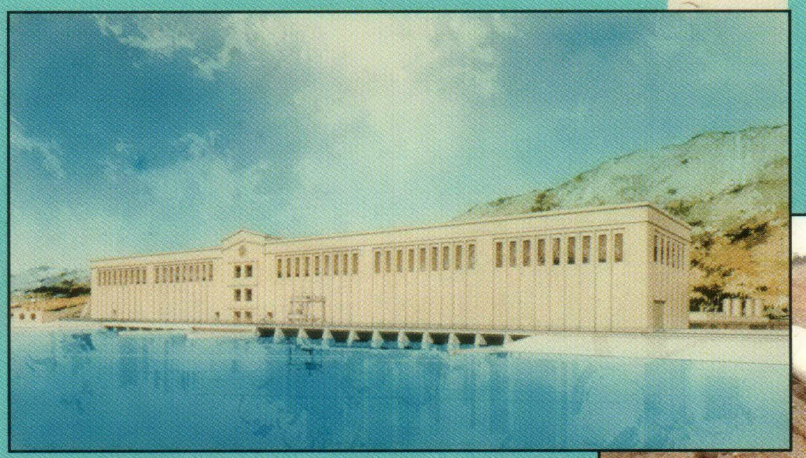

Southern California's Integrated Water Resources Plan

Volume 2: Metropolitan's System Overview

Report Number 1107
March 1996

MWD
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

SOUTHERN CALIFORNIA'S INTEGRATED WATER RESOURCES PLAN

Volume 2: Metropolitan's System Overview Study

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Report No. 1107

March 1996

FOREWORD

There is no resource more important to the economic and social well-being of Southern California than water. In 1996, the Metropolitan Water District of Southern California (Metropolitan) celebrates 55 years of service providing imported water to a region comprising half of the population, jobs, and business of the State of California. Looking back, we can take great pride in accomplishments that are unparalleled in the water industry. And yet, there is little time to look backward. Particularly, when the future looks so different from the past.

During the last three years, Metropolitan, its member agencies, groundwater basin management agencies, and other water providers have participated in the development of an Integrated Resources Plan (IRP). This plan represents a dramatic shift in the way we look at water management now and into the future. It replaces exclusive dependence on Metropolitan for supplemental water with coordinated approaches developed in conjunction with local resources. It implements water conservation measures together with new supplies. And it searches for solutions that offer long-term reliability at the lowest possible cost to the region as a whole.

This change did not occur overnight. Since the 1980s, Metropolitan has gradually shifted from an exclusive supplier of imported water to becoming a regional water manager — providing not only imported water, but also supporting local resource development, conservation, and seasonal storage. The IRP represents the fulfillment of this new role for Metropolitan and the recognition that meeting Southern California's future water needs is a shared responsibility among many water providers.

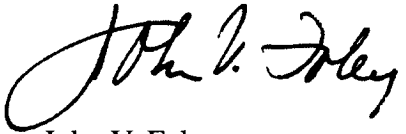
The IRP represents both a process and a plan. As a process, it broke new ground in communication among the many water agencies and providers in the region. Most importantly, the process achieved the coordination of hundreds of important initiatives and projects that were being undertaken throughout Southern California. As a plan, it explicitly linked future supply reliability with the necessary resource and capital investments.

This report documents the product of this process and sets targets for improvements in every area of demand management and water supplies available to the region. It presents Metropolitan's commitments, as well as the contributions expected from local water providers. It is a picture of where we are today and a vision for where we want to be in the future. Through the coming years, it will be an important yardstick against which we can measure our progress and adjust our plans.

In January of 1996, Metropolitan's Board of Directors approved the IRP as a planning guideline to be used for resources and capital facility investments. We expect that adjustments to this plan will be necessary. In fact, the only certainty with long-range planning is that the future is often unpredictable and never exactly what was projected.

For this reason, the most important message of the IRP is that the water providers of Southern California must continue to work together in a collaborative open process of management and wise stewardship of our water and financial resources. Frequently, the competition for water leads to conflict and disagreement. That fact will likely never change. On the other hand, the IRP process has demonstrated that it is economically prudent to look for ways to replace conflict with cooperation, good intentions with commitments, and fragmented efforts with coordinated plans.

We congratulate the many hundreds of participants and contributors to this Integrated Resources Plan for their sustained level of effort. For Metropolitan's part, we pledge to fulfill our commitments to the IRP and will continue to participate in a new era of collaborative water management for Southern California.



John V. Foley
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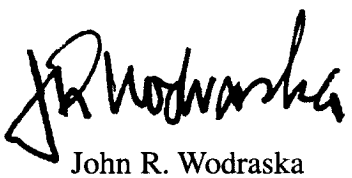

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The consensus reached during the Integrated Resources Planning (IRP) process could not have been possible without the dedication of the participants of the IRP Workgroup, comprising of staff from Metropolitan, general managers and staff from Metropolitan's member agencies and sub-agencies, general managers and staff from the major groundwater basin management agencies, and technical consultants.

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SOUTHERN CALIFORNIA'S INTEGRATED WATER RESOURCES PLAN
VOLUME 2: METROPOLITAN'S SYSTEM OVERVIEW

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LIST OF ACRONYMS/ABBREVIATIONS

AF	acre feet
AFY	acre feet per year
AGWA	Association of Groundwater Agencies
AMP	Allen-McColloch Pipeline
Authority	San Diego County Water Autority
BMPs	Best Management Practices
Board	Metropolitan Water District Board of Directors
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CIP	capital improvement program
CPA	Central Pool Augmentation
CRA	Colorado River Aqueduct
CUWA	California Urban Water Agencies
CVP	Central Valley Project
D-1485	State Water Resources Control Board Water Right Decision 1485
D-1630	State Water Resources Control Board Water Right Decision 1630 (Draft)
DBP	disinfection by-product
Delta	Sacramento - San Joaquin Delta
DSAUs	Distribution System Analysis Units
DWR	California Department of Water Resources
EPA	California Environmental Protection Agency
ERP	Eastside Reservoir Project
ESA	Endangered Species Act
gpd	gallons per day
GPCD	gallons per capita per day

LIST OF ACRONYMS/ABBREVIATIONS (Continued)

GRP	Groundwater Recovery Program
IID	Imperial Irrigation District
IRP	Integrated Resources Planning
IRPSIM	Integrated Resources Planning Simulation Model
IWR-MAIN	U.S. Army Corps of Engineers' Institute for Water Resources Municipal and Industrial Needs
LAA	Los Angeles Aqueduct
LAAFP	Los Angeles Aqueduct Filtration Plant
LADWP	Los Angeles Department of Water and Power
LPP	Local Projects Program
LRP	Local Resources Program
M&I	municipal and industrial
MAF	million acre feet
MAFY	million acre feet per year
MCAS	Marine Corps Air Station
Metropolitan	Metropolitan Water District of Southern California
MOU	Memorandum of Understanding Regarding Urban Water Conservation in California
MWD	Metropolitan Water District of Southern California
MWD-MAIN	IWR-MAIN modified for Metropolitan's service area
MWDOC	Metropolitan Water District of Orange County
NDC	new demand charge
NEPA	National Environmental Policy Act
O&M	operations and maintenance
PAYGO	Pay-As-You-Go Fund
RCP	SCAG's Regional Comprehensive Plan

LIST OF ACRONYMS/ABBREVIATIONS (Continued)

RTS	readiness-to-serve charge
RWQCB	Regional Water Quality Control Board
SANDAG	San Diego Association of Governments
SCAG	Southern California Association of Governments
SCP	South County Pipeline
SDCWA	San Diego County Water Authority
SSS	Seasonal Storage Service
Stabilization Fund	Water Rate Stabilization Fund
SWP	State Water Project
SWRCB	State Water Resources Control Board
THMs	trihalomethanes
TDS	total dissolved solids
U.S. EPA	United States Environmental Protection Agency
WTP	water treatment plant

SECTION 1 – INTRODUCTION

Focusing on the Metropolitan Water District of Southern California's (Metropolitan) infrastructure requirements, this report is the second in a series of three reports comprising *Southern California's Integrated Water Resources Plan* documentation. This report summarizes Metropolitan's policy issues and guidelines as they relate to the planning and development of Metropolitan's infrastructure requirements; presents projected water supplies and demands in Metropolitan's service area; describes the existing treatment and distribution system facilities; describes the methodology used to determine additional infrastructure requirements; and identifies alternatives for system improvements required to meet water supply reliability, water quality goals, and service objectives and policies. The report also presents the capital improvement program (CIP), proposed capital expenditures, and schedule for projects needed to meet Metropolitan's service objectives and policies.

PURPOSE AND OBJECTIVES

In 1988 Metropolitan prepared the *System Overview Study,* which projected demands; evaluated and identified long-term needs for new raw and treated water distribution facilities; and estimated costs, priorities, and schedules for the specific facilities identified in the study. The study was intended as a planning tool to guide financial planning efforts and future studies, and was intended to be periodically updated.

Since the completion of the *System Overview Study,* Metropolitan's Board of Directors (Board) adopted 12 broad goals to guide Metropolitan's efforts in the areas of water supply and reliability, water quality, environment, cost, water resources, financial matters, land resources, facility planning, personnel, legal representation, organization, and health and safety (October 1992). To accomplish the goals and objectives set forth by the Board, Metropolitan and its member agencies embarked on a 2½-year Integrated Resources Planning (IRP) process. Through the IRP, a "Preferred Resource Mix" was developed, balancing future investments in local and imported resources. In June 1995 Metropolitan's Board adopted the approach of the IRP and reaffirmed its reliability goal.

The purpose of this report is to update and supplement the information presented in the *System Overview Study* by incorporating the broader policies and goals established by the Board and the IRP. Specifically, the objectives of this report are to:

- Summarize guidelines for Metropolitan's infrastructure improvements and their relationship to the IRP;
- Summarize water supply and demand projections developed through the IRP process for Metropolitan's service area;
- Describe Metropolitan's existing system facilities;
- Determine if additional facilities are required to meet the level of demands projected through the IRP;
- Recommend system improvement alternatives based on the identified needs and the overall water supply planning goals formulated by Metropolitan in its IRP process;
- Identify other capital improvements, such as those needed to meet water quality goals and those needed to maintain delivery system reliability;
- Present the CIP, incorporating the estimated costs and schedules for implementing the identified improvement alternatives; and
- Summarize Metropolitan's effective water rates based on a proposed CIP.

The process of planning improvements to Metropolitan's regional distribution system is dynamic and continuous. Numerous factors contribute to the demands on Metropolitan's system, including the region's population and its characteristics, industry mix, economy, conservation, and availability of local water supplies. Consequently, as forecasts of these factors change, Metropolitan periodically updates its water supply and demand estimates. In turn, Metropolitan adjusts its plan for system improvements.

Because Metropolitan's planning process is dynamic, it is impossible for this report to recommend a definitive long-term plan for the capacity and timing of needed distribution system improvements. Rather, this report presents a general guideline for system improvements based on a "snap shot" in time of the overall planning process. All of the analyses and findings contained in this report are based on data and conditions as of March 1996.

GUIDELINES FOR METROPOLITAN'S INFRASTRUCTURE IMPROVEMENTS

In planning its CIP, Metropolitan incorporated broad guidelines established by the Board and the IRP. These guidelines are organized under seven guiding principles, covering the general areas of water, cost, finance, facilities, environment, workforce, and interdependence. These guidelines are summarized in detail in Section 2 of this report and include the following:

Water Supply and Quality

- Provide adequate and reliable supplies of high-quality water throughout the service area to meet current and future needs;
- Meet all of the region's firm wholesale demands in 98 of 100 years (only during the remaining time would Metropolitan consider implementing a shortage allocation plan for firm imported supplies);
- For emergency use, maintain a supply of water in surface storage west of the San Andreas Fault to meet 75% of normal demand for 6 months; and
- Achieve full compliance with primary drinking water standards 100% of the time.

Cost

- Implement only facility improvement projects that demonstrate cost effectiveness.

Finance

- Plan the CIP to ensure consistency with financial limitations, including the assessed valuation limit, debt-to-equity ratio limit, and revenue bond-debt cap; and
- Plan the CIP to hold increases in rates and charges to approximately 6% annually and to hold the maximum effective rate for water service to $500 per acre-foot until 2005.

Facilities

- Develop facilities to maintain consistency with Metropolitan's mission, giving current and potential future system and process needs highest priority and assuring internal efficiency and long-term compatibility of all site elements;
- Provide water delivery at or near the boundary of each member agency and, where practical and economical, provide multiple water delivery routes to all parts of the service area;
- Implement only facility improvement projects that provide benefits to the region as a whole;

- Provide treated water service to each member agency in the capacity as determined through consideration of cost and practicality;
- Ensure that proposed new facilities fit into a long-term development strategy that is economical and flexible to change;
- Plan and design distribution system facilities to meet the peak-week average retail demands, with demands less than 1 week met by local agencies;
- Plan and design for transverse capacity in pipelines by sizing based on economies of scale and long-term projections of need; and
- Take reasonable and appropriate action to maintain minimum hydraulic pressure in the distribution system, although specific hydraulic pressures at each service connection are not guaranteed.

Environment

- Fully comply with all applicable state and federal environmental regulations and consider potential environmental impacts early in the initial project planning phase;
- Plan and develop facilities for consistency with adopted regional growth management plans; and
- Plan and develop facilities to minimize impacts to communities and the environment, to create a positive public image, and to assure safety and security.

Workforce

- Plan and develop support facilities to improve the physical work environment and minimize physical constraints to improved productivity.

Interdependence

- Encourage the close coordination of Metropolitan's facility improvement plans with those of its member agencies.

REPORT ORGANIZATION

Southern California's Integrated Water Resources Plan documents are organized in three report volumes:

- *Volume 1: The Long-Term Resources Plan*
- *Volume 2: Metropolitan's System Overview*
- *Volume 3: Technical Appendices*

Volume 1: The Long-Term Resources Plan summarizes the purpose and reasons for embarking on the IRP effort. It presents the current water supply situation and defines the IRP process, reliability goals, and evaluation criteria used in the study. This volume also outlines the framework used to reach a broad consensus on regional water resource development targets, how to implement the IRP, the necessary commitment to partnership within the region, and policy issues to be tackled as a result of the IRP process.

This report, *Volume 2: Metropolitan's System Overview,* is organized in six sections. Following this introduction, Section 2 presents guidelines related to the development of Metropolitan infrastructure improvements. Section 3 describes the water supplies and demands developed for the Preferred Resource Mix identified through the IRP. Projected population, regional water demands, local supplies, and demands supplied by Metropolitan are presented. Section 4 discusses Metropolitan's major existing system facilities and system demands, and identifies the need for additional regional water management, water treatment, and water distribution. This section also addresses storage needs for both surface water supplies and for conjunctive use of groundwater. Section 5 discusses proposed system improvement alternatives including water conveyance facilities, additional filtration plant capacity, regional water management facilities, conjunctive-use of groundwater, and other facilities required to meet the goals and objectives of the Strategic Plan and IRP. Section 6 presents Metropolitan's proposed capital expenditures, cost estimates, and project schedules for capital projects identified in Section 5. It also briefly describes effective water rates and their sensitivity to projected water sales.

Volume 3: Technical Appendices contains technical information used throughout the IRP process. Population and water demand projections, groundwater production and storage data, local surface production, reclamation, and groundwater recovery projects are summarized. Imported State Water Project (SWP) and Colorado River Aqueduct (CRA) supplies are delineated. The water resources assumptions are addressed, and the IRPSIM computer model assumptions and procedures are discussed.

SECTION 2 – GUIDELINES FOR METROPOLITAN'S INFRASTRUCTURE IMPROVEMENTS

Over the years, Metropolitan has adopted numerous guidelines that define its responsibility to provide an imported water service and the necessary regional infrastructure to meet its basic service obligation. These guidelines have been adopted as policy in the Metropolitan Water District Act (MWD Act) and Administrative Code, through Board actions and policy statements, and through widely accepted facility planning criteria and guidelines.

This section summarizes the guidelines that affect the planning and development of Metropolitan's infrastructure, including adopted policy as well as unofficial goals and objectives.

GENERAL GUIDELINES

Metropolitan's first general policy statement, dated January 9, 1931, stated Metropolitan's basic service objective as: "[w]ater will be made available to all areas within the District in accordance with their requirements, domestic use being the dominant use." The policy statement also made general reference to supplying the region in the most effective and economical manner and in "the best interest of the area taken as a unit."

In 1992 the Board adopted a mission statement that encapsulates the many policies, guidelines, and objectives of Metropolitan that have evolved since the first policy statement of 1931. As stated in the Administrative Code (§4201), "[t]he mission of the Metropolitan Water District of Southern California is 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."

Following adoption of the mission statement, the board adopted the following 12 goals that define the accomplishment of Metropolitan's mission:

- Water Supply and Reliability Goal that sets forth specific parameters for achieving a reliable supply of water;
- Water Quality Goal to assure delivery of safe water supplies that meet or exceed standards and assure customer satisfaction;

- Environmental Goal to assure adequate consideration of environmental effects and appropriate mitigation of its activities;
- Cost Goal to assure operation in a cost-effective manner;
- Water Resource Goal to reserve additional developed water supplies in California for urban use;
- Financial Goal to assure stable water rates;
- Land Resource Goal to assure cost-effective acquisition, management, and disposal of real property;
- Facilities Planning and Development Goal to assure the provision of needed facilities and involve member agencies in the planning thereof;
- Personnel Goal to recruit and retain a quality staff that reflects the diversity of the service area;
- Legal Representation Goal to vigorously protect Metropolitan's legal interests;
- Organizational Goal to maintain adequate systems of internal controls; and
- Health and Safety Goal to maintain a safe and healthful working environment.

Following adoption of the Board goal's, Metropolitan embarked on the development of guiding principles that chart a course for fulfilling the Metropolitan mission and that serve as broad statements of Metropolitan's aspirations for the future. The guiding principles address the following seven general areas:

- Water: Establishes a level of service to provide a reliable water supply for Southern California, a collaborative IRP process, and water quality commitments;
- Cost: Commits Metropolitan to increased efficiency and productivity and cost-effective operations;
- Finance: Establishes a program to maintain financial stability and integrate financial planning with the IRP in establishing an equitable rate structure;
- Facilities: Addresses the CIP, operations and maintenance programs, Metropolitan's real property management, and the health and safety requirements for facilities;

- Environment: Establishes an approach to integrating environmental values and awareness into Metropolitan's decision making and makes a commitment to provide water to accommodate regional growth;
- Workforce: Establishes a commitment to maintain a well-qualified workforce that is representative of the service area and provides an efficient, cost-effective personnel system; and
- Interdependence: Commits Metropolitan to working cooperatively with member agencies to provide a reliable water supply for Southern California in an interdependent manner, including development of an appropriate IRP and operational strategies.

In addition to Metropolitan's mission statement, the adopted Board goals, and the guiding principles, four basic business principles were discussed during the IRP public assemblies to guide Metropolitan and its member agencies in the implementation of the IRP and resulting water management programs and capital investments. These principles are:

- Financial Integrity: Investments by Metropolitan, member agencies, and other water providers resulting from the IRP should be accompanied by a mutual commitment of reliable revenue sources that recover the fixed-capital and nonvariable operating costs of those investments.
- 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 delivery system and investments.
- Equity and Value: Metropolitan's rates 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 and the value of benefits provided. A clear connection must be established between financial incentives and the benefit to the region.
- Operating Integrity: The operating integrity of Metropolitan's distribution system should be maintained. The use of this delivery system for the transmission of non-Metropolitan supplies (wheeling) should be provided as long as there is no reduction in service (including water quality or capacity) to any member agency. Wheeling must not adversely impact the rates and charges to any other member agencies now or in the future.

The following subsections discuss the policy issues under each of the seven guiding principles as they relate to the planning and development of Metropolitan's infrastructure.

WATER

Metropolitan is dedicated to the development and management of sufficient and wholesome water in an innovative, cost-effective, and environmentally sound manner that will sustain the economy and quality of life in Southern California; it will accomplish this goal through collaborative stewardship with other water users in California and the western states.

This guiding principle sets the framework for Metropolitan's policies and guidelines of providing adequate water supplies for the region, maintaining water supply reliability, and ensuring acceptable water quality.

Water Supply

The Administrative Code incorporates a major policy statement on Metropolitan's obligation to supply water to the region. The statement, known as the Laguna Declaration (MWD Administrative Code §4202), states that Metropolitan will provide its service area with adequate supplies of water to meet increasing needs in the years ahead. The objective of ensuring a sufficient imported water supply for the region is to avoid the development of overlapping and parallel water distribution facilities, thus avoiding wasteful and unnecessary financial burdens on the public. The effect of this statement is that Metropolitan's infrastructure must be planned and implemented in a manner that permits orderly and economic enhancements of the distribution system to deliver imported water as required in future years.

While facilities may be planned for extension of service to new areas, it is Metropolitan's policy not to supply areas outside Metropolitan's boundaries, except as approved by the Board (MWD Administrative Code §4200 and §4509).

Water Supply Reliability

Reliability of Regular Deliveries

While the Laguna Declaration defines Metropolitan's obligation to serve imported water to the region, it does not define to what level of service. In 1993 the Board adopted a reliability goal that provides a signal when additional resources will be required in the region's supply plan. Equally important, the goal serves as a planning tool in determining when "enough is enough" — that is, when additional expenditures in water supplies and infrastructure would constitute an overinvestment in reliability and unnecessary increases in water rates.

The adopted reliability goal states that Metropolitan will meet all of its firm wholesale demands in 98 of 100 years and only during the remaining time consider implementing a shortage allocation plan. This reliability goal does not commit Metropolitan to delivery of water in excess of need, even though member agencies' service connection capacities generally provide for greater delivery capacity.

In interpreting the reliability goal, it is important to understand that Metropolitan provides different levels of service to its member agencies. Some deliveries of imported water are for firm (or basic) consumptive needs, while others are for non-firm storage (or replenishment needs). Firm deliveries are the most important because they impact the retail-level demands for local agencies. In contrast, non-firm storage needs may be interrupted during dry years with little or no impact to retail-level demands.

The reliability goal was the starting point for the IRP process. During this process, Metropolitan, its member agencies and sub-agencies and groundwater management agencies, evaluated whether this goal was achievable and at what cost. A Preferred Resource Mix, which balanced future investments in demand-side management, local resources, and imported supplies, was developed to meet the region's reliability goal. This Preferred Resource Mix has several advantages: (1) it represents the least-cost plan to the region, (2) it diversifies investments in order to reduce risk, and (3) it is flexible and can adapt to changing conditions. During the IRP process, the question was often raised concerning how Metropolitan's reliability goal affects local retail supply reliability. Although Metropolitan cannot adopt local agency reliability goals, the IRP does provide the framework for assessing regionwide reliability. The participants of the IRP process, which included local agencies, have endorsed the following regional reliability message:

Through the implementation of the Integrated Resources Plan Metropolitan and its member agencies have the full capability to meet all of the region's retail-level demands.

This full capability can be achieved by voluntary water transfers and coordinated local water management. The IRP provides the foundation for each individual local agency to contribute to providing 100% reliability.

Reliability in Emergencies

In addition to maintaining minimum levels of service for the regular delivery of water supplies, Metropolitan has established a guideline for maintaining delivery after a worst-case catastrophic earthquake scenario. In preparation for a major catastrophic event which could isolate Southern California from its essential imported water supplies, Metropolitan's objective is to provide water storage facilities within the region to provide a 6-month water supply under normal hydrologic conditions.

This guideline assumes a 25% reduction in average annual regional demands over the 6-month outage period due to the imposition of emergency conservation measures. The guideline also assumes that the production of local water would continue unimpaired during the emergency. Importation of water through the Los Angeles Aqueduct, however, is assumed to cease along with the SWP and CRA deliveries. Consequently, it is assumed that some additional demands on Metropolitan would occur during the outage period to offset the loss of the Los Angeles Aqueduct.

Water Quality

Drinking Water Quality

Metropolitan has a strong commitment to provide water of a quality that is desirable to its customers and meets federal and state standards. Of utmost importance to the public's satisfaction with drinking water is the guarantee that it is safe to drink. To this end, Metropolitan has adopted the objective that its treated water facilities achieve full compliance with primary drinking water standards 100% of the time.

Consequently, as the rapid pace of new drinking water regulation continues, Metropolitan must anticipate the treatment requirements that are likely to be required and plan its facilities accordingly. Additionally, aesthetic measures such as taste, odor, and mineral content, while not regulated under primary drinking water standards, are widely perceived by the public as indicators of the quality and healthfulness of their water. Thus, Metropolitan's treated water facilities must also consider the public's level of satisfaction with the apparent quality of the drinking water and the willingness to pay for improvement in aesthetic parameters.

Total Dissolved Solids

Beyond meeting primary drinking water regulations, Metropolitan must consider how all levels of constituents in its imported waters may ultimately affect the local water supplies and end users. The constituent of greatest concern is the total dissolved solids (TDS) concentration of Metropolitan's State Water Project and Colorado River sources. TDS concentration, while affecting such typical end users as municipal and industrial customers, can also greatly impact agricultural users and groundwater replenishment customers. More recently, the ability of agencies to market recycled water has become a TDS-related issue as well.

Because the TDS concentration of Colorado River water is substantially higher than that of the State Water Project, the issue of TDS in Metropolitan's imported water has historically been addressed through blending objectives. Even before the first deliveries of State Water Project supplies to Metropolitan, the MWD Act was amended to include the objective that, "to the extent determined to be reasonable and practical, not less than 50 percent of such blended water shall be water from the State Water Resources Development System," (MWD Act §136).

However, physical and operational limitations of Metropolitan's storage and distribution system facilities do not permit equal blending of supplies throughout the region. There are portions of the service area that can only receive 100% State Water Project supplies while other parts of the service area receive all or predominately all Colorado River supplies.

Within areas of the system receiving predominately Colorado River water, high TDS concentration is affecting the ability to use reclaimed water to irrigate landscaping and crops and the ability to replenish groundwater basins without exceeding basin water quality objectives. Because residential use of water adds TDS concentration, water recycled from a moderately high TDS source water can result in unacceptably high TDS concentration for certain agricultural, municipal and industrial use, and/or groundwater replenishment. Groundwater replenishment is affected because, depending on location, many groundwater basins within the service area have water quality limitations on the use of high-TDS replenishment water. These limitations are generally the result of water quality objectives developed by the governing Regional Water Quality Control Boards.

This TDS concern necessitates the development of a specific objective for TDS to minimize aesthetic and economic impacts on the public and to optimize water management programs. Any new policy on the management of TDS will need to fully address Metropolitan's obligation to meet recycled water quality objectives and groundwater basin standards. The effect of such a policy could result in significant infrastructure and operational requirements for Metropolitan, such as desalination of Colorado River Aqueduct water, desalination at the point of use, blending at the point of use, source control, or additional storage and distribution facilities to more evenly distribute the available State Water Project supplies for replenishment and direct use. These types of facilities have not been incorporated into the current capital improvement plan. However, the need for facilities to implement a long-term TDS management program will be re-evaluated as a new policy is developed and the IRP is updated.

In the absence of a comprehensive long-term implementation plan for TDS management, in April 1995 the Board adopted an interim policy of providing a 25% State Water Project blend to the Weymouth, Diemer, and Skinner service areas for the period of April through September 1995. This interim solution will help to alleviate the problems of attracting and retaining recycled water customers due to the high TDS levels.

COST

Metropolitan will conduct its business with an unwavering commitment to providing value to its customers in a cost-effective manner.

Commitment to this guiding principle will require institution of cost-saving programs in all areas, including the containment of costs for infrastructure improvements. Although no specific policies regarding the cost of infrastructure improvements have been adopted, it is implicitly understood that such improvement projects must demonstrate cost effectiveness in construction costs, as well as long-term operations. Any recommended infrastructure improvement project must be the lowest-cost alternative that is acceptable in terms of meeting project objectives and avoiding environmental impacts.

In addition, many cost containment programs have been implemented to assure cost containment of recommended infrastructure improvements. Value engineering is one tool that has been adopted in the design of recent projects to reduce costs and improve efficiency.

FINANCE

Metropolitan is committed to the development and responsible stewardship of financial resources to meet our customers' needs in an efficient, effective, and equitable manner.

Commitment to this guiding principle requires that long-range plans for infrastructure improvements be evaluated against Metropolitan and member agencies' financial limitations and the tradeoff between the consumers' willingness to pay and the consequences of a less reliable system. Financing structures must also be developed that provide, at least cost, the funds needed for the selected infrastructure improvements while remaining consistent with Metropolitan's policies and guidelines relating to facilities.

Reference is made to Metropolitan's Long Range Finance Plan which was updated and adopted in August 1995 for a comprehensive strategy for financing the recommended CIP in an efficient and economical manner.

Financial Limitations

Three possible limitations on Metropolitan's ability to finance an extensive infrastructure improvement program exist. These potential constraints are: (1) an assessed valuation limit, (2) a limit on the debt-to-equity ratio, and (3) a cap on revenue bond debt that can be issued at parity with current outstanding revenue bonds.

The first limitation is a stipulation that total indebtedness can not exceed 15% of assessed valuation of all taxable property included within the service area (MWD Act §123). As of August 1995, Metropolitan's assessed valuation was $876 billion. Because this 15%, or $131 billion, far exceeds the sum of any reasonable plan for improvement of Metropolitan's infrastructure, the assessed valuation limitation is not a financial limitation of concern.

The second limit is that revenue bond debt can not exceed Metropolitan's equity (MWD Act §239.2). Thus, Metropolitan's debt-to-equity ratio may not exceed 1. Assuming that revenue bonds would be the sole source of funding for a selected plan of infrastructure improvements, it is possible for the projected debt-to-equity ratio to exceed 1. To reduce the debt-to-equity ratio, certain projects may need to be eliminated or reduced in scale. Alternately, other funding sources utilizing non-borrowed or surplus funds and/or the issuance of revenue bonds with different maturities could be used to reduce the debt-to-equity ratio. Metropolitan has established a strategy of funding an average of 20% of the costs for infrastructure improvements from current revenues in order to maintain the debt-to-equity ratio at less than 1.

The third limit, which is not an adopted policy but rather a limitation contained in the revenue bond covenants, is that Metropolitan is precluded from issuing revenue bonds with the same credit strength as outstanding revenue bonds. However, this limitation does not apply if average annual net operating revenues for a consecutive 4-year period are at least equal to 120% of the combined maximum annual debt service on all revenue bonds outstanding, including any new revenue bonds issued. Because rates are set to ensure that this condition always applies, the revenue bond covenants are not expected to constrain Metropolitan's ability to raise capital for infrastructure improvements.

Affordability

While there is no set policy on regional affordability, acceptability of rates to the consumer must be considered when arriving at a selected plan for regional infrastructure improvements. Consequently, the selected plan of improvements, in conjunction with the adopted rate structure, must not result in unacceptable increases in water rates. In adopting the recommended rate structure and water rates for fiscal year 1995-96, Metropolitan's Board committed to try to hold increases in rates and charges to approximately 6% annually. The Board also endeavors to limit the effective cost of Metropolitan water to $500 per acre-foot until the year 2005. Therefore, the timing and magnitude of infrastructure improvements need to be evaluated against the ability to implement rate increases and obtain other revenue sources that can meet this objective.

Rate Structure

For fiscal year 1995-96, Metropolitan's Board adopted a new rate and revenue structure that addressed Metropolitan's objectives on financing, including equity, stability of rates, and a commitment to firm revenues, that finances the needs of planned infrastructure improvements and is consistent with the IRP. Three new components of the water rate structure, including a readiness-to-serve (RTS) charge, new demand charge, and connection maintenance charge, were added to the basic commodity charge and the charge for seasonal storage service. A treated water peaking was also proposed but not adopted. While these charges do not directly influence the planning and implementation of Metropolitan facility improvements, certain charges do reflect adopted or implied policy on facility planning. Specifically, the policy implications are reflected in the seasonal storage service charge, the treated-water peaking charge, and the connection maintenance charge.

Metropolitan encourages its member agencies to reduce their peak demands on Metropolitan's system. To meet this objective, Metropolitan's seasonal storage service pricing provides a financial incentive for member agencies to reduce their summertime usage of imported water. Under this program, member agencies with storage capabilities can obtain discounted water during the winter months for use later in the summer, in lieu of direct deliveries from Metropolitan's system. In the planning of facility improvements, Metropolitan assumes maximum participation in the seasonal storage service program.

A treated water peaking charge was proposed, in part, in response to Metropolitan's objective of reducing peak demands. Under the proposed charge, if member agencies' peak flow during May through September exceeds 130% of average flow during the same period, a penalty charge would

have been imposed. It is noted that the criterion of 130% was to be used only for imposing the peaking charge and not for the planning of capacity in Metropolitan's distribution system. The methodology for determining peak demands on Metropolitan for facility planning purposes is described in Section 3.

The connection maintenance charge is based on both the capacity and number of connections each member agency has with Metropolitan. The policy implication of this charge relative to facilities is that the number and size of service connections should reasonably reflect the member agencies' anticipated demands on Metropolitan's system.

FACILITIES

Metropolitan will plan and construct high-quality facilities and operate and maintain them in a manner that ensures reliability, safety, and security.

This guiding principle carries with it a commitment to developing, constructing, and operating the regional facilities needed to achieve Metropolitan's level of service and reliability objectives on a cost-effective and long-term basis. Accordingly, the development of any facility must be consistent with Metropolitan's mission, must give current and potential future system and process needs highest priority, and must assure internal efficiency and long-term compatibility of all site elements.

Several specific policies and guidelines apply to the development of Metropolitan's regional distribution system facilities. These policies and guidelines govern the points of delivery to member agencies, the need for facilities to demonstrate regional benefit, the type of service, and facility capacity and hydraulic requirements.

Points of Delivery

The 1931 General Policy Statement stated that delivery points will be "at or near the boundary" of each member agency and to such other points as the Board may determine. This policy also stated that the location of the delivery point would be determined by considerations of economy and convenience. Presently, each member agency has water available from Metropolitan's distribution system either "at or near the boundary" or within its boundary.

Almost all member agencies also have delivery points which were established under the "to such other points as the Directors may determine" portion of the 1931 General Policy Statement. Examples of these delivery points are those that were established through negotiations at the time of original

member agency annexation, considerations of economy and convenience, and utilization of available capacity in distribution pipelines traversing a member agency.

In the future, Metropolitan is not obligated to provide service augmentation at any of the established delivery points; however, it is generally understood and evident from historical occurrence that augmentation will be to some point "at or near" the member agency's boundary or some equivalent or otherwise definable point. Future planning, design, and construction of infrastructure improvements will include consideration of facilities for service to the District's area as a whole and the objective of providing equivalent service to all of Metropolitan's member agencies, to the extent that this can be done within reasonable limits.

Nearly all member agencies have redundant delivery points. Consequently, in the event of failure of one or more of Metropolitan's distribution pipelines due to earthquake or other disruptive event, water could likely continue to be distributed to the vast majority of the service area through alternate delivery routes. There are exceptions, however, and for these areas Metropolitan will attempt to provide such redundancy, where practical and economical, to assure equivalent levels of reliability throughout the service area.

Regional Benefit

It is generally recognized that distribution facilities developed by Metropolitan must benefit the region as a whole. The 1931 General Policy Statement makes reference to supplying water to Southern California in "the best interest of the area taken as a unit." Metropolitan's stated policy for the construction of water treatment plants is "to construct large regionally located facilities" (Metropolitan Report No. 952, *Metropolitan's Policies and Procedures Relative to the Authorization and Construction of Water Treatment Facilities,* 1984).

Consequently, any distribution system facility improvement undertaken by Metropolitan should demonstrate that it will independently benefit or improve water service to a large portion of the service area.

Type of Service

Metropolitan delivers treated water for direct use and untreated water for subsequent treatment by member agencies or for replenishment and agricultural use. It is Metropolitan's policy to provide treatment facilities such that every member agency has access to treated water for domestic purposes

(Metropolitan Report No. 952). All member agencies, with the exception of Chino Basin MWD, have the capability of receiving treated water from one or more of Metropolitan's five regional water treatment plants.

Treated water is provided at the Board's discretion as a "special service" (Metropolitan Report No. 952), and decisions to augment treated-water service must include considerations of economy and convenience with respect to the structure and operation of Metropolitan's distribution system.

In addition to supplying untreated water to Metropolitan and member agency treatment facilities, untreated water transmission facilities provide service for agricultural uses and groundwater replenishment. In some unique portions of the service area, treated water is also used to meet these demands. Under interruptible pricing, agricultural uses and groundwater replenishment are subject to availability and therefore are secondary to the primary purpose of providing supply to meet the region's urban water demands. As the service area continues to develop, the agricultural component of these demands will be replaced with urban demands. In the short-term, however, new facilities are planned to meet urban demands, as well as to accommodate the projected demands for agricultural uses and groundwater replenishment.

Capacity and Hydraulic Requirements

Facility Staging

In accordance with the 1931 General Policy Statement, Metropolitan's distribution system has been planned to supply water from the Colorado River and the State Water Project in the most effective and economical manner, and in the best interests of the area taken as a unit. The distribution system has also been planned to allow augmentation and extension of service to meet expanding and increasing needs in the years ahead.

In keeping with the guiding principles and the manner in which the distribution system has developed, Metropolitan's objectives for facility improvements are to ensure that: (1) each new facility fits into a long-term development strategy, (2) the long-term strategy is economical and reliable, and (3) long-range plans and construction staging preserve future options to the extent practical.

Individual facilities are staged over shorter periods based on the adopted population projections and corresponding water demands, the physical lifetimes of the planned facilities, modular scale

economies in construction, financial constraints, and other factors. Facilities that do not permit modular construction and that have long physical lifetimes—such as canals, pipelines, and reservoirs—are generally planned to meet long-term demands. However, all facilities must be planned in accordance with adopted population projections and regional growth management plans.

Capacity and Peaking

Metropolitan's distribution system facilities are intended to meet the peak weekly retail demands. The local agencies are expected to provide sufficient storage within their systems to meet peak retail demands shorter than 1 week in duration. Metropolitan limits variations in flow to 10% within a 24-hour period (MWD Administrative Code §4504) so that local agencies do not rely on Metropolitan's facilities to meet daily or hourly peaks in demand.

Prior to the seasonal program, peak demands on Metropolitan's system, which in theory represented the peak weekly average retail demand, ranged from 1.45 times to 1.75 times the average annual demand on Metropolitan, depending on the location within the service area, the amount of local resources, and storage capacity. In most cases, the historical peaking data is the basis of planning and sizing new distribution system facilities. Projected peak demands are then reduced by projected use of seasonal shift water and carryover production.

In practice, the peak deliveries provided through Metropolitan's system often meet peak demands with durations less than 1 week. In these cases, the development of additional local storage needs to be encouraged. Rather than imposing strict penalties on peaking of less than 1 week in duration or denying requests for changes in flow, it has been Metropolitan's general policy to encourage the development of additional local storage and supplies through incentives. Seasonal storage service pricing provides financial incentives to reduce peaking on Metropolitan's facilities by discounting the sale of water for groundwater and reservoir replenishment during the winter months. This stored water is then extracted in the summer months through local storage facilities (well fields, surface reservoirs, etc.) in lieu of meeting peak demands through Metropolitan's facilities.

Transverse Pipeline Capacity

Once it has been established that a new Metropolitan pipeline will be constructed, the demands of each member agency being traversed by the pipeline are generally taken into consideration so that the member agency will have the option of requesting additional pipeline capacity to specific delivery points along the alignment. Consequently, the point of delivery in this case is within the member agency boundary rather than "at or near" the boundary. This "built-in" capacity from the member agency boundary to such internal delivery points is known as transverse capacity.

Transverse capacity is a direct result of Metropolitan's ongoing practice of sizing its pipelines based on economies of scale and of providing facilities which are in the best interest of the service area taken as a whole (i.e., Metropolitan can provide additional capacity within a planned pipeline more economically than member agencies could construct parallel facilities from their boundaries).

Service Connections and "Service as Available"

Member agencies may request Metropolitan to construct, or have constructed, service connections to convey water from Metropolitan's facilities to those of the member agencies (MWD Administrative Code §4700). Because Metropolitan has generally provided for transverse capacity throughout its distribution system, a practice sometimes referred to as "service as available" has become standard operating procedure. Essentially, the term "service as available" means that if a member agency requests a service connection at a specific location on a pipeline and if unused capacity exists within the pipeline, then Metropolitan will permit the establishment of a service connection at the requested location.

Hydraulic Pressure

Metropolitan's treatment and storage facilities have been located at the highest elevation hydraulically and economically practical to avoid pumping within the distribution system. The hydraulic pressure available at each service connection is not guaranteed by Metropolitan as a part of its service criteria. However, in installing Metropolitan-owned hydroelectric facilities, Metropolitan may take "reasonable and appropriate" action to maintain minimum design pressure (MWD Administrative Code §4706).

ENVIRONMENT

Metropolitan will integrate environmental safety and health values, requirements, and awareness in its decision making to foster innovative and practical solutions in all its activities.

With regard to the planning and development of facility improvements, commitment to this guiding principle requires careful consideration of all environmental concerns and regulations. Environmental demands offer a significant challenge to the development of feasible and cost-effective infrastructure projects. In meeting this challenge, Metropolitan has taken an increasingly proactive approach in developing environmental strategies that: (1) ensure protection of environmental values, (2) are well received by resource agencies and the community, and (3) permit project development without unnecessary restrictions in construction and operating activities.

In addition to project-specific environmental impacts and regulations, the development of Metropolitan's facility improvements must be consistent with regional management plans that address the cumulative environmental and social impacts for the region.

Finally, once constructed, facility improvements must embody Metropolitan's commitment to environmental values. Site development should seek to create a positive public image and minimize negative impacts to surrounding land uses. Facilities should be designed to provide for and promote efficient use of natural resources, in addition to providing necessary safety and security for employees, visitors, and the general public.

Environmental Regulation

Metropolitan has demonstrated and will continue to demonstrate its commitment to full compliance with state and federal environmental regulation in the planning and implementation of its facility improvements. The documentation and consideration of environmental impacts of major facility projects undertaken by Metropolitan is governed by the California Environmental Quality Act (CEQA) and for projects requiring federal approvals also by the National Environmental Policy Act (NEPA).

Metropolitan's policy is to fully comply with CEQA and NEPA and other health, safety, and environmental requirements during project planning, design, construction, and operation. In this regard, Metropolitan's procedure is to consider potential environmental impacts early in the initial project planning phase to identify significant environmental constraints. Project alternatives that appear environmentally feasible are continually refined through the planning process to minimize

environmental impacts and community concerns to the maximum extent practicable. Mitigation measures are developed for impacts that can not be avoided based on considerations of cost, constructability, and effectiveness. The planning process is then fully described in appropriate CEQA and/or NEPA documentation and circulated for formal public and agency input.

Regional Growth Management Plans

In accordance with Metropolitan's policies on water supply, Metropolitan is responsible for ensuring an adequate and reliable supply of water to meet increasing demands within the service area. Metropolitan's service area has a long history of economic and population growth. Metropolitan is committed to continuing close coordination with the regional growth management agencies, Southern California Association of Governments (SCAG), and the San Diego Association of Governments (SANDAG) to provide input on the water resource elements of the regional growth management plans. Metropolitan's facilities are planned for consistency with the regional growth management plans and the growth projections and water supply mitigations contained therein.

Metropolitan does not initiate or implement "no-growth" policies. By adopting plans or policies intended to limit water supplies to levels that would not meet the projected demands anticipated under the regional growth management plans, Metropolitan would be engaging in de facto regional growth control that is beyond its legal authority. Consequently, Metropolitan's policy regarding regional growth is not to dictate levels of supply but rather to plan its facilities in accordance with adopted regional growth plans and to continue to supply the regional growth management agencies and local governments with information and analysis to assist them with their decisions.

Environmental and Community Sensitivity

Metropolitan has recently developed guidelines for the planning and siting of its facilities; these guidelines underscore Metropolitan's commitment to environmental values and its sensitivity to adjacent communities.

It is Metropolitan's objective in facility planning and development to minimize external impacts to communities and the environment. Facility development should seek to create beneficial impacts and minimize negative impacts on the surrounding community while conforming to all applicable environmental regulation. Site facilities, hardscape, and landscape should be designed to provide for and encourage efficient use of energy, water, and other natural resources, and to minimize the volume and toxicity of waste generated.

The planning and development of Metropolitan's facilities should also seek to create a positive public image. The planning and development of facility sites should balance the needs of all users, address external impacts on the community and adjacent neighborhoods, and provide complimentary community uses wherever practicable.

Finally, the planning and development of Metropolitan's facility sites must assure safety and security. The placement of individual facilities on a site, traffic circulation plans, and necessary safety and security features must provide for the protection of employees, visitors, and the general public.

WORKFORCE

Metropolitan is committed to providing a work environment that fosters empowerment and accountability, performance and career enhancement, well-being and mutual respect.

Policies and guidelines under this guiding principle focus on hiring and maintaining a high-quality workforce, improving productivity and ensuring equity in the diversification of Metropolitan's workforce, consultants, and contractors. Although these policies do not directly affect the planning and development of Metropolitan's facilities, certain major facilities and facility improvements will be required specifically in support of Metropolitan's workforce. New facilities such as office buildings, laboratories, control centers, and shops will need to be planned and designed with the underlying objectives of improving the physical work environment and minimizing physical constraints to improved productivity.

INTERDEPENDENCE

Metropolitan will continue to work cooperatively with its member agencies and their subagencies to provide a reliable water supply to Southern California and to provide that service in an interdependent, fiscally responsible, and equitable manner.

This guiding principle calls for Metropolitan and its member agencies to cooperatively commit to the development of a portfolio of programs and projects that will meet the regional service reliability objective at the lowest possible cost. Meeting the reliability objective depends equally upon the successful implementation of Metropolitan planned facilities, member agencies' planned facilities, joint facilities and coordinated water management programs, and cooperative operating strategies.

Thus, failure of either Metropolitan or its member agencies to implement the required facilities and programs as planned will cause the need for other additional facilities, which may result in higher total costs.

In order to avoid either of these outcomes, member agencies must be prominently involved in all of Metropolitan's water supply programs, including the planning and development of Metropolitan's facilities. In this regard, Metropolitan is committed to strengthening communication and directly involving member agencies in the facilities planning process.

In addition, the planning, development, and operation of member agency facilities should be coordinated with Metropolitan's facility plans to enhance overall system reliability and reduce total system costs. Where appropriate, Metropolitan may participate in funding local facilities that contribute to increased supply reliability for the region as a whole and reduce the costs for Metropolitan's facilities.

SECTION 3 – WATER SUPPLIES AND DEMANDS

The Southern California region faces a growing gap between its available water supplies and its demand for them. 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 growth. Shortages during the 1991 drought highlight the seriousness of the problem.

To address the region's water supply issues, Metropolitan, working with its member agencies, other water agencies, and the public, used the Integrated Resources Planning process to establish and implement an effective water resource strategy for its service area. The Integrated Resources Planning process involved a comprehensive evaluation of water supply options available to the region as a whole to find the right combination of additional local and imported water supply investments that met Metropolitan's reliability goal while minimizing costs and rate impacts to water customers. The reliability goal states Metropolitan will provide all of the firm wholesale water demands to its member agencies in 98 of 100 years and only in the remaining years consider implementing a shortage allocation plan for imported supply deliveries.

This section summarizes the IRP's evaluation of water supplies and demands for the region, including:

- Regional Water Demands in Metropolitan's Service Area,
- Water Supplies of the Preferred Resource Mix, and
- Demands on Metropolitan.

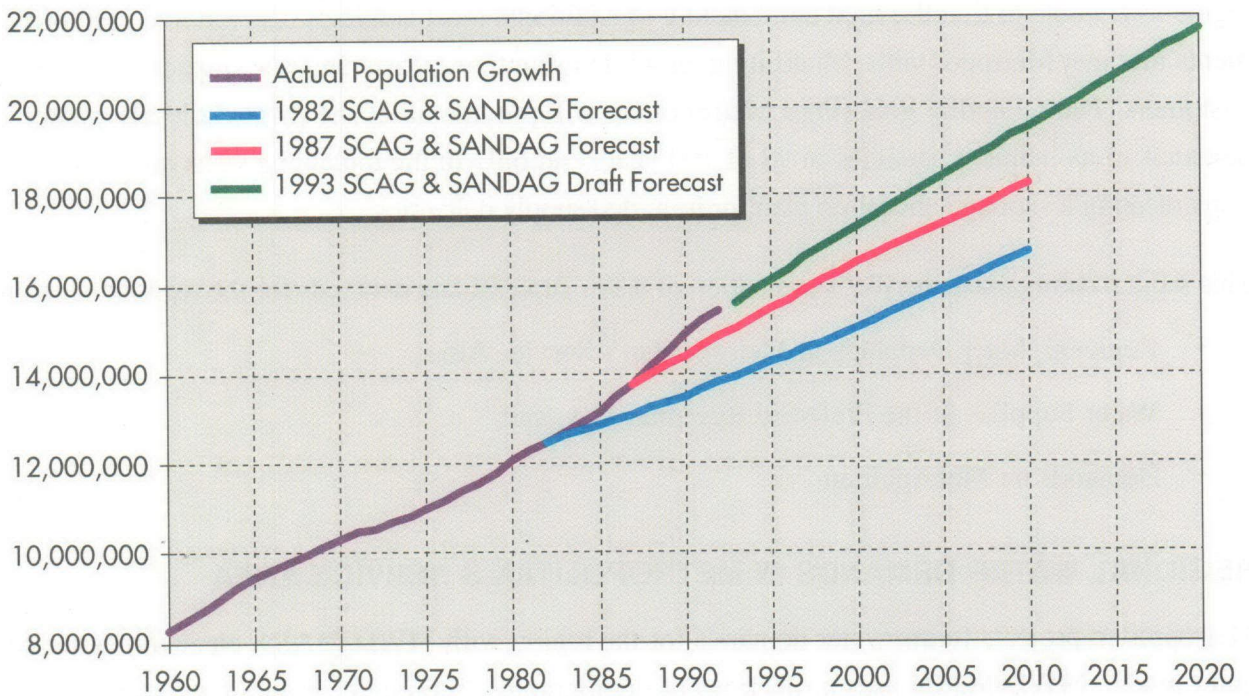
REGIONAL WATER DEMANDS IN METROPOLITAN'S SERVICE AREA

Metropolitan projects future water demands for the region with MWD-MAIN, an econometric computer model. MWD-MAIN uses projections of demographic, economic, and climatic trends to forecast urban water demand by residential, commercial, industrial, and public uses. A brief discussion of population, the most important demographic growth variable used in water demand projections, prefaces a summary of regional water demand. More detailed information on growth variables and their effects on regional water demand projections may be found in *Volume 1: The Long-Term Resources Plan* and *Volume 3: Technical Appendices.*

Population

Population is an important overall growth indicator used to project water demands—an increase in population typically corresponds to an increase in water demand. In 1980 the population in Metropolitan's service area was approximately 12 million. According to the latest 1993 SCAG and SANDAG population forecasts, the population in Metropolitan's service area is expected to increase from the current 15.7 million to 19.5 million by 2010, and to 21.5 million by 2020. Figure 3-1 shows historical population growth as well as SCAG and SANDAG population forecasts for Metropolitan's service area. This figure illustrates that prior forecasts have fallen short of actual growth by 1% to 5%. Given the likelihood that actual population growth will not match the projection, the IRP emphasizes a flexible resource strategy to meet regional water demands.

Figure 3-1
Population Forecasts for Metropolitan's Service Area



Water Demands

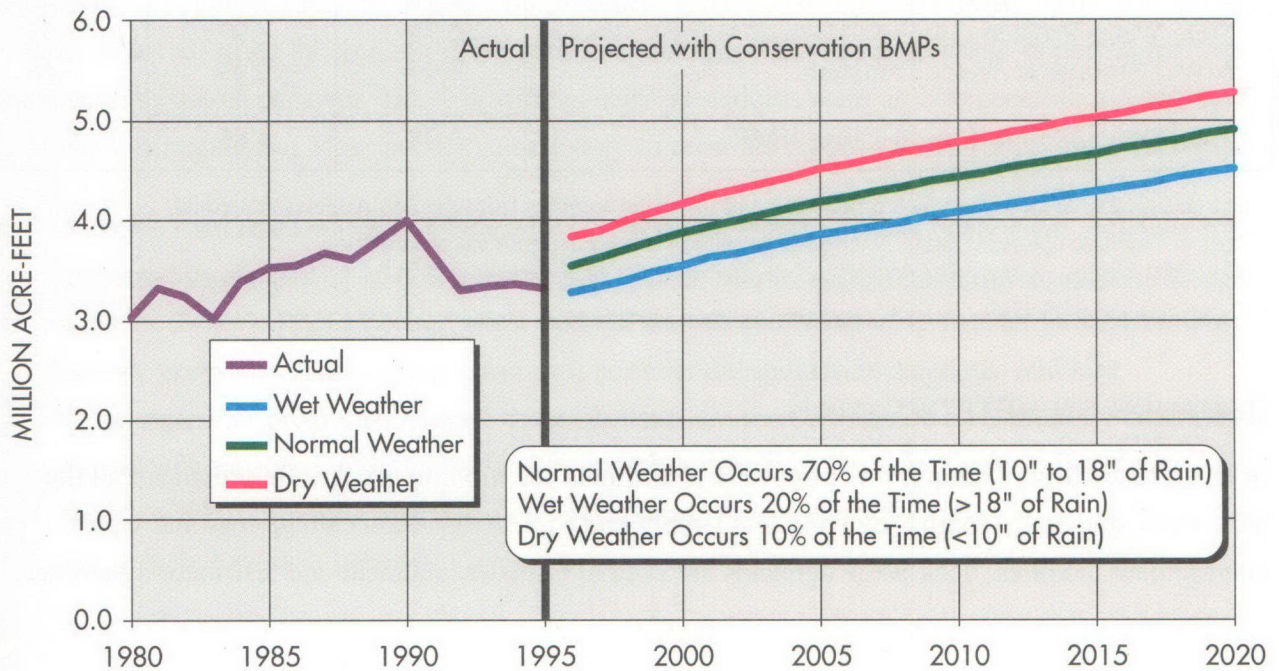
Urban water demand encompasses residential, commercial, industrial, and public water uses. In addition to urban water demand throughout Metropolitan's service area, agricultural water use accounts for about 10% of total regional demand.

Generally, water demand increases as population grows. However, year-to-year variations in demands are caused by weather, droughts, and economic growth. Weather can cause demand to vary between about plus or minus 5% in coastal areas of the service area and about plus or minus 12% in inland areas such as Riverside and San Bernardino counties. When droughts occur and supplies are limited, rationing of water can cause demands to be suppressed. In addition, economic cycles can cause significant variations in demand. For example, the recent economic recession significantly reduced water demand due to a loss of jobs and slowdown in residential and commercial construction. Water conservation also reduces water demand. Under normal weather conditions, projections indicate water conservation BMPs will save about 730,000 acre-feet per year by 2010 and 880,000 acre-feet per year by 2020.

The total regional water demand in Metropolitan's service area has increased from about three million acre-feet per year in 1980 to about 3.5 million acre-feet per year in 1993. Figure 3-2 presents historical regional water demands and forecasts of total regional demand under wet, normal and dry weather conditions. Based upon normal conditions and full implementation of water conservation BMPs, it is expected that regional demands will increase to about 4.5 million acre-feet by 2010 and to nearly 4.9 million acre-feet by 2020. During very hot and dry years, demands could be as high as 4.9 million acre-feet in 2010 and 5.4 million acre-feet in year 2020.

Figure 3-2

Retail Water Demand Projections For Wet, Normal And Dry Climate Conditions



WATER SUPPLIES OF THE PREFERRED RESOURCE MIX

The resource strategy developed in the IRP to meet these regional water needs, the Preferred Resource Mix, was based on: (1) the need for additional SWP supply for reliability and water quality requirements, (2) the commitment to maximize CRA deliveries as an economical source of supply, (3) the potential for local groundwater conjunctive-use and surface storage, (4) local project information on water recycling and groundwater recovery resources, and (5) the levels of low-cost water transfers that could be reasonably obtained. Table 3-1 shows the dry year supplies required for the Preferred Resource Mix.

Table 3-1
Dry Year Supplies Required for the Preferred Resource Mix (Million Acre-Feet)

Dry Year Supply	2000	2010	2020
Locally Developed Supplies:			
Local Production [1]	1.43	1.48	1.53
Water Recycling [2]	0.27	0.36	0.45
Groundwater Recovery	0.04	0.05	0.05
Local Groundwater Storage Production [3]	0.25	0.30	0.33
Metropolitan's Regional Supplies:			
Colorado River Aqueduct	1.20	1.20	1.20
State Water Project	0.75	0.97	1.35
MWD Storage & Water Transfers	0.34	0.49	0.46
Total Demand with Conservation BMPs [4]	4.28	4.85	5.37

[1] Includes groundwater and surface production and imported supplies from the Los Angeles Aqueduct.
[2] Does not include upstream Santa Ana recharge (which is included in local production).
[3] Represents the annual production and not the total storage capacity (which is about 1.5 million acre-feet).
[4] Represents retail demands under hot and dry weather conditions.

DEMANDS ON METROPOLITAN

In terms of facility planning, it is important to estimate the monthly pattern in demands and the peak-week demand. Monthly demand and supply patterns are used to evaluate regional water management facilities. Peak-week demands are used to evaluate treatment and distribution facilities.

For water distribution and treatment facility analyses, Metropolitan uses the "dry year" water demands that occur during hot and dry climatic conditions. When these conditions occur, peak summertime demands for imported water are highest. Under dry year demand conditions, Metropolitan encourages local carryover and seasonal production from both surface storage and groundwater basins to help offset summer peak demands and augment imported supplies. Carryover water is delivered to storage in local reservoirs and groundwater basins during normal and wet year hydrology conditions when available imported supplies are greater than needed to meet regional needs. This water is then locally produced during drought conditions. To decrease summer peaks on its system, Metropolitan provides seasonal deliveries to reduce groundwater production between October and April. A like amount of water is then produced during the summer season, defined as the 5 month period between May and September. The dry year demand condition on Metropolitan then becomes the total dry year regional demand less local supplies and less carryover production. During summer, the dry year demand is further reduced by seasonal production.

Demands on Metropolitan are projected at the member agency level. The member agency demands are then disaggregated into smaller areas called Distribution System Analysis Units (DSAUs). These DSAUs consist of either entire member agencies or portions of a member agency. The boundaries of the DSAUs were formulated to correspond with general areas of similar supply conditions, including groundwater basin boundaries, areas of local production, and relationship to Metropolitan's delivery system. Figure 3-3 presents DSAUs developed for the analysis. The greater level of detail afforded by creation of the analysis units provides more accuracy in portraying the distribution system's behavior. The following general procedures were used to generate monthly and peak-week demands that Metropolitan must satisfy to meet the region's water supply reliability goal:

a) Develop total retail water demands with conservation BMPs. Annual retail water demands are projected by the MWD-MAIN econometric demand model using demographic, economic, and climatic factors. BMPs conservation savings include plumbing code requirements, plumbing retrofit programs, landscaping programs, commercial/industrial programs, and leak detection/repair programs. Annual water demands are then distributed on a monthly basis using historical consumption data provided by member agencies. Historical data indicate that monthly retail demands for basic and agricultural service generally peak in July or August and are at their lowest in February.

b) Project local groundwater production, including historical base and seasonal production. Monthly historical base production is based on data provided by the groundwater basin managers. Monthly seasonal shift production is developed based on basin production capacity identified in the IRP.

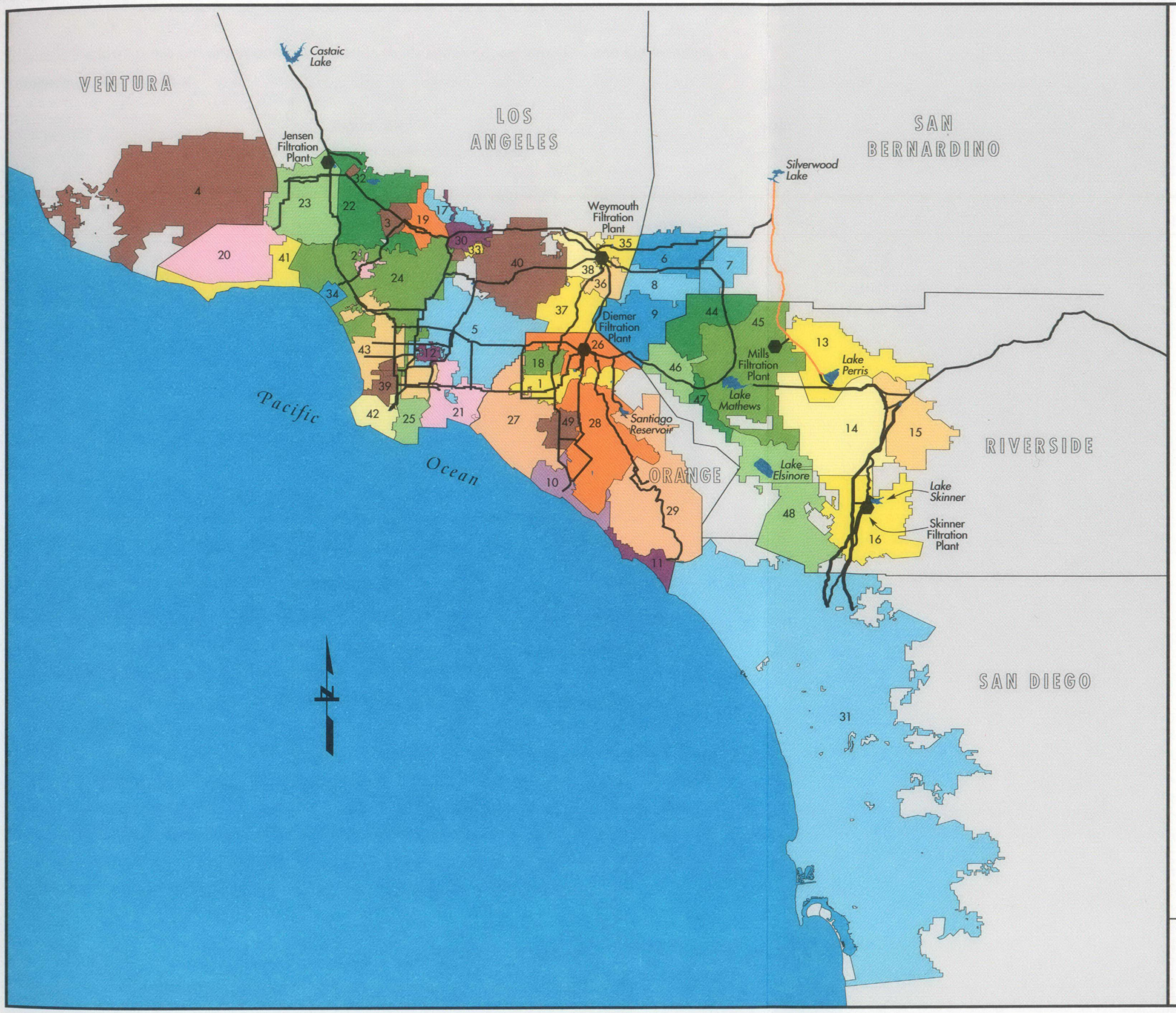
c) Project monthly local surface water production using historical production levels.

d) Estimate recycled water and groundwater recovery production levels using project-specific information provided by the member agencies. Monthly distribution of these supplies is also based on historical production levels.

e) Estimate monthly Los Angeles Aqueduct supplies using information provided by the Los Angeles Department of Water and Power.

f) Once local resources are established (steps b through e), calculate demands on Metropolitan by subtracting the sum of all local supplies (including Los Angeles Aqueduct supplies) from retail demands with conservation. Metropolitan must meet the resultant demands through Colorado River water deliveries, SWP deliveries, deliveries from Metropolitan surface storage, production of carryover water from groundwater basins, and water transfers. Carryover water produced from groundwater basins is assumed to be delivered through agencies' local distribution systems and not through Metropolitan's facilities.

g) Convert maximum monthly demand to peak-week demand based on historical peaking data.



County Boundary
DWR Distribution System
MWD Distribution System
Lakes
Filtration Plant

DSAU

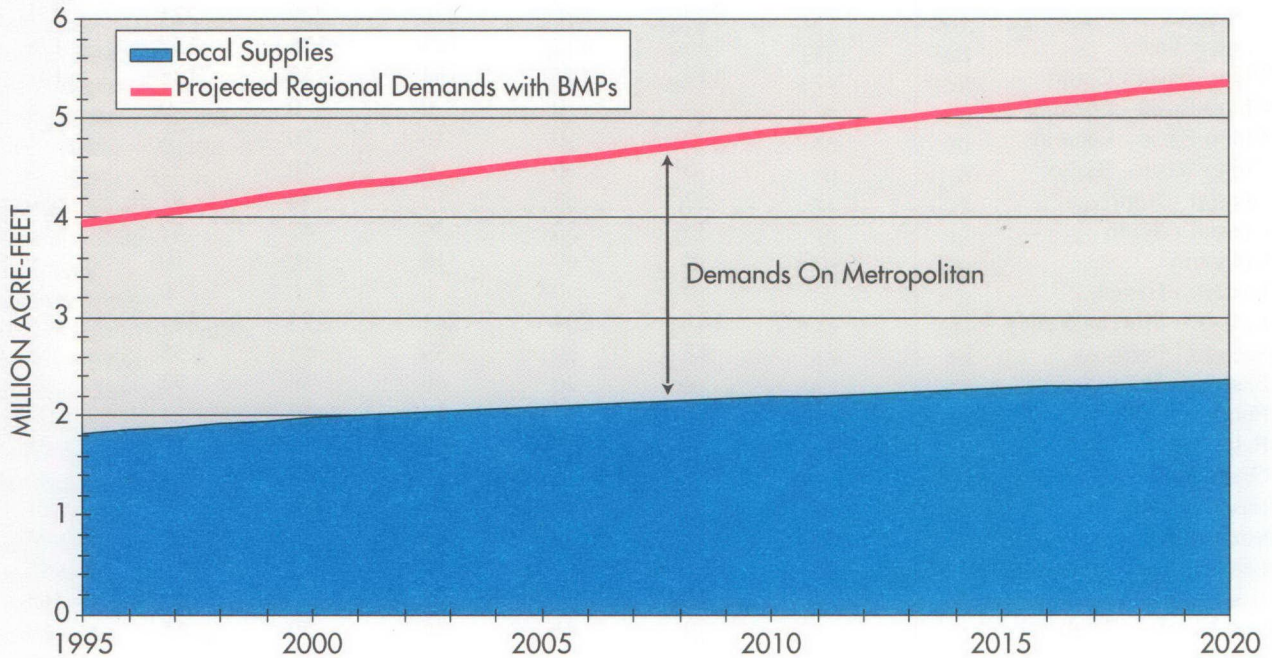
1 Anaheim
2 Beverly Hills (including West Hollywood)
3 Burbank
4 Calleguas MWD
5 Central Basin MWD
6 Chino Basin MWD (Rialto)
7 Chino Basin MWD (Fontana)
8 Chino Basin MWD (Ontario)
9 Chino Basin MWD (Chino)
10 Coastal MWD (North)
11 Coastal MWD (South)
12 Compton
13 Eastern MWD (Moreno Valley)
14 Eastern MWD (Perris Valley)
15 Eastern MWD (Hemet/San Jacinto)
16 Eastern MWD (Skinner)
17 Foothill MWD
18 Fullerton
19 Glendale
20 Las Virgenes MWD
21 Long Beach
22 Los Angeles (East Valley)
23 Los Angeles (West Valley)
24 Los Angeles (Central City including Brentwood)
25 Los Angeles (Harbor)
26 MWD of Orange County (North)
27 MWD of Orange County (West)
28 MWD of Orange County (Central)
29 MWD of Orange County (South)
30 Pasadena
31 San Diego County Water Authority
32 San Fernando
33 San Marino
34 Santa Monica
35 Three Valleys MWD (La Verne/Claremont)
36 Three Valleys MWD (Pomona)
37 Three Valleys MWD (South D. Bar, Industry, Walnut)
38 Three Valleys MWD (West Covina, San Dimas)
39 Torrance
40 Upper San Gabriel Valley MWD
41 West Basin MWD (Malibu)
42 West Basin MWD (Palos Verdes)
43 West Basin MWD (South Bay)
44 Western MWD of Riverside County (Jurupa/Norco)
45 Western MWD of Riverside County (Riverside/Lake Mathews)
46 Western MWD of Riverside County (Corona)
47 Western MWD of Riverside County (Temescal)
48 Western MWD of Riverside County (Elsinore)
49 Santa Ana

Figure 3-3
Distribution System Analysis Units and Existing Regional Facilities

Figure 3-4 shows projected dry year retail demands (with BMPs), local supplies, and the resulting demands on Metropolitan.

Figure 3-4

Dry Year Regional Demand and Local Supply



Dry Year Regional Demand and Local Supply

Metropolitan's facilities are designed to provide sufficient supplemental water so that the region can meet its water supply reliability goal. The dry year peak demands used to plan Metropolitan's facilities were developed using historical deliveries and reflect this level-of-service objective. Dry year peak demands in each DSAU can occur at different times during the year. This is because member agencies with groundwater basins may peak in April or October as they fill their basins and take advantage of seasonal storage pricing. However, overall peak demands on Metropolitan's system occur during the summer months of July and August. Peak demands used for facility needs incorporate the highest demand level for the analysis area and may therefore occur at different times for different analysis areas. As an example, peak demands in the Central Pool region occur in July, while peak demands in the Jensen/West Valley area (a subset of the Central Pool) occur in August. Projected dry year peak demands on Metropolitan (July and August) are summarized in Table 3-2.

Table 3-2
Projected DSAU Peak Demands – July (cfs)

Distribution System Analysis Unit	1995	2000	2005	2010	2015	2020
Anaheim	44	56	70	70	72	75
Beverly Hills	29	31	32	33	34	35
Burbank	46	50	55	57	59	61
Calleguas	227	245	226	229	224	251
Central Basin	146	147	143	138	157	178
Chino Basin - Chino	112	147	154	158	135	103
Chino Basin - Fontana	0	0	0	0	0	8
Chino Basin - Ontario	0	0	46	70	78	71
Chino Basin - Rialto	0	0	0	0	32	54
Coastal - North	57	68	75	78	82	86
Coastal - South	35	35	39	42	47	51
Compton	8	9	10	10	10	9
Eastern - Hemet	0	0	0	0	0	21
Eastern - Moreno Valley	141	204	241	273	324	354
Eastern - Perris	17	30	39	45	55	68
Eastern - Skinner	4	20	40	50	73	93
Foothill	16	17	19	20	21	22
Fullerton	15	16	19	19	20	21
Glendale	54	55	56	55	54	54
Las Virgenes	37	44	50	56	63	71
Long Beach	71	75	82	85	88	92
Los Angeles - Central City	233	282	359	380	403	445
Los Angeles - East Valley	85	107	118	134	154	165
Los Angeles - Harbor	30	41	46	50	55	60
Los Angeles - West Valley	69	93	102	118	134	143
MWDOC - Central	45	60	60	54	60	70
MWDOC - North	61	79	86	92	100	105
MWDOC - South	126	159	162	168	180	189
MWDOC - West	126	170	182	176	183	189
Pasadena	27	30	34	34	37	41
San Diego	1,178	1,294	1,400	1,510	1,633	1,755
San Fernando	1	1	2	2	2	2
San Marino	3	3	4	4	4	5
Santa Ana	18	25	31	32	34	36
Santa Monica	16	18	20	21	22	22
Three Valleys - La Verne	29	26	28	23	31	43
Three Valleys - Pomona	0	0	16	12	11	20
Three Valleys - South	40	45	43	46	47	47
Three Valleys - West	95	114	116	137	158	166
Torrance	32	32	32	30	30	30
Upper San Gabriel Valley	0	25	53	75	102	129
West Basin - Malibu	11	13	16	20	22	24
West Basin - Palos Verdes	40	43	44	44	45	44
West Basin - South Bay	286	292	289	271	260	252
Western - Corona	30	40	53	65	73	78
Western - Elsinore	0	16	34	50	66	79
Western - Jurupa	5	34	48	57	68	74
Western - Riverside	0	0	0	0	8	26
Western - Temescal	69	86	104	110	114	114

Table 3-2 (continued)
Projected DSAU Peak Demands – August (cfs)

Distribution System Analysis Unit	1995	2000	2005	2010	2015	2020
Anaheim	48	59	74	74	76	79
Beverly Hills	28	30	32	33	34	34
Burbank	44	49	53	55	57	59
Calleguas	220	241	242	251	249	275
Central Basin	165	173	172	168	189	210
Chino Basin - Chino	112	147	154	158	135	103
Chino Basin - Fontana	0	0	0	0	0	8
Chino Basin - Ontario	0	0	46	70	78	71
Chino Basin - Rialto	0	0	0	0	32	54
Coastal - North	56	67	74	77	80	84
Coastal - South	35	34	38	42	47	51
Compton	9	9	10	10	10	10
Eastern - Hemet	0	0	0	0	10	43
Eastern - Moreno Valley	133	194	236	269	312	339
Eastern - Perris	21	36	43	50	60	69
Eastern - Skinner	12	29	47	57	79	96
Foothill	15	16	18	19	20	21
Fullerton	18	19	22	22	23	25
Glendale	55	57	59	59	59	59
Las Virgenes	36	43	49	54	61	69
Long Beach	74	79	86	88	92	95
Los Angeles - Central City	182	234	303	324	344	383
Los Angeles - East Valley	54	74	84	98	114	124
Los Angeles - Harbor	23	34	39	43	48	52
Los Angeles - West Valley	54	74	84	98	114	124
MWDOC - Central	43	63	65	57	64	73
MWDOC - North	67	82	88	96	103	110
MWDOC - South	141	163	164	173	186	197
MWDOC - West	131	178	191	184	190	196
Pasadena	33	37	41	41	44	47
San Diego	1,166	1,274	1,378	1,486	1,606	1,726
San Fernando	2	2	2	3	3	3
San Marino	2	2	3	3	4	4
Santa Ana	19	26	32	34	35	37
Santa Monica	16	18	20	21	21	22
Three Valleys - La Verne	24	22	24	20	26	37
Three Valleys - Pomona	0	0	19	15	11	19
Three Valleys - South	39	44	41	44	46	46
Three Valleys - West	94	112	111	131	155	164
Torrance	32	33	33	31	31	31
Upper San Gabriel Valley	0	28	54	76	102	129
West Basin - Malibu	11	13	16	20	22	24
West Basin - Palos Verdes	40	42	44	44	45	44
West Basin - South Bay	283	289	286	267	257	249
Western - Corona	32	41	53	66	74	80
Western - Elsinore	0	17	35	51	69	81
Western - Jurupa	6	35	49	59	69	76
Western - Riverside	0	0	5	0	9	25
Western - Temescal	71	87	104	112	116	118

Project Timing Sensitivity

To assess impacts that potential changes in demands could have on Metropolitan's capital improvement program and funding requirements, two alternative levels of demand were evaluated. These alternative demand levels correspond to a 5% increase and a 5% decrease in projected regional retail water demand while keeping local supply levels constant. Increasing or decreasing demands change a project's required on-line date. This is especially true of treatment and distribution facilities. The number of years that a project's required on-line date moves indicates the project's sensitivity to increasing or decreasing demands. Projects that are very sensitive to changes in demand can be monitored more closely by updating demand projections more frequently than for other areas. Discussion of the effects of the plus 5% and minus 5% demand cases on capital project timing and capacity is included in the following section. It should be noted that SCAG/SANDAG demographic forecasts that Metropolitan uses as the basis for its water use projections have historically yielded demand projections that are less than actual demand.

SECTION 4 – DESCRIPTION OF EXISTING SYSTEM FACILITIES AND SYSTEM NEEDS

Metropolitan receives water from the State Water Project through the California Aqueduct and Colorado River water through the Colorado River Aqueduct. The imported water is stored in terminal reservoir facilities for distribution to about 225 cities and unincorporated areas within a 5,200-square-mile service area covering portions of Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura counties. The major water supply conveyance facilities serving Southern California are shown on Figure 4-1.

Metropolitan operates the Colorado River Aqueduct to import supplies from the Colorado River to Lake Mathews. The Colorado River Aqueduct is a 242-mile-long series of canals, tunnels, conduits, and siphons conveying water from Lake Havasu on the Colorado River to Lake Mathews in Riverside County, the terminal reservoir of the Colorado River Aqueduct system. Five pump stations on the Colorado River Aqueduct lift water from Lake Havasu to Lake Mathews. Metropolitan also imports water from the State Water Project, owned and operated by the California Department of Water Resources (DWR), via the Edmund G. Brown California Aqueduct. The aqueduct bifurcates into the East and West branches in the Antelope Valley. DWR delivers State Project water to Metropolitan from three points on the East Branch of the California Aqueduct: the Devil Canyon Power Plant, the Box Springs Turnout on the Santa Ana Valley Pipeline, and Lake Perris. Lake Perris is the terminal reservoir of the East Branch. DWR also delivers water to Metropolitan from Castaic Lake, the terminal reservoir on the West Branch of the California Aqueduct.

From the Colorado River and California Aqueduct supply systems, Metropolitan provides supplemental water to its 27 member public agencies through a regional distribution network of canals, pipelines, reservoirs, treatment plants, and appurtenant works. In addition to the Colorado River Aqueduct system, Metropolitan's facilities include 775 miles of pipelines, tunnels and canals; 5 regional water filtration plants; several other raw and treated water reservoirs; and 15 hydropower plants. The areas served with supplemental water imported by Metropolitan and its distribution system are shown on Figure 4-2, and Metropolitan's major distribution and storage facilities are summarized in Table 4-1.

For purposes of this report, Metropolitan's system facilities are defined in two groups:

- Regional water management facilities, which consist of the water conveyance and storage facilities necessary to import and store adequate water supplies for the region as a whole, and
- Water treatment and distribution facilities, which consist of the pipelines and treatment plants necessary to treat and distribute water supplies as needed across the service area.

For each of these two groups, this section describes:

- The existing facilities,
- Demands on the existing facilities and the methodology for evaluating capacity requirements, and
- Metropolitan's needs for increased capacity.

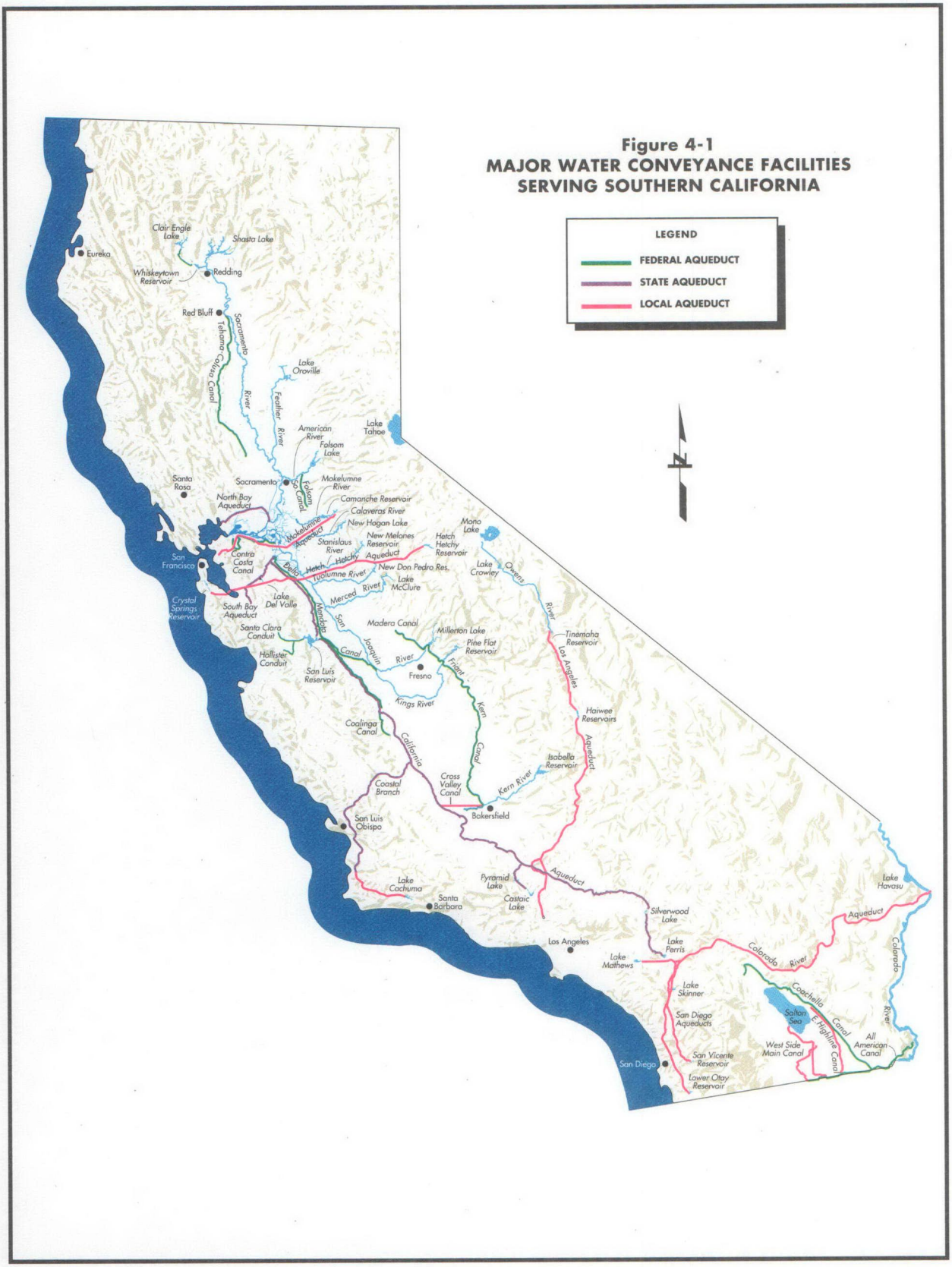
REGIONAL WATER MANAGEMENT FACILITIES

The water supplies Metropolitan imports to Southern California are delivered through major regional water management facilities. These facilities consist of the water storage and water supply conveyance projects needed to meet the region's overall water demands, and they are critical in meeting dry year demands as well as seasonal peak demands. This section summarizes the evaluation of the region's total storage and supply conveyance requirements performed under the IRP. A detailed discussion of evaluations conducted for the IRP is contained in *Volume 3: Technical Appendices.*

Storage Facilities

Metropolitan and DWR have constructed a number of surface storage reservoirs to meet regional needs for emergencies, seasonal demand fluctuations, and dry weather conditions. Local groundwater basins also provide regional storage benefits. Storage is a very cost-effective dry year supply and should be maximized whenever practical. Metropolitan has recently begun negotiations to store additional imported water in the region's groundwater basins for long-term needs. This section describes existing storage facilities and the storage evaluation methodology used to determine regional storage needs.

Figure 4-1
MAJOR WATER CONVEYANCE FACILITIES SERVING SOUTHERN CALIFORNIA



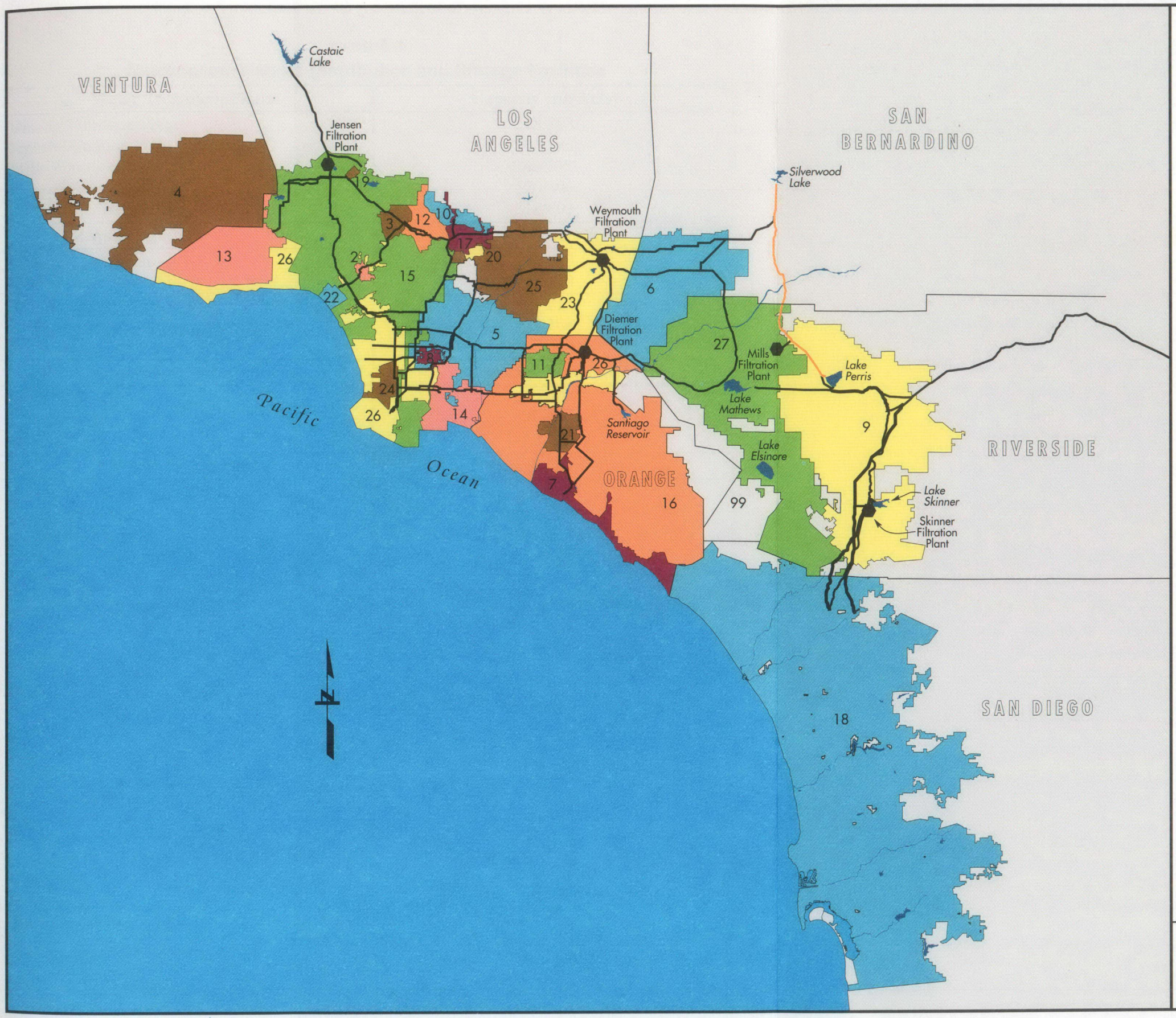


Figure 4-2
Metropolitan's Member Agencies and Distribution System

Table 4-1
Metropolitan's Major Distribution and Storage Facilities

Water Treatment Plants	Capacity (mgd/cfs)
Diemer Filtration Plant	518/803
Jensen Filtration Plant	750/1,163[1]
Mills Filtration Plant	325/505[1]
Skinner Filtration Plant	520/806
Weymouth Filtration Plant	518/803
Regulating Storage Facilities	**Capacity (acre-feet)**
Etiwanda Reservoir	400
Garvey Reservoir	1,610
Orange County Reservoir	212
Palos Verdes Reservoir	1,108
San Joaquin Reservoir	3,050
Supply Storage Facilities	**Capacity (acre-feet)**
Lake Mathews	182,000
Lake Skinner	44,000
Live Oak Reservoir	2,500
CRA Pumping Plants	**Capacity (MAF/yr)**
Whitsett (Intake) Pump Plant	1.2
Gene Pump Plant	1.2
Iron Mountain Pump Plant	1.2
Eagle Mountain Pump Plant	1.2
Hinds Pump Plant	1.2
Hydroelectric Power Plants	**Capacity (Megawatts)**
Corona Power Plant	2.8
Coyote Creek Power Plant	3.1
Etiwanda Power Plant	23.9
Foothill Feeder Power Plant	9.1
Greg Avenue Power Plant	1
Lake Mathews Power Plant	4.9
Perris Power Plant	7.9
Red Mountain Power Plant	5.9
Rio Hondo Power Plant	1.9
San Dimas Power Plant	9.9
Sepulveda Canyon Power Plant	8.6
Temescal Power Plant	2.8
Valley View Power Plant	4.1
Venice Power Plant	10.1
Yorba Linda Power Plant	5.1

[1] Capacity after plant expansion is completed.

Storage Evaluation Methodology

The region's storage need is calculated by subtracting existing surface storage from the total amount of storage required. Storage is required to balance supplies with demands and is divided into three general types: emergency, seasonal/regulatory, and drought carryover storage. The following describes the existing storage available to Metropolitan's service area; the requirements for emergency, seasonal shift and regulatory storage, and drought management; and the need for additional storage within the service area to support the region's long-term resource strategy.

Existing Storage Facilities

Existing imported water storage available to the region consists of Metropolitan's raw water reservoirs, a portion of DWR's raw water reservoirs in and near the service area, and the portion of the groundwater basins used for conjunctive-use storage.

Surface Water Storage. Table 4-2 lists the existing regional surface water storage facilities within or near Metropolitan's service area. With some limitations, these reservoirs can be used to help meet the region's water storage requirements for emergency, seasonal, and drought carryover uses. Total storage capacity available to Metropolitan in these existing reservoirs is about 871,000 acre-feet. It is important to note that storage analyses contained in this report were completed before enactment of a recent agreement between DWR and the State Water Contractors regarding storage allocation and other operations parameters. This agreement, known as the Monterey Agreement, will allow Metropolitan additional flexibility in utilizing storage available from the State Project reservoirs in Southern California. The Monterey Agreement will be incorporated in future storage analyses as the IRP progresses through the implementation phase.

Table 4-2
Existing Reservoirs Available for Metropolitan Use (acre-feet)

Owner	Reservoir	Total Storage	Dead Storage	Storage Paid by Others	Storage Paid by Metropolitan for Regional Use
Metropolitan	Lake Mathews	182,000	3,500	0	178,500
	Lake Skinner	44,000	200	0	43,800
	Subtotal	226,000	3,700	0	222,300
Dept. of Water Resources	Pyramid Lake	171,200	4,800	5,300	161,100
	Castaic Lake	323,700	18,600	11,400	293,700
	Elderberry	28,200	200	0	28,000
	Silverwood Lake	75,000	4,000	24,900	46,100
	Lake Perris	124,000	4,000	0	120,000
	Subtotal	722,100	31,600	41,600	648,900
Total		948,100	35,300	41,600	871,200

Metropolitan's Lake Mathews and Lake Skinner provide 222,300 acre-feet of storage. Lake Mathews distributes Colorado River water to Riverside, Orange, Los Angeles, and San Bernardino counties. Lake Skinner receives Colorado River and State Project water for distribution to Riverside and San Diego counties.

DWR owns and operates four major reservoirs in or near Metropolitan's service area. Castaic Lake and Pyramid Lake are located on the West Branch of the California Aqueduct. Silverwood Lake and Lake Perris are on the East Branch of the California Aqueduct. Metropolitan pays for about 650,000 acre-feet of the total storage in these four DWR reservoirs.

The allocation of total surface storage available to Metropolitan for emergency storage, seasonal/regulatory needs, and drought carryover needs is shown in Table 4-3. Seasonal/regulatory storage allocation is based on historical reservoir cycling and known cycling targets. Because DWR's Silverwood Lake is located east of the San Andreas Fault and therefore may be unavailable following a major seismic event, its capacity is assumed to be available only for seasonal/regulatory needs. The total existing surface storage capacity used for seasonal/regulatory storage is 320,100 acre-feet. The remaining 551,100 acre-feet of surface storage is assumed to be available for emergency needs.

Table 4-3
Storage Components of Existing Reservoirs (acre-feet)[1]

Reservoir	Storage Available	Emergency Storage	Seasonal/Regulatory Storage
Metropolitan			
Lake Mathews	178,500	78,500	100,000
Lake Skinner	43,800	33,800	10,000
Subtotal	222,300	112,300	110,000
DWR			
Pyramid Lake	161,100	161,100	0
Castaic Lake	293,700	139,700	154,000
Elderberry Forebay	28,000	28,000	0
Silverwood Lake	46,100	0	46,100
Lake Perris	120,000	110,000	10,000
Subtotal	648,900	438,800	210,100
Total	871,200	551,100	320,100

[1] Storage allocations prior to Monterey Agreement.

Conjunctive-Use Groundwater Storage. Most groundwater basins within Metropolitan's service area store local and imported water for later use to meet seasonal, dry year, and emergency demands. Under a conjunctive-use groundwater program, the groundwater basin is artificially replenished with imported water during wet years when available supply exceeds demand. During dry years, groundwater production is increased to supplement diminished imported water supplies. Consequently, groundwater conjunctive use enhances the region's ability to capture excess surface flows from the SWP and the Colorado River and reduces demands on Metropolitan's system during dry periods. For this report, the term conjunctive use refers to imported water that is stored within Metropolitan's service area. Groundwater basin storage use outside Metropolitan's service area is considered a water transfer and is assumed to be a component of Metropolitan's supply. Since 1980, direct replenishment and in-lieu replenishment of imported supplies have ranged between 125,000 and 450,000 acre-feet per year, with in-lieu replenishment playing an increasingly important role.

The groundwater basin managers have identified additional conjunctive use for the major groundwater basins in Metropolitan's service area that could potentially be achieved with resolution of certain basin institutional constraints. This additional conjunctive-use potential is shown in Table 4-4. As indicated, the total conjunctive-use groundwater storage potential for the region is 1.45 million

acre-feet. However, because of limits in extraction capacity, only a fraction of this total storage potential can be produced in any given month. In order to achieve this potential, discussions with the groundwater basin managers indicated that some of the basins could store and produce more imported water without additional facilities while in other basins minimal facilities were required.

Table 4-4
Groundwater Storage Parameters (acre-feet)

Basin	Potential Conjunctive-Use Storage Capacity[1]	Maximum Monthly Production Capacity[2]	Conjunctive-Use Recharge Annual Production Capacity[3]
Central/West	150,000	22,000	185,000
San Gabriel	300,000	29,000	171,000
LA/San Fernando	200,000	21,000	107,000
Raymond[4]	100,000	4,000	19,000
Orange County	350,000	36,500	297,000
North Las Posas[4]	100,000	8,500	23,000
Chino[4]	250,000	25,000	160,000
Total	1,450,000	146,000	962,000

[1]Achieving potential requires resolution of institutional constraints.
[2]Additional monthly production for conjunctive-use storage represents the difference between this maximum production and the typical monthly production used to meet demands in the basin.
[3]Historic safe-yield production.
[4]Additional facilities are required in this basin to achieve additional conjunctive use.

Components of groundwater conjunctive-use potential are summarized below:

- Conjunctive-Use Storage Capacity: The storage capacity or volume of space that could be used for conjunctive-use storage. This capacity does not represent the production of water being pumped from the basin but the ultimate size of dedicated storage.
- Maximum Monthly Conjunctive-Use Production Capacity: The monthly pumping capacity for conjunctive use. This capacity takes into account the basin's current monthly pattern for pumping water and subtracts it from the maximum monthly capacity to estimate the available capacity for conjunctive use.

  Annual Conjunctive-Use Production Capacity: The sum of the monthly conjunctive-use production capacity for each month of the year.

Storage Evaluation and Needs

Storage requirements for the region may be classified according to emergency, seasonal/ regulatory, and drought carryover needs. The need for each type of storage is discussed below.

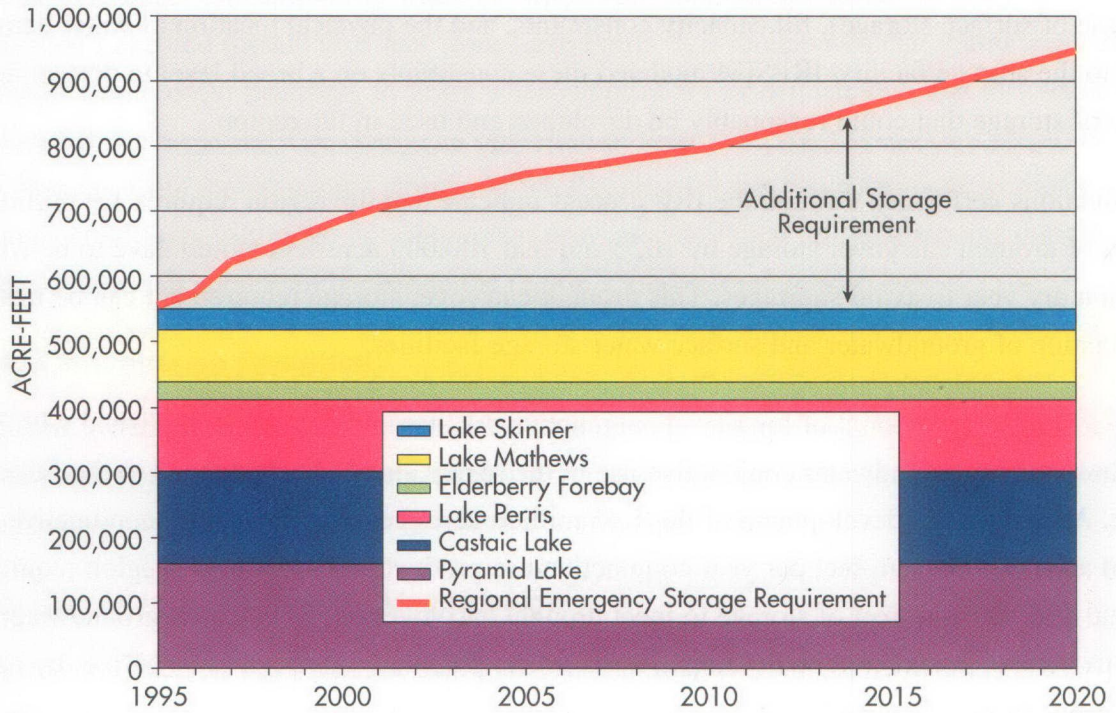
Emergency Storage Requirement. As discussed in Section 2, emergency storage requirements are based on the potential of a major earthquake damaging the aqueducts bringing water into Southern California. It is assumed that the damage to the aqueducts would require up to 6 months to repair. During such an outage, emergency water in storage would need to be available to supplement local supplies. During the emergency, it is assumed that full production of local surface water, groundwater, and recycled water would be maintained.

It is also assumed that there would be a mandatory 25% reduction in regional demands during the emergency (this translates to an approximate 50% reduction in demands on Metropolitan). Therefore, emergency storage would supplement local supplies during an emergency such that 75% of the region's normal water demands are met for 6 months.

Based on the assumptions that local water production would be unimpaired by a catastrophic emergency and that 25% mandatory rationing would be imposed, the emergency storage requirement for Metropolitan's service area is now approximately 557,000 acre-feet, increasing to 946,000 acre-feet by 2020 and 1,095,000 acre-feet by 2030. With the 551,100 acre-feet of emergency storage currently available in Metropolitan and DWR reservoirs, the region's need for additional emergency reservoir storage is now approximately 6,000 acre-feet, increasing to 395,000 acre-feet by 2020 and 544,000 acre-feet by 2030. Figure 4-3 presents the projected emergency storage needs to 2020. A portion of this emergency storage need will be offset by the San Diego County Water Authority's (Authority) Emergency Water Storage Project. This project will provide the Authority with 90,100 acre-feet of emergency storage and is scheduled to begin construction in 1997.

Figure 4-3

Projected Emergency Storage Needs and Existing Storage Capacity



Emergency storage requirements, if demand increases 5%, are 61,000 acre-feet of new surface storage in 1995 and 485,000 acre-feet by 2020. If demands were 5% less than projected, additional storage would be required in 1999 and 308,000 acre-feet of emergency storage would be required by 2020.

Seasonal/Regulatory Requirements. For the purposes of the IRP and this study it was assumed the current allocation of 320,000 acre-feet for seasonal/regulatory storage would not grow over the planning period. Individual reservoir allocations to seasonal/regulatory storage could change over time; however, the total allocation for seasonal/regulatory storage remains 320,000 acre-feet over the 25-year planning period.

Drought Carryover Requirements. Drought carryover requirements are described in detail in Volume 1 and are summarized below. Evaluation of the region's drought carryover storage requirement was accomplished through use of the IRPSIM computer model. The model tracks available surplus water, total storage capacity, recharge and production capacity of groundwater basins, and surface storage levels and capacities. The model is based on superimposing 70 years of hydrologic data on projected demands to determine the amount of storage needed to balance supplies and demands while meeting Metropolitan's reliability goal.

Limitations to the amount of storage that can be developed include the availability of water to put into storage, conveyance capacity constraints, production capacity constraints (or withdrawal rates in the case of surface storage), fill capacity constraints, and the physical location of water demands relative to the storage facility. IRPSIM modeled these constraints on a broad level to determine the quantity of storage that could reasonably be developed and used in the region.

The evaluations performed through the IRP process indicate that the region requires 1.9 million acre-feet of drought carryover storage by 2020 and that 700,000 acre-feet would have to be withdrawn in a dry year to avoid shortages. This drought carryover storage requirement can be met by a combination of groundwater and surface water storage facilities.

Because a significant amount of long-term conjunctive use storage can be accomplished with little capital investment, groundwater conjunctive use in the region should be developed to the full extent possible. Assuming full development of the 1.45 million acre-feet of groundwater conjunctive-use potential and 300,000 acre-feet per year conjunctive-use production capacity, the region requires an additional 450,000 acre-feet of storage to meet drought carryover needs. Because groundwater conjunctive use is assumed to be developed to its fullest potential, this need must be met by new surface water storage facilities.

The addition of more surface water storage also aids in water supply management for the region by enabling rapid capture of large quantities of surplus water from the SWP when it is available. This captured water can then be held during winter months when spreading basins are using the majority of their capacities for natural run-off. The captured surplus water can then be spread during the warmer months when basin capacity is available.

Total Storage Need. The region needs additional storage now. By 2020 the region will require an additional 395,000 acre-feet of emergency surface water storage and 450,000 acre-feet of surface water storage for drought carryover and seasonal needs, for a total requirement of 845,000 acre-feet. A portion of this storage need will be offset by the Authority's Emergency Water Storage Project. An additional 1.45 million acre-feet of conjunctive-use storage in the region's groundwater basins will need to be developed concurrently. Should the development of the additional groundwater conjunctive use fall short of this level, additional surface water storage capacity will be required.

It is also noted that, as part of the proposed SWP contract amendment to implement the Monterey Agreement, Metropolitan would have access to a portion of the water stored in Castaic and Perris reservoirs on a "loan" basis. Under the amendment, Metropolitan would be able to withdraw water

from this storage, in addition to its allocated SWP supply, and would have up to 5 years to replace that water in storage. The amount of water to which Metropolitan has access is 153,940 acre-feet from Castaic Lake and 65,000 acre-feet from Lake Perris. It is anticipated that withdrawals from this storage would occur primarily in years when supplies are inadequate and that this water would be replaced in wetter years. The change in operation of these reservoirs should not affect the availability of water from the remaining storage in SWP reservoirs that could be made available under emergency conditions. Although this agreement provides additional dry year storage during droughts, it does not significantly change the region's total storage needs.

Supply Conveyance Facilities

Supply conveyance facilities deliver available water to meet regional supplemental water demands either through direct deliveries or through deliveries to storage for later use. This section describes existing supply conveyance facilities and future conveyance needs.

Supply Conveyance Evaluation Methodology

Supply conveyance facilities needs are based on two major factors: the availability of water supplies and supplemental water demands, which include consumptive demands as well as deliveries to storage during wet periods required to meet dry year demands. In addition, other factors that are considered in sizing or routing supply conveyance facilities include water quality blend requirements, system reliability in an emergency or unusual supply year, and system flexibility under other-than-normal operating conditions.

Supply conveyance facilities are evaluated using the IRPSIM computer model, which indicates how much imported water is available during a given year, and a mass balance model of the distribution system, which indicates system capacity constraints. Both models use available imported supplies based on historical hydrology and map them against projected supplemental water demands on a monthly basis. Modeling results are analyzed to determine if shortages occur because of supply conveyance constraints or water supply constraints under various wet, dry, and normal conditions. The need for additional supply conveyance facilities is governed by the worst of the conveyance constraints limited by the available supply.

Existing System

Existing regional supply conveyance facilities consist of both Metropolitan and DWR facilities. Metropolitan's major supply facility is the Colorado River Aqueduct.

DWR facilities export water from Sacramento-San Joaquin Delta southward through a series of pumps, aqueducts, siphons, and tunnels that comprise the California Aqueduct. Conveyance facilities in or near Metropolitan's service area include the East Branch and West Branch of the California Aqueduct, the San Bernardino Tunnel, the Devil Canyon Power Plant, and the Santa Ana Valley Pipeline. Regional supply conveyance facilities are shown on Figure 4-1, and a summary of supply conveyance facilities and their capacities is contained in Table 4-5.

Table 4-5
Supply Conveyance Facilities Available to Metropolitan

Facility	Design Capacity (cfs)[1]	Actual Capacity (cfs)
East Branch SWP to Devil Canyon	2,130	2,400
West Branch SWP	1,490	1,700
Santa Ana Valley Pipeline	420	600
Colorado River Aqueduct	1,600	1,800

[1] For DWR facilities, capacity listed is that portion of total capacity paid for by Metropolitan.

System Demands and Supply Conveyance Needs

Dry year water demands on Metropolitan, including seasonal deliveries, are projected to be 2.06 million acre-feet in 1995 and 3.40 million acre-feet in 2020. It is anticipated that some of these dry year water demands would be met from groundwater production, surface storage, and water transfers. Water would be delivered to groundwater basins and surface storage during wet periods when water is available and would then be available for use later in these dry years. The conveyance capacity required to deliver sufficient water to storage in wet and normal periods so dry year demands could be met, as well as the capacity required in a dry year to deliver available supplies, were evaluated.

Current analyses indicate that additional conveyance is required in the future to reliably deliver available State Project water to storage and meet the regional reliability goal and summer blend goal. Ideally, the timing of the increase in conveyance capacity should follow the timing of

increased surface storage capacity as closely as practically possible to maximize the capture and storage of available supplies and provide a blend of State Project and Colorado River water in new surface storage. It is estimated that if 1,000 cfs of additional conveyance capacity is available in 2002, there is a 3 in 4 probability that 800,000 acre-feet could be delivered to a new surface storage facility by 2004. Without this additional conveyance capacity, the probability of filling a new 800,000 acre-foot reservoir by 2004 decreases to 2 in 3. For the purposes of this report, it is proposed additional conveyance be provided by 2002.

WATER TREATMENT AND DISTRIBUTION FACILITIES

Future peak demands on Metropolitan's treatment and distribution system are projected and used to evaluate the adequacy of Metropolitan's existing treatment and distribution system. The analyses are performed by comparing projected peak flows to existing pipeline and treatment plant capacities within Metropolitan's service area to identify where capacity deficiencies exist. The remainder of this section describes Metropolitan's existing distribution system, peak demands on facilities, and projected system needs.

Evaluation Methodology

Evaluation of Metropolitan's treatment and distribution system occurs in three steps:

- Project peak demands on Metropolitan,
- Evaluate Metropolitan's distribution system to determine if there are capacity constraints that would limit water deliveries, and
- Define the size and timing of facilities required to alleviate capacity constraints.

Dry year summer demands on Metropolitan are used to estimate the peak demand conditions on the treatment and distribution system, taking into account drought carryover and seasonal shift ground-water production distributed through local water systems.

Central Pool Region

As shown on Figure 4-4, the Central Pool region encompasses all of Metropolitan's service area in Los Angeles, Orange, and Ventura counties. This major service area, which accounts for more than 60% of Metropolitan's total demand for supplemental water, is served by three existing Metropolitan water treatment plants: the Jensen plant in Granada Hills, the Weymouth plant in La Verne, and the

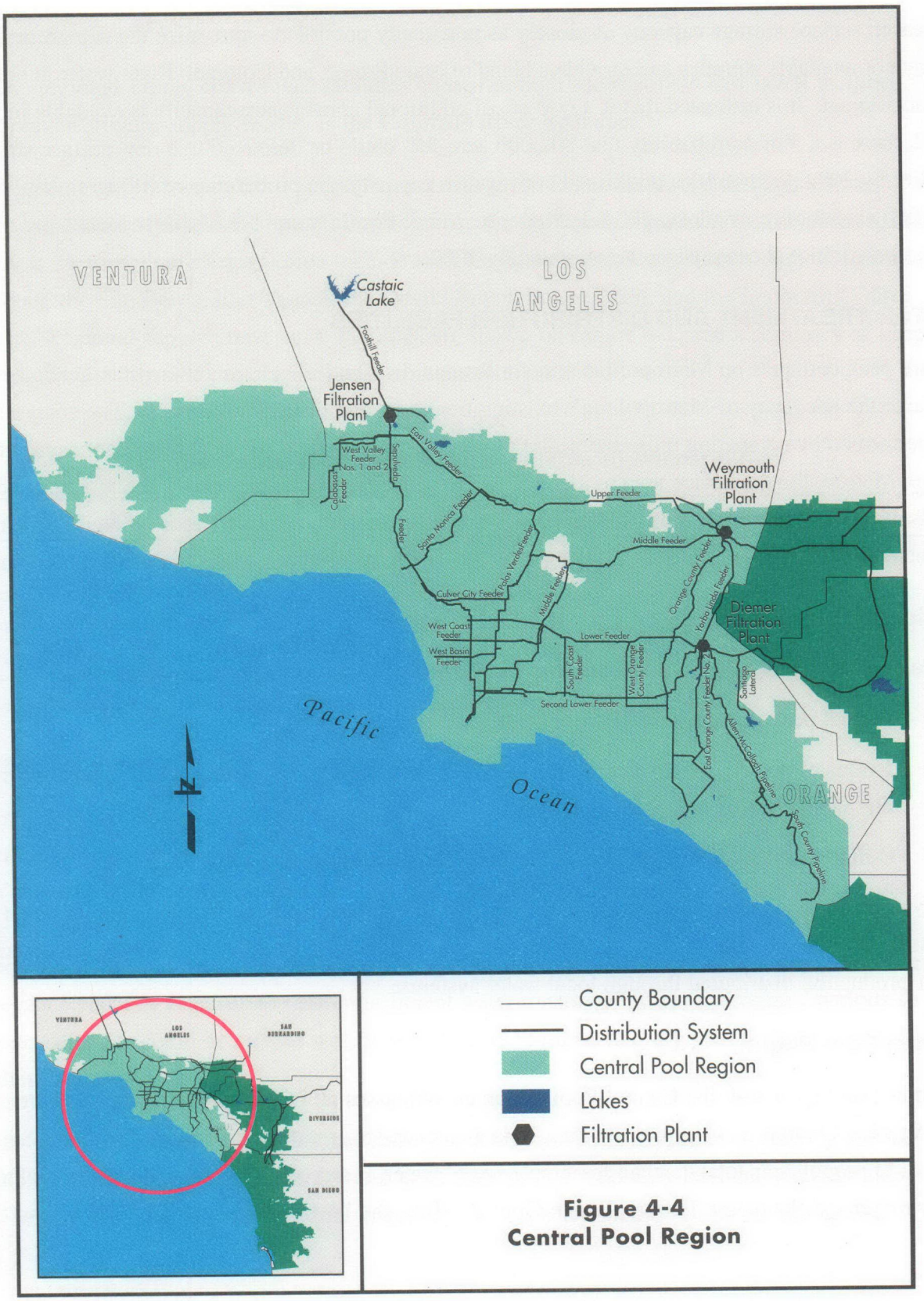


Figure 4-4
Central Pool Region

Diemer plant in Yorba Linda. These plants jointly serve a common area of the Central Pool, referred to as the "Common Pool," plus a localized area exclusively served by each.

Because of the unique overlap in the service areas of these three Central Pool treatment plants, treatment capacity available to serve the Common Pool must be evaluated by first evaluating the demands in each plant's exclusive service area. Once demands in the plant exclusive service areas are met, excess capacity is available to be conveyed to the Common Pool. Because of this relationship and in order to take into consideration capacity and hydraulic limitations in conveying treated water from one area of the Central Pool to another, system needs have been evaluated according to the following four areas:

- Jensen service srea
- Weymouth service area
- Diemer service area
- Common Pool service area

Demands for the Jensen, Weymouth, and Diemer exclusive areas, as well as the Common Pool, as defined for this study, are summarized in Table 4-6.

In addition to Metropolitan's water treatment plants, several member agencies operate local water treatment plants to process imported water. These treatment facilities directly offset the need for purchase of Metropolitan treated water. Evaluation of the Central Pool facilities assumes that local facility use in the region is maximized. The treatment facilities serving the Central Pool are summarized in Table 4-7.

Table 4-6
Projected Dry Year Peak Demands on Metropolitan in the Central Pool (cfs)[1]

Central Pool Service Subarea	Peak Demand					
	1995	2000	2005	2010	2015	2020
Jensen Exclusive Area						
Calleguas	227	245	226	229	224	251
Las Virgenes	37	44	50	56	63	71
Los Angeles - East Valley	85	107	118	134	154	165
Los Angeles - West Valley	69	93	102	118	134	143
San Fernando	1	1	2	2	2	2
Subtotal:	419	490	498	539	577	632
Weymouth Exclusive Area						
Foothill	16	17	19	20	21	22
Glendale	54	55	56	55	54	54
Pasadena	27	30	34	34	37	41
San Marino	3	3	4	4	4	5
Three Valleys - La Verne	29	26	28	23	31	43
Three Valleys - Pomona	0	0	16	12	11	20
Three Valleys - South	40	45	43	46	47	47
Three Valleys - West	95	114	116	137	158	166
Upper San Gabriel	0	25	53	75	102	129
Subtotal:	264	315	369	406	465	527
Diemer Exclusive Area						
Anaheim	44	56	70	70	72	75
Coastal - North	57	68	75	78	82	86
Coastal - South	35	35	39	42	47	51
Fullerton	15	16	19	19	20	21
MWDOC - Central	45	60	60	54	60	70
MWDOC - North	61	79	86	92	100	105
MWDOC - South	126	159	162	168	180	189
Santa Ana	18	25	31	32	34	36
Subtotal:	401	498	542	555	595	633
Common Pool						
Beverly Hills	29	31	32	33	34	35
Burbank	46	50	55	57	59	61
Central Basin	146	147	143	138	157	178
Compton	8	9	10	10	10	9
Long Beach	71	75	82	85	88	92
Los Angeles - Central City	233	282	359	380	403	445
Los Angeles - Harbor	30	41	46	50	55	60
MWDOC - West	126	170	182	176	183	189
Santa Monica	16	18	20	21	22	22
Torrance	32	32	32	30	30	30
West Basin - Malibu	11	13	16	20	22	24
West Basin - Palos Verdes	40	43	44	44	45	44
West Basin - South Bay	286	292	289	271	260	252
Subtotal:	1,074	1,203	1,310	1,315	1,368	1,441
TOTAL	**2,158**	**2,506**	**2,719**	**2,815**	**3,005**	**3,233**

[1] Projected peak demands in the Central Pool occur in July.

Table 4-7
Existing Water Treatment Plants Serving Imported Water to the Central Pool

Facility	Design Capacity (cfs)
Jensen Filtration Plant	1,163
Weymouth Filtration Plant	803
Diemer Filtration Plant	803
Los Angeles Aqueduct Filtration Plant[1]	930
Lenain Water Treatment Plant	23
Miramar Water Facility	30

[1] Filters both LADWP imported water and Metropolitan imported water.

Jensen Service Area

The Jensen exclusive area encompasses the San Fernando Valley area of the city of Los Angeles, Calleguas MWD in Ventura County, and Las Virgenes MWD. Sometime after 2000, a service through Las Virgenes MWD to West Basin MWD is anticipated to be implemented, which would also bring the Malibu area into the Jensen plant's service area. The Jensen exclusive area is shown in Figure 4-5.

Existing Facilities. Metropolitan treated water deliveries in the West Valley area are met solely by Jensen Filtration Plant. The Jensen plant receives State Project water delivered out of Castaic Lake via the Foothill Feeder. Metropolitan augments locally imported water supply to the Los Angeles Aqueduct Filtration Plant (LAAFP) with State Project water through the LA-35 service connection.

Treated water produced at the Jensen plant is delivered to the East Valley via the East Valley Feeder, the West Valley via West Valley Feeder No. 2 and Calabasas Feeder, and on to the Common Pool area via the Sepulveda Feeder and the end of the East Valley Feeder. A portion of Metropolitan's West Valley Feeder No. 1 is currently leased to the city of Los Angeles, which uses the pipeline to supply water either from the Los Angeles Aqueduct Filtration Plant or Metropolitan service connection LA-25 to its western San Fernando Valley service area. LADWP also maintains a network of large distribution pipelines to its western San Fernando Valley service area. Las Virgenes MWD service connections on West Valley Feeder No. 1 are currently backfed through West Valley Feeder No. 2. Metropolitan's distribution facilities and major LADWP facilities are shown schematically on Figure 4-6.

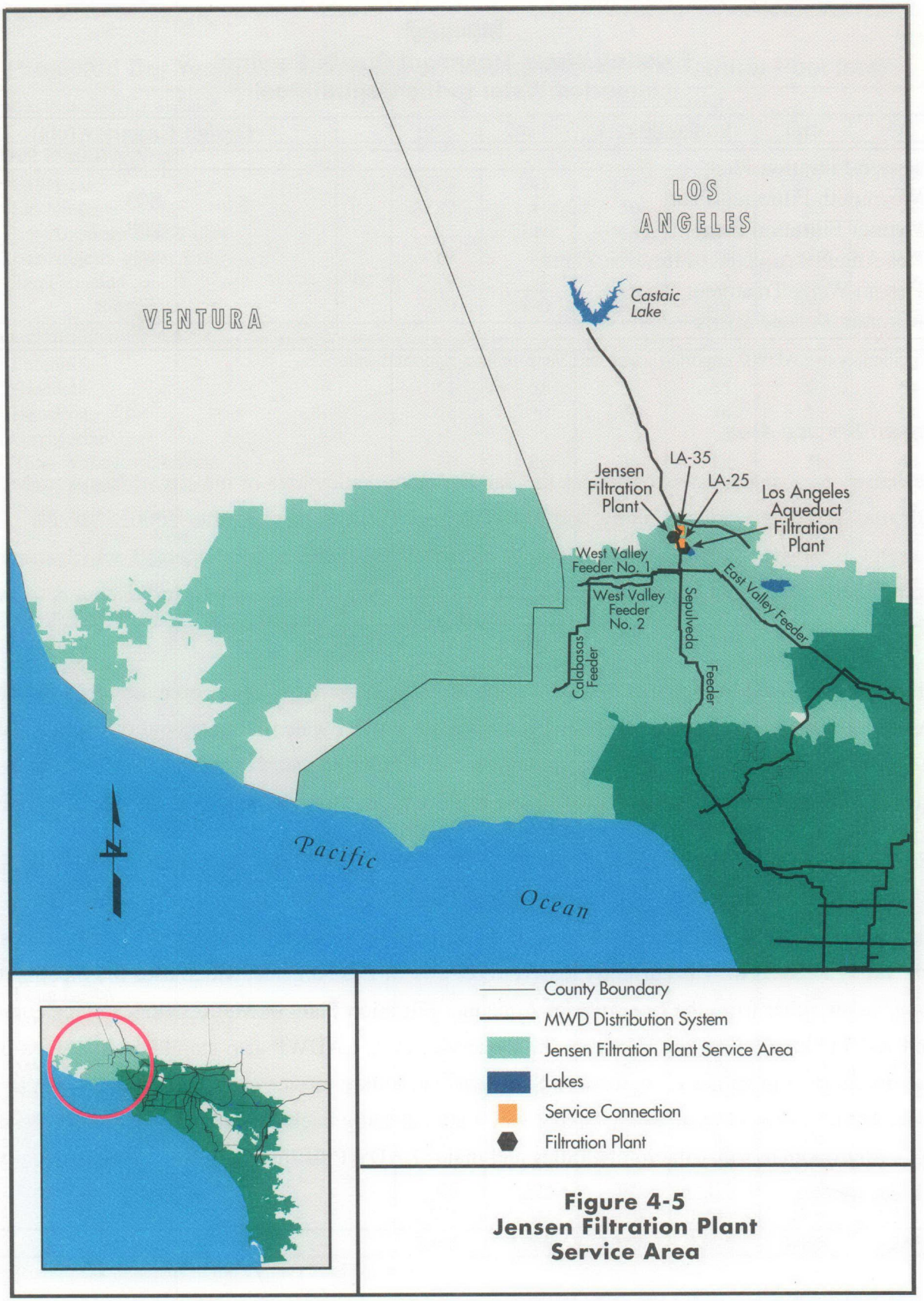


Figure 4-5
Jensen Filtration Plant Service Area

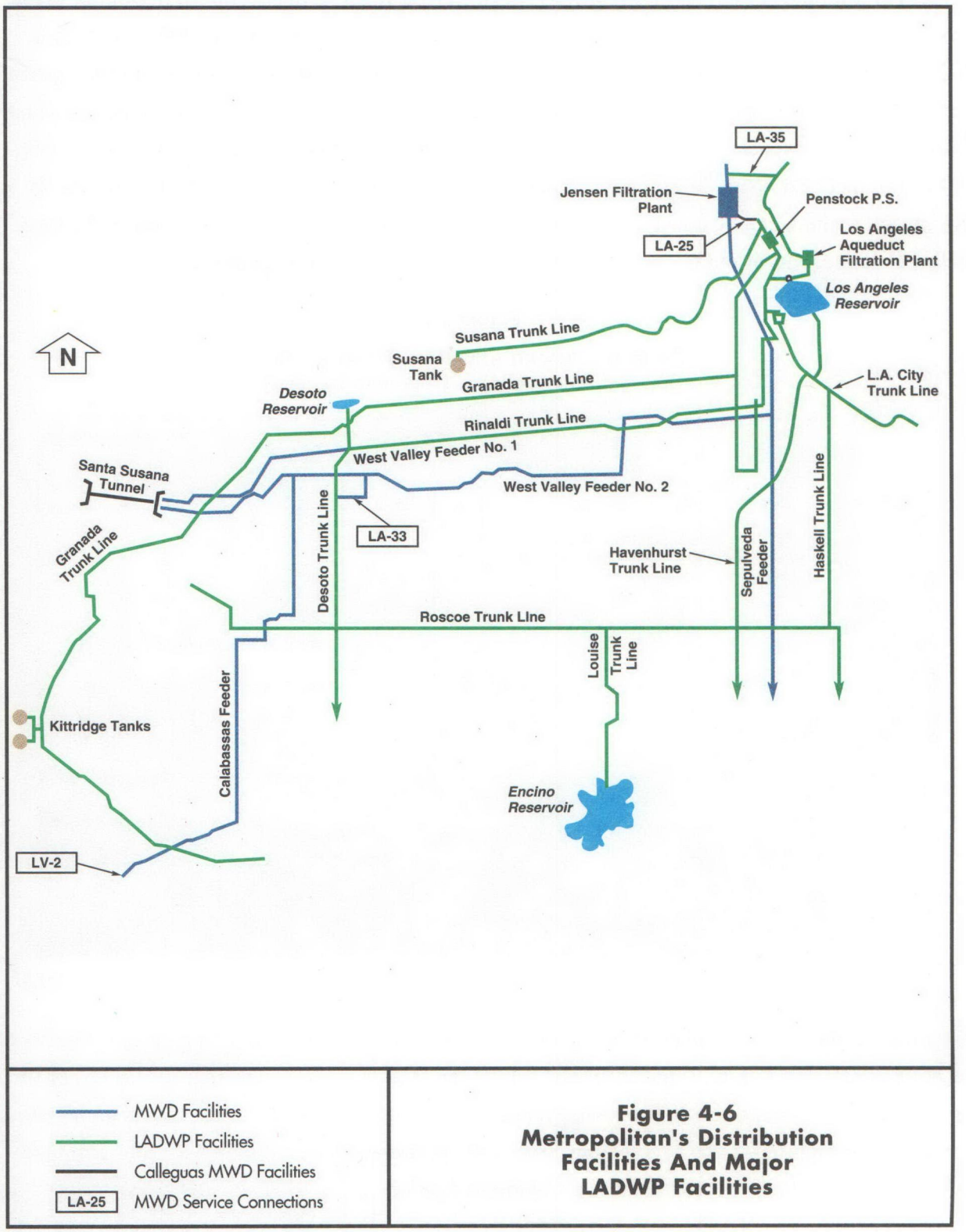
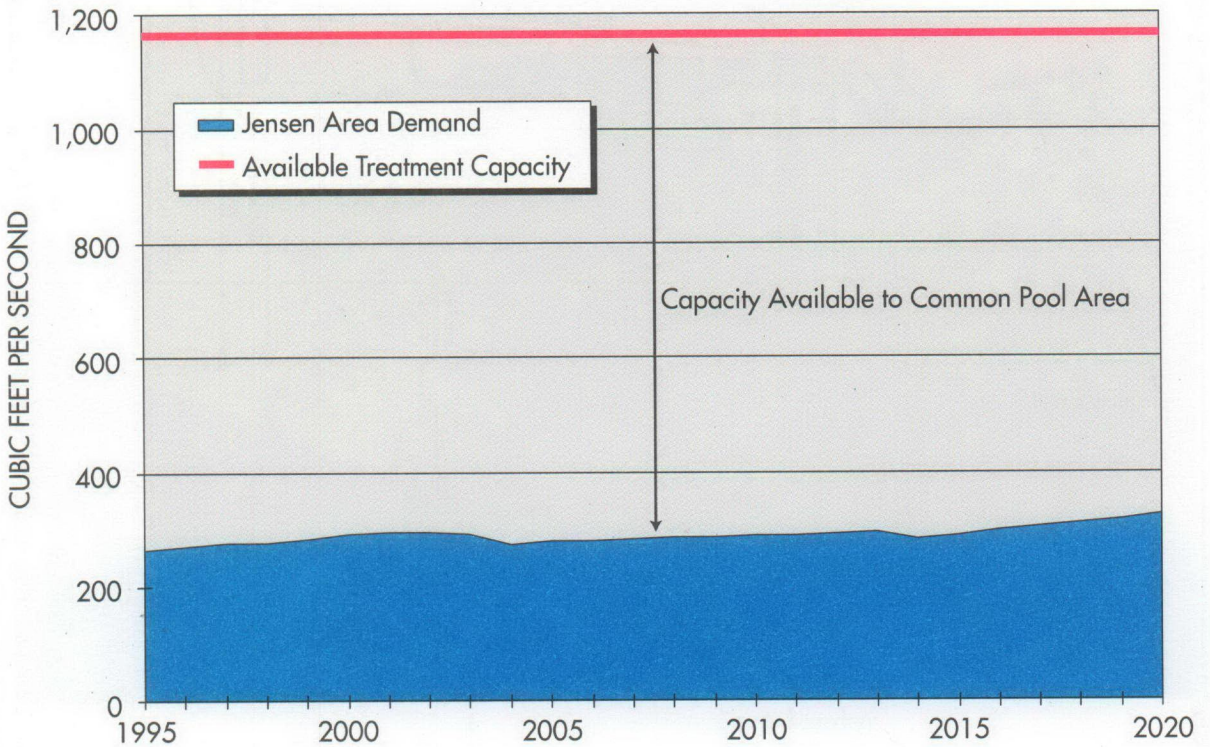


Figure 4-6
Metropolitan's Distribution Facilities And Major LADWP Facilities

System Demands. As shown on Figure 4-7, peak treated water demands on Metropolitan in the Jensen exclusive area are projected to increase from approximately 265 cfs in 1995 to 324 cfs in 2020. Because the Jensen plant's capacity will be 1,163 cfs upon completion of its current expansion and because the LAAFP provides additional treatment capacity for Metropolitan-provided water, ample treatment capacity will exist to meet the exclusive demands. The additional capacity not utilized to meet exclusive Jensen area demands is used in meeting Common Pool demands, up to the capacity which can be conveyed through the Sepulveda Feeder, through the end of the East Valley Pipeline, and through LADWP's system through LA-25 service connection.

Figure 4-7

Projected Jensen Area Peak Treated Water Demand and Available Treatment Capacity



Although ample treatment plant capacity exists to meet exclusive Jensen area demands, conveyance capacity constraints can limit the ability to deliver the treated water to the areas of need. For the Jensen exclusive area, a shortfall in conveyance capacity into the West Valley Area is anticipated. As shown on Figure 4-8, the West Valley area is the portion of the Jensen service area supplied through the West Valley Feeders and the Calabasas Feeder.

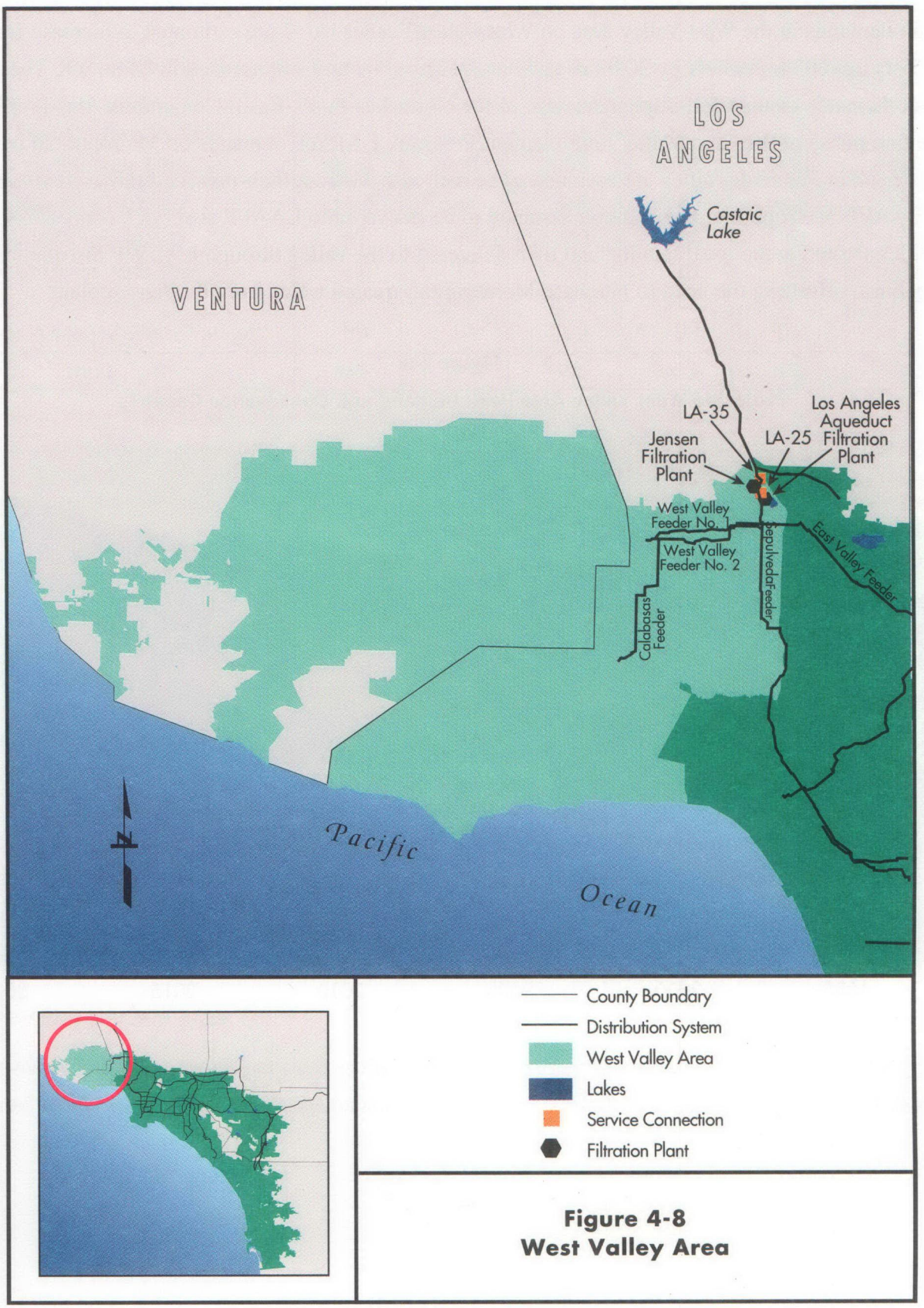


Figure 4-8
West Valley Area

Peak demands in the West Valley area on West Valley Feeder No. 2 are estimated to increase from 275 cfs in 1995 to 368 cfs by 2020, as shown on Figure 4-9 and summarized in Table 4-8. These peak demands assume full implementation of the North Las Posas Basin Conjunctive-Use Project, the first phase of the West Valley Improvement Program. LADWP demands on Metropolitan in the western San Fernando Valley are assumed to be met with Metropolitan-provided raw water treated at LAAFP. Metropolitan raw water is assumed to be delivered to LAAFP at service connection LA-35, treated at the local facility, and then delivered to the valley through LADWP distribution pipelines, offsetting the need to purchase Metropolitan-treated water from the Jensen plant.

Figure 4-9

Projected West Valley Area Peak Demand and Conveyance Capacity

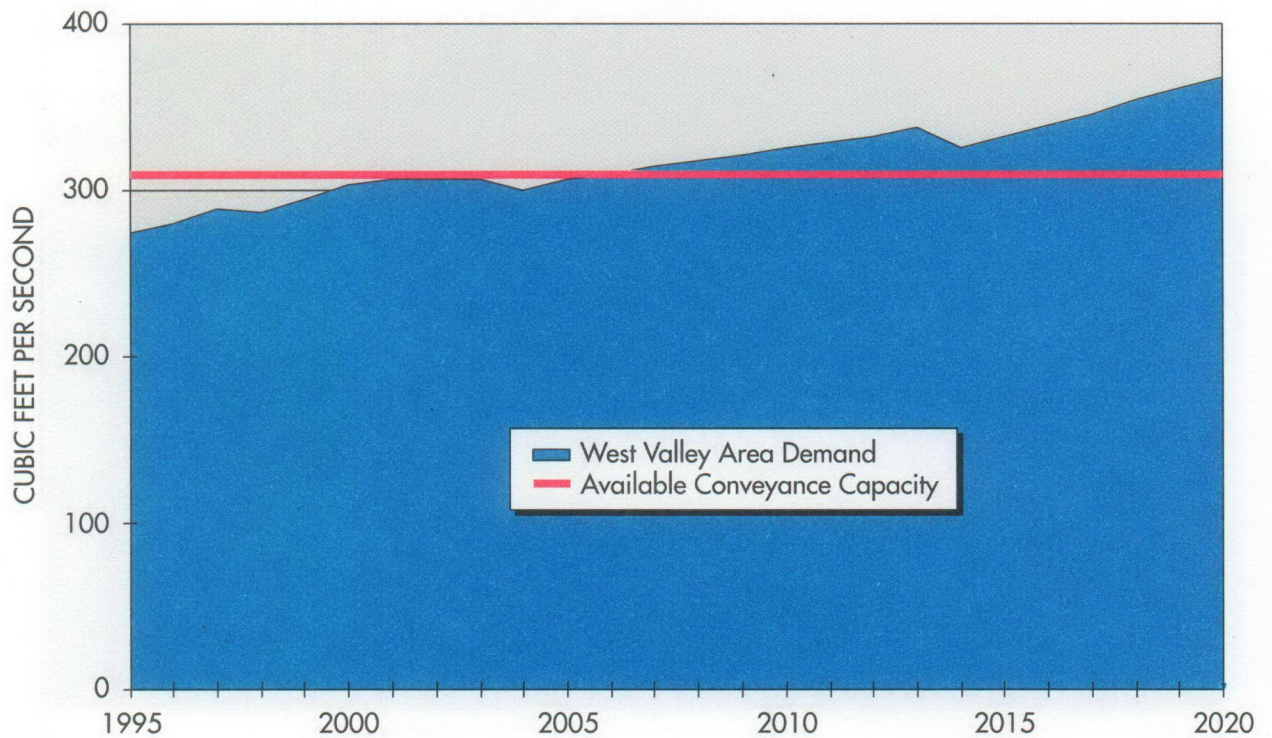


Table 4-8

Projected Dry Year Peak Demands on Metropolitan in the West Valley Area (cfs)

Distribution System Analysis Unit	Peak Demand[1]					
	1995	2000	2005	2010	2015	2020
Calleguas MWD	227	245	226	251	249	275
Las Virgenes MWD	37	44	50	54	61	69
West Basin - Malibu[2]	11	13	16	20	22	24
Subtotal	275	302	292	325	332	368
Los Angeles - West Valley[3]	69	93	102	98	114	124
Total	344	395	394	423	446	492

[1] During years 1995-2009, projected peak demands occur in July. During years 2010-2020 projected peak demands occur in August.

[2] West Basin-Malibu demand is assumed to be supplied through the Jensen plant after 2000.

[3] Regional demands within LADWP's western San Fernando Valley area are not projected to exceed local conveyance capacity. They are assumed to be supplied by the LAAFP through Metropolitan deliveries at service connection LA-35 and then conveyed through the local distribution system.

System Needs. As shown in Figure 4-9, even with full implementation of the North Las Posas Conjunctive-Use Project, demands in the West Valley area are anticipated to exceed existing conveyance capacities by the summer of 2007. To satisfy demands through 2020, about 60 cfs of additional conveyance is required.

Sensitivity Analysis. To meet demands through 2020 under the plus 5% demand condition, the need for additional conveyance capacity accelerates 7 years to the summer of 2000. Under this condition, the capacity needed by 2020 increases from 60 cfs to 80 cfs. Under the minus 5% scenario, the need for additional conveyance capacity would be delayed 9 years until the summer of 2016. In this case, only 35 cfs of additional conveyance capacity would be required to meet demands through 2020. Because the need for additional conveyance capacity is highly sensitive to changes in demand, it is important to periodically re-evaluate needs for the West Valley area.

Weymouth Service Area

The Weymouth plant exclusively serves the San Gabriel Valley and areas served through the Upper Feeder, including the cities of Pasadena and Glendale and Foothill MWD. The Weymouth service area is shown in Figure 4-10.

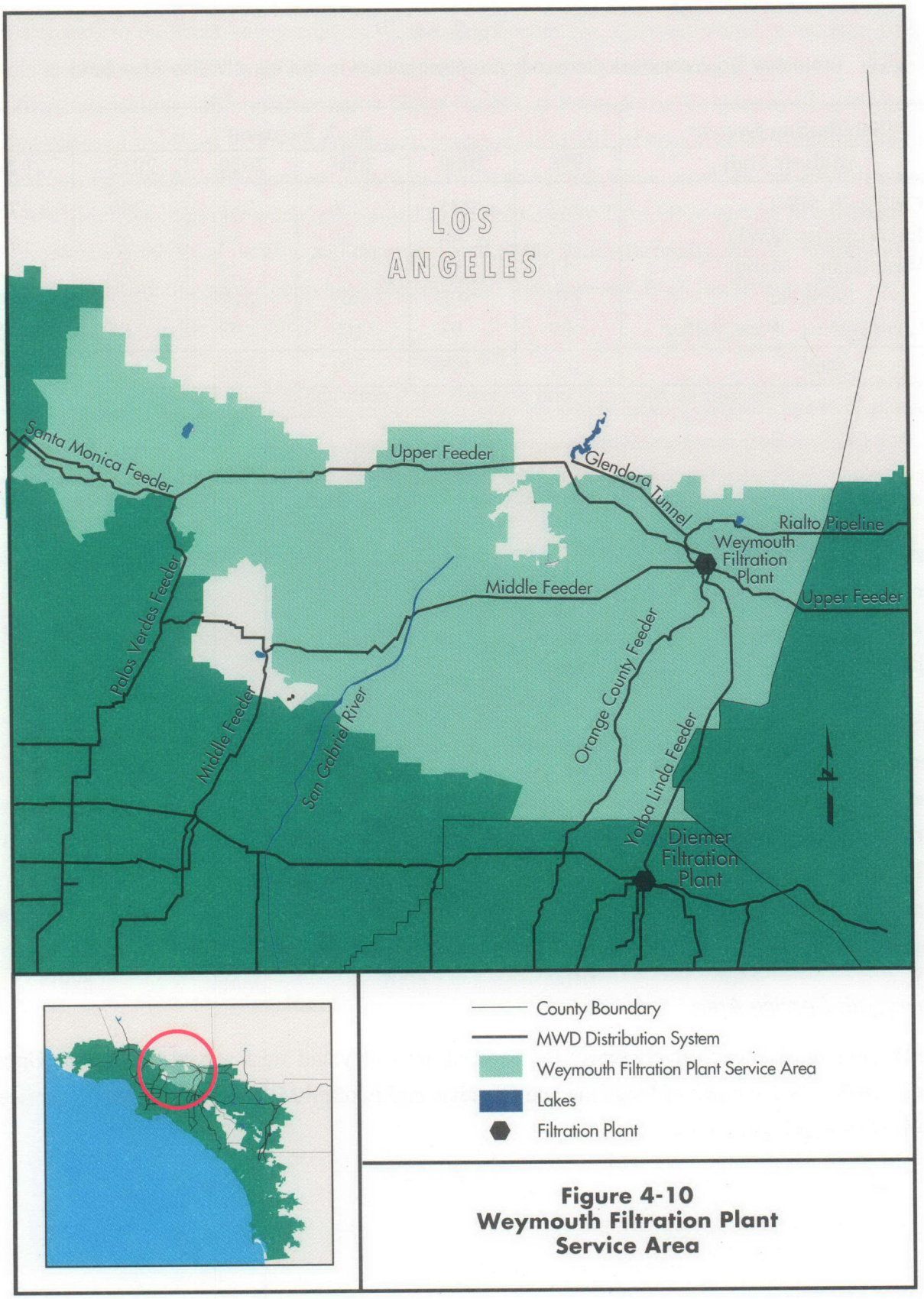


Figure 4-10
Weymouth Filtration Plant Service Area

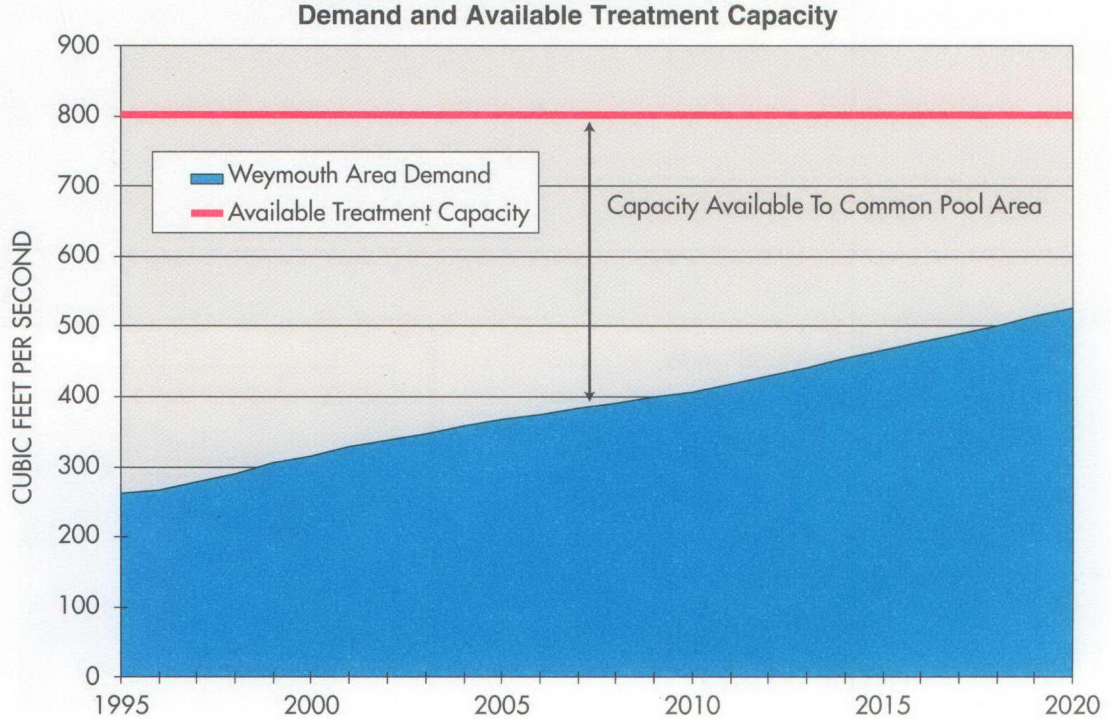
Existing Facilities. Untreated SWP supplies are delivered to the Weymouth plant from Devil Canyon through the Rialto Pipeline. Colorado River water from Lake Mathews is delivered to Weymouth through the Upper Feeder. The Upper Feeder can also deliver SWP supplies to Weymouth through the Etiwanda Pipeline connection with the Rialto Pipeline. The Weymouth plant provides treated water to its exclusive service area and on to the Common Pool region through the Upper Feeder, Middle Feeder, Orange County Feeder, and service connection PM-15. The Three Valleys MWD Miramar Water Facility provides some additional imported water treatment capacity to the area.

System Demands. Peak treated-water demands on Metropolitan in the Weymouth exclusive area are shown on Figure 4-11. As indicated, demands on the Weymouth plant are expected to increase from approximately 264 cfs in 1995 to 527 cfs in 2020. Since the Weymouth plant's capacity is 803 cfs, more than ample treatment capacity will exist to meet the exclusive demands. The excess capacity not used to meet Weymouth exclusive demands is used to meet Common Pool demands, up to the capacity that can be conveyed through Metropolitan's distribution system.

System Needs. No additional treatment or conveyance capacity is required to meet Weymouth exclusive area demands within the planning horizon.

Figure 4-11

Projected Weymouth Area Peak Treated Water Demand and Available Treatment Capacity



Diemer Service Area

The Diemer plant exclusively serves nearly all of Orange County and provides much of its capacity to serve the Common Pool area in conjunction with the Jensen and Weymouth plants. The Diemer service area is shown on Figure 4-12.

Existing Facilities. Raw water is provided to the Diemer plant through the Lower Feeder and Yorba Linda Feeder. The Diemer plant supplies treated water through the Lower Feeder, Second Lower Feeder, East Orange County Feeder No. 2 and the Allen-McColloch Pipeline (AMP) and South County Pipeline (SCP, formerly the Santa Margarita Pipeline). Existing facilities in the Diemer service area are shown on Figure 4-12.

System Demands. Peak treated-water demands on Metropolitan in the Diemer exclusive area are shown on Figure 4-13. As indicated, demands on the Diemer plant are expected to increase from approximately 401 cfs in 1995 to 633 cfs in 2020. Since the Diemer plant's capacity is 803 cfs, ample treatment capacity will exist to meet the exclusive demands. The excess capacity not used to meet Diemer exclusive demands is fully available to meet Common Pool demands, as there is sufficient conveyance capacity from the Diemer plant into the Common Pool.

System Needs. Although no additional treatment or conveyance capacity is required to meet Diemer exclusive area demands within the planning horizon, additional conveyance and treatment capacity is needed for the Common Pool area as subsequently discussed. The Diemer plant is very effective at serving Common Pool demands because of the large conveyance capacity into that area. Consequently, even though the Diemer service area itself does not require additional capacity, such augmentation would greatly benefit the Common Pool by making more Diemer capacity available. The need for additional Common Pool capacity, and hence Diemer plant capacity, is discussed in the following section.

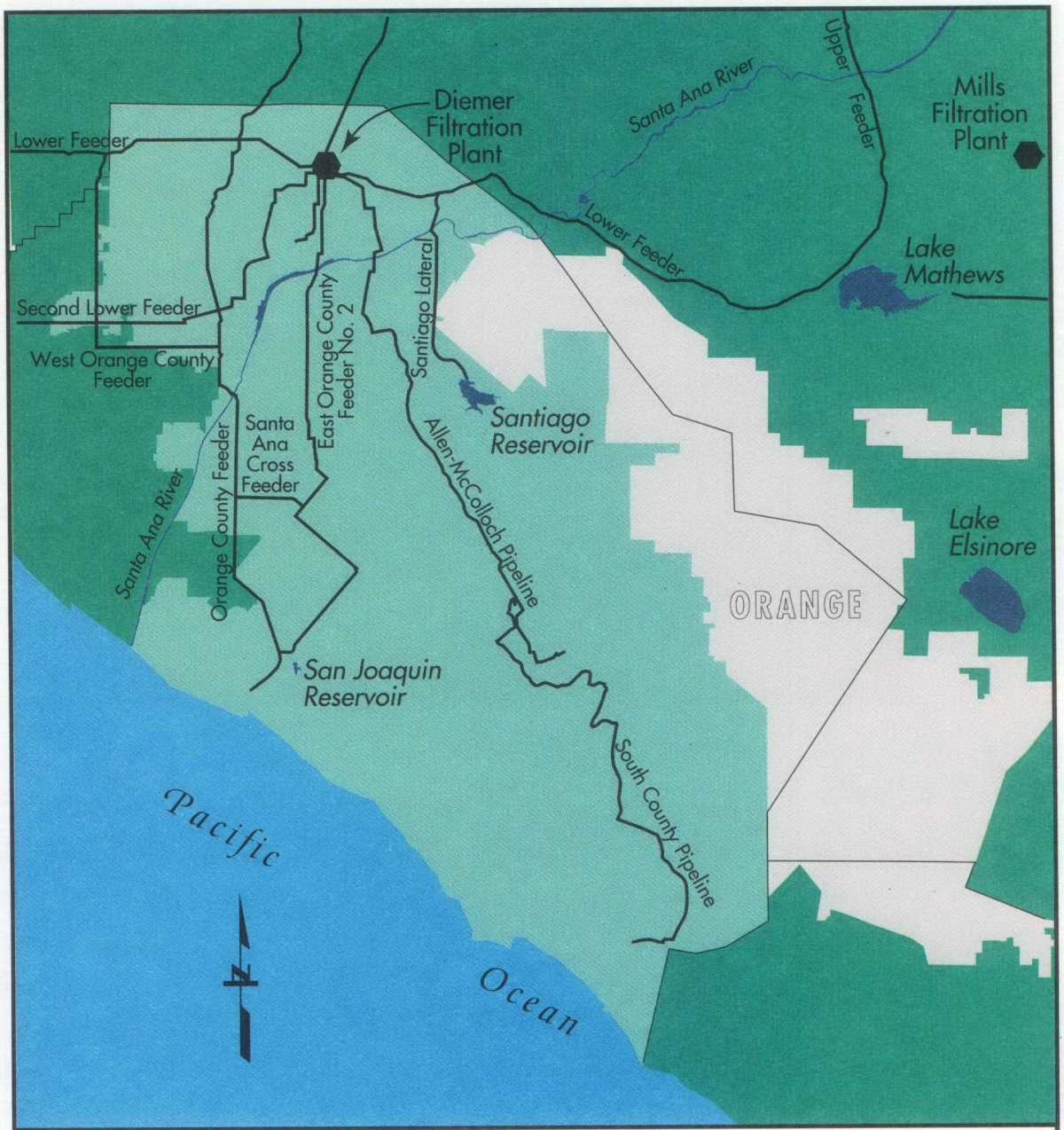
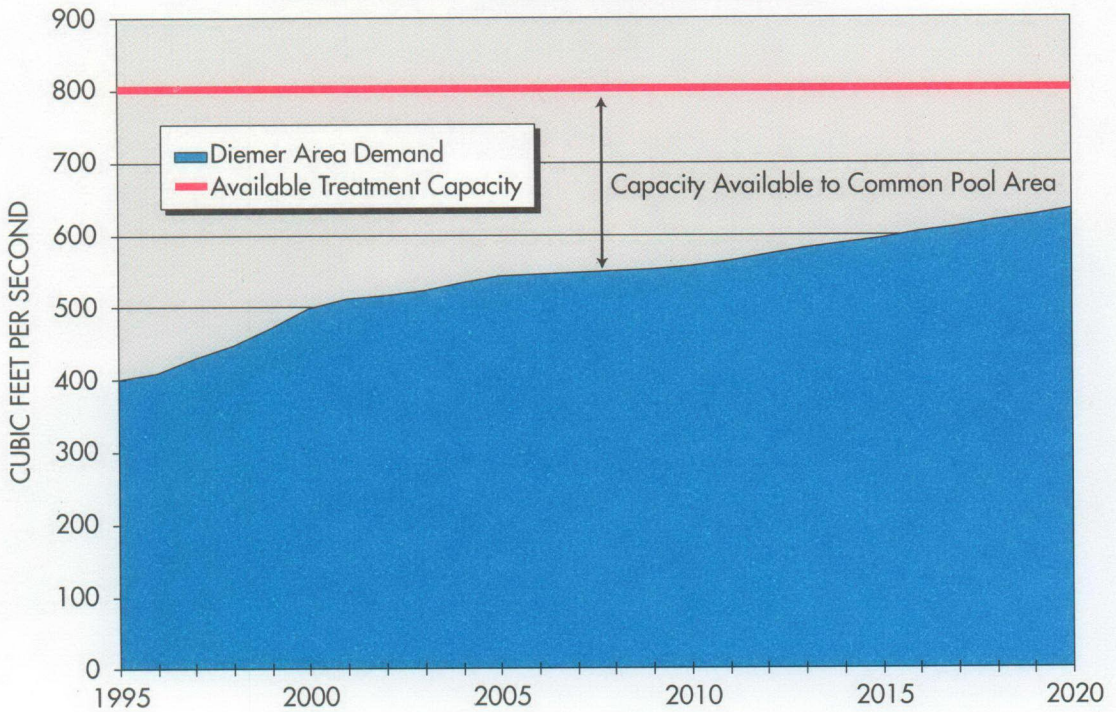


Figure 4-12
Diemer Filtration Plant
Service Area

Figure 4-13

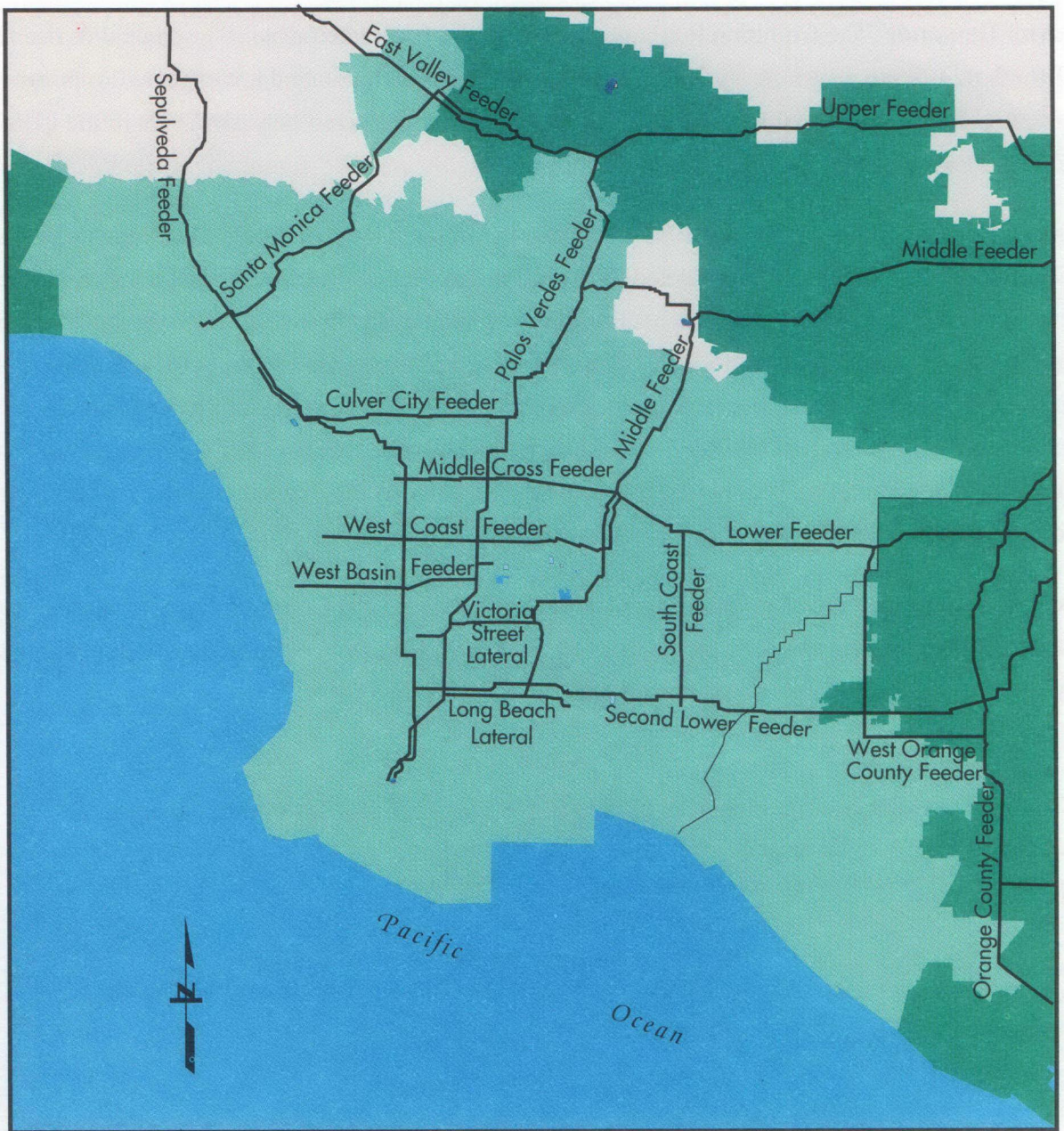
Projected Diemer Area Peak Treated Water Demand and Available Treatment Capacity

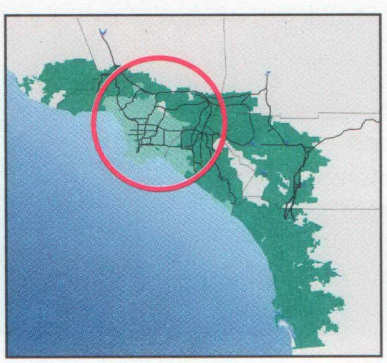


Common Pool Service Area

As previously described, the Common Pool consists of areas "common" to the three filtration plants serving the Central Pool, meaning treated water can be received from more than one of the Central Pool treatment facilities. Under normal operating situations, consumers in the Common Pool area could be receiving water from a combination of all three plants. The Common Pool area generally surrounds and extends north and northeast of the Palos Verdes peninsula. The area includes the cities of Beverly Hills, Burbank, Compton, Long Beach, portions of Los Angeles, Santa Monica, and Torrance. The Central and West Basin municipal water districts and the western portion of the Municipal Water District of Orange County are also contained in the Common Pool area.

Existing Facilities. The Common Pool area receives treated water from Metropolitan's Jensen, Weymouth, and Diemer filtration plants. The Los Angeles Aqueduct Filtration Plant also provides treatment capacity for the city of Los Angeles in this area. Conveyance facilities providing water in the Common Pool are included on Figure 4-14 and include the Sepulveda Feeder, East Valley Feeder, Santa Monica Feeder, Middle Feeder, Palos Verdes Feeder, Lower Feeder, Second Lower Feeder, and service connections at Eagle Rock and the Jensen plant.





County Boundary
Distribution System
Common Pool Service Area
Lakes

Figure 4-14
Common Pool Service Area

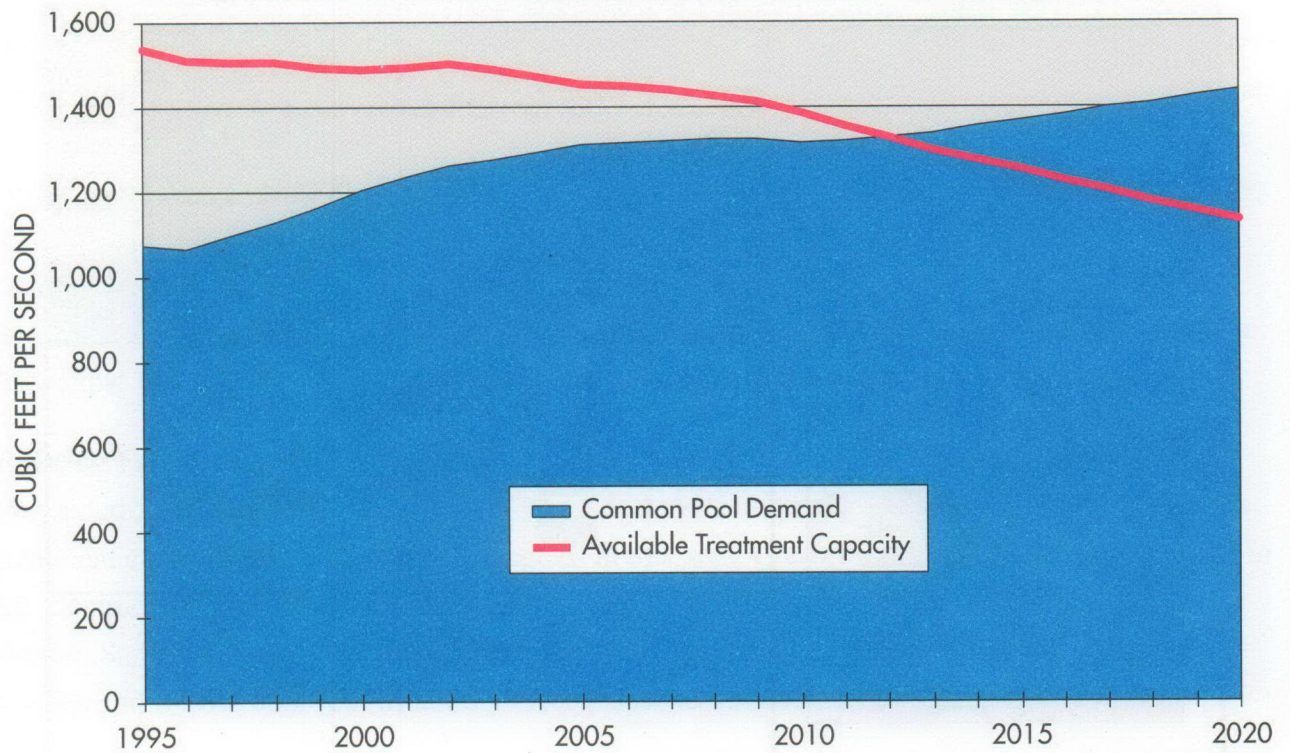
System Demands. The Common Pool area peak demand for treated water is projected to rise from 1,074 cfs in 1995 to 1,441 cfs by 2020. The largest increases in demand are expected to occur in the central Los Angeles and western Orange County areas. Projected peak demands in the Common Pool are shown on Figure 4-15.

System Needs. By the summer of 2013, demands in Orange County and the Los Angeles Basin areas of the Common Pool are projected to exceed the available treated water capacity available to them, also shown on Figure 4-15. The solid line shows the available treatment capacity, which is the sum of available capacity into the Common Pool from the Jensen, Weymouth, and Diemer filtration plants. This available capacity is calculated for each treatment plant by subtracting demands served entirely by that plant from the treatment plant capacity. Any excess capacity is available to the Common Pool, but is limited to the capacity of pipelines that convey treated water into the Common Pool.

Because of treatment capacity and conveyance limitations into the Common Pool, additional treated water capacity will be needed by the summer of 2013. By 2020, the Common Pool area is estimated to require an additional 286 cfs of treated water.

Figure 4-15

Projected Common Pool Peak Demand and Available Treatment Capacity



Sensitivity Analysis. Under the plus 5% demand condition, the time at which water demands in the Common Pool would exceed existing conveyance capacity would accelerate 9 years, from 2013 to 2004. By 2020, the Common Pool's need for additional capacity would increase from an additional 290 cfs to 589 cfs. If the minus 5% demand condition were realized, the Common Pool area would not require additional treated water capacity until after 2020.

Thus, the timing of any project in the Common Pool is very sensitive to changes in projected demands. The sensitivity analysis shows a 9- or 7-year shift in project timing if demands are 5% higher or lower, respectively, than projected. Because of the high sensitivity to changes in demand and the long design and construction schedule necessary to implement major infrastructure, it is critical to regularly update demands and evaluate the need for facilities in this area.

Riverside/San Diego Region

Metropolitan's service area in Riverside and San Diego counties is shown on Figure 4-16. The region includes Eastern and Western municipal water districts and the San Diego County Water Authority. Projected peak demands on Metropolitan for the Riverside/San Diego region are summarized in Table 4-9.

Table 4-9

Projected Dry Year Peak Demands on Metropolitan in the Riverside/San Diego Region (cfs)

Riverside/San Diego Service Subarea	Peak Demand					
	1995	2000	2005	2010	2015	2020
Mills Plant Area						
Eastern MWD – Moreno Valley	141	204	236	269	312	339
Eastern MWD – Perris	17	30	43	50	60	69
Eastern MWD – Hemet	0	0	0	0	100	43
Western MWD – Riverside	0	0	5	0	9	25
Western MWD – Corona	30	40	53	66	74	80
Western MWD – Temescal	69	86	104	112	116	118
Western MWD – Elsinore	0	10	22	30	40	48
Total[1]	277	330	410	465	549	660
Skinner Plant Area						
Eastern MWD – Skinner	4	20	40	50	73	93
Western MWD – Elsinore	0	7	14	20	27	32
Subtotal	4	27	54	70	100	125
San Diego County Water Authority	1,178	1,294	1,400	1,510	1,633	1,755
Total	1,182	1,321	1,454	1,580	1,733	1,880

[1] Total demand on Mill assumes Corona's local treatment capacity is 41 cfs through 2000 and 62 cfs through 2000

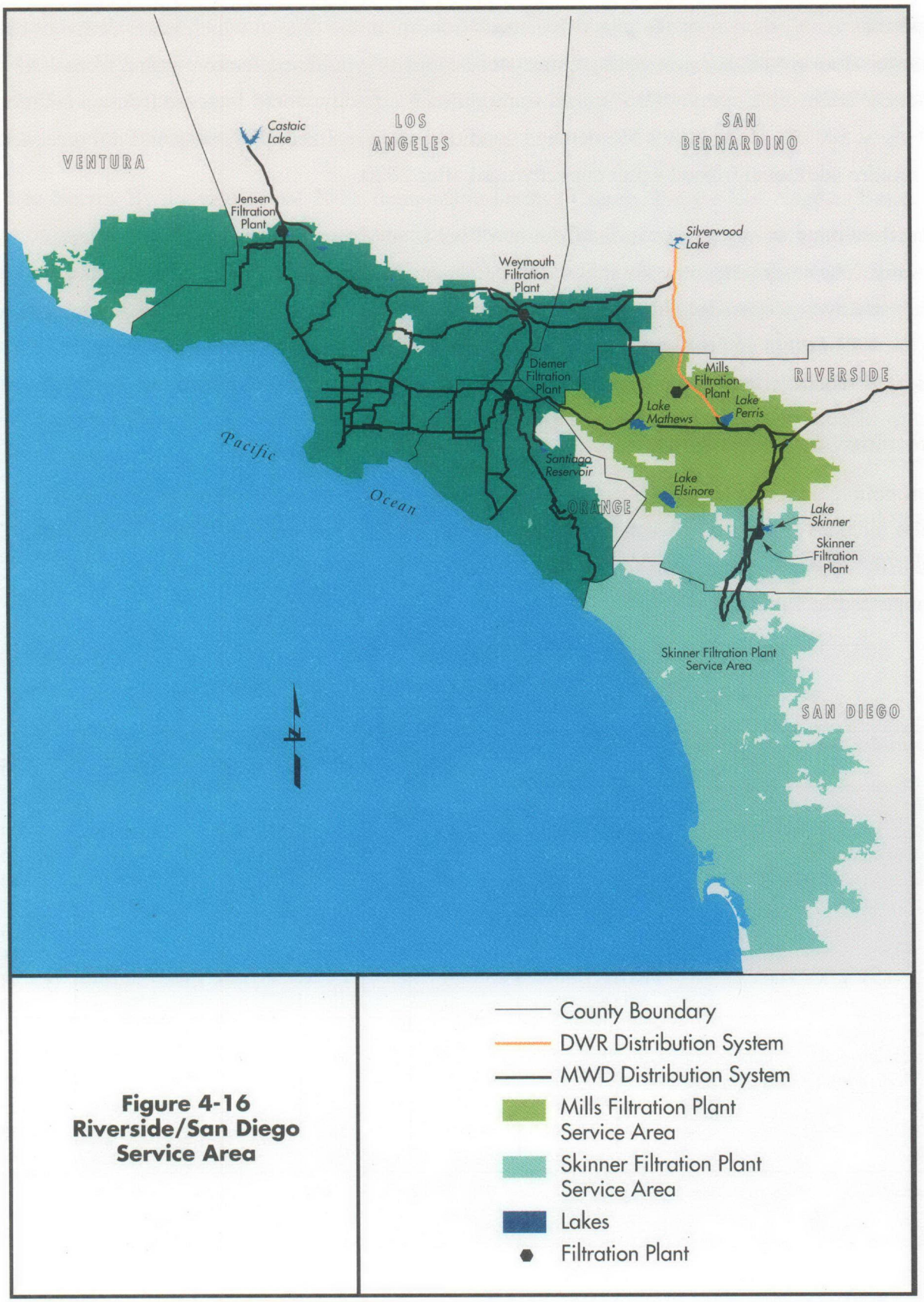


Figure 4-16
Riverside/San Diego Service Area

Existing Facilities

Metropolitan operates two regional water treatment plants in the Riverside/San Diego region: the Mills plant and the Skinner plant. Several local water treatment facilities are operated by Metropolitan's member agencies within this region. In addition, several Metropolitan distribution pipelines traverse the area. A summary of Metropolitan and local water treatment plants and Metropolitan distribution facilities is contained in Table 4-10 and shown on Figure 4-17.

Table 4-10

Facilities in the Riverside/San Diego Region (cfs)

Water Treatment	Design Capacity
Mills Filtration Plant	505
Skinner Filtration Plant	806
Treated Water Conveyance	**Design Capacity**
San Diego Pipeline Nos. 1 & 2	190
San Diego Pipeline No. 4	425
Auld Valley Pipeline	340
Raw Water Conveyance	**Design Capacity**
San Diego Canal	1,700
San Diego Pipeline No. 3	260
San Diego Pipeline No. 5	475
Local Water Treatment	**Design Capacity**
Chase & Lester WTP	31
Escondido WTP	139
Helix Levy WTP	124
Oceanside WTP	39
Poway WTP	37
San Dieguito Badger WTP	62
Sierra Del Oro WTP	10
Sweetwater Perdue WTP	46
San Diego Alvarado	186
San Diego Miramar	217
San Diego Otay	62

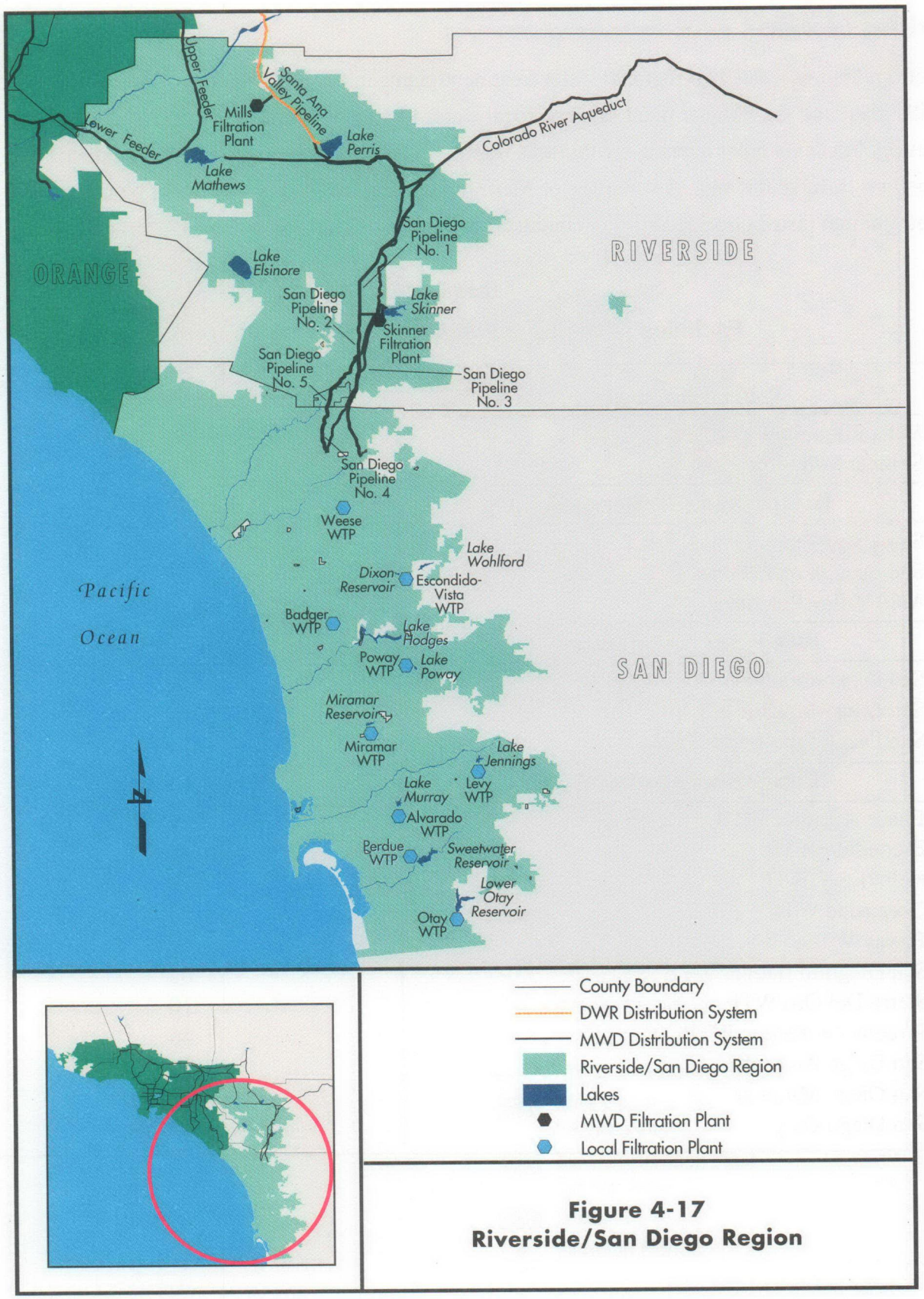


Figure 4-17
Riverside/San Diego Region

Mills Plant Service Area. The Mills Filtration Plant serves treated water to consumers in Riverside County. The plant is currently being expanded. Completion of this expansion will bring the capacity of the plant to 505 cfs. The Mills plant normally receives raw water through the Box Springs Feeder from Lake Silverwood via DWR's Santa Ana Valley Pipeline. In case of emergencies, maintenance shutdowns, or shortages of SWP deliveries, the plant can receive either State Project or Colorado River water through the Perris Pumpback Facility located near Lake Perris.

Skinner Plant Service Area. The Skinner Filtration Plant serves southern Riverside County and San Diego County and is supplied with raw water from Lake Skinner and the San Diego Canal. The plant filters water through three conventional and three direct-filtration modules with a combined capacity of 806 cfs and conveys treated water through San Diego Pipeline Nos. 1, 2, and 4. Treated water from the Skinner plant is also available to Riverside County through the Auld Valley Pipeline. Raw water from the San Diego Canal or Lake Skinner for agricultural and consumptive needs is supplied through San Diego Pipeline Nos. 3 and 5.

The city of Corona, within Western MWD, operates two water treatment plants that process Metropolitan-provided water: the Chase & Lester WTP and the Sierra Del Oro WTP, with rated capacities of 31 cfs and 10 cfs, respectively. This study incorporates the assumption that these facilities are planned for expansion to 46.5 cfs at Chase & Lester and 15.5 cfs at Sierra Del Oro.

System Demands

Projected peak demands on Metropolitan in the Mills plant service area are estimated to increase from 227 cfs in 1995 to 660 cfs in 2020, as shown on Figure 4-18. Total peak demand for Metropolitan treated and raw water in the Skinner plant service area is expected to rise from 1,182 cfs in 1995 to 1,880 cfs in 2020. Projected peak demands for treated water in the Skinner plant service area are shown on Figure 4-19. Projected demands for treated and raw water in San Diego County, as well as existing conveyance capacities, are shown on Figures 4-20 and 4-21, respectively.

Figure 4-18

Projected Mills Service Area Peak Demand and Treatment Capacity

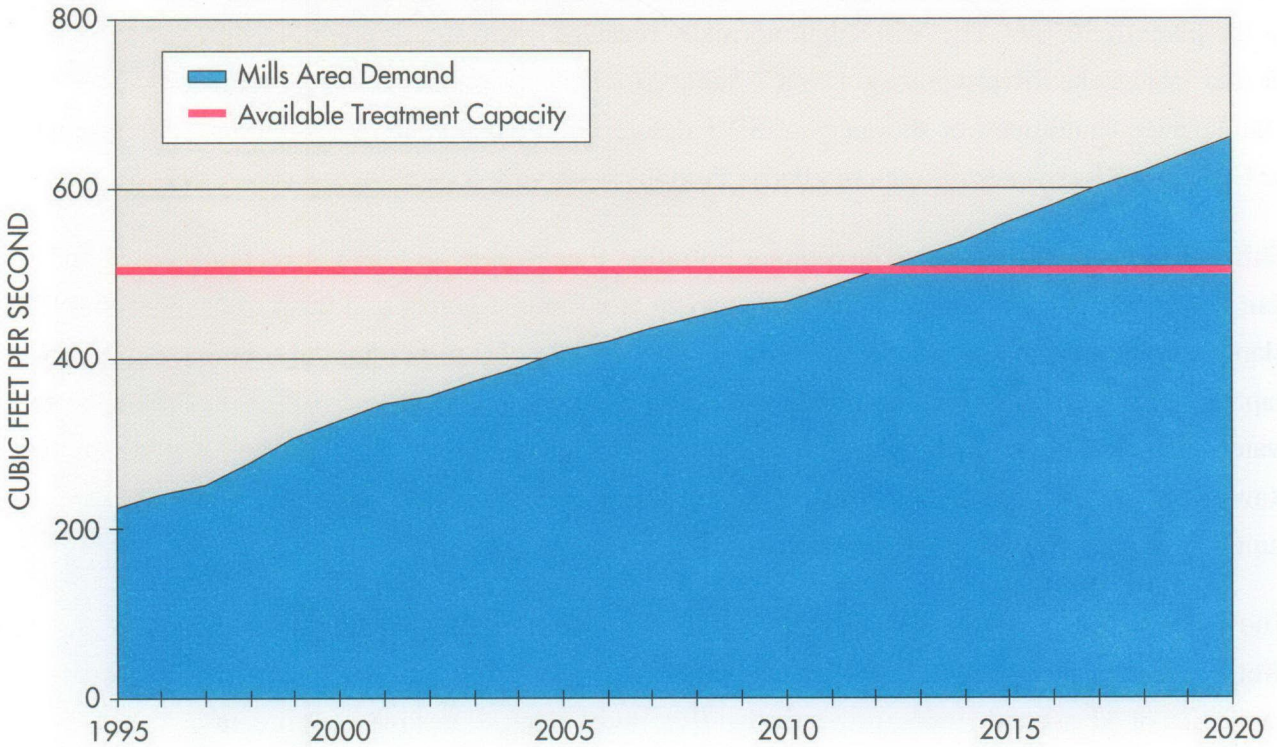


Figure 4-19

Projected Skinner Service Area Peak Demand and Treatment Capacity

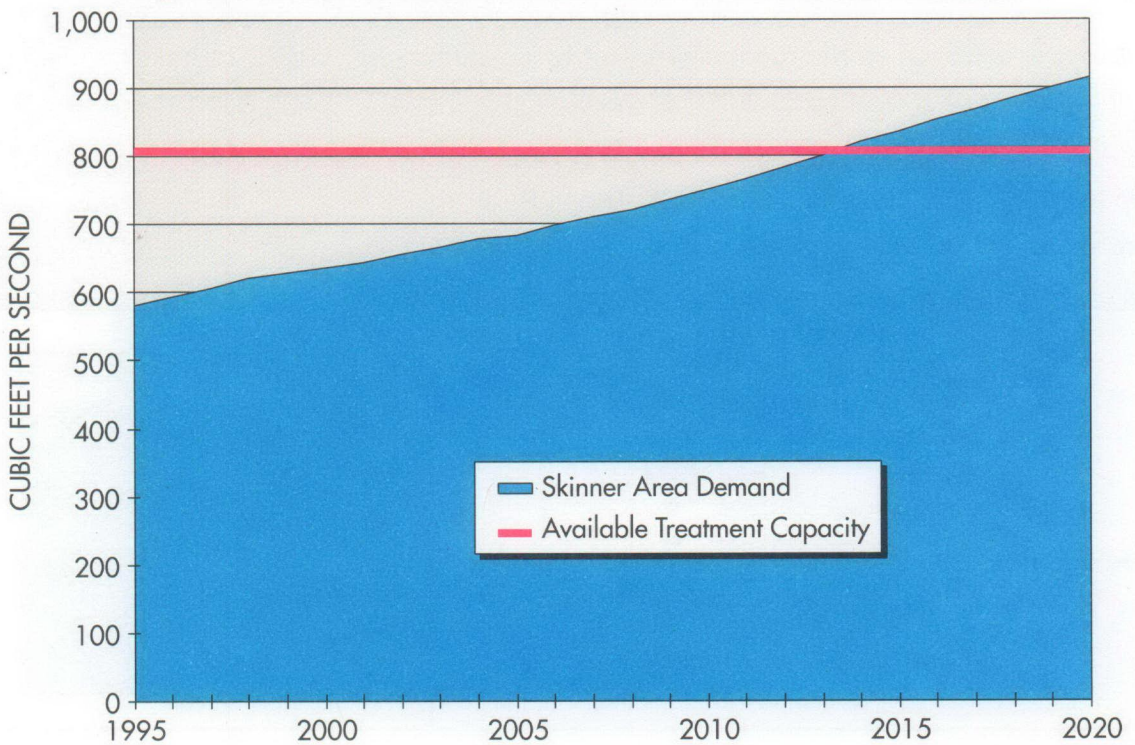


Figure 4-20

Projected San Diego Peak Treated Water Demand and Conveyance Capacity

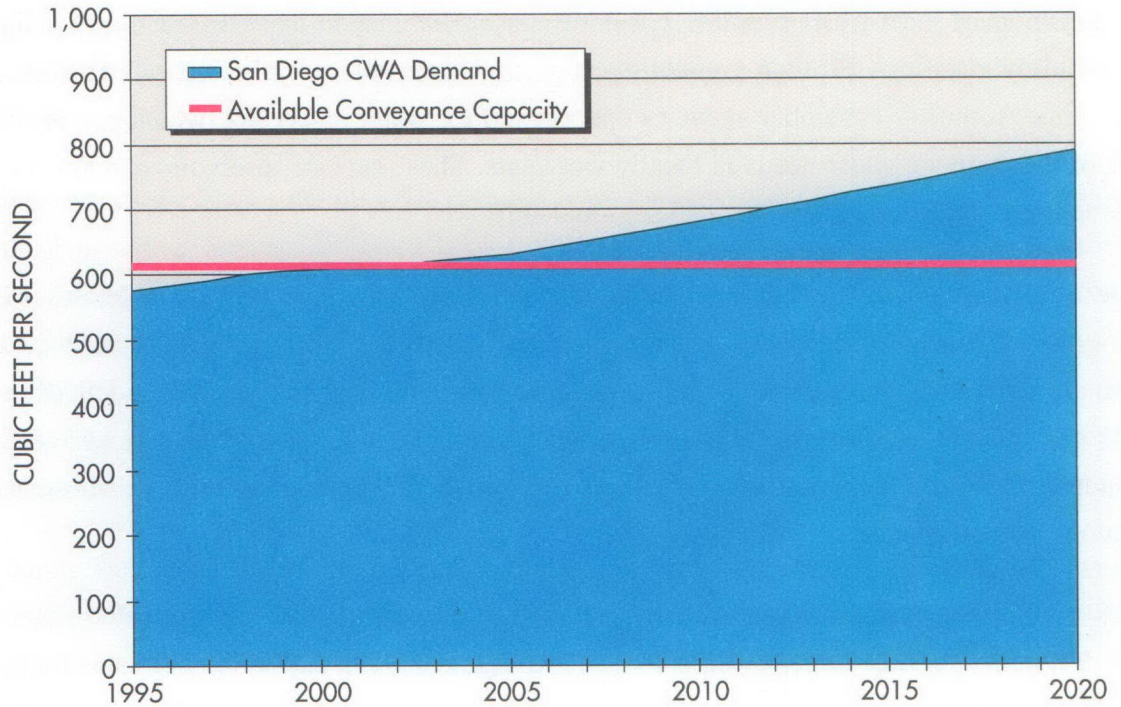
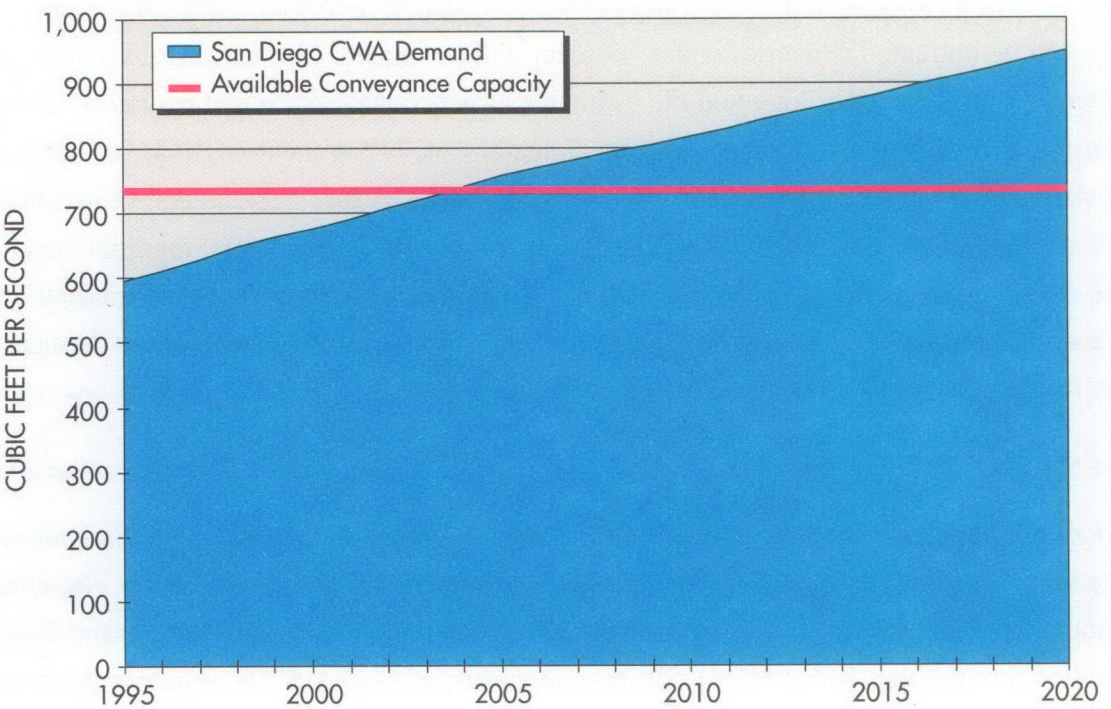


Figure 4-21

Projected San Diego Peak Raw Water Demand and Conveyance Capacity



Demands projections for treated and raw water provided to the Authority are difficult to derive because the Authority's member agencies differ from other Southern California water agencies in the management of local water supplies. Groundwater availability in San Diego County is limited to several alluvial valleys. Storage availability in groundwater basins is also limited. However, several of the Authority's member agencies operate surface water reservoirs, which can provide up to 40% of the county's water needs in locally wet years. These surface reservoirs can also be used for pre-delivery of imported supplies and seasonal shift.

The Authority also manages the delivery of treated water to many of its member agencies. Many Authority member agencies rely solely on Metropolitan's Skinner Filtration Plant for water treatment. Other agencies depend on imported supplies from the Authority via Metropolitan's delivery system for the raw (untreated) water used in their own local water filtration plants. The city of San Diego, for example, treats raw imported water (and local water when available) at its Otay, Miramar, and Alvarado treatment plants.

Consequently, Metropolitan and the Authority must manage both treated and untreated water deliveries to meet varying demands from its member agencies. The Authority estimates treated and untreated water needs based on projections of water demands from each of its 23 member agencies. These estimates were published in the Authority's *Treated Water Supply Study* (August 1994).

Based on this study, long-term demand projections show that 55 percent of imported water demands will be untreated deliveries and 45 percent will be treated. This estimate can vary each year depending on local hydrology and the estimates of new construction and operation of water treatment plants by individual member agencies. For example, during the drought period 1986-1990, approximately 30% to 35% of imported water deliveries were treated water and 65% to 70% were untreated. In 1995, following a locally wet period in San Diego County, total imported water deliveries were reduced (due to the availability of local supplies), with 60% of imported deliveries treated and 40% untreated. For long-term planning purposes, this study assumes that demands for Metropolitan water will be 55% untreated and 45% treated.

System Needs

Even after completion of the current Mills plant expansion, regional treated water demands within the Mills service area are projected to exceed plant capacity by the summer of 2013. The area will require an additional 155 cfs of water treatment capacity. By 2020 treated water demands in the area supplied through the Skinner plant will require construction of 109 cfs of new water treatment

capacity. Additionally, treated water demands in the Skinner plant service area are estimated to exceed available conveyance capacity in 2002, while raw water demands are projected to exceed existing conveyance capacity in 2004. To meet projected peak demands in 2020, an additional 175 cfs of treated water conveyance capacity and an additional 230 cfs of raw water conveyance capacity are required.

Sensitivity Analysis. Under the plus 5% demand case, the need for additional treatment capacity in the Mills plant service area accelerates 3 years to 2010. The required capacity increases from 155 cfs to 210 cfs in order to meet needs until 2020. At the plus 5% demand condition in the Skinner plant service area, the need for additional treated water conveyance capacity is accelerated 5 years to 1997, while the need for additional raw water conveyance capacity is accelerated 3 years to 2001. Under this case, the need for additional treated water conveyance increases from 175 cfs to 215 cfs and the need for additional raw water conveyance capacity increases from 230 cfs to 280 cfs.

At the minus 5% demand condition the need for additional treatment capacity in the Mills plant service area is delayed 2 years to 2015. In this case, the required treatment capacity is reduced from 155 cfs to 100 cfs. Under the minus 5% demand scenario in the Skinner plant service area the need for additional treated water conveyance capacity is delayed 5 years to 2007, while the need for additional raw water conveyance capacity is delayed 2 years to 2006. Under the minus 5% case, the Skinner plant service area requirement for additional treated water conveyance would decrease from 175 cfs to 134 cfs and the requirement for additional raw water conveyance would be reduced from 230 cfs to 180 cfs.

Recently, the Authority announced it had initiated negotiations with the Imperial Irrigation District to purchase up to 500,000 acre-feet of conserved water. The quantity of water that will be purchased, the timing of the purchases, and the means by which the water will be transported into the service area could affect the timing and sizing of projects in the Riverside/San Diego area. As details of an agreement are worked out, the timing and sizing of facilities in the Riverside/San Diego area will need to be re-evaluated.

Lower Feeder

The Lower Feeder delivers Colorado River water from Lake Mathews to Western Municipal Water District, Municipal Water District of Orange County, Orange County Water District, and the Diemer Filtration Plant. This system also provides water for replenishment of groundwater basins and supply for local treatment plants. The Lower Feeder service area is shown on Figure 4-22.

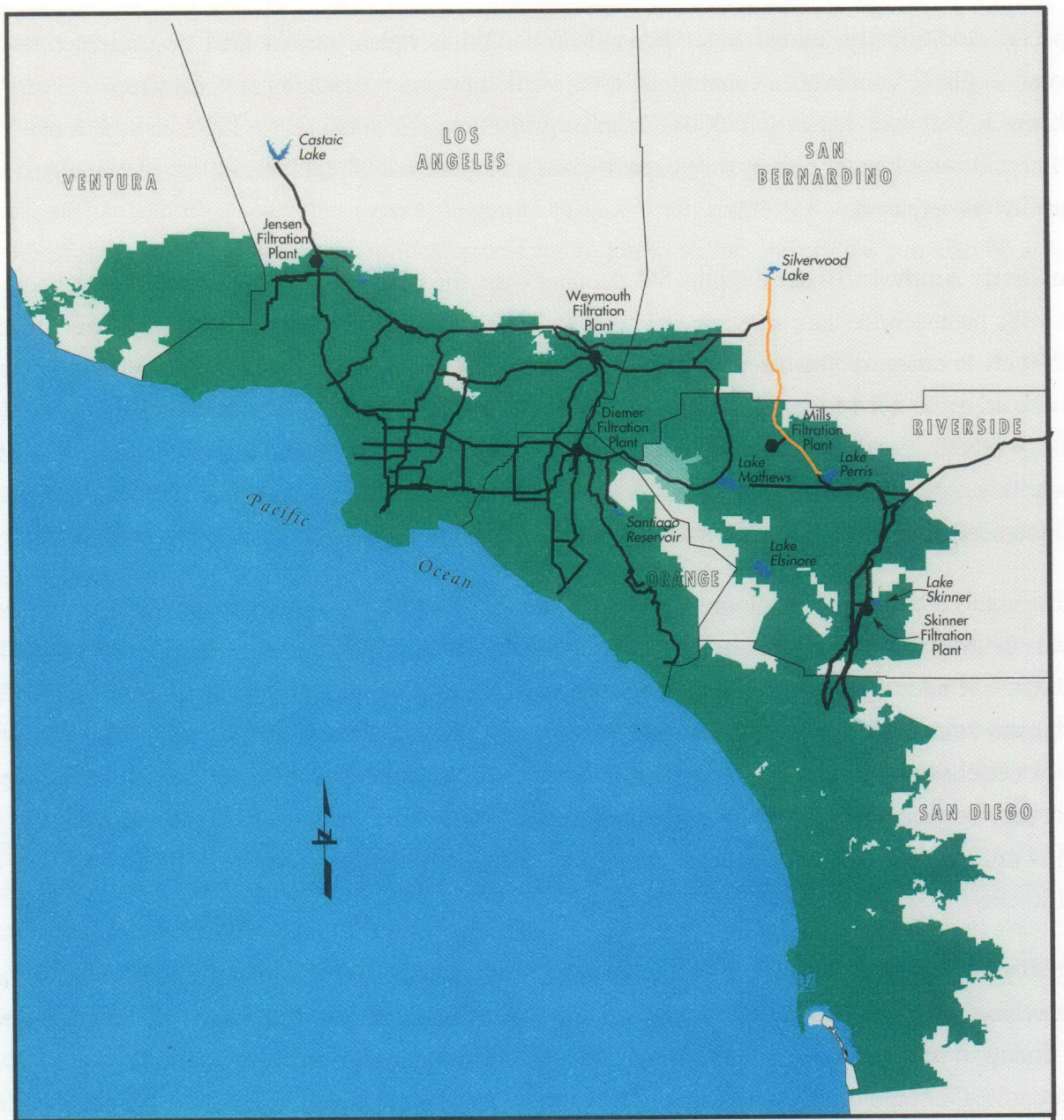


Figure 4-22
Lower Feeder System
Service Area

Existing System

Conveyance facilities include the Lower Feeder, the Santiago Lateral, and East Orange County Feeder No. 1. Table 4-11 summarizes the Lower Feeder system facilities.

Table 4-11
Metropolitan's Lower Feeder System Facilities

Facility	Design Capacity (cfs)
Lower Feeder	750
Santiago Lateral	200
East Orange County Feeder No. 1	300[1]

[1]Powerplant operation limits capacity to 190 cfs.

System Demands

Peak demands on the Lower Feeder system are projected to occur during the summer months when deliveries to the Diemer plant and local treatment plants in Corona are greatest. However, groundwater replenishment deliveries to the Orange County Basin could also cause system peaks. At existing capacity, the Diemer plant requires 803 cfs of water, while the Chase & Lester and Sierra Del Oro plants in Corona require 41 cfs of supply. The Corona plants are assumed to expand in 2001 to meet projected increases in demands. The peak need for supply will then occur, with Diemer requiring 803 cfs and the Corona plants requiring 62 cfs, for a total of 865 cfs.

System Needs

To meet needs at the Diemer plant until 2020, the Lower Feeder system capacity deficit of 338 cfs in conveyance capacity will be met with deliveries through the Yorba Linda Feeder (discussed in the following subsection). Use of this existing capacity will negate the need for additional conveyance capacity in the Lower Feeder system.

Rialto/Etiwanda/Upper Feeder Region

The Rialto/Etiwanda/Upper Feeder system provides water from the East Branch of the State Water Project and Colorado River water from Lake Mathews. Deliveries from this system are used to supply the Weymouth Filtration Plant and the Diemer Filtration Plant through the Yorba Linda Feeder, provide replenishment water to groundwater basins, and supply raw water to local treatment plants. The Rialto/Etiwanda/Upper Feeder service area is shown on Figure 4-23.

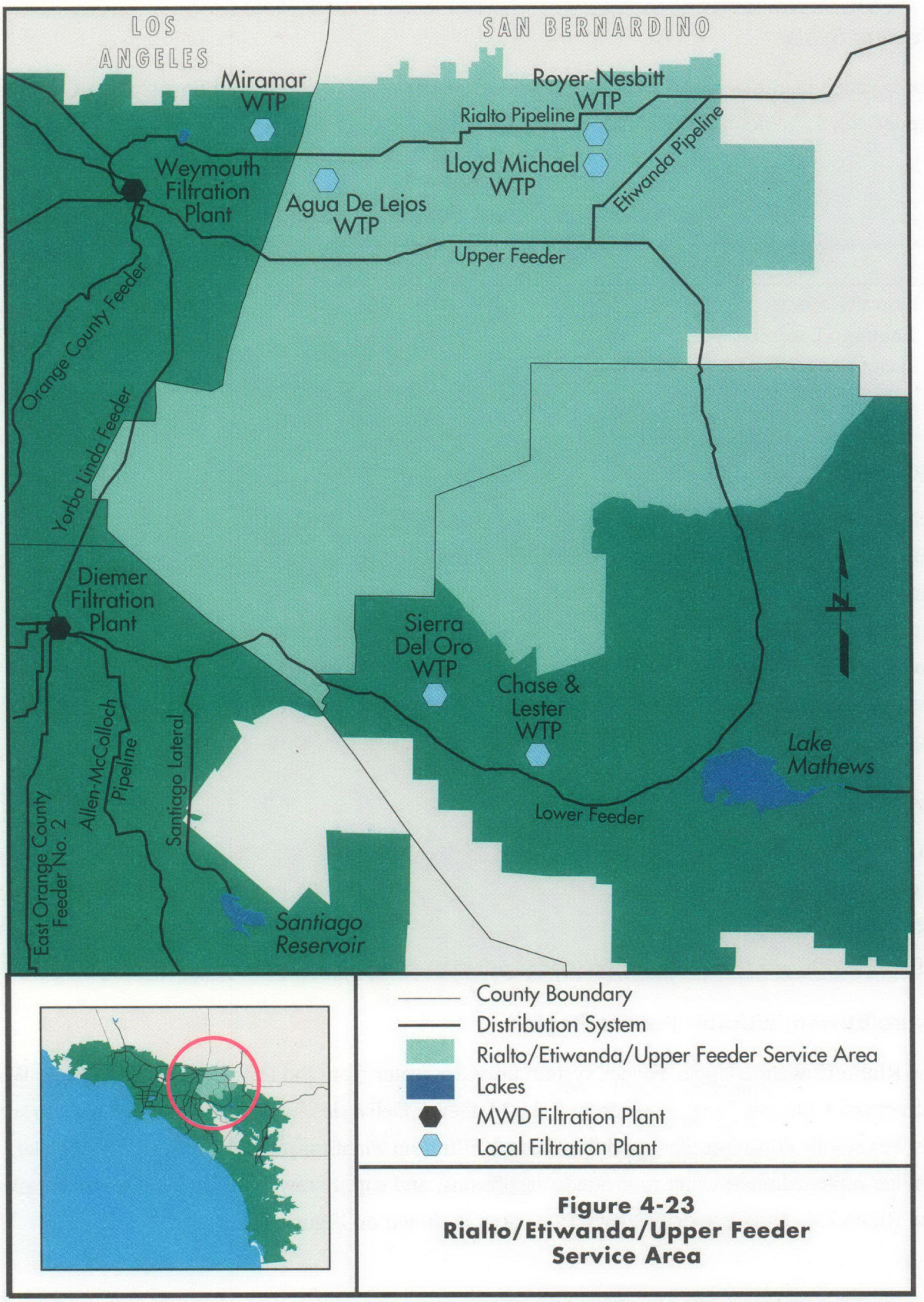


Figure 4-23
Rialto/Etiwanda/Upper Feeder Service Area

Existing System

The system is comprised of the Rialto Pipeline, the Etiwanda Pipeline, the La Verne Pipeline and the Upper Feeder, ranging from 8-feet to 12-feet in diameter. The system is briefly summarized in Table 4-12.

Table 4-12
Metropolitan's Rialto, Etiwanda, and Upper Feeder Facilities

Facility	Capacity (cfs)
Rialto Pipeline Reach 1	1,000
Rialto Pipeline Reach 2	614
Etiwanda Pipeline	1,000
La Verne Pipeline	750
Upper Feeder Reach 1	750
Upper Feeder Reach 2	832

Reach 1 of the Rialto Pipeline begins at the Devil Canyon Power Plant afterbay and ends at the Etiwanda Pipeline turnout. Reach 2 of the pipeline then continues west to Live Oak Reservoir and ends at the San Dimas facilities. The La Verne Pipeline routes water from Reach 2 of the Rialto Pipeline to the junction structure at Weymouth. Reach 1 of the Upper Feeder connects the Lake Mathews headworks and the Etiwanda Pipeline, and Reach 2 continues to the junction structure at the Weymouth plant site. The Etiwanda Pipeline connects the Rialto Pipeline and the Upper Feeder.

Prior to construction of the Etiwanda Pipeline, the design flow through the Rialto Pipeline was 614 cfs. Flow testing of the system with the Etiwanda Pipeline has demonstrated that Metropolitan can deliver over 1,000 cfs through the first reach of the Rialto Pipeline. The capacity through the first reach of Rialto Pipeline varies, corresponding with the demands supplied by the second reach of the pipeline, downstream of Etiwanda Pipeline.

To conservatively estimate facility needs in the area, deliveries to the Weymouth and Diemer plants through the Rialto Pipeline and the Upper Feeder are maximized at 614 cfs and 750 cfs, respectively. These capacities assume that at peak demands (a) flows through the Etiwanda Pipeline are minimized, (b) water is being withdrawn from Live Oak Reservoir to augment Rialto Pipeline deliveries, or (c) a combination of (a) and (b).

System Demands

Water deliveries through the Rialto/Etiwanda/Upper Feeder system serve portions of Western, Chino, and Three Valleys municipal water districts, as well as Metropolitan's Weymouth and Diemer filtration plants. Projected dry year peak demands are estimated to increase from 945 cfs in 1995 to 1,069 cfs over the planning horizon, as summarized in Table 4-13.

Table 4-13
Projected Peak Demands on Metropolitan's Rialto/Etiwanda/Upper Feeder System (cfs)

Rialto/Etiwanda/Upper Feeder Service Subarea	Peak Demand					
	1995	2000	2005	2010	2015	2020
Chino Basin MWD	112	147	200	228	245	236
Three Valleys MWD	30	30	30	30	30	30
Western MWD	0	0	0	0	0	0
Weymouth Filtration Plant	803	803	803	803	803	803
Total	945	980	1,033	1,061	1,078	1,069
Minimum Available to Diemer	419	384	331	303	286	295
Required at Diemer	317	317	338	338	338	338

Projections of Chino Basin MWD demand for peak summertime delivery of Metropolitan water are low, as the assumed operation of the underlying groundwater basin is wintertime delivery of water and increased groundwater production during the summer, reducing dependence on imported water during the summer. Projected peak demand for Metropolitan raw water remains constant for Three Valleys MWD to supply the Miramar Water Facility at its rated capacity of 30 cfs. Western MWD demands in the Jurupa-Norco area are assumed to be met with the construction of local groundwater production facilities in Riverside County.

System Needs

Peak demands on the conveyance facilities are projected to exceed their capacity in 2005, without considering withdrawals from Live Oak Reservoir. To meet peak demands in 2020, up to 1,000 acre-feet of storage in Live Oak Reservoir would be used (a 73 cfs withdrawal rate for 1 week). Because the conveyance capacity assumptions for these facilities are conservative, no additional conveyance facilities are proposed within the planning horizon.

Foothill Feeder Extension

The Foothill Feeder, as originally conceived, would have connected the west and east branches of the State Water Project with a system of tunnels and pipelines through the San Gabriel Mountains, connecting to the Rialto Pipeline in the east and the Castaic Lake outlet in the west.

Existing System

Elements of the Foothill Feeder that were constructed include the Castaic Tunnels, Saugus Tunnel, Placerita Tunnel, Newhall Tunnel, Magazine Canyon shaft, Balboa Inlet Tunnel, San Fernando Tunnel between Castaic Lake and Sylmar, and the Glendora Tunnel between La Verne and Morris Reservoir. Approximately 33 miles of the original Foothill Feeder system have not been constructed.

System Demands

The Foothill Feeder system is used to provide groundwater replenishment to the Main San Gabriel, San Fernando, and Central basins. When dry year demand conditions occur, replenishment deliveries usually are greatest in the late spring season (by May), outside of the peak demand window associated with summer water delivery.

System Needs

Analysis of peak system deliveries indicates that existing facilities are sufficient to meet needs until 2020; therefore, no new facilities are proposed. A more detailed discussion can be found in the *Foothill Area Study.*

SECTION 5 – DESCRIPTION OF SYSTEM IMPROVEMENT ALTERNATIVES

Metropolitan is committed to developing, constructing, and operating the distribution facilities needed to achieve its level-of-service and reliability objectives in a cost-effective and environmentally responsible way. This section presents a preliminary evaluation of Metropolitan's water treatment and distribution facility improvement alternatives for the needs identified in Section 4.

Facility improvement alternatives were identified and sized to meet the buildup of additional water demands on Metropolitan. New facilities have been identified when demands for imported water exceed capacities of existing Metropolitan facilities. This evaluation has been performed at a broad level, and the facility improvement recommendations presented in this report are intended to be conceptual in nature and do not represent final choices of proposed facilities except where projects have proceeded into the design phase.

In addition to meeting increased member agency demand for imported water, distribution system facility improvements are also needed to:

- Provide imported water for groundwater conjunctive use,
- Increase system reliability and flexibility, and
- Meet water quality regulations.

This section presents a variety of potential regional water management and treatment and distribution system projects that could contribute to satisfying Metropolitan's level-of-service and reliability objectives. These preliminary capital projects may be modified based on the results of more detailed analyses and as future studies reveal refinements that could lead to lower overall costs and that further enhance level-of-service and reliability objectives.

Costs presented in this section are total program estimates in escalated dollars, including contingencies.

REGIONAL WATER MANAGEMENT FACILITIES

Regional water management facilities include surface and groundwater storage and supply conveyance facilities needed to ensure that the region maintains an adequate supply of supplemental water. These facilities are needed to provide enough storage and water supply delivery capacity to meet seasonal, drought carryover, and emergency requirements.

Storage Facilities

As described in Section 4, the IRP process concluded that the region's total storage deficit will be 2.3 million acre-feet by 2020. Of this amount, approximately 1.9 million acre-feet will be required for drought carryover and seasonal needs and about 400,000 acre-feet will be required for emergency needs. Based on data from the Association of Groundwater Agencies (AGWA) and other analyses, the IRP determined that these storage requirements would best be met by an additional 1.45 million acre-feet of groundwater conjunctive use and about 800,000 acre-feet of surface water storage.

Groundwater Conjunctive Use

As discussed in Section 4, the region needs to develop an additional 1.45 million acre-feet of groundwater conjunctive-use storage for drought carryover and seasonal needs. To this end, Metropolitan is pursuing conjunctive-use programs to assist the region in meeting its target for additional groundwater storage. For this report, the term conjunctive use refers to imported water that is stored within Metropolitan's service area. Conjunctive use programs outside Metropolitan's service area are considered water transfers and are included as a component of Metropolitan's supply cost.

Metropolitan is participating in programs that provide funding to support the needed infrastructure improvements for conjunctive use. In addition to helping meet drought carryover and seasonal needs, these programs will help improve the reliability of deliveries within the region. To meet identified needs in the West Valley area, Metropolitan is developing a comprehensive program of conjunctive-use and conveyance system improvements that will be phased-in over the next 25 years. Under Phase 1 of the West Valley Improvement Program, Metropolitan has signed an agreement with Calleguas MWD to help fund the infrastructure needed to implement a conjunctive-use program in the North Las Posas Basin. Negotiations for conjunctive-use projects are also underway for Chino, Orange County, and Raymond groundwater basins. Opportunities to help meet drought carryover storage needs may also exist in other groundwater basins.

The combined conjunctive-use potential, as cited in the AGWA conjunctive-use report, of the Chino, North Las Posas, Orange County, and Raymond basins is about 800,000 acre-feet. Some infrastructure improvements will be required in these basins to meet this conjunctive-use potential. The managers of the remaining groundwater basins indicated that infrastructure improvements were not required in their basins to achieve a regional conjunctive-use level of 1.45 million acre-feet; however, resolution of institutional issues is requisite to development of this storage potential. Metropolitan has budgeted a total of $175 million in escalated dollars over the next ten years to assist local agencies in
implementing groundwater storage projects necessary to meet the conjunctive-use goals identified in the IRP.

Surface Storage

To meet the region's need for additional emergency, carryover, and seasonal storage beyond the amount provided by additional conjunctive use, Metropolitan is moving forward with the Eastside Reservoir Project in Riverside County. The Eastside Reservoir Project will help satisfy Metropolitan's emergency, carryover, and seasonal storage needs beyond 2020. The 800,000 acre-foot reservoir will provide about 400,000 acre-feet of emergency storage and a like amount of carryover and seasonal storage.

The Eastside Reservoir Project is an important project for the region's water management strategy. Once stored in the Eastside Reservoir Project, water can be delivered by gravity flow to the majority of Metropolitan's service area. Also, the conveyance capacity into and out of the reservoir is extremely large. This ability to move water quickly is crucial because large quantities of surplus water from the State Water Project may be available only for short durations. Moreover, the 400,000 acre-feet of emergency storage would have to be withdrawn in 6 months. Finally, the reservoir will hold water during winter months when groundwater basins are using their spreading capacities for natural runoff. Water could then be cycled to the spreading basins during the summer when groundwater basins have excess spreading capacity available, allowing for more water to be stored in the groundwater basins. These summertime groundwater basin deliveries, however, would be limited to the conveyance capacity available in Metropolitan's distribution system after consumptive demands are met.

The Eastside Reservoir Project is in the final design and beginning construction phase. Current plans call for the reservoir to be constructed on an approximate 12,000 acre site, including portions of Domenigoni and Diamond valleys. It is located in an unincorporated area of Riverside County, 4 miles southwest of Hemet and 3 miles southeast of Winchester, as shown on Figure 5-1. The resulting 800,000 acre-foot reservoir would have a surface area of 4,410 acres and the ability to serve approximately 90% of Metropolitan's service area by gravity flow.

Water would be delivered to the reservoir through the San Diego Canal and a proposed Inland Feeder pipeline discussed later in this section. Water supplied by the San Diego Canal would be delivered to a forebay at the base of the west dam and then pumped into the reservoir through a tunnel in the north abutment of the west dam embankment. This water could be 100% Colorado River water or a blend of State Project and Colorado River water. The Inland Feeder could supply State Project water by gravity to Eastside Reservoir Project through the reservoir supply line. Deliveries from the reservoir would be made through the forebay to the San Diego Canal or by reversing the flow in the reservoir supply pipeline to the CRA.

The Eastside Reservoir is scheduled to be operational in 1999. Up to a 5 year period to fill the new reservoir is expected, depending on the future availability of surplus water. The full reservoir capacity is expected to be on line in 2004. Based on this schedule, the project is estimated to cost $1.97 billion in escalated dollars.

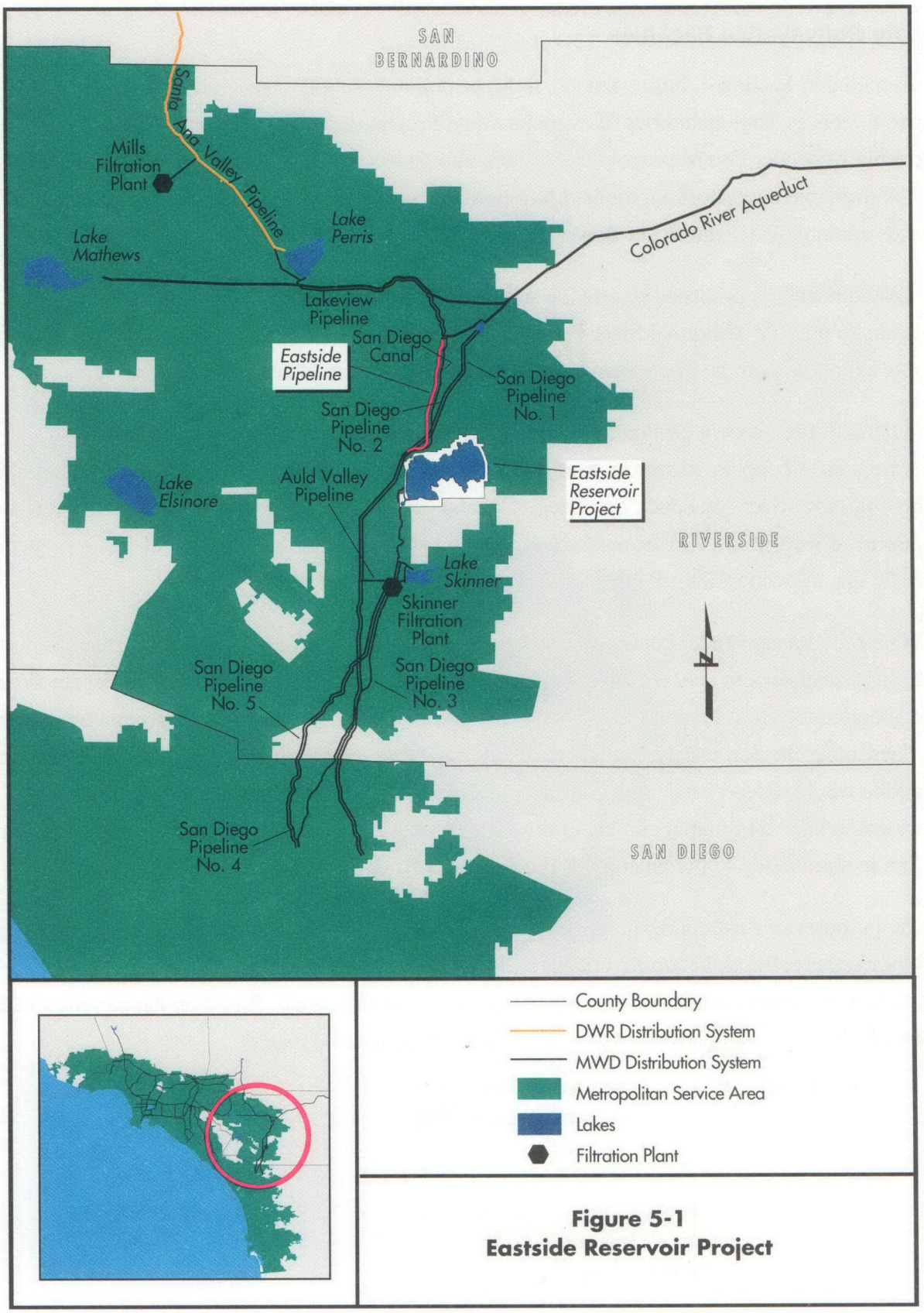


Figure 5-1
Eastside Reservoir Project

Supply Conveyance Facilities

As discussed in Section 4, improvements to Metropolitan's supply conveyance facilities will be needed to convey large quantities of available State Project water from the East Branch of the California Aqueduct into Metropolitan's system and Eastside Reservoir Project. Because water may only be available over short durations, Metropolitan's conveyance facilities must be sufficiently large to accommodate significant flows.

The Inland Feeder is proposed to provide supplemental water to meet consumptive and storage demands, to provide additional State Project water to meet blending goals, and to provide a more reliable supply system by implementing another route to deliver water into the service area.

The Inland Feeder, shown on Figure 5-2, consists of a tunnel and pipeline conveyance system, approximately 12-feet to 14-feet in diameter, to deliver SWP water from Devil Canyon Power Plant to the Colorado River Aqueduct, San Diego Canal, and Eastside Reservoir. The project will increase the conveyance capacity of Metropolitan's turnouts from the East Branch of the California Aqueduct by 1,000 cfs, allowing Metropolitan to use up to its full East Branch capacity.

The 43.3-mile Inland Feeder conveyance system is currently in final design and will extend primarily along rural roadways in western Riverside and San Bernardino counties. The Inland Feeder system would begin at DWR's Devil Canyon facility and extend east of San Bernardino through tunnels and pipelines under the San Bernardino Forest. From the tunnel under the San Bernardino Mountains, a pipeline would extend south and southeast, under the Santa Ana River and through Mentone, before going back into tunnel and under the San Timoteo Badlands. A pipeline would then cross the San Jacinto Valley to the junction of the Colorado River Aqueduct and the San Diego Canal.

For the purposes of this report, the project is scheduled for completion in 2002, when it will begin to deliver water to the Colorado River Aqueduct and Eastside Reservoir to meet consumptive demands, water quality goals, conjunctive-use goals, and storage goals. Based on the current schedule, the Inland Feeder is estimated to cost $1.03 billion in escalated dollars.

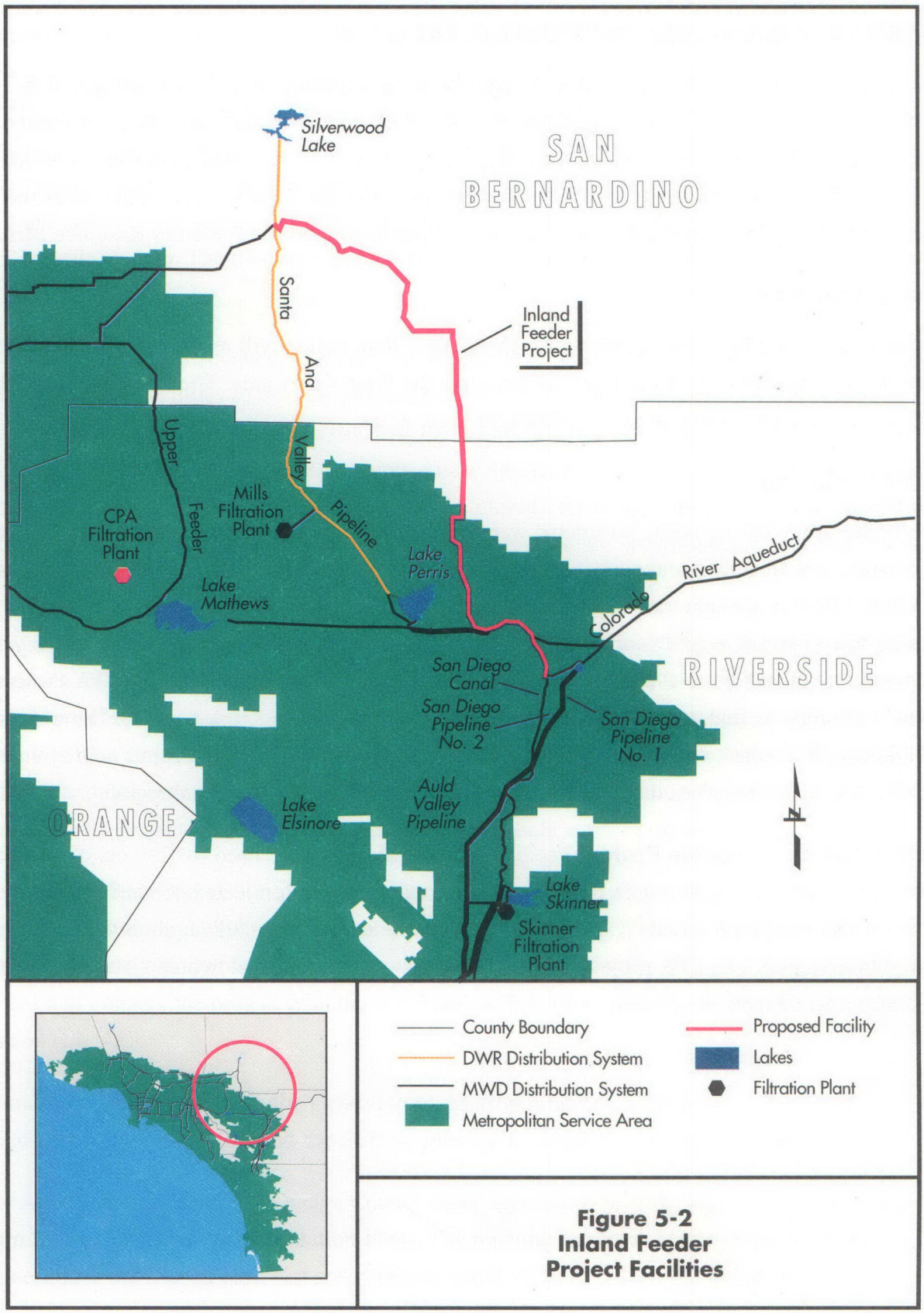


Figure 5-2
Inland Feeder Project Facilities

WATER TREATMENT AND DISTRIBUTION FACILITIES

Metropolitan has constructed regional water treatment and distribution facilities throughout its service area to provide its member agencies access to high-quality treated water at an economical cost. As demands for treated water increase, expansion of existing treatment plants or construction of new plants and distribution system improvements are required. This subsection describes the treatment and distribution facilities that may be required to support the Preferred Resource Mix.

Central Pool Region

As described in Section 4, two areas within the Central Pool region will require additional treated water delivery capacity: the Common Pool area and the West Valley area. The following two sub-sections describe the recommended facilities for these areas.

Common Pool Area

In response to increasing needs for treated water in the Common Pool area, Metropolitan will need to construct new treatment and conveyance facilities. For the purposes of this report, it is proposed the Central Pool Augmentation (CPA) Project be built by 2013 to fulfill that need. However, because this project is very sensitive to percentage changes in demand and is needed over 15 years into the future, it will be re-evaluated regularly. Metropolitan has been studying the CPA Project to deliver additional treated water to the Orange County area, relieving demands on the Diemer plant and allowing it to convey more water into the Common Pool area. The CPA Project conveyance facilities will also strengthen the network of pipelines serving the Central Pool region.

Central Pool Augmentation Project. Facility analyses identified the need for 290 cfs of additional treated water delivery capability in the Central Pool region to meet projected demands through 2020. Ultimately, the proposed CPA Project facilities would be able to deliver about 800 cfs to the Central Pool region. The CPA project is also intended to serve additional treated water to growing areas of western Riverside County.

Proposed facilities would consist of a new outlet structure to feed water from Lake Mathews to a new water treatment plant and an 18-mile-long tunnel and pipeline system to deliver water from a new treatment plant to the Orange County section of the Central Pool region. From the new outlet structure at Lake Mathews, a short tunnel and pipeline would convey raw water to a new regional water treatment plant located in nearby Eagle Valley. The water treatment plant would be constructed on approximately 400 acres of existing agriculture lands, about 1.5 miles northwest of Lake Mathews in Riverside County. The treatment plant would be constructed in stages, with a first stage capacity of 400 cfs.

The outlet structure associated with the CPA Project may be constructed before the filtration plant and conveyance facilities to provide increased seismic reliability and operational flexibility at Lake Mathews. Metropolitan is now investigating the feasibility of several alternatives to increase the reliability of deliveries from Lake Mathews. These alternatives include construction of various outlet tower configurations and extension of the Colorado River Aqueduct. This study assumes the second outlet tower would be implemented. The outlet structure is estimated to cost $145 million in escalated dollars based on completion in 2000.

Expansion of CPA Project treatment capacity would be required in 2020, as the treatment plant continues to serve increasing demands in western Riverside County. A second treatment module would be constructed adjacent to the initial plant, enlarging the plant capacity to 800 cfs. About 240 cfs of this capacity is projected to serve the Corona-Temescal-Elsinore area of Riverside County, with the remaining capacity available for future demand increases in Orange and Riverside counties. The projected ultimate area the CPA plant would serve is shown on Figure 5-3.

Distribution Facilities. From the CPA Project water treatment plant in Eagle Valley, water would be transported through a buried pipeline across Temescal Valley westerly along Bedford Canyon to a tunnel under the Santa Ana Mountains. A buried pipeline from the Orange County end of this tunnel will connect the project with the AMP and SCP northwest of the El Toro Marine Corps Air Station (MCAS).

To meet growing demands in the Central Pool, Metropolitan has negotiated the purchase of two existing pipelines, the AMP and the SCP, to enhance its delivery system in the area.

The AMP was constructed by Orange County water agencies to provide supplemental water deliveries from Metropolitan's Diemer Filtration Plant. The pipeline begins at Metropolitan's OC-60 service connection at the Diemer clearwell and continues southerly past El Toro MCAS, ending in Lake Forest.

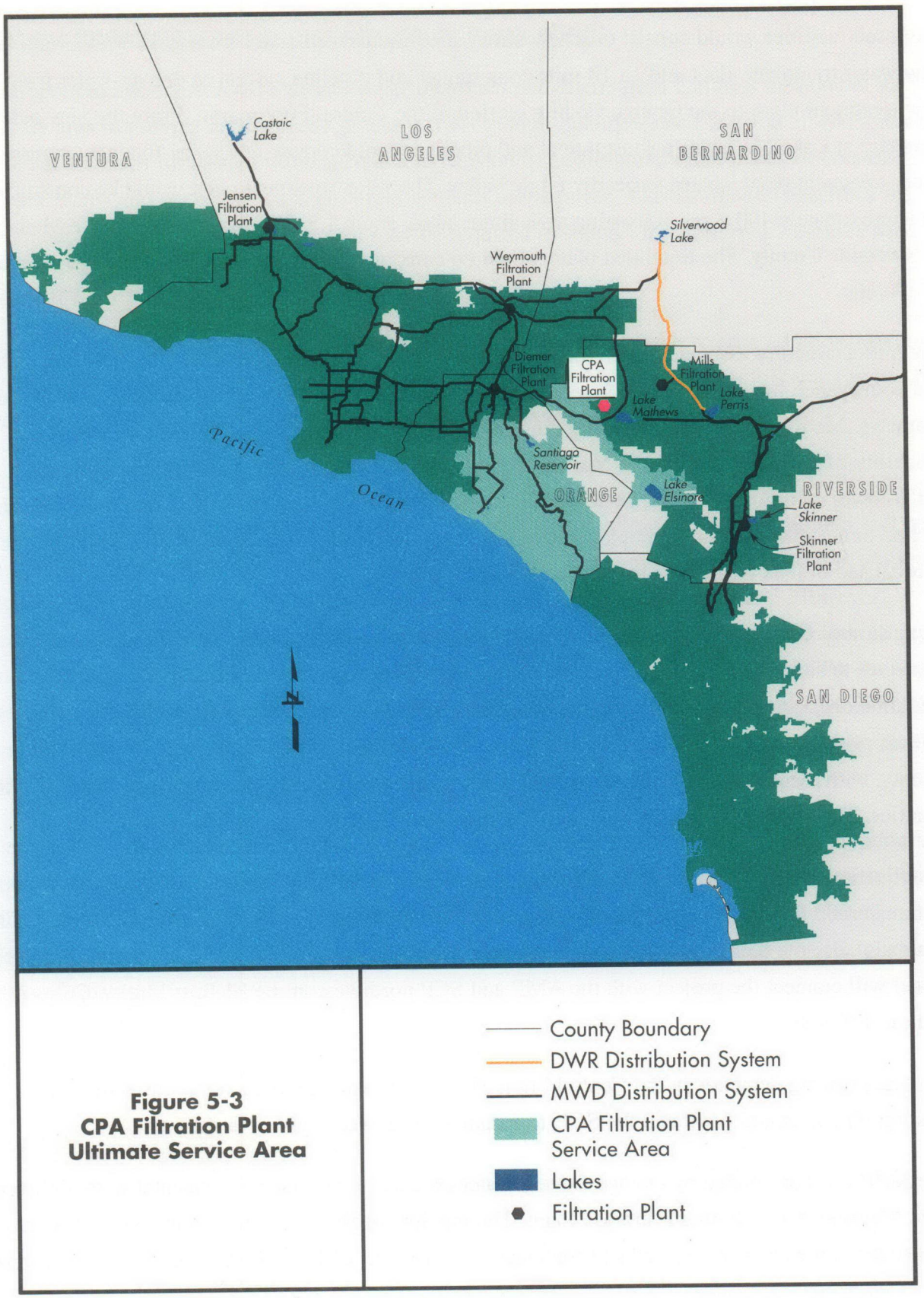


Figure 5-3
CPA Filtration Plant
Ultimate Service Area

The pipeline varies in diameter from 114 inches at its beginning to 48 inches at its terminal delivery point. Initially, the owner agencies contracted for capacity in the pipeline totaling 416 cfs. Upon Metropolitan purchase and operation of the AMP, the original capacity and hydraulic grades that were contracted will likely be modified.

The SCP was also constructed by Orange County water agencies. It begins near the El Toro MCAS, where it connects to the Allen-McColloch Pipeline. The pipeline alignment traverses southeasterly, ending near the southern edge of Orange County. The SCP ranges in diameter from 66 inches in the upper reaches to 48 inches at its terminal delivery point. The SCP was initially designed to supply 167 cfs to its south county users; however, this capacity may increase once Metropolitan operates the acquired distribution system with the CPA plant as the pipeline's source of supply.

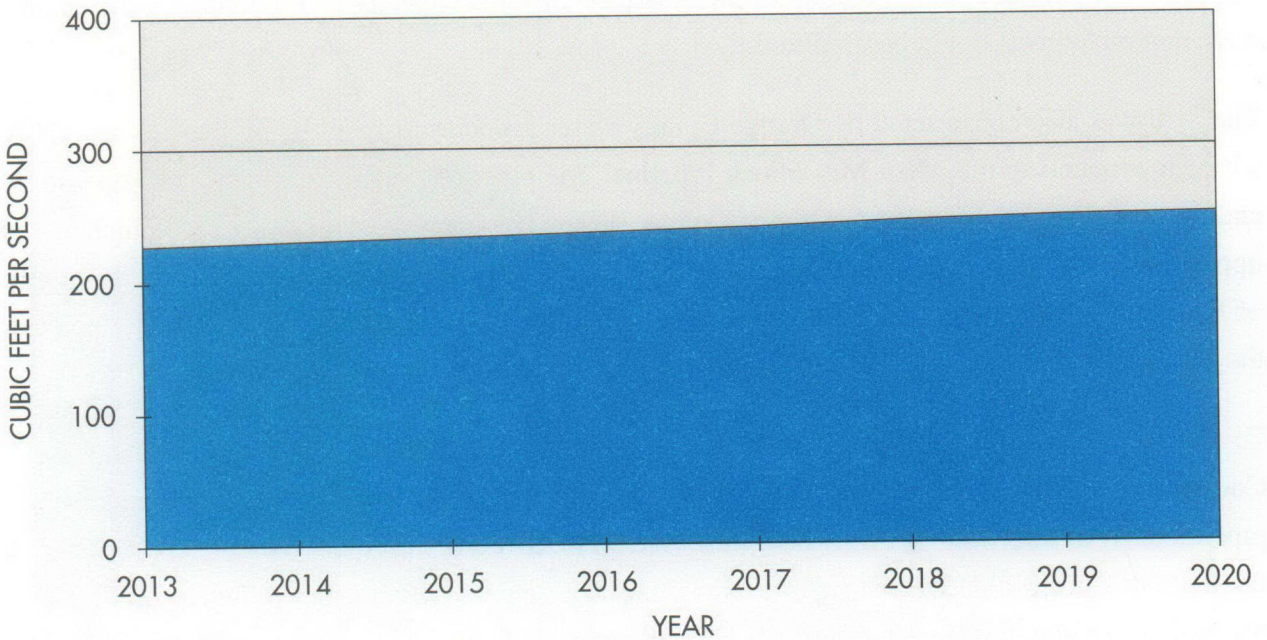
To maintain reliable service and meet increasing needs for supplemental water in the Orange County area, Metropolitan proposes to construct approximately 2.5 miles of 78-inch diameter pipeline next to the AMP (the S4B/S5 parallel) to connect the CPA project directly to the SCP. To facilitate this project, additional right-of-way along the pipeline alignment will be required. It is recommended that Metropolitan proceed with advance land acquisition to secure the necessary right-of-way in advance of project implementation.

Finally, the CPA Conveyance Extension is proposed to complete the CPA conveyance system for long-term needs. Once the CPA water treatment plant begins operating, it is projected to supply about 225 to 250 cfs during peak periods to southern Orange County. Figure 5-4 presents the expected peak demands the CPA plant will serve in Orange County, without linking conveyance facilities beyond the AMP and the SCP.

Once demands for additional treated water in the Central Pool region exceed the demand for water supplied by the AMP and the SCP, extension of the CPA conveyance system would be necessary. This conveyance extension is expected to be required around 2020. One possible alternative would be to extend conveyance facilities to Coastal Junction Pressure Control Structure, where an intertie to the East Orange County Feeder No. 2 and Tri-Cities' Aufdenkamp Pipeline would provide more getaway capacity from the CPA plant. This alternative would require construction of about six miles of 72-inch diameter pipeline.

Figure 5-4

Projected Orange County Demand Supplied Through CPA Filtration Plant



The components comprising the CPA Project--the AMP, the SCP, the S4B/S5 parallel and the CPA Conveyance Extension--are shown on Figure 5-5. Construction of CPA Project conveyance and treatment facilities would be completed by 2013 at an estimated cost of $788 million in escalated dollars for the conveyance facilities and $497 million in escalated dollars for the water treatment plant. Metropolitan has acquired the CPA Project filtration plant site in advance of construction at a cost of $12 million. An additional $28 million in escalated dollars is included in the land acquisition estimate for critically needed pipeline right-of-way and portal sites for the CPA Project conveyance facilities. To support the S4B/S5 pipeline parallel, it is recommended that Metropolitan purchase right-of-way for the alignment at an estimated cost of $4.5 million in escalated dollars. These advance land purchases are necessary to prevent loss of the project site due to pending development and land use changes. Capital outlays for purchase of the AMP will total $66 million, when completed in 1996, while outlays for the SCP will total $70 million when completed in 1996. Construction of the S4B/S5 parallel is estimated to cost $73.5 million in escalated dollars excluding land costs. Finally, construction of the CPA Conveyance Extension and plant expansion are estimated to cost $159 million and $108 million, respectively, in escalated dollars, excluding right-of-way costs.

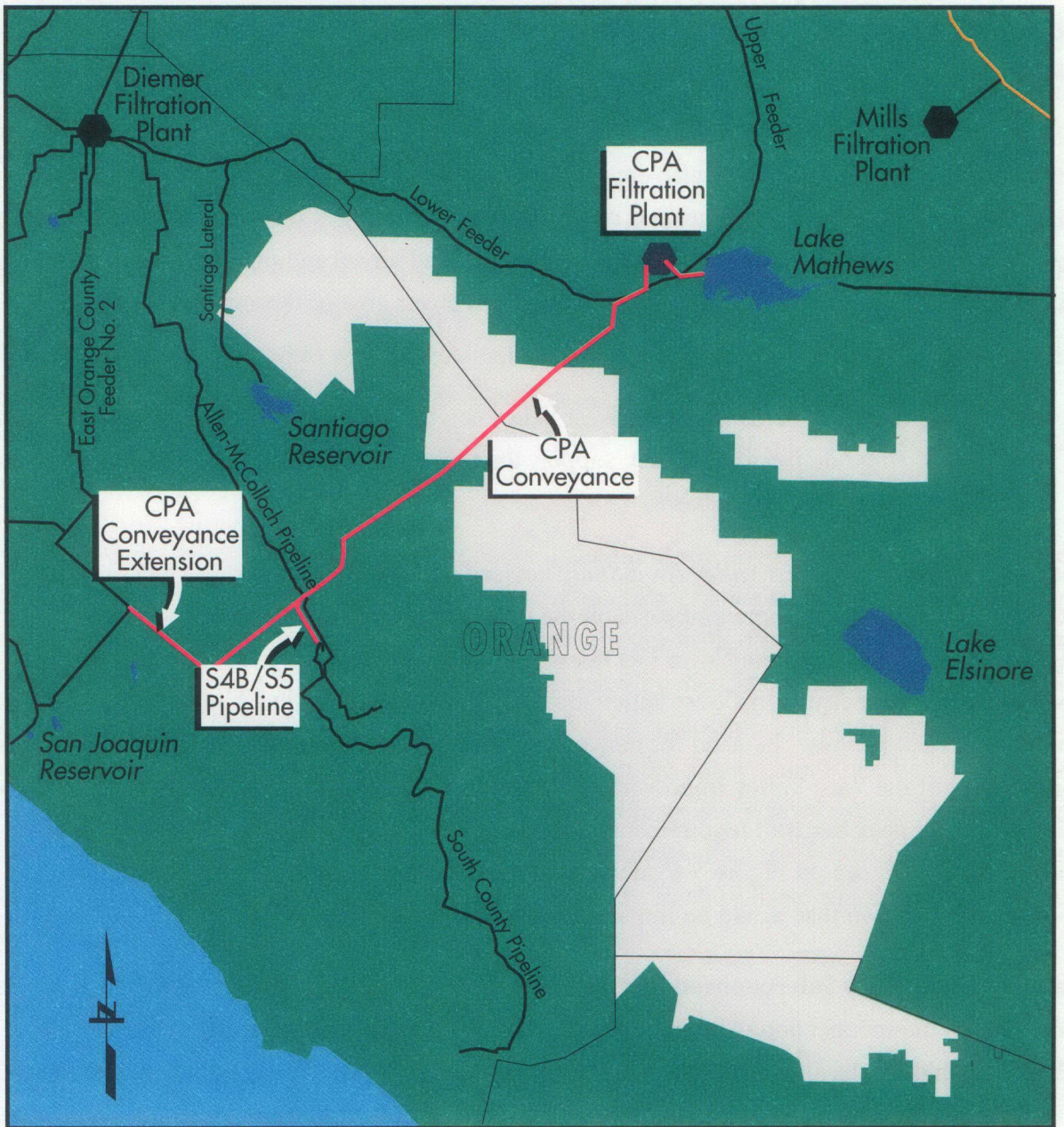


Figure 5-5
CPA Project Facilities

West Valley Area

In addition to groundwater conjunctive-use development in the North Las Posas Basin that is being implemented as Phase 1 of the West Valley Improvement Program, Metropolitan has studied various alternatives to increase the conveyance capacity into the West Valley area. The *West Valley Area Study* (March 1993) outlined two general project alternatives to meet projected long-term shortfalls in conveyance capacity. The alternatives investigated included tunnel and pipeline conveyance systems that followed alignments either through the Santa Clara River area or through the San Fernando Valley area.

Beyond meeting the water demands of the West Valley service area, these alternatives would increase the reliability of water deliveries and help support the increased local storage and conjunctive use in the North Las Posas groundwater basin.

Since completion of the *West Valley Area Study,* revised demand projections and local supply assumptions incorporating more emphasis on the use of local resources and development of conjunctive-use potential in the North Las Posas groundwater basin have reduced the need for new conveyance capacity to the West Valley area. As described in Section 4, about 60 cfs will be required by 2020. Because the need for new conveyance capacity has been reduced, a new interim project phase of the West Valley Improvement Program, the West Valley Interconnection, was formulated to meet peak demand requirements. The general location of the facilities contemplated under Phase 2 is shown on Figure 5-6, along with the conveyance system alignment alternatives of the long-term solution that would be implemented under Phase 3.

Phase 2 - West Valley Interconnection. Phase 2 of the West Valley Improvement Program proposes a West Valley Interconnection to connect West Valley Feeder No. 2 to West Valley Feeder No. 1 with a 54-inch diameter pipeline, valves, and appurtenant facilities. The interconnection would allow the existing West Valley pipelines to provide flows sufficient to meet needs for supplemental water through 2020. With the interconnection, flow would be routed directly to the Santa Susana Tunnel as well as through the existing power plant bypass during peak demand periods.

As part of the long-term solution, the interim interconnection proposed under Phase 2 would provide the West Valley area with adequate capacity for expected growth in the region through 2020, secure increased system reliability of water deliveries, and increase local storage and conjunctive use in the North Las Posas groundwater basin.

The West Valley Interconnection is needed by the summer of 2007. This project is estimated to cost $8.5 million in escalated dollars. Ultimately, the new conveyance system contemplated under Phase 3 may be needed to provide the West Valley area with adequate capacity for growth beyond 2020. Should demands for imported water substantially increase from current projections, Phase 3 may be needed sooner. Needs for Phase 3 will be re-evaluated as supply and demand projections are revised. A description of the alignment alternatives contemplated under Phase 3 of the West Valley Improvement Program are described below.

Phase 3 - West Valley Conveyance. The general location of the conveyance system alternatives proposed under Phase 3 of the West Valley Improvement Program is shown on Figure 5-6. The Santa Clara River alternative would deliver either raw water from the Foothill Feeder or treated water from the Rio Vista Water Treatment Plant operated by the Castaic Lake Water Agency in Santa Clarita to the Calleguas MWD service area through a pipeline and tunnel system. This alternative begins in Santa Clarita, traverses westerly through the Santa Clara River Valley, and then turns south near Fillmore to the boundary of Calleguas Municipal Water District. The San Fernando Valley alternative would deliver treated water from the Jensen plant to the existing Santa Susana Tunnel via an alignment through the San Fernando Valley. Each of these conceptual alignments has several subalternatives that are not presented in this report.

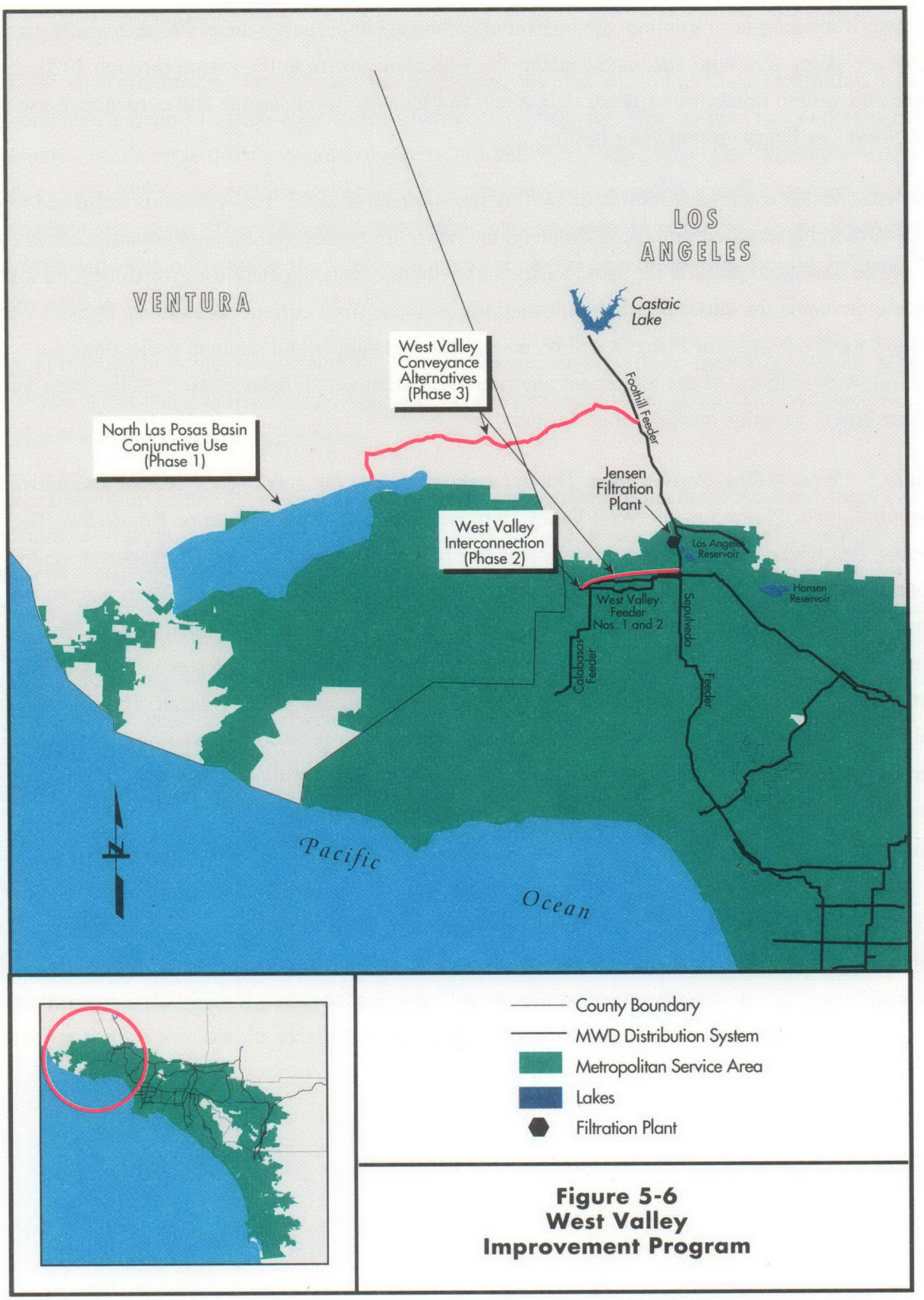


Figure 5-6
West Valley Improvement Program

Riverside/San Diego Region

As presented in Section 4, projected increases in demands for the Riverside/San Diego region will require implementation of new treatment and distribution projects as discussed in the following subsections.

Treatment Facilities

Metropolitan operates two regional water treatment facilities in the Riverside/San Diego region: the Mills Filtration Plant and the Skinner Filtration Plant, as described in Section 4. The IRP projects increases in needs for treated water in both the Mills and Skinner plant service areas. The following two subsections outline the recommended facilities to alleviate the projected the shortfall in treatment capacity.

Mills Plant Service Area. Demands in the Mills plant service area are projected to exceed plant capacity by 2013. A new water treatment plant will be required because the Mills plant will then be at its ultimate capacity with no further expansion possible. In addition, the Skinner plant has limited expansion capability and cannot easily serve areas where demands are highest—Perris and Moreno Valley. There are two potential new water treatment plant projects that could be implemented to meet the increased demand: the CPA Project filtration plant could supplement Mills capacity in the Corona-Temescal-Elsinore area, or the Perris Filtration Plant could supplement Mills and Skinner capacity in the Perris Valley-Hemet-Elsinore area. The potential service areas in Riverside County for the CPA and Perris filtration plants are shown on Figure 5-7. For the purpose of this study, it is assumed that the CPA Project filtration plant would be implemented to alleviate the initial shortages in treated water capacity, as it would have excess capacity available to provide relief for the Mills plant. The projected buildup of demands that could be supplied by the CPA Project in Orange and Riverside counties is shown on Figure 5-8.

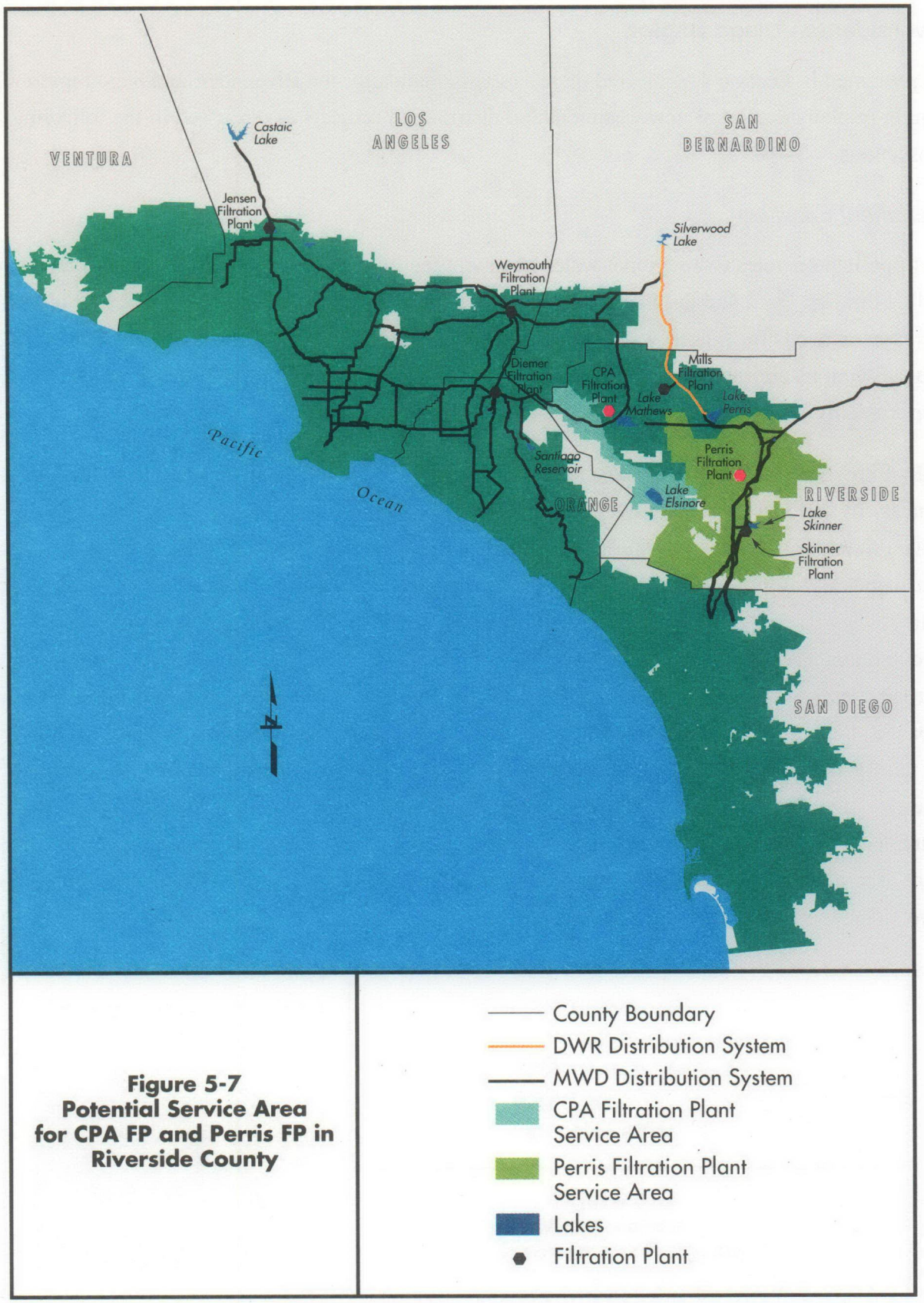
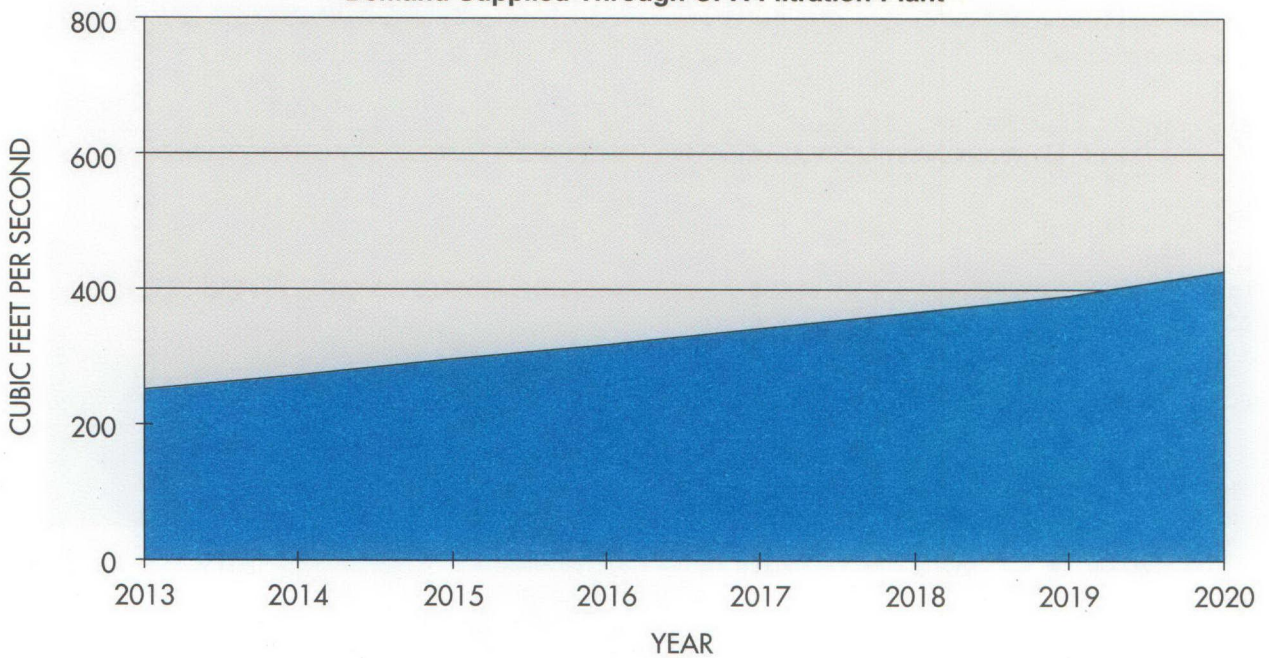


Figure 5-7
Potential Service Area for CPA FP and Perris FP in Riverside County

Figure 5-8

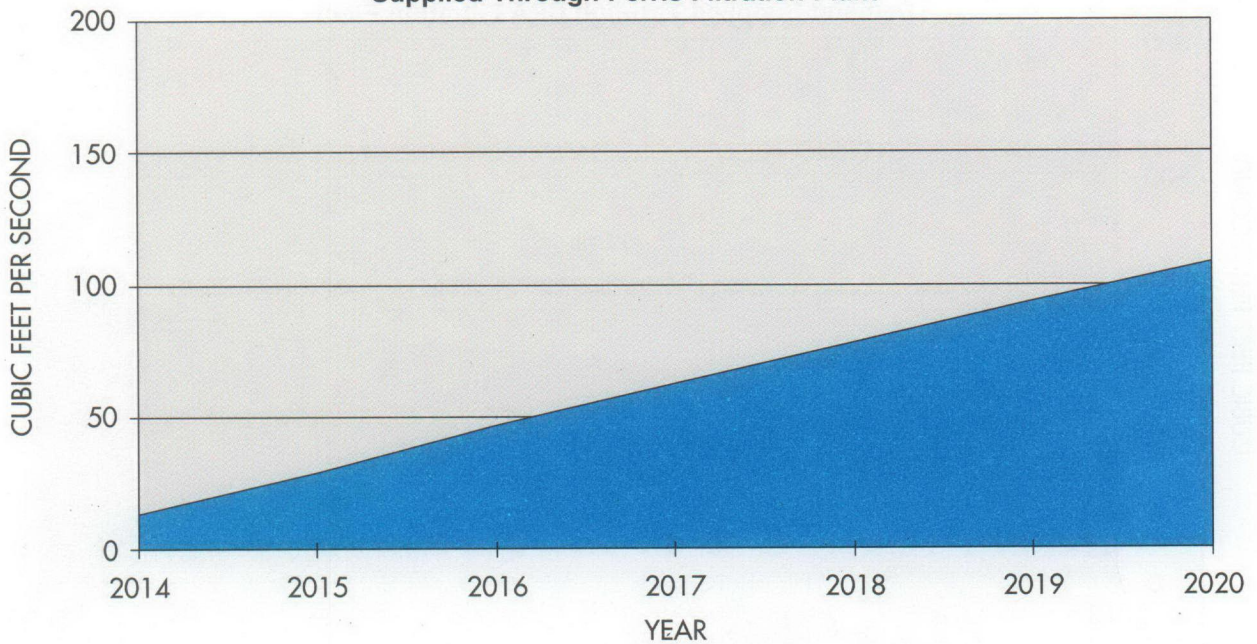
Projected Orange/Riverside County Demand Supplied Through CPA Filtration Plant



Skinner Plant Service Area. As projected demands in the Riverside/San Diego area increase, additional treatment capacity will be required to meet treated water needs in the area served by the Skinner Filtration Plant. There are two major alternatives that could provide sufficient additional treatment capacity to meet growing demands in this area. The first is a new treatment plant near Perris, and the second is an expansion of the Skinner plant. For the purposes of this report and capital expenditure estimates, a new Perris Treatment Plant is proposed to be operational by the summer of 2014. A new Perris plant would be at a higher elevation than the Skinner plant and could serve a larger area by gravity. It would also serve as a second source of treated water for the Skinner area and portions of the Mills area. An expansion of the Skinner plant in 2014 could also require more local infrastructure to serve water from Skinner or Mills to the Hemet/San Jacinto area before a new Perris plant is built. The buildup and distribution of demands in this area will be studied in more detail in a subsequent study. The projected buildup of demands that could be supplied by the Perris plant is shown in Figure 5-9.

Figure 5-9

Projected Riverside County Demand Supplied Through Perris Filtration Plant



The Perris plant is proposed to be constructed at one of the potential sites identified on Figure 5-10. The water treatment plant could receive water from the Inland Feeder, Colorado River Aqueduct, or Eastside Reservoir Project. The plant would be able to deliver water to both Riverside and San Diego counties, increasing reliability of treated water deliveries to the region. To deliver water to San Diego County, a pipeline connecting to San Diego Pipeline Nos. 1 and 2 would be constructed.

The Perris Filtration Plant facilities would be completed in 2014 to provide 155 cfs of treatment capacity for the region, which will meet the projected area need of 109 cfs in 2020. The estimated cost of the Perris Filtration Plant is $360 million in escalated dollars. An additional $21 million in escalated dollars has been budgeted to purchase a plant site in advance of construction to ensure that a facility site will be available when needed, as residential developments are proposed at the potential plant sites.

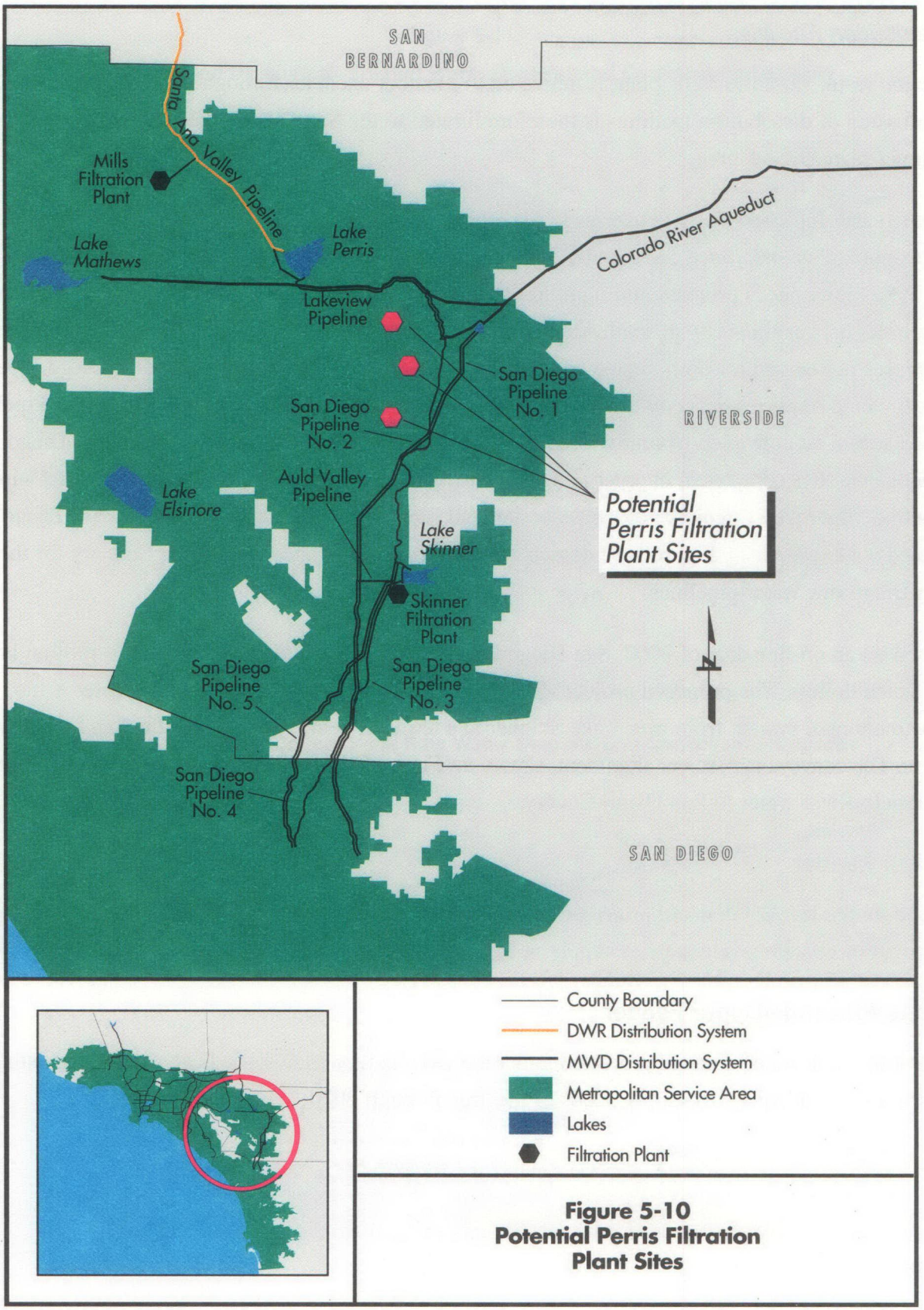


Figure 5-10
Potential Perris Filtration Plant Sites

Distribution Facilities

Treated water from the Mills plant is delivered to member agencies through their local facilities. Discussion of distribution facilities is therefore limited to the San Diego pipelines that supply the Skinner plant service area.

Treated and untreated water deliveries to the Skinner plant service area are projected to reach Metropolitan's conveyance capacity by 2002 and 2004, respectively, as discussed in Section 3. To meet future needs projected through the IRP, San Diego Pipeline No. 6 is proposed to increase raw water delivery capacity to southwestern Riverside and San Diego counties. To meet the projected increases in demand for both treated and untreated water through the year 2020, San Diego Pipeline No. 6 would require a capacity of 490 cfs. This proposed capacity assumes that San Diego Pipeline No. 3 would be converted from raw water service to treated water conveyance when San Diego Pipeline No. 6 is completed, in order to avoid construction of another San Diego treated water supply pipeline. Figure 5-11 depicts treated water demands and conveyance capacity for the San Diego treated water pipelines. Figure 5-12 depicts raw water demands and conveyance capacity for the San Diego raw water pipelines.

Based on an on-line date of 2002, San Diego Pipeline No. 6 is estimated to cost $324 million in escalated dollars. The proposed project would consist of a nine-foot to ten-foot diameter pipeline/tunnel system from near Lake Skinner to a terminal delivery point near the San Luis Rey River. The conveyance project alignment, shown on Figure 5-13, will deliver State Project and/or Colorado River water to San Diego County.

Lower Feeder

Based on the level of demand projected under the IRP, facility analysis indicates that the existing distribution system is adequate to supply needs of the area through 2020.

Rialto/Etiwanda/Upper Feeder

Based on the level of demand projected under the IRP, facility analysis indicates that the existing distribution is adequate to supply needs of the area through 2020.

Figure 5-11

Projected San Diego Peak Treated Water Demand and Conveyance Capacity

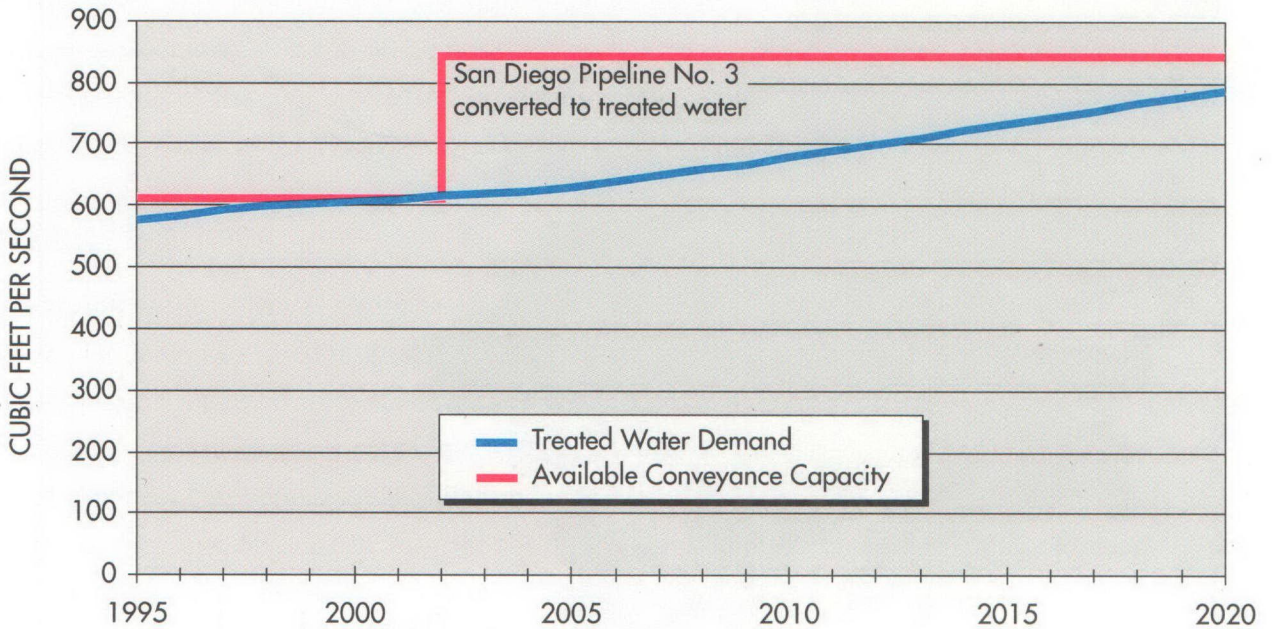
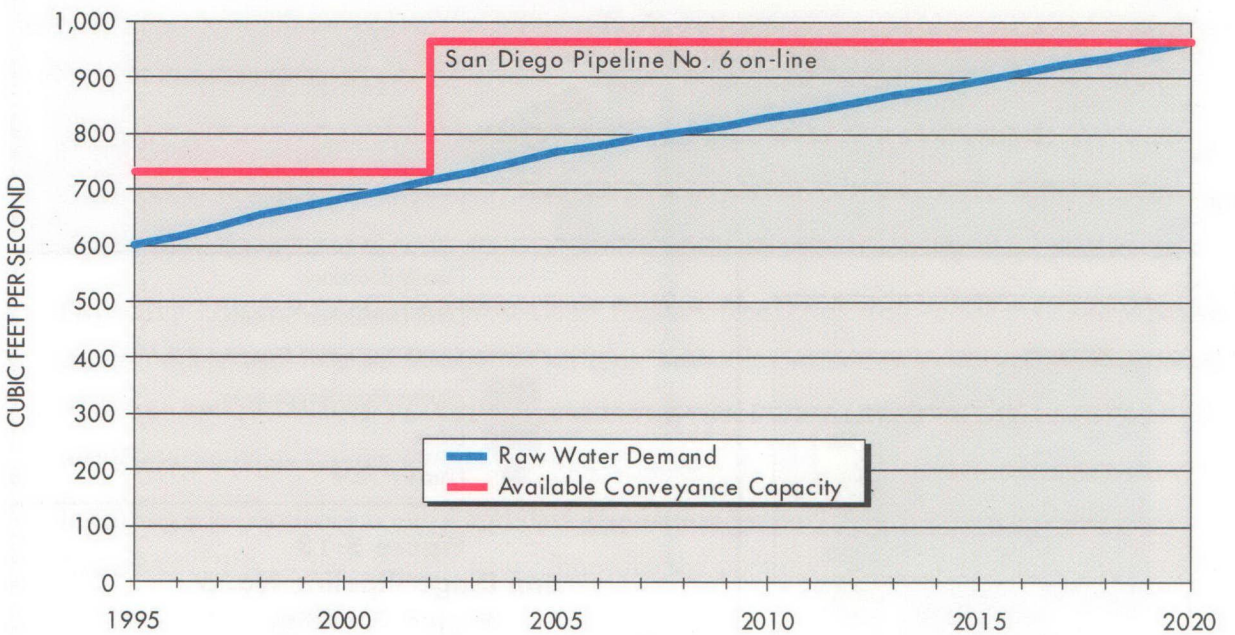


Figure 5-12

Projected San Diego County Peak Raw Water Demand and Conveyance Capacity



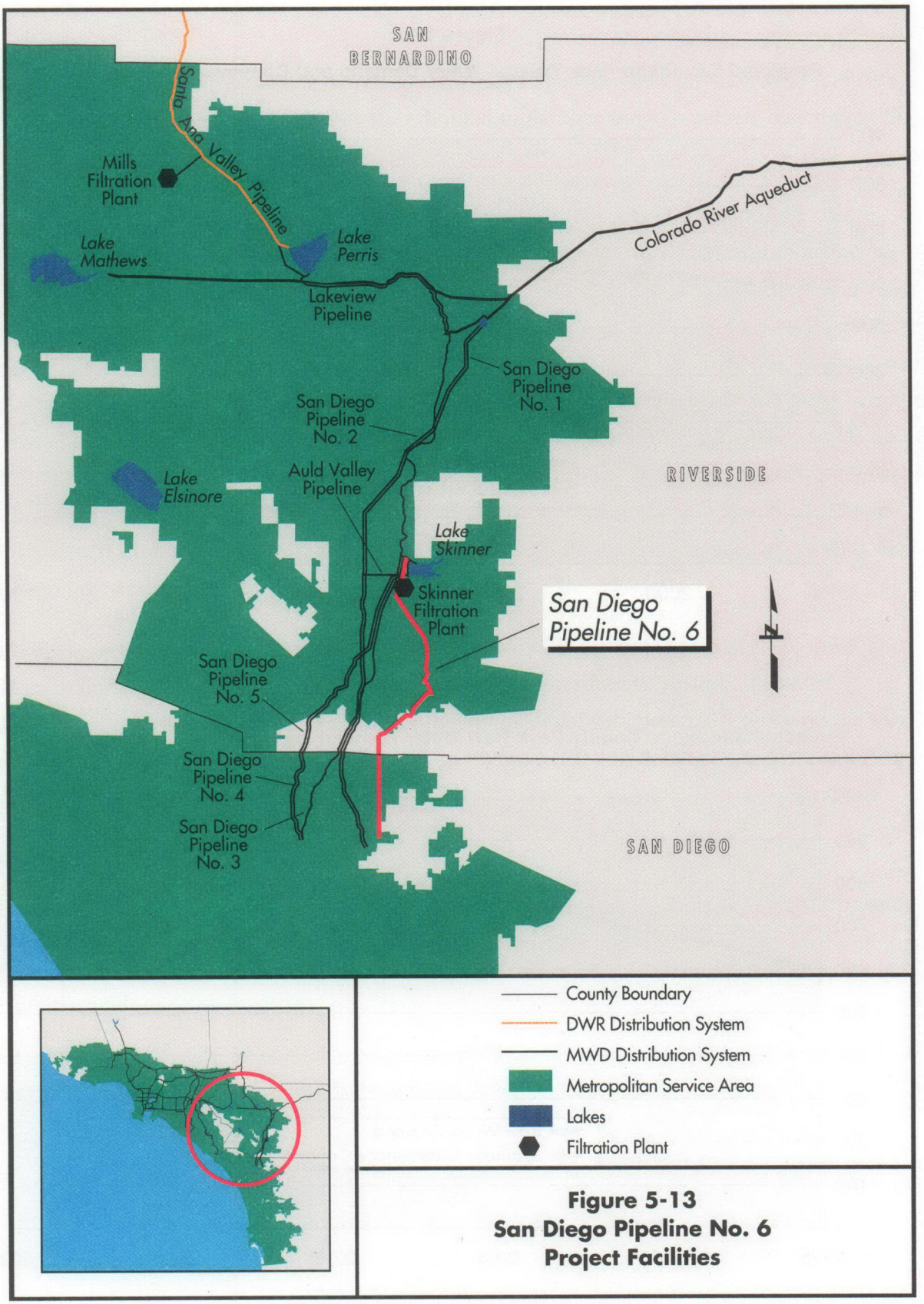


Figure 5-13
San Diego Pipeline No. 6
Project Facilities

Foothill Feeder Extension

The *Foothill Area Study* concludes that the Middle Reach of the Foothill Feeder could be deferred beyond 2020. However, the need for the Middle Reach will be re-evaluated as supply and demand projections are revised in future studies. The study also recommends that Metropolitan proceed with negotiations for conjunctive-use programs and to further study the feasibility of delivering State Project water to the Raymond Basin.

OTHER FACILITIES

In addition to the potential regional water management, and the water treatment and distribution system facilities identified in the previous sections, there are other facilities and projects in Metropolitan's capital improvement program that are critical in maintaining Metropolitan's ability to reliably meet the region's supplemental water needs. The other facilities are divided into two broad groups: (1) reliability, rehabilitation, and administrative facilities and (2) water quality and treatment facilities. Reliability, rehabilitation, and administrative facilities are improvements to the existing conveyance, distribution, and support systems so that the operational reliability of the system is maintained. Water quality and treatment facilities are improvements at existing water treatment facilities needed so these plants can continue to meet current and future water quality regulations.

Reliability, Rehabilitation, and Administrative Facilities

Reliability, rehabilitation, and administrative facilities maintain Metropolitan's current distribution system reliability, rehabilitate systems or infrastructure, and support administrative functions. Representative projects include:

- Constructing a second outlet facility at Lake Mathews - The existing Lake Mathews outlet tower is seismically vulnerable. This project includes construction of an access shaft and tunnel, a temporary bypass connection, access grading and paving, and construction of the tower.
- Protecting Lower, Middle, and West Coast Feeders from corrosion - Protects against active corrosion and interference from other utilities' cathodic protection systems. Project consists of design and installation of deepwell anode cathodic protection systems and refurbishing insulating joints at service connections.
- Installing a supervisory control and data acquisition system for the Colorado River Aqueduct (CRA) - This system would improve the operational reliability, safety, and efficiency of the CRA.

- Upgrading discharge pipelines and pump buildings for seismic activity - CRA facilities need to remain functional in the event of a major earthquake. Project involves geotechnical investigation, design, and construction to seismically upgrade all CRA pumping plants.
- Constructing a warehouse and storage building at Mills Filtration Plant - Project consists of design and construction of a warehouse and storage building to accommodate increased storage needs due to consolidation of facilities. A paved outside storage area, security fencing, and an asphalt access road are also part of the project.
- Building a new headquarters facility - Metropolitan is planning to locate its new headquarters in Los Angeles at Union Station. Metropolitan expects to occupy the facility in fiscal year 1998-99, when leases at Two California Plaza expire.

Total program cost for reliability, rehabilitation, and administrative facilities is $2.05 billion in escalated dollars. For a complete listing of reliability, rehabilitation, and administrative facilities included with Metropolitan's anticipated capital expenditures, see *Volume 3: Technical Appendices.* See Metropolitan's *Capital Program for Fiscal Year 1995/96* (April 1995) for descriptions of the current projects.

Water Quality and Treatment Facilities

Water quality and treatment facilities either treat or support treatment of raw water to meet current and future drinking water standards. Such projects include the Water Quality Laboratory expansion, the Oxidation Retrofit Program and various process improvements to the existing filtration plants.

Total program cost for water quality and treatment facilities is $1.25 billion in escalated dollars. For a complete listing of water quality and treatment facilities included with Metropolitan's anticipated capital expenditures, see *Volume 3: Technical Appendices.* Metropolitan's *Capital Program for Fiscal Year 1995/96* (April 1995) contains descriptions of the current projects.

SECTION 6 – CAPITAL EXPENDITURES

The Preferred Resource Mix of the regional reliability plan forms the basis for determining Metropolitan's facility requirements and capital expenditures from fiscal year 1995-96 through 2019-20. These capital expenditures conform with the buildup of water resources in the Preferred Resource Mix and reflect the schedule and magnitude of the water deliveries required by Metropolitan to meet the regional reliability goal.

Although the planning period for this study spans 25 years, Metropolitan's commodity rate projections are usually carried out 10 years into the future. Consequently, Metropolitan's capital improvement program only covers expenditures 10 years into the future. This is because project schedules and expenditures are more well defined in the first 10 years than in the later part of the 25-year planning period. Also, large facilities can take about 10 years to plan, design, and construct. Capital expenditures beyond the first 10 years of the 25-year planning horizon are less certain and are used to evaluate general rate trends and the longer-term potential for Metropolitan to run into debt limitations.

SUMMARY OF ANTICIPATED CAPITAL EXPENDITURES

Metropolitan's anticipated capital expenditures have been divided into two broad categories of projects to facilitate financial analyses. The first category–supply, distribution, and storage projects–includes raw water supply and treated water distribution lines, groundwater and surface water storage projects, and projects that maintain the operational reliability and efficiency of Metropolitan's existing conveyance and distribution system. The second category–water treatment projects–includes new water treatment projects to enable Metropolitan to meet existing and future water quality regulations, and upgrades, modifications, or rehabilitation projects at existing treatment facilities so these plants can continue to meet water quality regulations.

Table 6-1 summarizes the estimated capital costs over 10 years (fiscal year 1995-96 through 2004-05), over 25 years (1995-96 through 2019-20), and shows the total program estimate (including contingencies and actual costs since project inception) for the major projects anticipated. Costs are escalated at 5% per year as required to reflect the appropriate fiscal year cost. Table 6-1 also reflects capital expenditures through the first quarter of the 1995-96 fiscal year. Metropolitan uses the 10-year and 25-year escalated costs in determining revenue requirements and the impact the capital expenditures would have on commodity rates and indebtedness.

Table 6-1

Metropolitan's Anticipated Capital Expenditures ($ million)

Description	Escalated Costs Over the Next 10 Years	Escalated Costs Over the Next 25 Years	Total Program Estimate Including Contingencies and Actuals
Supply, Distribution, and Storage Projects			
Regional Water Management Facilities			
Conjunctive Use/Groundwater Storage	175.6	210.1	214.7
Eastside Reservoir Project	1,278.8	1,278.8	1,972.1
Inland Feeder	854.4	854.4	1,027.0
Distribution Facilities			
San Diego Pipeline No. 6	275.2	275.2	324.0
West Valley Interconnection	0.0	8.5	11.2
CPA Conveyance Projects	5.0	808.3	909.6
Treated Water Distribution Facilities	10.8	80.8	210.5
Other Projects			
Reliability, Rehabilitation, and Administrative Facilities	710.8	1,818.0	2,046.8
San Bernardino/Riverside Area Study	2.3	2.3	2.4
Desalination Demonstration Project	25.6	25.6	34.7
Water Treatment Projects			
New Major Water Treatment Facilities			
CPA Filtration Plant	23.0	569.1	645.5
Perris Filtration Plant	19.4	338.1	380.6
Other Projects			
Water Quality and Treatment (Existing Plants)	760.2	762.1	1,245.3
Total	4,141.1	7,031.3	

The supply, distribution, and storage projects category represents about 80% of the 10-year escalated capital costs and equals $3.34 billion. Estimated costs for each of the major projects or group of projects under the supply, distribution, and storage category are summarized in Table 6-1. Regional water management facilities under this first category include several groundwater conjunctive use projects, estimated to cost $176 million over the next 10 years; the Eastside Reservoir Project, estimated to cost $1.28 billion over the next 10 years; and the Inland Feeder, estimated to cost $854 million over the next 10 years. Distribution facilities under this category include San Diego Pipeline No. 6, estimated to cost $275 million over the next 10 years; and treated water distribution facilities such as the AMP and the SCP which are estimated to cost about $11 million over the next

10 years. Other projects include reliability, rehabilitation projects, and administrative facilities such as repair or replacement of the outlet tower at Lake Mathews, a supervisory control and data acquisition system for the CRA, seismic upgrades along the CRA, and the Union Station long-term headquarters, as well as other ongoing rehabilitation or upgrade projects in the system. These projects are estimated to cost approximately $711 million over the next 10 years. Other projects under this main category also include the Desalination Demonstration Project, estimated to cost $26 million over the next 10 years.

The water treatment projects category accounts for the remaining 20% of capital expenditures for the next 10 years or about $803 million. New major water treatment projects include the CPA Filtration Plant, estimated to cost $23 million over the next 10 years, mainly for right-of-way and land acquisition; and the Perris Filtration Plant, estimated to cost $19 million over the next 10 years for land acquisition. Water quality and treatment projects at the 5 existing filtration plants include the oxidation retrofit program for the 5 plants, completing expansions of the Mills and Jensen filtration plants, a second finished water reservoir at Diemer, the *Cryptosporidium* action plan, and other modifications or upgrades at the 5 existing filtration plants to enable these plants to continue to meet water quality regulations. These projects are estimated to cost $760 million over the next 10 years.

Figure 6-1 shows the estimated capital annual outlays for the 25-year planning horizon. Costs to the left of the vertical dashed 10-year line represent the current 10-year CIP.

Metropolitan Water Rates

The average unit cost of imported water is a composite of the commodity rate, proposed treatment surcharge, readiness-to-serve charge, new demand charge, and connection maintenance charge. Member agencies' average unit cost of imported water will vary because it depends on the type of service (e.g., treated, untreated, basic, seasonal, agricultural) and a member agency's relative use of Metropolitan's system. Figure 6-2 shows the average unit cost of imported water for expected sales, which represents the unit cost needed to meet the revenue requirements with the anticipated capital expenditures. Figure 6-2 shows the average unit cost of imported water will remain less than $500 per acre-feet through fiscal year 2004-05. Metropolitan's rate structure is described in more detail in Section 4 of *Volume 1: The Long-Term Resources Plan.*

Figure 6-1

Anticipated Capital Expenditures (Escalated – Without Contingencies)

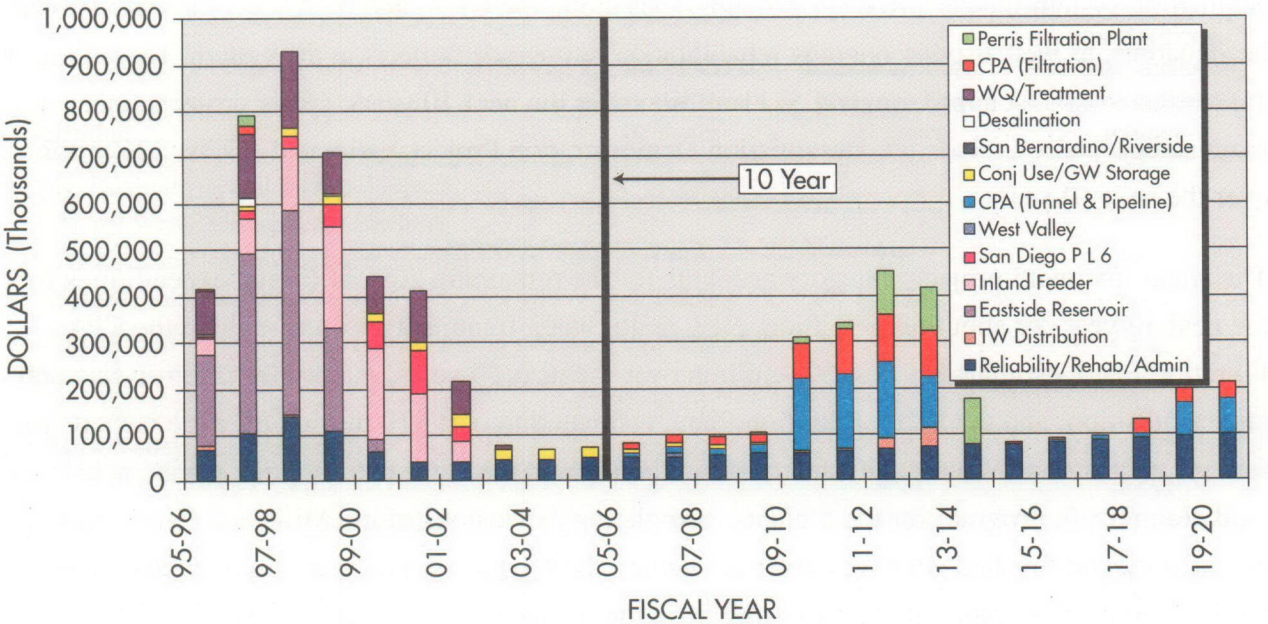
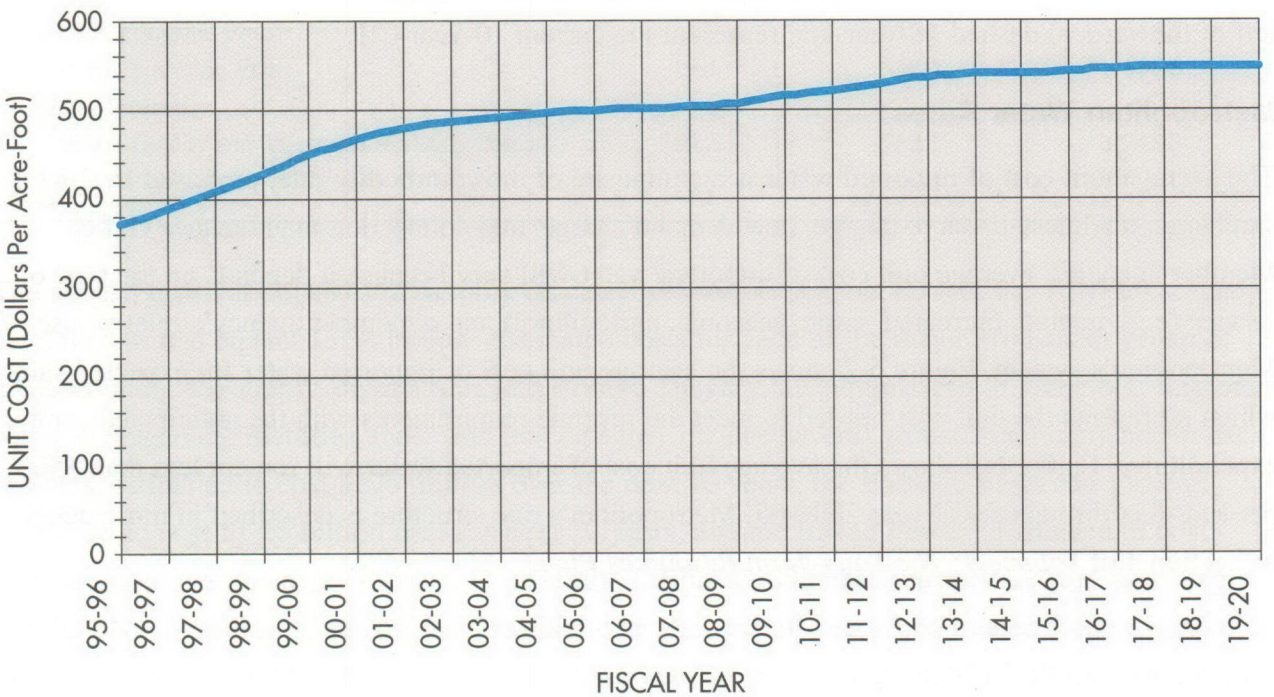


Figure 6-2

Average Unit Cost of Imported Water



SENSITIVITY ANALYSIS

Because there is uncertainty in projected water demands, two cases were evaluated to test the sensitivity of project need and timing to changes in water demand. This subsection describes the impacts on project scheduling and sizing if retail demands were 5% higher or 5% lower than projected.

Figure 6-3 summarizes the proposed on-line dates for the major regional water management facilities and distribution and treatment facilities as described in Sections 4 and 5.

Figure 6-3

Estimated Completion Dates

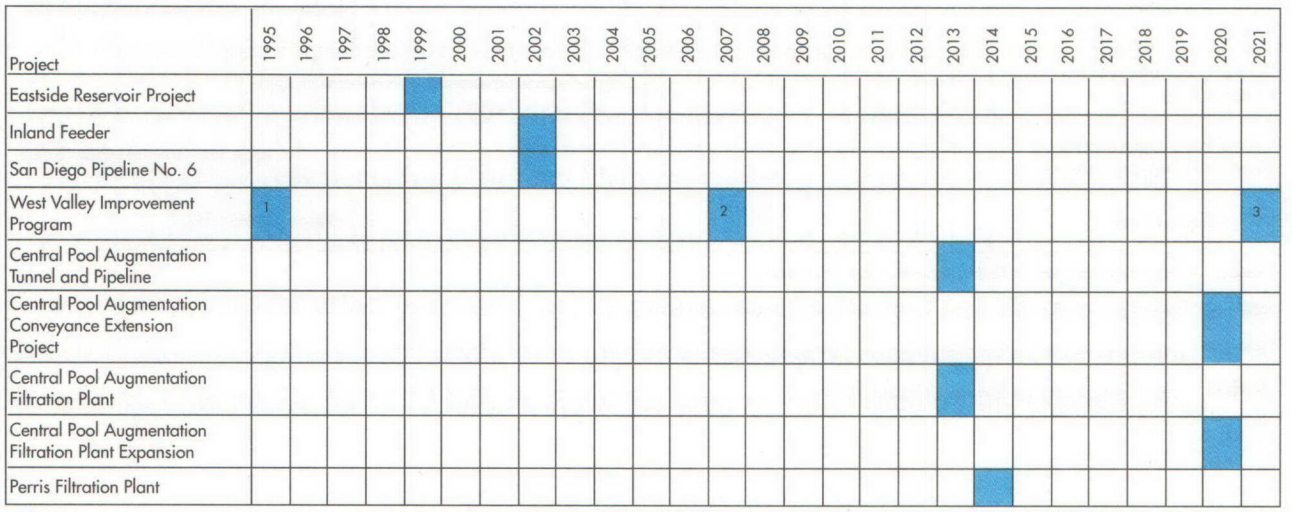
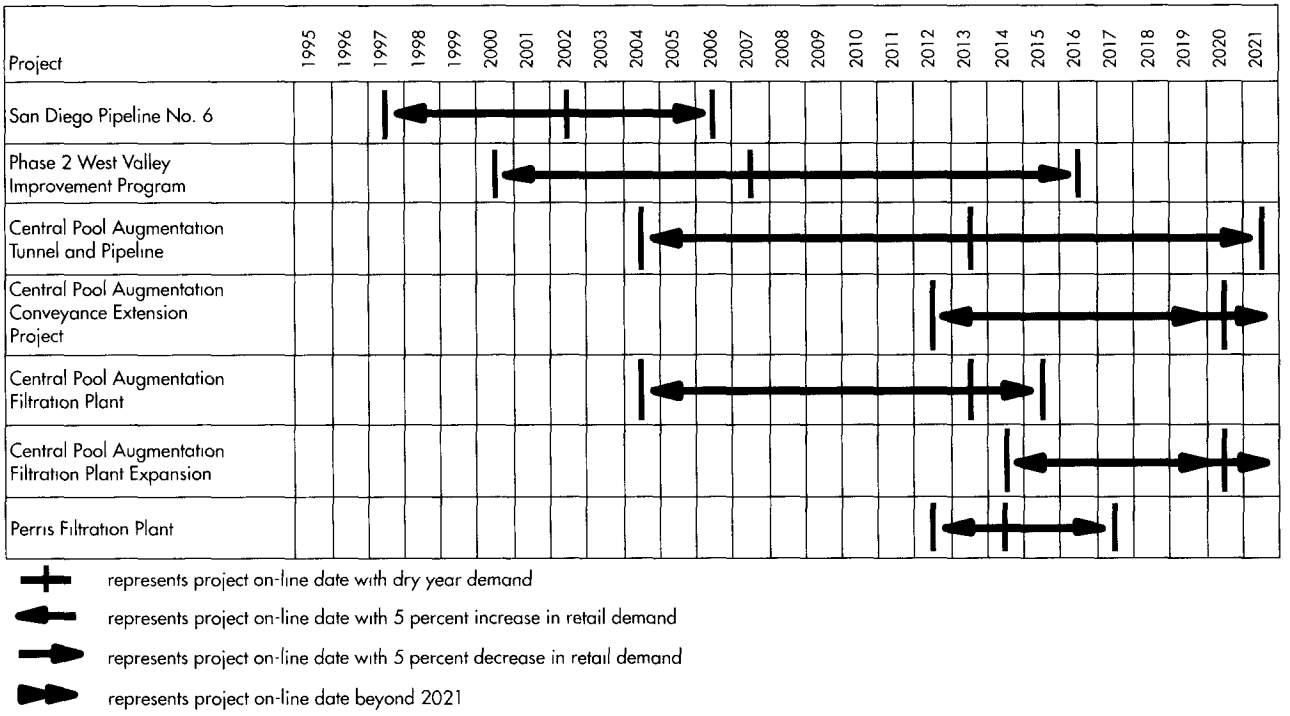


Figure 6-4 shows how the projects' on-line dates shift in response to 5% increases and decreases in retail demand. Project sensitivity is a function of both the magnitude and rate of change of demand.

Figure 6-4

Project Sensitivity to Plus and Minus Five Percent Changes in Retail Demand



Sensitivity of Projects to a 5% Increase in Retail Demands

A 5% increase in retail demands requires several projects to come on-line sooner than anticipated. The following list describes projects whose schedules change in the plus 5% sensitivity:

- San Diego Pipeline No. 6 would be needed 5 years earlier, in 1997;
- West Valley Interconnection would be needed 7 years earlier, in 2000;
- CPA Tunnel and Pipeline would be needed 9 years earlier, in 2004;
- CPA Conveyance Extension Project would be needed 8 years earlier, in 2012;
- CPA Filtration Plant would be needed 9 years earlier, in 2004;
- CPA Filtration Plant Expansion would be needed 6 years earlier, in 2014; and
- Perris Filtration Plant would be needed 2 years earlier, in 2012.

These schedule changes affect estimated capital outlays over the 10-year and 25-year planning periods. If this more aggressive schedule were implemented, capital expenditures over the next 10 years are estimated to be $4.84 billion, slightly higher than anticipated capital expenditures.

Sensitivity of Projects to a 5% Decrease in Retail Demands

A 5% decrease in retail demands would allow several projects to be delayed. The following list describes projects whose schedules change if retail water demands decrease 5%:

- San Diego No. 6 Pipeline is delayed 4 years to 2006;
- West Valley Interconnection is deferred 9 years to 2016;
- Central Pool Augmentation Tunnel and Pipeline to Orange County is delayed 8 years to 2021;
- Central Pool Augmentation Conveyance Extension Project is delayed beyond 2021;
- Central Pool Augmentation Filtration Plant is deferred 2 years to 2015;
- Central Pool Augmentation Filtration Plant expansion is delayed beyond 2021; and
- Perris Filtration Plant is delayed 3 years to 2017.

These schedule changes affect estimated capital outlays over the 10-year and 25-year planning periods. If this less aggressive schedule were implemented, capital expenditures over the next 10 years are estimated to be $4.12 billion, about the same as anticipated capital expenditures.