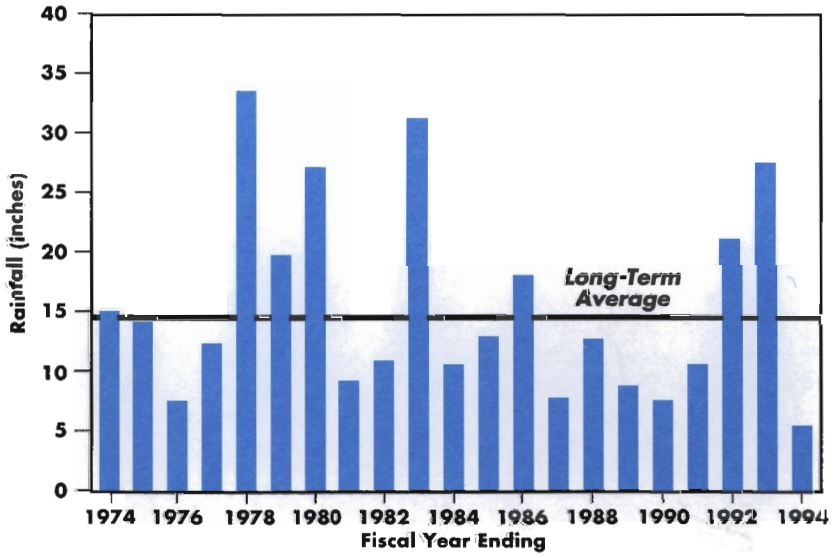


FIGURE IV-5

RAINFALL AT LOS ANGELES CIVIC CENTER



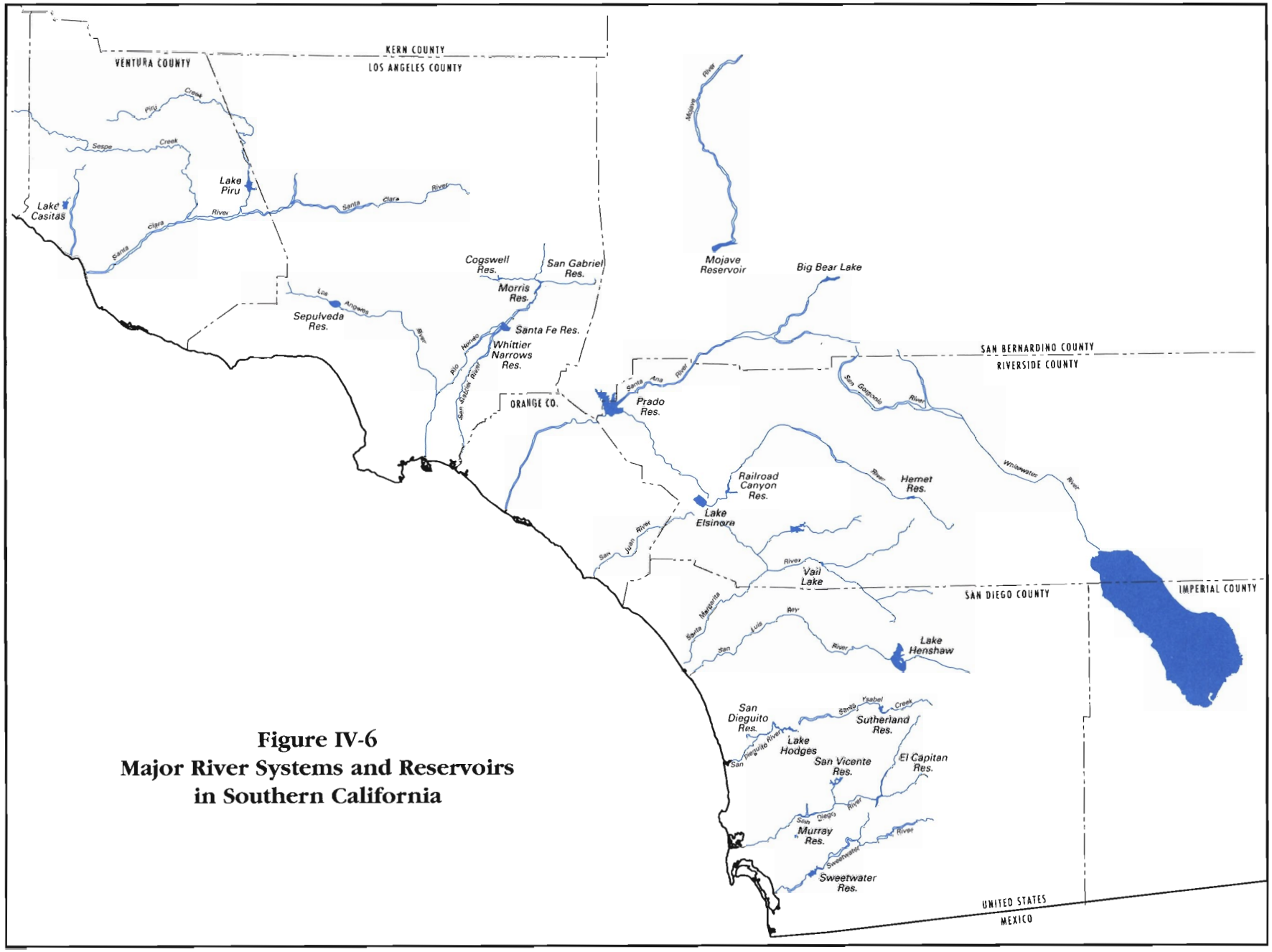


Figure IV-6
Major River Systems and Reservoirs in Southern California

TABLE IV-2

MAJOR LOCAL STORAGE RESERVOIRS IN METROPOLITAN'S SERVICE AREA

Member Agency/Subagency	Reservoir	Storage Capacity 1,000 AF
Calleguas MWD	Lake Bard	10.0
Eastern MWD		
Rancho California WD	Vail Lake	51.0
Lake Hemet MWD	Lake Hemet	14.0
Las Virgenes MWD	Westlake Reservoir	10.0
City of Los Angeles	Los Angeles	10.2
	Encino	9.8
	Stone Canyon	10.8
	Hollywood	4.2
MWD of Orange County		
Irvine Ranch WD & Serrano ID	Santiago	25.0
San Diego CWA		
Bueno Colorado MWD	Henshaw	53.4
Escondido	Lake Wohlford and Dixon	9.5
Helix ID	Cuyamaca Dam & Lake Jennings	18.0
City of San Diego	Barrett	38.0
	El Capitan	112.8
	Lake Hodges	33.6
	Morena	50.2
	Lower Otay	49.5
	San Vicente	90.2
	Sutherland	29.7
	Miramar	7.2
	Murray	4.8
National City	Lake Loveland	25.4
South Bay ID	Sweetwater	27.7
Western MWD of Riverside		
Temescal Water Company	Railroad Canyon	12.0
Total		707.0

130,000 AFY. The annual yield varies widely between wet and dry years, and most reservoirs that capture local surface runoff are operated with minimal carry-over storage. San Diego County has the greatest storage capacity for these types of reservoirs, with approximately two-thirds of the total local storage capacity in Metropolitan's service area.

Water Reclamation

To supplement imported water supplies, reclaimed water has been used in Metropolitan's service area for many years. Water reclamation projects involve treating wastewater to a level that is acceptable and safe for many nonpotable applications. Presently, there are more than 100 wastewater treatment facilities within Metropolitan's service area. Based on preliminary data from the ongoing United States Bureau of Reclamation's *Southern California Comprehensive Water Reclamation and Reuse Study* (1995), these wastewater facilities within Metropolitan's service area currently provide, at a minimum, secondary treatment of approximately 1.39 MAFY of wastewater. This quantity is projected to increase to approximately 2.35 MAFY in 2010. Most of these facilities are municipally owned and operated; Metropolitan does not own or operate any of these plants. The majority of these wastewater treatment facilities produce reclaimed water after secondary treatment. Moreover, many treatment facilities provide tertiary treatment, and a few of them also use reverse osmosis as a final purifying step. Effluent from these facilities is used primarily for direct nonpotable

reuse and groundwater recharge, with any excess of secondary effluent discharged to the ocean.

Direct use of reclaimed water is primarily for irrigation purposes. Various golf courses, cemeteries, school yards, parks, street medians, and freeway landscaping in Southern California are irrigated with reclaimed water. Many reclamation projects in Southern California have gone beyond traditional irrigation purposes to encompass groundwater recharge and industrial applications. Industrial applications include power plant cooling water and process water for paper plants. The largest use of reclaimed water in Southern California is for groundwater recharge. Groundwater replenishment is the most efficient use of reclaimed water, allowing large amounts of wastewater to be used at a relatively modest cost. Some reclaimed water is percolated in spreading basins for eventual reuse in potable systems. With additional treatment, reclaimed water can also be injected into the groundwater basin as a barrier to prevent seawater intrusion.

To promote the maximum use of reclaimed supplies, Metropolitan is providing financial incentives to local agencies (through the Local Projects Program as described in Chapter V) to build water reclamation plants and distribution system facilities to increase the use of reclaimed water and thus reduce the demand on Metropolitan's imported supplies. Figure IV-7 shows the location of existing and potential reclamation projects in Metropolitan's service area.

Imported Water Supplies

As local supplies currently provide only about 36 percent of the service area water needs, the balance is made up from imported sources. Most member agencies and retail water suppliers depend on imported water for a portion of their water supply. For example, the city of Los Angeles and the city of San Diego (the largest and second largest cities in the state) have historically (1970-93) each obtained about 83 percent of their water from imported sources. The magnitude of these imported water requirements is similar to that in other metropolitan areas of the state, such as San Francisco and East San Francisco Bay. The conveyance facilities for the imported water supplies are shown in Figure IV-1. Each of the imported sources of water available to Metropolitan's service area is described below.

Colorado River

Under the Seven Party Agreement (1931), apportionments to use of Colorado River water within the state were agreed to by the seven California parties with interests in diverting Colorado River water. In the early 1930s, Metropolitan entered into contracts for delivery of Colorado River water with the U.S. Department of the Interior. The contracts were for 1.212 MAFY and contained the provisions of the Seven Party Agreement. However, as a result of the 1964 U.S. Supreme Court decree in *Arizona v. California,* Metropolitan's dependable supply of Colorado River water was reduced to less than 550,000 AFY. This reduction in dependable supply occurred with the commencement of Colorado River water deliveries to the Central Arizona Project. In 1987, Metropolitan entered into a contract for an additional 180,000 AFY of surplus water. The Colorado River Aqueduct (CRA) conveys water 242 miles from its Lake Havasu intake to its terminal reservoir, Lake Mathews, near the city of Riverside.

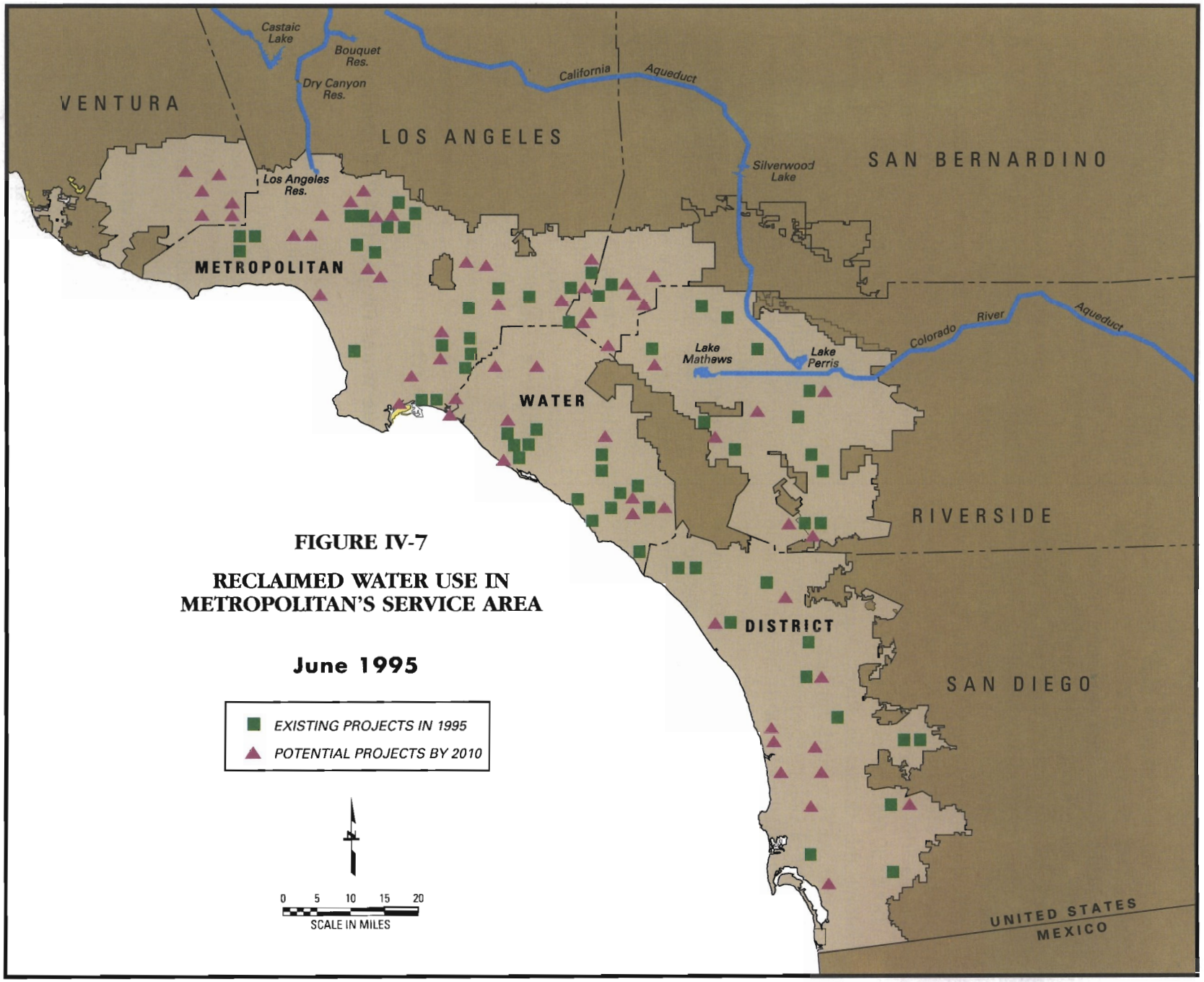


FIGURE IV-7

RECLAIMED WATER USE IN METROPOLITAN'S SERVICE AREA

June 1995

The capacity of the CRA is 1,800 cubic feet per second or 1.3 MAFY.

Although Metropolitan has a priority to divert 550,000 AFY of California's 4.4 MAFY basic apportionment under its water delivery contract with the Secretary of the Interior, current water use by holders of present perfected rights (such as Indian reservations, towns, and other individuals along the Colorado River) that predate Metropolitan's rights would reduce the dependable diversions by about 30,000 AFY. Conveyance losses along the Colorado River Aqueduct of 10,000 AFY would further reduce the amount of Colorado River water received in the coastal plain. With implementation of a water conservation program with Imperial Irrigation District (IID) under way, the firm annual yield is projected to be 608,000 AF in 1996.

Metropolitan has a goal of pursuing economic options to maximize its Colorado River water supplies and permit the CRA to be operated at capacity as much of the time as is feasible. This goal will be achieved through investment in conservation programs, conjunctive use, and land fallowing, as well as operating strategy optimization and storage of water in federal reservoirs. For example, through agreements with IID, Metropolitan is increasing its projected dependable Colorado River water supply upon completion of specific water conservation projects in 1998 to approximately 626,000 AFY through 2032. A detailed discussion of these programs is presented in Chapter V.

In April 1994, the U.S. Fish and Wildlife Service (Service) designated approximately 2,000 overlapping miles along the Colorado River and certain of its tributaries as critical habitat in an effort to allow four endangered fish species native to the rivers to survive and recover. While the Service had stated that it did not foresee changes in current hydrological operations of the Lower Colorado River, it remains to be determined whether efforts to recover these species could impact Metropolitan's Colorado River supplies.

Metropolitan's ability to divert additional Colorado River water in the short term beyond its dependable supply will be dependent upon various circumstances. One such circumstance is the hydrologic condition in the Colorado River Basin. If Colorado River system storage is such that the Secretary of the Interior (Secretary) declares a surplus condition, Metropolitan would have the highest priority to divert surplus water allocated to California. Another circumstance is the amount of Colorado River water used by others who have higher priority rights to the water. In years when others do not use their full entitlements, the possibility exists for Metropolitan to utilize the unused water. Examples of others holding rights to Colorado River water include California agricultural agencies and the states of Arizona and Nevada. The utilization by Metropolitan of unused Arizona and Nevada water is at the discretion of the Secretary annually.

State Water Project (SWP) Supplies

A second source of imported water for Metropolitan is the State Water Project (SWP). The SWP, owned by the state and operated by the California Department of Water Resources (DWR), conveys water from Northern California to areas south of the Bay Delta region through a series of reservoirs, pumping/generating plants, and aqueducts. Water from the State Water Project originates at Lake Oroville, which is located on the Feather River in Northern California. That water, along with all additional unused water from the

watershed flows into the Sacramento/San Joaquin Delta. Water from the Delta is then pumped to water users in the San Francisco Bay area, and it is transported through the California Aqueduct to water users in Central and Southern California.

DWR originally contracted to ultimately deliver a total of 4.23 MAFY to 32 SWP contractors (29 SWP contractors currently). Metropolitan is the largest contractor for SWP water, with a contracted entitlement of 2,011,500 AFY, or approximately 48 percent of the total contracted entitlement. Metropolitan receives deliveries of SWP supplies via the California Aqueduct at Castaic Lake in Los Angeles County, Devil Canyon Afterbay in San Bernardino County, and Box Springs Turnout and Lake Perris in Riverside County. The first delivery of SWP water to Metropolitan occurred in 1972.

The initial facilities of the SWP, completed in the early 1970s, were designed to meet the initial needs of the SWP contractors. It was intended that additional SWP facilities would be built over time to meet projected increases in contractors' delivery needs. Each contractor's SWP contract provided for a buildup in entitlement over time, with most contractors reaching their maximum annual entitlement by the year 1990. However, with the exception of four new pumps added to the pumping plant at the Delta, no additional SWP water supply facilities have been built since the early 1970s. During the same time, the contractors' needs for water from the SWP have increased. As a result, the contractors' demands for SWP water currently exceed the dependable yield. The dependable yield of the existing SWP facilities is considered to be the delivery capability during a critically dry seven-year period.

The amount of entitlement DWR approves for delivery varies annually with contractor demands and projected water supplies from tributary sources to the Delta, which are based on snowpack in the Sierra Nevada, reservoir storage, operational constraints, and demands of other water users. Historically, the SWP has been able to meet all contractors' requests for entitlement water except during the drought years of 1977, 1990-92, and 1994. In many years, surplus water has been delivered to contractors. Deliveries to Metropolitan reached a high of 1.3 MAF in fiscal year 1990. Metropolitan experienced shortages in SWP supplies in fiscal years 1991 and 1992, with reduced SWP deliveries of 714,000 AF and 710,000 AF, respectively.

The listing in recent years, under both state and federal Endangered Species Acts, of several fish species in the Sacramento/San Joaquin Delta (Delta) has constrained SWP operations and created more uncertainty in SWP supply reliability. However, the December 15, 1994 consensus agreement among state and federal agencies, agricultural and urban water users, and environmental groups on Delta standards was a major step forward in reducing this uncertainty. The agreement is a consensus among these agencies on flow requirements and operational constraints to meet fishery and habitat needs during the next three years, and provides more certainty to SWP supply availability during that period. In addition, it is the foundation for immediate initiation of a process for identifying a long-term solution to water supply and fishery problems in the Delta, which is necessary to enable the pursuit of additional SWP programs and facilities to increase SWP supplies.

In addition to the immediate reduction in regulatory uncertainty included in the consensus agreement on the Delta, a separate agreement was reached on December 1, 1994 which would provide opportunities for SWP contractors to improve their water supply reliability in the short-term. This agreement, known as the Monterey Agreement, was reached by DWR and the agricultural and urban SWP contractors, and is a set of principles for a significant amendment to the contractors' SWP contracts with DWR. These principles cover a number of issues, and include the ability for SWP contractors to improve their water management through greater and more flexible use by the contractors of existing SWP storage and water conveyance facilities, and through the opportunity for urban contractors to purchase agricultural water entitlements.

Los Angeles Aqueducts

The city of Los Angeles imports water through the Los Angeles Aqueducts from the eastern Sierra Nevada. The original Los Angeles Aqueduct was completed in 1913 and imported water from the Owens Valley. In 1940, the aqueduct was extended to the Mono Basin. A second Los Angeles Aqueduct, which parallels the original aqueduct, was completed in 1970.

With the completion of the aqueduct system in 1970, an average of 400,000 acre-feet of water was delivered annually through the Los Angeles Aqueducts. Of this total, 330,000 acre-feet originated from surface water and groundwater in the Owens Valley, while 70,000 acre-feet came from surface water in the Mono Basin. In 1983, the aqueduct delivered a record 534,000 acre-feet of water.

In the late 1980s, a series of court injunctions limited the amount of water that Los Angeles could receive from its aqueduct system. In 1990, these limitations, along with the persistent drought, limited the delivery from the aqueduct to only 100,000 acre-feet. The Mono Lake Water Rights Decision in September of 1994 ended the litigation in the Mono Basin, while negotiations continue with Inyo County on the fate of the Owens Valley groundwater supply. In the Mono Lake Decision, the state ruled that Mono Lake should rise to an average level of 6,392 feet. During this time, Los Angeles will only be permitted to divert a fraction of its historical diversion amounts. After the lake has risen, the City of Los Angeles will still be allowed, on average, only one-third of its historic diversions.

With the Mono Lake Decision and the expected outcome of the Inyo County negotiations, the average projected delivery of the Los Angeles Aqueduct has been reduced to 360,000 acre-feet annually. As Mono Lake rises, diversions will increase slightly, but this increase is not expected to be significant for the next 20 years, except during wet years.

Historic Total Regional Water Supplies

The previous sections have presented the various sources of Metropolitan's water supply. The amount of water supplied by each local and imported source from 1990 through 1994 is presented in Table IV-3. The imported supplies represent the amount of water imported into Metropolitan's service area, *not* the amount delivered to member agencies (as shown in Table IV-1). The difference between Metropolitan's imports and deliveries is water placed into storage. The fluctuation in water supplies that occurred during this 1990-94 period is the

result of a number of factors. California experienced a drought during this period which was particularly severe in 1991 and 1992. The long duration of this drought, which began in 1987, resulted in a decline in local supplies over the period due primarily to a reduction in groundwater availability. In addition, shortages in SWP supplies in 1991 and 1992 resulted in significant efforts to increase water conservation activities, and for part of that time, the imposition of water rationing. Water conservation activities in the region were already considerable before the 1991-92 shortage years, but these efforts were greatly expanded during those years and have stayed at similar levels even though adequate supplies have been available. As a result, these conservation efforts have contributed to a reduction in water demand in the region. Regional water demand has been further reduced from 1990 levels by the economic recession. Due to all of these contributing factors, the lower imported supply quantities shown for 1993 and 1994 are due not to inadequate supplies, but to lower water demands.

Potential Water Supplies

In an effort to increase the reliability of future water supplies, Metropolitan is actively pursuing alternatives to expand present water supplies and develop new water supplies. Local supplies, imported supplies, and new technologies (such as seawater desalination) are sources of potential water supplies. These alternatives are referred to as potential because prior to the implementation of a number of

TABLE IV-3

HISTORIC WATER SUPPLIES FOR METROPOLITAN'S SERVICE AREA (MAFY)

	Fiscal Year Ending				
	1990	**1991**	**1992**	**1993**	**1994**
Local supplies					
Groundwater Production	1.382	1.329	1.277	1.187	1.130
Surface Production	0.057	0.054	0.087	0.144	0.167
Reclamation (Direct)	0.051	0.052	0.048	0.073	0.061
Reclamation[1] (Recharge)	0.060	0.063	0.055	0.055	0.067
Reclamation (LPP)	0.013	0.015	0.013	0.018	0.019
Groundwater Recovery	0	0	0	0.001	0.003
Total local supplies	1.564	1.513	1.480	1.478	1.448
Imported supplies					
Colorado River[2]	1.238	1.262	1.184	1.200	1.295
State Water Project	1.325	1.060	0.714	0.710	0.815
Los Angeles Aqueduct	0.206	0.124	0.172	0.234	0.213
Total Imported supplies[3,4]	2.770	2.446	2.070	2.144	2.323

[1] Reclamation Recharge does not include the Santa Ana River Recharge project, which is included in Groundwater Production.
[2] Deliveries to Desert and Coachella groundwater basins are not included, however, losses along the Aqueduct are included.
[3] Summation of supplies may not equal totals due to rounding.
[4] Includes replenishment supplies that may partially be reflected in groundwater production.

these programs, certain issues related to these alternatives must be resolved. These issues, depending on the particular program considered, may include technical, legal, and financial matters; mitigation of environmental impacts; state and/or federal legislative or regulatory approvals; and negotiations of agreements with other agencies.

Local Water Supplies

Potential for increased local water supplies is found mostly in the areas of water reclamation, groundwater recovery, and seawater desalination. These potential supplies are addressed in the following sections.

Water Reclamation

A survey of current and potential reclamation projects in Metropolitan's service area (IRP Phase I Report, Draft, 1994) indicated that the potential for water reclamation ranges from 0.4 MAFY to 0.7 MAFY in 2000, and 0.5 to 1.0 MAFY in 2020. The actual amount of reclaimed water produced will depend on the level of investments made in water reclamation projects, public acceptance and market penetration, and removal of certain existing regulatory and institutional constraints. The California Department of Health Services is currently revising water quality criteria to regulate direct and indirect use of reclaimed water. The vehicle being used by Metropolitan to promote reclamation projects is the Local Projects Program, which is presented in Chapter V. The projected use of reclaimed and recycled water within Metropolitan's service area is presented in Chapter VIII.

Groundwater Recovery

The potential exists for increased local water supplies through groundwater recovery. Contaminated groundwater can be recovered and used for municipal purposes. Metropolitan has implemented a Groundwater Recovery Program to encourage member agencies to recover contaminated groundwater in a manner that improves water supply reliability for municipal and domestic uses. A full description of this program is presented in Chapter V.

Desalination

Seawater desalination is another potential water supply that Metropolitan has been studying. Metropolitan has constructed a 5,000 gallon per day experimental plant at an existing Southern California Edison (SCE) Power Plant at Huntington Beach on the Southern California coast. This plant will test a multieffect distillation process that will use steam from the power plant as a heat source. The next step, scheduled to begin in 1995, is the construction of a 5 million gallon per day (MGD) demonstration plant using the same technology. If this plant is successful, construction may begin near the year 2000 on a larger 20 to 100 MGD plant at the same site or at another existing power plant on the coast.

Other efforts are also taking place to explore desalination as a potential water supply source. Metropolitan is working with the city of Long Beach, Central Basin MWD, West Basin MWD, and SCE on a feasibility study of a 5 MGD desalination plant using reverse osmosis technology at the SCE Alamitos generation

station. A 0.132 MGD reverse osmosis desalination plant has been developed by SCE at Avalon, on Santa Catalina Island, which is capable of supplying up to one-third of the island's water demand. The plant was built as a supplemental supply source to be used when surface water supplies on the island are not adequate to meet demand, which occurs in drought years.

Currently, the price of water per acre-foot produced by desalination is higher than alternative potential sources of water. As new technologies are developed and tested, desalination may become more economically feasible.

Imported Water Supplies

The potential exists for Metropolitan to acquire additional water supplies in the future from imported sources. The greatest potential for additional supplies are from the Colorado River and the State Water Project. The Los Angeles Aqueduct provides the least potential for additional future supplies.

Colorado River Supplies

One of Metropolitan's objectives is to pursue economic options that maximize Colorado River water supplies and permit the CRA to be operated at capacity as much of the time as is feasible. In its effort to achieve this goal, Metropolitan is working toward acquiring additional Colorado River water that might be available in the future from the following sources and programs.

Surplus Water. When the Colorado River System reservoirs are nearly full, water from the Colorado River would be available over and above normal apportionments. During these times, the Secretary of the Interior (Secretary) would likely declare that surplus Colorado River water is available for use by Metropolitan. Currently, the availability of surplus water is determined on a year-to-year basis by the Secretary of the Interior, based on a recommendation by the Commissioner of Reclamation. Surplus water was available between 1986 and 1988 and is projected to be available in the future from time to time. With reservoir storage near 74 percent of capacity at the beginning of 1995, the likelihood of Metropolitan receiving surplus water is projected to increase to 55 percent in the year 2002.

Unused Arizona and Nevada Water. The Secretary of the Interior has the discretion to allow California to use any water that Arizona and Nevada have available from the Colorado River under their contracts but do not use. Arizona and Nevada are not expected to use their full apportionment until the years 2029 and 2003, respectively. Thus, more than 580,000 AFY of Arizona's apportionment and more than 40,000 AFY of Nevada's apportionment may be available for Metropolitan's use for some time. However, it is difficult to predict the criteria the Secretary will use in determining whether to release any unused water to California. Currently, the availability of water apportioned to but unused by Arizona and Nevada is determined on a year-to-year basis by the Secretary based on a recommendation by the Commissioner of Reclamation. In the past, Nevada has preferred that the Secretary keep the water in storage rather than release unused water to California.

Unused Agricultural Water. Of California's apportionment of 4.4 MAFY from the Colorado River, 3.85 MAFY (less

the amount of water made available to Metropolitan under the water conservation program with the Imperial Irrigation District) are available for use by agricultural agencies in California. If the agricultural agencies do not use their entire available supply, Metropolitan has the right to divert the unused portion. Forecasts can be made during the year to project how much of the agricultural water will go unused for the current calendar year. Based on such forecasts, Metropolitan can plan its operations to take advantage of this unused agricultural water in the latter part of the year. Between 1986 and 1994, the amount of unused agricultural priority water available to Metropolitan has varied from zero in 1989 and 1990 to more than 500,000 acre-feet in 1992. The amount of unused agricultural priority water will continue to vary in the future depending on agricultural economics, type of crops grown, and acreage irrigated.

Water Conservation Program with Imperial Irrigation District. Implementation of a water conservation program with Imperial Irrigation District (IID), the largest agricultural user of Colorado River water, began in January 1990. In brief, the IID/Metropolitan agreement provides for Metropolitan to fund the costs of specific conservation projects. The program calls for structural and nonstructural conservation measures including lining existing canals, constructing local reservoirs and spill interceptor canals, installing nonleak gates and automation equipment, and instituting distribution system and on-farm management activities. In return, Metropolitan is entitled to divert from the Colorado River or store in a reservoir a quantity of water equal to the amount of conserved water resulting from these projects, which totals 74,570 AFY in 1995, increasing to an estimated 106,110 AFY following completion of all improvements in 1998.

Phase 2 Water Conservation Program with Imperial Irrigation District. Implementation of a second-phase water conservation program with IID could conserve up to an additional 150,000 AFY. IID has not expressed an interest in negotiating a second-phase water conservation program with Metropolitan since 1992. IID believes that the Inland Surface Waters Plan (ISW Plan) adopted by the State Water Resources Control Board (SWRCB) and comments received from the Colorado River Basin Regional Water Quality Control Board (RWQCB) would hinder such negotiations. The RWQCB staff have suggested that widespread implementation of conservation measures in the Imperial Valley be delayed until selenium control measures for agricultural drainage water are developed. In September 1994, the SWRCB rescinded the ISW Plan to comply with a superior court decision, and the SWRCB will prepare a new draft ISW Plan.

Demonstration Program to Store Unused Colorado River Water Underground in Central Arizona. In 1992, Metropolitan entered into an agreement with the Central Arizona Water Conservation District (CAWCD) that allowed for the storage of unused Colorado River water in central Arizona. The program's basic goal is to store Colorado River water underground in Arizona aquifers to reduce the potential for future flood control releases from Lake Mead. In April 1993, the Southern Nevada Water Authority (SNWA) notified Metropolitan that it wished to participate in the program at a level of 50 percent of the amount of

water stored. By the end of 1993, SNWA and Metropolitan had equally shared the cost of transporting 100,000 acre-feet of water from the Colorado River via Central Arizona Project facilities to central Arizona for storage. Metropolitan and CAWCD have executed an amendment to the original agreement that increases the total amount of water that may be stored from 100,000 AF to 300,000 AF and extends the time for storage activities from December 31, 1996, to December 31, 2000. Metropolitan has obtained approvals of the amendment by other water agencies and state and federal agencies. If flood releases occur from Colorado River reservoirs, or if surplus water is made available by the Secretary of the Interior (Secretary), approximately 90 percent of the stored groundwater would be made available through water exchanges to Metropolitan and the other parties funding the program at their request in any future year. Should the Secretary declare a Colorado River shortage condition prior to flood control releases occurring, the stored water would be made available to CAWCD.

All-American Canal and Coachella Branch Lining. The U.S. Bureau of Reclamation has published the final environmental impact statement/environmental impact report (EIS/EIR) for the All-American Canal Lining Project, and has issued a Record of Decision for the project. Implementation of the project to construct a 23-mile parallel concrete-lined canal would conserve 67,700 AFY for use by the California contractors (Palo Verde Irrigation District (PVID), Imperial Irrigation District (IID), Coachella Valley Water District (CVWD), and Metropolitan). Metropolitan and IID have executed an Agreement Relating to the Construction Of A Concrete Lined Canal Parallel to the Existing All American Canal. Under the Agreement, Metropolitan will provide the funding for implementation of the lining project and be reimbursed if another California contractor uses the conserved water. The Agreement also addresses the banking of the conserved water in Lake Mead. Negotiations between Metropolitan and the Bureau of Reclamation on a construction-funding agreement for the project will soon begin.

IID, Metropolitan, and the Bureau of Reclamation have executed an advance funding agreement to initiate the process of establishing a design and construction management organization and have undertaken other preliminary planning and scheduling activities. Should a construction-funding contract be negotiated with Reclamation and executed in 1995, construction could be completed by 1999.

The Bureau of Reclamation filed the draft EIS/EIR for the Coachella Canal Lining project in January 1994. Implementation of the project to construct a 33-mile, concrete-lined canal in the existing cross section while bypassing water through temporary pipelines would conserve 25,700 AFY for use by the California contractors.

Colorado River Basin Management. Representatives of the seven states in the Colorado River Basin and the Bureau of Reclamation are working to reach consensus on a number of components that would improve water management in the Colorado River Basin. This consensus, which could take the form of regulations for administering entitlements, may address provisions for banking conserved and non-Colorado River System water,

interstate water transfers, guidelines for surplus and shortage declarations, and accounting for overuse of Colorado River water.

Land Fallowing Programs. Under these programs, landowners/lessees in the Palo Verde and/or Imperial valleys who irrigate crops with Colorado River water would be paid to leave land fallow in exchange for use of the water saved. These land fallowing programs could be implemented following the completion of test programs.

Palo Verde Valley Test Land Fallowing Program. In 1992, Metropolitan entered into 63 agreements with landowners/lessees in the Palo Verde Valley to fallow 20,215 acres of irrigated farmland in exchange for monetary compensation. The water saved by the test land-fallowing program, a total of 185,978 acre-feet over the two-year period, is being stored in Lake Mead for use by Metropolitan prior to the year 2000.

IID Test Land Fallowing and Modified Alfalfa Irrigation Program. Early in 1993, representatives of Metropolitan and IID negotiated the terms and conditions of a two-year test land fallowing and modified alfalfa irrigation program to save 100,000 AFY. While IID was interested in implementing the program in 1993, it was necessary for Metropolitan to decline the offer to begin the program in that year. Because of the 7.1 million acre-foot increase in Colorado River System reservoir storage in water year 1992-93, the likelihood was significant that the water that would have been saved by this program would be released from Lake Mead for flood control purposes in the near future. Metropolitan did inform IID that it would be appropriate to obtain PVID and CVWD's comments and to continue working to develop the agreement to a near-ready state for implementation in a future year should the need arise.

State Water Project Supplies

Due to many complex issues, the facilities needed to increase the yield of the SWP have not been built. In the Integrated Resource Planning (IRP) process, Metropolitan identifies interim South Delta facilities, acoustic fish barriers, and a Delta water transfer facility as additional SWP facilities to be included in the preferred resource mix (the IRP and the preferred resource mix are presented in Chapter VIII). These facilities and programs are described below.

Acoustic Fish Barriers. Acoustic fish barriers have been installed on a trial basis along the Sacramento River at the Delta Cross Channel and at Georgianna Slough. These barriers are used during times of migration and are designed to keep fish in the Sacramento River and out of the Delta. Keeping the fish in the Sacramento River increases their chance of survival and reduces the number of fish found in the pumps. If proven to be effective, acoustic barriers will reduce SWP impacts to certain fish species and improve SWP operation flexibility.

Interim South Delta Water Management Program. The preferred alternative for the Interim South Delta Program consists of an additional SWP intake structure at Clifton Court Forebay, limited dredging in South Delta channels, and four South Delta channel flow-control structures. These facilities are intended to allow the SWP to increase its export pumping capacity, provide increased operational flexibility, reduce fishery impacts, and improve water levels and circulation for local agricultural diverters.

Long-Term Delta Solutions. In 1992, Governor Wilson delivered a water policy statement that established a Bay Delta Oversight Council to guide the planning and environmental documentation process for implementation of a long-term Delta solution, which is anticipated to include a Delta water transfer facility. In 1994, federal regulatory agencies joined the state in this effort by forming a coalition, known as CalFed. Members of CalFed signed a Framework Agreement that outlined a joint state/federal process to develop a long-term solution. It is anticipated that this process will take three to four years to identify solutions and carry out the California Environmental Quality Act/National Environmental Policy Act (CEQA/NEPA) process.

In addition, DWR began a scoping process in late 1994 to develop a SWP water supply planning strategy that will guide them in the development of other programs to increase the SWP yield. This process is focusing on identifying new strategies to develop SWP water supplies during the next 30 years through interim, short-term (next 10 years), and long-term measures. The strategies will include both traditional and nontraditional options to develop the necessary supplies in a timely manner. DWR has indicated that they intend to gain broad-based support for this program through public and regulatory agency participation programs. DWR plans to have a report outlining details for implementing the SWP Future Water Supply Planning Strategy by spring 1996.

Los Angeles Aqueducts

Future water delivered via the Los Angeles Aqueducts will be limited by the Mono Lake Decision, which ruled that Mono Lake should rise 17 feet over the next 25 years. During this time, Los Angeles will be able to divert only a small fraction of its historical withdrawals. After the lake has risen, Los Angeles will be able to divert up to one-third of its historic diversions.

Quality of Water Supplies

The issue of water quality is important not only in the use of existing water supplies but also in the development of future water supplies. Providing a high-quality water supply is explicitly stated in Metropolitan's mission statement. Water quality considerations are an important factor in Metropolitan's selection of raw water sources, treatment alternatives, and modifications to existing treatment facilities. Water quality constituents, as well as water treatment plant performance, are becoming more strictly regulated by federal, state, and local entities. Thus, future water quality regulations will continue to play a significant role in the evaluation of proposed alternatives to improve Metropolitan's water supply system.

Present and proposed water quality regulations impact Metropolitan because contaminants have been found in groundwater basins in Metropolitan's service area as well as in water imported via the State Water Project and the Colorado River Aqueduct. Future water quality regulations such as EPA proposals to revise drinking water regulations, congressional amendments to the Safe Drinking Water Act (SDWA) that mandate increased regulations, and State Department of Health Services (DHS) regulations will collectively impact Metropolitan's water quality monitoring and treatment requirements. The water quality issues and the proposed water quality regulations are presented in the following sections.

Groundwater

The existing and projected quality of groundwater supplies are of great concern to the Southern California region. High mineral and nitrogen content of groundwater due to historic agricultural and other human-made activities have affected the capacity of groundwater production. In recent years, organic chemicals from industrial activities have been found in Southern California groundwater basins. Figure IV-8 shows the groundwater contamination in Metropolitan's service area.

Metropolitan conducted a study to evaluate the groundwater quality in Southern California, using a 14-year (1976-89) period of analysis (Groundwater Quality: A Regional Survey of Groundwater Quality in the Metropolitan Water District Service Area, Report Number 991, May 1994). The condition of the groundwater was assessed by measuring various chemicals in wells. The changes in groundwater quality that were found are a result of the disposal of waste and wastewater, seawater intrusion, and salt and nitrogen loading that has occurred over a period of many decades. Using the criteria that at least one primary or secondary chemical Maximum Contaminant Level (MCL) (levels established for drinking water by state and f ederal agencies) was exceeded during the 1976-89 study period, it was found that 46 percent of the wells were impacted and 46 percent of well production was impacted. The leading contamination problems in the regional groundwater basins, impacting all of the groundwater basins, included elevated levels of (1) nitrogen, (2) volatile organic compounds (VOC), (3) minerals, and (4) total dissolved solids (TDS).

Loss of local production capacity due to groundwater quality problems is viewed by Metropolitan and its member agencies as a temporary problem because the value of the resources to Southern California is too great to allow their abandonment. Current planning studies assume that these water quality problems will not affect the long-term availability of groundwater, since efforts are being undertaken to develop treatment and management approaches to reclaim these supplies and maintain their availability in the future. Metropolitan and its member agencies developed the Groundwater Recovery Program to rehabilitate contaminated groundwater and increase groundwater production (see more discussion in Chapter V).

State Water Project

Water from the SWP is low in total dissolved solids relative to Colorado River water. The lower TDS water from the SWP is blended with water from the Colorado River Aqueduct to lower the overall TDS concentration in the water that Metropolitan delivers to its customers. SWP water, however, does contain other contaminants that are of concern. For example, bromides from seawater contribute to the formation of harmful disinfection by-products during the water treatment process. Water diverted from the Banks Pumping Plant has high levels of these precursors that could result in the formation of disinfection by-products.

The new EPA regulations on drinking water standards for disinfection by-products could have an impact on Metropolitan's ability to use water from the State Water Project. To comply with the new standards, alternative disinfection technologies at Metropolitan's filtration plants would most likely be required. Alternatively,

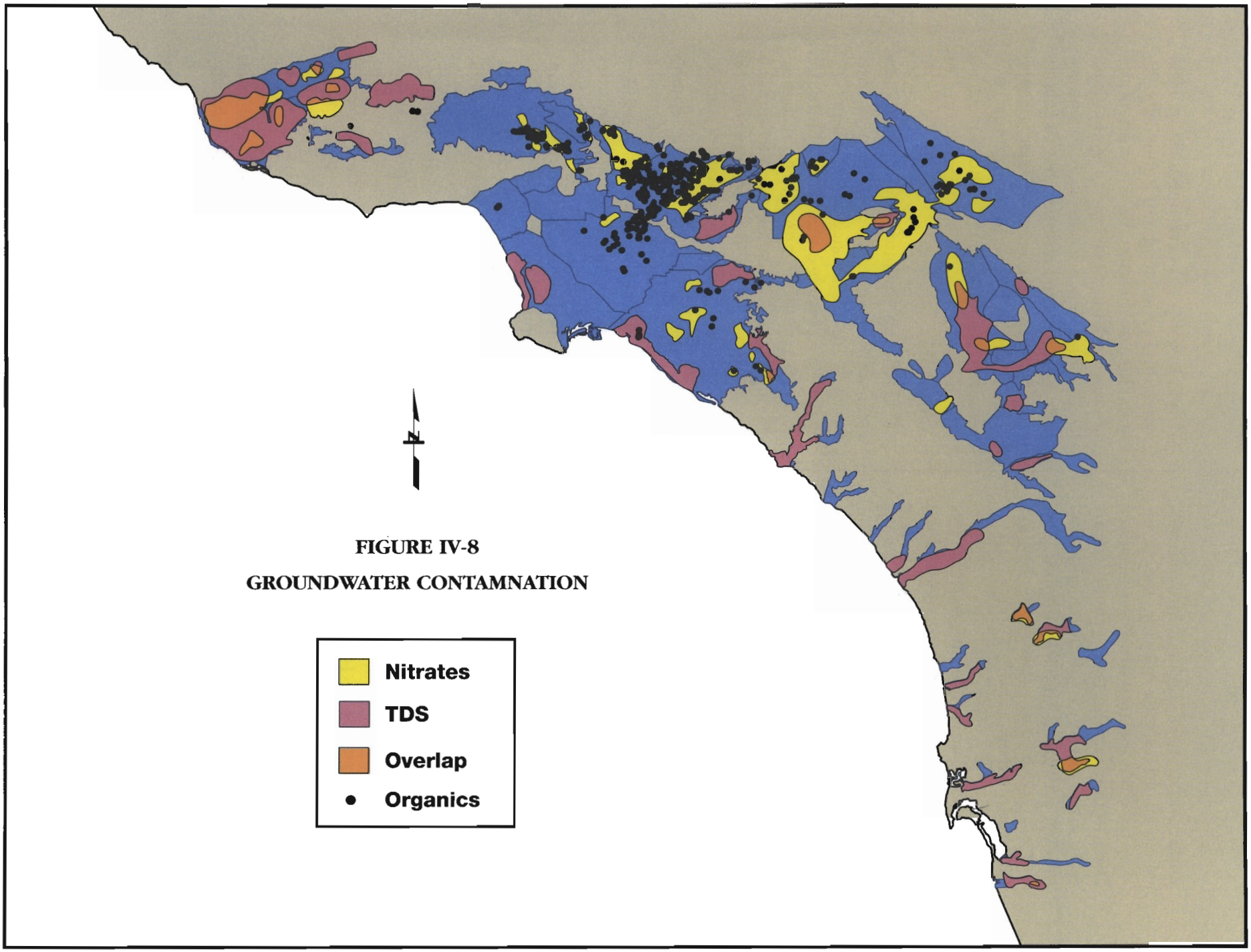


FIGURE IV-8

GROUNDWATER CONTAMNATION

implementation of Delta improvements, which could include moving the diversion for SWP exports from the southern Delta to north of the Delta, would greatly reduce the presence of disinfection by-product precursors in SWP supplies.

Colorado River

In the late 1960s and early 1970s, state and federal agencies recognized the seriousness of increasing salinity levels in the Colorado River Basin and the impacts to water users in both the United States and the Republic of Mexico. About half of the salinity in the Colorado River originates from natural sources, including saline springs, and about half originates as the consequence of consumptive use of water for irrigation, municipal, and industrial use. Of the latter amount, reservoir evaporation and exports account for 12 percent and 3 percent, respectively.

With the passage of the Clean Water Act (Public Law 92-500) in 1972, the Environmental Protection Agency required that water quality standards be implemented, including beneficial use designations, numeric salinity criteria, and a plan of implementation for the Colorado River. The criteria, based on an annual flow-weighted average in milligrams per liter (mg/l) of total dissolved solids (TDS), are 723 below Hoover Dam, 747 below Parker Dam, and 879 at Imperial Dam. By comparison, the Colorado River at its headwaters in the mountains of Colorado has a TDS concentration of about 50 mg/l.

In 1974, Congress enacted the Colorado River Basin Salinity Control Act (Public Law 93-320) that directs the Secretary of the Interior to address the United States' commitment to Mexico and to create a salinity control program for water quality in the Colorado River Basin. Public Law 93-320 was amended in 1984 when the President signed Public Law 98-569. This law directed the Secretary of the Interior and the Secretary of Agriculture to give preference to the salinity control units with the least cost per unit of salinity reduction. A major provision of the amendment was the authorization of a voluntary on-farm salinity control program administered by the Department of Agriculture.

Existing salinity control activities are removing about 262,000 tons of salts per year (as of January 1993). Salinity is expected to increase significantly if future actions to control it are not taken. Future salinity control activities need to remove an additional 1.1 million tons per year by 2015 to offset future projected increases.

To meet these criteria, the overall strategy is to prevent salt from entering and mixing with the river's flow. A number of agricultural, point, and diffuse sources of salinity have been identified throughout the basin. The salinity control program is implementing controls at those sites that contain salt sources that can be intercepted, reduced, and/or prevented from entering the river. Without additional controls, mean salinity concentrations below Parker Dam are projected to approach 800 mg/l by the year 2010. With additional controls, the projected mean salinity concentration below Parker Dam is about 700 mg/l.

The Colorado River Basin Salinity Control Forum (Forum) and Colorado River Basin Salinity Control Advisory Council (Council) were established as mechanisms for developing water quality standards and advising the federal agencies, respectively. The Forum and Council consist of representatives from each of the seven basin states appointed by the governors of the respective states. The

Forum is responsible for determining whether the numeric criteria should be revised and updating the plan of implementation periodically. In coordination with federal agencies, the Council evaluates the progress of salinity control activities and makes recommendations to the Department of the Interior and the Environmental Protection Agency regarding ways of implementing the Salinity Control Act.

Management of Total Dissolved Solids

Metropolitan is currently working to address the management of total dissolved solids in its water supplies. An objective contained in Metropolitan's preliminary Strategic Plan related to water quality states: "Develop a specific objective for total dissolved solids (TDS) by 1995 to minimize aesthetic and economic impacts to the public and optimize water management programs." Another element of the preliminary Strategic Plan calls for Metropolitan to assist in the implementation of new reclamation projects. These two elements of the preliminary Strategic Plan are brought together because there are several reclamation projects within Metropolitan's service area, which treat water derived from essentially all Colorado River water supplied by Metropolitan, that are having problems attracting and/or retaining customers for their product water. The reasons given are that apparently, at least in part, higher levels of TDS in the reclaimed water would not be suitable for certain types of irrigation and industrial purposes. Metropolitan cannot control the TDS blend of water served within its service area without incurring higher operational costs until either the Domenigoni Valley Reservoir (DVR) project is brought on-line or until Metropolitan's water demands rise significantly.

Metropolitan has reviewed several operational options to address the management of TDS. In April 1995, Metropolitan's Board of Directors approved a policy to provide a 25 percent blend of SWP water in the water delivered in the Weymouth, Diemer, and Skinner service areas for an interim period (until DVR is completed or demands rise enough to eliminate the need for these extraordinary measures). This change will entail the importation of additional East Branch SWP water not otherwise needed to meet quantitative demands, in order to provide sufficient water for blending. The amount imported from the East Branch would be the amount of Colorado River water that would have to be left unpumped, or if possible, stored. It is estimated that it would require between 130,000 AF and 169,000 AF of extra SWP water be imported to achieve the 25 percent blend for April-September 1995. Due to the cost differential between East Branch and Colorado River water, the estimated additional operating costs for this strategy could be between $9.1 and $11.8 million in 1995.

Impacts of Proposed Drinking-Water Regulations on Metropolitan

Drinking-water regulations that are currently being developed at the federal level could adversely affect water agencies in Southern California that are using or planning to use groundwater to augment their supplies. Four pending regulations could have a significant impact on the use of local groundwater. These regulations regard radon, arsenic, groundwater disinfection, and disinfection by-products. Also, there is concern over the existing total coliform and surface water treatment rules because agencies may be required to provide additional disinfection or treatment for affected groundwater. Rules

regarding disinfectant/disinfection by-products are expected to have a major impact on Metropolitan and all member agencies with surface water sources. These pending regulations are reviewed below.

Radon is a gas produced through the naturally occurring radioactive decay in certain rock formations. The EPA proposed a maximum contaminant level (MCL) of 300 picocuries per liter (pCi/l). The final release date for the MCL was expected in October 1993; however, it was not released. The MCL is expected to be issued after October 1995.

The EPA may propose a rule to reduce the current MCL for arsenic from 50 micrograms per liter (µg/l) to a range of 0.5 to 20 µg/l. Most laboratories have an arsenic detection limit of 5 µg/l, which means that many water utilities may not have known that arsenic was a problem. However, in recent years, laboratory techniques have been developed that reduce the arsenic detection limit to 0.5 µg/l.

In July 1992, the EPA released a draft groundwater disinfection rule that would require disinfection to inactivate viruses unless the likelihood of microbiological contamination is remote. The draft rule is expected to become final in August 1997. With many of the local groundwater supplies not routinely disinfected, this rule could make it necessary for the addition of chlorine or chloramines in wells. The formation of disinfection by-products (DBPs) produced by the use of disinfection in groundwater will lead to the need for controlling the precursors of DBPs.

A negotiated rule-making procedure to limit disinfectant/disinfection by-products (D/DBP), including trihalomethanes (THMs), haloacetic acids (HAAs), and disinfectant residuals, was conducted by the EPA. The proposed MCL for THMs will be dropped from 100 µg/l to 80 µg/l, and HAAs will have a proposed MCL of 60 µg/l. A second stage of the DBP rule may lower these MCLs to 40 and 30 µg/l, respectively. The disinfectant residuals for chlorine and chloramines will be limited to 4.0 mg/l. The effective dates for the standards will be based on utility size and whether the groundwater is influenced by surface water. This rule was published for public comment in July 1994. For Metropolitan, the current regulatory schedule would require compliance by June, 1998. Most local groundwater is unlikely to be affected by the DBP rule because it is believed to be low in total organic carbon (TOC). However, the TOC data are not complete. Along the coast in Long Beach and Orange County there is some groundwater with high color, which indicates the presence of organic material sufficient to form DBPs above the expected limits.

The total coliform rule (TCR), promulgated by the EPA in June 1989, became effective in December 1990. Compliance with the TCR is based on monthly monitoring of the distribution system for the presence of coliform bacteria. To meet the TCR requirement, disinfection of groundwater supplies may be required. At the present time, most groundwater sources are not disinfected. The compliance with the TCR may affect compliance with the proposed DBPs rule.

In June 1993, the surface water treatment rule (SWTR) became effective. The SWTR specified which surface water sources must be filtered and provided performance criteria for filtration and disinfection. A proposed enhanced surface water treatment rule (ESWTR) for Cryptosporidium may substantially

impact existing surface water treatment plants and could cause additional groundwater sources to be considered under the influence of surface water, necessitating treatment of the groundwater. The California Department of Health Service (DHS) considers a well not at risk if it meets the state's construction requirements and is located more than 100 feet from a surface source and is not subjected to inundation from normal water runoff. Additional investigation of a well's construction may be needed if it is located around the periphery of a recharge basin. Both the existing SWTR and the proposed ESWTR could adversely affect some groundwater recharge activities.

SUMMARY

The existing local and imported water supplies may not be adequate to meet growing water demands in Metropolitan's service area in the future. The availability of water supplies is affected by uncertainties surrounding future allocations of imported supplies and by constraints due to water quality regulations. Metropolitan expends significant funds and efforts to manage the existing water supplies to prevent any diminishment in their future availability. Some innovative water management techniques allow Metropolitan to maximize the use of available supplies. These water management efforts are described in the following chapter.

V. METROPOLITAN'S WATER SUPPLY MANAGEMENT PROGRAMS

OVERVIEW

Metropolitan's mission statement calls for Metropolitan "to provide its service area with adequate and reliable supplies of high-quality water to meet present and future needs in an environmentally and economically responsible manner." In carrying out this mission, Metropolitan established a number of water supply management programs. These programs are designed to create regionwide benefits by delaying or permanently avoiding the costs that Metropolitan would incur developing additional imported water supplies. To be a successful program, two simultaneous objectives must be met: (1) the program must provide an incentive that is sufficient to encourage the needed investments in local resources; and (2) the cost of the program must be kept below the cost Metropolitan would have to pay to develop an equivalent level of additional imported water supplies. It is vital that Metropolitan do what it can to fully develop and expand the efficient use of local water supplies through water supply management programs. As the competition increases for water from the State Water Project and the Colorado River, the potential for acquiring surplus water from these sources will most likely be reduced from its current level. Therefore, Metropolitan is working to enhance present programs and to create new programs over time in an effort to fulfill its mission of providing an adequate and reliable water supply for its service area.

Securing reliable water supplies requires that a number of water sources and water management programs be pursued. Metropolitan currently has three specific types of water management programs: (1) conjunctive-use programs, (2) Groundwater Recovery Program (GRP), and (3) Local Projects Program (LPP). It is through these programs that Metropolitan is working to maximize the efficient use of current water supplies and to increase reliable water supplies in the future. Water management programs are designed to maximize the yields from local water production (groundwater, surface water, and reclamation) and help use imported supplies as efficiently as possible. In addition to these three programs, Metropolitan has a policy of acquiring additional water supplies through a number of voluntary transfer and exchange agreements.

Almost 90 percent of natural local supplies in Southern California are produced from groundwater basins. These supplies account for a significant portion of all water used in this area. In addition, portions of the imported supplies are stored in groundwater basins for future use. There are nearly 75 groundwater basins covering 2,800 square miles that supply Metropolitan's service area with about 1.2 to 1.4 MAFY of water in an average year. Since the 1950s, Metropolitan has supported the replenishment of groundwater resources through discounted water rates. Currently, Metropolitan is working with member agencies to improve the reliability of the regional water supply through four groundwater basin management objectives:

- Expand conjunctive use.
- Reduce peaking demands on Metropolitan.

- Recover contaminated groundwater.
- Protect groundwater quality.

In addition to management of groundwater basins, surface reservoirs are utilized to capture local runoff, to store imported supplies, and to regulate delivery systems. Metropolitan's storage capacity will be increased with the completion of the Domenigoni Valley Reservoir (DVR) project, scheduled to become operational in 2000. The DVR will provide seasonal, drought carry-over, and emergency storage. It will allow Metropolitan to take water when available from either the State Water Project or the Colorado River Aqueduct and store it for delivery when water is limited by drought or other conditions. The storage capacity of the DVR will be 800,000 acre-feet.

Programs to increase local water supplies by recovering contaminated groundwater, along with wastewater reclamation and reuse, are an integral part of Metropolitan's water supply management program. The GRP encourages the treatment and use of contaminated groundwater, and the LPP facilitates the implementation of water reclamation projects. Both the GRP and LPP are discussed later in this chapter.

Conjunctive-Use Programs

Local water management has included the conjunctive use of surface water and groundwater sources since the 1950s. Conjunctive use of water refers to the use and storage of imported surface water supplies in groundwater basins and reservoirs during periods of abundance for later use during periods of low surface water supplies to deal with seasonal and multiyear imbalances of supply and demand. Basins are recharged with imported surface water supplies using spreading basins and injection wells. There are more than 70 such recharge facilities in Southern California that are currently being used to replenish groundwater basins, as shown in Figure V-1. Another method of maintaining the water supply in groundwater basins is by using an in-lieu exchange, which is using imported water instead of pumping water out of the groundwater basin. The 45-year history of water delivered to member agencies for local storage replenishment is presented in Table V-1. Over this time period, Central Basin MWD and MWD of Orange County alone have replenished more than 6 MAF to groundwater basins (approximately 63 percent of water used for replenishment).

Many local groundwater storage programs have been implemented over the years to make maximum use of local water supplies. These programs have included the collection of local runoff in surface storage reservoirs at the base of the mountains and the diversion of water flows into percolation ponds for artificially recharging groundwater basins. Another type of groundwater storage program is being implemented by Metropolitan. Under this new type of program, an agency stores water for Metropolitan, and Metropolitan pays that agency for the water management services it performs. This type of program is called a *Semitropic-style* program (named after the first agreement of this type with the Semitropic Water Storage District).

The storm waters of San Antonio Creek in Los Angeles County have been impounded and spread since 1895. Since these early operations, the county flood control districts in Southern California have played a major role in developing and maintaining extensive recharge facilities,

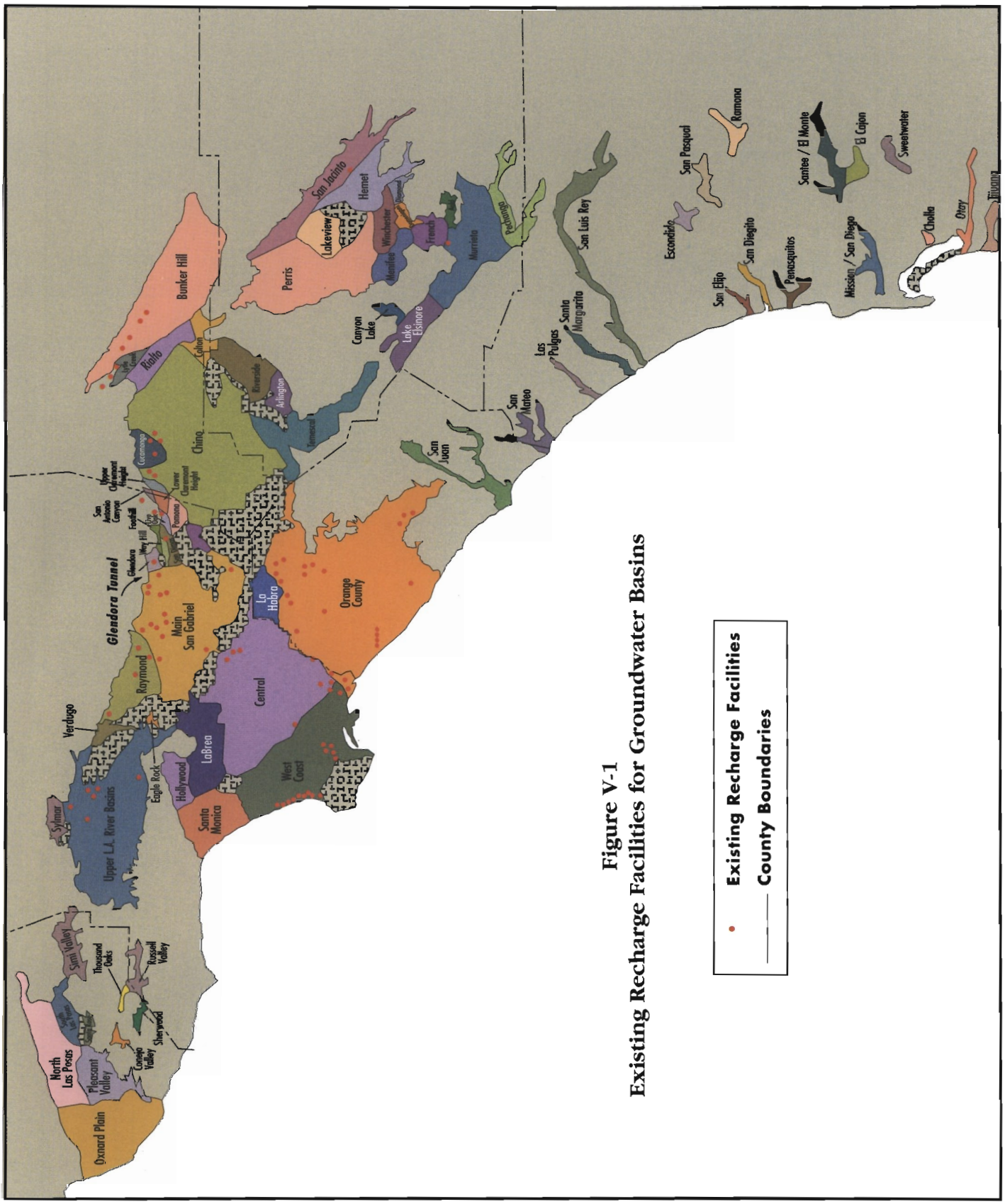


Figure V-1
Existing Recharge Facilities for Groundwater Basins

TABLE V-1
WATER USED FOR STORAGE REPLENISHMENT
(Acre-feet)

Member Agency	Type of Replenishment	FY's 1948-85	1985-86	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94	1948-94 Total
Anaheim	In-Lieu*	70,322			7,440	7,350	11,795	12,010	10,704	5,318	8,356	133,295
Burbank	In-Lieu*	11,050	10,000	10,000	6,000	6,000	6,000	5,540	1,652			56,242
	Spreading**						378	504	503	500		1,885
Calleguas MWD	Spreading**	2,464			1,620		1,717	2,835	1,287	2,625	890	13,437
Central Basin MWD	In-Lieu*	40,977	18,290	22,531	21,140	18,919	22,098	16,393	11,311	20,753	38,812	231,225
	Spreading**	2,130,399	21,495	44,501	34,542	44,001	49,531	50,785	59,033	22,987	19,239	2,476,513
	Injection	89,709	4,610	6,958	6,538	5,599	5,756	6,168	6,034	5,241	4,145	140,758
Chino Basin MWD	In-Lieu*	20,233	9,443	8,307	9,751	18,524	26,157	28,792	10,243	17,136	19,188	167,775
	Spreading**	118,023	16,330	13,609	15,636	7,407	26,617	3,291	5,534*	12,535*	8,859	227,841
Coastal MWD	In-Lieu*	1,916			411		349	1,281	339	471	263	5,030
Compton	In-Lieu*	2,478	401	200	200	200	450	465	125	830	1,195	6,544
Eastern MWD	In-Lieu*						2,924	4,151				7,075
	Spreading**	567							1,721	2,231		4,519
Foothill MWD	In-Lieu*	1,796	192	192	192	192	559	778	590	1,292	2,086	7,869
	Spreading**										94	94
Fullerton	In-Lieu*	32,117			2,771	2,412	1,880	4,980		3,432	3,010	50,602
Glendale	In-Lieu*	12,137	10,000	10,000	8,125	7,000	7,000	6,425	686			61,373
Las Virgenes MWD	In-Lieu*				474	120						594
Long Beach	In-Lieu*	17,288	5,000	5,000	6,061	5,175	8,043	12,576	2,542	7,156	19,844	88,685
Los Angeles	In-Lieu*	14,990	30,000	49,500	45,400	106,744	73,283	60,538	26,769	35,062	128,266	570,551
	Spreading**	89,255							21			89,276
MWD of O.C.	In-Lieu*	101,671	11,359	24,078	36,013	36,322	49,389	38,508	24,246	32,848	38,898	393,331
	Spreading**	2,587,744	31,779	27,126	38,752	10,761	31,027	15,619	51,672	26,293	78,521	2,899,294
Pasadena	In-Lieu*	16,489	6,599	8,000	8,910	1,830	8,000	10,648	8,601	11,880	12,261	93,217
	Spreading**					8,000			24			8,024
San Diego CWA	In-Lieu*	24,018				6,485			*			30,503
	Spreading**							240				240
Santa Ana	In-Lieu*	7,165	3,750	3,750	5,153	4,842	9,343	9,320	9,466	4,614	8,152	65,554
	Spreading**	17										17
San Fernando	In-Lieu*					546	652	803	480	425	532	3,438
Santa Monica	In-Lieu*	7,820					643					8,463
	Injection	8,126		2,251	1,822		3					12,202
Three Valleys MWD	In-Lieu*	15,055	2,015	1,665	685	1,163	712	998		419	1,986	24,697
	Spreading**							242	3,800	4,700	2,000	10,742
Torrance	In-Lieu*	9,909	4,750	5,000	5,000	5,000	5,000	4,128	1,400			40,187
USGVMWD	In-Lieu*	1,208						148				1,356
	Spreading**	400,510	3,000	25,000	37,570	43,186	56,428	57,213	64,074	60,490	27,123	774,594
West Basin MWD	In-Lieu*	31,619	7,625	8,520	8,750	9,974	10,028	8,026	3,434	14,265	27,656	129,898
	Injection	645,675	25,730	31,600	31,522	29,257	25,050	27,176	25,736	25,705	21,958	889,408
	Spreading**							112				112
Western MWD	In-Lieu*		878	929	810	1,390	1,376	2,330	1,000	2,413	1,944	13,070
	Spreading**							699				699
Total		**6,512,747**	**223,246**	**308,718**	**341,288**	**388,399**	**442,187**	**393,721**	**333,025**	**321,619**	**475,278**	**9,740,228**

Source: MWD, 1994

Notes: * Includes water delivered for groundwater replenishment and reservoir storage by in-lieu means under the Interruptible and the Seasonal Storage Service Programs. Also includes water delivered under Temporary In-Lieu Program.

** Includes water delivered for replenishment under the Interruptible and Seasonal Storage Service Programs

thus utilizing all storm water runoff before it would drain to the ocean. Local runoff and reclaimed water have been conserved in spreading grounds, injection wells, reservoirs, and unlined river channels. An additional responsibility of the county flood control districts is the operation of seawater barrier projects in Los Angeles and Orange counties to prevent seawater intrusion into the coastal groundwater basins.

As described in the previous chapter, groundwater supplies have been fully developed with pumping rights in many of the basins established by adjudication or managed by local agencies. Groundwater management agencies (1) provide orderly withdrawals to ensure long-term safe yields or meet other criteria; (2) maintain an orderly market for the sale or lease of groundwater-pumping rights; (3) assess pump taxes that are used to buy imported or reclaimed replenishment water needed to supplement natural recharge; and (4) pay for the spreading operations by which replenishment water augments underground supplies. For example, on the coastal plain, groundwater managers buy imported water from Metropolitan at replenishment rates and assess retail purveyors for annual well pumpage in amounts sufficient to repay replenishment costs. In most of the basins, long-term safe yields are established according to local groundwater recharge. These safe yields consist of recharge from natural precipitation and return flow from delivered groundwater less losses from subsurface outflow, rising water outflow, evaporation, and infiltration into sewers.

Conjunctive water use is being implemented by Metropolitan through five separate programs: (1) Seasonal Storage Service, (2) Cyclic Storage Program, (3) Cooperative Storage Program, (4) Demonstration Local Storage Program, and (5) Chino Basin Short-Term Conjunctive-Use Projects. Each of these five programs is described below.

Seasonal Storage Service

The Seasonal Storage Service (SSS) currently serves as Metropolitan's primary program for reservoir and groundwater conjunctive use with member agencies. Under this program, Metropolitan provides financial incentives to stimulate conjunctive use of groundwater basins to store imported water. The three principal goals of the SSS are (1) to achieve greater conjunctive use of imported water and local supplies, (2) to encourage the construction of additional local production facilities, and (3) to reduce the dependence of member agencies on Metropolitan's imported water supplies during the summer months and drought periods. Member agencies are able to purchase surplus imported water at a discounted rate between October 1 and April 30, or at other times at the discretion of the General Manager (see Chapter VI for pricing structure). Agencies are required either to produce the stored water during the high-demand summer months or to hold it in long-term storage to receive the discount. The discount provides money to the member agencies to construct and operate the groundwater facilities and to improve groundwater basin management strategies such as producing water in the summer and storing Metropolitan's water in the winter. In addition, the discount rate may also be used to finance groundwater treatment facilities. Metropolitan typically sells about 400,000 acre-feet of water under this Seasonal Storage Service. In fiscal year 1993-94, Metropolitan's SSS sales were about 520,000 AF.

Cyclic Storage Agreements

Since the early 1970s, Metropolitan has entered into several agreements that provide for advance delivery of replenishment water for groundwater storage. Under the Cyclic Storage Program, Metropolitan may deliver water from a cyclic storage account as a substitute for direct replenishment deliveries requested by the participating member agency. Cyclic water is sold at the replenishment water rate prevailing at the time it is withdrawn from storage. During the 1987-92 drought, about 240,000 AF were withdrawn from three storage accounts. These agreements served as models for the Cooperative Storage Program.

Cooperative Storage Program

Metropolitan initially adopted the Cooperative Storage Program (CSP) in 1993. The CSP has been refined in 1994 and 1995. The objective of the CSP is to coordinate Metropolitan's carry-over storage needs with storage capacity available to member agencies. Under the current CSP, Metropolitan delivers water available for storage to participating member agencies. Participating member agencies will provide partial payments for the water delivered to cover the incremental costs to Metropolitan to import the water. The remaining payments for the water is deferred until Metropolitan subsequently recovers the water from storage (typically during a regional water supply shortage). At the time of recovery, the member agency pays for the water released from its CSP storage account at the SSS rate that was in effect when the water was originally placed into storage less the initial payments by the agency. This program is designed to improve the water supply reliability of both the region served by Metropolitan as well as that of the participating agency. The program will also generate additional shortage-year revenue for Metropolitan. Water is released from storage to the participating member agency under the following terms:

(1) In any fiscal year (typically during minor drought), Metropolitan may substitute up to half of the CSP water in storage for SSS deliveries it chooses not to make.

(2) In a year when Metropolitan's General Manager suspends SSS deliveries due to a water supply shortage, the participating member is allowed to withdraw up to half of the CSP water in storage to make up the shortfall of any deliveries from Metropolitan.

(3) In an emergency, such as an earthquake, the participating member may withdraw and use all stored CSP water to meet emergency supply needs.

(4) In any year, Metropolitan's General Manager may unilaterally release certain amounts of CSP water for payment by the participating member, even if that member does not request such water. The amount, in combination with the member's prior SSS purchase for that year, may be up to the member's historic four-year average SSS purchases but shall not exceed half of the CSP water in storage.

As with any new program, the operation of the CSP is being reviewed to assure that it is meeting the objectives of the program and is operating in an efficient manner.

1993 Demonstration Local Storage Program

Under this one-time program, agencies purchased discounted imported water in 1993 and agreed to store it for

up to ten years. The participating agencies also agreed to produce the stored water at Metropolitan's request in four increments, each lasting three months. Production would be requested during the dry summer periods of April through June and July through September. The two member agencies (Calleguas MWD and the city of Anaheim) that participated in this program stored a total of approximately 11,000 AF.

Chino Basin Short-Term Conjunctive-Use Project

Metropolitan stored 4,800 acre-feet in the Chino Groundwater Basin through in-lieu replenishment deliveries as part of a three-year pilot project. The project was conducted to gain hands-on experience regarding the physical and institutional aspects of storing and recovering imported water in a local groundwater basin. The participating local agency, the Cucamonga County Water District (CCWD), will operate its wells at Metropolitan's request to pump the stored groundwater into Metropolitan's Upper Feeder. Metropolitan constructed the booster pumping facilities at a cost of about $500,000. The CCWD will be reimbursed for the energy costs (about $80 per acre-foot) of pumping. In the November 1993 pump test, stored groundwater was recovered and pumped successfully into Metropolitan's feeder system for the first time.

Groundwater Recovery Program

In 1991, Metropolitan implemented its Groundwater Recovery Program (GRP) in order to encourage member agencies to treat and use contaminated groundwater for municipal purposes. In many groundwater basins, the high cost of treating contaminated groundwater is an obstacle to expanded conjunctive use of groundwater and imported water supplies. The GRP supports member agency efforts to improve regional water supply reliability through conjunctive use and the development of additional local sources of supply.

Financial assistance is provided to the local agencies by Metropolitan for the construction and operation of project facilities used to recover contaminated groundwater. Local agencies, however, are expected to independently develop projects costing less than Metropolitan's applicable noninterruptible water rate (see Chapter VI for pricing structures). Those projects whose per unit cost is less than the applicable noninterruptible water rate are not eligible for participation in the GRP.

The GRP is open to all technologies that recover and use contaminated groundwater. To qualify, a project must meet the following criteria:

- *Contaminated groundwater.* The project must recover groundwater that is recognized as being contaminated under existing California health standards.
- *Project costs.* Project costs must exceed Metropolitan's applicable noninterruptible water rate.
- *Location of water service.* Product water must be used in Metropolitan's service area. However, the groundwater may be pumped from basins outside of the service area.
- *Groundwater production rates.* Participating agencies must increase their annual groundwater production rates by the stated project yield.
- *Three years of sustained production.* Each project must be able to sustain production during a three-year shortage period without receiving

replenishment water from Metropolitan. However, under exceptional circumstances such as operating in a small basin, a two-year period would be proposed for consideration by Metropolitan's Board of Directors.

- *Sound basin management.* Agencies must demonstrate that projects are consistent with sound basin management.
- *California Environmental Quality Act (CEQA).* Projects must comply with the provisions of CEQA before Metropolitan's Board of Director's can approve GRP participation.
- *Participation limits.* Each member agency's participation is limited to the greater of (a) 5,000 acre-feet per year or (b) 10 percent of the agency's total annual consumer demand. Total GRP participation is limited to 200,000 acre-feet per year.

For the projects meeting the above qualifying criteria, a contract specifying the terms and conditions of participation is negotiated between Metropolitan and the participating agency. Approval by Metropolitan's Board of Directors is required before it commits to participation in specific projects. Metropolitan provides financial assistance based on the difference between the project unit cost and Metropolitan's treated water rate up to a maximum of $250 per acre-foot.

At the present time, nine GRP projects have been approved and six projects are under review. The nine approved projects will recover almost 30,000 AFY of impacted groundwater (Table V-2). The six projects under review will recover more than 40,000 AFY of impacted groundwater. In addition, there are currently projects that are classified as under planning and possible. If these under planning and possible projects are developed, they would increase the yield of the GRP by about 120,000 AFY (Table V-3). GRP projects primarily treat and remove high concentrations of total dissolved solids (TDS) and volatile organic compounds (VOC). In some cases, groundwater recovery provides the availability for water storage through replenishment. Some of the GRP projects may require replenishment water to maintain the basin's safe yield. Replenishment provided by Metropolitan is listed on Table V-2 and V-3. However, it should be noted that replenishment water can be suspended during a water shortage year.

Local Projects Program

To assist the development of reclaimed water supply projects, the Local Projects Program was initiated by Metropolitan's Board of Directors in 1982. The LPP provides financial support to local agencies that develop reclaimed water projects that reduce the demand for imported water and improve regional water supply reliability. Metropolitan's goal is to assist in the development of 200,000 AFY of reclaimed water by the year 2000.

Between 1986 and 1990, the financial contribution for a project was equivalent to Metropolitan's avoided energy cost for pumping an equivalent amount of water through the State Water Project. In April 1990, Metropolitan's Board modified the LPP financial contribution to $154/AF. In August 1995, Metropolitan's Board adopted a revised contribution scheme for existing LPP projects. The unit contribution for a project will range from $0 to a maximum of $250/AF, and will be equal to the net actual cost of producing project water above the avoided costs of purchasing an

TABLE V-2

METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
GROUNDWATER RECOVERY PROGRAM

Project Name	Contaminant	Total Yield (AFY)	MWD Replenishment (AFY)	Estimated Start Year
Approved projects				
Santa Monica GW Treatment	VOC	1,800	0	1993
Burbank Lake Street GAC Plant	VOC	2,744	2,744	1993
West Basin Desalter No. 1	TDS	1,524	0	1993
Oceanside Desalter No. 1	TDS	2,000	0	1994
Tustin Desalter	TDS	3,271	909	1995
Irvine Desalter	TDS, VOC, Se	6,700	1,926	1996
Rowland GW Treatment Project	TCE/TDS	516	0	1996
Menifee Basin Desalter	TDS	3,360	0	1998
Chino/SAWPA Desalter No. 1	TDS/Nitrate	8,000	0	1997
Subtotal		29,915	5,579	
Projects under review				
Beverly Hills Desalter	TDS	2,688	0	1997
Arlington Desalter[1]	TDS/Nitrate	7,200	0	1998
Capistrano Beach Desalter	TDS	1,372	0	1999
San Juan Basin Desalter No. 1	TDS	2,200	0	1998
Baldwin Park Operable Unit	VOC	24,100	24,100	1999
Sweetwater Desalter No. 1	TDS	3,440	0	1998
Subtotal		41,000	24,100	
Total (Approved + Review Projects)		**70,915**	**29,679**	

[1]Conversion from LPP to GRP.

acre-foot of treated noninterruptible water from Metropolitan. Existing participants of LPP can elect to remain at the $154/AF flat rate or convert to the revised contribution scheme, under which Metropolitan's contribution will be adjusted annually based on actual project costs and Metropolitan's rates.

Participation Criteria

To qualify for the LPP contribution, a project must meet the following criteria:

- The project must be supported by a Metropolitan member agency.
- The cost of the reclaimed water to be produced by the project will exceed the cost of purchasing water from Metropolitan.
- The project must be implementable under the Metropolitan Water District Act and any other applicable laws, including the California Environmental Quality Act.
- The project must have a facilities plan and marketing analysis that indicate the completed project layout, implementation schedule, prospective users of reclaimed water, and project costs.

TABLE V-3

METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
GROUNDWATER RECOVERY PROGRAM: POTENTIAL PROJECTS

Project Name	Contaminant	Total Yield (AFY)	MWD Replenishment (AFY)	Estimated Start Year
Projects under planning				
Oceanside Desalter No.2	TDS	3,360	0	1998
San Juan Basin Desalter No.2	TDS	2,800	0	2000
Subtotal		6,160	0	
Possible projects				
San Pasqual Basin Desalter	TDS/Nitrate	5,000	0	1999
Winchester/Hamet Desalter	TDS	3,000	1,500	2001
Laguna Beach GW Treatment	Color	2,000	500	2000
Santee/El Monte Basin Desalter	TDS	1,000	0	2000
Otay/Sweetwater Desalter	TDS	3,000	0	2001
Corona/Temescal Basin Desalter	TDS/Nitrate	10,000	0	2001
Perris Basin Desalter	TDS	6,000	0	2001
Chino/SAWPA Desalter No. 2	TDS/Nitrate	8,000	9,200	2001
Torrance Elm Ave. Fac.	Chloride	4,000	0	2004
Western/Bunker Basin Treatment	Nitrate	8,100	0	2002
IRWD Colored Water Treatment	Color	10,000	2,625	2002
West Basin Desalter No. 2	TDS	6,000	0	2002
West Basin Desalter No. 3	TDS	5,000	0	2003
Tijuana River Valley Desalter	TDS	2,500	0	2004
San Dieguito Basing Desalter	TDS	5,000	0	2003
OCWD Undetermined Colored	Color	12,000	3,000	2004
Rubidoux/Western Desalter	TDS/Nitrate	3,000	0	2004
Chino/SAWPA No. 3	TDS/Nitrate	9,050	10,400	2005
Huntington Beach Colored Water	Color	5,000	1,250	2005
Mesa Colored Water Project	Color	2,500	625	2005
Sweetwater Desalter No. 2	TDS	4,000	0	2005
Subtotal		114,150	29,100	
Total (Planning + Possible Projects)		**120,310**	**29,100**	

- The project sponsor must demonstrate an ability to obtain all necessary public health and regulatory permits.
- The project is not existing or under construction, and it will be owned and operated by the project sponsor.

Current Program Outcomes

The LPP currently has 40 projects that will ultimately produce about 178,000 AFY of reclaimed water. The LPP projects are listed in Table V-4. Of these projects, 30 are in operation and receiving Metropolitan's LPP incentives. The remaining ten projects are currently in design or under construction. These projects produced about 28,000 acre-feet of reclaimed water in the fiscal year 1993-94. Through April 1995, Metropolitan has provided about $19.4 million in incentives for the production of approximately 137,145 AF of reclaimed water for landscape and golf course irrigation, nurseries, and industrial uses. In addition to the approved LPP projects, there are seven reclamation projects, with a potential yield of about 30,000 AFY, currently under review.

Program Expansion Constraints

The projections for expanded development of water reclamation within Metropolitan's service area are not assured given the many constraints confronting water suppliers in the process of developing reclaimed water projects. The major issues preventing substantially greater use of reclaimed water, up to the present time, include funding, regulatory requirements, institutional arrangements, and public acceptance of reclaimed water. These constraints are discussed below.

Financial Constraints

Lack of funding is the reason most often given by local agencies for not constructing new reclamation projects. Reclamation projects can require significant capital investments, as they normally require a new distribution system separate from a potable system. The cost of reclamation projects may exceed the current price of imported supplies from Metropolitan. In addition, the slow yield buildup and variability of demand for reclaimed water affects project economics by increasing unit costs during the early years of operation. Metropolitan developed the LPP to assist member agencies in overcoming this financial constraint. In its role as the regional water supplier, Metropolitan effectively distributes the costs of new supplies to all agencies within its service area because all agencies benefit when any new supplies are developed to offset regional shortages. The 1990 and 1995 modifications in the LPP contribution are intended to offset, at least partially, the disincentives associated with high project costs.

Regulatory Requirements

Two state agencies are involved in regulating water reclamation projects. The Regional Water Quality Control Board is the permitting authority, and the Department of Health Services advises with regard to health concerns and standards. Combining water quality concerns and health effects requires that stringent goals and standards be met. Title 22 of the California Administrative Code provides specific guidelines for treatment levels and the corresponding reuse opportunities. However, there are no uniform criteria for groundwater recharge with reclaimed

TABLE V-4

METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
LOCAL PROJECTS PROGRAM

Member Agency/Project	Ultimate Yield (AFY)	1993-94 Deliveries (AF)	Total Yield Through April 1995 (AF)
Burbank			
Burbank Reclaimed Water System Expansion Project	850	0	0
Calleguas			
Oak Park/North Ranch Reclaimed Water Distribution System	1,300	0	0
Central Basin MWD			
* Century Reclamation Program	5,500	1,462	3,410
* Cerritos Reclaimed Water Extension Project	260	123	290
* Lakewood Water Reclamation Project	440	447	2,266
* Rio Hondo Water Reclamation Program	5,000	0	69
Coastal MWD			
* San Clemente Water Reclamation Project	4,000	367	1,705
* South Laguna Reclamation Expansion Project	700	0	54
* South Laguna Reclamation Project	860	785	7,376
Eastern MWD			
EMWD Regional Reclamation Water System	4,900	0	0
* Rancho California Reclamation Expansion Project	6,000	979	2,381
Foothill MWD			
* Glenwood Nitrate Water Reclamation Project	1,600	823	1,546
Glendale			
* Glendale Water Reclamation Expansion Project	600	298	936
Glendale Verdugo-Scholl Reclaimed Water Project	2,000	0	0
Glendale Brand Park Reclaimed Water Project	225	0	0
Las Virgenes MWD			
* Calabasas Reclaimed Water System Expansion Project	700	503	2,063
* Las Virgenes Reclamation Project	2,700	2,513	23,947
Long Beach			
* Long Beach Reclamation Project	1,700	992	6,811
Los Angeles			
* Los Angeles Green Belt Project	1,610	592	1,209
Sepulveda Basin Water Reclamation Project	1,900	0	0

TABLE V-4 (Continued)

METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
LOCAL PROJECTS PROGRAM

Member Agency/Project	Ultimate Yield (AFY)	1993-94 Deliveries (AF)	Total Yield Through April 1995 (AF)
MWD of Orange County			
* Green Acres Reclamation Project	7,000	927	1,921
* Irvine Reclamation Project	10,000	6,766	46,058
* Moulton Niguel Water Reclamation Project	8,000	726	1,989
* Santa Margarita Water Reclamation Project	3,600	1,505	8,623
* Trabuco Canyon Reclamation Expansion Project	800	247	595
San Diego County Water Authority			
* Encina Basin Water Reclamation Project Phase I	2,050	848	1,877
* Encina Water Pollution Control Facility Reclamation Project	165	123	291
Escondido Regional Reclamation Water Project	2,800	0	0
* Fallbrook Sanitary District Water Reclamation Project	1,200	143	1,006
North City Water Reclamation Project	17,500	0	0
* Oceanside Water Reclamation Project	300	26	58
* Otay Water Reclamation Project Phase I	1,500	749	2,184
Padre Dam MWD Reclaimed Water System Phase I	850	0	0
Rancho Santa Fe Reclaimed Water System	220	0	0
* San Pasqual Water Reclamation Project	1,100	0	33
Santa Maria Water Reclamation Project	1,600	0	0
* Shadowridge Water Reclamation Project	375	294	825
City of Santa Ana[1]			
* Green Acres Reclamation Project	See MWDOC	71	100
Three Valleys MWD			
* Walnut Valley Water Reclamation Expansion Project	500	273	468
West Basin MWD			
* West Basin Water Reclamation Program	70,000	0	11
Western MWD			
* Arlington Basin Groundwater Desalter Project	6,100	5,159	17,092
Total yield of 40 approved projects	**178,505**	**27,741**	**137,145**

* Projects in operation.

[1] The Green Acres Reclamation Project delivers to both the MWD of Orange County (MWDOC) and the city of Santa Ana. The deliveries to the city of Santa Ana are reported separately.

water. Currently, state statutes mandate that regulatory agencies review and determine requirements for each recharge project on a case-by-case basis.

Institutional Arrangements

Often, multiple local agencies are involved in a proposed reclamation project. For example, reclaimed water from a single wastewater source may be used by a number of reclaimed water distributors, or the reclaimed water may be treated and delivered by an agency in one geographical area and used by another group in another geographical area. Also, an agency responsible for wastewater collection and treatment may wish to deliver reclaimed water within a water district's service area. In most instances, it requires a committed agency that is willing to negotiate with other affected agencies to develop a reclamation project.

Public Acceptance

Most agencies find they need to implement a public education program along with their reclamation projects. Reclaimed water users and the general public need to be educated on the benefits of using reclaimed water as well as being reassured about the health effects associated with reclaimed water use.

Metropolitan is actively working with local, regional, and state agencies to overcome the various constraints facing reclamation projects. Metropolitan encourages the use of reclaimed water through its LPP and is committed to overcoming those constraints by:

- Promoting cooperative statewide efforts to develop reclamation;
- Advocating and lobbying for favorable legislation;
- Promoting safe and beneficial use of reclaimed water;
- Supporting consistent regulations for safe use of reclaimed water for direct use and groundwater recharge purposes;
- Supporting regional or statewide reuse symposiums;
- Participating in workshops and public relations programs.

TRANSFERS AND EXCHANGES

In addition to local water supply management programs, Metropolitan continues to pursue a policy of acquiring additional water supplies through a variety of voluntary marketing agreements and cooperative arrangements. Water transfers and exchanges are a way that Metropolitan can acquire water to meet water supply shortfalls and increase the reliability of its water supplies. Metropolitan's policy on water transfers has several considerations that guide its water transfer activities:

- Water transfers, including water marketing, will be developed only on a voluntary basis with willing partners.
- A full-range of water transfer options will be pursued, including arrangements with appropriate state and federal agencies, public and private water entities, and individual water users.
- Water transfers will be designed to protect and, where feasible, to enhance environmental resources.
- Water transfers will be designed to avoid contributing to or creating a condition of long-term groundwater overdraft.

- Water transfers will be developed in cooperation with the agricultural community and to avoid unreasonable operational and financial impacts.
- Strategies will be developed to appropriately address community impacts of water transfers.

Metropolitan's water marketing programs include water transfers and water exchanges. Water transfers typically involve purchasing water during a specified period from an agency or individual who then reduces their water use by that amount. Water transfer activities can be classified as spot transfers, option transfers, core transfers, storage transfers, or exchanges. Spot transfers make water available through an annual contract entered into in the same year that the water is delivered. Option transfers are multiyear contracts that allow Metropolitan to obtain water only when the need exists. Core transfers make water available through multiyear contracts that convey a specific amount of water to Metropolitan each year. Storage transfers allow Metropolitan to store and later recover available water that cannot be transported immediately to Southern California. Finally, water exchanges are agreements between Metropolitan and other agencies that allow Metropolitan to exchange water from one source for the other agency's water from a different source. An example of an exchange agreement is Metropolitan delivering a portion of its Colorado River entitlement to a SWP contractor in return for the SWP entitlement of that agency. Entering into an exchange agreement can benefit a water agency by reducing the need to build new facilities to take delivery of its water entitlements, and it can help increase the operating efficiency of the delivery system. Current and proposed transfer and exchange agreements are presented in the following sections.

Current Transfer and Exchange Programs

Colorado River

Desert Water Agency and Coachella Valley Water District. In 1967, Metropolitan entered into water exchange agreements with the Desert Water Agency (DWA) and the Coachella Valley Water District (CVWD). The DWA and the CVWD serve the northern and southern portions of the Coachella Valley, respectively. All three participants in the agreements are State Water Contractors. However, because there are no facilities to convey water from the State Water Project (SWP) to the Coachella Valley, neither the DWA nor the CVWD is able to take delivery of their SWP entitlements. Rather than build facilities to take delivery of SWP water, the two agencies initiated negotiations with Metropolitan that culminated in agreements allowing the two agencies to exchange their SWP entitlements for a like amount of Colorado River water. The exchange agreements specify that Metropolitan will deliver Colorado River water via the Colorado River Aqueduct to service connections in the Upper Coachella Valley. From that point, CVWD and DWA convey the water to spreading basins via the Whitewater River. In return, Metropolitan takes delivery of a like amount of SWP water through the East Branch of the California Aqueduct.

The current agreements extend through the year 2035. Under a third agreement, Metropolitan delivers Colorado River water in advance to CVWD and DWA when sufficient supplies are available for storage in the Upper

Coachella Valley groundwater basin. The advance storage agreement permits Metropolitan to continue to utilize CVWD's and DWA's State Water Project entitlements and suspend deliveries of Colorado River water for recharge. Then, water stored in the groundwater basin can be used by the DWA and CVWD, and Metropolitan can maximize the use of the Colorado River Aqueduct (CRA). Approximately 550,000 AF of Colorado River water had been stored through 1987. As of July 1995, 370,991 AF remained in the storage account.

Tijuana, Mexico. In 1972, the United States Bureau of Reclamation, Metropolitan, the International Boundary and Water Commission, and certain other agencies entered into an agreement providing for delivery of up to 20,600 AFY of Colorado River water to the city of Tijuana. This is water that Mexico is entitled to receive under the 1944 Treaty between the United States and Mexico regarding the waters of the Colorado River and the Rio Grande. The water was transported through Metropolitan's Colorado River Aqueduct and water conveyance systems to San Diego County. This agreement was terminated on August 13, 1983. It was anticipated that with the completion of Tijuana's own aqueduct system, Metropolitan would not be required to convey any more water. However, in 1989, Tijuana experienced a break in its distribution system. On the basis of previous agreements, Metropolitan was asked by the federal government to work in conjunction with the San Diego County Water Authority (a Metropolitan member agency) and the Otay Water District to provide emergency water to Tijuana, Mexico. During 1989, the three agencies provided approximately 323 AF of water to Tijuana. Emergency deliveries to Tijuana were also made in 1992 at the federal government's request to allow for major repairs to the Tijuana Aqueduct. During 1992, the three agencies provided approximately 243 AF of Colorado River water to Tijuana.

State Water Project/Central Valley Project

Areias Dairy Farm (ADF) Transfer. Metropolitan signed an initial agreement with ADF to transfer up to 32,200 acre-feet of ADF's highly reliable Central Valley Project (CVP) exchange water supply over a maximum of 20 years. The transfer is authorized under the Central Valley Project Improvement Act (CVPIA) of 1992 and was negotiated in two parts: an initial agreement and a final agreement. The initial agreement established the framework for the transfer and set the method and timing of the up-front payments to be made to ADF. The final agreement will be executed once the necessary regulatory approvals are obtained and environmental documentation completed. ADF will receive $175 per acre-foot of transferred water. Metropolitan is currently negotiating with the San Joaquin River Exchange Contractors Water Authority to include this transfer in a larger district-to-district transfer.

Semitropic/Metropolitan Water Storage and Exchange Program. Under the Semitropic/Metropolitan groundwater storage program (Program), the Semitropic Water Storage District (Semitropic) will provide Metropolitan with access to existing and new facilities, funded by Metropolitan, and provide other service necessary for Metropolitan to store and recover portions of its SWP or other water supplies in the groundwater basin underlying Semitropic. Semitropic is located in Kern County, about 25 miles northwest of Bakersfield.

Under this program, Metropolitan will have the right to store up to 350,000 acre-feet of water and will receive a minimum annual yield of 31,500 acre-feet and a maximum annual yield of up to 170,000 acre-feet in the years Metropolitan desires the water. The cost to store and retrieve this water will be about $130 per acre-foot, plus energy costs.

Local Exchanges

San Gabriel Valley Municipal Water District. Prior to 1975, a groundwater overdraft condition existed throughout the Main San Gabriel Basin, including the western portion of the basin known as the "Alhambra Pumping Hole." This general overdraft condition resulted in a lawsuit that adjudicated the water rights of the Main San Gabriel Basin. Six of the seven producers extracting water from the Alhambra Pumping Hole are members of the Upper San Gabriel Valley Municipal Water District, a Metropolitan member agency. The other producer is the city of Alhambra, a member agency of the San Gabriel Valley Municipal Water District (SGVMWD). The SGVMWD has a contract with the state for water from the State Water Project. In connection with the adjudication and to help reduce the overdraft of the basin, it was agreed that Metropolitan would deliver approximately 3,000 AFY of water to the city of Alhambra through the Upper San Gabriel Valley Municipal Water District. The city of Alhambra would then reduce pumping by 3,000 AFY, thereby reducing the overdraft.

In exchange for providing the 3,000 AFY, Metropolitan receives the right to use capacity in San Gabriel Valley Municipal Water District's Devil Canyon-Azusa pipeline. This will augment the capacity of Metropolitan's Rialto pipeline. The agreement can be terminated only by mutual agreement of the contracting parties.

Proposed Transfer and Exchange Programs

In addition to existing transfer and exchange agreements, Metropolitan is continuing to pursue additional programs that would supplement existing water supplies or enhance operations efficiency. Some currently identified potential programs are presented below.

Efforts to Permanently Acquire Additional SWP Water

Metropolitan has discussed the purchase of a SWP supply from SWP agricultural contractor's member agencies. Negotiations for this purchase were inactive while Metropolitan reevaluated its position on related SWP issues. In late 1994, the parties agreed to resume negotiations.

Pilot Program in the San Joaquin Valley Drainage Program Study Area

This program would involve fallowing agricultural lands with drainage-related problems. This would create a dry-year water supply for Metropolitan, provide a wet-year water supply for the environment and/or agricultural partner, and reduce the damage caused by agricultural drainage from these lands. Such programs also have the potential to mitigate for other transfer impacts in the San Joaquin Valley and potentially in the Delta.

Calleguas MWD/Metropolitan Groundwater Storage Program

Staff from Metropolitan and the Calleguas MWD are currently finalizing Principles for a Water Management Service Agreement that will meet two separate Board objectives. The first is a Semitropic-style groundwater storage program, where Metropolitan will pay for

water management services performed by Calleguas. Metropolitan will also develop a second point of delivery of treated water for Calleguas MWD by developing additional facilities in the groundwater basin (the West Valley Project).

Using facilities developed to meet both objectives, Calleguas will store and retrieve water for Metropolitan at Metropolitan's request, including during peak demand periods. Calleguas will pay Metropolitan's firm water rate, less water management costs, when water stored for Metropolitan is retrieved.

San Joaquin River Exchange Contractors Water Authority (Authority)

Metropolitan anticipates negotiating a long-term water transfer with the Authority that would make more than 50,000 acre-feet per year of water available for transfer in dry-years. The Authority represents the four San Joaquin River Exchange Contractors. The Exchange Contractors entered into a contract with the U.S. Bureau of Reclamation (Reclamation) under which they agreed not to exercise their right to San Joaquin River water in exchange for Delta water delivered from the CVP's Delta-Mendota Canal. It is particularly desirable for Metropolitan to obtain water from the exchange contractors because their contract with Reclamation ensures they will receive at least a 75 percent supply in all years.

Colorado River Banking Concept

The Colorado River Banking concept is a means of creating an additional supply of water for an interim period by making use of State Project water. The concept calls for Metropolitan to adjust its Colorado River deliveries in accordance with the availability of water from the State Water Project. In years when SWP supplies are adequate, Metropolitan would take more SWP water and correspondingly less of its Colorado River entitlement. The difference between Metropolitan's Colorado River entitlement and its actual diversions would remain in Lake Mead and be credited to Metropolitan's account. Any water lost by flood control releases or evaporation resulting from additional stored water would be deducted from Metropolitan's account. As needed, Metropolitan would draw on its accumulated net water credits in Lake Mead.

The banking concept depends on several factors, including (1) availability of storage space in Lake Mead, (2) capacity in the SWP and Colorado River aqueducts, (3) flexibility in Metropolitan's distribution system, and (4) whether or not the participating agencies and certain Colorado River Basin states can reach a consensus that banking nonsystem water is appropriate for improving water management. The yield will depend on the factors listed above and the incremental evaporation losses and flood control releases incurred at Lake Mead. Without additional SWP and Metropolitan facilities, the yield would be less.

SUMMARY

The mission statement of Metropolitan calls for the provision of adequate and reliable water supplies to its service area. In pursuit of its mission, Metropolitan has initiated three water supply management programs to maximize yields of local water supplies: conjunctive use programs, the Groundwater Recovery Program, and the Local Projects Program. Metropolitan

continues to look for ways to improve and expand these types of water supply management programs that aid in achieving the goal of water supply reliability. In addition, Metropolitan continues to pursue opportunities to acquire additional water supplies through water transfer and exchange agreements.

The continued development of local water supplies is an essential component of Metropolitan's plan for meeting future water demands. As part of the new rate structure study, the Seasonal Storage Service and the other water supply management programs are currently being reviewed for ways they can be improved. The Seasonal Storage Service has a significant value because it encourages member agencies to purchase and store imported water, and to produce the water during periods of peak demand and system shortages. Metropolitan has many opportunities for refinement of the seasonal storage program, such as developing appropriate measures that would simplify implementation and assure benefits, implementing contract groundwater storage programs (similar to Semitropic) in conjunction with the Seasonal Storage Service, and accounting for storage deliveries in the long-term drought management plan.

Through the Integrated Resource Planning (IRP) process that is discussed in Chapter VIII, Metropolitan reaffirmed the need to adopt a leadership and partnership role with its member agencies and subagencies in local water management. The Southern California water community has concluded that Metropolitan should adhere to the following principles when establishing its local water management programs. These local water management programs include development and management of reclaimed water, groundwater storage and treatment, and water conservation. These principles are not listed in order of priority, and they need to be taken into account as a whole (and in conjunction with the guiding principles identified for the water conservation programs shown at the end of Chapter III).

- The regional benefits of both local storage and local project programs should be measured by (a) the reduction in capital investments due to deferral and/or downsizing of regional infrastructure, (b) the reduction in O&M expenditures needed for treatment and distribution of imported water, and (c) the reduction in expenditures associated with developing alternative regional supplies.
- Metropolitan's investments for local storage and local project programs should not exceed the regional benefits over the life of the project(s).
- Metropolitan's investments for local storage and local project programs should be sufficient to encourage the implementation of projects identified in the Preferred Resource Mix (see Chapter VIII). Such investments and their associated payment schedules should also be flexible enough to meet the needs of each project.
- Metropolitan's participation in local storage and local project programs should not cause large fluctuations in Metropolitan's water rates.
- Local storage and local project programs should increase regional supplies during the time of need. Specifically, water placed in local storage programs must be able to be utilized during the time of need

without displacing dependable local supplies. The amount of water involved should be agreed to in advance when each storage and local project program is established.

- Local project programs must increase regional supplies and provide measurable regional benefits.
- Performance of local storage and local project programs should be verifiable (e.g. deliveries into and withdrawals out of local storage should be accounted for by either direct measurement or by incorporation into a shortage management plan).

VI. PRICING AND RATE STRUCTURES

Metropolitan's pricing policy is designed to achieve sound and efficient management of water resources. This chapter provides a review of Metropolitan's financial structure, wholesale water rates, and positive incentive pricing programs. The chapter concludes with a description of retail prices in Metropolitan's service area.

PRICING POLICY

Since the 1987-92 drought, Metropolitan has made significant progress in modifying its wholesale rate structure and incentive programs to achieve water conservation and improved water management. The major objectives of the current pricing policy include:

(1) *Revenue sufficiency and stability.* The structure of water rates is designed to secure a firm revenue base and provide for relatively stable water commodity rates over time. These rates should be sufficient to generate total revenue requirements less receipts from interest, power recovery, taxes, and other revenue sources. The rate structure is expected to provide a substantial base amount of assured revenue each year to ensure the stability of net revenues. The stability of revenue is enhanced by the use of a Water Rate Stabilization Fund.

(2) *Efficient water management.* Together with incentive programs, water rates are structured to promote efficient water use and achieve the water supply management goals of Metropolitan's Integrated Resources Plan. The pricing policy is expected to encourage efficient use of the distribution system so that peaking demands are discouraged and the storage of surplus water is maximized. The policy is also designed to provide water resource management incentives and to encourage member and local agencies to increase the use of local water resources, particularly during droughts.

(3) *Equity and fairness.* A central concern in setting water rates is that they follow the principle of equity under which member agencies and their customers are apportioned costs of service in a manner that is fair and avoids the subsidy of one group of users at the expense of another. The rate structure provides equal rates for the same class of service to all member public agencies. The new growth in the service area is expected to pay its fair share of the additional costs of growth on Metropolitan's system.

(4) *Effective management of shortages and surpluses.* The pricing policy also considers the need for a proactive plan to ensure equity and efficient use of regional resources during shortage periods as well as effective use of storage during periods of water surplus. The water rate structure is easily convertible to an emergency conservation pricing plan if necessary.

(5) *Minimum rate shock and administrative effort.* The water rate structure and reserves are set up so the amount of change in water rates each year is relatively small, yet it allows Metropolitan to reach the necessary revenue levels. Also, the current rates are simple to administer and easy to implement.

(6) *Financial viability.* The pricing policy allows Metropolitan to maintain high bond ratings to access capital markets at the lowest possible interest rate. The water rate structure is designed to avoid negative impacts on the borrowing capability of Metropolitan and its member agencies.

The various components of the wholesale rate structure and the financial incentive programs are designed to achieve one or more of the objectives listed above. Additional objectives are also considered. They include (1) full allocation of the actual and social costs of providing service, (2) efficient use of water in terms of quantity used and timing of use, (3) efficient pattern of system development over time and efficient growth in water use, and (4) transparency of water rates to provide a clear and predictable price signal to member agencies and their customers. The following sections describe the financial structure of Metropolitan and the current system of water pricing that follow these objectives.

Metropolitan's Financial Structure

Legal Basis

Metropolitan's financial structure is determined by state legislation that enables the Board of Directors to impose water rates and other charges. The Metropolitan Water District Act and its amendments enable Metropolitan to establish water rates, impose a water standby or service availability charge, incur bonded indebtedness, issue notes and short-term revenue certificates, and levy taxes on property within its service area.

In November 1992, Metropolitan began a financial structure study as a consensus-driven effort among its staff, the member agencies, and a special committee of the Board of Directors. In 1993, the Board of Directors approved a revenue structure to cover the current fixed and operating costs and implement Metropolitan's capital and water management programs. The current annual revenue requirement to cover all costs is nearly $930 million, of which about 80 percent is needed to cover fixed costs.

Sources of Revenue

Metropolitan's primary source of income is revenue from the sale of water. Currently, this source covers approximately 80 percent of the total revenue requirement. The remaining 20 percent is covered from fixed service charges (including the connection maintenance charge and readiness-to-serve charge) and from property taxes and annexation charges, electric power sales, interest, and miscellaneous income.

Wholesale Water Rates

Table VI-1 presents Metropolitan's wholesale water rates for the period from fiscal year 1985 to 1996. Historically, Metropolitan's pricing policy has been based on the principle of charging *like rates for like services.* Under this pricing system, separate rates are established for different types of service (e.g.,

noninterruptible treated water service, emergency service, and others). However, the price of water for a given service does not discriminate against member agencies located at more distant locations relative to Metropolitan's aqueduct supplies. This system is referred to as *postage stamp pricing*. The geographically uniform rates are used because Metropolitan's water delivery system is interconnected within its service area, and the cost of water transmission within the six-county service area represents only a part of the total cost of water importation and treatment. A policy for separating the cost of wheeling water within the region and establishing appropriate charges is expected to be developed in the next year.

Between fiscal years 1986-87 through 1990-91, water rates remained unchanged. Since then, the prices of non-interruptible and emergency service have increased each year. Interruptible service was discontinued in 1991 and replaced by a new class of service, seasonal storage, which was introduced in fiscal year 1989-90. The changes in levels of water rates and charges has affected the average cost of water to member agencies, which is obtained by dividing water sales revenue (accrual) by total volume of water sold each fiscal year. Between fiscal years ending in 1986 and 1994, the average cost of Metropolitan's water increased from $201 to $306 per acre-foot (Table VI-2). After removing the effects of

TABLE VI-1

TRENDS IN METROPOLITAN'S WHOLESALE WATER RATES: 1985-1996
(Dollars per Acre-Foot)

Type of Service		Fiscal Year								
		85-85	86-89	89-90	90-91	91-92	92-93	93-94	94-95	95-96
	Untreated	192	197	197	197	222	269	318	335	344
	Treated	224	230	230	230	261	322	385	412	426
	Untreated	148	153	153	153/ 197	N/A	N/A	N/A	N/A	N/A
	Treated	180	186	186	186/ 230	N/A	N/A	N/A	N/A	N/A
	Untreated	N/A	N/A	N/A	N/A	N/A	N/A	205	222	231
	Treated	N/A	N/A	N/A	N/A	N/A	N/A	248	275	289
	Untreated	N/A	N/A	115	115	130	168	208	222	229
	Treated	N/A	N/A	135	135	154	203	253	275	286
	Untreated	586	591	591	591	666	807	954	1005	1032
	Treated	618	624	624	624	705	860	1021	1082	1278
		84	84	84	84	84	84	113	113	113

(4/1/91) Interruptible discount eliminated.

(5/1/94) Interim Agricultural Water Program implemented.

general price inflation (by converting the historical rates to constant dollars), the real increase in the average cost of water was 13.9 percent for the eight fiscal years between 1986 and 1994.

Metropolitan's current pricing system consists of two types of charges: *commodity charges and water service charges.* The commodity charges are based on the quantity of water sold to member agencies and depend on the type of service. The water service charges are based on demand characteristics other than the actual volume of water sold. The specific charges under each category are described below.

Water Commodity Charges

As shown in Table VI-1, Metropolitan adopted new commodity rates for different types of service for fiscal year 1995-96. Each type of service is briefly described below.

Noninterruptible Water Service

Noninterruptible service refers to water deliveries for domestic and municipal purposes that require continuity of service. It is not subject to interruption or reduction in demands except as a last resort during shortages. Approximately 70 percent of Metropolitan's water is sold under the noninterruptible class of service. Slightly more than two-thirds of this water is treated. The price of untreated noninterruptible water in fiscal year 1995-96 is $344 per acre-foot, or $1.06 per 1,000 gallons. The price of treated water includes a surcharge of $82 per acre-foot, or $0.25 per 1,000 gallons.

Emergency Water Service

Emergency service is available only in the event a member agency cannot sustain all or any part of a reduction or interruption in the delivery of water

TABLE VI-2

AVERAGE COST OF METROPOLITAN'S WATER SUPPLY

Fiscal Year	Water Sales ($ Million)	Water Sales (1,000 AF)	Average Cost per AF (Nominal Dollars)	Average Cost per AF (1990$)
1985-86	329.4	1,642	201	238
1986-87	373.5	1,826	205	239
1987-88	392.6	1,922	204	228
1988-89	424.9	2,095	203	219
1989-90	486.8	2,511	194	198
1990-91	411.9	2,265	182	176
1991-92	404.5	1,889	214	201
1992-93	544.0	1,911	285	260
1993-94	630.4	1,931	306	271

Source: Metropolitan Financial Reports 1985-1994.

required under the obligation of interruptible water service. The delivery of water under this type of service must be authorized by the General Manager upon the determination that serious hardship would result to a member agency or any of its subagencies. This extra water is priced at a rate three times the noninterruptible rate. However, since interruptible water service and its obligations have expired, emergency water service has not been necessary.

Seasonal Storage Rates

When surplus water is available, generally between October 1 and April 30 and as designated by the General Manager, member agencies are allowed to buy available water at a discounted rate if they participate in the Seasonal Storage Program described in the next section. Approximately 18 to 25 percent of Metropolitan's water is sold at seasonal storage rates.

Interim Agricultural Water Rates

Approximately 5 percent of Metropolitan water is sold under the Interim Agricultural Water Program established in 1994. The discounts for agricultural water deliveries are currently set at $137 per acre-foot for treated water and $113 per acre-foot for untreated water. In return for the discount, agricultural users are subject to delivery interruptions of up to 30 percent prior to any mandatory delivery reductions to municipal and industrial users. The Interim Agricultural Water Program is scheduled to last for a three-year period ending April 1997.

Reclaimed Water Rate

Reclaimed water includes wastewater that has been collected in a sanitary sewer system and treated within a reclamation plant. The reclaimed water is not suitable for direct domestic use, but it can be used for selected nonpotable uses. The wholesale price of reclaimed water is set at $113 per acre-foot. Metropolitan buys and sells reclaimed water through the contract provisions in the Local Projects Program agreements.

Water Service Charges

For fiscal year 1995-96, the Metropolitan rate structure will maintain four other water service charges plus an assessment tax. These charges are shown in Table VI-3. The assessment tax, readiness-to-serve, and connection maintenance charges are considered fixed charges.

Property Assessment Tax

Property tax revenue is used to pay Metropolitan's general obligation bond debt service and a portion of its obligations under the State Water Contract. The general tax rate for this purpose has been gradually reduced from a peak equivalent rate of 0.1250 percent of full assessed valuation in fiscal year 1945-46 to 0.0089 percent in fiscal year 1995-96. By the year 2024, when the bonds have been fully paid, it is projected that Metropolitan will no longer levy an ad valorem property tax.

TABLE VI-3

ADOPTED WATER SERVICE CHARGES FOR FISCAL YEAR 1995-96

Type of Charge	Payees	Unit
Taxes	Property owners	$/1,000 of assessed value
Readiness-to-serve charge	Member agencies	$/year or $/AF of historical demand
Connection maintenance	All Metropolitan Connections	$/CFS per month
New demand charge	Member agencies	$/AF above historical demand
Treated water peaking	Agencies with peak week use above 130 percent of average summer-time use	$/CFS

Readiness-to-Serve Charge

The readiness-to-serve (RTS) charge is designed to recover the principal and interest payments on nontax-supported debt incurred by Metropolitan to fund capital improvements associated with meeting the reliability and quality needs of existing water users. For 1995-96, each member agency's share of the RTS charge will be based on the average of Metropolitan's sales in 1992-93 and 1993-94 net of long-term storage water sales. Standby charges collected by Metropolitan on land in a member agency's service area may be used by the member agency as credit against the RTS charge obligation.

Connection Maintenance Charge

The connection maintenance charge (CMC) is devised to recover a portion of the costs associated with operating and maintaining service connections. This charge is based on the capacity and number of connections each agency has with Metropolitan. The current charge is equal to $50 per cubic-foot per second of connected capacity per month, with a maximum charge of $5,000 per connection each month.

New Demand Charge

The new demand charge (NDC) is designed to recover the capital costs associated with meeting new demands on Metropolitan's system. Specifically, this charge covers the full costs of providing water quality and reliability for incremental demands above 2.2 million acre-feet per year of normal demands. The full cost for untreated incremental demands is estimated to be $1,621 per acre-foot. The incremental costs of treatment may be added to this charge in the future. For 1995-96, the NDC has been set at $1,000 per acre foot of water above average historical demands. The intention is to increase this charge toward full cost over the next five years.

Treated Water Peaking Charge

The treated water peaking charge is set to encourage agencies that contribute to the peak rates of flow through Metropolitan's water treatment facilities during the summer season to change their operations or more equitably share in the cost of facilities to meet their needs. If the peak weekly flow to a member

agency during the five-month period from May through September exceeds 130 percent of average weekly flows during the five-month period, then the agency pays a charge for each cubic foot per second above the average. This demand charge will first be assessed during the calendar year 1996 and collected in 1997-98. Revenue from this charge will be used to offset increases in the treated water surcharge.

The Long-Range Financial Plan that Metropolitan's Board adopted in August, 1995 indicates Metropolitan's projected pevenues and water rates through 2004. Table VI-4 illustrates these projections.

Pricing Incentive Programs

Metropolitan maintains four programs that provide economic incentives to encourage member agencies to maximize the use of regional resources, increase local storage of imported supplies, and implement long-term water conservation programs. These four programs are described below.

Local Projects Program

This program, started in 1982, is designed to encourage local agencies to develop water reclamation projects. Under this program, Metropolitan currently provides a financial contribution of $154 per acre-foot of new water from a local reclamation project that replaces a demand on Metropolitan (see Chapter V for a full description of the program).

Groundwater Recovery Program

This program was initiated in 1991 to encourage the treatment and production of contaminated groundwater within Metropolitan's service area (see Chapter V for a full description of the program). Local agencies are offered financial assistance for construction and operation of local facilities that are used to recover contaminated groundwater. The level of Metropolitan's participation is based on the project water supply yield and the project's per unit cost, with a maximum financial incentive of $250 per acre-foot of firm yield.

Conservation Credits Program

Metropolitan is a signatory to the *Urban Water Conservation Best Management Practices (BMPs) Memorandum of Understanding (MOU).* The Conservation Credits Program, established in 1988, provides financial and technical assistance to member agencies for implementing the 16 water conservation measures, or BMPs, that are listed in the MOU, as well as other programs (see Chapter III for a full description of the program). Metropolitan pays the lesser of one-half the program cost or the equivalent of $154 per acre-foot of water saved. A variation of this policy provides funding for ULF toilet replacement programs at a flat rate of $60 per toilet.

Seasonal Storage Service

Under the Seasonal Storage Service, Metropolitan can deliver water at a discount to be used for direct (spreading or injection) or in-lieu groundwater replenishment, or direct or in-lieu reservoir storage (see Chapter V for a full description of the program). The stored water is used during a peak demand period or in times of supply shortage.

TABLE VI-4

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
PROJECTED REVENUES AND WATER RATES

Revenues ($1,000's)	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04
Taxes	80,695	81,000	82,000	85,000	87,000	90,000	94,000	94,000	94,000	94,000
Interest	33,743	33,000	34,000	35,000	36,000	37,000	38,000	39,000	40,000	41,000
Power & Misc	13,215	12,010	14,311	13,456	13,751	14,053	14,503	14,812	14,936	15,263
Readiness to Serve										
Standby Charge	49,002	41,984	41,984	41,984	41,984	41,984	41,984	41,984	41,984	41,984
Readiness to Serve Charge	–	14,016	40,460	70,795	101,355	120,492	135,605	161,382	164,294	167,093
Connection Maintenance Charge	–	5,521	5,521	5,521	5,521	5,521	5,521	5,521	5,521	5,521
Treated Peaking Charge	–	–	–	–	–	–	–	–	–	–
New Demand Charge	–	–	227	506	1,817	2,996	6,104	8,567	12,897	19,438
Water Sales	526,509	521,978	568,016	626,509	670,298	718,313	758,708	782,268	800,573	819,148
Treatment Surcharge*	81,161	88,968	98,685	110,492	120,901	131,856	145,844	162,001	178,421	187,612
Use of Rate Stabilization Fund	(47,776)	44,593	67,715	18,560	18,885	12,539	7,183	177	(31,226)	(46,287)
Total Revenues	736,549	843,070	952,919	1,007,823	1,097,512	1,174,754	1,247,452	1,309,711	1,321,400	1,344,773
Total Water Sales (TAF)	1,628	1,656	1,785	1,920	2,008	2,085	2,153	2,205	2,251	2,295
Projected Commodity Rates ($/AF)										
Basic Treated	412	426	438	450	463	480	495	505	515	518
Percent Increase	7.0%	3.4%	2.8%	2.7%	2.9%	3.7%	3.1%	2.0%	2.0%	0.6%
Basic Untreated	335	344	351	358	366	378	385	385	385	385
Percent Increase	5.3%	2.7%	2.0%	2.0%	2.2%	3.3%	1.9%	0.0%	0.0%	0.0%

* Minor differences due to rounding error.

Source: Metropolitan Water District. August 1995. Long-Range Financial Plan.

Retail Pricing in Metropolitan's Service Area

Metropolitan, as a wholesale agency, has no authority, nor does it have the ability, to establish retail water rates in its service area. The wholesale price of water purchased from Metropolitan represents only one of many factors that affect retail prices and structures of retail water rates. However, Metropolitan's pricing policy is designed to encourage member agencies and their subagencies to set their retail prices and rate structures so that households and businesses in Southern California use water efficiently. The following sections describe the ranges and average levels of retail prices found in Metropolitan's service area.

Retail Price Levels

Metropolitan staff conducted a survey of 1992-93 retail prices of water services in Southern California. Table VI-5 summarizes retail price levels in a sample of 94 agencies in the six counties in Metropolitan's service area.

Generally, retail rates are adjusted every two years. The prices in Table VI-5 reflect changes made during the 1992 and 1993 period. The current (i.e., 1995) prices may be 10 to 20 percent higher, because retail agencies were increasing their rates by approximately 5 percent each year after the 1987-92 drought.

In the sample of 94 retail agencies, the weighted average cost of water to a household using 15,000 gallons per month was $29.25 per month, or $1.95 per 1,000 gallons. This is equivalent to $635 per acre-foot. Water is most expensive in Los Angeles County where the average cost is $2.18 per 1,000 gallons, or $710 per acre-foot.

Water Rate Structures

Almost all retail agencies charge a fixed amount for water service plus a commodity charge depending on the quantity of water used. The weighted average fixed charge in the sample of agencies surveyed was $5.00 per month for a 5/8- or 3/4-inch connection. The commodity rates (or marginal charges) at the average level of use of 15,000 gallons per month ranged from $0.49 to $2.81 per 1,000 gallons. The weighted average marginal price at this level of use was $1.74 per 1,000 gallons.

More than one-half of the surveyed agencies (49 out of 94) use uniform rate structures whereby all units of water are sold at the same price. The remaining 45 agencies use increasing block rate structures under which the marginal price paid for water increases with usage. Some agencies use as many as eight blocks, with large price increments between blocks. Many agencies also used emergency rate structures during the critical years of the recent drought that charged very high prices for water use beyond average levels of usage.

Impacts of Retail Prices on Water Use

Metropolitan has undertaken several research studies to determine the impact of retail prices on water conservation. The preliminary results indicate that during the 1980-92 period, residential (single-family) consumers in Southern California decreased their average water use by 0.185 percent for each 1.0 percent increase in marginal price of water (taking into account inflation). An average reduction of 0.157 percent per 1.0 percent increase in price was found in all other types of residential housing. Businesses showed the lowest response of 0.106 percent reduction for 1.0 percent increase in price.

TABLE VI-5

1992-1993 RETAIL WATER PRICES IN SOUTHERN CALIFORNIA[1]

County	Number of Sampled Agencies[2]	Average Cost at 15,000 Gal/Month $/1,000 Gallons $/AF	Range of Marginal Prices $/1,000 Gallons $/AF	Average Marginal Charge $/1,000 Gallons $/AF
Los Angeles	19	2.18 710	0.49-2.81 160-916	2.09 681
Orange	37	1.59 518	0.88-2.41 287-785	1.18 385
Riverside	5	1.32 430	0.68-1.32 222-431	0.92 300
San Bernardino	3	1.33 433	0.96-1.10 314-357	1.06 345
San Diego	22	2.10 684	1.39-2.59 453-845	1.86 606
Ventura	8	2.06 671	1.10-1.85 357-601	1.76 573
Total area	**94**	**1.95** **635**	**0.49-2.81** **160-916**	**1.74** **567**

[1] Average values are weighted by the population served of the sampled agencies.

[2] The 94 agencies surveyed serve approximately 10 million people (or 65 percent of the population in Metropolitan's service area).

VII. SHORT-TERM DROUGHT MANAGEMENT

NEED FOR MANAGEMENT RESPONSE

The effective management of water supply deficits is an important responsibility of Metropolitan. Possible deficits in Metropolitan's supplies may be caused by droughts, failures of major water transmission facilities during earthquakes, an acute contamination of supplies due to chemical spills, or other adverse conditions. The need for an effective management program to mitigate water supply shortages arises from Metropolitan's experiences during the drought of 1976-77 and the recent six-year drought of 1987-92. The current approach to managing water shortages has evolved from these drought experiences. The following sections describe Metropolitan's drought response measures during these two events and the currently adopted 1995 *Drought Management Plan.*

RESPONSE TO 1976-1977 DROUGHT

Major actions of Metropolitan during the 1976-77 drought in California included changes in the operation of imported and local sources of supply and reduction of urban water demand in Southern California through voluntary conservation and economic incentives.

Metropolitan's modified operation of supply sources involved a significant increase in the pumping rates of water from the Colorado River. All 45 pumps on the Colorado River Aqueduct were put into a 24-hour-a-day, seven-day-a-week operation. The increased use of Colorado River water allowed Metropolitan to release SWP water for use in the northern and central portions of the state. On February 11, 1977, DWR and Metropolitan reached an exchange agreement that released 320,000 acre-feet of Metropolitan's entitlement for use in the northern and central portions of the state, where there were no alternate sources of supply. This agreement also stipulated that 80,000 acre-feet of SWP in San Luis Reservoir near Los Banos be reserved for possible use by the city of Los Angeles. In addition, the operation of local sources of supply was changed to maintain sufficient carry-over storage and groundwater reserves in case the drought continued throughout 1978 and 1979.

On the demand side, Metropolitan and member agencies undertook a combination of methods to reduce total regional water use. On February 17, 1977, Metropolitan's Board of Directors passed a resolution requesting that all citizens cut back their water use by 10 percent on a voluntary basis. Measures included in the resolution were:

- Member agencies would prepare a drought emergency study.
- Member agencies that delivered agricultural water would initiate an agricultural water conservation program.
- Member agencies would study the feasibility of alternate rate structures and surcharges that would provide economic incentives for the conservation of water.

- Metropolitan would draft a model ordinance prohibiting wasteful uses of water.
- Member agencies would prepare a list identifying nonessential or wasteful water uses.
- Metropolitan working with member agencies, public interest groups, and trade associations would assume publicity for, and wide distribution of, devices and practices for home and business water conservation.

An appeal to all citizens for a voluntary 10 percent cutback was reinforced by two multimedia public information campaigns and a distribution of 100,000 water conservation kits to member agencies. Metropolitan's wholesale water rates were adjusted to include a 100 percent surcharge for all deliveries in excess of 90 percent of the deliveries in the corresponding month of the previous year. Also, a $20 credit was given for each acre-foot of water savings below 90 percent of 1976 deliveries.

These and other actions resulted in significant reductions in water use. The amount of water savings resulting from conservation varied by agency from a low of 6 percent to a high of 30 percent. The overall average was between 12 and 15 percent.

Response to the 1987-1992 Drought

Major actions of Metropolitan during the 1987-92 drought in California included changes in the operation of imported and local sources of supply and the reduction of urban water demand in Southern California through voluntary conservation, economic incentives, economic disincentives, and mandatory cutbacks in water deliveries.

1988 Drought Action Plan

In April 1988, Metropolitan's management, anticipating a possible second consecutive year of drought, prepared the *1988 Drought Action Plan.* The implementation of the Plan helped reduce regional demands by 190,000 AF. Many of the supply-and-demand management efforts of the *1988 Drought Action Plan* continued into 1989. The specific actions included in the *1988 Drought Action* Plan are described below.

To manage limited water supplies, Metropolitan optimized operations of the major water supply projects to make the best use of available water. The first action was to change Metropolitan's State Water Project order to minimize summer deliveries and to maximize the use of water from the Colorado River by rescheduling and delaying to the extent possible the rehabilitation of the Colorado River Aqueduct. To coordinate local storage for best yields of surface reservoirs and groundwater basins, Metropolitan began to build storage reserves in regional reservoirs and local groundwater basins to help withstand the continuing drought. Whenever possible, other groundwater replenishment and in-lieu storage programs were practiced to store excess water that would otherwise have been released into the ocean. At the same time, Metropolitan gave agricultural users the required one-year notice of possible interruption.

The demand-side measures of the 1988 *Plan* included the *Ten-Plus-Ten* demand reduction program, and the public information and education program. The

goal of the voluntary conservation program was to achieve a 10 percent reduction in demands on Metropolitan in addition to the estimated 10 percent reduction already achieved by ongoing *every-year* conservation activities in Metropolitan's service area. Specific measures of the *Ten-Plus-Ten* program, implemented by Metropolitan and retail water agencies, included distribution of conservation retrofit kits, leak detection assistance, a telephone hotline, conservation seminars, odd-even day watering, and restricted watering hours. The public information and education program was focused on timely and continuing information and provided updates to the public and its elected officials. The main elements of the information program included conservation conferences and newsletters, major media advertising, weathercasts, restaurant table tent cards, school and public education, speakers bureau presentations, and drought resistance plant tags. In addition, a variety of new printed materials were prepared and distributed, including a brochure on the need to conserve, conservation tips, a conservation calendar, and conservation stickers for use in public restrooms and hotels/motels.

1990-1992 Drought Action Plan

In order to respond to the potential supply shortfalls in 1990 and 1991, Metropolitan's Board of Directors adopted the *1990 Drought Action Plan*. In February 1992, Metropolitan's board adopted a *Drought Contingency Plan* to amend Metropolitan's 1990 *Regional Urban Water Management Plan*. The 1992 document was prepared in response to Assembly Bill 11x, which was chaptered on October 14, 1991, amending the Urban Water Management Planning Act to include drought contingency planning. The 1992 Drought Contingency Plan reaffirmed the response measures that comprised the *1990 Drought Action Plan*.

Many response measures of this *Drought Plan* continued until the end of the drought in 1992. In addition to maximizing available water supplies, the *Plan's* drought response measures included voluntary demand reduction programs, participation in the State Drought Emergency Water Bank, and mandatory interruptions of Metropolitan's water deliveries. The following sections summarize some of the major components of this drought response.

Demand Reduction Activities

The voluntary component of the *1990 Drought Action Plan* included the following activities:

- *Reduction goal.* Metropolitan set and publicized a goal to achieve at least a 10 percent reduction in total demands from 1989 levels, adjusted for population increases.
- *Drought rebate program.* Metropolitan offered a $100/AF rebate for a June 1 through September 30 period to any member agency that reduced total water demand within its service area during that period to less than 95 percent of that used during the same period in 1989, adjusted for population increases.
- *Water conservation packages.* Metropolitan purchased one million water conservation packages for distribution to retail purveyors' customers through Metropolitan's member agencies. The packages included shower flow restrictors, dye tablets to check for toilet leaks, a package of drought-resistant plant seeds, a package of soil polymers

to hold water in the root zone of plants, and water conservation information materials.

- *Weathercaster slides.* Metropolitan provided computer-generated slides for use by weathercasters at local television stations.
- *Restaurant tent cards.* These cards were placed on tables of restaurants to explain why water was served only on request.
- *Plant tags.* "Drought Resistant" plant tags were distributed through the Nurserymen's Association.
- *Newspaper slicks.* Camera-ready articles and artwork on the drought were provided for use in local newspapers.
- *Task force on implementation.* A Metropolitan staff task force was created to assist local water purveyors in developing and adopting water conservation ordinances.

State Drought Emergency Water Bank

In 1991, the fifth year of the drought, Metropolitan and 11 other urban and agricultural water districts joined the State Drought Emergency Water Bank, and Metropolitan purchased 215,000 AF of water to partially replace the severe cutbacks in SWP deliveries. Water for the bank was obtained by fallowing or idling farmland, using groundwater instead of surface water, and transferring surplus surface water from local reservoirs to the bank. During 1992, Metropolitan purchased 10,000 AF from the state bank.

Incremental Interruption and Conservation Plan

In November 1990, the Incremental Interruption and Conservation Plan (IICP) was adopted by Metropolitan's Board of Directors. The IICP allowed Metropolitan to respond to the continuation of the drought. By the fall of 1990, the water supply situation for 1991 worsened. Carry-over storage in the Oroville and San Luis reservoirs on September 30, 1990, was projected to be only 1.2 million acre-feet, 1.2 million acre-feet lower than the previous year and only 200,000 acre-feet greater than minimum operating storage for these reservoirs. There was also the possibility of lower-than-expected deliveries from the Colorado River Aqueduct.

The philosophy of the IICP was to use water held in reserve in concert with conservation to meet needs during a drought. The program was implemented in stages. Each stage progressively reduced the target quantities for each public agency while always holding as much water in reserve as possible for the eventuality of an even longer drought. The IICP assigned each member public agency a monthly conservation target of water from Metropolitan. At the inception of the IICP, the target quantity was calculated for each member public agency based on a percent of the total amount of water taken from Metropolitan during the same month in the base year of 1989-90. Target quantities of agencies who received nonfirm water (Interruptible Service and Seasonal Storage Service) in the base year were further reduced in proportion to the amount of nonfirm water they received. Table VII-1 specifies the percents by which firm and nonfirm services were reduced in determining monthly target quantities for the member agencies.

Stage I of the IICP was the continuation of a voluntary program to encourage consumer conservation implemented since 1988. In Stages II through V, agencies

received a disincentive charge on the amount of Metropolitan water used over their target. Agencies using less than the target quantity received an incentive payment based on the extent their water use fell below their target quantity. While disincentives of the IICP proved to be effective in reducing Metropolitan's demand, the incentive payments had unfavorable effects on regional water management by encouraging agencies to overpump local groundwater reserves and were discontinued after September 1, 1991. Adjustments were made to the target quantities to reflect growth and development, changes in local water supplies, and for conservation and reclamation programs. Stage VI was added to the IICP in March 1991 when it appeared that Stage V of the IICP may be inadequate to address the severe supply shortfalls that could occur.

Table VII-2 gives the chronology of the various stages of the Incremental Interruption and Conservation Plan in the 1990-92 period. Metropolitan was in targeted reduction stages for fourteen months of the 1987-92 drought. With increased allocation of SWP supplies in March 1992, Metropolitan moved to Stage I of the IICP effective April 1, 1992. Metropolitan continued to be in Stage I of the IICP through November 8, 1994. At that time, the *1995 Drought Management Plan* was adopted by Metropolitan's Board of Directors. It included revisions to the IICP and the deletion of the voluntary Stage I.

1995 Drought Management Plan

Since 1994 was the fourth driest year on record and state reservoir levels were still below normal in late fall 1994, it was anticipated that Metropolitan might receive only a 30 to 35 percent allocation of SWP water for 1995. In response to these conditions, the *1995 Drought Management Plan* (1995 DMP) was designed. The 1995 DMP sought to improve the drought response measures of the previous plans. The DMP was

TABLE VII-1

INCREMENTAL INTERRUPTION AND CONSERVATION PLAN 1990

Stage	Reduction Target in Nonfirm Deliveries (Percent)	Reduction from Base Year Conservation Target of Firm Deliveries (Percent)	Expected Savings (AFY)	Overall Reduction (Percent)
I	Voluntary	Goal 10	100,000	—
II	20	5	260,000	10
III	30	10	430,000	17
IV	40	15	600,000	24
V	50	20	770,000	31
VI	60	30	1,230,000	50

TABLE VII-2

IMPLEMENTATION OF IICP IN 1990-1992 PERIOD

Stage	Implementation Date	Percent Firm/Nonfirm Reduction
I	12/01/90	Voluntary
III	02/01/91	10/30
V	03/01/91	20/50
III	03/01/92	10/30
I	04/01/92	Voluntary
None	11/08/94	N/A

designed as a set of operating procedures for implementation during a supply shortage in calendar year 1995. One primary objective of the 1995 DMP was to minimize impacts on retail water customers. There are several important principles embedded within the 1995 DMP. These principles are as follows:

- Avoid mandatory stages of the Incremental Interruption and Conservation Plan to the extent practicable.
- Use Metropolitan's water management programs in a coordinated and efficient manner.
- Operate Metropolitan's system in a manner that captures and stores excess Metropolitan water in groundwater and surface reservoirs.
- Encourage regional storage during periods of excess water supply and use of storage during periods of drought.
- Use equitable means to conserve and use alternative supplies.
- Adopt measures that will have a balance of minimum cost and minimum inconvenience to consumers.
- Avoid to the extent practicable financial hardship on Metropolitan and its member agencies.
- Utilize cost-efficient water transfer programs.
- Use public information to encourage efficient water use and to educate the public on water supply and reliability issues.
- Recognize the need for minimizing the impacts of water shortages on the region's economy.
- Reward conservation efforts through the water allocation methodology and penalize inefficient water practices.

In addition to these general principles, special consideration was given to determining the basis on which the quantities of available water should be allocated among member agencies. The following guiding principles were established with a purpose of achieving an equitable allocation of reduced water deliveries:

- The base allocations (base year) should be an equitable allocation of available supplies reflecting payments for reliable deliveries.
- The base allocations should be adjusted to distribute regional benefits in proportion to the regional dollars spent in the development of local resources such as reclamation.
- The base allocations should reward the agencies that have implemented conservation through Best Management Practices and/or penalize those that have not

through reduced drought allocations or financial penalties.

- Adjustments to the base allocations accounting for growth would be considered if it can be demonstrated that such growth has significantly altered an agency's water demands.
- The agricultural allocation will be based on a rolling average of historic, certified, agricultural usage, up to a maximum of 155,034 acre-feet. The allocation would be adjusted upward to reflect any rationing that occurs during the base period.

The 1995 DMP will not be implemented in 1995 because of the above-normal statewide precipitation in January and February and because Metropolitan received a 100 percent allocation of its SWP supply requests in February 1995. However, the principles of the 1995 DMP will be retained and refined for future adoptions of DMPs. In addition, the action plan in the 1995 DMP will become a model for future plans.

The 1995 DMP Phases

The 1995 DMP includes a step-by-step strategy for evaluating supply and demand conditions and utilizing Metropolitan's available options. Several phases are incorporated into the DMP with the final phase being the implementation of mandatory stages of the Incremental Interruption and Conservation Plan. The following sections discuss the various supply options and delivery cutbacks available to Metropolitan as a result of ongoing water management programs.

Supply Management Options

Metropolitan can temporarily increase the amount of available water by mobilizing one or more of its water storage, purchase, and transfer options. The specific water supply options include:

- *Cyclic Storage Program.* Metropolitan delivers water to a member agency for storage in a groundwater basin. This water is owned by Metropolitan until such time as the water is sold to the member agency. Requests for purchases normally occur when the seasonal storage discount is available.
- *Cooperative Storage Program.* Metropolitan delivers water to a member agency for storage in a groundwater basin or surface reservoir. This water is sold by Metropolitan when it is placed into storage. Metropolitan governs the water until such time as the water is released to the member agency through payment of the applicable rate. Metropolitan may release up to half of the water in place of Seasonal Storage Service delivery requests. The Cyclic Storage Program and Cooperative Storage Program had 130,000 AF available in storage as of December 31, 1994.
- *Carry-over.* Metropolitan may, under certain circumstances, carry over in San Luis Reservoir its allocated but unused SWP water from one calendar year to the next. This water may be stored when storage space not needed for SWP operations is available, and currently may not be stored past March 31.
- *Drought Storage Program.* In 1991, Metropolitan delivered water to the city of Los Angeles for storage. The water can be returned indirectly; Metropolitan can request that the city use water from storage in substitution of deliveries from

Metropolitan, directly through the Los Angeles-Metropolitan Intertie at Magazine Canyon, or via differential metering from flow rates taken from appropriate meters along the Los Angeles Aqueduct and/or Metropolitan's distribution system. Terms for the city of Los Angeles' account expire October 1, 1995. As of December 31, 1994, 10,235 AF are available in storage.

- *Chino Basin Short-Term Conjunctive Use.* Metropolitan delivers water to local entities in Chino Basin. Metropolitan can then pump that water at no more than 1,000 AF per month by October 1, 1995. As of December 31, 1994, there was an account balance of about 4,800 AF.
- *Desert Water Agency/Coachella Valley Deliveries.* Metropolitan stores Colorado River water in the Coachella Valley Groundwater Basin in advance of the exchange of the DWA's and CVWD's deliveries from the SWP. As of July 1995, there was an account balance of 370,991 AF.
- *1993 Demonstration Storage Program.* Metropolitan delivered discounted water below seasonal rates to Calleguas Municipal Water District. In exchange, Calleguas will return one-quarter of the stored water over a three-month summer period, not to exceed two periods in one year. As of December 31, 1994, there was an account balance of about 11,900 AF available for Metropolitan's use.
- *San Gabriel Exchange.* In 1992, Metropolitan delivered 4,100 AF of SWP water to the San Gabriel Valley Municipal Water District. As of December 31, 1994, that amount of water was available in account for Metropolitan's use.
- *Semitropic Storage.* Through agreements with the Semitropic Water Storage District, Semitropic can provide facilities and services necessary for Metropolitan to store SWP and other water supplies in the underlying groundwater basin. At Metropolitan's request, Semitropic will recover the stored water, thus providing Metropolitan with supplemental dry-year supplies as needed. The cost of Semitropic storing and retrieving this water for Metropolitan will be about $175/AF.
- *Water Transfer Options.* Metropolitan may enter into agreements with water users outside its service area to purchase dry-year supplies.
- *Supplemental State Water Project Purchases.* Metropolitan entered into a one-year agreement with the Department of Water Resources and other SWP contractors to supplement SWP supplies for 1994 by purchasing water from willing sellers. Under this program, Metropolitan purchased 100 AF at $50/AF in 1994 to test the feasibility of the program as a source of supplemental supply. One five-year agreement is currently being negotiated to provide supplemental water purchases.
- *1995 California Drought Water Bank.* Metropolitan can purchase options for water through the State Drought Water Bank. The state Department of Water Resources has agreed to act as a broker for Metropolitan and other interested buyers in purchasing options or making direct water purchases from willing sellers in the Central Valley.

Separate Board approval would be required before these options are exercised. Bank water would be delivered to Metropolitan through SWP facilities.

Delivery Cutback Options

Once all short-term supply management options have been activated, Metropolitan may still meet water deficits by cutting back on such uses as groundwater replenishment and some agriculture. These options include:

- Cut replenishment deliveries. Metropolitan may cut direct replenishment deliveries.
- Cut in-lieu Seasonal Storage Service deliveries. Metropolitan may cut in-lieu groundwater replenishment deliveries and reservoir storage deliveries.
- Interim agricultural cutbacks. Through the Interim Agricultural Water Program, Metropolitan may cut agricultural deliveries up to 30 percent before cuts are made to noninterruptible water.

Through these various supply management and delivery cutback options, Metropolitan maintains maximum operational flexibility, thus allowing it to minimize impacts on the municipal and industrial water users of Southern California. Figure VII-1 illustrates the DMP action plan assuming a low initial SWP allocation in December 1994. Phases of the DMP that would be exercised prior to mandatory rationing would begin with a suspension of direct groundwater spreading, water sales to the Cooperative Storage Program, and in-lieu seasonal deliveries. The next option would be calling on water from various storage programs, followed by participating in water bank and transfer options. The last option before mandatory rationing would be reducing Interim Agricultural Water Program deliveries. It is estimated that in 1995 these options would have allowed Metropolitan to reduce water deliveries by 40,000 to 90,000 AFY, depending on actual demands. They could also activate up to 181,000 AFY of water in storage programs and transfer options.

In addition to the supply options and delivery cutbacks, Metropolitan would work with the member agencies in fashioning statements that appropriately characterize the balance between supply and demand. Drought stages and associated activities, such as *Drought Watch, Drought Concern, Drought Shortage,* and *Critical Drought Shortage,* would be created to characterize for the public the actual conditions at any point in time and to encourage suitable levels of voluntary conservation.

The Modified 1995 Incremental Interruption and Conservation Plan

Implementation of the IICP would be the final step taken by Metropolitan during a water supply shortage. The 1990 IICP was modified so that it would have the least effect on municipal and industrial users. These modifications to the IICP would have been for 1995 only, since more attention is currently being spent on refining the IICP in the forthcoming *Water Supply and Drought Management Plan* .

Under the 1995 IICP, an agency's base allocation would be an average of deliveries in fiscal years 1989-90, 1990-91, and 1991-92 less long-term seasonal storage service, contractual deliveries, direct groundwater replenishment, and agricultural water. An agency's agricultural water

Figure VII-1

1995 DMP STEPS ASSUMING LOW INITIAL SWP ALLOCATION

	DMP STEPS
August 1994	Initiate Drought Bank Discussions
September	Evaluate Seasonal Storage Services (SSS)/Cooperative Storage Program (COOP) Deliveries
October	
November	
December ▲ **Initial SWP Allocation**	Assess SWP <30% Re-evaluate SSS/COOP Deliveries Public Education
January 1995	Suspend Spreading & COOP Deliveries
February	
March	Reassess SWP <30% Notice to Cut In-Lieu SSS Initiate the Call of Storage Program waters Participate in Water Transfer Options
April	Reassess SWP <30% Additional Call on Storage Programs Participate in Water Bank Call Semitropic Storage Notice to Cut Agricultural Deliveries
May ▲ **Final SWP Allocation**	Increase Public Education Evaluate the Need for Incremental Interruption and Conservation Plan (IICP)
June-August	
September	Evaluate SSS/COOP Deliveries
October	
November	Assess Financial Impacts

TABLE VII-3

1995 IICP
MANDATORY RATIONING STAGES

Stage	Reduction in Agricultural Deliveries	Plus Conservation of Firm Deliveries	Overall Reduction Percent
I	30%	5%	6%
II	30%	10%	11%
III	40%	15%	16%
IV	50%	20%	22%
V	75%	25%	28%
VI	90%	30%	33%

TABLE VII-4

1995 IICP DISINCENTIVE RATES

Stage	Disincentive as Percent of Noninterruptible Rate	$/AF Based on Rounded FY 1994-95 Rate
I	40%	134.00
II	50%	168.00
III	90%	302.00
IV	125%	419.00
V	165%	553.00
VI	200%	670.00

allocation would be based on either (1) the agriculture certifications submitted during the twelve months prior to an agricultural water reduction or (2) the average of agriculture certifications in fiscal years 1989-90, 1990-91, and 1991-92. The amount would be limited to the maximum agricultural water allowed to be certified under the Interim Agricultural Water Program. The base allocation of an agency may be adjusted for loss of local supply, growth, conservation for those implementing Best Management Practices, and reclamation. Any available Metropolitan water in excess of the target would be delivered at the General Manager's discretion.

As necessary, an Interagency Advisory Committee would be formed to recommend stages of the IICP and to help develop methodologies for adjustments. The Executive Committee would be authorized to change IICP stages on behalf of the Board to facilitate quicker responses to changing supply-and-demand conditions.

Table VII-3 presents mandatory rationing stages of the 1995 IICP. The level of mandatory rationing ranges from a low of a 30 percent reduction in agricultural deliveries and a 5 percent conservation of firm deliveries in Stage I, to a high of 90 percent reduction in agricultural deliveries and 30 percent conservation of firm deliveries in Stage VI. This would result in between a 6 and 33 percent overall reduction of Metropolitan deliveries. Voluntary conservation and the cutbacks in deliveries to those participating in the Interim Agricultural Water Program are considered in the phases of the DMP prior to mandatory rationing.

The 1995 IICP contains a tiered disincentive rate schedule that would be charged on each acre-foot purchased above an agency's target allocation. The disincentive rates are listed in Table VII-4. The 1995 IICP also contains provisions for interagency transfers if an agency wants to avoid a disincentive charge.

Further Development of the DMP

Before the existing 1995 DMP is adopted as a model plan for dealing with water shortages in any future year, a number of critical issues will be addressed. These issues include determining equitable allocation of cutbacks in water deliveries among member agencies, dealing with uncertainty in deciding on the level of carry-over storage, and clarifying other specific elements of the implementation process. The 1995 DMP addressed some of these issues through a process of adjustments to base year allocations. Adjustments can be made by the General Manager based on written requests by a member agency. The current DMP guideline includes the following four types of adjustments:

- *Loss of local water supply.* Adjustments to the base year sales of water will be made if (1) a well, reclamation plant, aqueduct, reservoir, or pipeline fails; (2) there is less local surface water because of drought; (3) court order, regulatory order, or negotiated agreement limits the use of local supplies; (4) a decreasing groundwater table that causes a loss of supply from a basin does not readily lend itself to replenishment of imported water and has historically relied solely on the infiltration on natural runoff.
- *Conservation.* Adjustments will be allowed if an agency is implementing Best Management Practices and thus uses less water because of significant conservation effort that occurred in the base year consisting of (1) a mandatory water conservation program, (2) a major water management program with demonstrated results, (3) participation in the Drought Action Plan 1990 during the month of June 1990 when a 5 percent voluntary reduction in demands was rewarded, and (4) implementation of municipal and industrial plumbing retrofits that resulted in verifiable monthly conservation.
- *Growth and development.* The base year sales will be adjusted based on efficient water practices: (1) the number and size of new service connections, (2) a demonstrated change in the mix of service connections toward larger-size connections, (3) the establishment or expansion of a major industrial water user after the base year, and (4) official population estimates.
- Reclamation water projects. An increase in the base quantity of water can be made if an agency operated a reclamation plant with a project cost that is greater than the cost of Metropolitan water and clearly replaced a potential use of Metropolitan water. The increase would be equal to the overall reduction percent in the applicable stage of IICP, not to exceed 33 percent.

Although these provisions permit member agencies to seek an equitable allocation of reduced supplies, they do not address all potentially difficult problems. A brief description of such difficult-to-resolve issues is given below.

Demand Hardening

The two main principles of the DMP are to reward long-term demand reduction (conservation) efforts through a water allocation methodology and to penalize inefficient water practices. The implementation of these principles

requires Metropolitan to recognize that the member agencies which eliminated inefficient uses of water by implementing aggressive water conservation programs will face difficulties in achieving additional reductions in water use during periods of water shortage. This diminished ability or unwillingness of urban water users to reduce demand during a supply shortage is often referred to as demand hardening (Flory and Panella, 1994).

Although demand hardening is usually associated with the implementation of long-term demand management measures, the ability of consumers to reduce demands during a period of water shortage may also be related to the presence or absence of significant discretionary uses of water (e.g., landscape irrigation) in the member agency service area. In other words, if during normal conditions of supply, a large proportion of total water use is dedicated to irrigation of landscapes, this water use can be temporarily restricted or eliminated without causing major hardships to consumers, thus allowing the member agency to satisfy the remaining demands despite limited supplies. Demand hardening is a major concern to water supply planners because it reduces the flexibility in dealing with potential water shortages.

Baseline for Allocation of Reduced Water Deliveries

To recognize the effects of demand hardening, the allocations of reduced supplies should reward the agencies that have implemented conservation through Best Management Practices while penalizing those who have not with reduced allocations or financial penalties. In addition to demand hardening, other equity considerations must be dealt with in arriving at base allocations of reductions in water deliveries during drought. These allocations must reflect payments by member agencies for reliable deliveries, including investments in the development of local resources, such as reclamation.

The 1995 DMP established tentative base allocations for the IICP based on the average total sales for fiscal years 1989-90, 1990-91, and 1991-92 less the average direct groundwater replenishment, the average long-term seasonal storage service, the average one-time drought storage, and agricultural water that was certified previous to a cutback. Those allocations were subject to change pending the seasonal service audit and the actual agricultural water certified. The percent cutback provides for some recognition of prior conservation where lower average sales would be cut less in terms of the volume of reductions, but it does not explicitly recognize all long-term conservation efforts prior to the base years on which the allocation is based. To address these prior efforts, the final allocations should include allowances for long-term water conservation. Ideally, the allocations could be established by recognizing the level of efficiency in water use achieved by a member agency.

Risk Management with Carry-over Storage

The absolute quantities of water made available to member agencies are determined by state and federal agencies that manage imported water supplies and also by Metropolitan's decision on how much water under its control should be left in reserve for the subsequent year. This amount of water, referred to as carry-over storage, can be increased by reducing allocations of available water during a current year. Some guidelines for dealing with uncertainty related to carry-over storage and for arriving at

acceptable solutions to other issues will be incorporated into the long-term Resource Management Plan.

Water Supply and Drought Management Plan

The 1995 DMP is a short-term plan designed only to provide for the 1995 calendar year. As such, it does not provide specific detail regarding the above-mentioned important issues of equity and other concerns. These concerns will be included in the forthcoming *Water Supply and Drought Management Plan* (WSDM Plan). The WSDM Plan will be a long-term plan that not only will address shortage situations but also will provide guidelines for operating during years with normal and surplus supplies. The WSDM Plan will be divided into two interrelated sections–the Shortage Mitigation Section and the Surplus Operations Section. Both sections will address three operational periods: pre-Domenigoni Valley Reservoir, fill period for Domenigoni Valley Reservoir, and postfill of Domenigoni Valley Reservoir.

Three critical elements that will be addressed in the Shortage Mitigation Section are:

(1) Resource use strategies and priorities;

(2) A methodology for determining equitable allocation of cutbacks;

(3) A methodology for determining allowable adjustments to the allocations so that regional benefits are allocated by regional dollars spent.

The Surplus Operations Section will incorporate a matrix of different storage facilities and accounts, as well as a strategy for priority setting that considers a variety of factors such as:

(1) Ease in storing and withdrawing water in a facility or account;

(2) Water quality concerns;

(3) Target levels of facility of account storage;

(4) Priorities and costs of storing, withdrawing, and transferring water among accounts.

Different operating scenarios during surplus conditions will also be developed and analyzed. The WDSM Plan is expected to be completed in November 1995.

VIII. INTEGRATED RESOURCES PLAN

INTRODUCTION

Southern California's water community is facing increasing challenges as stewards of the region's water resources. The region faces a growing gap between its water requirements and its firm water supplies. Increased environmental regulations and the attendant competition for water from outside the region have resulted in reduced supplies of imported water. At the same time, demand is rising within the region because of continued population and economic growth. Shortages during 1991 highlighted the seriousness of the problem.

As described in the previous chapters, the water used in Southern California comes from a number of sources. About one-third of the water supplies are found locally. The rest of the region's water is imported from three sources: the Colorado River, the Sacramento-San Joaquin River Delta (via the State Water Project), and the Owens Valley and Mono Basin (through the Los Angeles Aqueducts). The ability of Southern California to secure the same amounts of imported water in the future, much less a greater amount, is in question.

Metropolitan's water service area population is forecast to increase from the current 15.7 million to about 19.5 million by 2010, and to 21.5 million by the year 2020. At present, about 200 gallons of water are consumed daily for municipal and industrial uses for every person living in Southern California. Since the 1970s, the total regional water demand in Metropolitan's 5,153 square-mile service area has increased from about 3.0 MAFY to about 3.2 MAFY in 1994. Based on normal weather conditions and full implementation of Best Management Practices, it is expected that total regional demands will increase to about 4.5 MAFY by 2010 and about 5.0 MAFY by 2020. During very hot and dry years, demands could be as high as 4.9 MAFY in 2010 and 5.6 MAFY in 2020.

The delivery of water to Southern California water consumers has been nearly 100 percent reliable in the past. However, as existing firm water supplies continue to decrease, future reliability is uncertain. Even with a 15 percent reduction in demand due to the full implementation of BMPs, the reliability of water deliveries during a drought could fall to 50 percent by the year 2000 without any additional water supply investments or improvements. This would mean that there would be some type of shortage, on average, every other year, and there could be rationing in many of these years.

The water managers of Southern California have recognized these challenges and have joined together to develop a plan for the future. Initiated in June 1993, Metropolitan, its member agencies, subagencies, and other local and regional water providers have been involved in an Integrated Resource Planning (IRP) process that has led to the development of a coordinated and affordable approach to meeting the regions present and future needs for dependable supplies of high-quality water. The overall objective of the IRP is the selection and implementation

of a Preferred Resource Mix (or strategy), consisting of complementary investments in local water resources, imported supplies, and demand-side management that meet the region's desired reliability goal in a cost-effective and environmentally sound manner. The IRP addresses the currently predicted periodic shortages in a cost-effective manner, providing Southern California with an essential building block in the foundation of a strong economy and a healthy quality of life.

Through implementation of the IRP, the region's water supply reliability would increase over time as local and imported water supply investments are made. Based on possible hydrologic and weather conditions, it is expected that water shortages similar to those experienced in 1991 would occur less than once every 50 years. The cost for implementing this diverse resource strategy is estimated to increase the average water cost for the region by about 4 percent annually over the next 10 years (including inflation).

This chapter presents (1) the general framework for the development of an IRP and (2) Metropolitan's IRP process and preliminary results.

The Integrated Resources Planning Framework

The basic concept of an IRP is that it integrates various planning activities into one systematic planning process. It encompasses least-cost analyses of all feasible supply-side and demand-side options. More importantly, this approach relies on an open and participatory decision- making process that brings together the many institutions, policies, and plans that govern water resources. The IRP process also identifies and considers the external characteristics of resource options, and it incorporates consideration of the uncertainties inherent in each of the options.

Although an IRP process for different entities may vary in scope and emphasis depending on planning conditions, there are basic steps that form the building blocks of any IRP. The following steps generally constitute the planning activities of the IRP process:

(1) *Define planning objectives and associated evaluation criteria.* This critical step goes well beyond a broad statement of planning goals. It is the result of an introspective process to determine what is really important to the agency, followed by the development of measurable criteria against which to evaluate alternative resource futures.

(2) *Involve the appropriate constituencies.* Involving and informing political leaders, key stakeholders, and the public at large is a hallmark of IRP. The breadth and magnitude of such involvement vary widely depending on the needs of the local area and the perceived level of interest in the resource alternatives that are being considered.

(3) *Assess supply options.* Potential supply options are identified and then evaluated in a rigorous, multitiered fashion. The purpose of this component of the IRP process is to narrow the range of alternatives to be considered in developing integrated resource strategies and to clearly specify the important characteristics of each such option so that the alternative resource strategies can be evaluated.

(4) *Assess conservation options.* This step is the demand-side counterpart of step three. While specific tools may differ, the rigor and structure of the analysis must be similar to allow the different types of resources to be jointly considered and successfully integrated.

(5) *Formulate and evaluate resource strategies.* Resource options that emerge from the foregoing assessments are subjected to a multitiered evaluation against agreed-upon evaluation criteria until a small number of resource strategies emerge. These strategies should span the range of policy alternatives facing decisionmakers and explicitly illustrate the tradeoffs among the different evaluation criteria.

The basic premise of IRP is that a process is needed to integrate a wide range of traditional and innovative supply-side and demand-side options. While there may be a specific option that addresses one objective or constraint, there will not be a single option that fully addresses all multiple objectives. During the IRP process, the underlying assumptions behind each objective are analyzed collectively in an attempt to correctly weight or rank each one. The rankings for each objective are then applied to the various options and analyzed numerically.

The IRP process can be tailored to fit the particular context of the water agency and the region. Its strength as a planning tool is its flexibility, individuality, and adaptability. The IRP can provide guidance to the water agency and to the stakeholders as to the best option(s) for providing needed water supplies given the individual context of the agency and its region. Furthermore, involving the stakeholders in the determination of a solution helps ensure that the solution can and will be effectively implemented. The experience of the electric and gas utilities over the past decade has clearly demonstrated the effectiveness of IRP as a planning tool, as a consensus builder, and as a collaborative approach to solving different resource management issues.

METROPOLITAN'S INTEGRATED RESOURCES PLANNING PROCESS

In the broadest terms, Metropolitan's IRP process sought to answer some very critical questions related to future water supply planning and management:

(1) What level of water supply reliability does the region require?

(2) What is the most desirable means of achieving reliability given the range of potential water supply options?

(3) How large an investment in resource development can the region afford?

(4) What needs to happen in order to accomplish the desired outcome?

These questions are important because as the degree of supply reliability increases, the cost for resource system improvements also increases. Therefore, setting an appropriate level of supply reliability is a critical decision.

The primary objective of the IRP process is to identify a Preferred Resource Mix that would cost-effectively increase water supply reliability in the service area. Metropolitan's IRP is being developed in a two-phase process. Phase 1 (Figure VIII-1) was a data-gathering, analysis, and decision-making phase that includes defining resource management and business principles, projecting water

demands, defining possible resource options, and examining different mixes of these resource options. This process is designed to answer the four questions presented above. Metropolitan is not developing the IRP in a vacuum, in fact, the IRP planning process has been open and participatory, involving Metropolitan, member agencies, other water resource agencies, and the public (in the refinement and decision-making phases). Review of the methodology and results, as well as establishing the technical framework, included the active involvement of member agencies and groundwater agencies.

Phase 2 has focused on the development of the Preferred Resource Mix and the evaluation of coordinated local water management efforts, which will be used to guide the development and implementation of revised programs. It should be noted that the IRP process is ongoing and dynamic. Figure VIII-2 shows the products that will result from Phase 2 of the IRP. The following sections provide more detailed discussion of the activities and preliminary outcomes of the IRP process.

FIGURE VIII-1

DEVELOPMENT OF A REGIONAL RESOURCE STRATEGY

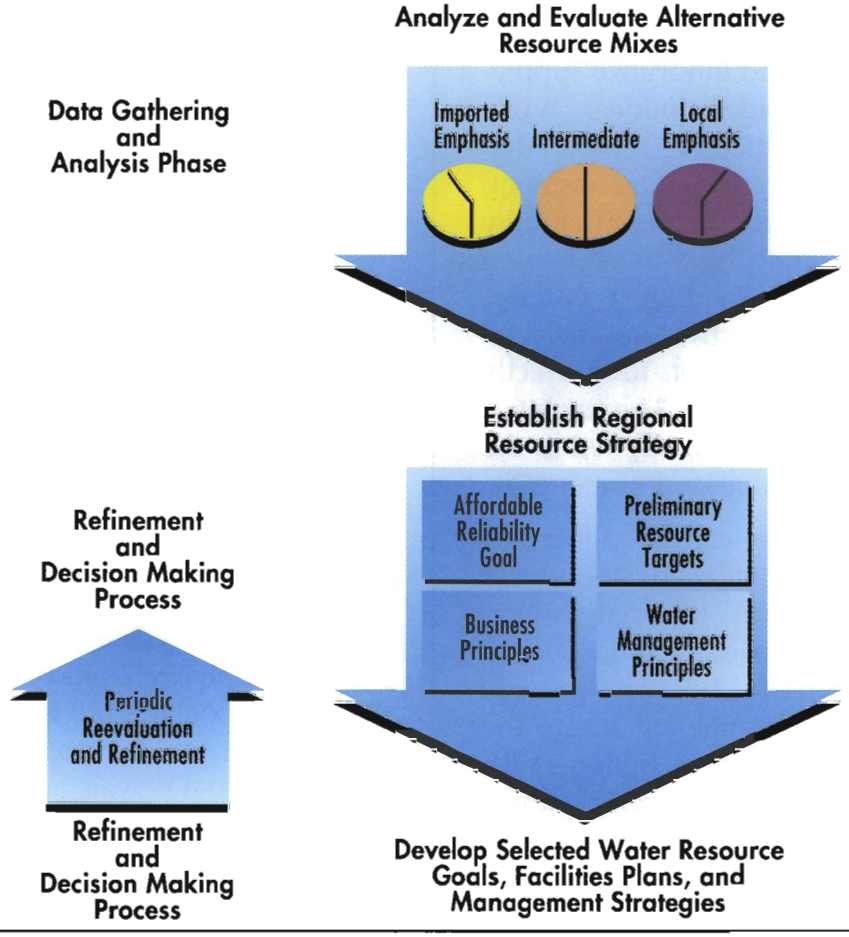
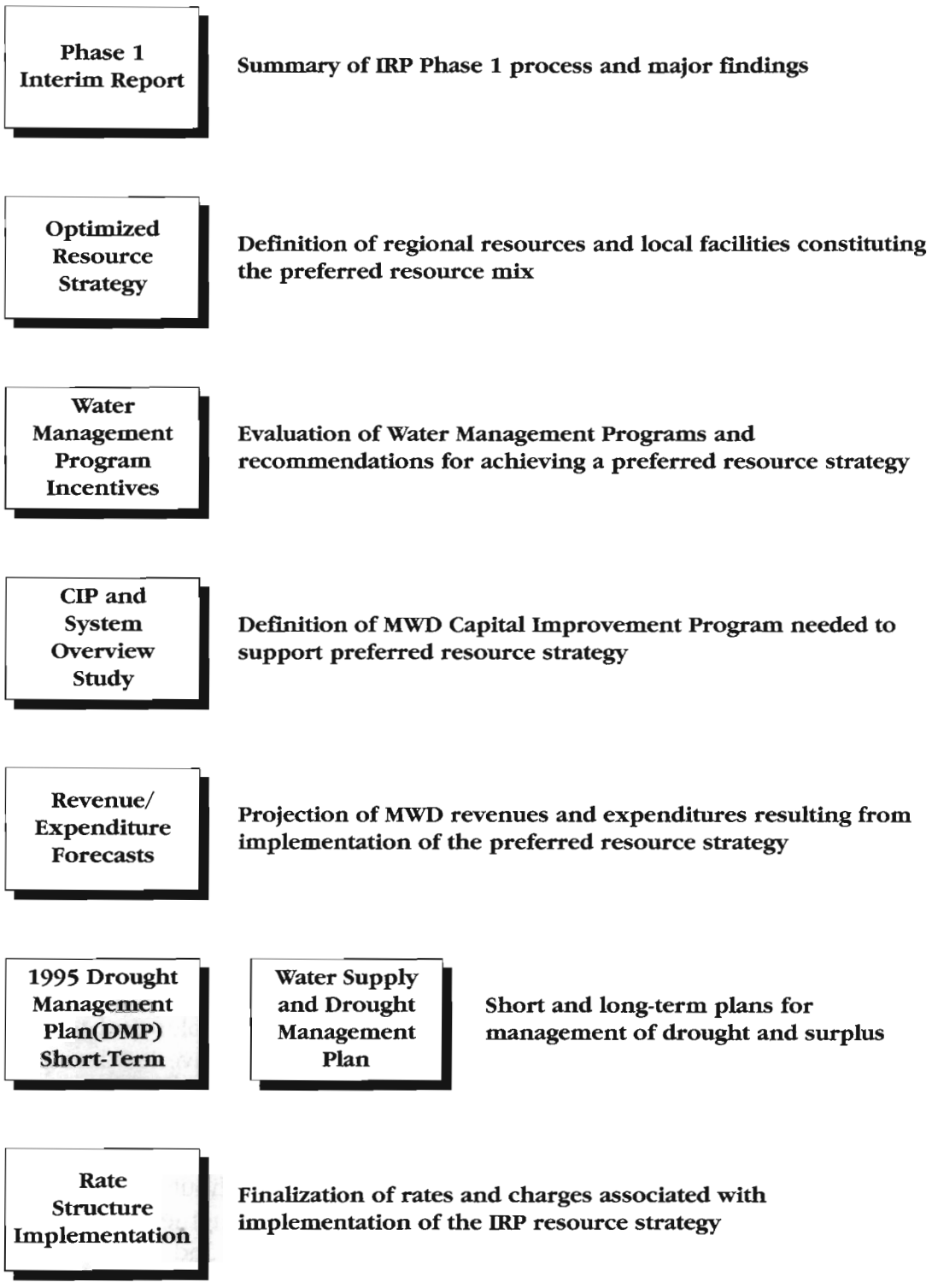


FIGURE VIII-2

IRP PHASE 2 PROCESS PRODUCTS



PHASE 1

During Phase 1 of the IRP, the objectives and criteria were developed for evaluating possible resource mixes (combinations of conservation measures, local supplies, and imported supplies). Metropolitan staff and the member agency managers met monthly to develop the evaluation criteria and policy guidance for the IRP. Groundwater basin managers also participated in the IRP process, which was crucial due to the desirability of additional local conjunctive use storage. During Phase 1, three broad resource mixes were developed and evaluated in terms of their supply reliability, costs, flexibility, water quality, and institutional/environmental impacts. They were:

(1) *Emphasis on imported supplies.* The majority of new water supply investments would be in imported supplies, namely the State Water Project and aggressive water transfers.

(2) *Emphasis on local supplies.* The majority of new water supply investments would be for the development of local supplies (including conservation BMPs), mostly in reclamation and groundwater recovery programs.

(3) *Intermediate strategy.* About one-half of the new water supply investments would be in local supplies, the other half would be in imported supplies.

Phase 1 of the IRP concluded with the June 1994 Strategic IRP Assembly, where more than 100 water officials from Metropolitan's Board of Directors, Metropolitan's top staff, and member agency managers gathered to formulate guidance to regional policymakers and direction for the IRP. Three IRP public forums and three IRP member agency-sponsored workshops were held prior to the IRP Assembly to solicit input from environmental, business, and community leaders concerning Southern California's water supply and resource management. The following points summarize the major resource strategy issues and conclusions from the public forums and the June 1994 IRP Assembly:

(1) Metropolitan's water supply reliability goal of *providing 100 percent of full service wholesale water demands 90 percent of the time and never providing less than 80 percent of full service wholesale demands* was affordable and appropriate.

(2) In meeting the reliability goal, the region should utilize all cost-effective local supplies, including reclamation, desalination of brackish groundwater, and groundwater conjunctive use storage programs.

(3) The region should fully implement the statewide water conservation Best Management Practices.

(4) Supplies from the Colorado River Aqueduct are very cost-effective and should be maximized, but steps should be taken to address water quality impacts on local water resource development.

(5) State Water Project deliveries should be maintained and enhanced to use SWP supplies more efficiently in times of surplus and to reduce the need for deliveries during droughts or periods when there could be significant impacts to fisheries in the Delta. Southern California water agencies should commit to creating and strengthening broad-based coalitions and actively support a

multispecies habitat conservation and protection program for the Delta.

(6) Southern California water agencies should commit to the establishment of a fully functional and efficient water market for the voluntary transfer of water between willing buyers and sellers. Water transfers play a key role in ensuring supply reliability in even the worst-case droughts. Water transfers should also be used as a cost-effective way to replenish local groundwater and surface storage.

(7) A sufficient blend of State Water Project and Colorado River water supply should be maintained in order to reduce overall salinity so that local groundwater conjunctive use and reclamation can be implemented.

(8) Metropolitan's associated Capital Improvement Program, including the construction of Domenigoni Valley Reservoir and Inland Feeder, is required and essential to the Preferred Resource Mix in providing much-needed emergency and drought storage while also enhancing the ability to store imported water in the local groundwater basins and surface reservoirs.

In addition, the IRP Assembly participants discussed four basic business principles that should guide Metropolitan and its member agencies in the implementation of the IRP and resulting water management programs. These guiding principles are:

(1) *Financial integrity.* Investments of Metropolitan, member agencies, and the other water providers that are consistent with the IRP process should be accompanied by a mutual commitment of reliable revenue sources that recover the fixed and nonvariable operational and capital costs of those investments.

(2) *Fairness.* Metropolitan should provide comparable access to reliable water service to each of its member agencies, recognizing that all member agencies have a beneficial interest in Metropolitan's system and investments.

(3) *Equity and value.* Metropolitan's fees and charges for the delivery of water service should be set in a manner that establishes a clear and proportionate relationship between the cost of service to member agencies and the value of the benefits that are provided to them by Metropolitan. A clear connection must be established between the financial incentives and the benefits to the region, and Metropolitan must have the ability to assure that the benefit is delivered.

(4) *Operating integrity.* The operating integrity of Metropolitan's delivery system should be maintained. The use of this delivery system for the transmission of non-Metropolitan water supplies (wheeling) should be provided as long as there is no reduction in the level of service, including water quality and capacity, to any member agency. Wheeling must not negatively impact the rates or charges to any of the other member agencies.

Another outcome of the June 1994 Assembly was the selection of the intermediate resource mix as the best broad-based resource combination, as opposed to the local supply or the imported supply emphasis. This intermediate

resource mix was the strategy of balancing local and imported supplies and storing seasonally available imported water in surface reservoirs and groundwater basins. It was deemed that the intermediate resource mix would provide the greatest diversity, adaptability, and flexibility. However, in supporting an intermediate mix, the participants supported a general direction for further analysis in Phase 2.

PHASE 2

Based on the resource management and business principles that were identified during Phase 1 and the IRP Assembly, Phase 2 of the IRP is focused on the refinement of the Preferred Resource Mix. Phase 2 is also focused on the evaluation of the coordinated local water management efforts, which will be used to guide the development and implementation of revised water demand and water supply management programs.

Developing the Preferred Resource Mix

The major objective of the Preferred Resource Mix is:

To find the right combination of additional local water resources, imported supplies, and demand-side management investments that meet the region's reliability goal in a cost-effective and environmentally sound manner.

Four criteria were used to develop this Preferred Resource Mix:

(1) *Cost and rate impacts.* Cost-effective supply resources should be optimized before more expensive resources are developed in order to minimize costs and unnecessary rate increases to water consumers.

(2) *Water quality.* An adequate blend of State Water Project supply is crucial to the development of local resources, such as reclamation and groundwater storage, due to salinity (total dissolved solids) concerns.

(3) *Flexibility/diversity.* A resource mix that relies on flexible supplies that can be developed and used only when necessary will ensure that costs are minimized. Diversity, relying on many different sources of water (local and imported), minimizes the risk on uncertainties and allows for the modification of investment strategies if conditions change.

(4) *Institutional/environmental issues.* A resource mix should take into account the possible institutional and environmental constraints in the development of resource investments. For example, although water transfers may be a least-cost water supply, it may be institutionally difficult to achieve significant quantities without demonstrated development of additional local resources.

Prior to establishing the resource targets for the Preferred Resource Mix, an estimate of future water demands and an assessment of existing water supplies was necessary. Based on this assessment, it was determined that the IRP would need to develop about 1.1 MAF of new local and imported water supplies by the year 2000 and about 2.4 MAF by 2020 to avoid significant water shortages and to meet Metropolitan's reliability goal. In order to determine how much of the remaining water needs would be developed with local and/or imported water supply investments, all possible future supply resources were ranked in terms of their overall unit cost (dollars per acre-foot).

The unit costs reflect the average incremental cost of developing additional dry-year water supply. These costs include the cost of resource development (capital facilities and land acquisition) and the operation and maintenance (O&M) costs associated with treating and distributing the supply. Costs for additional State Water Project supply include only those costs associated with providing new water supply and omit any environmental and/or regulatory costs needed to keep existing deliveries from declining. Costs for local water supplies were provided by Metropolitan's member agencies and local retail agencies. Figure VIII-3 presents a summary of the regions supply sources ranked by unit cost. Unit costs for an additional acre-foot of water range from a little more than $200 per acre-foot for water from the Colorado River Aqueduct to approximately $1,500 per acre-foot for water produced by ocean desalination. It should be noted that Figure VIII-3 is to be used only as a guide, and the actual resource development targets were based on cost information at the project level.

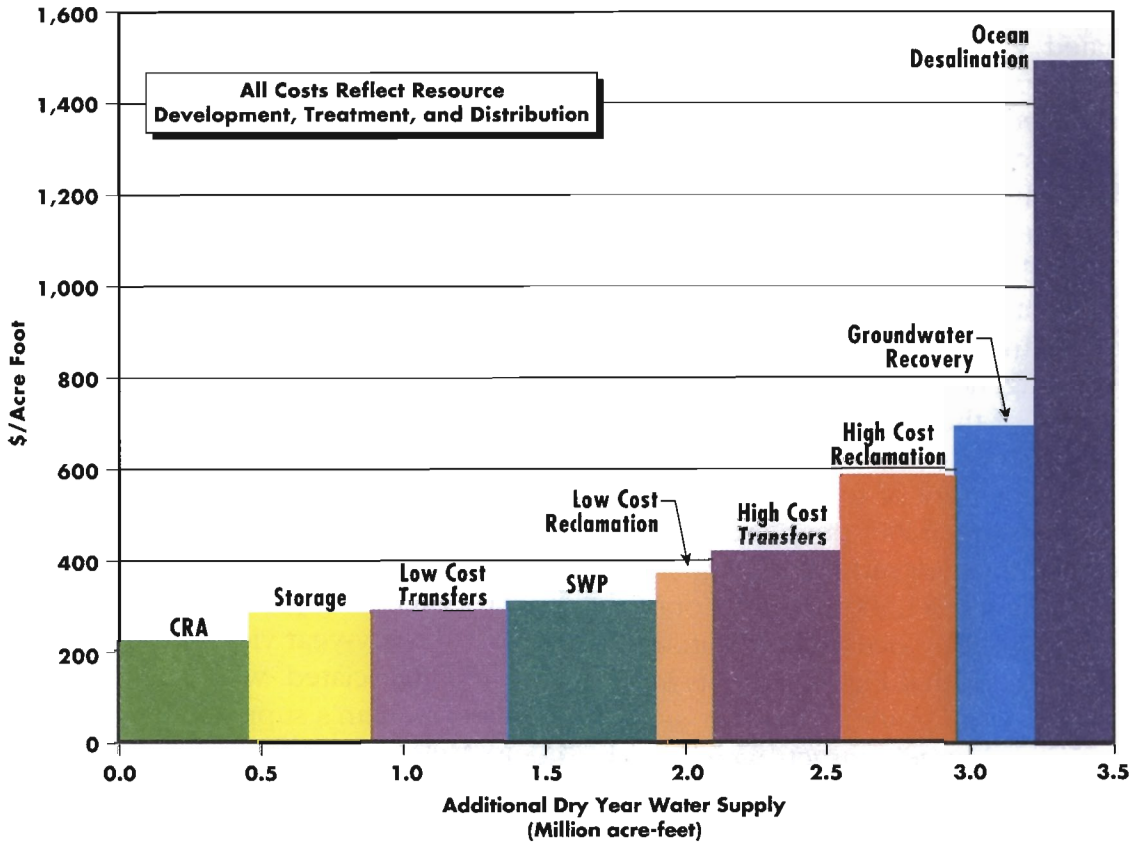
In addition to resource cost evaluations, supply reliability and detailed storage evaluations were completed in order to develop the Preferred Resource Mix. Storage, for example, was evaluated using detailed computer models that simulate weather and hydrology for projected water demands and supplies. Working with the Association of Groundwater Agencies, Metropolitan reviewed detailed assumptions regarding the potential for using the local groundwater basins to store available imported water. These assumptions were incorporated into the resource simulation model to determine the benefit of groundwater conjunctive use storage for the region. The results of the evaluation indicated that about 1.5 million acre-feet of total storage capacity could be used to store imported water in local groundwater basins. But over the next ten years, only 1 million acre-feet of storage capacity would be required. About 300,000 AF of additional groundwater production could be used during a dry year as a result of storing available water.

The analysis of the Preferred Resource Mix determined that the most cost-effective approach would be to emphasize local resources and divert 1.2 MAF of Colorado River water in the early planning horizon (2000). However, as demands continue to grow, reliance on SWP supplies become critical.

Table VIII-1 summarizes the dry-year local and imported supplies that would be required under the Preferred Resource Mix. For the purposes of the IRP, the dry-year yield is the simultaneous yield associated with shortage years of Metropolitan's supplies. Because supplies to Metropolitan's service area come from several hydrologically diverse regions, the dry-year yield had to be defined to represent a composite dry year of all water supplies. For example, in the drought of 1976-77, supply from the State Water Project was curtailed significantly; however, Southern California was somewhat insulated from the severity of the drought by the near-capacity Colorado River supply to Metropolitan. Due to the hydrological diversity in water supplies to Metropolitan's service area, it is not valid to sum the dry-year yields of individual resources and call it the dry-year yield of the region, because the likelihood of all the resources being simultaneously dry is quite small. This concept of dry year yield is made more complicated because local hydrology not only influences local supply but also local demand. Local and imported

FIGURE VIII-3

AVERAGE UNIT COST OF PROVIDING
ADDITIONAL DRY-YEAR WATER SUPPLY
($/ACRE-FOOT)



supplies along with local demand are the indicators of the region's water shortage or surplus status. When reported, dry-year yields are the simultaneous yields resulting from the average of the top 10 percent of supply shortages.

Based on the Preferred Resource Mix, resource targets for local and imported water supplies were developed to provide adequate dry-year supplies. Targeted amounts include:

- *Water conservation.* An additional 130,000 AF of conservation savings by the year 2000 (representing a 35 percent increase over current levels), of which about 89,000 AF results from the implementation of new plumbing codes and ordinances. By the year 2020, about 512,000 AF of additional conservation savings, of which about 235,000 AF results from the implementation of plumbing codes and ordinances. By 2020, the additional conservation savings represent a 138 percent increase over current levels.
- *Reclamation.* Additional reclamation supply of about 100,000 AF by the year 2000, representing a 60 percent increase from current levels of 170,000 AF. Targets for new reclaimed water development for the years 2005 and 2010 are 150,000 AF

TABLE VIII-1

DRY-YEAR SUPPLIES REQUIRED FOR THE PREFERRED RESOURCE MIX

Dry-Year Supply (MAF)	1996	2000	2020
Local supplies			
Local production[1]	1.44	1.48	1.62
Groundwater recovery[2]	0.02	0.04	0.05
Reclamation[3]	0.17	0.27	0.45
Local groundwater & surface dry-year storage production (conjunctive use)[4]	0.20	0.32	0.33
Imported supplies			
Colorado River Aqueduct	1.20	1.20	1.20
State Water Project	0.69	0.70	1.37
MWD storage & water transfers	0.22	0.19	0.45
Supply shortages allowable by MWD reliability goal (drought management)	0.01	0.09	0.16
Total consumptive demand with conservation BMPs[5]	3.95	4.29	5.63

[1] Includes local groundwater and surface production and the Los Angeles Aqueduct supplies.
[2] Net supply, replenishment deliveries from Metropolitan not included.
[3] Does not include Santa Ana recharge (currently at 100,000 AFY), which is included in the local production supply.
[4] Represents the annual storage production that is needed, not the total storage capacity, which is 1.5 million acre-feet.
[5] Represents water demands with below-normal rainfall and above-normal temperatures.

and 210,000 AF respectively. By the year 2020, about 280,000 AF of additional reclamation supply (representing a 165 percent increase over current levels) will be developed.

- *Groundwater programs.* About 1.0 MAF of local groundwater storage capacity developed over the next ten years to be used to store available imported water. About 40,000 AF of year-round groundwater production and 300,000 AF of dry-year groundwater production over the next 10 years, as a result of groundwater recovery and storage programs.
- *Colorado River Aqueduct.* About 450,000 AF of additional firm CRA supplies through conservation projects (such as canal lining), land-fallowing agreements, and other similar arrangements over the next 20 years, with the objective of maximizing CRA deliveries.
- *State Water Project.* About 650,000 AF of additional dry-year SWP supplies

will be utilized by 2010. This target could be accomplished through a Delta transfer facility and improved operational plans, conjunctive use, and additional storage locally and on the SWP system. Reliance on SWP supplies is critical to achieving the region's reliability goals and to provide water quality adequate to implement local resource programs.

- *Central Valley Water Transfers.* About 400,000 AF of voluntary water transfers developed by options and agreements and purchases of water through the drought bank and other similar spot markets. These agreements allow Metropolitan to use this water only when needed (estimated to be about 20 percent of the time).

As specific resource targets in the Preferred Resource Mix were developed, more was learned about the Mix's strengths, weaknesses, and implications. The most important lesson is the need to make the IRP a continuous process. The Preferred Resource Mix, along with the policies and procedures required to implement it, should be periodically evaluated and, if appropriate, adjusted.

Capital Improvement Program

As part of the IRP, Metropolitan has developed a capital improvement program (CIP) that reflects the local and imported resource development and resulting water demands on Metropolitan as called for by the Preferred Resource Mix. The development of the CIP will be critical in meeting three major objectives: (1) meeting Metropolitan's supply reliability goal, (2) meeting future drinking-water quality standards, (3) maintaining the integrity of the distribution system. Before the IRP process was implemented, the 10-year CIP was estimated to be about $5.9 billion. As a result of the local resource targets identified in the Preferred Resource Mix, the estimated 10 year CIP is about $4.7 billion.

SUMMARY

The Preferred Resource Mix and Metropolitan's associated CIP represent a regional water resources strategy that meets the desired reliability goal while balancing costs, water quality, and environmental/ institutional concerns. Specifically, the Preferred Resource Mix is a combination of cost-effective local resources, water conservation, and imported water supply from the Colorado River Aqueduct and State Water Project. Based on the variability in water demand and supplies due to weather and hydrology, the likelihood of having water supply shortages similar to those experienced in 1991 would be reduced to once in 50 years.

Metropolitan's existing policy objective for the IRP process is to achieve its water supply reliability goal through the implementation of the IRP Preferred Resource Mix. The IRP process will meet this objective through both a short- and long-term implementation. In the remaining months of 1995, the Board will continue the IRP process of revising and adopting policies for the following Water Management Programs:

- Wheeling,
- Local Resource Program; joining the current LPP and GRP into one program,
- Storage Programs,

- Water Supply and Drought Management Plan; for shortage mitigation and surplus operations.

The adopted policies will include 5-year yield and expenditure targets for each resource.

The IRP is a dynamic planning process. Metropolitan is committed to using the IRP framework to establish the region's long-term water resource plan.

As current and projected economic, demographic, and water supply conditions change, adjustments to the Preferred Resource Mix will be necessary. In addition, the IRP process will continue to develop an updated capital improvement program (forthcoming *System Overview Report*) to support the Preferred Resource Mix. The initial IRP process is scheduled to be completed in December 1995.

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APPENDIX A

CALIFORNIA URBAN WATER MANAGEMENT PLANNING ACT

CALIFORNIA
URBAN WATER MANAGEMENT PLANNING ACT

Established: AB 797, Klehs, 1983

Amended: AB 2661, Klehs, 1990
AB 11X, Filante, 1991
AB 1869, Speier, 1991
AB 892, Frazee, 1993
SB 1017, McCorquodale, 1994
AB 2853, Cortese, 1994

CALIFORNIA WATER CODE DIVISION 6
PART 2.6. URBAN WATER MANAGEMENT PLANNING

CHAPTER 1. GENERAL DECLARATION AND POLICY

10610. This part shall be known and may be cited as the "Urban Water Management Planning Act."

10610.2. The Legislature finds and declares as follows:

(a) The waters of the state are a limited and renewable resource subject to ever increasing demands.

(b) The conservation and efficient use of urban water supplies are of statewide concern; however, the planning for that use and the implementation of those plans can best be accomplished at the local level.

10610.4. The Legislature finds and declares that it is the policy of the state as follows:

(a) The conservation and efficient use of water shall be actively pursued to protect both the people of the state and their water resources.

(b) The conservation and efficient use of urban water supplies shall be a guiding criterion in public decisions.

(c) Urban water suppliers shall be required to develop water management plans to achieve conservation and efficient use.

CHAPTER 2. DEFINITIONS

10611. Unless the context otherwise requires, the definitions of this chapter govern the construction of this part.

10611.5. "Conservation" means those measures that limit the amount of water used only to that which is reasonably necessary for the beneficial use to be served.

10612. "Customer" means a purchaser of water from a water supplier who uses the water for municipal purposes, including residential, commercial, governmental, and industrial uses.

10613. "Efficient use" means those management measures that result in the most effective use of water so as to prevent its waste or unreasonable use or unreasonable method of use.

10614. "Person" means any individual, firm, association, organization, partnership, business, trust, corporation, company, public agency, or any agency of such an entity.

10615. "Plan" means an urban water management plan prepared pursuant to this part. A plan shall describe and evaluate reasonable and practical efficient uses and reclamation and conservation activities. The components of the plan may vary according to an individual community or area's characteristics and its capabilities to efficiently use and conserve water. The plan shall address measures for residential, commercial, governmental, and industrial water management as set forth in Article 2 (commencing with Section 10630) of Chapter 3. In addition, a strategy and time schedule for implementation shall be included in the plan.

10616. "Public agency" means any board, commission, county, city and county, city, regional agency, district, or other public entity.

10617. "Urban water supplier" means a supplier, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually. An urban water supplier includes a supplier or contractor for water, regardless of the basis of right, which distributes or sells for ultimate resale to customers. This part applies only to water supplied from public water systems subject to Chapter 7 (commencing with Section 4010) of Part 1 of Division 5 of the Health and Safety Code.

CHAPTER 3. URBAN WATER MANAGEMENT PLANS

Article 1. General Provisions

10620. (a) Every urban water supplier shall prepare and adopt an urban water management plan in the manner set forth in Article 3 (commencing with Section 10640) .

(b) Every person that becomes an urban water supplier after December 31, 1984, shall adopt an urban water management plan within one year after it has become an urban water supplier.

(c) An urban water supplier indirectly providing water shall not include planning elements in its water management plan as provided in Article 2 (commencing with Section 10630) that would be applicable to urban water suppliers or public agencies directly providing water, or to their customers, without the consent of those suppliers or public agencies.

(d) (1) An urban water supplier may satisfy the requirements of this part by participation in areawide, regional, watershed, or basinwide urban water management planning where those plans will reduce preparation costs and contribute to the achievement of conservation and efficient water use.

(2) Each urban water supplier shall coordinate the preparation of its urban water shortage contingency plan with other urban water suppliers and public agencies in the area, to the extent practicable.

(e) The urban water supplier may prepare the plan with its own staff, by contract, or in cooperation with other governmental agencies.

10621. (a) Each urban water supplier shall periodically update its plan at least once every five years. After the review, it shall make any amendments or changes to its plan which are indicated by the review.

(b) The amendments to, or changes in, the plan shall be adopted and filed in the manner set forth in Article 3 (commencing with Section 10640).

Article 2. Contents of Plans

10630. It is the intention of the Legislature, in enacting this part, to permit levels of water management planning commensurate with the numbers of customers served and the volume of water supplied.

10631. A plan shall be adopted in accordance with this chapter and shall do all of the following:

(a) Include an estimate of past, current, and projected potable and recycled water use and, to the extent records are available, segregate those uses between residential, industrial, commercial, and governmental uses.

(b) (1) Identify conservation and reclamation measures currently adopted and being practiced.

(2) Urban water suppliers that are members of the California Urban Water Conservation Council and submit annual reports to that council in accordance with the "Memorandum of Understanding Regarding Urban Water Conservation in California," dated September 1991, may submit the annual reports for the purposes of identifying conservation measures as required by paragraph (1).

(c) Describe alternative conservation measures, including, but not limited to, consumer education, metering, water saving fixtures and appliances, pool covers, lawn and garden irrigation techniques, and low water use landscaping, that would improve the efficiency of water use with an evaluation of their costs and their environmental and other significant impacts.

(d) Provide a schedule of implementation for proposed actions as indicated by the plan.

(e) Provide an urban water shortage contingency plan that includes all of the following elements that are within the authority of the urban water supplier:

(1) Past, current, and projected water use and, to the extent records are available, a breakdown of those uses on the basis of single-family residential, multifamily residential, commercial, industrial, governmental, and agricultural use.

(2) An estimate of the minimum water supply available at the end of 12, 24, and 36 months, assuming the worst case water supply shortages.

(3) Stages of action to be undertaken by the urban water supplier in response to water supply shortages, including up to a 50 percent reduction in water supply, and an outline of specific water supply conditions that are applicable to each stage.

(4) Mandatory provisions to reduce water use that include prohibitions against specific wasteful practices, such as gutter flooding.

(5) Consumption limits in the most restrictive stages. Each urban water supplier may use any type of consumption limit in its water shortage contingency plan that would reduce water use and is appropriate for its area. Examples of consumption limits that may be used include, but are not limited to, percentage reductions in water allotments, per capita allocations, an increasing block rate schedule for high usage of water with incentives for conservation, or restrictions on specific uses.

(6) Penalties or charges for excessive use.

(7) An analysis of the impacts of the plan on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts, such as the development of reserves and rate adjustments.

(8) A draft water shortage contingency resolution or ordinance to carry out the urban water shortage contingency plan.

(9) A mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency plan.

(f) Describe the frequency and magnitude of supply deficiencies, based on available historic data and future projected conditions comparing water supply and demand, including a description of deficiencies in time of drought and emergency and the ability to meet deficiencies.

(g) To the extent feasible, describe the method which will be used to evaluate the effectiveness of each conservation measure implemented under the plan.

(h) Describe the steps which would be necessary to implement any proposed actions in the plan.

(i) Describe findings, actions, and planning relating to all of the following:

(1) The use of internal and external water audits for single-family residential, multifamily residential, institutional, commercial, industrial, and governmental customers, and the use of incentive programs to encourage customer audits and program participation.

(2) The use of distribution system water audits.

(3) Leak detection and repair.

(4) The use of large landscape water audits.

(j) Describe actions and planning to eliminate the use of once-through cooling systems, nonrecirculating water systems, and nonrecycling decorative water fountains, and to encourage the recirculation of water if proper public health and safety standards are maintained.

(k) Describe actions and plans to enforce conservation measures.

(l) To the extent feasible, describe the amount of water saved through water conservation measures employed by user groups.

(m) Describe actions and planning to ensure the involvement of community members within the service area with regard to water management planning.

10632. (a) In addition to the elements required pursuant to Section 10631, a plan projecting a future use which indicates a need for expanded or additional water supplies shall be adopted in accordance with this chapter and shall include an evaluation of the following alternatives:

(1) Recycled water. The plan's evaluation of this alternative shall provide information on recycled water and its potential for use as a water source in the service area of the urban water supplier and shall include all of the following information:

(A) A description of the waste water collection and treatment systems in the supplier's service area, including a quantification of the amount of waste water collected and treated and the methods of waste water disposal.

(B) A description of the recycled water currently being used in the supplier's service area, including, but not limited to, the type, place, and quantity of use.

(C) A description and quantification of the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.

(D) The projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years.

(E) A description of actions, including financial incentives, which may be taken to encourage the use of recycled water where fresh water is not necessary, and the projected results of these actions in terms of acre-feet of recycled water used per year.

(F) A plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems and to promote recirculating uses.

(2) Exchanges or transfer of water on a short-term or long-term basis.

(3) Management of water system pressures and peak demands.

(4) Issues relevant to meter retrofitting for all uses.

(5) Incentives to alter water use practices, including fixture and appliance retrofit programs.

(6) Public information and educational programs to promote wise use and eliminate waste.

(7) Changes in pricing, rate structures, and regulations.

(b) The preparation of the plan shall be coordinated with local water, waste water, and planning agencies.

10633. The plan shall contain an evaluation of the alternative water management practices identified in Sections 10631 and 10632, taking into account economic and noneconomic factors, including environmental, social, health, customer impact, and technological factors.

Evaluation of the elements in Section 10632 shall include a comparison of the estimated cost of alternative water management practices with the incremental costs of expanded or additional water supplies, and in the course of the evaluation first consideration shall be given to water management practices, or combination of practices, which offer lower incremental costs than expanded or additional water supplies, considering all the preceding evaluation factors.

Article 3. Adoption and Implementation of Plans

10640. Every urban water supplier required to prepare a plan pursuant to this part shall prepare its plan pursuant to Article 2 (commencing with Section 10630).

The supplier shall likewise periodically review the plan as required by Section 10621, and any amendments or changes required as a result of that review shall be adopted pursuant to this article.

10641. (a) An urban water supplier required to prepare a plan may consult with, and obtain comments from, any public agency or state agency or any person who has special expertise with respect to water conservation and management methods and techniques.

(b) In order to assist urban water suppliers in obtaining needed expertise as provided for in subdivision (a), the department, upon request of an urban water supplier, shall provide the supplier with a list of persons or agencies having expertise or experience in the development of water management plans.

10642. Prior to adopting a plan, the urban water supplier shall make the plan available for public inspection and shall hold a public hearing thereon. Prior to the hearing, notice of the time and place of hearing shall be published within the jurisdiction of the publicly owned water supplier pursuant to Section 6066 of the Government Code. A privately owned water supplier shall provide an equivalent notice within its service area. After the hearing, the plan shall be adopted as prepared or as modified after the hearing.

10643. An urban water supplier shall implement its plan adopted pursuant to this chapter in accordance with the schedule set forth in its plan.

10644. An urban water supplier shall file with the department a copy of its plan no later than 30 days after adoption. Copies of amendments or changes to the plans shall be filed with the department within 30 days after adoption.

Plans filed under this section shall describe the basis for the decision of the urban water supplier to add, change, or retain conservation measures.

The department shall annually prepare and submit to the Legislature a report summarizing the status of the plans adopted pursuant to this part. The report prepared by the department shall highlight the outstanding elements of individual plans. The department shall provide a copy of the report to each urban water supplier which has filed its plan with the department. The department shall also prepare reports and provide data for any legislative hearings designed to consider the effectiveness of plans submitted pursuant to this part.

10645. Not later than 30 days after filing a copy of its plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours.

CHAPTER 4. MISCELLANEOUS PROVISIONS

10650. Any actions or proceedings to attack, review, set aside, void, or annul the acts or decisions of an urban water supplier on the grounds of noncompliance with this part shall be commenced as follows:

(a) An action or proceeding alleging failure to adopt a plan shall be commenced within 18 months after that adoption is required by this part, or within 18 months after commencement of urban water service by a supplier commencing that service after January 1, 1984.

(b) Any action or proceeding alleging that a plan, or action taken pursuant to the plan, does not comply with this part shall be commenced within 90 days after filing of the plan or amendment thereto pursuant to Section 10644 or the taking of that action.

10651. In any action or proceeding to attack, review, set aside, void, or annul a plan, or an action taken pursuant to the plan by an urban water supplier on the grounds of noncompliance with this part, the inquiry shall extend only to whether there was a prejudicial abuse of discretion. Abuse of discretion is established if the supplier has not proceeded in a manner required by law or if the action by the water supplier is not supported by substantial evidence.

10652. The California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) does not apply to the preparation and adoption of plans pursuant to this part or to the implementation of subdivision (e) of Section 10631. Nothing in this part shall be interpreted as exempting from the California Environmental Quality Act any project that would significantly affect water supplies for fish and wildlife, or any project for implementation of the plan, other than projects implementing subdivision (e) of Section 10631, or any project for expanded or additional water supplies.

10653. The adoption of a plan shall satisfy any requirements of state law, regulation, or order, including those of the State Water Resources Control Board, for the preparation of water management plans or conservation plans; provided, that if the State Water Resources Control Board requires additional information concerning water conservation to implement its existing authority, nothing in this part shall be deemed to limit the board in obtaining that information. The requirements of this part shall be satisfied by any water conservation plan prepared to meet federal laws or regulations after the effective date of this part, and which substantially meets the requirements of this part, or by any existing water management or conservation plan which includes the contents of a plan required under this part.

10654. An urban water supplier may recover in its rates the costs incurred in preparing its plan and implementing the reasonable water conservation measures included in the plan. Any best water management practice that is included in the plan that is identified in the "Memorandum of Understanding Regarding Urban Water Conservation in California" is deemed to be reasonable for the purposes of this section.

10655. If any provision of this part or the application thereof to any person or circumstances is held invalid, that invalidity shall not affect other provisions or applications of this part which can be given effect without the invalid provision or application thereof, and to this end the provisions of this part are severable.

10656. An urban water supplier that does not submit an amendment to its urban water management plan pursuant to subdivision (a) of Section 10621 to the department by January 31, 1992, is ineligible to receive drought assistance from the state until the urban water management plan is submitted pursuant to Article 3 (commencing with Section 10640) of Chapter 3.

SEC. 2. No appropriation is made and no reimbursement is required by this act pursuant to Section 6 of Article XIII B of the California Constitution or Section 2231 or 2234 of the Revenue and Taxation Code because the local agency or school district has the authority to levy service charges, fees, or assessments sufficient to pay for the program or level of service mandated by this act.

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APPENDIX B
CONSERVATION CREDITS PROGRAM

WATER CONSERVATION CREDITS PROGRAM 02/07/95
APPROVED AND PROPOSED PROJECTS

ITEM	MWD MEMBER AGENCY	PROPOSAL FROM	PROJECT DESCRIPTION	AGREEMENT NO.	TYPE/SIZE			EXECUTION DATE	TERM EXPIRE	EST. SAVINGS (AF)		PROJECT COSTS		MWD COSTS	
					ULFT	SHWRHD	OTHER			ANNUAL	TOTAL	TOTAL ($)	per AF	PROJECT ($)	MWD %
1	Anaheim	Anaheim	ULFT/$100 rebate (Phase 1)	3237	4,000 1,000		Comm. ULFT	07/10/91	07/10/92	220	2,245	$628,197	$280	$314,098	50%
2			ULFT/$100 rebate (Phase 2)	3390	2,800	2,800		01/07/92	03/07/93 Ext. 6/30/94	129	1,106	$392,739	$355	$170,310	43%
3			Disneyland Hotel ULFT (PILOT)	2978	304			04/11/91	06/27/92	(?)	(?)	$30,400	(?)	$10,133	33%
4			Showerhead Kits (WW'91)	3462		35,000		02/24/92	03/24/93	1,405	7,025	$279,607	$40	$139,803	50%
5			ULFT Replacement w/CTSI	3930	5,200	3,120		03/07/94	05/07/95	243	2,435	$491,827	$202	$315,027	64%
6			School Audit and Retrofit (USBR)	4070	1,200		60 schools	10/12/94	02/12/98	49	393	$252,500	$642	$126,250	50%
7			Waterless Urinal Replacement	4069	1 Urinal			08/22/94	07/22/95			$1,049		$525	50%
8	Burbank	Burbank	ULFT/$100 rebate	3389	4,000			12/02/91	02/02/94	184	1,580	$453,000	$287	$226,500	50%
9			Showerhead Kits (WW'91)	3386		15,000		10/29/91	12/02/92	406	2,030	$237,000	$117	$118,500	50%
10			ULFT Rebate	3782	2,500			03/03/93	05/03/94	100	959	$204,500	$213	$102,250	50%
10			ULFT Replacement w/CTSI	4565	800			04/05/94	06/05/95	29	292	$96,000	$329	$48,000	50%
11			ULFT Distribution w/CTSI (USBR)	4728	800			01/13/95		29	292	$96,000	$329	$48,000	50%
12			ULFT/Rebate (USBR)	4657	1,500			09/07/94	11/07/95	55	547	$150,000	$274	$90,000	60%
13	Calleguas MWD	Calleguas MWD	ULFT/$100 rebate	3364	5,000			10/15/91	10/15/93	231	1,976	$631,758	$320	$304,304	48%
14			ULFT Rebate	3780	5,000			02/02/93	02/02/94 Ext. 8/16/94	220	1,880	$636,500	$340	$289,520	45%
15	Central/West Basins MWD	Central/West Basins MWD	Main Leak Detection (PILOT)	2791			1,685 miles of main	12/03/90	12/03/92	750	1,500	$362,000	$241	$181,000	50%
16			ULFT/$100 rebate	3151	25,000			06/05/91	06/05/93 Ext.6/30/94	1,152	9,885	$3,480,445	$352	$1,522,290	44%
17			Showerhead Kits (WW'91)	3149		75,000		06/05/91	06/05/92 Ext. 5/31/93	2,032	10,160	$528,700	$52	$264,350	50%
18			Low-Income Water Audit ULFT Installation	3748	Included in 3151		1,000 audits	11/03/92	05/14/93 Ext.12/31/93	48	485	$40,000	$86	$20,000	50%
19			ULFT/$60 flat-rate FAME w/CTSI	4200	2,000			06/29/93	06/29/94	65	650	$220,000	$338	$120,000	55%
20			Low-Income Water Audit ULFT Installation	3983	1,430		1,430 audits	05/20/93	05/20/94 Ext.10/31/94	46	484	$50,000	$108	$25,000	50%
21			ULFT/$60 flat-rate	4256	12,500			06/29/93	06/29/94 Ext. 6/30/95	494	4,943	$1,740,220	$352	$750,000	43%
22	Central Basin	Central Basin	ULFT Distribution CTSI	4084	1,500			12/22/94	12/22/95	55	547	$180,000	$329	$90,000	50%
23	West Basin	West Basin	ULFT Distribution CTSI	4083	1,500			12/22/94	12/22/95	55	547	$180,000	$329	$90,000	50%
24			Handbook on Reclaimed Water in Cooling Towers	4272			Handbook	08/08/93	02/08/93			$50,000		$25,000	50%
25		City of Carson	Xeriscape Demonstration Garden	PO # SW-84								$10,000		$5,000	50%
26			Conservation in Landscaping Act	4297				12/02/93	12/02/94			$50,000		$25,000	50%
27		Central/West Basins MWD	ULFT/Low-Income Audit	4655	4,480		4480 audits	06/30/94	08/28/95	163	1633	$627,200	$384	$347,200	55%
28	Chino Basin MWD	Upland	ULFT/$100 rebates w/showerheads	3464	5,000	5,000		12/23/91	12/23/92 Ext.6/30/94	231	1,976	$580,000	$294	$290,000	50%

ITEM	MWD MEMBER AGENCY	PROPOSAL FROM	PROJECT DESCRIPTION	AGREEMENT NO.	TYPE/SIZE			EXECUTION DATE	TERM EXPIRE	EST. SAVINGS (AF)		PROJECT COSTS		MWD COSTS	
					ULFT	SHWRHD	OTHER			ANNUAL	TOTAL	TOTAL ($)	per AF	PROJECT ($)	MWD %
29		Chino Hills	Showerhead kits (WW'91)	3387		5,000		12/16/91	06/16/92	135	677	$62,500	$92	$31,250	50%
30		Chino Basin	Residential In/Outdoor Audits (USBR)	Pending			5359 audits			120	600	$500,000	$833	$250,000	50%
31	Coastal MWD	San Clemente	Showerhead kits (WW'91)	2997		8,000	2,000 water audits	05/06/91	05/06/92	230	1,152	$208,660	$181	$104,330	50%
32		South Coast	Showerhead kits (WW'91)	3027		3,000		06/26/91	06/26/92	88	442	$35,000	$79	$17,500	50%
33		Laguna Bch	Showerhead kits (WW'91)	2981		5,000		07/11/91	07/11/92	99	497	$104,623	$211	$52,311	50%
34		Tri-Cities/ San Clemente	ULFT/$60 flat-rate w/CTSI	3785	2,000			03/04/94	03/04/95	86	862	$200,000	$232	$120,000	60%
35	Compton	Compton	ULFT Replacement w/CTSI	Pending	5,000			Pending		192	1,920	$605,000	$315	$605,000	100%
36			Residential Water Audits (USBR)	4637			458 audits	Pending		10	51	$50,000	$980	$25,000	50%
37			Leak Detection/Repair (USBR)	4635			800 miles	09/22/94	11/22/95	16	32	$78,750	$2,461	$39,375	50%
38	Eastern MWD	Eastern MWD	ULFT/CTSI	3929	1,200			04/26/93	04/26/94	46	458	$141,000	$308	$70,500	50%
39			Pilot Residential Indoor/Outdoo Water Audits	4067			400 residences	07/29/94	09/29/94	9	45	$20,575	$457	$10,288	50%
40			ULFT/CTSI (USBR)	4731	2,661			Pending		97	970	$242,000	$249	$120,000	50%
41			ULFT/CTSI (USBR)	4649	2,000			06/15/94	10/15/95	73	729	$231,400	$317	$120,000	52%
42			Landscape Water Conservation Workshops	4081			4 Workshops	10/03/94	05/03/95			$10,000		$5,000	50%
43	Foothill MWD	Lincoln	ULFT/$100 rebates (Step Rebatee)	3459	431			01/17/92	01/17/93	20	168	$43,969	$262	$21,985	50%
44		Foothill MWD	Showerhead Kits/Mats. Various Dist. (WW'91)	3346		3,000		11/10/91	11/10/92	85	425	$10,502	$25	$5,251	50%
45		Crescenta Valley	ULFT CTSI	4585	500			09/19/94	11/19/95	18	182	$60,000	$330	$30,000	50%
46	Glendale	Glendale	ULFT/$100 rebates	3365	4,000			11/05/91	11/05/92	185	1,583	$467,000	$295	$233,500	50%
47	Las Virgenes MWD	Las Virgenes MWD	ULFT/$100 rebates	2728	900			07/02/90	07/02/93	70	600	$140,300	$234	$70,150	50%
48			ULFT Rebates	3816	500	100		12/01/92	02/01/94	21	193	$64,125	$332	$29,722	46%
49			ULFT/Rebate	4595	700			06/05/94	06/05/95	26	255		$0	$42,000	
49	City of Long Beach	City of Long Beach	ULFT/$60 flat-rate w/CTSI	3984	1,000			12/08/93	02/08/95	43	430	$120,000	$279	$60,000	50%
50			ULFT Rebate	4741	2,000			01/24/95		73	729	$207,000	$284	$120,000	58%
51	City of Los Angeles	LADWP	ULFT/$100 rebates #1 (PILOT)	2687	7,500			04/01/90	05/01/92	247	2,470	$900,000	$364	$276,640	31%
52			ULFT #2	3219	40,000			07/15/91	06/15/93	1,318	13,176	$5,200,000	$395	$2,029,104	39%
53			ULFT #3	3440	50,000			11/25/91	11/25/92	1,647	16,470	$6,200,000	$376	$2,536,380	41%
54			ULFT #4 w/CTSI	3786	133,637			04/26/93	07/04/94	6,390	63,900	$14,000,000	$219	$7,000,000	50%
55			ULFT w/CTSI	4527	60,000			05/26/94	07/26/95	21,187	21,866	$6,600,000	$302	$3,000,000	45%
56			ULFT/Rebate	4569	60,000			05/11/94	07/11/95	2,187	21,866	$6,600,000	$302	$3,600,000	55%
57			Toilet Flapper Retrofit (W/E Partnership)	2776			16,000 homes PILOT	06/04/91	------	?	?	$32,000	?	$16,000	50%
58	MWD of Orange County	Irvine Ranch MWD	Retrofit kits Home Water Survey	2277		4,000		09/01/89	09/01/91	135	675	$100,000	$148	$50,000	50%

ITEM	MWD MEMBER AGENCY	PROPOSAL FROM	PROJECT DESCRIPTION	AGREEMENT NO.	TYPE/SIZE			EXECUTION DATE	TERM EXPIRE	EST. SAVINGS (AF)		PROJECT COSTS		MWD COSTS	
					ULFT	SHWRHD	OTHER			ANNUAL	TOTAL	TOTAL ($)	per AF	PROJECT ($)	MWD %
59			Showerhead kits (WW'91)	3470		Kits/mats		04/28/92	06/30/92	157	784	$39,895	$51	$19,947	50%
60		Mesa Consol.	Showerhead kits (WW'91)	3376		5,000		06/16/92	06/16/93	169	847	$100,000	$118	$50,000	50%
61		Capistrano Valley	ULFT Rebate	3792	1,093	1,000		05/14/93	07/14/94	65	429	$100,285	$234	$50,142	50%
62		Irvine Ranch	ULFT Rebate	3791	2,000			07/01/93	09/01/94	70	654	$192,000	$294	$83,468	43%
63		SoCal Water Co	ULFT Rebate	3861	500			06/10/93	06/10/94	15	146	$45,000	$308	$22,422	50%
64		SoCal Water Co.	ULFT/$60 flat-rate	4249	500			06/29/93	06/29/94	15	146	$52,000	$357	$30,000	58%
65		MWDOC	ULFT/$60 flat-rate w/CTSI	4344	30,500			11/10/93	07/10/95	1,571	15,710	$3,050,000	$194	$1,830,000	60%
66		Moulton Niguel Aliso Viejo	Irrigation Control System	4534			Control System	05/11/94	05/11/97	79	787	$508,000	$645	$254,000	50%
67		Santa Margarita Casta del Sol	Irrigation Control System	4257			Control System	04/05/94	04/05/97	156	1,563	$270,000	$173	$135,000	50%
68		La Habra	ULFT Rebate	4495	575	500		08/02/94	10/02/95	19	187	$54,125	$289	$35,840	66%
69		SoCal Water Co.	ULFT/$60 flat-rate w/CTSI	Pending	1,000			Pending		33	325			$60,000	
70		SoCal/Edison/CTSI	ULFT/CTSI Water/Energy Partnership	4415	2,500			02/18/94	04/18/95	91	911	$302,500	$332	$150,000	50%
71		MWDOC	ULFT Rebate	4582	1,500			08/04/94	10/04/95	55	547		$0	$90,000	
72		Irvine Ranch	CII Water Management Study Project	4636			18 surveys	09/13/94	11/13/95			$135,000		$67,500	50%
73		Capistrano Valley	Large Landscape Audit (USBR)	4076			100 audits	Pending				$57,000		$28,500	50%
74		MWDOC	CII Survey Program (USBR)	Pending			87 surveys	Pending				$81,000		$40,500	50%
75		Irvine Ranch	Landscape Irrigation Water Conservation Studies	-----				05/10/94				$93,009		$53,009	57%
76	Pasadena	Pasadena	Home Water Survey (PILOT)	89-20			2,400 residences	11/01/88	05/01/89	90	452	$271,718	$602	$33,900	12%
77			Retrofit Kits "Lite Bill"	2426		34,600		11/01/89	11/01/91	996	4,980	$802,247	$161	$373,500	47%
78			Resid. Leak Repair (PILOT)	3378			2,000 homes low-income	11/21/91	11/21/92	(?)	(?)	$88,500	(?)	$44,250	50%
79			ULFT/$100 rebate	3369	4,000			01/22/92	03/22/94	132	1,317	$420,000	$319	$202,818	48%
80			Multi-Fam Retrofit Kits	2724		15,500		08/15/90	08/15/91	224	1,118	$148,000	$132	$74,000	50%
81			ULFT Replacement Institutional	3746	23			02/16/93	02/16/94	5	51	$32,821	$644	$7,854	24%
82			ULFT Rebate	3779	3,500 (800)			02/16/93 Amnd 8/9/94	02/16/94 Ext.10/9/95	185	1,729	$278,475 $11,525	$161	$139,238 $5,762	50% 50%
83	San Diego Co. Water Auth.	SDCWA	Large Turf Water Audit Program (PILOT)	2519			965 acres	04/01/90	10/01/91	994	4,970	$285,000	$57	$142,500	50%
84		City of San Diego	Retrofit Kits	3153		50,000		04/29/91	10/29/91	1,132	5,660	$917,729	$162	$458,865	50%
85		Escondido	ULFT/Multi-Family $100 rebate/$50 install	2975	500	500		01/21/91	02/21/92	34	336	$96,500	$287	$48,250	50%
86		SDCWA	ULFT Rebate	3135	14,205			04/30/91	05/30/93	1,113	9,095	$2,130,750	$234	$1,065,375	50%
87		SDCWA	ULFT Rebate II	3505	13,025			03/19/92	03/19/94	782	6,338	$1,953,750	$308	$976,025	50%
88		SDCWA	ULFT Public Facilities (Pilot)	3629	1,120			09/15/92	09/15/93	82	820	$280,000	$341	$140,000	50%
89		SDCWA	Showerhead Kits SDG&E (WW'91)	3412		40,300		12/03/91	12/03/92	903	4,515	$482,391	$107	$241,195	50%
90		City of	Showerhead Kits	3458		50,000		02/04/92	06/04/92	1,132	5,660	$969,485	$171	$484,743	50%

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					ULFT	SHWRHD	OTHER			ANNUAL	TOTAL	TOTAL ($)	per AF	PROJECT ($)	MWD %
		San Diego	Canvass Dist. (WW'91)												
91		SDCWA	Showerhead Kits (WW'91)	3264		100,000		11/15/91	11/15/92	474	2,371	$271,300	$114	$135,650	50%
92		SDCWA	ULFT Rebate III	3755	16,696			10/27/92	07/14/93	662	6,625	$1,920,000	$290	$960,000	50%
93		City of San Diego	Showerhead Kits (CTSI)	3814		50,000		03/03/93	03/03/94	1,132	5,660	$969,485	$171	$484,743	50%
94		SDCWA	Turf Audit	3817			unknown	09/08/92	09/08/94	300	1,500	$180,000	?	$90,000	50%
95			ULFT Rebate IV	3836	21,308	9,589		02/08/93	04/08/94	827	8,276	$2,450,420	$296	$1,225,210	50%
96			ULFT Replacement CBO w/CTSI	3961 Amendment	7,746 8,333			06/10/93 07/06/94	06/30/94 09/30/94	251	2,516	$836,568 $899,964	$332	$464,760 $499,980	56% 56%
97			Irrigation Hardware	3991				04/12/94	04/12/95	65	325	$125,000	$385	$50,000	40%
98			ULFT Rebate	4460	51,027			01/26/94	03/26/95	1,377	13,770	$6,174,267	$448	$3,061,620	50%
99			Single-Family Home Water Survey	4563			2400 surveys	03/19/94	05/19/95	54	269	$120,000	$446	$60,000	50%
100			Pilot Single-Family and Multifamily Residential Surveys	4598			4000 residences	09/16/94	11/16/95	90	448	$163,530	$365	$81,765	50%
101			Pilot Distribution System Water Audit Project	4078			4 Subagencies	10/11/94	10/11/95			$80,000		$40,000	50%
102			ULFT Rebate Project	4093	51,704			10/26/94	10/26/95	1,895	18,953	$5,170,400	$273	$3,102,240	60%
103		SDCWA	Large Turf Water Audit Pilot (Continuation)	4079			?	11/29/94	11/29/96			$180,000		$90,000	50%
104		SDG&E	Pilot Washing Machine Rebate Program	-----			125	03/06/94		6	84	$12,500	$149	$3,125	25%
105			CII Survey Project	4737	385,000		unknown	12/15/94	06/30/96			$385,000		$192,500	50%
106	San Marino	San Marino	ULFT Rebate	3745	157			11/03/92	11/03/93 Ext. 1/3/94	6	55	$18,408	$337	$8,408	46%
107			ULFT/Rebate (USBR)	4648	157			Pending		6	55	$14,240	$259	$9,420	66%
108			ULFT (USBR)	4685	157			06/02/94		6	55	$19,178	$349	$9,577	50%
109	Santa Ana	Santa Ana	ULFT/$60 flat-rate w/CTSI	4345	500			01/10/94	03/10/95	23	231	$52,100	$226	$30,000	58%
110			ULFT/Rebate - Showerheads (USBR)	4685	157	157		Pending		6	55	$19,178	$349	$9,577	50%
111	Santa Monica	Santa Monica	ULFT/$100 rebate #1 (AMENDED)	2276	4,000			09/01/89	09/01/94	183	1,560	$360,000	$231	$118,500	33%
112			ULFT Rebate #2 (Amends #1)	3118	16,320			06/04/91	06/04/93	753	6,320	$2,495,000	$395	$903,472	36%
113			ULFT Rebate #3	3787	8,496			04/26/93	06/26/94 Ext. 6/26/95	983	9,827	$1,047,998	$107	$523,998	50%
114			Irrigation Maintenance and Repair Class									$6,800		$3,400	50%
115			Central Computer Control Feasability Study (USBR)	4075			24 sites	Pending				$100,000		$50,000	50%
116	Three Valleys MWD	SoCal Water Co.	ULFT Rebate	3784	500			05/25/93	05/25/94	20	198	$45,000	$227	$22,422	50%
117		Walnut Valley	ULFT Rebate	3819	1,000			01/29/93	03/29/94 Ext. 7/29/94	40	396	$137,150	$346	$60,984	44%
118		La Verne	ULFT Rebate	3874 Amendment	350			04/14/93	06/14/94	11	114	$47,000 ($5,964)	$412	$17,556 $1,540	37%
119		SoCal Water Co.	ULFT/$60 flat-rate	4216	500			06/09/93	06/09/94	15	146	$52,000	$357	$30,000	58%
120		Rowland	ULFT/$60 flat-rate	4246	250	175		07/19/93	09/19/94	9	90	$30,950	$344	$15,000	48%
121		Pomona	ULFT/$60 flat-rate	4237	250			12/07/93	02/07/95	12	120	$22,500	$188	$15,000	67%

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					ULFT	SHWRHD	OTHER			ANNUAL	TOTAL	TOTAL ($)	per AF	PROJECT ($)	MWD %
122		La Verne	ULFT/$60 flat-rate	4323	333			02/01/94	04/01/95	11	108	$43,300	$401	$19,980	46%
123		Covina	ULFT/CTSI (USBR)	4068	370			08/03/94	10/03/95	13	135	$44,770	$332	$22,200	50%
124		La Verne	ULFT/Rebate (USBR)	4650	700			08/18/94	10/18/95	26	255	$80,000	$314	$42,000	53%
125		West Covina	Residential Water Audits (USBR)	Pending			208 audits	Pending		81	405	$21,000	$52	$10,500	50%
126		So. Cal./San Dimas	Moisture-Sensor Installation (USBR)	4071			64 sensors	Pending				$22,600		$11,300	50%
127		So. Cal./Claremont	Moisture-Sensor Installation (USBR)	4074			15 sensors	Pending				$8,250		$4,125	50%
128		So. Cal./La Verne	Moisture-Sensor Installation (USBR)	4072			70 sensors	Pending				$41,100		$20,550	50%
129		Rowland	CII Survey Program (USBR)	Pending			26 surveys	Pending				$30,000		$15,000	50%
130	Torrance	Torrance	ULFT/$60 flat-rate w/CTSI	3781	5,000			12/17/93	02/17/95	39	386	$303,600	$787	$180,000	59%
131	Upper San Gab. Valley MWD	California-America	ULFT Rebate	3715	725			08/27/92	08/27/93 Ext.8/27/94	29	242	$88,200	$364	$37,268	42%
132		Valley County	ULFT Rebate	3931 Amendment	354	354		04/02/93 Pending	08/02/94 10/02/94	14	119 24	$43,160 ($3,080)	$363	$18,326	42%
133		Upper District	ULFT Rebate w/CTSI	3985	1,000			05/24/93	05/24/94	27	269	$126,000	$468	$60,000	48%
134			Landscape Water Audits (USBR)	Pending				Pending				$70,000		$35,000	50%
135		USGVMWD	Residential Water Audits USBR	Pending			1,361 audits			30	152		$0		
136		Upper District	ULFT Distribution CTSI / (USBR)	4729	2,661			11/29/94	11/29/95	97	970	$319,320	$329	$159,660	50%
137	Western MWD of Riverside County	Riverside	ULFT/? (USBR)	Pending	2,400			Pending		87	875	$240,000	$274	$144,000	60%
Total Costs/Savings for All Programs					1,125,635	521,695				63,203	362,987	$96,042,941	$265	$47,338,305	49%

APPENDIX C

COMMENTS & RESPONSES TO METROPOLITAN'S REGIONAL URBAN WATER MANAGEMENT PLAN

ASLA

August 24, 1995

Amy Gallaher, Associate Engineer
Metropolitan Water District of Southern California
Planning and Resources Division
350 South Grand Avenue
Los Angeles, CA 90071

SOUTHERN
CALIFORNIA
CHAPTER
AMERICAN
SOCIETY OF
LANDSCAPE
ARCHITECTS
1100 IRVINE BLVD
SUITE 371
TUSTIN
CALIFORNIA
92680-3596
714 838-3615

Dear Amy,

Thank you for the opportunity to submit these comments regarding the Final Draft of Regional Urban Water Management Plan for the Metropolitan Water District of Southern California that was completed in July of this year. The Southern California Chapter of the American Society of Landscape Architects is highly interested in this Plan and would like to contribute to its development. Our task force on landscape water conservation has reviewed the Draft Plan and recommend the addition of five specific points that can add to the quality and effectiveness you landscape conservation program. These points are summarized below and are explained as briefly as possible. We would be happy to respond to any questions you might have.

These comments address Section III, Demand-Side Management and Public Affairs Programs, which discuss the commitment to conservation. Additionally, most of these recommendations are directed to enhancing and advancing the commitment to landscape water conservation.

1. Metropolitan's Commitment to Conservation (p. 35). A fourth objective is recommended to help achieve even greater balance in achieving Metropolitan's water conservation program goal. Suggested wording for this fourth objective is:

- Encourage lifestyle choices and activities based on using water wisely.

Discussion:

Achieving and maintaining reliable water supplies through demand side management by adopting conservation goals and objectives should reflect the same MWD effort in achieving its Integrated Resource Planning Process. These goals and objectives need to be well balanced, unified and coordinated. In this regard, the first three objectives of this Plan help achieve the water conservation goal by stressing 'efficiency'. It is now time to evolve beyond the view of avoiding waste in existing practices, and to encourage a stronger attitude towards better choices affecting the use of water. This fourth objective connects this part of the plan to the positive nature of your slogan "Use Water Wisely; Its a Way of Life" that is key to the Public Affairs programs described in a later section.

2. Landscape Water Conservation Program (p.47) . MWD is encouraged to clarify its commitment to landscape water conservation use based upon a water budget approach for new and existing commercial, industrial, governmental and multifamily developments (BMP 6) by more clearly endorsing AB 325 and its value to water conservation. Both MWD and its member agencies are encouraged to support the following water budget guidelines for new and existing landscapes. Suggested language:

SOUTHERN CALIFORNIA CHAPTER AMERICAN SOCIETY OF LANDSCAPE ARCHITECTS
1100 IRVINE BLVD
SUITE 371
TUSTIN
CALIFORNIA
92680-3596
714 838-3615

- MWD recognizes the value of planning and managing both new and existing landscapes based upon defined water budgets.
- Water budgets for new landscapes should be based upon the adopted State Model Water Efficient Landscape Ordinance which establishes an annual water budget based upon 80% of the regional evapotranspiration of tall fescue turfgrass.
- Water use for existing landscapes should not exceed the total annual evaporation of moisture of its region.

Discussion:

Stronger language in the Urban Water Management Plan should be adopted by MWD in support of the implementation of AB 325, the California Water Conservation in Landscaping Act. This legislation led to the landmark model water conservation strategy to design and maintain landscapes based upon defined water budgets. Water budget planning helps to achieve new landscapes that have been conceived with the goal of water conservation in mind. This model ordinance was being drafted in 1991 at the same time as the Memorandum of Understanding and the 16 Best Management Practices. It has been endorsed by many stakeholders, including water agencies, and provides key details for several of the BMP's. MWD and its member agencies can provide

3. Landscape Water Conservation Program (p.47) . MWD is encouraged to clarify and expand its commitment to widely adopted xeriscape principles.

- Member agencies and cities are encouraged to apply the principles of xeriscaping in achieving beautiful and water efficient landscapes. Xeriscape principles include sound planning and design, limited turf areas, efficient irrigation, soil improvement, mulching, using low water use plants, and providing sound maintenance.

Discussion:

Stronger language in support of the xeriscape principles should be adopted by MWD. These principles have wide support and have proven to be cost-effective landscape water conservation practices. The language in the current Draft Plan cites the term xeriscape, but is non-committal and unclear as to their full value, and support of them by MWD.

4. Landscape Water Conservation Program (p.47). MWD is encouraged to express an interest in working with organizations and members of the green industry, such as landscape architects, contractors, manufacturers, suppliers and managers.

- The development and implementation of policies, goals, and actions for landscape water conservation can be enhanced through the interaction and participation of organizations and members of the green industry.

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Discussion:

In addition to participating in the Urban Water Conservation Council, highly productive and positive levels of progress in landscape water conservation can occur with task force groups and subcommittee meetings that bring water planners and the green industry participants together to achieve an integrated landscape water conservation plan.

5. Landscape Water Conservation Program (p.47). MWD is encouraged to clarify and expand its commitment to a more coherent and visible landscape education program.

- Education programs regarding landscape water conservation encourage the use of landscape water budget landscape practices and the application of the principles of xeriscaping. Such programs should also advance the slogan 'Use Water Wisely, It's a Way of Life' in an effort to positively influence people's thoughts about pursuing landscaping that are more appropriate to dry climate of Southern California and in identifying quality and interest in a waterwise lifestyle.

Discussion:

Appropriate water budgets for landscaping can now be established with CIMIS weather data to help guide designers and landscape managers in conserving water. Additionally, the widely accepted xeriscape principles are currently being practiced by many people within the green industry. The combination of water budget planning and application of the xeriscape principles are among the most important advances of the 1990's in the pursuit of attractive and water efficient landscapes. An educational program should be conceived with strong recognition and advancement of these practices. (Please note: On page 47, reference is made to CIMIS as a network of **10** weather stations. This is incorrect; there are **88** CIMIS weather stations in the DWR program).

ASLA

In conclusion, the Southern California Chapter of the American Society of Landscape Architects is committed to the goal of achieving landscapes that use water wisely. The Urban Water Management Plans prepared by the Metropolitan Water District and its member agencies address a number of issues of landscape water conservation and we are interested in contributing to the success of these Plans. We believe the six points described above should become part of the final 1995 Plan prepared by the MWD.

Again, thank you for the opportunity to submit these comments.

Sincerely,

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Bob Perry, Chair
Landscape Water Conservation Task Force
Southern California Chapter of the American Society of Landscape Architects

RESPONSE TO COMMENTS
SUBMITTED BY THE
SOUTHERN CALIFORNIA CHAPTER OF THE
AMERICAN SOCIETY OF LANDSCAPE ARCHITECTS

The response to Mr. Perry's comments is incorporated into the Regional Urban Water Management Plan, in the Demand-Side Management and Public Affairs Programs Chapter (Chapter III), as the first paragraph under the Landscape Conservation Program heading:

> The goal of the landscape program is to allow people to enjoy beautiful landscapes that do not consume more water than is necessary and to encourage lifestyle choices and activities that reflect the Metropolitan slogan "Use Water Wisely. It's a Way of Life". In an effort to reach this goal, Metropolitan has promoted landscape water budgeting similar to that described in the State Model Water Efficient Landscape Ordinance (AB 325), and it has encouraged member agencies and cities to support education programs that promote water efficient xeriscaping principles. Metropolitan has also actively sought the participation of organizations and members of the green industry in the development and implementation of policies, goals, and actions for landscape water conservation.

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West Basin Municipal Water District
17140 S. Avalon Blvd • Suite 210 • Carson, CA 90746-1218
telephone 310-217-2411 • fax 310-217-2414
From the office of Richard W. Atwater, General Manager

August 31, 1995

Ms. Debra Man, Chief, Planning and Resources
Metropolitan Water District
of Southern California
P. O. Box 54153, Terminal Annex
Los Angeles, CA 90054

Dear Debra:

Draft Regional Urban Water Management Plan

The WBMWD/CBMWD staff have reviewed MWD's draft *Urban Water Management Plan* and offer the following comments. The draft Plan is well organized and provides an excellent overview of MWD programs.

In general, it appears that the draft *Regional Urban Water Management Plan* does not include the elements described in MWD's *"A Way to Look into the Future Urban Water Management Plan - 1995 Update."* In addition, the draft Regional Plan does not meet the prescribed requirements of the Urban Water Management Planning Act (see enclosed requirements from MWD notebook for Water Code Sections 10631 and 10632). Below is a chapter by chapter review.

Chapter I - Introduction

We would suggest that the introduction chapter include an executive summary of the plan's recommendations.

Chapter II - Water Demands

A description of the current below normal retail demands, including the low MWD water deliveries should be included in this chapter. The analysis in MWD's *Long-Range Financial Plan* on forecasting MWD demands is an excellent analysis and it would seem that this should be included in Chapter II.

Chapter III - Demand-Side Management (Conservation) and Public Affairs Programs

This chapter summarizes the historic MWD conservation program activities well. However, the chapter does not describe future conservation programs. In addition, at the member agency workshop on August 24-25 it was agreed that MWD would prepare a five-year program budget for conservation. I would suggest that this be included in Chapter III. There is no discussion in this chapter of greywater and other new innovative water conservation programs. I would suggest that Chapter III include a discussion of potential BMPs and innovative conservation programs that may be implemented over the next 25 years (2020).

Chapter IV. Water Supplies

Table IV-1 is incorrect for CBMWD, Torrance, and WBMWD with regard to local production, because you have left out groundwater production in the Central Basin and West Coast Basin by private pumpers. Your statistics only include groundwater production by local retail water utilities.

Recycled water use information is not documented in sufficient detail in Chapter IV as required in Water Code Section 10632.(a)(1)A-F. It appears that the MWD draft UWMP does not meet the minimum requirements with regard to recycled water use: projected use of recycled water 5, 10, 15, and 20 years; a description of actions including financial incentives, which may be taken to encourage the use of recycled water and the projected results; a plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems; and a map of water recycling project distribution systems and areas served by recycled water would help. In addition, I would suggest a table listing all the wastewater treatment plants, and highlighting the wastewater plants that produce Title 22 tertiary recycled water and what percent at each plant is currently being put to beneficial use(Water Code 10632 (a)1A).

The SCAG Water Resources Element of the Regional Comprehensive Plan (pages 21-22) and Bulletin 160-93 have significantly different projections of water recycling use in Southern California than the draft *Regional Urban Water Management Plan.* Both of these plans were published less than a year ago. It also appears that your projected recycled water use forecasts are different than the draft WBMWD/CBMWD *Urban Water Management Plan*.

We would offer our assistance to MWD staff in meeting these recycled water use statutory requirements of an urban water management plan.

Chapter V - Water Supply Management Programs

This chapter is out of date with regard to the current IRP evaluation of local resource programs. The revisions to the Local Projects Program at the August MWD Board of Directors meeting should be included in the revised draft UWMP.

Table V-1 Water Used for Groundwater Replenishment

This table is incorrect in that it has left out historic interruptible in-lieu deliveries and seasonal storage in-lieu deliveries. I would suggest that local supplies for groundwater replenishment also be acknowledged in your table (see draft CBMWD/WBMWD *Urban Water Management Plan*, Chapter 6).

Chapter V - Water Supply Management Programs

The title of the chapter should be "Metropolitan's Water Supply Management Programs," since other activities like the U.S. Bureau of Reclamation's Title XVI grant funding of water recycling projects is not considered, nor are locally sponsored initiatives. (See discussion in SCAG's *Water Resources Element of the Regional Comprehensive Plan*, pages 61-62.)

Chapter VI - Pricing and Rate Structure

The draft *Long-Range Financial Plan* has an excellent description of the future increases in MWD's water rates and charges, I would suggest that a summary of future rates and charges be included in this chapter.

Table VI-4 1992-1993 Retail Water Prices in Southern California: This is out of date and current data should be utilized (e.g., Black and Veatch survey, see Appendix B of WBMWD/CBMWD draft *Urban Water Management Plan*).

Chapter VII - Short-Term

I would suggest including the recently enrolled bill, AB 1845 water supply reliability assessment, in this chapter. Also, the MWD adopted (1992) AB 11x Drought Contingency Plan should be referenced and discussed. The current IRP evaluation of a long-term drought plan (when completed in September) should also be discussed in this chapter.

Chapter VIII - Integrated Resources Plan

The IRP is not an adopted plan, but the *Regional Urban Water Management Plan* is a statutory requirement. What components of the IRP will be adopted in the *Regional Urban Water Management Plan*?

There is no evaluation of alternatives, or a description as suggested in your workbook of incremental costs of new water supplies (see page 45 of MWD workbook, Evaluation of Alternatives).

In addition, there is not a "short-term action plan" (e.g., five-year conservation program budget), or a "long-term action plan" in Chapter VIII. In fact, the draft *Urban Water Management Plan* does not discuss or propose any recommendations for the future. I would suggest that the draft *Regional Urban Water Management Plan* should include specific recommendations, both short-term and long-term.

If you have any questions about these comments on the Regional Urban Water Management Plan, please do not hesitate to contact me.

Sincerely,

Richard W. Atwater
General Manager

RWA:ctm c:\wp60\rich\mwduwmp.man

Enclosure

REQUIREMENTS OF SECTIONS 10631 and 10632
(IN MORE SENSIBLE ORDER)

Demand Projections

- Past, current, and projected water use, and to the extent records are available, a breakdown of those uses on the basis of single-family residential, multi-family residential, commercial, industrial, governmental, and agricultural use

Supply Description and Projections

- Describe the frequency and magnitude of supply deficiencies, based on available historic data and future project conditions comparing water supply and demand, including a description of deficiencies in time of drought and emergency and the ability to meet deficiencies.

- Exchanges or transfer of water on a short-term or long-term basis.

Conservation Program Descriptions

- Identify conservation measures currently adopted and being practiced ; Use CUWCC Report if filed as substitute.

- Describe any mandatory provisions to reduce water use that include prohibitions against specific wasteful practices, such as gutter flooding.

- Describe any penalties or charges for excessive use.

- Describe findings, actions, and planning relating to all of the following:

    1. Use of internal and external water audits or single-family residential, multi-family residential, institutional, commercial, industrial, and governmental customers, and the use of incentive programs to encourage customer audits and program participation.
    2. Use of distribution system water audits.
    3. Leak Detection and Repair.
    4. Use of large landscape water audits and incentives for conversion to water reuse.

- Describe "alternative conservation measures", including, but not limited, to consumer education, metering, water-saving fixtures and appliances, pool cover, lawn and garden irrigation techniques, and low water-use landscaping that would improve the efficiency of water use with an evaluation of their costs and their environmental and other significant impacts.

- Describe actions and planning to eliminate the use of once-through cooling systems, nonrecirculating water systems, and nonrecycling decorative water fountains, and to encourage the recirculation of water if proper public health and safety standards are maintained.

- To the extent feasible, describe the amount of water saved through water conservation measures employed by user groups.

- Provide a schedule of proposed implementation and what steps would be necessary to implement any proposed actions.

- Describe actions and plans to enforce conservation measures.

<u>Applies only if supplier is projecting a need for new supplies or expansion of existing supplies:</u>

- Evaluate management of water system pressures and peak demands.

- Evaluate issues relevant to meter retrofitting for all uses.

- Evaluate incentives to alter water use practices, including fixture and appliance retrofit programs

- Evaluate public information and education programs to promote wise use and eliminate waste.

- Evaluate changes in pricing, rate structures, and regulations.

<u>Urban Water Shortage Contingency Plan</u>

- An estimate of the minimum water supply available at the end of 12, 24, and ~~24~~ 36 months, assuming the worst case water supply shortages.

- Stages of action to be undertaken by the urban water supplier in response to water supply shortages, including up to a 50 percent reduction in water supply, and an outline of specific water supply conditions that are applicable to each stage.

- Consumption limits in the most restrictive stages. Each urban water supplier may use any type of consumption limit in its water shortage contingency plan that would reduce water use and is appropriate for its area. Examples of consumption limits that may be used include, but are not limited to, percentage reductions in water allotments, per capita allocations, an increasing block rate schedule for high usage of water with incentives for conservation, or restriction on specific uses.

- An analysis of the impacts of the plan on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts, such as the development of reserves and rate adjustments.

- A draft water shortage contingency resolution or ordinance to carry out the urban water shortage contingency plan.

- A mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency plan.

Reclamation or "Recycled Water" Program Descriptions
(applies only if supplier needs to find new sources of supply or expand existing supply)

- Provide information on recycled water and its potential for use as a water source in the service area of the urban water supplier, as follows:.

- Describe the waste water collection and treatment systems in the supplier's service area, including a quantification of the amount of water collected and treated and the methods of waste water disposal.

- Describe the recycled water currently being used in the supplier's service area, including, but not limited to the type, place, and quantity of use.

- Describe and quantify the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, and other appropriate uses, and a determination with regard to the technical and economic feasibility o service those uses.

- The projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years.

- A description of actions, including financial incentives, which may be taken to encourage the use of recycled water where fresh water is not necessary, and the projected results of these actions in terms of acre-feet of recycled water used per year.

- A plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems and to promote recirculating uses.

- Provide a schedule of proposed implementation and what steps would be necessary to implement any proposed actions.

- Describe actions and plans to enforce reclamation measures.

Evaluation Requirements

- To the extent feasible, describe the method which will be used to evaluate the effectiveness of each conservation and reclamation measure implemented under the plan.

- To the extent feasible, describe the amount of water saved through water conservation and reclamation measures employed by user groups.

Adoption of Plan (also see Sections 10640 through 10645)

- Describe actions and planning to ensure the involvement of community members within the service area with regard to water management planning.

- Coordinate the preparation of the plan with local water, waste water, and planning agencies.

RESPONSES TO COMMENTS SUBMITTED BY WEST BASIN MWD

Chapter I - Introduction

Comment: Suggest that the introduction include an executive summary of the plan's recommendations.

Response: The key recommendation in Metropolitan's water resources plan is to implement the Preferred Resource Mix that was identified through the Integrated Resource Planning (IRP) process. As such, we have incorporated the recently adopted reliability goal, the Preferred Resource Mix and the water management principles in the section describing the IRP. In addition, we have incorporated a description of the Board's upcoming actions on the water management programs, and the water supply and drought management plan.

Chapter II - Water Demands

Comment: A description of the current below normal demands, including the low MWD water deliveries should be included in this chapter. The analysis in MWD's Long-Range Financial Plan on forecasting MWD demands is an excellent analysis and it would seem that this should be included in Chapter II.

Response: The same forecasting methodology is used in forecasting regional water demands in the RUWMP and the Long-Range Financial Plan. The current low retail demands and MWD deliveries are mentioned on page 19 of the draft RUWMP. The low ranges of water demand projections, however, were not included in the RUWMP because the focus of the RUWMP is Metropolitan's and the region's ability to meet water demands during dry periods. This contrasts with the focus of the analysis in MWD's Long-Range Financial Plan, which is to evaluate the financial impacts associated with future variations in Metropolitan's water sales.

Chapter III - Demand-side Management (Conservation) and Public Affairs Programs

Comment: At the member agency workshop on August 24-25 it was agreed that MWD would prepare a five-year program budget for conservation. I would suggest that this be included in Chapter III.

Response: We are not able to include a five-year program budget in the RUWMP as Metropolitan is still in the process of developing such a budget. The process and plan to prepare the five-year program budget, however, is referenced in the RUWMP.

Comment: I would suggest that Chapter III include a discussion of potential BMPs and innovative conservation programs that may be implemented over the next 25 years.

Response: A list of potential BMPs and innovative conservation programs have been incorporated.

Chapter IV - Water Supplies

Comment: Table IV-1 is incorrect for CBMWD, Torrance, and WBMWD with regard to local production, because you have left out groundwater production in the Central Basin and West Cost Basin by private pumpers..

Response: Table IV-1 has been revised to include the production by private pumpers.

Comment: Recycled water use information is not documented in sufficient detail in Chapter IV as required in Water Code Section 10632 (a) (1) A-F. It appears that the MWD draft RUWMP does not meet the minimum requirements with regard to recycled water use:

1) The projected use of recycled water at the end of 5, 10, 15, and 20 years.

Response: The draft RUWMP included the targeted recycled water use for the year 2000 and 2020 under the description of the Preferred Resource Mix in Chapter VIII. The additional information regarding intermediate year targets has been incorporated into the section. A reference to Chapter VIII has also been added to the reclaimed water section in Chapter IV.

2) A description of actions including financial incentives to encourage the use of recycled water.

Response: Chapter IV of the draft RUWMP referenced the description of Metropolitan's Local Projects Program that is discussed in Chapter V under Metropolitan's Water Supply Management Program.

3) A plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems.

Response: Metropolitan's primary tools to encourage the use of recycled water are the Local Projects Program and the design and implementation of wholesale water rates to encourage efficient water use and local water development. The determination of Metropolitan's contribution under the Local Projects Program takes into account the costs of installation of dual distribution systems to program participants.

4) I would suggest to include a map of water recycling project distribution systems and areas served by recycled water; a table listing all wastewater treatment plants, and highlighting the plants that produce Title 22 tertiary recycled water and what percent at each plant is currently being put to beneficial use (Water Code 10632 (a) 1 A).

Response: The draft RUWMP lists the projects under Metropolitan's Local Projects Program. We believe that detailed project distribution systems and service areas are best described in Urban Water Management Plans prepared by local agencies. This suggested information would be useful, but unfortunately not readily available for the entire Metropolitan service area at this time. As you have suggested, Metropolitan will collect the data from local water agencies' Urban Water Management Plans and other sources for the next RUWMP update.

Comment: The SCAG Water Resources Element of the Regional Comprehensive Plan (pages 21-22) and Bulletin 160-93 have significantly different projection so water recycling use in Southern California than the draft RUWMP.

Response: All the planning documents reflect the information available at the time they were prepared. This leads to differences in projections at different times. The draft RUWMP is using the resources targets identified at the March 1995 IRP Assembly and the reliability goal and Preferred Resource Mix targets adopted by Metropolitan's Board in June 1995. The SCAG Regional Comprehensive Plan and DWR Bulletin 160-93 were both released for public review in December 1993. The review period for both documents "closed" in February 1994. At that time, Metropolitan and its member agencies had not developed the Preferred Resource Mix.

Chapter V - Water Supply Management Programs

Comment: The revisions to the Local Projects Program at the August MWD Board of Directors meeting should be included in the revised RUWMP.

Response: A summary of the August Board action has been incorporated into the LPP section.

Comment: Table V-1 left out historic interruptible in-lieu deliveries and seasonal storage in-lieu deliveries.

Response: Table V-1 has been corrected.

Comment: The title of the chapter should be "Metropolitan's Water Supply Management Programs", since other activities like the US Bureau of Reclamation's and locally sponsored initiatives are not included.

Response: The title has been changed as suggested.

Chapter VI - Pricing and Rate Structure

Comment: I would suggest that a summary of future rates and charges be included in this chapter.

Response: Metropolitan's future rates and charges have been included as suggested.

Comment: Table VI-4 1992-93 Retail Water Prices in Southern California is out of date, and current data should be utilized.

Response: The 1992-93 water prices were collected directly from our member agencies and subagencies as part of the effort in developing Metropolitan's Interim No. 5 M & I water demand projections. Although the water rates were adopted during 1992 and 1993, the rates were not effective until 1994 for some agencies. These water rates data have been weighted for population served by each agency. The data also covers water agencies serving over 65 percent of the population within Metropolitan's service area. The data Metropolitan collected includes the marginal data (block structure) of each agency; while the Black & Veatch report did not publish the block structure of each agency. The information is needed to calculate the average marginal charge. This data, although a year older than the more recent Black & Veatch survey, provides a more useful perspective of water rates of the six-county service area. (Table VI-4 in the final RUWMP has been revised to incorporate

LADWP's water rates and corrected for errors discovered after the printing of the draft.)

Chapter VII - Short-Term Drought Management

Comment: I would suggest including the recently enrolled bill AB 1845 water supply reliability assessment in this chapter.

Response: The adoption of a reliability goal by Metropolitan's Board, which is described in Chapter VIII, has in effect provided a water supply reliability assessment for Metropolitan's water resource plan. Due to timing issues, and the fact that the assessment in the format specified in AB 1845 is not required for UWMPs prepared prior to January 1, 1996 per SB 1011, we have not revised this section.

Comment: The MWD adopted (1992) AB 11x Drought Contingency Plan should be referenced and discussed.

Response: The adopted 1992 Drought Plan is discussed under the section titled "1990-1992 Drought Action Plan". The reference to the adopted document and AB 11x has been added to the section as suggested.

Comment: The current IRP evaluation of a long-term drought plan (when completed in September) should also be discussed in this chapter.

Response: The RUWMP discusses the principles to be utilized in developing a drought management plan. The principles were developed under the IRP process. While the initial analyses and proposals for a long-term drought plan have been considered, no single proposal has been adopted by the Board. The RUWMP discusses the process and Board action for completing the long-term drought plan.

Chapter VIII - Integrated Resource Plan

Comment: The IRP is not an adopted plan, but the RUWMP is a statutory requirement. What components of the IRP will be adopted in the RUWMP?

Response: The adopted reliability goal, Preferred Resource Mix, and principles to water management programs and water conservation have been incorporated and within the RUWMP.

Comment: There is no evaluation of alternatives, or a description as suggested in your workbook of incremental costs of new water supplies.

Response: The description of the IRP process includes defining feasible alternative resource mixes as part of the development of a Preferred Resource Mix. This discussion provides insight into Metropolitan's evaluation of alternatives from a regional perspective. A description of incremental costs of new water supplies is included in the description of the development of the Preferred Resource Mix and graphically represented in Figure VIII-3. The evaluation and approach by a local water agency may be different.

Comment: There is not a "short-term action plan", or a "long-term action plan" in Chapter VIII.

Response: The upcoming Board actions on the various water supply management programs, together with the five-year budget and targeted yield for each resource would constitute a "short-term action plan." The "long-term action plan" is to maintain a valid IRP (with revisions to resource targets, implementation tools as conditions change) through the collaborative efforts of Metropolitan and its member agencies. These thoughts have been incorporated in the Introduction and Chapter VIII of the RUWMP.