2007

Integrated Area Study

The Metropolitan Water District of Southern California

Report No. 1317

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EXECUTIVE SUMMARY

The Metropolitan Water District of Southern California (Metropolitan) has continued to lead collaborative planning efforts with its Member Agencies since the successful completion of the 1996 Integrated Resources Plan (IRP). The 1996 IRP was a milestone planning process to meet Southern California's future water supply needs through a coordinated and diversified investment in supply development at both the regional and local level. Over the past two years, Metropolitan and its Member Agencies have applied the same mutual commitment to collaboration and integrated planning in the development of the facilities infrastructure required to reliably deliver those supplies.

Building on the foundation of prior Systems Overview Studies completed in 1988 and 1996, Metropolitan, together with its Member Agencies, launched an Integrated Area Study (IAS) process covering the region's four primary load areas: (1) the Central Pool, (2) Riverside and San Diego Area, (3) West Valley Area, and (4) San Bernardino Area.

The results of this intensive analysis are presented in the following report. The findings and recommendations are significant for two reasons. Their most obvious importance is that they lay out a clear picture of future facilities needs and a broadly supported program for implementing improvements. Just as significant, however, the IAS has established an important precedent for the future of regional facilities planning in Southern California.

The IAS effort has shown the value and benefits of an open, collaborative planning process that clearly defines all technical assumptions; establishes mutually-acceptable program objectives; develops evaluation criteria based on the unique interests of participants; and explores all options, both structural and operational, for the achievement of those objectives. With the successful completion of the IAS, Metropolitan has further strengthened its relationships with its Member Agency partners in the delivery of a reliable supply of safe water to the citizens and ratepayers of Southern California.

The benefits that have accrued as a result of the effort are considerable. Participants agreed that the timing of major investments in certain water treatment and conveyance facilities can be safely delayed – providing ratepayers with significant near-term savings. At the same time, operational improvements were identified that could further extend the useful capacity of existing facilities.

In addition, IAS participants were provided with a better understanding of the planning and design criteria employed in the development of facilities within Metropolitan's service area. The process explored and clarified many of the policy assumptions that are part of Metropolitan's historical facilities planning methodology. It established a sound basis for communications, understanding, and trust in a world characterized by complex systems, uncertain future demands, valuable existing system assets, and a wide range of operational and facilities options available to meet future needs.

The future challenge is great. It requires the provision of system capacity before it is needed, the coordination of capital improvements within both Metropolitan and member agency systems, the capacity to rapidly adapt in cases where the timing and location of future demands are uncertain, and long-term dynamic approach to system facilities planning. The IAS has set the stage for delivering on those challenges and set a benchmark for future planning efforts. Metropolitan and its member agencies will meet these challenges through the continued coordination of local and regional planning efforts through annual IAS update meetings and through formal IAS updates linked to the IRP.

One of the key remaining open issues of the IAS is the determination of the financial responsibilities between regional and local agencies. Traditionally, long-term capital improvement programs (CIP's) generated from the System Overview Study provided the cost-basis for estimating the rate impacts to Metropolitan from the CIP. Unique to the current planning process, some alternative strategies for meeting future demands included local projects that defer regional facilities. However, the implementation of several of these local projects may depend upon external funding. Resolution on this matter is needed prior to comparing alternative portfolios on an economic basis.

The following sections summarize the results of the IAS process and the report that follows.

SECTION 1 – INTRODUCTION

In its role as the regional wholesale water supplier to Southern California, Metropolitan has developed an extensive water conveyance, treatment and distribution system. To ensure that it can continue to reliably deliver its water supplies, Metropolitan periodically analyzes its system capability. The Integrated Area Study (IAS) represents a refined component of that ongoing effort.

The IAS builds on past Metropolitan studies, such as the 1988 System Overview Study and the subsequent 1996 System Overview Study as Volume 2 of Southern California's Integrated Water Resources Plan (IRP). The 1996 study updated and supplemented the 1988 study, which projected demands, evaluated and identified long-term needs for new water distribution facilities, and estimated costs, priorities, and schedules for the specific facilities identified in the study.

Using current infrastructure improvement policies as a guide to facility planning, Metropolitan - in cooperation with its member agencies - proceeded with the IAS to:

- Increase collaboration between Metropolitan and member agencies
- Promote a common understanding of key concerns of all agencies
- Achieve a consensus on demand projections and facility timing assessments
- Clarify policy issues related to facility planning
- Consider alternative approaches to meeting future demands (e.g. Integrating local and regional plans for facilities and operations)
- Identify areas within the service area that will need additional study

Process Overview

Metropolitan and its member agencies embarked on a two-year process to determine how facilities would be developed to meet projected demands. In many ways, the IAS applied many of the same principles used to develop Metropolitan's Integrated Resources Plan (IRP). These principles included:

- Clearly defined regional objectives
- Collaborative planning between Metropolitan and its member agencies
- Increased understanding of local and regional water distribution systems and operations
- Identification of system needs by service area
- Identification of local and regional projects to fill the system needs
- Evaluation of alternatives from a regional perspective
- Discussion and clarification of relevant Metropolitan policy issues

Metropolitan and its member agencies worked collaboratively to gather information on demographics, local projects, and peaking factors. Data was evaluated and nationally recognized experts were brought in to examine the methodologies used to determine the demand on Metropolitan. The evaluation process included presentations by Metropolitan and its member agencies on system operations. Each agency analyzed how it might optimize operations to minimize peak demands on Metropolitan.

To help facilitate the IAS, an agreed-upon process was established by participants. The process had three distinct elements: technical, level of service, and finance. This report focuses only on the first two elements (technical and level of service). The finance element was moved from the IAS process to the formal to the discussions on rates being facilitated by the Chief Financial Officer. Work progressed concurrently on the technical element (an analysis of facility needs) and on the level of service element (an analysis of the policy governing the development of facilities).

The IAS took a regional approach to developing alternatives for meeting additional system capacity needs by assuming that the region was one entity capable of implementing any of these projects or alternatives based on technical merits. Projects were evaluated not on the basis of whether they were member agency or Metropolitan projects, but whether they achieved the desired objectives.

SECTION 2 – POLICY GUIDELINES FOR METROPOLITAN'S INFRACTURE IMPROVEMENTS

On January 9, 1931, the Metropolitan Board of Directors issued a one-page statement of policy that served as the foundation for many of Metropolitan's governing policies regarding the need for new facilities. Over the years additional board policies have been documented through a variety of mediums including: specific policy statements, the Administrative Code, board-adopted policy principles, and board letters. Policy statements also are embedded in formal board meeting discussion and recorded in meeting minutes. One of the first steps in the IAS process included examining and clarifying past policies. The eight key historical policies discussed, along with their discussion outcomes, are as follows:

Equity. Metropolitan strives to treat all areas as equitably as possible, although precise equality of service is not possible (e.g. geographic inequities).

Facility Construction/Timing. A consensus was reached on an open, adaptive "Right-Time" approach to set, monitor, and update facility target on-line dates.

Flexibility, Redundancy and Adaptability. Metropolitan's goal is to construct a safe, reliable, and flexible system in an economical manner. Redundancy is not a goal and there is no obligation for multiple delivery points.

Level of Service. Metropolitan designs for retail peak week demands and currently uses its maximum day demands as a proxy for retail peak week demands**.**

Point of Delivery. Metropolitan delivers water "at or near the agency boundary" and the Metropolitan Board determines the meaning of "at or near."

Discounted Water Programs and Planning. Replenishment demands are not included in facility planning. The Interim Agriculture Water Program (IAWP) demands are included in facility timing evaluations. The amount of the discount and/or justification should be addressed in future rate structure discussions.

Water Supply/Treatment. Metropolitan policy is to meet expanding and increasing domestic, industrial & municipal needs. Treated water is provided at the Board's discretion.

As Metropolitan and its member agencies discussed the eight historical policy issues, four additional policy issues emerged as critical issues. These issues have become important as political, economic and water supply conditions in Metropolitan's service area continue to evolve and change. The four emerging policy issues, along with their discussion outcomes, are as follows:

Reliability. IAS discussions focused on four components of reliability: water supply, system capacity, facility availability and system flexibility. It was demonstrated existing Metropolitan programs adequately address the first three components. The IAS team reached a consensus the following strategy for system flexibility:

Metropolitan goals – Continue to develop a demand-driven, flexible regional system aimed at meeting demands, while reducing the impacts of regional treatment plant outages. Regional system flexibility improvements will be achieved through demand-driven projects.

Member agencies goals – The member agencies will construct flexible wholesale/retail systems aimed at minimizing service interruptions at the customer level. Improvements will be achieved through both demand-driven and non-demand projects. Compliance with 4503 should be a specific goal.

Cooperative goals – Metropolitan and its member agencies will continue to work together to explore ways to reduce the impacts of Metropolitan facility outages on member agency systems, including outage coordination, consideration of flexibility benefits during the evaluation of demand-driven projects, and incentives for local supply projects.

Facility Implementation. A consensus was reached on a more open, collaborative "right-time" approach to scheduling regional to reduce the risk of having inadequate capacity while guarding against stranded investments.

Service Connections. A consensus was reached that new service connections on conveyance pipelines be considered as long as the requesting agencies demonstrate they will not impose new restrictions on regional operations.

Introduction of Local Water into Metropolitan Facilities. Although this topic remains under discussion, the preliminary recommendations are:

Emergency Use. Emergency use will be considered on a case-by-case basis and is defined as: An unplanned outage of Metropolitan facilities, an emergency occurring during a planned outage (e.g., unusually warm weather) or a planned outage greater than seven days in duration. Emergency use is also subject to the restrictions of the CDPH which include consecutive use of no more than five days or a total use of less than 15 days/year.

Routine Use. Routine use was not recommended for treated water system when there are multiple downstream member agency users.

SECTION 3 – WATER SUPPLIES AND DEMANDS

Two of the main IAS achievements were general consensus on the methodologies for forecasting water demands and determining peaking factors. As part of the IAS, a panel of nationally-known technical experts was convened to examine the methodologies for forecasting demand and estimating peaking factors. The expert panel was composed of highly regarded economists, statisticians, and water resource planners that included: Dr. Ben Dziegielewski of the Department of Geography and Environmental Resources, Southern Illinois University; Dr. John Boland, Department of Geography and Environmental Engineering, the Johns Hopkins University; Dr. Darwin Hall, Department of Economics and Environmental Science & Policy California State University, Long Beach; and Dr. Tom Chesnutt, President of A&N Technical Services, California. The member agencies also formed a technical panel to guide the expert panel. The expert panel confirmed the viability of the existing methodologies and gave numerous suggestions on how to improve the forecast and peaking methodology. Most of the suggestions deal with gathering additional data for future work.

Demand Forecasts

One of the main inputs to forecasting water demand includes projections of demographic and economic variables from regional planning agencies (the Southern California Association of Governments, or SCAG, and the San Diego Association of Governments, or SANDAG). According to these projections, Metropolitan's service area will grow at a rate of just over 150,000 people per year, from an estimated 18.2 million in 2005 to 22 million in 2030.

The effect of this growth on water demand is modeled, along with the contrasting effect of conservation, to attain the Retail Municipal and Industrial (M&I) water demand forecast. Retail M&I water demand with conservation is projected to grow from an average-year estimate of 3.8 million acre-feet in 2005 to 4.7 million in 2030, assuming an average economy.

The Metropolitan Sales Model then produces an estimated amount of Metropolitan supply needed to supplement the region's local supplies based on forecasted demands. The expected regional demand on Metropolitan supplies is the difference between total retail

demands, adjusted for conservation, and projected local supplies. An inventory of local supply projects was developed through the IAS process in close collaboration with the member agencies. Demand on Metropolitan is projected to be approximately 3.2 MAF by the year 2030.

Peaking Factors

To account for fluctuating demands throughout the year Metropolitan uses calculated factors to estimate future peaks. As determined through policy discussions, Metropolitan currently designs for maximum day demands on Metropolitan's system as a proxy for retail peak week demands.

The max-day peaking factors used for this analysis were based on historic flow data from Automatic Meter Reading System (AMR) at each delivery point. The peaking factors were also based on the 6-year average of max-day peaking factors of historic high demand years of 2000 to 2005. The max-day peaking factor results ranged from 1.35 to 1.88.

Combining the firm demand with the max-day peaking factor results in design peak flows (peak firm demand) projects the highest daily demand on Metropolitan facility based on historic behavior and hydrology.

SECTION 4 – DESCRIPTION OF EXISTING SYSTEM AND NEEDS

To more accurately analyze existing facilities and future needs, Metropolitan divides its service area into load areas based on water deliveries through member agency service connections. Using the methodology described in Section 4, the projected demand on Metropolitan was compared to the existing system capability in each load area. The following is a description of each load area and a summary of the analysis.

Central Pool

Results of the analysis indicates that the Central Pool, comprised of all areas served by the Jensen, Weymouth, and Diemer water treatment plants, has adequate treatment capacity to meet supplemental peak demands through the 2030 planning horizon. Unique to this region is the Common Pool, which receives a blend of water from the three Central Pool treatment plants. The earliest indication of any need for additional treatment capacity occurs in 2045, well beyond the timeframe that necessitates any near-term action. However, Metropolitan will continue to monitor the key drivers that might affect timing for additional treatment, such as performance of local resource programs and changes to demographic forecasts.

Riverside and San Diego Area

Results of the analysis showed that additional facilities will be needed within a 2030 timeframe in the Riverside and San Diego area, which is served by the Mills and Skinner Treatment Plants. Using the existing operational strategy, the Mills Exclusive area and the Skinner Exclusive area will require additional treatment capacity by 2020 and 2036, respectively. However, if Eastern and Western are capable of balancing their demands between the Mills and Skinner facilities, the regional need for additional treatment would not occur until 2026

West Valley Area

Additional conveyance facilities will be required when Metropolitan's future demand within the West Valley area exceeds the current conveyance capacity. The West Valley Area analysis indicates that sufficient conveyance capacity is available until the year 2037. Similar to the Central Pool Area, near-term action is not required at this time. However, there are ancillary issues that could affect regional operations. These issues have been evaluated and summarized in Section 4.

San Bernardino Area

The analysis shows that no additional conveyance capacity will be required within the 2030 timeframe. Required influent flow to meet peak demands at the Diemer treatment plant is projected to exceed existing conveyance capacity on the Rialto/Upper Feeder system until 2041.

SECTION 5 – DEVELOPMENT OF PROJECT PORTFOLIOS

This section focuses on the process involved in developing and evaluating alternative project configurations developed to meet projected demand. Historically, Metropolitan used existing local projects as an input to project demands for imported water. Metropolitan then develops a facility plan to meet these demands. Under the IAS, Metropolitan and the member agencies developed a database of local and regional projects that could be used to meet future service area demands. Concurrent with the development of the database, CDM (the IAS consultant) facilitated the development of the evaluation criteria that would be used to evaluate individual projects. Member agency representatives and Metropolitan staff worked together to refine the draft planning objectives and convert them into performance measures.

Table ES-1
Summary of Performance Measures

Objective	Performance Measure
Manage Cost	Net present value, ($ capital and O&M costs through the 2050)
Water quality: Improve Salinity Balance	Overall total dissolved solids, (TDS, mg/l)
Reliability: Increase system Flexibility	Ability to back-up emergency outages of local and regional facilities and planned outages of regional facilities, (1-100%)
Increase Adaptability & Sustainability	Ability to adapt to changes in demand, regulations and energy costs, (1-5)
Reduce Implementation Risk	Risk in areas of permitting, project complexity and land acquisition, (1-5)

After consensus was reached regarding the definition of objectives, a weighting exercise was conducted to account for the varying levels of importance IAS participants placed on each objective. A Pair-wise comparison was selected as the weighting method. For this method, every possible pair of objectives was compared and participants choose the two most important. A tally marked how many times an objective was selected, and a weight (normalized to 100%) was derived. The results of the weighting exercise were then averaged for three groups: Central Pool Area selections, Riverside and San Diego Area selections, and senior Metropolitan staff selections. The results are presented in Table ES-2.

Table ES-2
IAS Objective Weights

Objective	Central Pool Weighting	Riverside and SD Weighting	Metropolitan Weighting
Manage Cost	20%	15%	30%
Improve System Reliability	27%	25%	20%
Improve Water Quality (Salinity)	10%	20%	17%
Improve Adaptability	23%	20%	17%
Reduce Implementation Risk	20%	20%	16%

CDM assembled draft portfolios along a wide variety of themes to help demonstrate how various approaches impact overall performance. The following six portfolios were developed and evaluated for the Riverside and San Diego IAS:

- ***Under $500/acre-foot (AF) Local Projects Portfolio*** - An economical portfolio of local and regional projects aimed at using the lowest cost local projects.
- ***Maximum Local Projects Portfolio*** - This portfolio was aimed at maximizing local participation, adaptability and water TDS improvements.
- ***MWD Option A Portfolio*** - This regional portfolio was aimed at minimizing costs and implementation risks by expanding existing Metropolitan facilities.
- ***MWD Option B Portfolio*** - This regional portfolio aimed at minimizing costs and also improving reliability by constructing a new centralized facility located near multiple raw water sources (Inland Feeder and CRA).
- ***MWD Option C Portfolio*** - This regional portfolio was a variation of Option B that included additional treated water conveyance capabilities to maximize the reliability benefits.
- ***Balanced Mix Portfolio*** - This portfolio of local and regional projects was aimed at achieving low overall TDS levels and a high adaptability score.

The six project portfolios developed under the IAS process were evaluated using the objectives and performance measures summarized in Table ES-1 above.

CDM calculated the overall performance of the portfolios by inputting the individual project scores and the IAS participants weighted performance measures. The results will be summarized for the following groups:

- Riverside and San Diego IAS
- Central Pool IAS
- Metropolitan Senior Staff

Note that size of the colored bars on these charts indicate the relative performance and weighting for each objective. A large bar indicates strong portfolio performance and high objective weighting. The absence of a color bar indicates there was no improvement towards this particular objective.

For example, in Figure ES-1, the large blue bar for the Balanced Mix portfolio indicates that this portfolio scored well in the area of lowering TDS levels and that this objective was highly valued by the Riverside and San Diego group. Likewise, the large red bar shown for MWD Option B indicates this portfolio scored well in terms of improving system flexibility and that this reliability objective had a high weighting for this group. The lack of a blue bar for the three regional portfolios indicates these portfolios did not provide any TDS improvements - they were assumed to meet the existing TDS target level of 500 mg/l TDS.

Figure ES-1 Portfolio Rankings Based on Riverside/San Diego Objective Weights

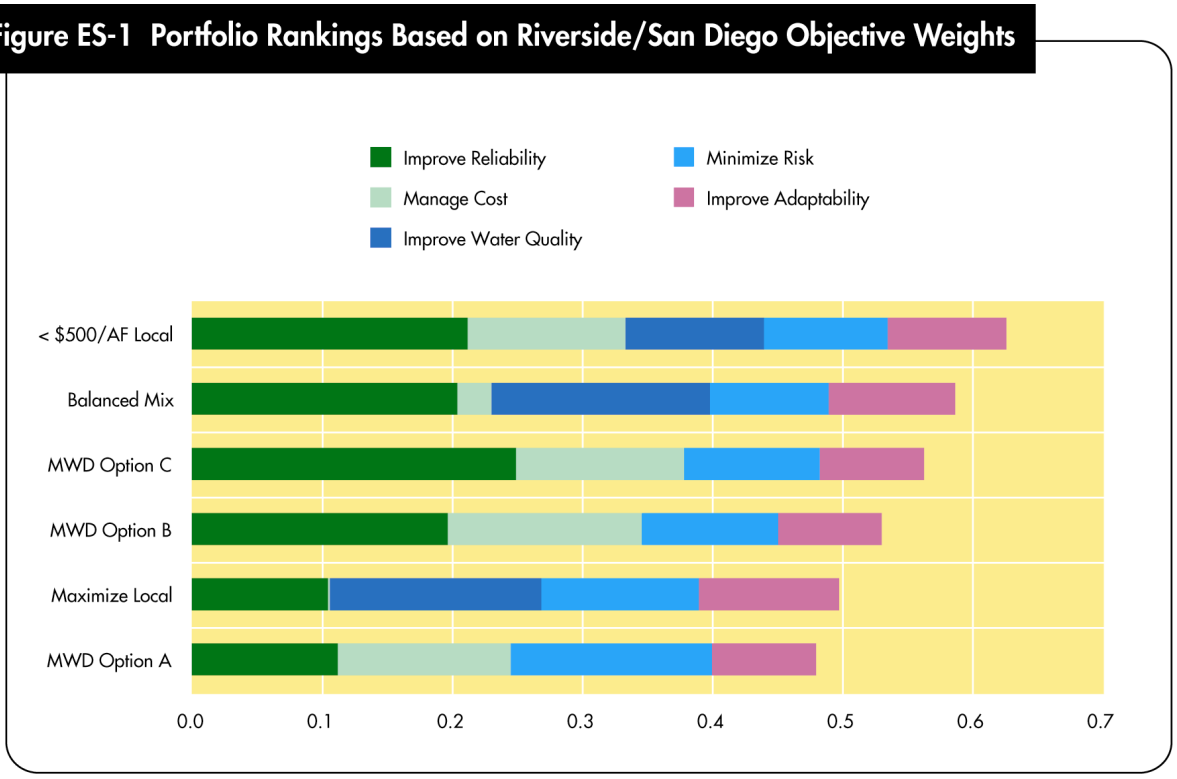


Figure ES-2 illustrates how the different weighting of objectives can influence the overall performance of the portfolios. The Central Pool group weighted the cost objective higher than the Riverside and San Diego group (20% vs. 15%) and weighted the water quality objective lower (10% vs. 20%). Although the Under $500 Local portfolio still scored highest, the Balanced Mix Portfolio moved from the second to third position.

Figure ES-2 Portfolio Rankings Based on Central Pool Objective Weights

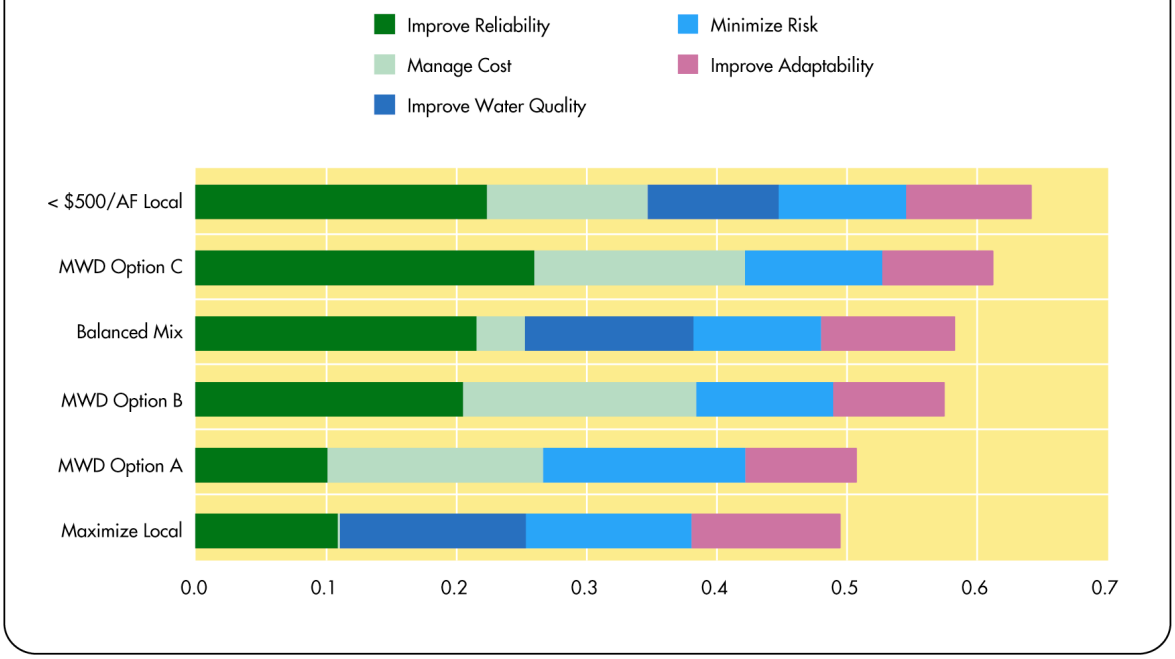
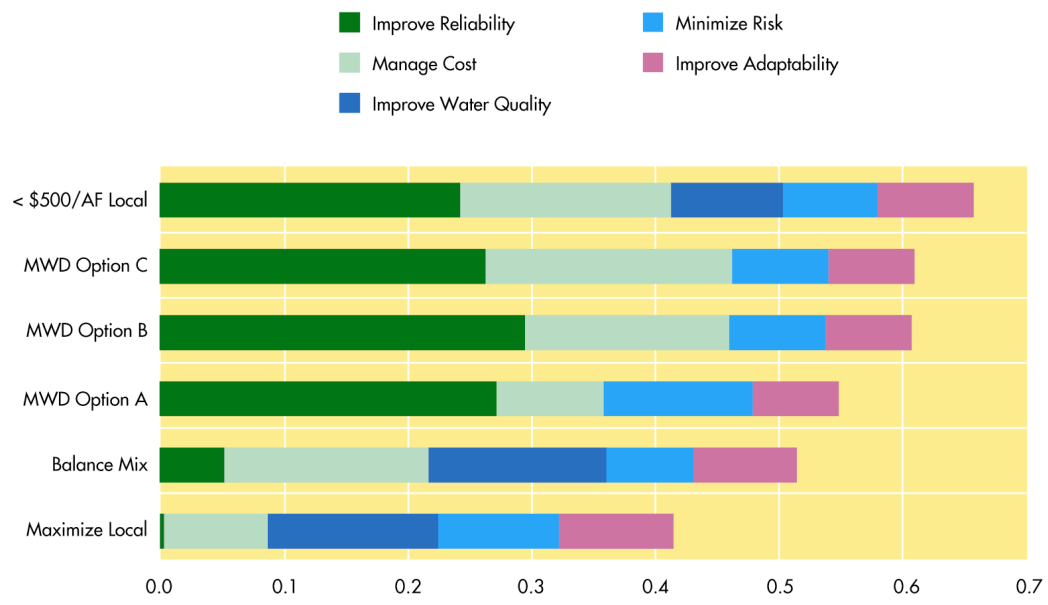


Figure ES-3 shows an even greater change from the results of the Riverside and San Diego group resulting from Metropolitan staff's high weighting of the manage cost objective (30% vs. 20%). Again, the Under $500 Local Portfolio scored highest. However, the Balanced Mix Portfolio moved from the second to the fifth position (behind the three regional portfolios).

Figure ES-3 Portfolio Rankings Based on Metropolitan Senior Staff Objective Weights



The portfolio evaluation results were shared with all IAS Teams in a facilitated meeting. Participants generally agreed that the CDM analysis were logical and consistent with the agreed-upon approach to portfolio evaluations.

Even with different weighting of objectives, there was consistency in the portfolio rankings between the independent IAS groups as shown in Table ES-3. The portfolio that consists of developing lower cost local projects (plus a centralized regional facility) to meet the gap scored highest among all stakeholders. Also, the centralized and fully networked regional portfolio scored second highest for two of the three groups. The majority of the represented agencies also agreed that the top four performing portfolios warranted further consideration.

Table ES-3
Summary Portfolio Rankings

	Rank			
Portfolio	Riverside and San Diego	Central Pool	MWD	Average
<$500 Local	1	1	1	1.0
MWD Opt. C	3	2	2	2.3
Balanced Mix	2	3	5	3.3
MWD Opt. B	4	4	3	3.7
MWD Opt. A	6	5	4	5.0
Max. Local	5	6	6	5.6

Each of the proposed project portfolios requires a Metropolitan regional treatment plant to meet the capacity need by 2050. The amount of additional capacity required from a new regional treatment facility will vary depending on the amount of local supply that will be developed through the local projects identified within each portfolio.

IAS participants realize that actual local project implementation will be dictated by many factors such as cost, local reliability, grant funding opportunities, and other local initiatives and needs. Several member agencies expressed optimism on the likelihood of several local projects within the various project portfolios moving forward.

SECTION 6 – FINDINGS AND RECOMMENDATIONS

Metropolitan operates and maintains an extensive water treatment and conveyance system to deliver an adequate and reliable supply of high quality water to its customers. Consequently, Metropolitan must continually evaluate the performance and adequacy of its facilities and review its planning policies to ensure reliable water deliveries are achieved in an economical manner. The purpose of the IAS was to take a more collaborative approach in evaluating these needs in order to strengthen local and regional partnerships and to seek optimal solutions.

This section summarizes findings and recommendations stemming from this open, cooperative IAS process. The IAS process was successful in achieving the objectives outlined in Section 1:

- **Increase collaboration between Metropolitan and member agencies.** The IAS led to increased cooperation between agencies and sharing of data and ideas that were beneficial in moving the planning process forward and achieving consensus on technical and policy issues.
- **Promote a common understanding of key concerns of all agencies.** The technical presentations made by staff from member agencies and Metropolitan helped achieve a common understanding of important planning drivers and operational issues.
- **Achieve consensus on demand projections and facility timing assessments.** The open discussions, internal coordination, IAS Technical Panel and Expert Panel review process yielded valuable results. Participants reached a consensus on demands, method for determining peak demands, the gap analyses, and facility timing results for each of the independent IAS efforts.
- **Clarify policy issues related to facility planning**. The policy discussions were productive in clarifying the eight historical policies and three of the four emerging policies. A consensus was reached on clarifications in the following areas for Metropolitan's Board to consider:
  - Reliability
  - Facility implementation
  - Service connections on conveyance facilities.

Discussions on the policy issue of potential introduction of local water into Metropolitan's treated water system will continue through the existing IAS committee.

- **Consider alternative approaches to meeting future demands** (e.g. Integrating local and regional plans for facilities and operations)**.** The IAS project portfolio development and evaluation process was effective in identifying alternative approaches to meeting future demands. For the Riverside and San Diego area, a portfolio containing a mix of local and regional projects scored highest and the implementation of the highest performing local projects could defer construction of a regional treatment facility.

  The IAS also identified some opportunities to improve the integration of local and regional facility operations that could help defer investments in new regional facilities. These options included balancing the operation of the Mills and Skinner facilities, reducing peak treated water demands on Metropolitan through implementing a recycled/raw water project in southern Riverside County, and the optimization of the West Valley load area. Metropolitan will continue to coordinate with member agencies to seek similar opportunities.

- I**dentify areas within the service area that will need additional study.** For the Riverside and San Diego area, the IAS teams assumed that the region could balance flows between the Mills and Skinner plants in order to defer regional investments by up to 6 years. The local and regional conveyance systems must be studied in greater detail to validate this assumption. In addition, potential raw water conveyance constraints for the delivery of water to SDCWA will be investigated further.

Findings

One of the main objectives of the IAS is to determine what actions are needed to ensure that Metropolitan will continue to be able to reliably deliver water supplies to its member agencies. Table ES-4 shows the major findings of the study.

Table ES-4
Summary of Findings on System Capacity Needs

Load Area	Timing of Facility Need	Required Facility
Central Pool	2045 in Weymouth Exclusive area 2049 in Common Pool area	Treatment capacity Treatment capacity
West Valley	2037	Conveyance capacity
San Bernardino	2041	Conveyance capacity
Riverside and San Diego	2026 (assuming balance operation)	Treatment capacity

Recommendations

To ensure that all of the goals of the IAS are met, Metropolitan will pursue a multi-faceted strategy outlined in the IAS report. In areas where sufficient treatment and conveyance capacity is available through the planning horizon, Metropolitan will carefully monitor critical forecast variables and evaluate any changes in the drivers that affect facility timing under the right-time facility monitoring discussed in Section 2.

In areas where facility improvements are required within the planning horizon, recommended strategy will be implemented in two phases: (1) Near-term action and (2) Mid- to Long-term action. The near-term actions consist of strategic elements of the Recommendation that will require immediate planning attention and implementation within 5 years. Mid- to Long-term actions consist of strategic elements that are implemented throughout the planning horizon and will not require implementation until beyond 5 years. Specific timing requirements for implementing mid- to long-term actions will depend on on-going findings of the Right-Time Facility Tracking Program discussed in Section 2. Table ES-5 summarizes the recommended near-term actions.

Table ES-5
Near Term Actions

Responsible Agency	Near-term Action
Member Agencies	• Implement local projects that were assumed completed within the IAS Gap Analysis. This includes projects now under construction and 21 projects that were identified to be fully designed and with appropriated funding, including: – *Calleguas (Tapo Canyon WTP)* – *Eastern (Soboba & Recycled Pipeline Reach 16)* – *Inland Empire (Chino Desalter & IEUA Regional recycle project)* – *Las Virgenes (Kanan, Mulholland & Sepulveda recycle projects)* – *MWDOC (LBCWD Well, San Clemente GW, IRWD Reclamation & SMWD Chiquita Reclamation)* – *San Diego (Encina Desalination and Carlsbad, Meadowlark, Santa Fe Valley & Woods Valley recycle projects)* – *Three Valleys (Pomona Well and Rowland, Walnut & Suburban Three Valleys recycling projects)* • Seek grant funding for high-rated local projects and secure right-of-way in advance, where necessary, to preserve these options • Identify additional supply projects within the Calleguas area • Develop plans for achieving compliance with Administrative Code Section 4503 requiring member agencies to have sufficient resources to sustain a 7-day interruption in Metropolitan deliveries
Metropolitan	• Secure right-of-way for a new regional water treatment plant in Riverside County • Monitor implementation of identified IAS local projects • Schedule annual IAS update meetings to: – *Report on the status of IAS Action items and the development of local projects* – *Discuss & evaluate newly proposed IAS projects* – *Update the target on-line dates for regional projects*
Joint Metropolitan and Member Agency	• Develop the Mills and Skinner Balanced Operating Plan • Negotiate the extension of the West Valley Feeder #1 lease • Continue policy discussions on the potential introduction of local water into Metropolitan's treated water system

In addition to the near-term actions, the IAS report also recommends a number of mid- to long-term actions that facilitate a strategic process for meeting facility-planning objectives through data gathering, analysis, and monitoring. Implementing these programs will require continued collaboration between Metropolitan, member agencies, and retail agencies.

Metropolitan has a long history of working together effectively with its member agencies to ensure a reliable supply of water for its service area. The IAS represents the recent best efforts of Metropolitan and its member agencies to improve on past efforts. Through the IAS, Metropolitan and its member agencies will ensure that facilities will be in place to reliably deliver water to the region.

Conclusion

The IAS process was able to achieve its objectives primarily because of the high level of agency participation and collaboration. This close coordination in long-term regional planning will continue through annual IAS Update meetings and through formal IAS updates linked to the IRP.

Findings indicate that there is adequate time to monitor conditions for the regional component of the portfolio evaluations. The annual IAS meetings will allow for:

- Open policy discussions and introduction of new actions items
- Communicating the status of the implementation of local projects
- Updating demands, peaking factors and facility timing assessments
- Evaluating new local projects proposed for consideration in the preferred portfolios
- Updating the regional facility on-line dates
- Evaluating emerging planning issues

One of the key remaining open issues of the IAS is the determination of the financial responsibilities between regional and local agencies. Traditionally, long-term capital improvement programs (CIPs) generated from the System Overview Study provided the cost-basis for estimating the rate impacts to Metropolitan from the CIP. Unique to the current planning process, some IAS portfolios include local projects that defer regional facilities. Some of these local projects may depend on external funding. Resolution on this matter is needed prior to comparing portfolios on an economic basis.

Metropolitan and its member agencies will continue to work collaboratively to develop a System Overview Study that will finalize an overall solution to meet identified system capacity needs. This study will include a consensus implementation plan consisting of regional and local projects including a detailed evaluation of impacts on Metropolitan's water rate. Determination of financial responsibilities and rate impacts will help determine final combination of regional and local project solutions.

1 INTRODUCTION

PURPOSE

The Metropolitan Water District of Southern California (Metropolitan) has developed an extensive water conveyance, treatment and distribution system in its role as the regional wholesale water supplier to Southern California. To ensure that it can continue to reliably deliver its water supplies, Metropolitan periodically analyzes its system capability. The Integrated Area Study (IAS), initiated in 2005 at the request of its member agencies, represents a refined component of that ongoing effort.

The purposes of the IAS are to:

- Increase collaboration between Metropolitan and member agencies
- Promote a common understanding of key concerns of all agencies
- Achieve consensus on the demand projections and facility timing assessments
- Clarify policy issues related to facility planning
- Consider alternative approaches to meeting future demands (e.g., integrating local and regional plans for facilities and operations)
- Identify areas within the service area that will need additional study

This report will outline the policies and technical studies used to develop the recommendations presented in Section 6 of the report.

BACKGROUND

The Metropolitan Water District of Southern California (Metropolitan) was formed under the auspices of the Metropolitan Water District Act and given a broad range of discretion related to importing and distributing water.

> *"…Metropolitan water districts may be organized for the purpose of developing, storing, and distributing water for domestic and municipal purposes and may provide, generate, and deliver electric power within or without the state for the purpose of developing, storing, and distributing water for such district…"*
> (***Sec. 25. Metropolitan Water District Act)***

Metropolitan has served as the regional importer of water that gets distributed through a complex system of infrastructure controlled by many different institutional entities since its inception. In fact, more than 300 different public agencies and private companies now

provide water to those residing within Metropolitan's service area. With so many different entities involved, the need for cooperation has become increasingly apparent. Without close coordination, given the fact that there is much overlapping governance, it is likely that there could be inefficiencies with regard to water supply and infrastructure.

In the mid 1990s, Southern California faced growing demands and increasing competition for existing water supplies. Metropolitan and its member agencies responded to this challenge with an Integrated Resources Plan (IRP) process to develop a comprehensive water resources strategy to provide the region with a reliable and affordable water supply. The IRP was a collaborative effort drawing input from many groups including Metropolitan's Board, an IRP workgroup (comprised of Metropolitan staff, member agency managers, and groundwater basin managers), and representatives from the environmental, agricultural, business and civic communities.

The drivers for the IRP were reliability, affordability, water quality, diversity, flexibility, and environmental and institutional constraints. The outcome of the 1996 Board-adopted IRP was a "Preferred Resource Mix" which would ensure that Metropolitan and its member agencies meet their full service retail demands without interruptions through 2020. The IRP was intended to be a dynamic process that allows for responses to any changes in water supply or demand. In July 2004, Metropolitan's Board adopted an updated IRP that addressed resource targets through 2025.

Metropolitan's resource planning efforts are complemented by the System Overview Study planning process that focuses on regional infrastructure requirements to convey, treat and deliver the water resource mix identified by the IRP. The System Overview Study describes the size and timing of facility improvements required to meet imported water delivery needs. The study also estimates the cost of proposed facilities and potential rate impacts of Metropolitan's resulting long-term Capital Investment Plan (CIP). In 2004, Metropolitan began work on the System Overview Study Update to address changes in water resources development and adjustments to the resource targets identified in the IRP Update.

In February 2005, staff initiated workshops with member agencies to discuss the System Overview Study's purpose, process and preliminary findings. These findings were also presented at a joint meeting of the Engineering and Operations Committee and the Water Planning, Quality and Resources Committee, and to member agency managers in August 2005. In these meetings, the member agencies expressed an interest in exploring additional options for meeting the identified capacity needs, including additional local facilities, and to seek clarification on key policies related to facility planning.

In response to the member agencies' recommendations, Metropolitan proposed the collaborative IAS process where Metropolitan staff and member agency staff would work together to develop alternative approaches to meeting future demands. This effort considered demands to 2050 but was focused on the facilities that would be necessary to meet the demands projected in the planning horizon of 2030, consistent with the IRP.

PROCESS OVERVIEW

The IAS process represents a step forward in regional planning. Metropolitan and its member agencies embarked on a two-year process and worked together to determine how facilities would be developed to meet projected demands.

In many ways, the IAS applied many of the same principles used to develop Metropolitan's Integrated Resources Plan (IRP). These principles included:

- Clearly defined regional objectives
- Collaborative planning between MWD and its member agencies
- Increased understanding of local and regional water distribution systems and operations
- Identification of system needs by service area
- Identification of local and regional projects to fill the system needs
- Evaluation of alternatives from a regional perspective
- Discussion and clarification of relevant MWD policy issues

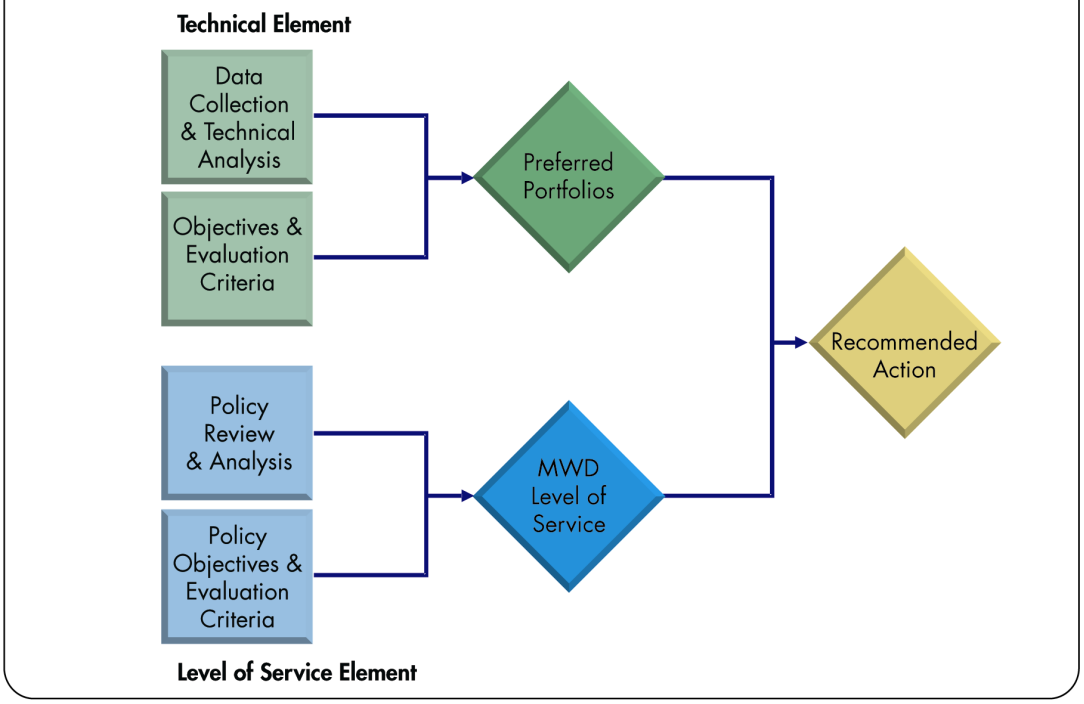
Metropolitan and its member agencies worked extensively to gather information on demographics, local projects, and peaking factors. Data were evaluated and nationally recognized experts were brought in to examine the methodologies used to determine the demand on Metropolitan. The expert panel included: Dr. Ben Dziegielewski of the Department of Geography and Environmental Resources, Southern Illinois University; Dr. John Boland, Department of Geography and Environmental Engineering, the Johns Hopkins University; Dr. Darwin Hall, Department of Economics and Environmental Science and Policy, California State University, Long Beach; and Dr. Tom Chesnutt, President of A&N Technical Services, California. The evaluation process included presentations by Metropolitan and its member agencies on system operations. Each agency analyzed how it might optimize operations to minimize peak demands on Metropolitan.

The IAS took a regional approach to developing alternatives for meeting additional system capacity needs. In a sense, the IAS assumed that the region was one entity and that this entity could implement any of these projects or alternatives based on technical merits alone. Projects were evaluated not on the basis of whether they were member agency or MWD projects, but whether they achieved the desired objectives.

To help facilitate the IAS, a consensus process was established by participants (Figure 1-1). The process has three distinct elements: technical, level of service, and finance. This report focuses only on the first two elements (technical and level of service). The finance element was moved from the IAS process to the formal discussions on the long-range finance plan being addressed by Metropolitan's CFO's office.

Work progressed concurrently on the technical and level of service elements.

Figure 1-1 IAS Process Overview



Technical Element

The technical element was primarily aimed at developing a preferred portfolio for meeting peak demands. This element focused on understanding the current local and regional water systems and operations, data collection and analysis, and the definition of common objectives and evaluation criteria.

Four load area studies focused on specific portions of Metropolitan's service area, including the Central Pool, Riverside and San Diego, West Valley, and San Bernardino areas presented in Figure 1-2. Metropolitan worked closely with the member agencies to determine additional regional system capacity need (or gap) through 2050 while focusing on facility needs to meet planning horizon through 2030. Figure 1-3 presents the concept behind the "gap" analysis.

The gap analysis compares the existing available treatment or distribution capacities with the projected total demand on Metropolitan for each load area. When projected demand exceeds existing capacities, need or gap is identified. The resulting gap could be met by new local projects, changes in local system operations, new regional (Metropolitan) projects, changes in regional system operations or some combination of local and regional projects.

Figure 1-2 Four Independent IAS Efforts

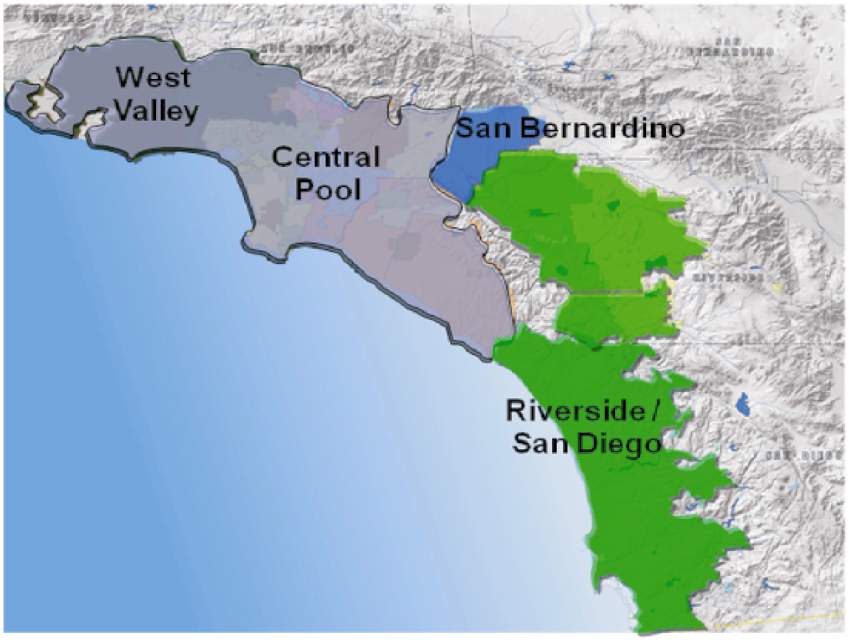
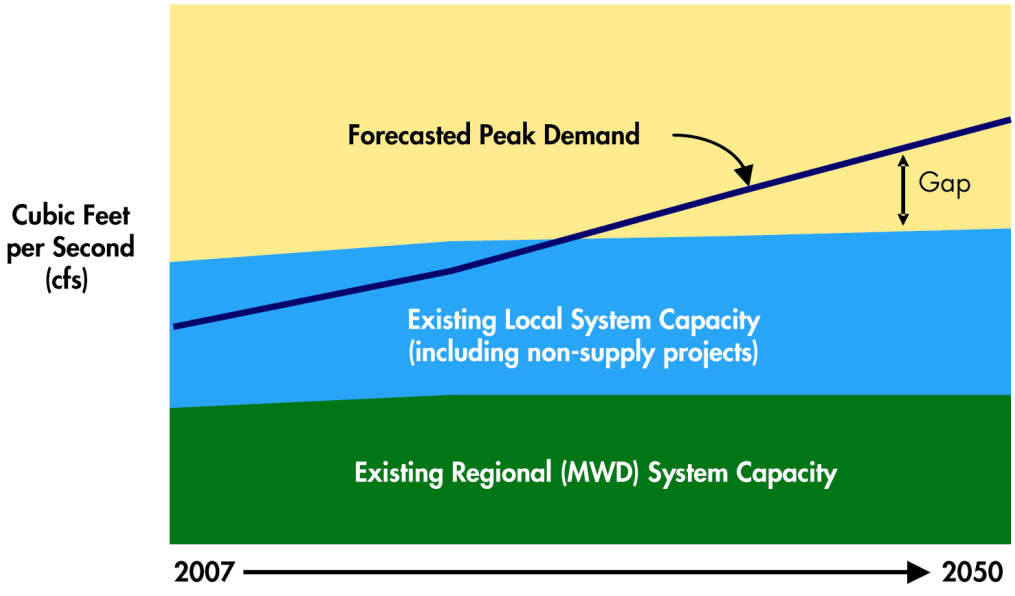


Figure 1-3 Conceptual System Needs Assessment for IAS



After the gap was determined, Metropolitan and the member agencies identified projects that would later be combined into complete alternatives. Criteria for evaluating these alternatives were the objectives and performance measures developed during the technical element of the IAS.

In addition to the four specific load area workshops, joint IAS workshops were held with all IAS participants to discuss the results of the technical analyses and to discuss relevant policy issues.

Level of Service Element

The level of service element was primarily an analysis of the policy governing facility development. This element focused on relevant MWD policies and included discussion on issues such as:

- Equity
- Facility Construction/Timing
- Reliability
- Obligation
- Level of Service
- Point of Delivery
- Economic Efficiency/Rates
- Water Supply/Treatment
- Introduction of Local Water

Metropolitan prepared a policy matrix with an historical account of relevant policies pertaining to these issues and discussed four emerging policy issues. The policy matrix and IAS policy discussions are covered in Section 2 of this report.

REPORT ORGANIZATION

This report includes a summary of Metropolitan's policy statements, findings on water supplies and demands, a description of existing system facilities and system needs, and a description of system improvement alternatives. A brief summary of each major section is presented below.

- *Section 2 – Policy and Guidelines for Metropolitan's Infrastructure Improvements*: Presents a summary of current policy questions with regard to infrastructure improvements to be addressed by Metropolitan's Board of Directors.
- *Section 3 – Water Supplies and Demands:* Presents the updated findings of Metropolitan's retail municipal and industrial (M&I) water demand forecasting based on sector-specific econometric models of water use, including the development of maximum demands that Metropolitan must satisfy to meet the region's water supply reliability goal and to plan for needed facilities.

- *Section 4 – Description of Existing System Facilities and System Needs*: Presents a description of Metropolitan's water importation, treatment, storage, and distribution systems; identifies system needs for imported water; summarizes future peak demands on Metropolitan's treatment and distribution systems; and evaluates the adequacy of facilities by load area.
- *Section 5 – Evaluation of Project Portfolios*: Describes the methodology for development and evaluation of portfolio alternatives that that may be implemented to meet identified future demands.
- *Section 6 – Findings and Recommendations*: Presents the findings of the IAS process and recommendations for Metropolitan's system improvements.

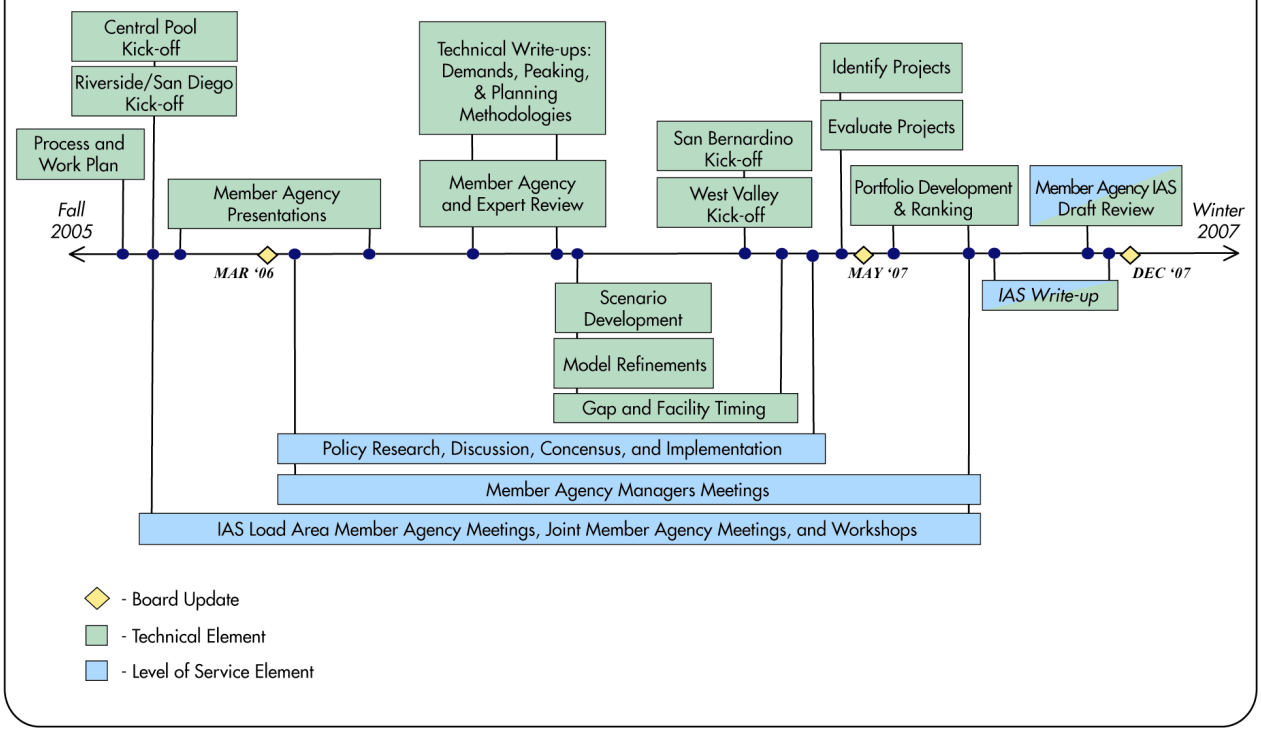
IAS STAKEHOLDER PARTICIPATION

Member agency participation has been the driving force behind the IAS process. Over 20 agencies participated in the IAS process and their input was essential in making this effort a success. Seventeen of these agencies made individual technical presentations on their systems, operational challenges, status of planning efforts, and expectations for the IAS process. Summaries of the individual agency presentations are included in Appendix 3.

Member agencies also participated in the technical review of the assumptions and methodologies used in Metropolitan's demand projections, evaluation of peaking, and assessment of system capacity need and timing. In addition, member agency and sub-agency staff and managers participated in a workgroup formed to discuss the policy issues surrounding the potential introduction of local water into Metropolitan's treated water system.

Figure 1-4 illustrates the IAS progression and key milestones in which member agencies provided significant input and value to the IAS process. Activities from the technical element are shaded green and activities from the level of service element are shaded blue. As can be seen, the IAS process began with the concurrent initiation of the Central Pool and Riverside / San Diego area, which constituted the larger part of the technical effort and coordination with the majority of agencies. The West Valley and San Bernardino efforts were initiated after the completion of the analysis of system needs in the Central Pool and Riverside and San Diego areas.

Figure 1-4 IAS Progression and Stakeholder Participation



POLICY GUIDELINES FOR METROPOLITAN'S INFRASTRUCTURE IMPROVEMENTS

2

INTRODUCTION

Since its inception, one of the major questions faced by Metropolitan's board of directors has been how to fairly and equitably build facilities to deliver water supplies to member agencies. Historically, facility development policy has been guided by eight categories or considerations that included:

- Equity
- Facility construction/timing
- Flexibility, redundancy and adaptability
- Obligation
- Level of service
- Point of delivery
- Economic efficiency/rates
- Water supply/treatment

During the initial IAS meetings, member agencies expressed interest in discussing and clarifying policies that relate to the planning of regional facilities. The member agencies suggested that more certainty at the regional level would help member agencies' master planning efforts.

As the IAS process progressed, it became clear that there were four emerging policy questions or considerations with regard to facility development. Metropolitan and member agency staff conducted more detailed discussion on key topics, including: 1) reliability, 2) facility implementation, 3) service connections on conveyance facilities, and 4) introduction of local water into Metropolitan's treated water facilities

The purpose of this Section is to revisit existing policies that have guided Metropolitan's facility development decisions and to convey Metropolitan positions on emerging policy considerations. This section of the report is divided into the following main topics:

- Background
- Historical policy positions
- Emerging policy positions

BACKGROUND

In 1928, the California state Legislature passed into law the Metropolitan Water District Act (Act). The Metropolitan Water District of Southern California (Metropolitan) was formed under the auspices of the Act and given broad powers. Its governing board of directors has operated within the boundaries of the Act to develop and deliver a reliable supply of water to its 26 member public agencies for nearly 80 years.

Throughout its history, the board has delegated certain tasks to Metropolitan staff which are codified in Metropolitan's Administrative Code (Code). In addition, Metropolitan has developed policy principles to help achieve its mission to provide adequate and reliable supplies of high quality water in an environmentally and economically responsible way. These policies can be found in a variety of documents including: specific policy statements, the Administrative Code, board-adopted policy principles, and board letters. Policy statements also are embedded in formal board meeting discussion and recording in meeting minutes. Policies extended through, and are further refined within the development of programs and language of related agreements. One key element of policy-making at Metropolitan is stated in Report No. 952:

> The reliance upon the "discretion of the Board of Directors" is pervasive throughout virtually all aspects of the decision-making process at Metropolitan. In numerous opinions of the General Counsel regarding a wide range of policies and procedures, the board's discretion is invariably noted.

The Act which formed Metropolitan gave its board the discretion to make decisions. And, while the board has established an Administrative Code and set policies, it is not bound by these guidelines. Establishing policies provides clarity for member agencies, but the board retains its discretion to adhere to or diverge from established policy as defined by the boundaries of the Act.

HISTORICAL FACILITIES POLICIES

Historically, Metropolitan has not kept a catalog of current policy, but has relied on the corporate knowledge of planning staff. The 1996 *System Overview Study* did document a number of facilities-related policies and represents the most complete list to date. It is not definitive, however. It is possible to find sources with conflicting policy statements. In an effort to track the historical development of facilities policy Metropolitan staff conducted an exhaustive document search. The result is the Policy Matrix (shown on the following pages), which summarizes the key findings of this effort. The Policy Matrix does not include all statements of policy related to facilities, but chronicles how the policies in the eight major categories have evolved. Information is color-coded to reflect Metropolitan's Code, policies and those policies that are not part of the Code.

Policy Matrix

WATER SUPPLY

The District is prepared, with its existing governmental powers and its present and projected distribution facilities, to provide its service area with adequate supplies of water to meet expanding and increasing needs in the years ahead. When and as additional water resources are required to meet increasing needs for domestic, industrial and municipal water, the District will be prepared to deliver such supplies.

MWD Code 4202 (a) - Laguna Declaration

The six objectives driving the IRP include: reliability, affordability, water quality, diversity, flexibility, and environmental & institutional constraints.

Integrated Resource Plan Update (July 2004)

In terms of reliability, the results of the IRP Update analysis demonstrate that the resource targets of the 1996 IRP, factored in with the changed conditions discussed in this report, provide for 100 percent reliability in 2020 and up to 2025.

Integrated Resource Plan Update (July 2004)

In terms of buffer supply, the IRP Update identified two new areas of concern: (1) increasingly stringent water quality regulation, and (2) resource implementation risk surrounding the development of planned projects. The IRP Update recommends a supply buffer of up to 10 percent of regional demands to manage the two concerns and other uncertainties. The planning buffer calls for Metropolitan to develop 500,000 acre-feet of supplies in addition to the resource targets by 2025. Development of the buffer will be equally split between local and imported sources. The supply buffer is consistent with Metropolitan's practice of developing supplies that are available at least 10 years in advance of need.

Integrated Resource Plan Update (July 2004)

MWD Code

Non-Codified Policies

EQUITY

...the treatment of all areas of the District as equitably as possible.

Board Minute Item 28401 (Nov 1970)

Although precise equality of such service by the District does not exist as to all units, it is believed that such discrepancies as do exist are the result of decisions of the Board which are founded in reason and logic…

Board Report to Water Problems Committee by General Counsel (May 1967)

…the Board must endeavor to reasonably and fairly continue to authorize construction of feeder lines and service connections thereto which will be consistent with the policy the Board has followed in the past…

Board Report to Water Problems Committee by General Counsel (May 1967)

OBLIGATION

The District shall not be obligated to provide additional works or facilities, necessitated by the annexing area, for the delivery of water from works owned and operated by the District.

MWD Code 3104 (d) Standard Disclaimer

All sales and deliveries of water at the rates established by Section 4401 shall be subject to the ability of the District to sell and deliver such water under operating conditions determined by the Chief Executive Officer, and, to the extent not inconsistent herewith, shall be subject to the provisions of this chapter, and Chapter 9.

MWD Code 4512

With respect to water delivered for groundwater replenishment purposes, deliveries of such water may be made at the General Manager's discretion when water and system capacity are considered available for same.

MWD Code 4512

Policy Matrix
(continued)

FACILITY CONSTRUCTION/TIMING
"Base Firm Demand" shall mean the greater of a) the member agency's Initial Base Firm Demand or b) the member agency's ten-fiscal year rolling average of deliveries of water from the District … excluding, in either case, water delivered under Long-Term Seasonal Storage Service or Replenishment Service…and Interim Agricultural Water Program Service…"
MWD Code 4122
Metropolitan should plan its distribution system to have sufficient capacity to meet the above-normal projection of demands to be met by Metropolitan that are identified in this report
MWD Report 949 (Jul 1983)
... particular consideration shall be given to designing the feeder system so that areas of large potential consumption may be adequately served.
1931 Statement of Policy (Jan 1931)
The overall objective of the expansion program is to develop a combination of facilities that results in a reliable, safe, and flexible distribution system at the lowest total cost.
MWD Report 949 (Jul 1983)
It is Metropolitan's policy to enlarge existing or construct additional water treatment facilities when existing facilities are inadequate to meet the reasonable demands of Metropolitan's agencies.
MWD Report 952 (Aug 1985)

FLEXIBILITY, REDUNDANCY, AND ADAPTABILITY
(a) Subject to the Chief Executive Officer's determination of available system capacity, Metropolitan will offer wheeling service. The determination whether there is unused capacity in Metropolitan's conveyance system, shall be made by the Chief Executive Officer on a case-by-case basis in response to particular requests for wheeling.
MWD Code 4405
The District may join or enter into agreements with member public agencies to make more effective use of water resources, including agreements providing for the wheeling, exchange, or banking of water, so long as such agreements serve a purpose of the District.
MWD Code 4209
…another design consideration is to provide extra capacity in Metropolitan's system for flexibility of operations. Options include 1) Over sizing of pipelines, 2) Dual or alternative pipelines to deliver water to a particular area.
MWD Report 949 (Jul 1983)
"As long as capacity is available in existing facilities for meeting the demands of our member agencies, constructing similar facilities in the same region cannot be justified. Such additional facilities would not only be redundant, but would impose an unnecessary financial burden on other users."
Letter to Water Problems Committee (June 1983)
In a number of cases, the Board has stated that one of Metropolitan's goals is to construct a reliable and flexible system. Storage, interconnections, alternate raw water sources for treatment plants, and multiple routes for delivering water are ways to accomplish this.
Technical Report—Criteria for Meeting Water Demands (Mar 1989)

MWD Code

Non-Codified Policies

Policy Matrix
(continued)

LEVEL OF SERVICE
Metropolitan limits variations in flow to 10% within a 24-hour period.
MWD Code 4504
"Suspension of Deliveries," restates that the agency is responsible for maintaining a seven-day supply. However, previous shutdowns have shown that purveyors do not always have sufficient local supplies to sustain a seven-day interruption. When lack of local resources results in postponement or cancellation of a shutdown, Metropolitan incurs certain direct costs.
MWD Code 4503
Metropolitan's system was designed to be a regional, wholesale system—not a local retail system. As such, it was not designed to meet hourly, daily, and weekly demands. This is the responsibility of Metropolitan's member agencies, or their sub agencies, which provide retail water service.
MWD Report 949 (Jul 1983)
Local agencies should provide storage to meet peak demands of less that one week in duration. If Metropolitan were to meet peaks of a shorter duration, it would create an over reliance on Metropolitan.
Technical Report - Criteria for Meeting Water Demands (Mar 1989)
The Board has never adopted a fixed level of peak demands which would be met.
Technical Report - Criteria for Meeting Water Demands (Mar 1989)
In practice, Metropolitan has served such peaks as were experienced and has provided new capacity as needed.
Technical Report - Criteria for Meeting Water Demands (Mar 1989)

POINT OF DELIVERY
"The Chief Executive Officer is authorized to construct, or have constructed, any service connection requested by a member public agency, which, in the opinion of the Chief Executive Officer, should be authorized and which is not specifically precluded by resolution of the Board; subject to such terms and conditions as shall be deemed by him to be reasonable and proper..."
MWD Code 4700
District water will be available only to cities and areas now or hereafter included within the legal boundaries of the District. This means that District water will not be sold or released under any terms to any area as long as such area is outside the boundaries of the District except as may be approved by the Board.
MWD Code 4200
Delivery points will be at or near the boundary of each member agency and to other points as the Board determines, considering economy and convenience, or to such other points as the Directors may determine.
1931 Statement of Policy (Jan 1931)
"For those areas traversed by Metropolitan's distribution system delivery points may be established on that system anywhere capacity is available provided existing water service is not impaired"
MWD Report 78-6 (Oct 1977)
"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..."
Adopted 1996 System Overview Study (Mar 1996)

MWD Code

Non-Codified Policies

Policy Matrix
(continued)

ECONOMIC EFFICIENCY/RATES
Taxpayers and water users residing within the District already have obligated themselves for the construction of an aqueduct supply and distribution system. This system has been designed and constructed in a manner that permits orderly and economic extensions and enlargements to deliver the District's full share of Colorado River water and State Project water as well as water from other sources as required in the years ahead. Establishment of overlapping and paralleling governmental authorities and water distribution facilities to service Southern California areas would place a wasteful and unnecessary financial burden upon all of the people of California, and particularly the residents of Southern California.
MWD Code 4202 (b) - Laguna Declaration
The adopted policy of the Board is that all costs pertaining to the treatment of water be recovered from those who use treated water.
MWD Report 952 (Aug 1985)
These policies were adopted in order that supplying water to Southern California "…may be accomplished in the most effective and economical manner, and to the best interests of the area taken as a unit."
1931 Statement of Policy (Jan 1931)
All water shall be sold by the District within its defined limits at wholesale rates which shall be uniform for like classes of service throughout.
1931 Statement of Policy (Jan 1931)

TREATMENT
It is Metropolitan's policy to provide treated water for domestic use purposes.
MWD Report 952 (Aug 1985)
It is Metropolitan's policy to restrict its major importation pipelines to the conveyance of untreated water only.
MWD Report 952 (Aug 1985)
It is Metropolitan's policy to construct large regionally located water treatment facilities such that every member agency has access to treated water for domestic use purposes.
MWD Report 952 (Aug 1985)
No documents in Metropolitan's records were found that states Metropolitan is required by any authority to provide treated water. Treated water service is provided at the Board of Director's discretion as a "special service"
MWD Report 952 (Aug 1985)
"...water will be made available to all areas within the District in accordance with their requirement, domestic use being the dominant use."
1931 Statement of Policy (Jan 1931)

MWD Code

Non-Codified Policies

The Policy Matrix was presented at both IAS and member agency manager meetings. Using the Policy Matrix as a starting point, staff from Metropolitan and the member agencies reached consensus with regard to the eight major policy categories. A draft summary document was distributed to the IAS team members for review and comment in August 2007 and is summarized below:

1. Equity

   Metropolitan strives to treat all areas as equitably as possible although precise equality of service is not possible (e.g., there will always be geographic inequities).

2. Facility Construction/Timing

   Metropolitan's Board has discretion in determining what and when new facilities should be constructed to meet demands. The IAS discussions led to the following clarifications:

   Gap analysis – The IAS Technical and Expert Panel reviews validated the Metropolitan methodologies and assumptions to evaluating demands and assessing the need for new treatment and conveyance facilities.

   Establishing facility on-line dates – Metropolitan will adopt an open, adaptive "right-time" approach to set, monitor, and update facility target on-line dates. This is discussed further in the Emerging Policy Issues sub-section.

3. Flexibility, Redundancy and Adaptability

   Metropolitan's goal is to construct a safe, reliable and flexible system at an economical cost. Redundancy is not a goal, and there is no obligation for multiple delivery points. Reliability is discussed further in the Emerging Policy Issues sub-section.

4. Obligation

   Metropolitan has limited legal obligations to construct facilities and make water deliveries. However, it is clearly Metropolitan's stated Board policy to continue to meet the goals outlined in the Mission Statement.

5. Level of Service

   Metropolitan is a regional wholesale provider. As a result, Metropolitan designs for retail peak week demands, not retail peak day or instantaneous peak conditions. Member agency flow changes are limited to 10% within 24 hours unless approved in advance. Hydraulic grade is not guaranteed. Although Metropolitan currently uses its maximum day as a proxy for retail peak week demands, Metropolitan and its member agencies anticipate being able to measure retail peak demand in the future and may then use retail peak week data as the basis for timing new facilities.

   Metropolitan's service is interruptible (Admin. Code 5503). As a result, member agency's are required to: (1) Maintain sufficient resources to sustain a 7-day interruption to Metropolitan's service based on annual average demands, and (2) reimburse direct costs for canceled routine outages. In addition, Metropolitan's code implies that member agencies should anticipate and plan for emergency outages.

6. Point of Delivery

   Service connections – Metropolitan's General Manager is authorized to construct service connections, however, Metropolitan is concerned about granting new connections on key raw water conveyance systems to avoid operational constraints. As result, requests will be subject to a case-by-case review and requesting agencies are to demonstrate the local capabilities to accommodate Metropolitan's operational conditions and to accept responsibility to adapt to future changes in outage duration, water quality, and hydraulic grade.

   Delivery points – Metropolitan delivers water "at or near the agency boundary" and the Metropolitan Board determines the meaning of "at or near." It was agreed that additional discussions on this topic would be conducted external to the IAS.

   Transverse capacity – Transverse capacity is a matter of geography, not policy.

7. Economic Efficiency/Rates

   A number of items related to economics and rates were deferred to the rate structure discussions. In general, Metropolitan strives to deliver water in an effective and economical manner, which includes the following principles: (1) avoid overlapping and paralleling facilities, (2) provide uniform cost-of-service-based water rates, and (3) recover all costs associated with treating water from those using treated water.

   Peaking – Both the IAS Technical and Expert Panels review validated the Metropolitan approach to peaking as the best possible method given the current data. They also recommended that Metropolitan continue to gather data and develop improved methods for determining future peaks. The issue of a peaking charge was deferred to future rate discussions.

   Discounted water programs and planning – Replenishment demands are not included in facility planning and the Interim Agriculture Water Program (IAWP) demands are included in facility timing evaluations. The amount of the discount and/or justification will be addressed in future rate structure discussions.

8. Water Supply/Treatment

   Water Supply – Metropolitan policy is to provide its service area with adequate and reliable supplies of water, which includes, (1) Meeting expanding and increasing needs and, (2) Meeting domestic, industrial and municipal needs.

   Treatment – Treated water is provided at the Board's discretion and is provided under the following guidelines: It is Metropolitan's policy to construct regional treatment plants and that every member agency will have access to treated water.

EMERGING POLICY ISSUES

As Metropolitan and the member agencies discussed the eight historical policy issues, four additional policy issues emerged as critical issues. These issues have become important as political, economic and water supply conditions in Metropolitan's service area continue to evolve and change. The four emerging policy issues are:

- Reliability

- Facility implementation
- Service connections on conveyance facilities
- Introduction of local water into Metropolitan facilities

Each of the emerging issues is discussed below.

Emerging Issue No. 1: Reliability

During the initial IAS background presentations, a number of agencies identified reliability as a key issue for IAS discussion. Historically, Metropolitan had defined reliability primarily with respect to water supply reliability. However, if examined as the ability not only to have the water resources to deliver, but also the ability to reliably deliver these water supplies, the definition of reliability expands significantly. As a result of discussions during the IAS workshops and meetings, reliability was divided into its primary components: water supply, system capacity, facility availability, system flexibility and emergency response. The emergency response component was briefly discussed because there were concurrent discussions on this topic by other workgroups. An effective emergency response program is an important aspect of system reliability and Metropolitan has demonstrated it substantial capability in recent years. The IAS focused on the four remaining components of reliability.

1. Water Supply

   A reliable water supply is essential for overall water system reliability. There was consensus that the regional water supply reliability component is adequately addressed through implementation of the Integrated Resources Plan (IRP).

2. System Capacity

   Reliability from a system capacity standpoint would mean that Metropolitan would have the ability to deliver the supplies developed under the IRP to the member agencies. Specifically, this includes the ability to convey, treat, and distribute supplies to meet firm Metropolitan demands under peak conditions identified in the board-adopted IRP. As described in the Administrative Code, Metropolitan does not guarantee hydraulic pressure available at each service connection as a part of its service criteria. Section 4 is a complete analysis of Metropolitan's system capacity.

3. Facility Availability

   This is the capability to maintain facilities in the state of readiness necessary to ensure Metropolitan system deliveries. The availability of facilities when needed is essential to overall system reliability and requires significant effort for all complex and aging systems. This component is addressed through Metropolitan's routine O&M practices and is complemented by the supplemental investigations and oversight of the System Reliability Plan (SRP).

   Metropolitan staff gave several presentations on the SRP and results from specific reliability investigations. The material presented on this topic has been summarized and included in Appendix 5. The IAS teams concluded that Metropolitan's existing program is adequate.

4. System Flexibility

   System flexibility was discussed in detail because it is a key component of overall system reliability, and there were differing views within the IAS team. The IAS team established a consensus view, and system flexibility was defined as the capability to respond to short-term changes in water supply, water quality, treatment requirements, retail demands, and/or to maintain partial to full water supply deliveries during planned and unplanned single facility outages.

Detailed Evaluation of System Flexibility

In early discussions about the Policy Matrix, deliberations focused on the application of Metropolitan's stated commitment to 'construct a flexible system.' The IAS teams examined Metropolitan's current system flexibility, discussed the member agencies' obligation to sustain a 7-day outage of Metropolitan's facilities (detailed in Metropolitan's Administrative Code Section 4503), and considered whether flexibility alone should be a driver, as opposed to new demands, for new regional treatment and distribution projects.

To work towards a consensus strategy, staff first evaluated Metropolitan's existing system flexibility and then explored the combined flexibility of the regional and local systems. The team reported its findings and then examined what long-term strategy would be appropriate for Metropolitan and its member agencies.

Two aspects of regional system flexibility were studied:

- **Operational flexibility** – The ability to accommodate short-term changes in regional supply, water quality, or member agency demands.
- **Delivery flexibility** – The ability to maintain deliveries to member agencies during single regional facility planned or unplanned outages.

The internal and joint agency studies helped focus the IAS discussions on reliability and resulted in a clarification of local and regional responsibilities for the flexibility component of reliability. A detailed discussion of the two aspects of flexibility follows.

Operational Flexibility

Metropolitan staff evaluated the operational flexibility of its entire system in terms of raw water delivery to its treatment plants, redundancy of key components within the treatment plants, finished water reservoir capacity, and getaway capacity. The results of this internal investigation were summarized for the IAS teams.

Metropolitan's initial system lacked flexibility; its capabilities were developed over a long period of time as the system was constructed to meet growing demands. Metropolitan now has substantial operational flexibility to accommodate short-term changes in water supply, treatment, and demands. This is the result of having multiple water supplies and the ability to blend the supplies, robust treatment processes and significant chemical storage and feed capabilities, large storage capacities in multiple treated water reservoirs, and a flexible treated water delivery system with numerous interconnections.

Not only was this internal evaluation useful for further IAS discussions regarding potential long-term goals, it helped Metropolitan identify areas where additional regional operational

flexibility needed further investigation. Follow-up studies were initiated to consider the following recommendations:

- Increase the capacity of the Mills pump-back system
- Increase the operational volume of the Weymouth finished water reservoir
- Improve the emergency bypass capabilities at Skinner and Weymouth
- Investigate emergency bypass alternatives for Mills and Jensen

Delivery flexibility

Metropolitan staff worked with the member agencies to perform a high-level study of system flexibility. The study evaluated the ability to maintain partial or full raw and treated water deliveries during planned and unplanned regional facility outages using both Metropolitan and member agency capabilities. This study illustrated where the combined local and regional system flexibility was adequate and identified areas where additional flexibility would be advantageous. A brief summary of the flexibility study results is provided below; the full report has been included in Appendix 6.

Distribution System
The investigation found that 260 of 344 service connections (76%) have full back-up capability for postulated single failures within Metropolitan's distribution system. This was primarily the result of local system flexibility. Additional regional Metropolitan facilities do not appear to be the answer to providing backup to the remaining 24% of the connections.

Metropolitan Treatment Plants
In the event of a treatment plant outage, 299 of 344 service connections (87%) have full back-up capability. This is the result of overlap of regional treatment plants, conjunctive use projects, and local system flexibility. New local projects, local resource projects (LRP) and IAS projects could further reduce the number of service connections affected by Metropolitan treatment plant outages.

Conclusions

The System Flexibility Study demonstrated two key points:

- Local system flexibility is key to providing backup to individual service connections on Metropolitan Feeders.
- Both local and regional system flexibility capabilities are important in minimizing the effects of planned or unplanned outages of Metropolitan's treatment plants.

These findings validated Metropolitan's historic policy of implementing demand-driven flexibility improvements while avoiding the construction of redundant facilities and requiring member agencies to be capable of sustaining a 7-day interruption of regional service. The findings also recognized areas where additional actions could improve system flexibility.

IAS Recommendation for Demand-driven System Flexibility
After considerable deliberation, the IAS team reached a consensus on a strategy for system flexibility. It was recognized that Metropolitan will continue to implement projects as necessary to meet its own regional operational flexibility needs (in addition to projects

necessary to address the water supply, system capacity and facility availability components of reliability). At the same time, the IAS teams agreed that there are local and regional actions necessary to ensure reliability to the retail customer and the majority of represented agencies supported the following approach for addressing system flexibility:

Metropolitan goals – Continue to develop a demand-driven, flexible regional system aimed at meeting demands, while reducing the impacts of regional water treatment plant outages. Regional system flexibility improvements will be achieved through demand-driven projects.

Member agencies goals – The member agencies will construct flexible wholesale/retail systems aimed at minimizing service interruptions at the customer level. Improvements will be achieved through both demand-driven and non-demand projects. Compliance with Metropolitan's Administrative Code Section 4503 should be a specific goal.

Cooperative goals – Metropolitan and its member agencies will continue to work together to explore ways to reduce the impacts of Metropolitan facility outages on member agency systems, including outage coordination, consideration of flexibility benefits during the evaluation of demand-driven projects, and incentives for local supply projects.

Most participants agreed that the results of the IAS system flexibility study would be one factor applied to the evaluation of future demand-driven projects and, ultimately, could help reduce the number of service connections that currently do not have back-up capability. Participants also recognized that Metropolitan's investments in local projects through the Local Resources Program would also help reduce the impacts of Metropolitan facility outages.

[Note 1: The Municipal Water District of Orange County did not agree with the majority view on this topic and suggested that Metropolitan and member agencies consider additional joint local/regional projects and/or increased integration of local and regional systems to increase overall system flexibility to minimize the interruption of service in the event of regional facility outages. In addition, it was suggested that flexibility be considered as a project driver.]

Emerging Issue No. 2: Facility Implementation

An important part of the IAS process was the discussion of when to bring facilities online to meet demands. There was considerable discussion on how best to schedule the projects to reduce the risk of having inadequate capacity while guarding against stranding large investments. Several approaches were offered including advancing projects a set number of years ahead of the calculated need or by a fixed percentage of capacity for the given service area.

Discussions in the IAS and member agency managers' meetings led to a consensus on a more open and collaborative "right-time" approach to implementing regional projects. The right-time approach will help identify triggers for board action that would initiate construction of new facilities. Right-Time Facility Tracking will require both internal and external data requirements. Key demographic forecast data from entities such as SCAG and SANDAG will provide inputs for updating Metropolitan’s water demand forecast model. Member agencies will provide updates on all projections that affect demand on Metropolitan, including performance of all local resource programs.

Changes in the project drivers can change the timing and size of facilities. Metropolitan staff will develop a “Right-Time” analysis for each project and begin tracking the key drivers. Results of the tracking process will be updated on a yearly basis when the IAS is updated.

Emerging Issue No. 3: Service Connections on Conveyance Facilities

Background

Historically, Metropolitan has allowed new service connections on supply transmission pipelines and facilities as requested by member agencies. The problems related to this practice have been highlighted by a recent shutdown of the Rialto Feeder when deliveries to local treatment plants were shut off for several days during repairs. The IAS forum addressed this topic in detail. Metropolitan staff provided background information and then solicited input on the development of a strategy for evaluating future service connection requests on conveyance facilities and for addressing the constraints imposed by the existing service connections on these facilities.

Conditions have changed since the original Metropolitan raw water feeders were designed and constructed. These facilities were designed to deliver water to Metropolitan's reservoirs and water treatment plants but not to serve as distribution feeders. These facilities typically did not include isolation valves and were not interlinked. However, once development began to occur adjacent to these feeders, it was natural for local agencies to want to draw water from them. The construction of some service connections on some of these pipelines eventually resulted in challenges for planning Metropolitan facility shutdowns. To further complicate the issue, a number of factors have increased the necessary duration of planned outages. These include environmental restrictions that increase the time to dewater the lines and aging facilities that require more maintenance. With changing environmental requirements, the durations of outages for large conveyance facilities could extend beyond 14 days.

Much of the rapid growth in Metropolitan's service area is occurring in areas where Metropolitan's major conveyance facilities are located. Metropolitan recognizes the potential benefits of allowing some additional service connections on these key raw water conveyance facilities in the future. For instance, additional local treatment plants can potentially increase local reliability, facilitate Metropolitan planned outages, and reduce overall regional costs. At the same time, it is necessary to first consider all of the potential effects of these connections before granting permission for future connections.

IAS draft proposal for new connections

The IAS teams agreed that there may be a strong case for allowing new service connections on the conveyance pipelines, but under more stringent conditions. Because it would not be beneficial for the region to permit new connections that could constrain routine facility operation and maintenance, Metropolitan proposed that service connection agreements be amended to document member agency capability to:

- Back up the connection for the anticipated duration of outages on the given feeder (this could include other Metropolitan service connections that can independently supply the member agency's needs)
- Provide a robust treatment process to accommodate all anticipated blends and sources of water
- Accommodate the hydraulic fluctuations within the feeder

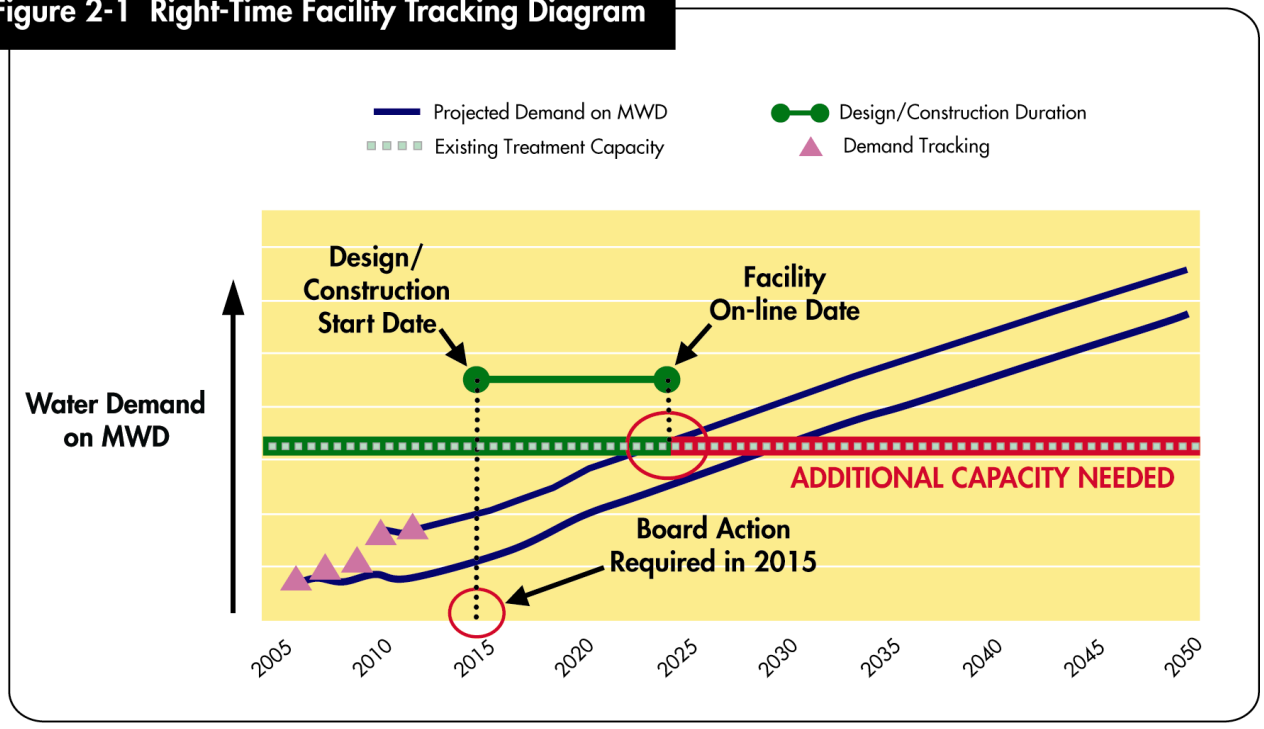
It was also suggested that service connection amendments could not guarantee that future political pressure would be applied to reduce the duration of outages. Although, this approach would not address the potential constraints of existing connections, a revised policy on new connections would help start a dialogue regarding existing connections, and existing agreements could be revisited if requests are made to increase their capacity.

Metropolitan has formed a task force to revise the service connection agreement form to capture the IAS suggested improvements. This work should be completed in Spring 2008.

Addressing existing service connections

Metropolitan staff investigated all of the existing service connections located on raw water conveyance pipelines to identify all of the connections that potentially could constrain existing operations and to consider how these constraints could be mitigated. The approach for mitigating constraints on the Rialto Pipeline (addition of isolation valves) is generally not applicable to other pipelines due to their specific alignments and construction methods. Fortunately, the constraints were limited to a handful of service connections on the Lower Feeder, CRA, and Rialto Pipelines (Figure 2-1).

Figure 2-1 Right-Time Facility Tracking Diagram



Member agency staff and Metropolitan staff reviewed these service connections to determine if these constraints would be addressed by either current or planned project and concluded that about 90% of the constraints will be mitigated by planned projects (including projects that involve additional service connections on these same Metropolitan feeders). Refer to Appendix 7 for detailed findings.

IAS conclusions

Recognizing that additional service connections could benefit the region if they reduced regional costs, increased reliability, and/or relieved existing constraints on Metropolitan's system, it was recommended that new service connections on conveyance pipelines be given consideration. At the same time, it was recommended the requesting agencies demonstrate that they would not impose new restrictions on regional operations. The service connection request process and formal service connection agreement documents will be used to review and document local capabilities to accommodate Metropolitan's operations and maintenance requirement, as well as the member agency's responsibility to adapt to future changes in outage duration, water quality or grade. The approach to evaluating new service connections on conveyance facilities is summarized in Table 2.1.

Table 2.1
Approach to evaluation requests for new service connections

Step	Description
1	Verify outage requirements are understood and can be met a. Metropolitan will specify the duration and frequency of outages (by facility) b. Requesting agency will document they have an adequate back-up plan
2	Verify that water quality conditions are understood and can be accommodated a. Metropolitan will specify the anticipated water source and typical range of conditions b. Requesting agency will provide robust treatment processes
3	Verify that hydraulic grade conditions are understood a. Metropolitan will share our hydraulic profile (and typical ranges) b. Requesting agency will be responsible to meet own needs
4	Verify it is understood conditions may change over time Requesting agency must accommodate changes in outage duration, treatment requirements and hydraulic grade
5	Accept financial responsibility for system improvements (e.g., conveyance system isolation valves) should they be required to avoid local system constraints from impacting regional system operations

Emerging Issue No. 4: Introduction of Local Water Into Metropolitan's Treated Water System

Background

Metropolitan established a raw-to-raw water pump-in policy in 2001 that is consistent with the Department of Water Resources' policy governing groundwater pump-in projects into the California Aqueduct. The policy allows for automatic approval of a pump-in proposal when the water quality is better than the ambient quality of the receiving water. However, whenever a constituent of concern (COC) is above ambient quality, the proposed project undergoes a facilitated workgroup evaluation process involving all downstream users. All water quality issues are evaluated along with the proposed mode of operation and potential resource flexibility benefits. Approval of all downstream users is required.

Metropolitan proposed a similar process for evaluation of potable-to-treated water pump-in projects and raised a number of special considerations for potential potable-to-treated water projects. These include:

- Additional California Department of Public Health (CDPH) permits
- Responsibility/liability for water quality
- Consumer Confidence Reports
- Control of fluoridation and disinfectant residuals
- Emergency, planned outages, and routine operation

This topic was opened for discussion because potable water pump-in projects may offer advantages of additional water resources for the region, flexibility, cost savings, and improved reliability. The Municipal Water District of Orange County (MWDOC) presented several proposals aimed at providing increased flexibility to accommodate planned and unplanned outages of the Diemer plant.

Based on the initial IAS team responses to the draft proposals, projects are more likely to gain agency support when they involve emergency use rather than routine use and single downstream member agencies rather than multiple downstream member agencies.

Several concerns were raised, including how to appropriately define an emergency, and it was agreed to form a smaller working group to address this issue in more detail.

In April 2007, the Introduction of Local Water Workgroup met briefly. Attendees were provided with a brief summary of the material presented to the IAS as background. Specific proposals for introducing water into Metropolitan's system were presented.

Attendees to the presentations asked numerous questions, including requests for more details of the proposals and comments about routine use versus emergency, reliability obligations, and liability. The comments illustrated the sensitive nature of this topic and reinforced the preliminary conclusions that it would be difficult to gain support for projects that would introduce local water into Metropolitan's treated water system for other than emergency use.

Member agency comments included:

- Metropolitan should consider adding "loss of supply" to the emergency definition
- The potential supply benefit should not be limited to the 30 days initially proposed for emergency use (Note: Metropolitan will be limited by CDPH requirements.)
- Routine use projects may affect discussions on peaking water charges
- Liability for incidents is something that has to be considered
- Responsibility for pumping costs must be addressed
- Affected sub-agencies should be brought into the working group meetings
- Although supportive of emergency use projects, all of the proposed projects appeared to be designed to use Metropolitan facilities on a routine basis and such projects should be financed solely by requesting agencies

- These types of projects should be financed solely by requesting agencies
- Water quality incidents in one part of the Metropolitan system may indirectly affect public confidence in the entire system

Status

Although this topic remains under discussion, the preliminary recommendations were:

Emergency Use. Emergency use will be considered on a case-by-case basis and is defined as: An unplanned outage of Metropolitan facilities, an emergency occurring during a planned outage (e.g., unusually warm weather), a planned outage greater than seven days in duration. Metropolitan's Board of Directors may also define other situations to be considered an emergency. In all cases, however, emergency use is also subject to the restrictions of the CDPH which include consecutive use of no more than five days or a total use of less than 15 days/year.

Routine use. Routine use was not recommended for treated water system when there are multiple downstream member agency users.

Note that additional workgroup meetings will be held after Metropolitan meets with the CDPH to determine if liability for water quality may be assumed by an agency that introduces local water into Metropolitan's system (downstream of the point of injection). The CDPH ruling on liability will influence whether non-emergency use projects are reconsidered.

SUMMARY

The policy discussion by the IAS teams should be considered one of the major successes of the IAS. The healthy debate surrounding the subject encouraged a clear understanding of the issues and the ramifications for facility development. The positions and conclusions established in this section will give clarity to the member agencies as they pursue their own facility planning. In addition, Metropolitan's Board of Directors will have an established baseline of facility policies that will aid them in their future decisions.

WATER SUPPLIES AND DEMANDS

3

RETAIL M&I DEMAND PROJECTIONS

Within Metropolitan's service area retail urban water demands can be met with either local supplies, such as groundwater, surface water and recycling, or imported supplies. Metropolitan's long-term plans focus on the future demands for Metropolitan's imported supplies. However, imported water demand is a function of changes in retail demands and local supplies. In order to project the need for imported resources and system capacity, Metropolitan starts with a long-term projection of retail municipal and industrial (M&I) demands.

Methodology versus Assumptions

The methodology and assumptions behind the retail demand projection are described separately. The methodology includes the models used in generating the projection, while assumptions include the data used in the models. Metropolitan's conservation model is an example of a methodology. Device savings factors are examples of assumptions used in the model.

2005 Regional Urban Water Management Plan Projection

Metropolitan updates its retail M&I projection every three to four years based on the release of official regional growth projections. The 2005 Regional Urban Water Management Plan (RUWMP) represents the last major update of retail M&I demands based on new growth projections and is the basis for the Integrated Area Study analysis. As a result, this memo refers to the 2005 RUWMP retail demand forecast and relies on its description of demands.

RETAIL M&I DEMAND FORECAST

Retail M&I demands represent the full spectrum of urban water use within a region, including residential, commercial, industrial, institutional and un-metered uses. Within the water industry, there are numerous approaches for projecting M&I water demands. These approaches include per capita methods, trend extrapolation, land use build-out analysis, and econometric models. Each of these approaches has benefits and limitations. Metropolitan uses a disaggregated econometric model, known as MWD-MAIN, that can capture and explain the impacts of long-term socioeconomic trends on retail demands.

MWD-MAIN features statistically estimated water demand models that have been adapted to conditions in Southern California. The models incorporate projections of demographic and economic variables from regional planning agencies (the Southern California Association of Governments, or SCAG, and the San Diego Association of Governments, or SANDAG) to produce forecasts of water demand. The retail projections produced by MWD-MAIN are adjusted by estimates of conservation savings, described later in this section.

Table 3-1 depicts key relationships in the MWD-MAIN model.

Table 3-1
MWD-MAIN Driver and Explanatory Variables

Demand Sector	Projected Driver Variable	Dependent Variable	Socioeconomic Explanatory Variable
Single Family Residential	Number of Single Family Households	Water use per household	Climate Household Size Income Price and Conservation Housing Density
Multifamily Residential	Number of Multifamily Households	Water use per household	Climate Household Size Income Price and Conservation Housing Density
Commercial, Industrial, Institutional (CII)	Total Urban Employment	Water use per employee	Climate Price and Conservation Industrial / Service employment Share
Un-metered Use			Percentage of total use

Assumptions: Demographics

This section describes the key assumptions for the 2005 RUWMP retail M&I demand forecast used for the integrated area study, including (1) a discussion of SCAG and SANDAG's growth projections (2) a description of the retail rate projections, and (3) a discussion of member agency service area boundaries.

SCAG & SANDAG Growth Forecasts

SCAG's and SANDAG's regional growth forecasts are the core assumptions underlying Metropolitan's retail M&I projection. With the exception of retail water rates, all of the projected variables used in MWD-MAIN are derived from the latest official growth plans for Metropolitan's service area. Projected totals of single family households, multifamily households, and employment are critical driver variables because they represent the overall level of growth in the region and for each agency. Household size, housing density, and other explanatory variables affect the water use factors applied to the housing and employment totals.

Demographic Projections

SCAG and SANDAG are required to update their Regional Transportation Plans and associated growth forecasts every three to four years. Metropolitan's 2005 RUWMP retail M&I projection is based on SCAG's 2004 Regional Transportation Plan (RTP-04) and SANDAG's Final 2030 Forecast, also released in 2004.

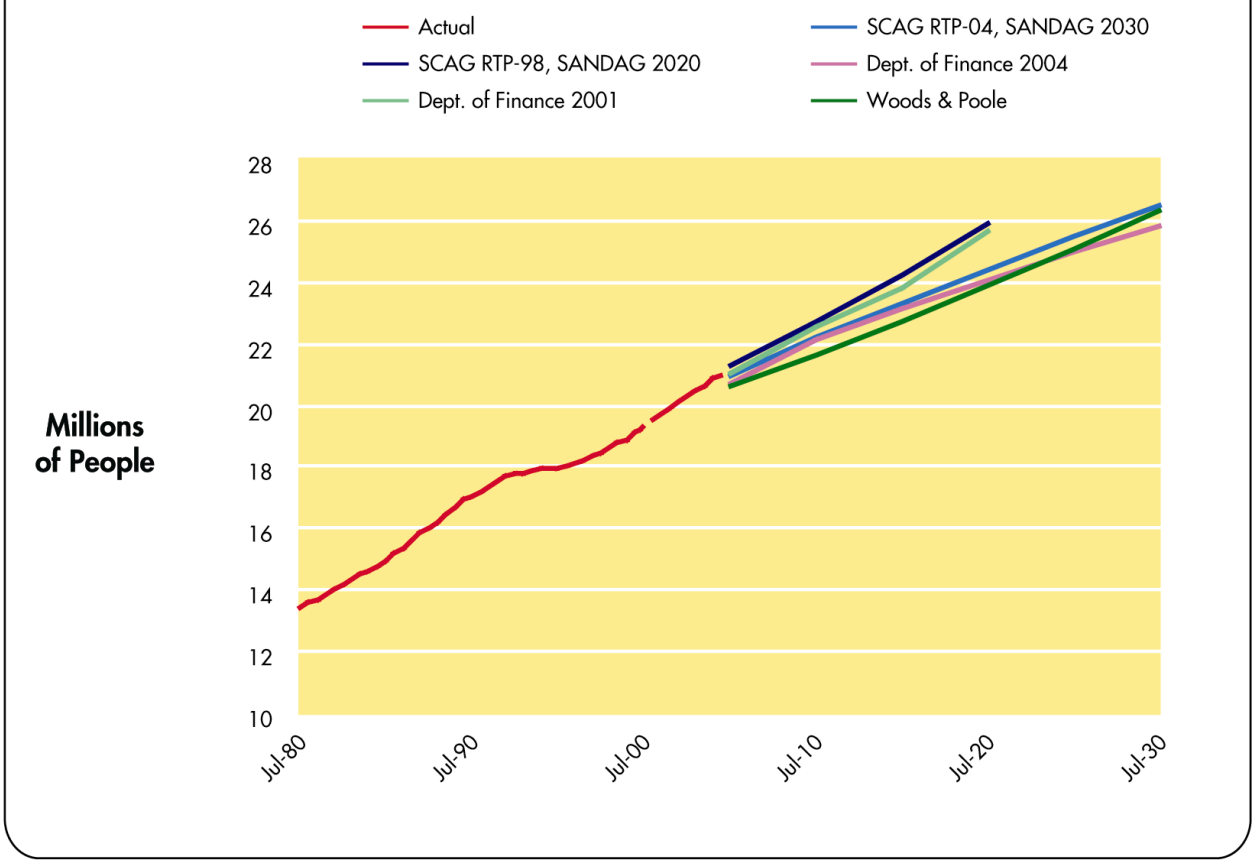
SCAG and SANDAG's projections undergo extensive local review and incorporate zoning information from city and county general plans. Finally, both growth projections are backed by Environmental Impact Reports (EIRs).

Population Projections

Population is a key indicator of regional growth. Since 2000, Metropolitan's service area has grown an average of more than 275,000 people per year, approaching the boom levels of the 1980s. According to SCAG and SANDAG's 2004 projections, Metropolitan's service area will grow just over 150,000 people per year, from an estimated 18.2 million in 2005 to 22.0 million in 2030.

The 2005 RUWMP population projections are lower than prior estimates. By comparison, the 1996 IRP projection reaches nearly 22 million by 2020 and the IRP Update projection reaches about 21.4 million by that time. Figure 3-1 compares SCAG and SANDAG's current and prior population projections for the six counties served by Metropolitan, to projections produced by Department of Finance (DOF) and a private company (Woods & Poole).

Figure 3-1 SCAG and SANDAG Population Projections



Member Agency Boundary Assumptions

For various reasons, the political and service area boundaries of many member agencies are different. The city of West Hollywood for example, is politically part of West Basin MWD, but actually receives water from Beverly Hills and LADWP. The 2005 RUWMP - and the IAS Study - bases its demographics on each member agency's service area rather than political area to match each agency's demographics to its reported water use.

Land Use and Demographic Analysis Tool
Member agency service area boundaries are used to convert Census, SCAG and SANDAG data into member agency demographics. This is performed in a GIS software program call LANDAT (Land Use and Demographics Analysis Tool). LANDAT uses each member agency's boundary as a cookie cutter over maps of land use, census tracts, and transportation analysis zones (TAZs - used by SCAG instead of tracts).

San Diego Demographics
For the 2005 RUWMP, demographics for the San Diego County Water Authority (Authority) were developed separately by SANDAG and provided directly to Metropolitan by the County Water Authority. These demographics are not processed using LANDAT. At the Authority's request, Metropolitan excludes Camp Pendleton demographics in its analysis, and represents its demands with a fixed 8,900 acre-feet demand.

CONSERVATION PROJECTIONS

In order to account for conservation, Metropolitan reduces the demands generated in MWD-MAIN by conservation savings projections. The following major sources of conservation savings are accounted for:

- Active Conservation - Water saved directly as a result of conservation programs by water agencies (includes implementation of Best Management Practices.) This form of conservation is unlikely to occur without agency action.
- Code-Based Conservation - Water saved as a result of changes in water efficiency requirements for plumbing fixtures in plumbing codes. This form of conservation would occur without any water agency action.
- Price-effect Conservation - Water saved by retail customers attributable to the effect of changes in the real (inflation-adjusted) price of water.

Active and code-based conservation savings are calculated in a conservation model described here, while price-effect savings is calculated using the MWD-MAIN statistical models discussed in the previous section.

Conservation Methodology

Metropolitan's conservation model features device-based savings estimates applied to both active programs and plumbing code conservation. The 2005 RUWMP (IAS) conservation projection includes almost 40 active devices and programs. These devices are aggregated into residential, landscape, and Commercial, Industrial, Institutional (CII) sectors. Eight of the fixtures are tied to plumbing code models. The model is run individually for each agency, with the results input into MWD-MAIN.

A complete description of the methodology for determining conservation savings is included in Appendix 8.

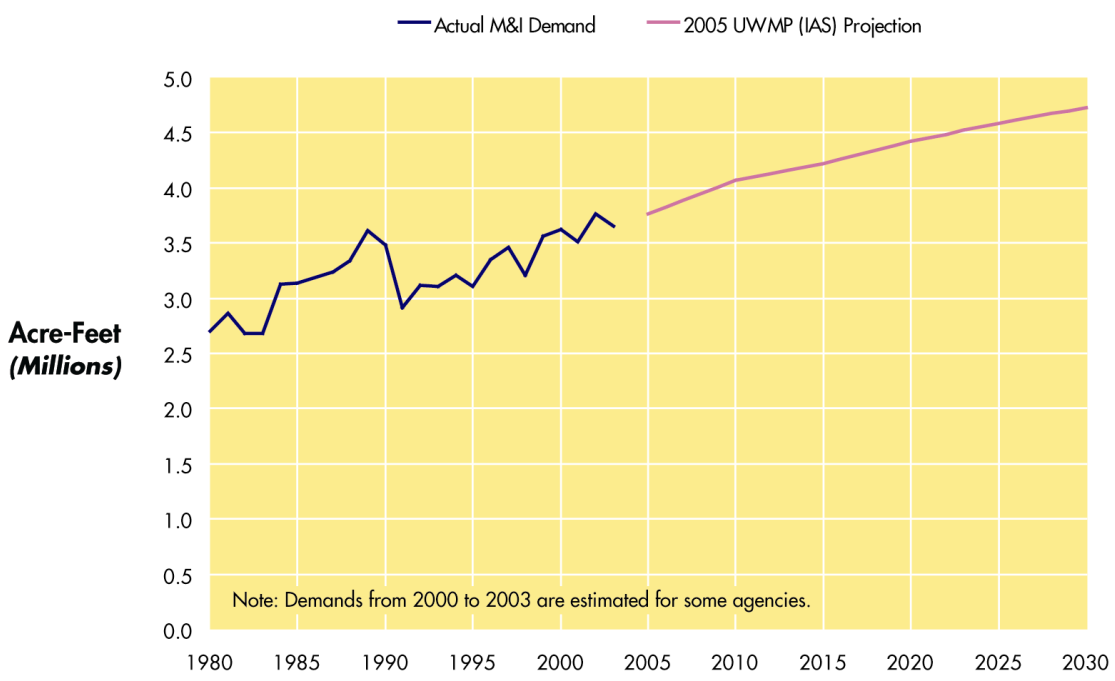
Projected Active Conservation: a New Approach
Beginning with the 2005 RUWMP, Metropolitan has taken a new approach to modeling future local supplies and active conservation. In the 2005 RUWMP, local supplies were limited to existing, under construction, and committed projects. It was assumed that planned projects were covered by Metropolitan's local supply IRP target, which is included in the regional totals. This recognizes the uncertainty in local supplies and avoids over- and under-allocating local supply targets to individual agencies.

Un-metered Water Use Savings
A final category of savings is a product other conservation efforts. MWD-MAIN projects un-metered water use as a fixed percentage of total retail M&I demand. As conservation savings lowers residential and CII demands, it lowers un-metered use by the same percent. For instance, if conservation reduces M&I demands by 10 percent in 2020 (compared to demands before conservation) un-metered water use is also reduced 10 percent. This reduction assumes that un-metered use varies according to overall demand, and that reducing overall use also reduces un-metered use. The reduction in un-metered water use is captured in the MWD-MAIN model and included as a conservation source.

RESULTS

Based on the methodology and assumptions described above and in the appendices, retail M&I water demand with conservation is projected to grow from an average-year estimate of 3.8 million acre-feet in 2005 to 4.7 million in 2030 (Figure 3-2) assuming an average economy. The projection accounts for the water savings resulting from plumbing codes, price effects, and existing active conservation. Retail M&I demand is projected to grow 38,600 acre-feet per year from 2005 to 2030, compared to 41,200 acre-feet per year from 1980 to 2003.

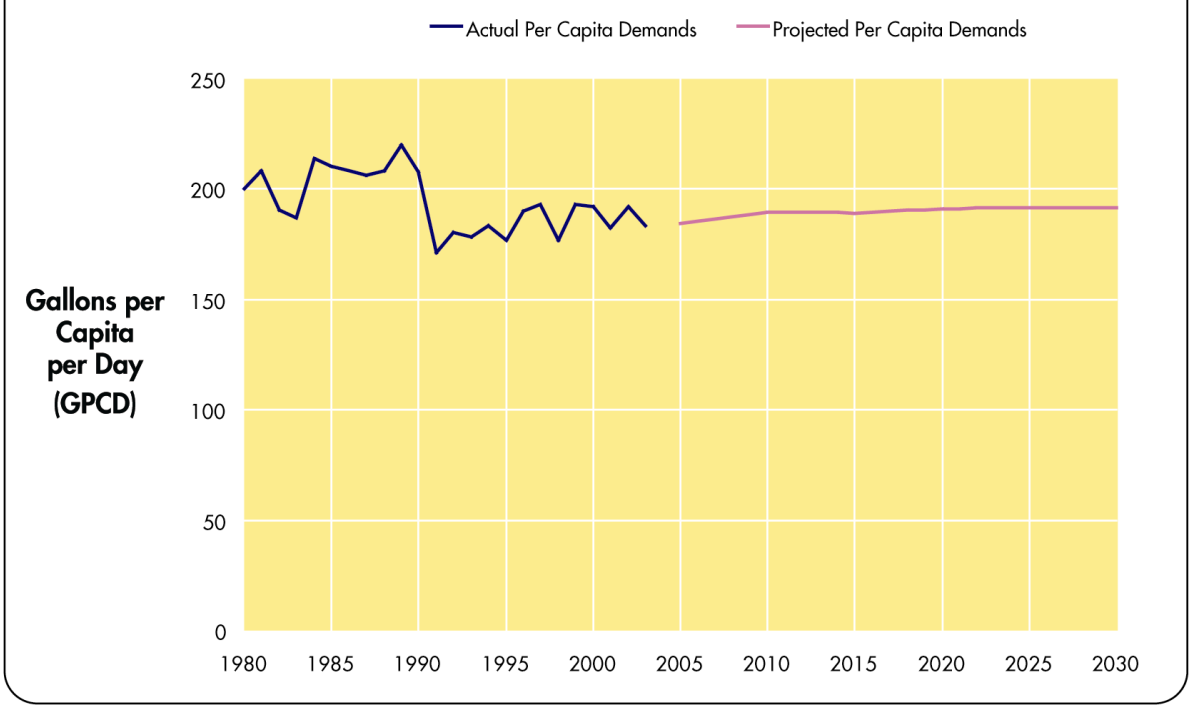
Figure 3-2 Projected M & I Demands



Per Capita Water Demands

Regional water use dropped from over 205 gallons per capita per day (gpcd) in the late 1980's to about 180 gpcd in the early 1990s, this drop is a result of the combined effects of the drought, recession, and conservation efforts (Figure 3-3). Since late 1990s, the average per capita water use in Metropolitan's region has varied between 185 and 195 gpcd. This increase has been caused by the gradual employment recovery from the 1990s recession and rapid growth in the hotter and drier regions within Metropolitan's service area.

Figure 3-3 Per Capita Water Demands

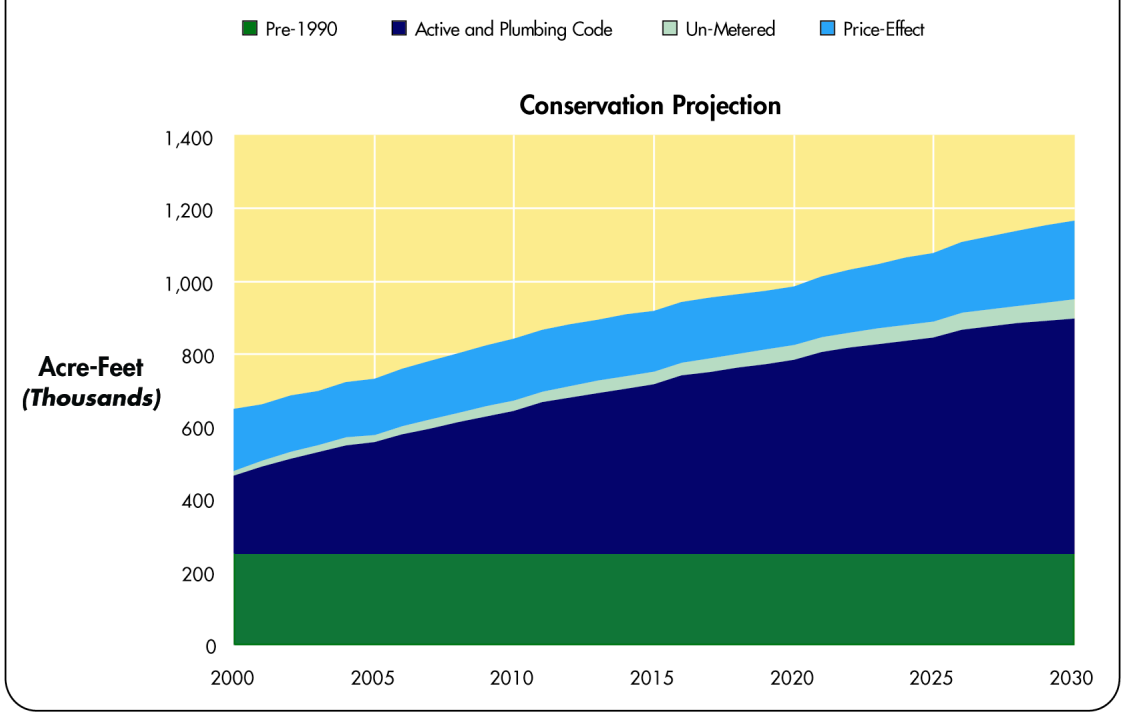


Per capita demands are projected to rise from about 185 gpcd by 2010 and hover around 190 gpcd through 2030. This is a counter-intuitive result given the amount of new conservation accounted for in the projection. Even though conservation reduces projected per capita water use, the impacts of other assumptions counter its effects. These assumptions include rising income, a higher overall employment share (jobs per household), and disproportionate growth in hotter and drier inland areas. Without projected conservation savings, per capita demand would increase steadily.

Conservation Projection

Without existing and projected conservation, retail M&I water demand would grow significantly faster than projected. Conservation savings are expected to grow from an estimated 730,000 acre-feet in 2005 to a projected 1,164,000 in 2030, representing an increase of 434,000 acre feet over the next 25 years (Figure 3-4). About 342,000 acre-feet are projected to come from active and plumbing code savings. Price-effect savings and savings in un-metered water use are projected to account for 63,000 and 29,000 acre-feet respectively.

Figure 3-4 Conservation Projection



SALES FORECAST

The Metropolitan Sales Model (Sales Model) is a mass-balance model used to estimate the amount of Metropolitan supply needed to supplement the region's local supplies based on forecasted demands. Key inputs to the Sale Model are demand forecasts for each member agency and their projected local supplies. The Sales Model calculates the difference between forecasted demands and projected local supplies after factoring in climate impacts. The Sales Model employs a modeling method using historical hydrologic conditions from 1922 to 2004 to simulate the expected demands on Metropolitan supplies based on hydrologic conditions. Each hydrologic condition results in one possible outcome for the forecast year in the planning horizon. For example, each forecast year, say 2015, has 83 possible outcomes, one for each hydrology year during the period 1922 to 2004. This method of modeling produces a distribution of outcomes ranging from the driest to the wettest years during this historical period. The facility planning analysis uses the driest years with the highest expected demands on Metropolitan supplies.

SALES MODEL KEY INPUTS

Total Demand

Total demand is the sum of retail demand for M&I and agricultural, seawater barrier demand, and replenishment demand. Total demand represents the total amount of water needed by the member agencies.

Retail Demand M&I and Conservation

Retail M&I demands represent the full spectrum of water use within the region, including residential, commercial, industrial, institutional, and un-metered uses. To forecast urban water demands, Metropolitan uses the MWD-Main Water Use Forecasting System (MWD-Main), consisting of econometric models that have been adapted to conditions in Southern California. The current analysis used population projections developed for the SCAG 2004 Regional Transportation Plan and SANDAG's 2030 Forecast.

Retail Agricultural Demand

Retail agricultural demands consist of water use for irrigating crops. Member agencies estimate agricultural water use based on many factors, including farm acreage, crop types, historical water use, and land use conversion. Each member agency estimates their agricultural demand differently, depending on the availability of information.

Seawater Barrier Demand

Seawater barrier demands represent the amount of water needed to hold back seawater intrusion into the coastal groundwater basins. Groundwater management agencies determine the barrier requirements based on groundwater levels, injection wells, and regulatory permits.

Replenishment Demand

Replenishment demands represent the amount of water member agencies plan to use to replenish their groundwater basins.

Local Supplies

Local supplies represent a spectrum of water produced by the member agencies to meet their total demands. Local supplies are a key component in determining how much Metropolitan supply is needed to supplement member agencies local supplies to meet their total demand. Local supplies include:

- Groundwater and Surface Water: Groundwater production consists of extractions from local groundwater basins. Surface water comes from stream diversions and rainwater captured in reservoirs.
- The Los Angeles Aqueduct: A major source of imported water is conveyed from the Owens Valley via the Los Angeles Aqueduct (LAA) by LADWP. Although LADWP imports water from outside of Metropolitan's service area, Metropolitan classifies water provided by the LAA as a local resource because it is developed and controlled by a local agency.
- Seawater desalination: Seawater desalinated for potable use.
- Groundwater Recovery and Recycled Water: Locally developed and operated, groundwater recovery projects treat contaminated groundwater to meet potable use standards. Recycled water projects recycle wastewater for municipal and industrial use.
- Non-Metropolitan Imports: Water supplies imported by member agencies from sources outside of the Metropolitan service area.

Integrated Area Study Survey

Through the Integrated Area Study process, Metropolitan, in cooperation with its member agencies, conducted a survey to develop a comprehensive inventory of current and planned local supply projects with the potential to reduce the need for imported supplies. The surveys returned by the member agencies included existing supplies as well as those that were previously not accounted for by Metropolitan. In addition, the survey included local projects that are in early and intermediate planning stages. The information from this survey was entered into a database. Each local supply is classified by supply type, status, expected on-line date, and expected production ramp-up. The status of local projects are classified as follow:

- Existing: Projects that are producing water;
- Under Construction: Projects that are under construction;
- Full Design and Appropriated Funds: Projects that are designed and have secure funding for construction;
- Advanced Planning (EIR/EIS Certified): Projects that have completed environmental impact report and other approvals;
- Feasibility: Projects that have undergone a feasibility study but have not obtained permits; and
- Conceptual: Projects in early planning phases.

For the Integrated Area Study, projects with a status of Existing, Under Construction, and Full Design and Appropriated Funds are considered in the base demand and supply analysis, while the other three classifications are included in developing portfolios of projects intended to meet deficiencies in future years.

SALES MODEL OUTPUT

Demand on Metropolitan

The expected regional demand on Metropolitan supplies is the difference between total retail demands, adjusted for conservation, and projected local supplies. These demands are calculated using the Integrated Resources Planning Simulation Model (IRPSIM), which is designed to apply hydrologic variations and climate impacts to projected retail demands and projected local supplies. The Sales Model, programmed in IRPSIM, uses a sequentially-indexed simulation algorithm to apply historical effects of hydrology and weather to retail demands and supplies, generating a distribution of projected outcomes.

As noted earlier, the Sale Model uses historical hydrologic conditions from 1922 to 2004. Each forecast year in the planning horizon has 83 sequentially indexed outcomes, one for each hydrology year. Sequential simulation preserves the order of the historical year's climate and hydrology. In addition, sequential simulation preserves the interrelationships of weather between years. Indexed simulation preserves the contemporaneous relationships between hydrology and climate effects on supply and demand. For example, the same hydrology year and climate impact for one outcome is applied to the demands and local

supplies, producing the demands on Metropolitan that corresponds to that specific hydrology year.

For facility planning analysis, the driest year or the year that resulted in the highest demand on Metropolitan, is used. The historic hydrologic years with the highest firm demand on Metropolitan are 1990, 1961, and 1960 for Central Pool, the Riverside/San Diego Area, and the San Bernardino Area, respectively.

Water Type

The Sales Model output consists of three water use categories: Full Service Rate, Seasonal Rate and Agricultural Rate. For Sales Model purposes, the term "Rate" does not imply Tier 1 or Tier 2 rate, but simply the type of water Metropolitan delivers.

Full Service Rate

Full service rate, or firm demand, refers to Metropolitan's non-interruptible supplies. Non-interruptible supplies are used to meet retail M&I and seawater barrier demands.

Seasonal Rate

Seasonal Rate refers to discounted, interruptible water for groundwater replenishment, when available, to meet replenishment demands. Groundwater replenishment can be accomplished in two ways: direct groundwater spreading/injection or in-lieu delivery. Direct groundwater spreading/injection uses spreading basins or injection wells to percolate Metropolitan water into the groundwater basin as a means of storage. For in-lieu delivery, an agency takes Metropolitan surface supply in-lieu of pumping groundwater to meet its demand, in essence preserving the unused groundwater and keeping it in storage.

Agricultural Rate

The Agricultural Rate, applied under the Interim Agriculture Water Program (IAWP), refers to Metropolitan water supplied for agricultural use. Metropolitan can cut this supply up to 30 percent during periods of declared drought.

Regional Analysis

The Integrated Area Study divides the Metropolitan service area into three service regions: Central Pool, Riverside/San Diego, and San Bernardino (see Facility Planning Assumptions for more details). Demand forecasts are done at the member agency level. The demands for each region are aggregates of the demands for member agencies within the region (see Table 3-2). The Central Pool Region consists of the demands of 22 member agencies in Ventura, Los Angeles, and Orange counties. The Riverside/San Diego Region consists of Eastern MWD, Western MWD, and San Diego County Water Authority. The San Bernardino Region consists of the Inland Empire Utility Agency.

Table 3-2
Service Area by Member Agency

Central Pool Region	
City of Anaheim	City of Los Angeles
City of Beverly Hills	Municipal Water District of Orange County
City of Burbank	City of Pasadena
Calleguas Municipal Water District	City of San Fernando
Central Basin Municipal Water District	City of San Marino
City of Compton	City of Santa Ana
Foothill Municipal Water District	City of Santa Monica
City of Fullerton	Three Valleys Municipal Water District
City of Glendale	City of Torrance
Las Virgenes Municipal Water District	Upper San Gabriel Valley Municipal Water District
City of Long Beach	West Basin Municipal Water District

Riverside/San Diego Region	San Bernardino Region
Eastern Municipal Water District	Inland Empire Utilities Agency
Western Municipal Water District	
San Diego County Water Authority	

Central Pool

Table 3-3 shows Sales Model simulation results based on the aggregate projected demands and local supplies of the 22 member agencies in the Central Pool Region. The 1990 hydrological year was during which demands on Metropolitan were the highest of the 83 simulated hydrologic scenarios between 1922 and 2004. This year was characterized by high demands and below average local supplies. Accordingly, to meet total retail demands, demands on Metropolitan increase to supplement local supplies. For facility planning analysis, the highest demand on Metropolitan represents the maximum amount of water Metropolitan has to deliver through its system.

In a 1990 hydrologic year, the Los Angeles Aqueduct is projected to produce about 63,000 AF, well below its 10-year average of 308,000 AF. Local projects, such as groundwater recovery and recycling projects are not affected by hydrologic conditions. As such, local projects are expected to be constructed and produce water as planned. As can be seen in Table 3-3, the amount of recycled water increases appreciably in 2008. During this year the Orange County Water District and the Municipal Water District of Orange County's Groundwater Replenishment System is expected to come on-line, producing 61,000 AF of recycled water for groundwater replenishment and seawater barrier.

Table 3-3
Central Pool Region (Thousand Acre-Feet)

Demand	2007	2008	2009	2010	2015	2020	2025	2030
Retail M&I	2,794	2,832	2,867	2,902	2,957	3,048	3,119	3,167
Retail Agricultural	41	39	37	35	31	27	25	24
Seawater Barrier	44	70	71	74	71	71	71	71
Replenishment	114	151	156	154	154	155	155	153
Total Demand	**2,993**	**3,091**	**3,132**	**3,165**	**3,212**	**3,300**	**3,370**	**3,416**

Local Supply	2007	2008	2009	2010	2015	2020	2025	2030
Groundwater Production	988	1,017	1,015	1,014	1,037	1,046	1,048	1,056
Surface Production	30	30	30	30	30	30	30	30
Los Angeles Aqueduct	60	62	56	62	62	63	63	63
Seawater Desalination	0	0	0	0	0	0	0	0
Groundwater Recovery	75	78	84	86	89	89	89	90
Recycling	183	253	268	280	306	314	320	326
Recycling – M&I	113	123	131	136	159	167	173	179
Recycling – Replenishment	51	86	91	88	88	88	88	88
Recycling – Seawater Barrier	19	44	46	57	59	59	59	59
Other Non-Metropolitan Imports	7	7	7	7	7	7	7	7
Total Local Supply	**1,341**	**1,446**	**1,459**	**1,478**	**1,531**	**1,549**	**1,557**	**1,572**

Demand on Metropolitan	2007	2008	2009	2010	2015	2020	2025	2030
Full Service Rate	1,548	1,555	1,585	1,599	1,596	1,665	1,729	1,769
Full Service - Consumptive Use	1,522	1,529	1,559	1,581	1,583	1,653	1,717	1,757
Full Service – Seawater Barrier	26	26	26	18	12	12	12	12
Seasonal Rate	95	82	80	81	81	82	82	74
Shift Seasonal	16	3	0	0	0	0	0	0
Seasonal - Shift - Reservoir In-Lieu	2	0	0	0	0	0	0	0
Seasonal - Shift – GW In-Lieu	14	3	0	0	0	0	0	0
Long-term Seasonal	79	80	80	81	81	82	82	74
Seasonal - Long-term - GW Spreading	63	65	65	66	66	67	67	65
Seasonal - Long-term - GW In-Lieu	16	15	15	15	15	15	15	9
Agricultural Rate	9	9	8	8	6	4	2	1
Total Net Demand on Metropolitan	**1,652**	**1,646**	**1,673**	**1,687**	**1,682**	**1,751**	**1,813**	**1,844**

Riverside/San Diego Region

The Riverside/San Diego area consists of Eastern MWD, Western MWD, and the San Diego County Water Authority (SDCWA). The 1961 hydrological year represents the highest demand on Metropolitan of the 83 simulated hydrologic scenarios between 1922 and 2004.

In the Riverside/San Diego Region, agricultural demand is expected to decrease gradually as agricultural land is converted to urban use. SDCWA's seawater desalination project, currently in the Full Design and Appropriated Funds phase, is expected to be on-line in 2011, producing 56,000 AF of water. However, demand on Metropolitan continues to increase as total demands within the region outpace local supplies.

Table 3-4
Riverside/San Diego Region (Thousand Acre-Feet)

Demand	2007	2008	2009	2010	2015	2020	2025	2030
Retail M&I	1,090	1,110	1,131	1,150	1,235	1,329	1,425	1,516
Retail Agricultural	257	255	252	250	235	218	195	179
Seawater Barrier	0	0	0	0	0	0	0	0
Replenishment	13	16	20	23	35	41	41	41
Total Demand	**1,361**	**1,381**	**1,403**	**1,423**	**1,505**	**1,587**	**1,662**	**1,737**

Local Supply	2007	2008	2009	2010	2015	2020	2025	2030
Groundwater Production	301	301	302	302	305	308	309	309
Surface Production	24	24	24	24	24	24	24	24
Los Angeles Aqueduct	0	0	0	0	0	0	0	0
Seawater Desalination	0	0	0	0	56	56	56	56
Groundwater Recovery	23	35	44	48	49	49	49	49
Recycling	36	40	45	50	71	79	82	83
Recycling - M&I	36	40	44	49	71	79	81	82
Recycling - Replenishment	0.33	0.33	0.33	0.34	0.34	0.34	0.34	0.34
Recycling - Seawater Barrier	0	0	0	0	0	0	0	0
Other Non-Metropolitan Imports	0	0	0	0	0	0	0	0
Total Local Supply	**384**	**401**	**415**	**424**	**505**	**517**	**520**	**521**

Demand on Metropolitan	2007	2008	2009	2010	2015	2020	2025	2030
Full Service Rate	850	852	858	867	869	945	1,034	1,120
Full Service - Consumptive Use	850	852	858	867	869	945	1,034	1,120
Full Service - Seawater Barrier	0	0	0	0	0	0	0	0
Seasonal Rate	13	16	20	23	35	40	41	41
Shift Seasonal	0	0	0	0	0	0	0	0
Seasonal - Shift - Reservoir In-Lieu	0	0	0	0	0	0	0	0
Seasonal - Shift - GW In-Lieu	0	0	0	0	0	0	0	0
Long-term Seasonal	13	16	20	23	35	40	41	41
Seasonal - Long-term - GW Spreading	13	16	20	23	35	40	41	41
Seasonal - Long-term - GW In-Lieu	0	0	0	0	0	0	0	0
Agricultural Rate	114	112	111	109	97	85	67	56
Total Net Demand on Metropolitan	**976**	**980**	**988**	**999**	**1,000**	**1,071**	**1,142**	**1,216**

San Bernardino Region

For the San Bernardino Region, consisting of the Inland Empire Utility Agency (IEUA), 1961 is the simulated hydrologic year with the highest demand on Metropolitan.

IEUA's recycled water distribution system is expected to be on-line in 2008, producing 6,150 AF, subsequently expanding to 32,000 AF in 2015. In addition, IEUA is expected to recharge up to 35,000 AF of recycled water in 2030.

Table 3-5
San Bernardino Region

Demand	2007	2008	2009	2010	2015	2020	2025	2030
Retail M&I	248	252	257	261	283	306	331	355
Retail Agricultural	35	35	34	34	25	14	12	12
Seawater Barrier	0	0	0	0	0	0	0	0
Replenishment	1	6	12	17	24	27	34	35
Total Demand	**284**	**293**	**303**	**312**	**332**	**348**	**377**	**402**

Local Supply	2007	2008	2009	2010	2015	2020	2025	2030
Groundwater Production	122	123	125	126	124	120	123	124
Surface Production	7	7	7	7	7	7	7	7
Los Angeles Aqueduct	0	0	0	0	0	0	0	0
Seawater Desalination	0	0	0	0	0	0	0	0
Groundwater Recovery	6	14	14	14	23	23	23	23
Recycling	8	22	35	48	71	76	83	84
Recycling - M&I	7	15	23	31	47	49	49	49
Recycling - Replenishment	1	6	12	17	24	27	34	35
Recycling - Seawater Barrier	0	0	0	0	0	0	0	0
Other Non-Metropolitan Imports	0	0	0	0	0	0	0	0
Total Local Supply	**143**	**166**	**180**	**195**	**225**	**225**	**235**	**238**

Demand on Metropolitan	2007	2008	2009	2010	2015	2020	2025	2030
Full Service Rate	138	125	119	114	104	119	138	161
Full Service - Consumptive Use	138	125	119	114	104	119	138	161
Full Service - Seawater Barrier	0	0	0	0	0	0	0	0
Seasonal Rate	3	3	3	3	3	3	3	3
Shift Seasonal	0	0	0	0	0	0	0	0
Seasonal - Shift - Reservoir In-Lieu	0	0	0	0	0	0	0	0
Seasonal - Shift - GW In-Lieu	0	0	0	0	0	0	0	0
Long-term Seasonal	3	3	3	3	3	3	3	3
Seasonal - Long-term - GW Spreading	0	0	0	0	0	0	0	0
Seasonal - Long-term - GW In-Lieu	3	3	3	3	3	3	3	3
Agricultural Rate	0	0	0	0	0	0	0	0
Total Net Demand on Metropolitan	**141**	**128**	**123**	**117**	**107**	**122**	**141**	**164**

SUMMARY

Forecasting future demands is a dynamic process. Future water use is a function of a large number of demographic, socio-economic, climatologic, and structural variables which change over time and may be different within the various points of Metropolitan's service area. In addition, the demand for Metropolitan imported water supplies is a function of changes in retail demands and local supplies.

An expert panel was assembled to critically review Metropolitan's methodologies and assumptions. The expert panel was composed of highly regarded economists, statisticians,

and water resource planners that included: Dr. Ben Dziegielewski of the Department of Geography and Environmental Resources, Southern Illinois University; Dr. John Boland, Department of Geography and Environmental Engineering, the Johns Hopkins University; Dr. Darwin Hall, Department of Economics and Environmental Science & Policy California State University, Long Beach; and Dr. Tom Chesnutt, President of A&N Technical Services, California. The expert panel reviewed Metropolitan's retail and M&I demand methodology and associated assumptions – including an evaluation of the econometric model specifications and implementation, review of the strengths and limitation of the data, development of options for improving the forecast, and discussion of alternative scenario planning. The expert panel worked closely with the IAS Technical Review Panel composed of participating member agencies. The expert panel findings concluded with an overall favorable review of Metropolitan's forecasting method. The review process resulted in a higher degree of confidence

The dry year peak demands developed under the assumptions and methodology outline in this section in combination with historical behavior for delivering water to various parts of the service area were used to evaluate the future need for facility. Metropolitan's facilities are designed to provide sufficient supplemental water so that the region can meet its water supply reliability goal. Peak demands used for evaluating facility needs incorporate the highest demand level for the analysis area and may therefore occur at different times for different analysis areas. Evaluation of the adequacy of existing facilities in delivering the demand projected is presented in Section 4.

DESCRIPTION OF EXISTING SYSTEM AND NEEDS

4

DISTRIBUTION SYSTEM AND STORAGE FACILITIES

Overview

Metropolitan receives water from the State Water Project through the California Aqueduct and water from the Colorado River through the Colorado River Aqueduct. The imported water is stored in terminal reservoir facilities for distribution to about 241 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.

Colorado River Aqueduct

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. From the Colorado River and California Aqueduct supply systems, Metropolitan provides supplemental water to its 26 member public agencies through a regional distribution network of canals, pipelines, reservoirs, treatment plants, and appurtenant works.

State Water Project

Metropolitan 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.

Figure 4-1 Water Imports to Southern California

Existing Conveyance Facilities and Surface Storage

From the Colorado River and California Aqueduct supply systems, Metropolitan provides supplemental water to its 26 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 820 miles of pipelines, tunnels and canals, five regional water filtration plants, several other raw and treated water reservoirs, and 16 hydropower plants. Metropolitan's distribution system and areas served with supplemental water imported is shown on Figure 4-2

Metropolitan's Lake Mathews and Lake Skinner provide a total of more than 200,000 acre-feet (AF) of storage for use within Metropolitan's service area. Lake Mathews, located in the city of Riverside, distributes Colorado River water to Los Angeles, Orange, Riverside, and San Bernardino counties. Lake Skinner, located in the city of Winchester, receives Colorado River and State Project water for distribution to Riverside and San Diego counties. Metropolitan also operates Diamond Valley Lake to store water from the Colorado River and State Project. Diamond Valley Lake, located four miles southwest of the city of Hemet, has more than 800,000 AF of storage and provides Metropolitan with additional storage flexibility that can be used to meet demands during normal and emergency conditions. In addition, DWR owns and operates five major reservoirs in or near Metropolitan's service area: Castaic Lake, Elderberry Forebay and Pyramid Lake on the West Branch of the California Aqueduct and Silverwood Lake and Lake Perris are on the East Branch of the California Aqueduct. Metropolitan also has dedicated access to storage in Castaic and Perris reservoirs, which can be used for a variety of operational needs.

Groundwater Storage

In recognition of the importance of coordinated management and most efficient use of surface and groundwater supplies, many groundwater basins within Metropolitan's service area store local and imported water for later use to meet seasonal, dry year, and emergency demands. Metropolitan's participation in this venture has two facets that ensure reliable water service to the region. First, Metropolitan's Replenishment Service program seeks to encourage sustainable management of groundwater basins that can maintain production levels during droughts by making its surplus water supplies available for storage at reduced water rates. Second, Metropolitan's dry-year Conjunctive Use Programs store surplus imported supplies to maintain reliability of imported supplies during dry, drought, and emergency conditions.

The conjunctive use programs can be used to offset imported water deliveries by Metropolitan to meet firm demands during shortages of imported water or during emergencies (e.g., major unplanned facility outage) and thereby supplement surface reservoir storage and enhance reliability of imported water service. This type of storage in service area groundwater basins by Metropolitan is accomplished through contractual agreements with the member agencies. A participating member agency would be asked to produce Metropolitan water stored in the groundwater basin and to reduce its delivery of Metropolitan imported water at the service connection. During a shortage, the offset imported supply can be provided to another member agency. This storage increases regional reliability of water supplies.

Recently, Metropolitan successfully developed dry-year conjunctive use program agreements within its service area. There are currently ten conjunctive use programs that have been developed in partnership with various member and retail agencies. These conjunctive use programs provide Metropolitan with a total of more than 420,000 AF of additional storage within the service area with contractual yield of more than 115,000 acre-feet per year (AFY) during dry, drought, and emergency condition. Table 4-1 below summarizes the total storage and dry-year yields.

Table 4-1
Conjunctive Use Programs within Metropolitan Service Area

Conjunctive Use Programs (CUP) Within Metropolitan Service Area	Total Storage (in AF)	Dry Year Yield (in AFY)
Jensen Exclusive Area:		
North Las Posas CUP Phase 1 and 2*	210,000	47,000
Weymouth Exclusive Area		
Foothill CUP	9,000	3,000
Live Oak CUP	3,000	1,000
Claremont CUP	3,000	1,000
Diemer Exclusive Area		
Orange County CUP	66,000	20,000+
Common Pool		
Long Beach CUP Phase 1	13,000	4,333
Long Beach – Lakewood CUP	3,600	1,200
Compton CUP	2,295	765
San Bernardino		
Chino Basin CUP	100,000	33,000
Riverside		
Western Elsinore CUP	12,000	4,000
TOTAL	**421,895**	**115,298**

Note: North Las Posas CUP Phase 3 will increase dry-year yield of the program to 70,000 AFY.

Potential for additional dry-year storage programs in groundwater basins in the Metropolitan service area is currently being discussed and evaluated. Possibilities include increased storage in Central and West Coast Basins, Orange County Basin, and Chino Basin. Other potential basins include the San Fernando, San Jacinto Watershed Basins, and San Gabriel Basin. These programs would need to be developed to achieve the in-region groundwater storage dry-year yield target of 275,000 AFY by 2010.

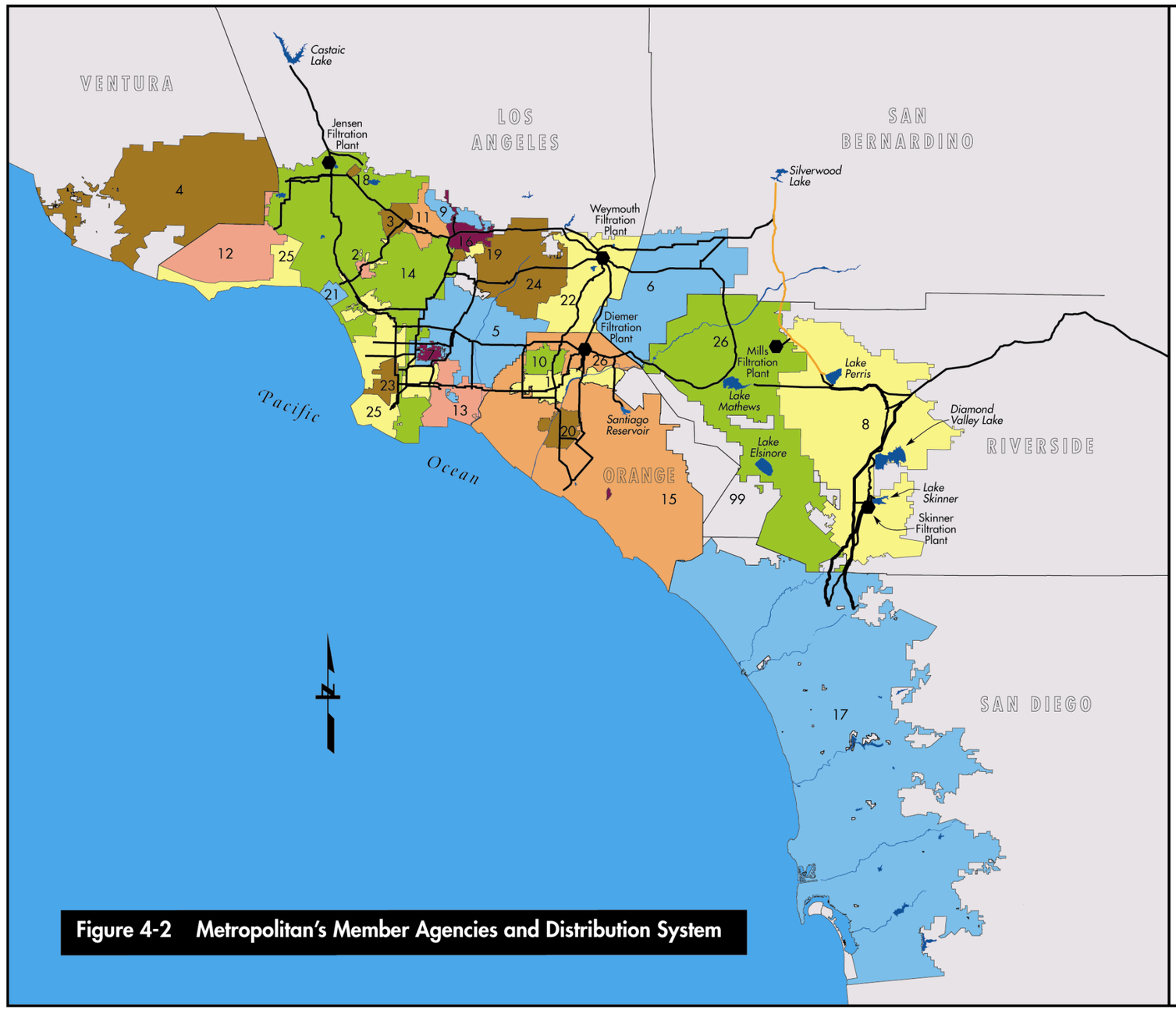


Figure 4-2 Metropolitan's Member Agencies and Distribution System

FACILITY PLANNING

Methodology for Facility Planning

The main purpose of the facility planning analysis is to determine additional treatment and conveyance capacities required to deliver supplies identified in the 2004 Integrated Resource Plan Update to meet future demands within Metropolitan's service area.

The process of planning improvements to Metropolitan's regional distribution system is dynamic and continuous. The methodology used to predict future capacity takes into account the demands on Metropolitan's system, which is affected by the total retail demand for each agency. The methodology also takes into account the numerous demographic factors that govern retail demand, the local supply development within the service area, and the historical usage and planned operation of the system. Consequently, as forecasts of these factors change, Metropolitan periodically updates its water supply and demand estimates and adjusts its plan for system improvements.

The total retail demand within Metropolitan's service area is affected by demographic factors that include the region's population and its characteristics, industry mix, economy, conservation, and availability of local water supplies. For this facility planning analysis, the effects of these factors are taken into account in developing the retail demands for each member agency. Detailed discussion of these demographic components and the development of the statistical analysis that is used to quantify impacts on demand are discussed in detail in Section 3 and a separate technical memorandum entitled "Technical Memorandum on Retail M&I Projections" included in Appendix 8.

Properly identifying the level of local supply development is critical in planning for regional facilities since one acre-foot of local supply may translate to one less acre-foot of water that Metropolitan must deliver as a supplementary supply. The level and timing of development of local supplies is subject to a number of variables, including permitting, funding, construction schedule and local supply sales. For this facility planning analysis, a comprehensive survey was conducted in cooperation with all the member agencies to develop an inventory of local supply projects that will enhance supply reliability in the region. The information obtained from this survey is used as the projected amount of local supply development for the facility planning analysis. This inventory will also be used to develop project portfolios as solution alternatives to any identified future facilities requirements.

In determining treatment and conveyance requirements for the current facility planning analysis, Metropolitan evaluated the system using the maximum hydrologic conditions that simulate the highest annual demand on Metropolitan for non-interruptible supplies. The total firm demand on Metropolitan was obtained from forecasted total retail demand and projections in local supply development completed in coordination with the member agencies. Firm demands on Metropolitan are non-interruptible demands for full service water, which excludes replenishment deliveries.

The firm demand on Metropolitan is evaluated under a peaking condition that simulates maximum day conditions. This is calculated by determining the daily peaking behavior

observed during the years of high demand for Metropolitan supplies. Peaking factors used for this analysis were calculated based on historic data from Automatic Meter Reading System (AMR). The AMR data provides a more accurate reading of the historic peaking behavior for delivering water to various points within the service area as compared to the plant effluent data that were used in previous facility planning studies. A detailed discussion of the methodology for determining the peaking factors and peak flows are contained in a separate technical memorandum entitled "Technical Memorandum: Peaking Factors in Projecting the Need for New Facilities" presented in Appendix 9.

Coupling the extreme conditions described above results in design peak flows that simulate the highest daily demand on Metropolitan facilities based on historic behavior and hydrology. These assumptions dictate the requirement for capacity and timing of future facilities, and ultimately the capital expenditures associated with constructing facilities to meet such requirements.

The resulting peak flows for each load area is then compared to existing treatment and conveyance facilities to determine if and when additional capacities will be required. Existing facilities are evaluated assuming the most efficient operation of the system based on extensive practical experience and knowledge of Metropolitan's Water System operators. For load areas where the peak flows exceed the existing treated and/or conveyance facilities, the need for additional facilities is identified. The timing of need and required capacities to meet future flows are also compared under different sensitivity cases by varying the assumptions.

Full evaluation of the system operation also enables proper delineation of the load areas based on deliveries of treated water through member agency service connections. This is an improvement from the previous system overview analyses because this level of resolution was not attainable when only plant effluent flows were available. As a result, the analysis is able to reflect the deliveries to the member agencies and the plant source of treated water deliveries. The historic peaking behavior is more effectively captured and the future forecasted demands of the member agencies are more accurately reflected in the appropriate load areas.

Facility Planning Assumptions

In order to effectively capture the impacts of these various factors, a facility planning model was developed to systematically process the information on forecasted demands, peaking behavior, and existing system capacities to determine future facility needs. The model incorporates demand and supply projections through 2050. The modeling assumptions used for the current facility planning analysis are summarized below:

Retail Urban Water Demand. The retail demand projections used for the facility planning analysis were based on the latest Southern California Association of Governments (SCAG) and San Diego Association of Governments (SANDAG) regional growth projections. This forecast was also the basis for the 2005 Final Regional Urban Water Management Plan (RUWMP). Projections for the long-term period of 2030 through 2050 were extrapolated based on growth rates from Department of Finance projections. Detailed discussions of the assumptions on retail demand projections are covered in a separate technical memorandum included as Appendix 8.

Local Supply Development. The level of local supply development directly impacts the amount of supplemental water that Metropolitan needs to provide to the service area. For the facility planning analysis, local supply projects that are identified to be existing, under construction, or fully designed with appropriated funding are included in the analysis.

Maximum Firm Demand on Metropolitan. The driest, or maximum hydrology, year that resulted in the highest annual demands on Metropolitan is used for the facility planning analysis. In determining the firm demand on Metropolitan, only full-service deliveries are considered. Replenishment deliveries are considered to be interruptible during peak demand conditions. The maximum hydrology years for the Central Pool and the Riverside / San Diego Area were identified as 1990, and 1961, respectively.

Peaking Factors. Historic AMR data are used to determine peaking factors for each load area. The flow data used for determining peak factors includes all firm water deliveries supplied through the meter. The peaking factors are based on the 6-year average max-day peaking factors of historic high demand years of 2000 to 2005. The methodology for calculating the peaking factors is fully described in a separate technical memorandum included as Appendix 9.

Existing Treatment Capacities. The existing treatment capacities are based on the design capacity of the water treatment plant minus a percentage of the influent plant capacity that is used as backwash water (which is processed through a washwater reclamation plant and returned to the plant influent works).

Conveyance Constraints. The conveyance constraints within the system may limit the amount of treated water deliveries from the plants to where the demands are within the service area. In evaluating conveyance constraints, the system capacities and hydraulic limitations are analyzed under current operating conditions. The conveyance constraints for each load areas are described in the succeeding sections.

Required Facilities and Timing of Need. For load areas where the projected peak flows exceed the capacity of the existing facilities, the need for additional capacity and timing for need are identified in this section. The development of project portfolios are are fully discussed in Section 5.

FORECASTING PEAK DEMANDS

Peak demands are commonly expressed as a percentage of average annual demands. Originally, a monthly peaking guideline of 130 percent of average annual demand was used as a system design criterion. This was based on the peak-month demands of the 13 original cities during the years from 1928 to 1930. In subsequent years, Metropolitan has served such peaks as were experienced and has provided new capacity as needed. For example, the Colorado River system expansion of the 1950's and the State Water Project distribution system expansion of the 1960's were both constructed using peak-month ratios in the range of 1.4 to 1.5.

A March 1989 Metropolitan Planning Division Report entitled, *Criteria for Meeting Water Demands*, stated a number of reasons supporting a shift in policy from meeting peak-month demands to a peak-week criterion. The report states that patterns of retail water use in Metropolitan's service area have become more accentuated during the summer months.

Also, water quality considerations have complicated the design and operation of Metropolitan and member agency systems on a peak-month basis. Taste and odor problems were noted in member agency systems storing water for more than one week, and nitrification (the growth of a type of bacteria that removes ammonia added as part of the chloramines disinfection system) has been linked to long storage periods in Metropolitan and member agency systems. Since that time, facilities at Metropolitan have been designed based on a peak-week basis.

The *1996 Integrated Water Resources Plan* cites a "retail peak-week" factor, but data for a retail peak-week has not been readily available, and staff has used Metropolitan's max-day as a proxy for retail peak-week in determining peak factors.

Table 4-2 below shows historical daily peaking factors calculated from AMR data of the various load areas for the last six calendar years 2000 to 2005.

Table 4-2
Calculated Daily Peaking Factors

Load Area	2000	2001	2002	2003	2004	2005	Six Year Average
Diemer	1.54	1.61	1.45	1.63	1.44	1.56	1.54
Jensen	1.58	1.26	1.45	1.48	1.40	1.49	1.45
Weymouth	1.65	1.99	1.59	1.75	1.68	1.77	1.74
Common Pool	1.42	1.28	1.26	1.42	1.37	1.32	1.35
Mills	1.79	1.59	1.69	1.65	1.72	1.92	1.73
Skinner	1.86	1.78	1.73	1.85	1.73	1.82	1.79
West Valley	1.59	1.63	1.60	1.55	1.46	1.56	1.56
San Bernardino	1.87	2.16	1.74	2.02	1.71	1.77	1.88
Common Pool	1.42	1.28	1.26	1.42	1.37	1.32	1.35

The methodology of applying historical peaking factors to forecasted annual demands to estimate future peak demands is commonly used in the water supply industry. A benefit of the current methodology is its simplicity and its validity as a standard practice. A limitation of the current methodology is that historically based peaking factors embody a set of past weather conditions, that may not necessarily emulate those used in developing the demand forecast. Ideally, peaking factors should reflect the annual daily demand pattern that occurred under the demand-forecast weather conditions, in this case, a hot dry-year that yields the highest demand on Metropolitan; conditions not captured in the past 10 years of historical AMR data.

Understanding the drivers affecting peaking behavior and their resultant peaking factors is critical in estimating future peak demands. For example, wet and cool years in Southern California tend to produce a low annual-average demand, while daily peak demands are likely to remain relatively high due to isolated hot weather occurrences. Calculating a

peaking factor using these values counter-intuitively yields an inflated peaking factor value. Applying an inflated peaking factor to a high-demand forecast, developed using hot dry-year weather conditions, results in an overestimated future peak demand.

Peaking behavior is also greatly influenced by the types of water uses demonstrated by individual member agencies. Member agencies water use needs are diverse, ranging from municipal and industrial needs to agricultural and groundwater replenishment needs. As such, rate structures are in place to support delivery of various types of water and an array of incentive programs. In determining long-term facility needs, Metropolitan assesses its ability to delivery future firm demands to its customers.

Regression Modeling - Alternative Methodology

An improvement to the current methodology is to develop an empirical method to estimate future demand peaks based on weather conditions. Metropolitan has rigorously analyzed historical demand variation as a function of weather. Both peak flows and peaking factors that occurred from 1997 through 2005 were regressed on several weather measurements. A number of different specifications were considered, including several alternative transformations of the dependent variable. The models successfully explained 60 to 80 percent of the variation in the dependent variables, but they failed to adequately reproduce extreme demand values. Findings are fully discussed in the technical memorandum provided in Appendix 9.

Expert Assessment of Methodologies

In addition to reviewing retail demand forecast, the expert panel was also tasked to critically review the current methodology and assumptions for determining peaking factors. The panel reviewed available data; determined the strengths, limitation, and options for improving the current methodology; and identified strengths and limitations of other potential methodologies.

The expert panel findings state that given the limited time span of useful peak load data, the averaging methodology currently used is adequate. Using regression model to estimate an annual peaking factor as a function of selected weather variables is feasible but gains in accuracy is not large to warrant the complexity of applying this method. As additional demand data accumulates, the regression approach can be expected to yield greater benefits. Appendix 12 includes the technical memorandums prepared by the industry experts.

Based on these expert findings, the IAS analysis uses a 6-year average of peaking factors that occurred from 2000 through 2005, for each load area. Recent history has demonstrated high demands on Metropolitan. Consequently, peaking factors calculated from this period would not over-estimate peak demands, when applied to a high-demand annual forecast.

ANALYSIS OF REQUIRED FACILITIES

Future peak demands on Metropolitan's treatment and distribution facilities are projected and used to evaluate the adequacy of existing facilities. The analysis of required facilities entail dividing the Metropolitan service area into discrete "load areas" based on the way imported

water is treated and distribution to meet demands within the various points of service area. Evaluation of the treatment capacity needs requires a thorough analysis of the 1) area served by the Jensen, Weymouth, and Diemer water treatment plants commonly referred to as the Central Pool and 2) area served by the Mills and Skinner water treatment plants in the Riverside and San Diego areas. An analysis of future distribution needs in the West Valley area and Rialto system in San Bernardino are also presented in this section.

Central Pool Area

The Central Pool is that area served by three existing Metropolitan water treatment plants: the Jensen Filtration Plant in Granada Hills, the Weymouth Filtration Plant in La Verne, and the

Diemer Filtration Plant in Yorba Linda. It encompasses all of Metropolitan's service area in Los Angeles, Orange, and Ventura Counties, and historically accounts for over 60 percent of Metropolitan's total demand for supplemental water. These filtration plants each serve an exclusive area and also jointly serve a subset of the Central Pool, referred to as the Common Pool. The locations of the three existing plants and the areas served are shown in Figure 4-3. Table 4-3 shows treatment capacities of each plant, based on the plant effluent capacities.

Because of the unique overlap in the service areas of these three Central Pool treatment plants, treatment capacity available to serve the Common Pool was determined by first evaluating the demands in each plant's exclusive service area. Once demands in the plant exclusive service areas are met, excess treated water is conveyed through available conveyance capacity in the system to meet demands in the Common Pool. Because of this relationship and in order to take into account system constraints 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 Exclusive Service Area
- Weymouth Exclusive Service Area
- Diemer Exclusive Service Area
- Common Pool Area

In addition to the three filtration plants owned and operated by Metropolitan, there are four local water treatment plants located within the Central Pool that treat Metropolitan imported supplies: Three Valleys MWD's Miramar WTP in the city of Claremont, city of Anaheim's Lenain WTP, Trabuco Canyon Water District's WTP in Lake Forest, and Serrano Water District's WTP in Villa Park. These four plants deliver up to 65 cfs of treated water to meet local demands within the Central Pool region and are included in the system overview analysis Table 4-3 depicts the usable treatment capacities for these local plants.

Recently, Metropolitan developed eight conjunctive use programs within the Central Pool region in partnership with various member and retail agencies. These conjunctive use programs will provide the region with more than 300,000 AF of additional storage and a contractual yield of more than 78,000 AFY that can be exercised during dry, drought, and emergency condition. The total dry-year take will most likely be called during a high demand condition. Under the contractual agreements that Metropolitan signed with various member

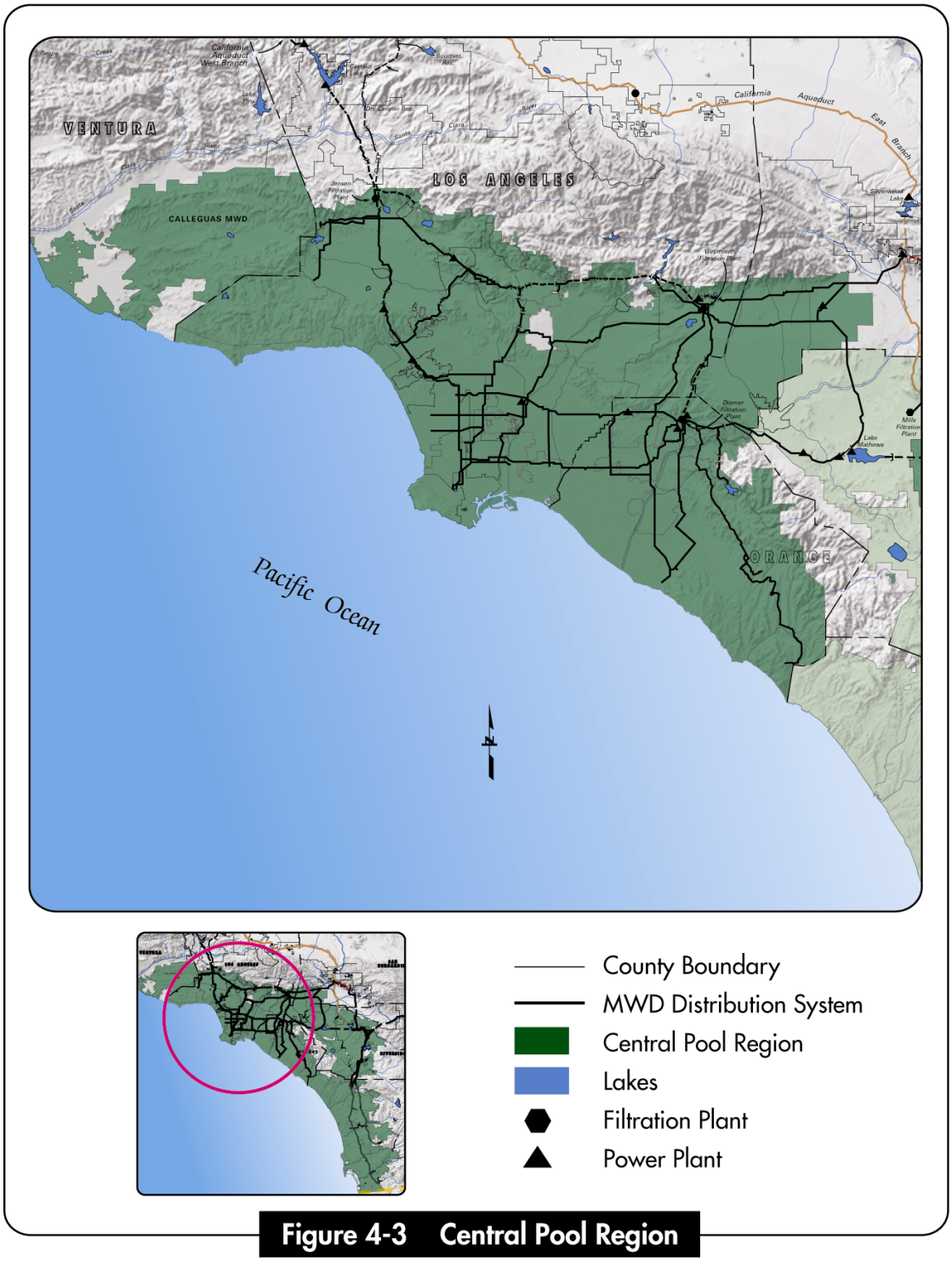


Figure 4-3 Central Pool Region

Table 4-3
Treatment Capacities of Filtration Plants
Serving the Central Pool Region

Water Treatment Plant	Usable Treatment Capacity	
	cfs	MGD
Jensen Filtration Plant	1,105	713
Weymouth Filtration Plant	763	494
Diemer Filtration Plant	763	494
Miramar Water Facility	30	19
Anaheim Lenain WTP	23	15
Trabuco WTP	6	4
Serrano WTP	6	4
Total	**2,696**	**1,743**

agencies, there is a potential to "take" 108 cfs of CUP storage to meet demands that would have otherwise been met through imported supplies. The conjunctive use program dry-year yield is distributed within the Central Pool region as follows: 65 cfs in Jensen, 7 cfs in Weymouth, 28 cfs in Diemer, and 9 cfs in the Common Pool area. The dry-year "take" effectively translates to a corresponding decrease in surface deliveries of Metropolitan imported supplies in meeting demand.

Jensen Exclusive Service Area

The Joseph Jensen Filtration Plant (Jensen Plant) is located in Granada Hills, approximately 25 miles northwest of Los Angeles. The Jensen Plant exclusive area encompasses the San Fernando Valley portion of the city of Los Angeles, Calleguas MWD in Ventura County, Las Virgenes MWD, city of San Fernando, city of Santa Monica, and a portion of the city of Burbank. In 2000, a service connection through Las Virgenes MWD to West Basin MWD was constructed bringing the Malibu area into the Jensen service area. The Jensen exclusive service area is shown in Figure 4-4.

Existing Treatment Capacity. The Jensen Plant has a design capacity of 1,163 cfs. However, 5% of the influent plant capacity is utilized as backwash water that is processed through a washwater reclamation plant and returned to the plant influent works. As a result, the effective effluent treatment capacity of the Jensen Plant is 1,105 cfs. In addition, the North Las Posas conjunctive use program may be used to offset surface water deliveries from Metropolitan during dry, drought, and emergency periods. It is assumed that Metropolitan will make a call on this conjunctive use program during peak conditions.

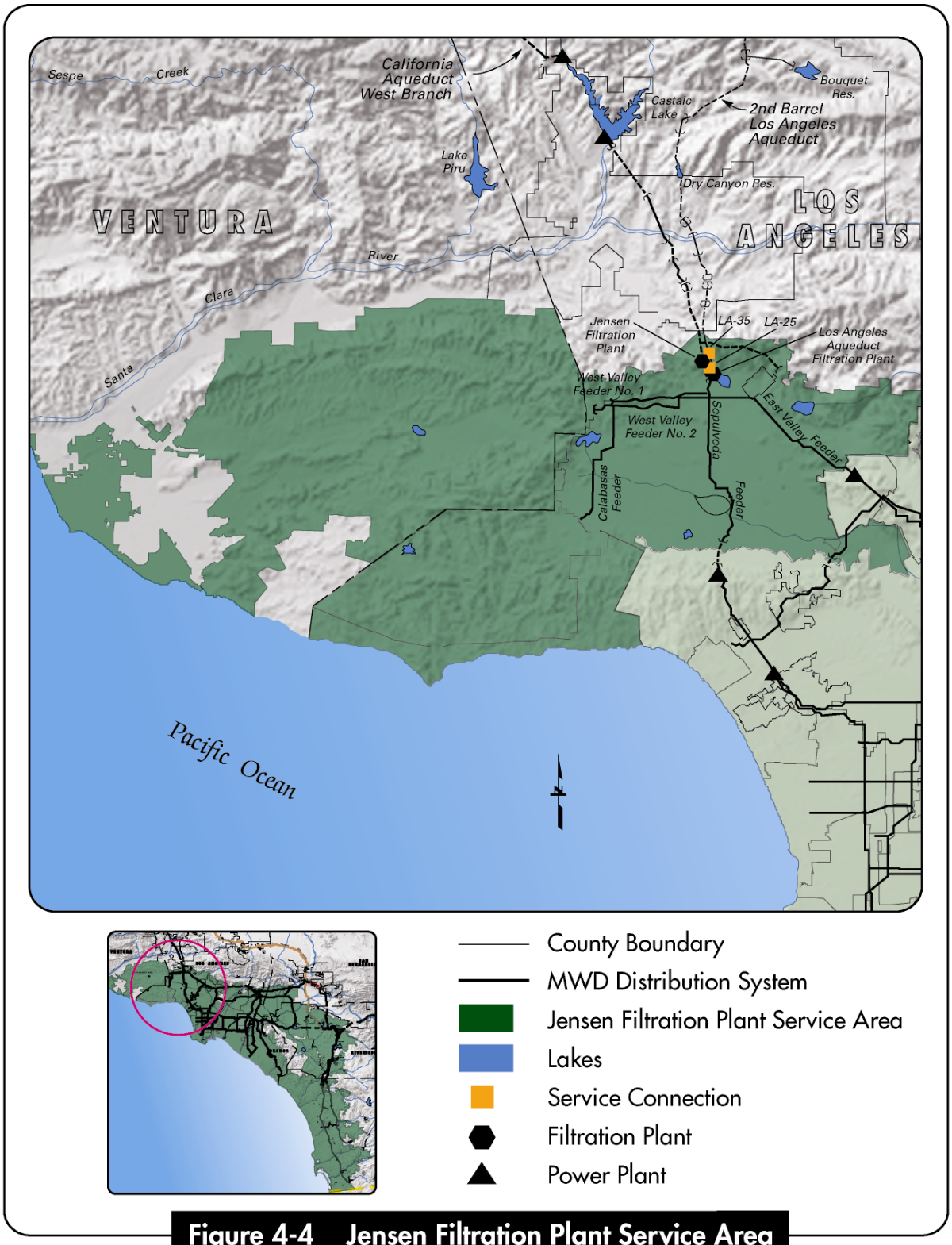


Figure 4-4 Jensen Filtration Plant Service Area

Existing Conveyance Facilities. The Jensen Plant meets the treated water demands in Metropolitan's West Valley area. The Jensen Plant receives SWP water delivered out of Castaic Lake via the Foothill Feeder. Metropolitan also augments locally imported water delivered by the Los Angeles Department of Water and Power's (LADWP) Los Angeles Aqueduct Filtration Plant (LAAFP) with SWP water through the LA-35 service connection. A large portion of Los Angeles demand on Metropolitan is met through raw water deliveries to LA-35. This raw water demand further increases during periods when flow in the Los Angeles Aqueduct is low or groundwater pumping is limited.

A portion of Metropolitan's West Valley Feeder No. 1 is currently leased to LADWP, which uses the pipeline to supply water either from the LAAFP or Metropolitan service connection LA-25 to its western San Fernando service area. LADWP also maintains a network of large distribution pipelines to its western San Fernando Valley service area. The service connections for Calleguas and Las Virgenes on the West Valley Feeder No. 1 are currently backfed through West Valley Feeder No. 2.

Under normal water supply conditions, treated water produced at Jensen is delivered to the eastern San Fernando Valley via the East Valley Feeder, the western San Fernando Valley via the West Valley Feeder No. 2 and Calabasas Feeder, and to the Common Pool area via the Sepulveda Feeder and the East Valley Feeder.

As a result of CRA supply reductions during 2003, Metropolitan also met western Orange County demand by delivering Jensen water as far as Coyote Creek Power Plant on the Lower Feeder, the Carbon Creek Pressure Control Structure on the Second Lower Feeder, and through the West Orange County Feeder.

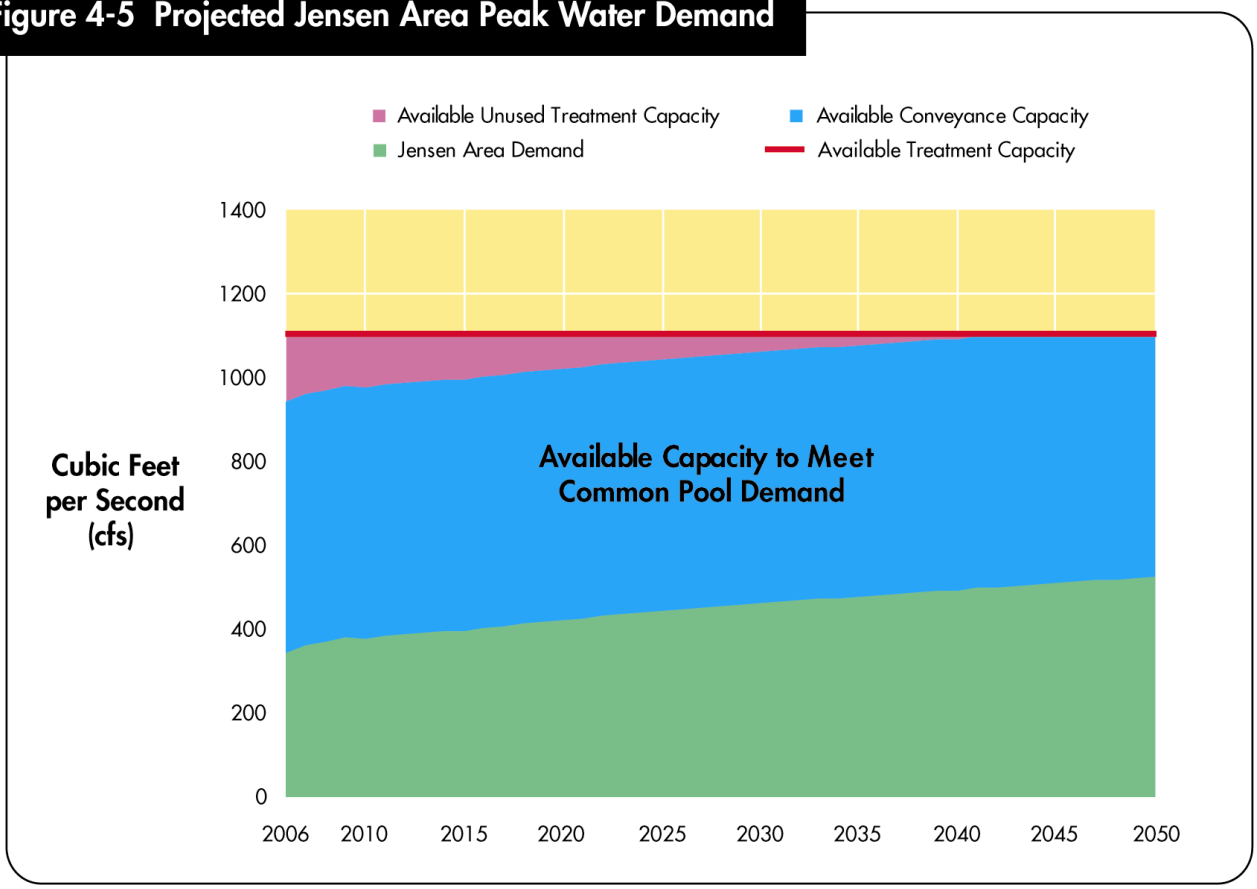
Conveyance Constraints. The portion of the treatment capacity that is not used to meet demands within the Jensen exclusive area is available to meet Common Pool demands. Treated water from Jensen can be delivered through the Sepulveda Feeder and East Valley Feeder onto the network of pipelines that feeds various areas within the Common Pool. The amount of treated water that can be delivered to the Common Pool through the Sepulveda Feeder is to 550 cfs, which is limited by the flow capacity through the Venice Pressure Control Structure (PCS). In addition, the East Valley Feeder can deliver up to 50 cfs of imported supplies treated from the Jensen Plant through the Santa Monica Feeder to meet a portion of the demands in the Common Pool area.

Demand. The maximum peak demands on Metropolitan in the Jensen exclusive area show a steady increase over the study period. The peak demands are projected to increase from approximately 342 cfs in 2006, to 458 in 2030, and ultimately to 521 cfs in 2050, as shown in Figure 4-5. Since the effluent treatment capacity of the Jensen Plant after completing plant expansion in 1996 is 1,105 cfs, Jensen will have enough capacity to meet its exclusive area demands. In addition, there exists available treatment capacity that can contribute to meeting demands in the Common Pool.

The getaway capacity of 600 cfs that is used to meet demands in the Common Pool area through the Sepulveda Feeder and East Valley Feeder are expected to be available through 2045. Beyond 2045, the Jensen treatment capacity available to the Common Pool, denoted by the light blue area in the chart below, is limited to the amount that is not used to meet the demands within the exclusive area.

Required New Treatment Capacity. New treatment facilities will be required when Metropolitan's future demand within the Jensen exclusive area exceeds the available Jensen Plant capacity. As shown in Figure 4-5 no additional treatment capacity is required to meet Jensen exclusive area demand within the period analyzed.

Figure 4-5 Projected Jensen Area Peak Water Demand



Weymouth Exclusive Service Area

The F. E. Weymouth Filtration Plant (Weymouth Plant) is located in the city of La Verne, approximately 25 miles east of Los Angles. The Weymouth Plant exclusively serves the San Gabriel Valley and areas served through the Upper Feeder, including the city of Pasadena, a major portion of the city of Glendale, Foothill MWD, Upper San Gabriel Valley MWD, Three Valleys MWD, and the northern portion of Central Basin MWD. In addition, Weymouth also serves the Central city area within LADWP through service connection LA-17 located in the Eagle Rock facility. The forecasted demand at LA-17 incorporates the effects of increased population within its cloistered area but is independent of the fluctuations in availability of supplies through the Los Angeles Aqueduct (LAA). Thus, decrease in supply availability in the LAA for instance does not translate to increase in demand in LA-17 for Metropolitan supplies. Decreased availability of supply in LAA may be compensated by increase take of raw water from service connection LA-35 that is treated at the LAAFP. The Weymouth exclusive service area is shown in Figure 4-6.

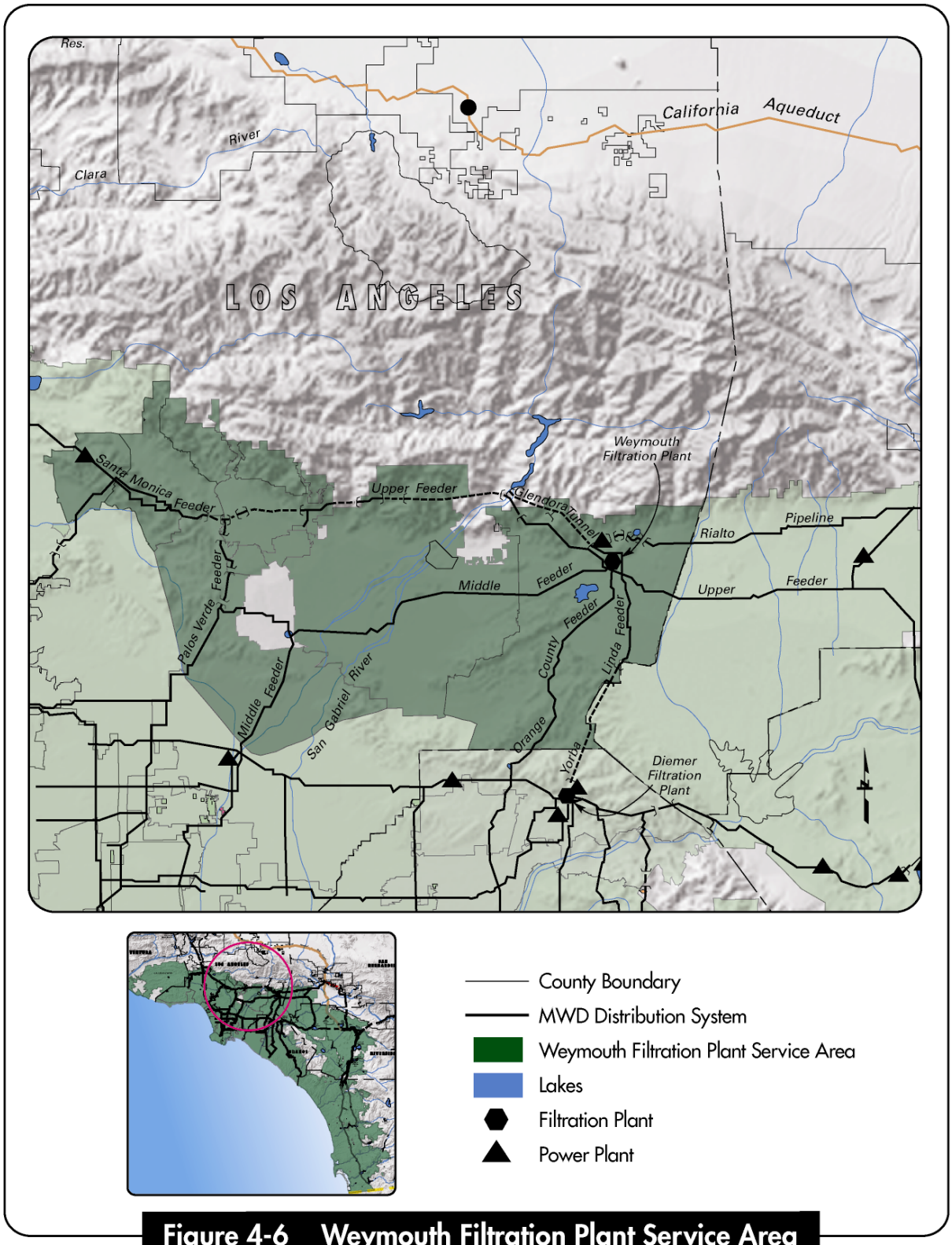


Figure 4-6 Weymouth Filtration Plant Service Area

Existing Treatment Capacity. The Weymouth Plant has a design capacity of 803 cfs. However, 5% of the influent plant capacity is utilized as backwash water that is processed through a washwater reclamation plant and returned to the plant influent works. As a result, the effective effluent treatment capacity of the Weymouth plant is 763 cfs. In addition to Weymouth, the Three Valleys Miramar Water Facility provides 30 cfs of water treatment capacity to the area. The conjunctive use programs in Foothill, Live Oak, and Claremont may also be used to offset surface water deliveries from Metropolitan during dry, drought, and emergency periods. It is assumed that Metropolitan will make calls on these conjunctive use programs during peak conditions.

Existing Conveyance Facilities. Untreated SWP supplies are delivered to the Weymouth plant from Devil Canyon through the Rialto Pipeline. CRA water from Lake Mathews is delivered to Weymouth through the Upper Feeder pipeline. 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 area through the Upper Feeder, Middle Feeder, Santa Monica Feeder, Palos Verdes Feeder, Orange County Feeder, and the service connections off the Weymouth plant and Eagle Rock facility. The treated water from Weymouth can also be delivered to various points within the Common Pool through the Palos Verdes Feeder, Middle Feeder, and Santa Monica Feeder.

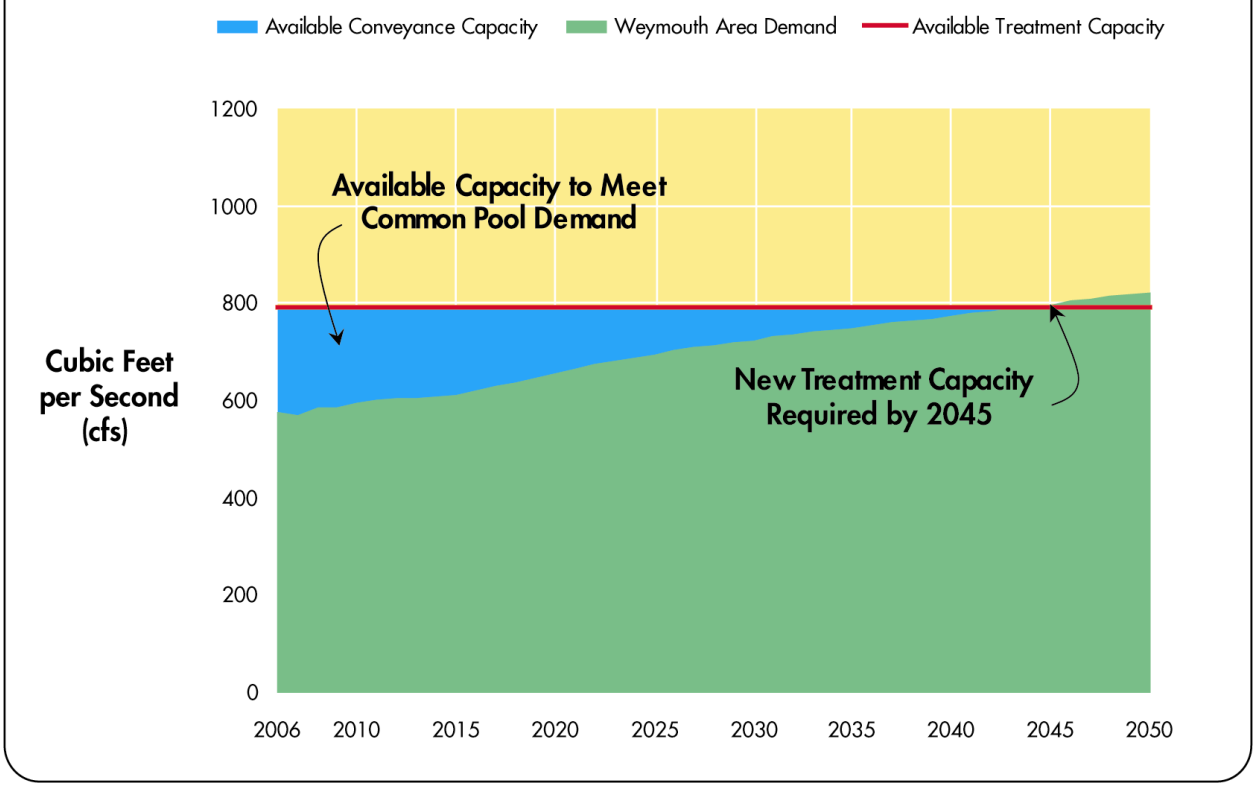
Conveyance Constraints. The treatment capacity in the Weymouth plant that is available after meeting exclusive area demands can be used to meet demands in the Common Pool. However, there exists conveyance constraints in the system that limit the delivery of treated water from the Weymouth plant to the Common Pool area to 275 cfs. Of the 275 cfs, 100 cfs is delivered via the Palos Verdes Feeder through the Washington Street PCS, up to 125 cfs through the Middle Feeder, and 50 cfs through the Santa Monica Feeder.

Demand. The maximum peak demands on Metropolitan in the Weymouth exclusive area, including demands in the Los Angeles Central city area, show a steady increase over the study period. The peak demands are projected to increase from approximately 575 cfs in 2006, to 722 cfs in 2030, and ultimately to 819 cfs in 2050, as shown in Figure 4-7. Since the effluent treatment capacity of the Weymouth plant is 763 cfs and the Miramar Water Treatment Facility contributes another 30 cfs, there exists available capacity in Weymouth plant to meet demands within its exclusive area until the year 2045. Beyond 2045 there will be a need for additional treatment capacity to meet demands in the Weymouth exclusive area. At the end of the model simulation at 2050, it is projected that there will be a need for an additional 26 cfs of treatment capacity.

Up to 275 cfs of treated Weymouth water can be delivered to the Common Pool area through the Palos Verdes Feeder, Middle Feeder, and Santa Monica Feeder. However, the amount of treated water available to meet Common Pool demand is limited to 218 cfs at the beginning of the model simulation in 2006 because of the high demands within the Weymouth exclusive area. Because of the continued increase in demands within the exclusive area, there will be no available treatment capacity in Weymouth that may be used to meet Common Pool demand by year 2045.

Required New Treatment Capacity. New treatment facilities will be required when Metropolitan's future demand within the Weymouth exclusive area exceeds the available Weymouth plant capacity. As shown in Figure 4-7, additional treatment capacity will be required to meet demands in the Weymouth exclusive area by year 2045.

Figure 4-7 Projected Weymouth Area Peak Water Demand



Diemer Exclusive Service Area

The Robert B. Diemer Filtration Plant (Diemer plant) is located approximately 30 miles southeast of Los Angeles in the city of Yorba Linda. The Diemer plant serves most of the demand in the cities of Anaheim, Fullerton, Santa Ana, and the Municipal Water District of Orange County. It also provides a significant portion of its capacity to serving the demands within the Common Pool area.

Existing Treatment Capacity. A blend of SWP and CRA water is normally provided to the Diemer plant through the Lower Feeder and Yorba Linda Feeder. The Diemer plant has a design capacity of 803 cfs. However, 5% of the influent plant capacity is utilized as backwash water that is processed through a washwater reclamation plant and returned to the plant influent works. As a result, the effective effluent treatment capacity of the Diemer plant is 763 cfs. In addition, the water treatment facilities in Anaheim, Trabuco, and Serrano contribute another 35 cfs of capacity in meeting treated water demands in the Diemer exclusive area. The conjunctive use program in Orange County basin may also be used to offset surface water deliveries from Metropolitan during dry, drought, and emergency periods. It is assumed that Metropolitan will make a call on this conjunctive use program during peak conditions.

Existing Conveyance Facilities. Treated water from Diemer is delivered to Metropolitan member agencies through the Lower Feeder, Second Lower Feeder, East Orange County Feeder No. 2, the Allen-McColloch Pipeline (AMP), and the South County Pipeline (SCP). Existing facilities in the Diemer service area are shown in Figure 4-8.

Conveyance Constraints. The treated capacity in Diemer that is not used to meet demand in its exclusive area is available to meet demands in the Common Pool. Treated water from Diemer may be delivered through the Lower Feeder, Second Lower Feeder, and West Orange County Feeder. The treatment capacity available to meet demands in the Common Pool is limited by the unused capacity at Diemer since there exist adequate conveyance capacity to deliver treated water into the Common Pool area.

Demand. The maximum peak demands on Metropolitan in the Diemer exclusive area are projected to range from approximately 578 cfs in 2006 to 509 cfs in 2030, and ultimately to 567 cfs at 2050, as shown in Figure 4-9. As can be seen from this chart, the projected peak demand for the Diemer exclusive area varies. The peak demand in this load area is greatly affected by the management and use of the Orange County groundwater basin and other local project supplies in the area. The projected increase in demands around 2008 to 2016 can be attributed to decrease in groundwater production over this period, which directly translates to additional need for supplemental supply from Metropolitan.

Since the effluent treatment capacity of the Diemer plant is 763 cfs, the Diemer plant will have enough capacity to meet exclusive area needs. In addition, the Diemer plant will be able to contribute to meeting demands in the Common Pool area through the extent of the study period. The Diemer plant effectively meets demands in the Common Pool area because of the large existing conveyance capacity into that area.

Required New Treatment Capacity. New treatment facilities will be required when Metropolitan's future demand within the Diemer exclusive area exceeds the available Diemer plant capacity. As shown in Figure 4-9, no additional treatment capacity is required to meet Diemer exclusive area demand within the period analyzed.

Common Pool Area

As previously described, the Common Pool consists of an area "common" to the three filtration plants that service the Central Pool, shown in Figure 4-10. This means that within the Common Pool, water can be received from more than one of the three existing plants in the Central Pool. 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, Compton, Long Beach, Torrance, and portions of Burbank, the majority of the service areas of Central and West Basin Municipal Water Districts, and the western portion of the Municipal Water District of Orange County. Also served within the Common Pool is the Harbor Area of LADWP. Similar to the Central city LA-17, the demand in LADWP's Harbor area incorporates the effects of increased population but is independent of the fluctuations in availability of supplies through the Los Angeles Aqueduct (LAA). Thus, decrease in supply availability in the LAA does not translate to increased demand on Metropolitan within the Harbor area.

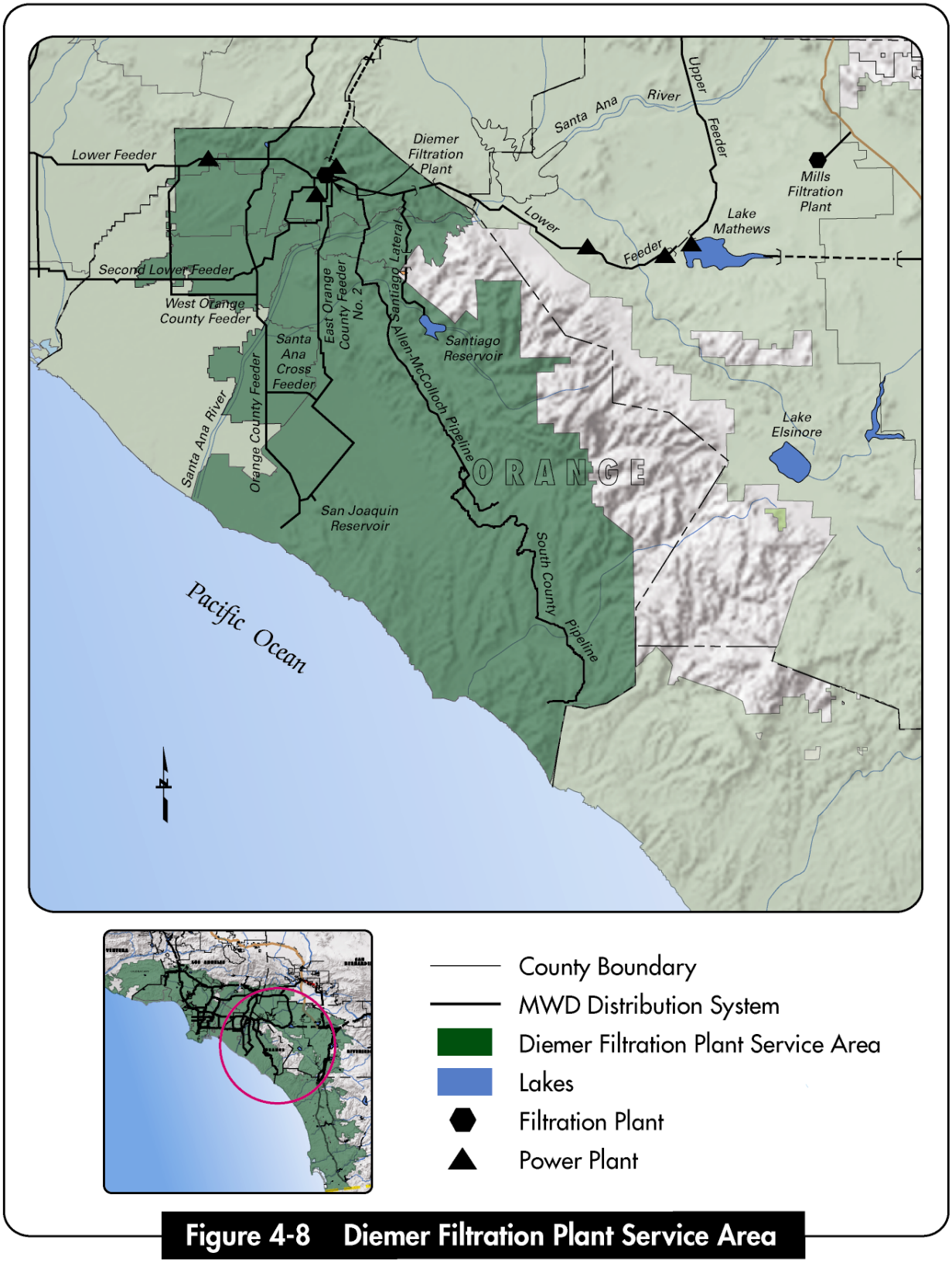
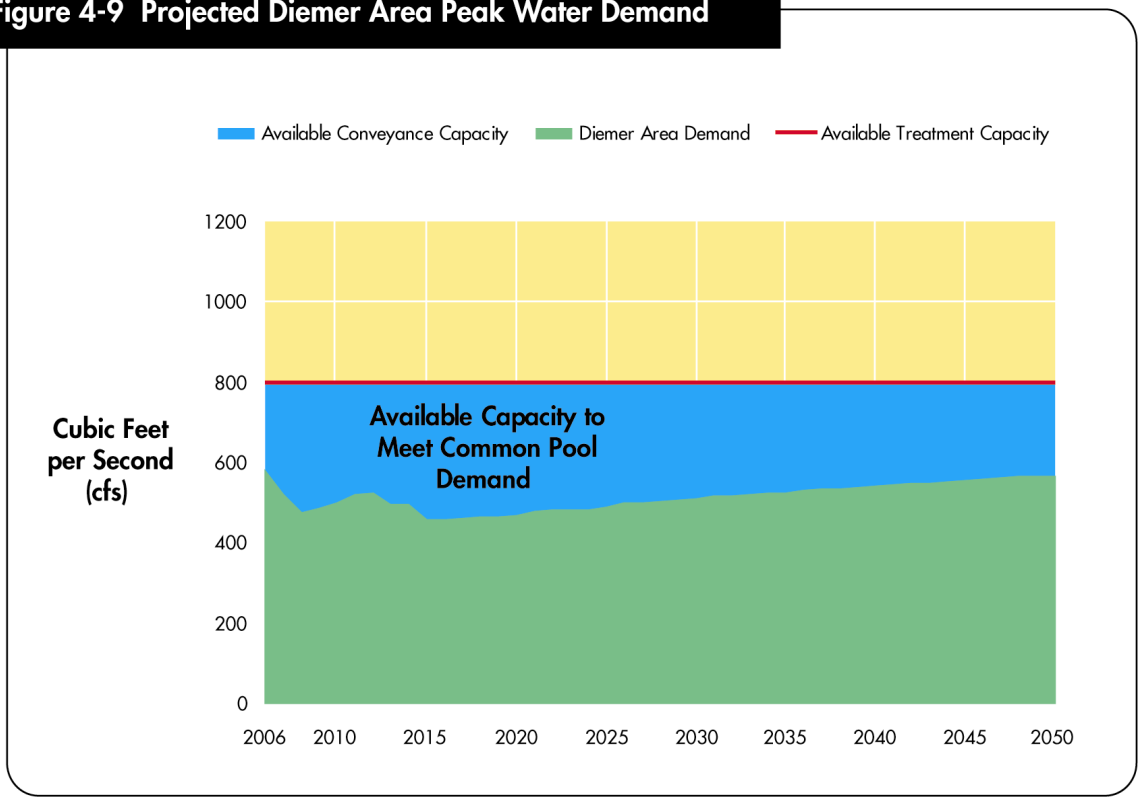


Figure 4-8 Diemer Filtration Plant Service Area

Figure 4-9 Projected Diemer Area Peak Water Demand



Existing Treatment Capacity. The Common Pool area receives treated water from Metropolitan's Jensen, Weymouth, and Diemer plants. The treatment capacity in the Common Pool consists of a combination of available capacities from the Jensen, Weymouth, and Diemer plants delivered through existing conveyance facilities. Recent conditions that required Metropolitan to deliver SWP further eastward in the system shows that the Jensen Plant can deliver approximately 600 cfs of treated water into the Common Pool. The Weymouth plant, with existing conveyance constraints in the Santa Monica and Palos Verdes Feeders, can supplement treated water delivery into the Common Pool area by approximately 275 cfs under current conditions. In addition, the Diemer plant is able to deliver all of its excess treated water into the Common Pool area. This amount of available treatment capacity decreases over time as demands in each of the plant exclusive service areas increases. The LAAFP also provides treatment capacity for LADWP in this area.

The conjunctive use programs in Long Beach, Lakewood, and Compton may also be used to offset surface water deliveries from Metropolitan during dry, drought, and emergency periods. It is assumed that Metropolitan will make calls on these conjunctive use programs during peak conditions.

Existing Conveyance Facilities. Conveyance facilities providing water to the Common Pool are shown previously in Figure 4-10 and include the Sepulveda Feeder, East Valley Feeder, Santa Monica Feeder, Middle Feeder, Palos Verdes Feeder, Lower Feeder, Second Lower Feeder, and service connection at the Jensen Plant.

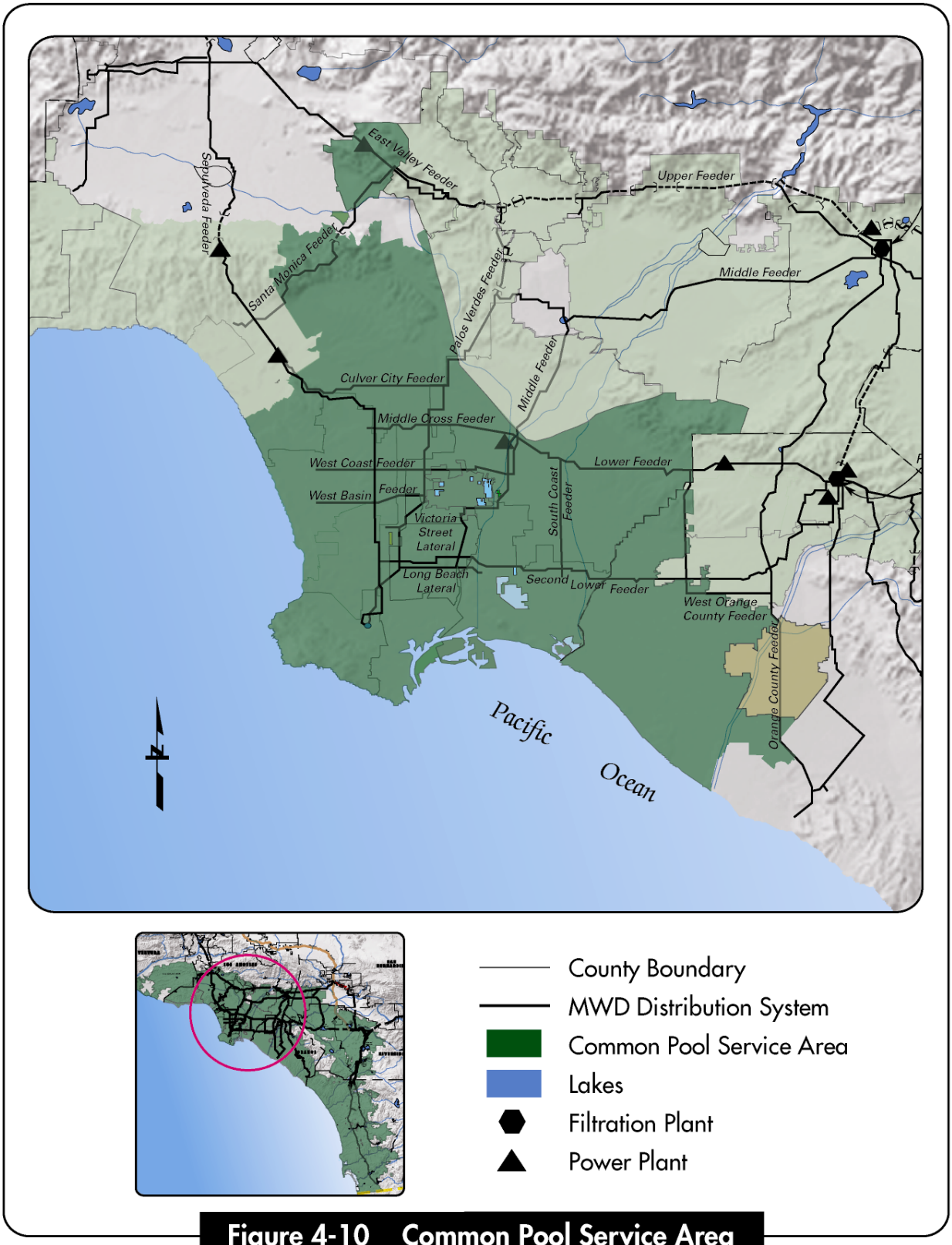


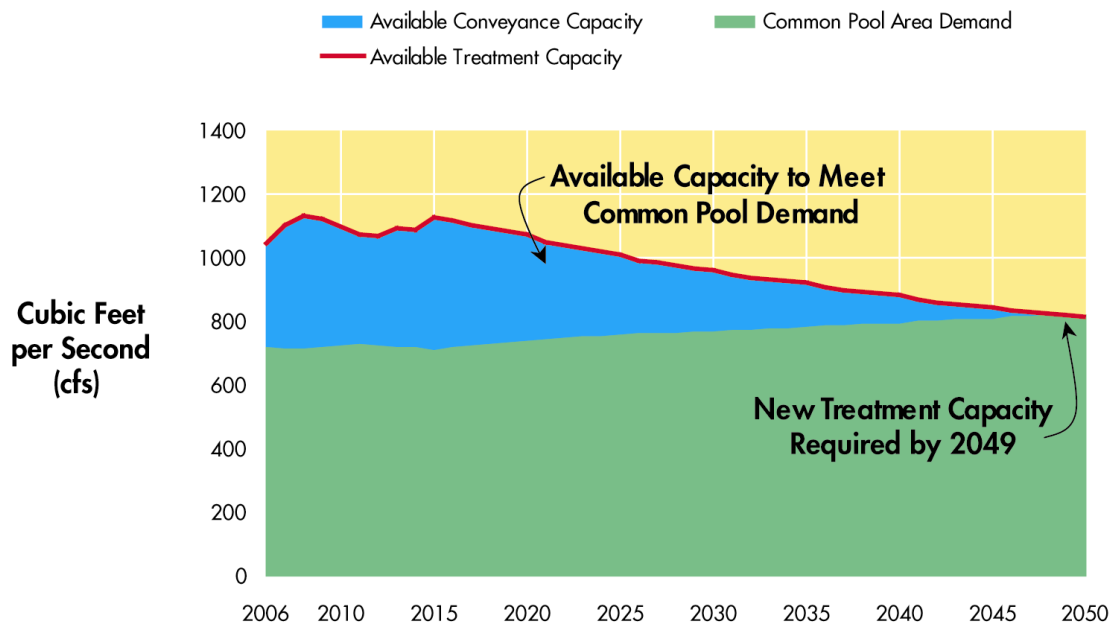
Figure 4-10 Common Pool Service Area

Demand. The maximum peak demands on Metropolitan in the Common Pool area shows a steady increase over the study period. The peak demands are projected to increase from 719 cfs in 2006, 764 cfs in 2030, and eventually increasing to 821 cfs in 2050, as shown in Figure 4-11.

Required New Treatment Capacity. New treatment facilities will be required when Metropolitan's future demand within the Common Pool area exceeds the available treatment capacity. Figure 4-11 shows the projected demands in the Common Pool area and the treatment capacity available from Jensen, Weymouth, and Diemer filtration plants. This available capacity is calculated for each treatment plant by subtracting the exclusive area demands served entirely by that plant from the plant treatment capacity. Any remaining treatment capacity from each plant is then available to the Common Pool, but is limited to the capacity of pipelines that convey treated water into the area. As the demand in the exclusive areas increases over time, the available treatment capacity in the Common Pool decreases. This explains the downward trends of the red line in the chart below.

As shown in Figure 4-11, there exists available treatment capacity to meet Common Pool demand through the near term with an estimated excess treatment capacity of almost 200 cfs in 2030. However, under continued trend, the analysis shows a potential shortfall and a possible need for additional treatment capacity to meet Common Pool demand by 2049.

Figure 4-11 Projected Common Pool Area Peak Water Demand



The additional treatment capacity to meet the need identified in this analysis may be developed at any point in the Central Pool region. New facilities may be developed to help meet exclusive area demands thereby increasing the ability of existing water filtration plants to meet demands in Common Pool. Development of additional local supplies may also be implemented to decrease total demand for imported supplies. Metropolitan will periodically revisit this analysis to ensure its ability to meet future needs in the Common Pool and to develop options for meeting projected shortfalls.

Riverside and San Diego Areas

Metropolitan's service area in Riverside and San Diego counties is illustrated in Figure 4-12. The region includes Eastern Municipal Water District (Eastern), Western Municipal Water District (Western), and the San Diego County Water Authority (SDCWA).

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 4-4.

Table 4-4
Facilities in the Riverside and San Diego Area

Water Treatment	Design Capacity (MGD)
Mills Filtration Plant	316
Skinner Filtration Plant	600
Treated Water Conveyance	**Design Capacity (CFS)**
San Diego Pipeline No. 1	85
San Diego Pipeline No. 2	95
San Diego Pipeline No. 4	475
Auld Valley Pipeline	340
Raw Water Conveyance	**Design Capacity (CFS)**
San Diego Canal	1,700
San Diego Pipeline No. 3	262
San Diego Pipeline No. 5	474
Local Water Treatment	**Available Capacity (MGD)**
Barger, Ramona MWD	5
Escondido-Vista, city of Escondido/Vista	62
Levy, Helix Water District	94
Weese, city of Oceanside	23
Berglund, city of Poway	24
Badger, San Dieguito Water District	38
Olivenhain, Olivenhain MWD	34
Perdue, Sweetwater Authority	28
Alvarado, San Diego	120
Miramar, San Diego	133
Otay, San Diego	30
Twin Oaks, SDCWA	100
Menifee, EMWD	7
Perris, EMWD	29
Corona, WMWD	34

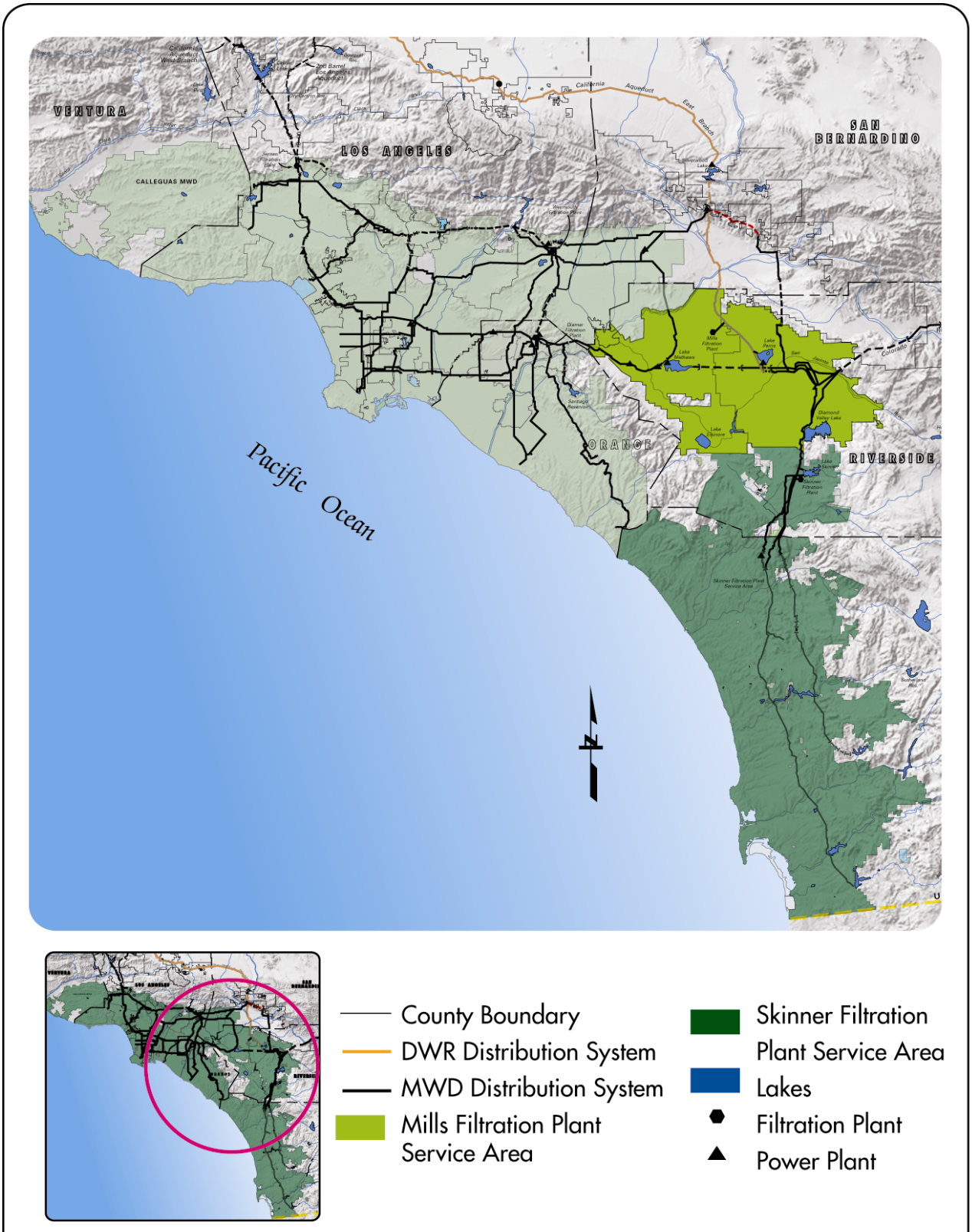


Figure 4-12 Riverside/San Diego Service Area

Metropolitan recently developed a conjunctive use program within the Riverside area in partnership with Western and Elsinore. This conjunctive use program will provide an additional 12,000 AF of storage and a contractual dry-year take of 4,000 AFY that will most likely be called during a high demand condition. The dry-year "take" effectively translates to a corresponding decrease in surface deliveries of Metropolitan imported supplies in meeting demand.

Mills Plant Service Area

The Henry J. Mills Water Filtration Plant (Mills Plant), located in the city of Riverside, provides treated water to the northern portion of Eastern MWD and Western MWD the service areas.

Existing Treatment Capacity. The Mills Plant has a design capacity of 316 MGD. Currently, the plant is utilizing the first of two ozone contactor modules, each rated at 160 MGD, as the plant's primary method of disinfection. Design and construction of the second contactor has been expedited to increase the plant's full treatment capacity during peak demands. Currently, the plant is limited to operating only Modules 3 and 4, with a combined capacity of 155 MGD. Treatment Modules 1 and 2 are scheduled for retrofit concurrent with the ozone expansion project, scheduled for completion prior to 2009. These improvements will enable full use of the plant's entire 316 MGD capacity.

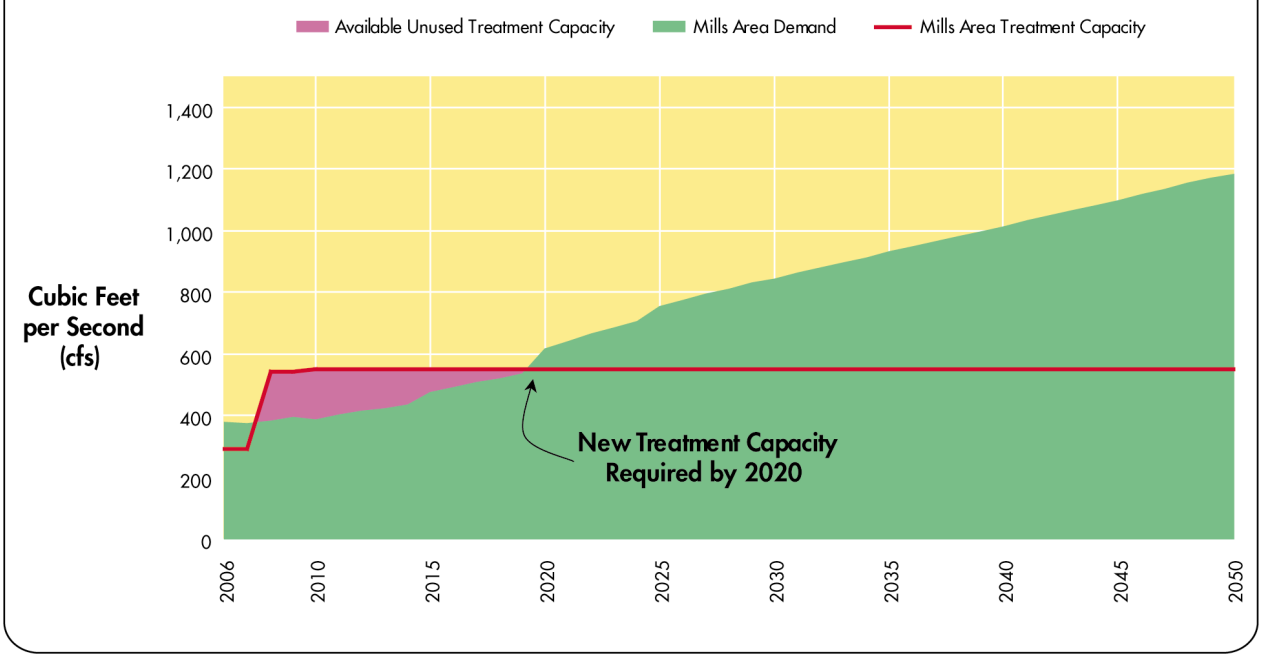
The city of Corona, within Western service area, operates two water treatment plants that treat Metropolitan untreated water: the Chase & Lester WTP and the Sierra Del Oro WTP, with rated capacities of 25 MGD and 9 MGD, respectively. This study incorporates the assumption that these facilities will be expanded for a total capacity of 39 MGD available in 2010.

Existing Conveyance Facilities. 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.

Conveyance Constraints. Treated water conveyance from the Mills plant to Eastern and Western is achieved through the EM-12 and WR-24 service connections, respectively, all located at the plant. Metropolitan's capacity to deliver water through EM-17 is 157 cfs but deliveries to Eastern have been limited to approximately 107 cfs due to conveyance constraints within its distribution system. The Perris Valley Pipeline, which is currently under construction, will provide conveyance from Mills plant to the Eastern and Western boundary just southwest of the March Air Reserve Base. The new pipeline will include two connections for Eastern and two connections for Western.

Demand. Future demand on the Mills plant is estimated by subtracting projected local supplies from the projected total Mills exclusive demand. Because a portion of Eastern's and Western's service areas can be met by either the Mills plant or Skinner plant, Metropolitan worked closely with both agencies to establish criteria for distributing forecasted peak demands between the Mills and Skinner plants throughout the planning horizon. The peak demands are projected to increase from 376 cfs in 2006, to 843 cfs in 2030, and up to 1,182 cfs in 2050, as shown in Figure 4-13.

Figure 4-13 Projected Mills Exclusive Area Peak Water Demand



Required New Treatment Capacity. New treatment facilities will be required when Metropolitan's future demand within the Mills exclusive area exceeds the available Mills plant capacity. As shown in Figure 4-13 above, additional treatment capacity will be needed in the Mills area by 2020. Under current demand projection, up to 633 cfs of additional treatment capacity will be needed by 2050.

Skinner Plant Service Area

The Robert A. Skinner Filtration Plant (Skinner Plant) is located adjacent to Lake Skinner in the city of Winchester. The Skinner Plant provides treated water to SDCWA and the southern portions of Eastern and Western in southern Riverside County.

Existing Treatment Capacity. The Skinner Plant is supplied with raw water from Lake Skinner and the San Diego Canal. The plant's effluent capacity recently increased from 495 MGD to 600 MGD with the construction of Module 7, which went online on June 2007.

Metropolitan supplements water supplied from local treatment facilities operating within the SDCWA and Eastern service areas. Currently, local treatment plants can supply nearly 630 MGD to meet treated water demands. SCDCWA and Eastern anticipate that local facility improvements will increase treatment capacity up to 905 MGD by 2030. Table 4-4 presents current capacities of local treatment plants.

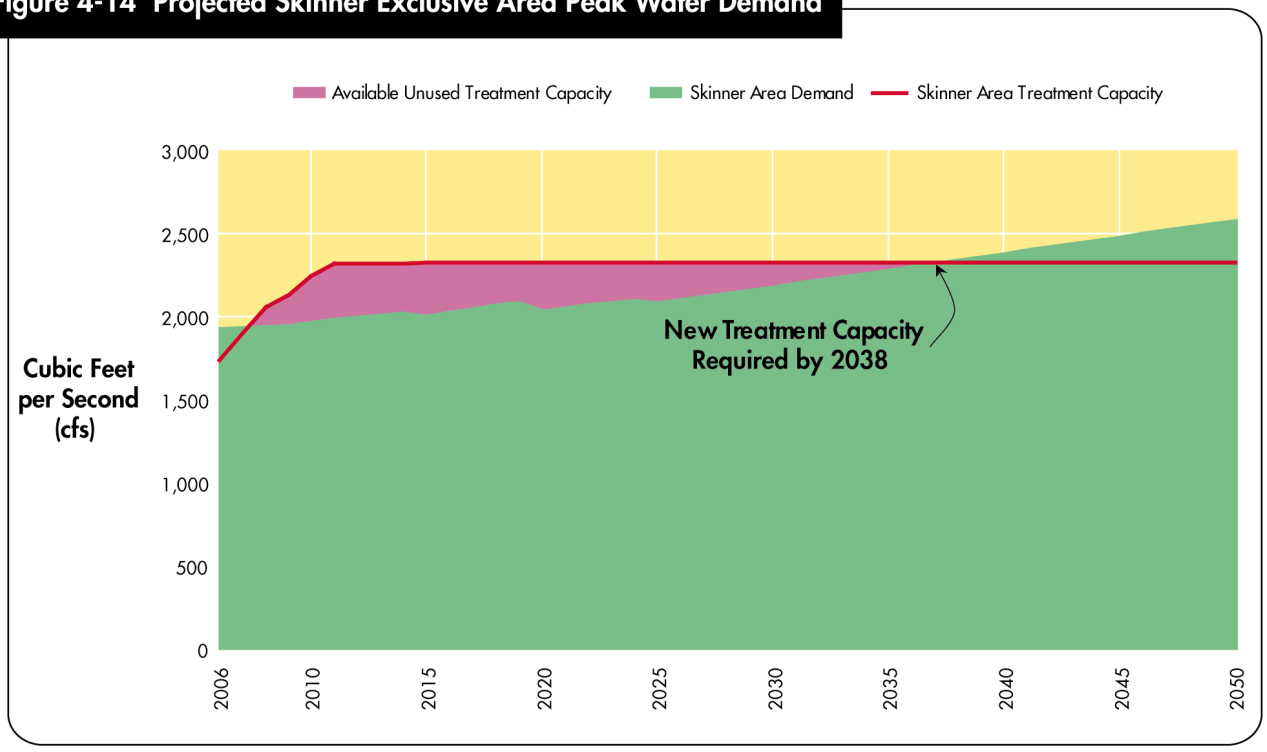
Existing Conveyance Facilities. Treated water from Skinner is conveyed through San Diego Pipeline Nos. 1, 2, and 4 to serve Eastern and Western just north of the county line and SDCWA south of the county line. In addition, raw water deliveries are conveyed to SDCWA through San Diego Pipeline Nos. 3 and 5.

Regional facility planning is influenced by SDCWA's ability to store and transport imported water throughout their distribution system. Local treatment plants meet a significant portion of the regional water demand. Prudent operation of local storage and conveyance facilities is required to ensure that sufficient supply is available to local treatment plants. SDCWA currently participates in storage programs with Metropolitan to ensure that adequate water is stored during off-peak months and available to supply local treatment plants during summer months.

Conveyance Constraints. Phase 1 of the San Diego Pipeline 3 Bypass, completed in 2003, provides Rancho California Water District (RCWD) of Eastern and Western with additional treated water capacity. Phase 2 of the bypass project will convert Pipeline 3 from raw water to treated water and will coincide with construction of raw water Pipeline 6. Metropolitan recently completed the north reach of Pipeline 6 to San Diego, which provides a new raw water connection to RCWD. These projects will ensure that sufficient conveyance capacity is available to meet future delivery requirements. San Diego's participation in this program will continue until 2008.

Demand. Future demand on the Skinner plant is estimated by subtracting projected local supplies from the projected Skinner exclusive demand. The Skinner exclusive area consists of the entire SDCWA service area and portions of the Eastern and Western service areas located in southern Riverside County. As discussed in the Mills Plant Service Area section, Metropolitan worked closely with both agencies to establish criteria for distributing forecasted peak demands between the Mills and Skinner plants. The peak demands are projected to increase from 1,934 cfs in 2006 to 2,182 cfs in 2030, and up to 2,579 cfs in 2050, as illustrated in Figure 4-14

Figure 4-14 Projected Skinner Exclusive Area Peak Water Demand



Required New Treatment Capacity. New treatment facilities will be required when Metropolitan's future demand within the Skinner exclusive area exceeds the available Skinner plant capacity. As shown previously in Figure 4-14, additional treatment capacity will be needed in the Skinner area by 2038. Under current demand projections, up to 251 cfs of additional treatment capacity will be needed by 2050.

Balance Operation of the Mills and Skinner Plants

Because portions of the Eastern and Western service areas can receive treated water from either the Mills plant or Skinner plant, an effort to balance the operation between the two plants during peak demand periods can offset the need for a treatment plant expansion or a new treatment facility. Under current operations, the Mills exclusive area and the Skinner exclusive area will require additional treatment capacity by 2020 and 2038, respectively. If Eastern and Western were able to utilize more Skinner plant capacity during peak demands, alleviating demand on the Mills plant, additional treatment capacity to the region would not be needed until 2026, as shown in the following Figures 4-15 and 4-16. Under current demand projection, up to 894 cfs of total additional treatment capacity will be required to meet demands in Riverside and San Diego area by 2050.

Figure 4-15 Projected Mills Exclusive Area Peak Water Demand Under Balanced Operation

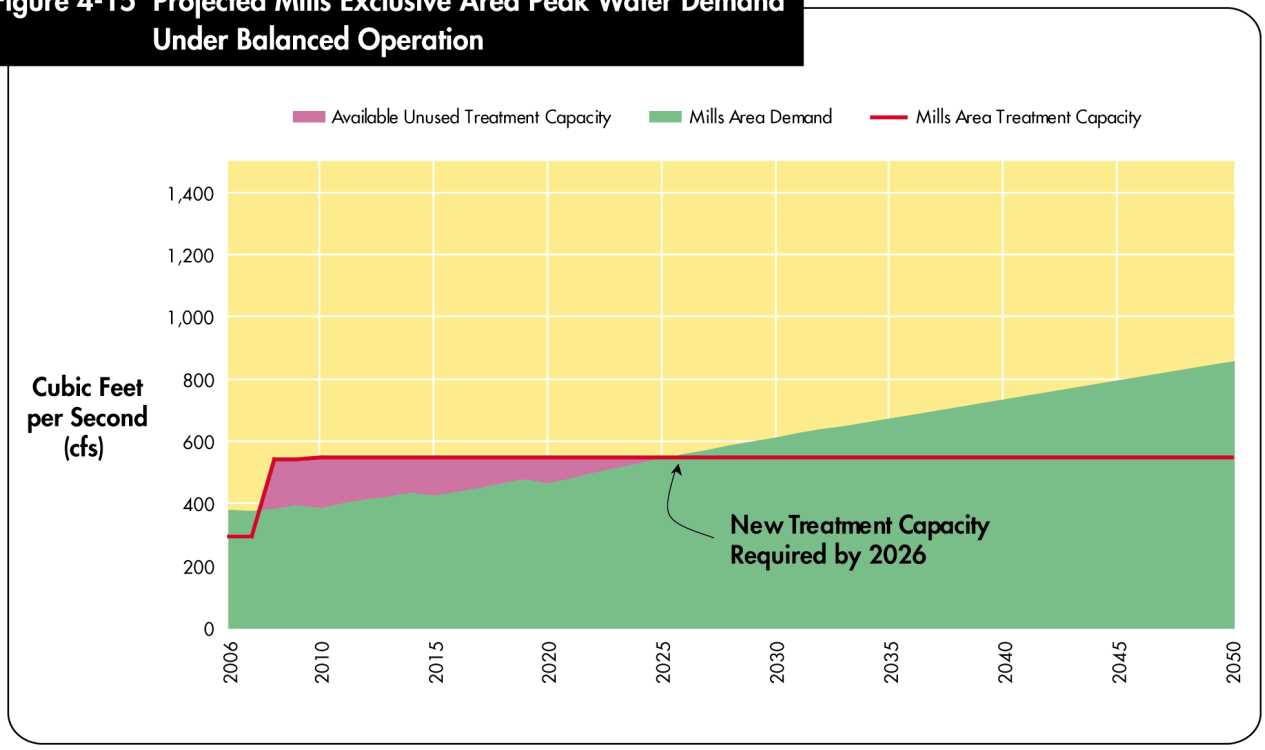
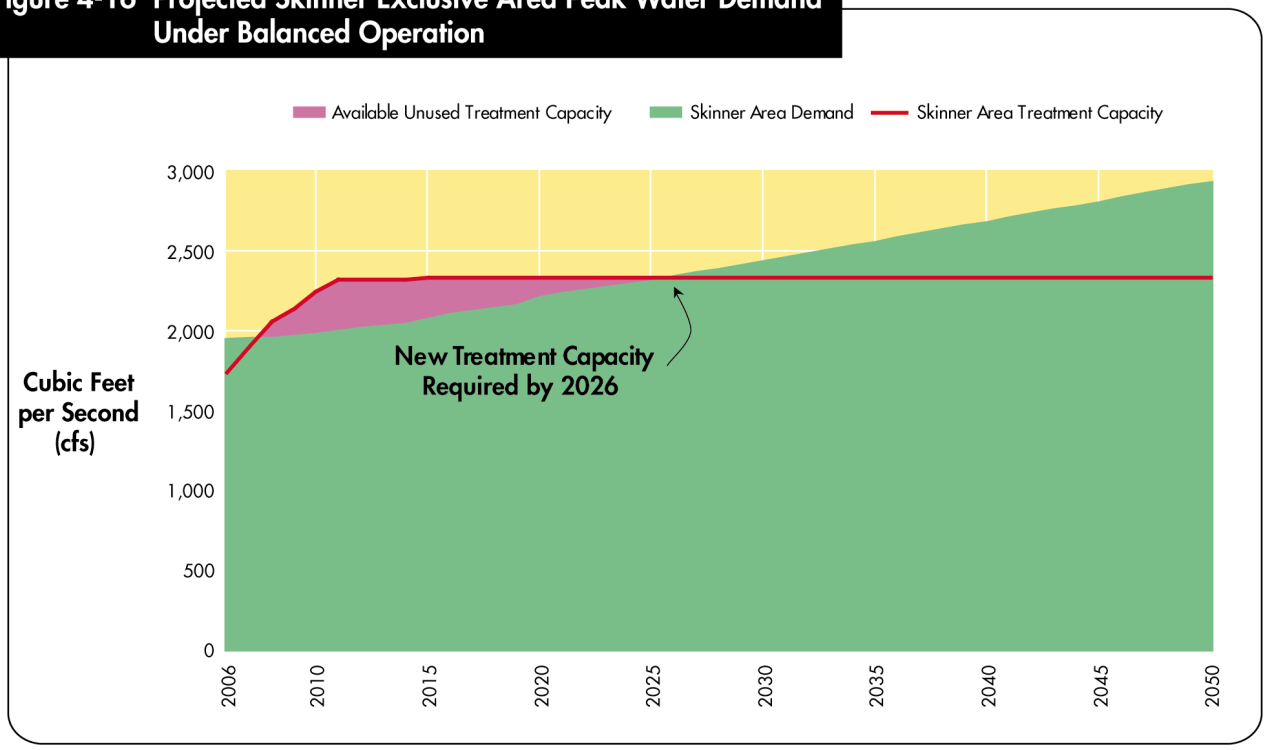


Figure 4-16 Projected Skinner Exclusive Area Peak Water Demand Under Balanced Operation



Balanced operation requires that Eastern, Western and Metropolitan establish an operating plan that will optimize the existing available treatment capacities of the Mills and Skinner plants in meeting demands within the southern Riverside area during peak demand periods. Facilitating a balanced operation will require operational commitments and possibly local conveyance improvements.

West Valley Area

The West Valley Area is a portion of the Jensen exclusive area that is located in the northwestern edge of Metropolitan's service area. The West Valley includes the areas served by Calleguas Municipal Water District and Las Virgenes Municipal Water District, as well as the western portion of San Fernando Valley served by the LADWP. Treated water is delivered to the area from Metropolitan's Jensen Plant and the Los Angeles Aqueduct Filtration Plant, which is owned and operated by LADWP. Figure 4-17 shows a location map of the West Valley area.

Calleguas serves an area of approximately 350 square miles in southern Ventura County and provides water to the cities of Oxnard, Camarillo, Thousand Oaks, Simi Valley, Moorpark, Port Hueneme, and the unincorporated areas of Oak Park, Santa Rosa Valley, Bell Canyon, Lake Sherwood, Somis, Camarillo Estates and Camarillo Heights. Metropolitan provides most of Calleguas' total water supply, delivering SWP water from the Jensen Plant through the West Valley Feeder #2 through service connection CA-02. From CA-02, Calleguas conveys the water through their internal distribution system, which includes 130 miles of large-diameter pipelines to local water agencies for delivery to area water users. Rapid population and economic growth have placed additional demands on Calleguas, resulting in an increase in annual deliveries.

Las Virgenes provides potable water, wastewater treatment, recycled water and biosolids composting for over 65,000 residents and industrial customers in the cities of Agoura Hills, Calabasas, Hidden Hills, Westlake Village and unincorporated areas of western Los Angeles County. Because local supplies are scarce and are of poor quality, Metropolitan provides Las Virgenes all of its potable water. Metropolitan delivers water to Las Virgenes from the Jensen Plant through the West Valley Feeder #2 and the Calabasas Feeder. Metropolitan deliveries amount to approximately 80 percent of Las Virgenes' total water supply and 20% made up of locally produced recycled water. With only one source of drinking water, local storage is critical for Las Virgenes. The 10,000 acre-foot Las Virgenes Reservoir, completed in 1972, stores enough treated water to serve all of Las Virgenes' customers for up to six months. Because the water stored is open to the environment, additional treatment at Las Virgenes' Westlake Filtration Plant is required before it is served to customers.

LADWP purchases water from Metropolitan to supplement its supplies from the Los Angeles Aqueduct, local groundwater, and recycled water. On average, Metropolitan provides approximately 35 percent of the LADWP's water supply to the West Valley Area. Metropolitan supplies LADWP's West Valley service area with treated water from the Jensen Plant and untreated supplies from the State Water Project.

Existing Treatment Capacity. Metropolitan meets treated water demand in the West Valley Area water from the Jensen Plant, which has an effective effluent treatment capacity of 1,105 cfs. The Jensen Plant is supplied, via the Foothill Feeder, with SWP water stored in Castaic Lake. In addition to the Jensen Plant, LADWP also operates the LAAFP to meet the demands of its service area. The LAAFP treats water from the Los Angeles Aqueduct and SWP water delivered through Metropolitan service connection LA-35.

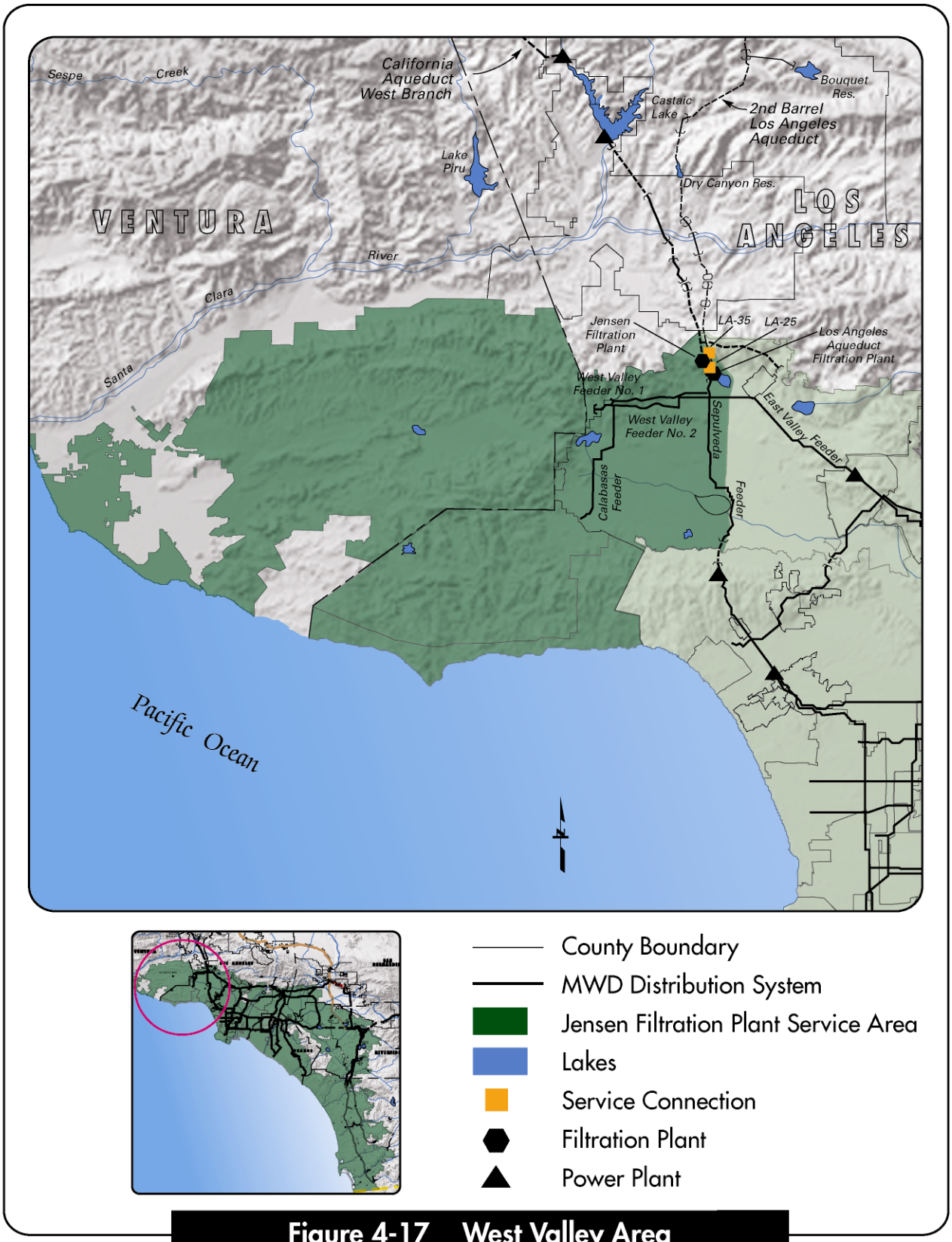


Figure 4-17 West Valley Area

Existing Conveyance Capacity. Metropolitan treated water from the Jensen Plant is delivered to the West Valley area, specifically Calleguas and Las Virgenes. Figure 4-18 shows a detailed schematic of the West Valley Area System.

Metropolitan's West Valley Feeder No. 1 connects to the Sepulveda Feeder in Granada Hills, and terminates at Calleguas' Santa Susanna Tunnel in Chatsworth, approximately 8.25 miles to the west. The feeder is 54-inch diameter, except for the first 2,500 feet of pipeline that is 48-inch diameter. The West Valley Feeder #1 is currently leased to LADWP, which allows delivery of treated water from the LAAFP and Metropolitan service connection LA-25. LADWP also maintains a network of large distribution pipelines to meet demands in the western San Fernando Valley.

Metropolitan's West Valley Feeder No. 2 (WVF#2) also connects to the Sepulveda Feeder in Granada Hills. The feeder terminates at the Calleguas flow control facility, at this same location as West Valley Feeder No.1. The WVF#2 is approximately 8.5 miles long. The feeder begins as a 102-inch diameter pipeline at the connection with the Sepulveda Feeder and reduces in diameter near Station 312+75 to 96-inches. The feeder supplies three service connections, LA-33, LV-03, and CA-02. LA-33 is not normally used, but is rated at 75 cfs. LV-03 is used infrequently and is rated at 4 cfs. CA-02 is normally in service and is the largest service connection, rated at 300 cfs. [LV-01 and CA-01 are on the WVF#1 but supplied by WVF#2.]

The Calabasas Feeder connects to WVF#2 in Chatsworth and terminates in Calabasas where it supplies Las Virgenes. The feeder is 54-inch in diameter and approximately 10 miles in length. The feeder currently serves only Las Virgenes through service connection LV-02. The Metropolitan facilities in the West Valley area are summarized in Table 4-5.

Conveyance Constraints. Because WVF#1 is leased to LADWP, the supply conveyed through WVF#2 and the supply from the North Las Posas (NLP) conjunctive use storage project are Calleguas' only supplies of imported water to its service area. The constraints in delivering water to meet demand in the West Valley area is mainly defined by limitations in the West Valley Feeder #2 and the service connections along this feeder. As a result of the flow tests performed on August 2004, Metropolitan determined that higher flows are achievable while maintaining safe operating conditions on WVF#2. Metropolitan will operate the WVF#2 up to 390 cfs as needed to maintain operational flexibility within the distribution system. Pipe velocities for this flow are well within Metropolitan's hydraulic design criteria.

The operational concern for Calleguas has been the ability to achieve the rated design capacity at service connection CA-02. Since supplies to Las Virgenes service connection LV-01 are currently delivered through CA-02, delivery to Calleguas at the rated design capacity of 300 cfs is not achieved. Several alternatives for system improvements have been presented in the draft West Valley Area Study (June 2007). It is assumed under this IAS analysis that a successful modification of the system will be implemented in the near term to allow delivery of required capacities at both CA-02 and LV-01.

Table 4-5
Metropolitan Facilities in West Valley Area

Metropolitan Facilities	Location	Design Capacity	Service Connections	Comments
Foothill Feeder	From Castaic Lake to Magazine Canyon Shaft	2,000 cfs (approx.)	Interconnection with city of L.A.'s 1st Aqueduct	Raw water supply @ 20.5 ft diameter
Foothill Feeder	From Magazine Canyon Shaft to Jensen Treatment Plant	1,500 cfs	LA-35 700-cfs	Raw water supply @ 14 ft diameter
Joseph Jensen Treatment Plant	On the Sepulveda Feeder, near the terminus of the Foothill Feeder, in Granada Hills	750 MGD (1,160 cfs)	LA-25 500-cfs	LA-25 treated at Jensen Plant effluent
West Valley Feeder #1	From Sepulveda Feeder in Granada Hills to Santa Susana Tunnel in Chatsworth	100 cfs	LV-01 25-cfs CA-01 90-cfs CA-03 2-cfs	8.25 miles @ 48 & 54-in diameter. A section currently leased to city of L.A.
West Valley Feeder #2	From Sepulveda Feeder in Granada Hills to Santa Susana Tunnel in Chatsworth	300 cfs	CA-02 300-cfs LV-03 4-cfs LA-33 75-cfs	8.5 miles @ 96 & 102-in diameter
Calabasas Feeder	From West Valley Feeder #2 in Chatsworth to LV-02 in Calabasas.	105 cfs	LV-02 75-cfs	10 miles @ 54-in diameter

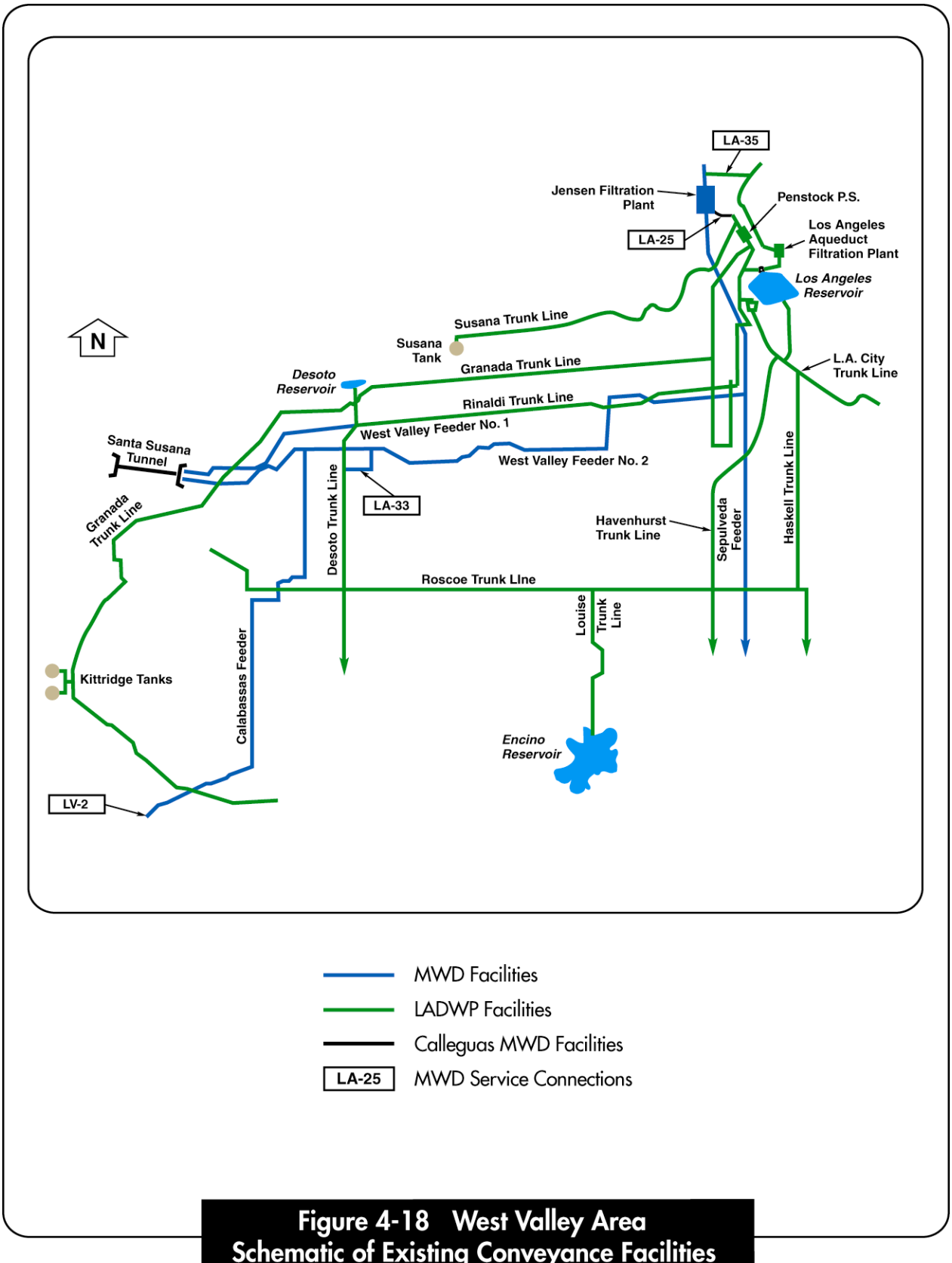


Figure 4-18 West Valley Area
Schematic of Existing Conveyance Facilities

Demand. Metropolitan supplies to the West Valley area during peak periods are comprised mainly of deliveries to meet demands for Calleguas and Las Virgenes. Metropolitan deliveries to Los Angeles are predominantly untreated water through service connection LA-35 to feed the LAAWTP or treated water deliveries during off peak periods to augment deliveries to its service area during periods when the local treatment plant is out for maintenance service.

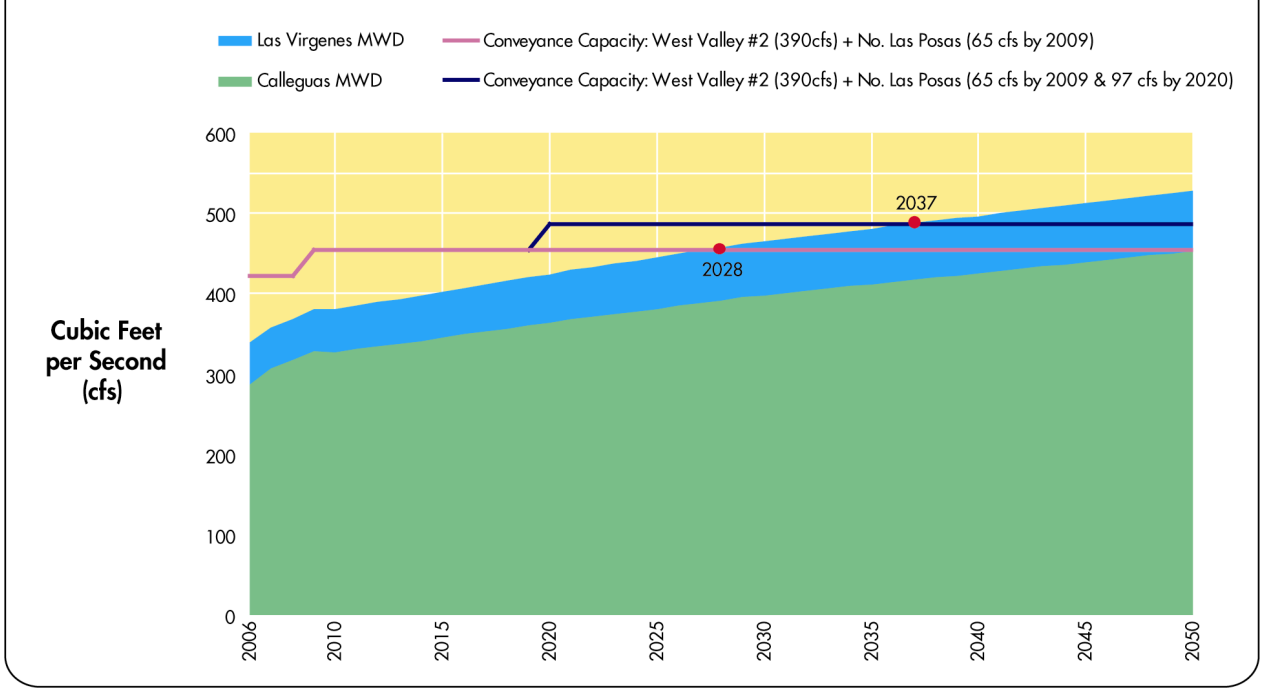
In 2000, a service connection through Las Virgenes to West Basin Municipal Water District was conceptualized to bring the Malibu area into the Jensen service area. This concept was carried through to the planning level by West Basin and LA County Water Works District 29 but was never constructed. Recent communications with West Basin reveals that future demand in the Malibu area will be met through modifications of current West Basin service connection off of Sepulveda Feeder.

Peak demands in the West Valley area is reduced by the amount of groundwater produced from the existing conjunctive use storage. Under the North Las Posas Conjunctive Use Program, Metropolitan contracted with Calleguas to store up to 210,000 acre-feet of imported water supplies in the groundwater basin. Metropolitan has the ability to extract any previously stored supplies during dry, drought, and emergency periods. Extraction from the conjunctive use account during high demand periods effectively decreases the surface delivery of imported supplies and delays the need to augment facilities required to deliver imported water. Under the current program, Phases 1 and 2 groundwater extraction facilities have been completed to pump 65 cfs. Calleguas is currently constructing the Moorpark pump station to allow delivery of water pumped under Phases 1 and 2 to meet demands within their service area. The pump station is scheduled for completion in 2009. In addition, Phase 3 of the conjunctive use program is scheduled to come online by year 2020. This final phase of the conjunctive use program will further increase the total pumping capacity to 97 cfs.

The maximum total peak demands on Metropolitan in the West Valley area are projected to range from approximately 339 cfs in 2006 to 464 cfs in 2030, and ultimately to 527 cfs at 2050, as shown in Figure 4-19. Since the available conveyance capacity of the West Valley Feeder #2 is 390 cfs and full build out of the North Las Posas conjunctive use program allows for a groundwater extraction of up to 97 cfs, there exists available conveyance capacity to deliver West Valley area demands until the year 2037. Beyond 2037 there will be a need for additional conveyance capacity to meet demands in the West Valley area. At the end of the model simulation at 2050, it is projected that there will be a need for an additional 41 cfs of conveyance capacity. If only Phases 1 and 2 of the conjunctive use program are considered, additional capacity will be required by 2028, with a shortfall of 72 cfs by 2050.

Required New Facilities. New conveyance facilities will be required when Metropolitan's future demand within the West Valley area exceeds the current conveyance capacity. As shown in Figure 4-19 below, additional conveyance capacity will be needed in the West Valley area by 2037 assuming full build out of the North Las Posas Conjunctive Use Program. At the end of the study period at 2050, an estimated 41 cfs of additional treatment capacity may need to be developed to meet projected demands.

Figure 4-19 Projected West Valley Area Peak Water Demand



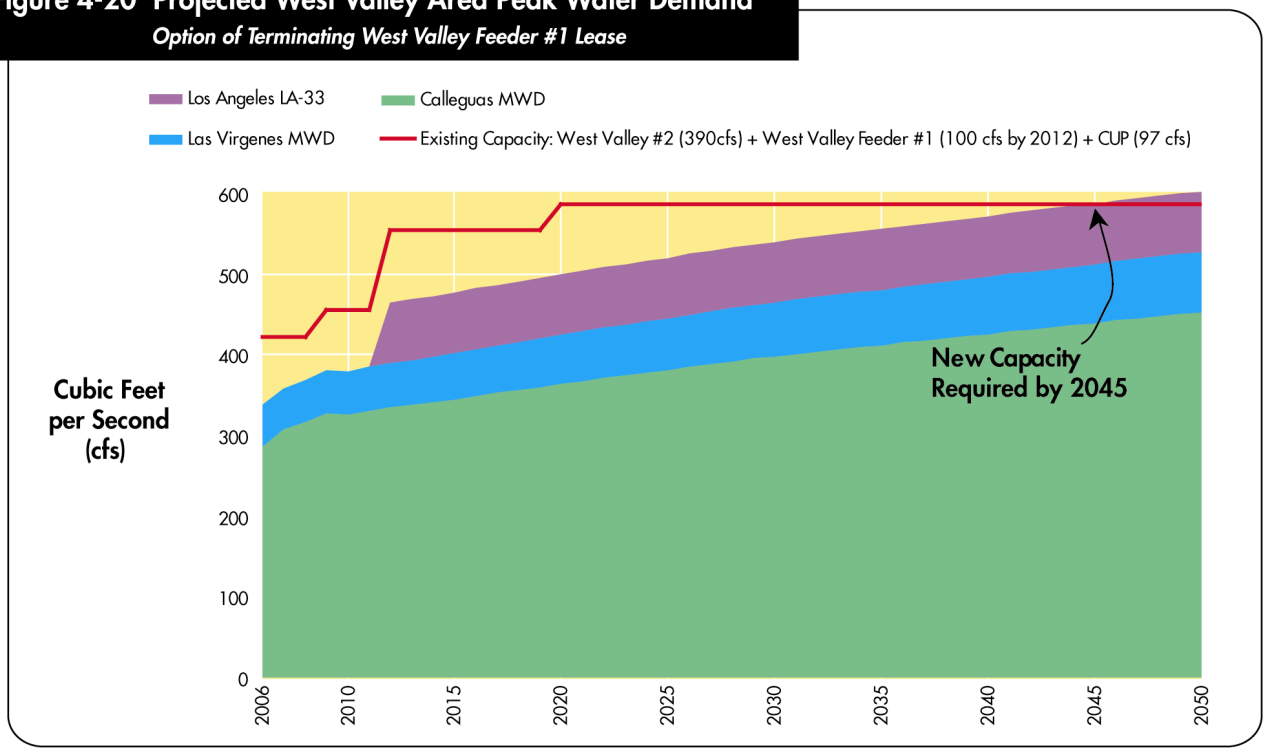
West Valley Feeder #1 Lease Issues. Metropolitan currently leases the WVF#1 to LADWP in accordance with the 1977 *"Agreement No. 10122 First Amendment to Agreement for Lease of District Pipeline."* LADWP operates WVF#1 to supply approximately 100 cfs of treated water from its LAAFP or from service connection LA-25 to the western San Fernando Valley portion of its service area. Under the lease agreement, in the event of an emergency resulting in interruption of service of WVF#2, LADWP is obligated to maintain and operate the feeder and to provide 60 cfs average daily flow to serve Las Virgenes and Calleguas. In exchange, Metropolitan is obligated to make available an equivalent amount of water to LADWP at service connections designated by them. This lease is in effect until 2012 unless either party gives notice to terminate. Five-year notice is required to terminate the agreement earlier than 2012. At the end of its term, both parties can agree to extend the agreement. When Metropolitan and LADWP entered into the lease, Metropolitan expected that the city of L.A. would resolve its distribution capacity issues in the West Valley Area by 2012 and would no longer require use of WVF#1. However, recent meetings with LADWP revealed their preference to maintain the lease on WVF#1 through the current contract term and possible renewal after 2012. In addition, LADWP indicated that if the lease were not renewed, it would place an equivalent demand on a different Metropolitan service connection along WVF#2.

Option of terminating West Valley Feeder #1 Lease. The option of terminating lease and assuming operations of the West Valley Feeder #1 could present Metropolitan additional flexibility for delivering water to Calleguas and Las Virgenes. Projected West Valley peak demands for Metropolitan supplies are expected to continue to increase, as shown in the Figure 4-20.

Utilizing WVF#1 capacity would augment current capacity to deliver Metropolitan supplies to Calleguas and Las Virgenes. However, termination of lease would also result in increase in demand from Los Angeles for an additional 100 cfs delivery from the Jensen Plant.

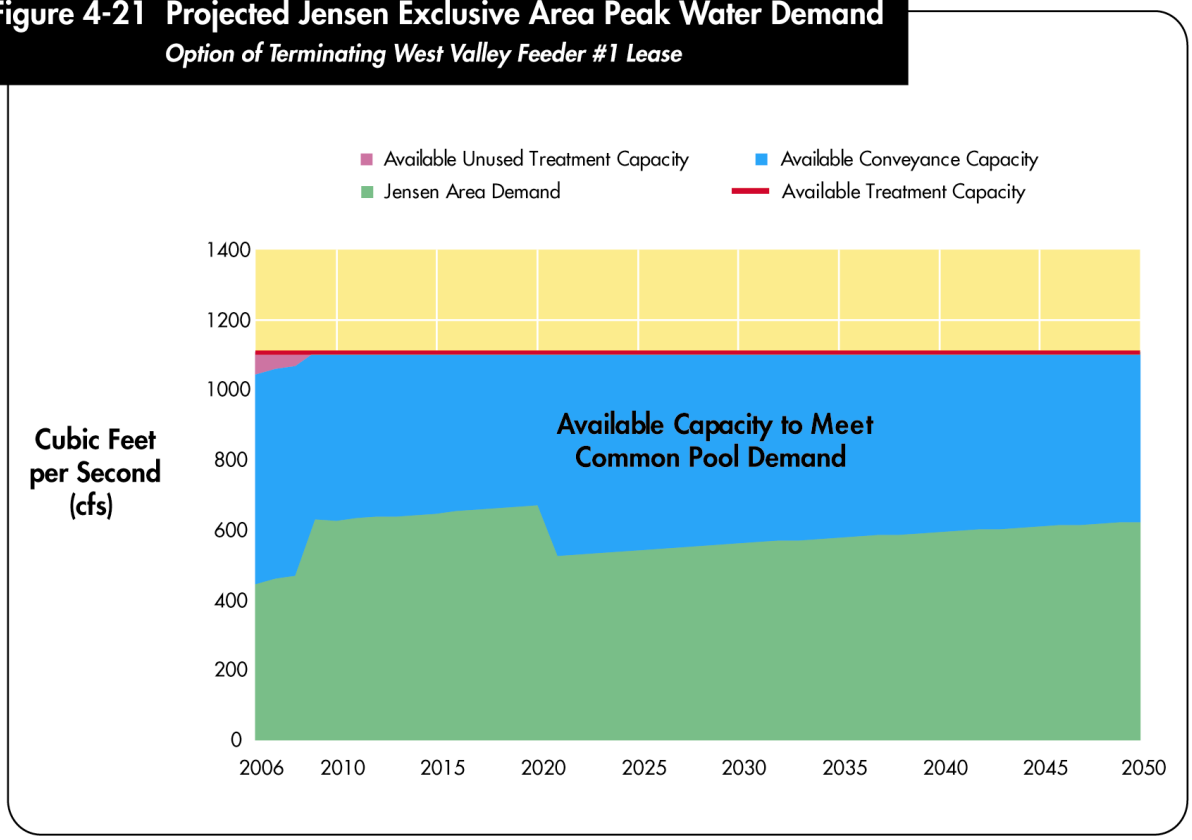
Possible shift in LADWP demand to WVF#2 upon termination of WVF#1 lease would mostly be met through deliveries at LA-33. The analysis presented below assumes that the 100 cfs Los Angeles demand would be met by delivering 75 cfs through service connection LA-33 and 25 cfs through either LA-25 off the finished water reservoir at Jensen or through additional untreated water deliveries at LA-35. Figure 4-20 shows the additional demand from LADWP and the conveyance capacity that could be gained with Metropolitan operating WVF#1. Under this scenario, the need for additional facilities to deliver imported supplies to the West Valley area would be pushed back from 2037 to 2045. Incorporating the WV#1 back to the Metropolitan system would delay the need for additional conveyance facilities in the West Valley area. The additional conveyance capacity that could be gained from taking back operation of WVF#1 would satisfy the "at or near boundary" obligation for delivering Metropolitan water to member agencies. However, this increase in flexibility to deliver to Calleguas would require Calleguas to improve the Santa Susana Tunnel and local pipelines to be able to take additional deliveries from Metropolitan through existing service connections CA-01 and CA-02 off of the WVF#1 and WVF#2.

Figure 4-20 Projected West Valley Area Peak Water Demand
Option of Terminating West Valley Feeder #1 Lease



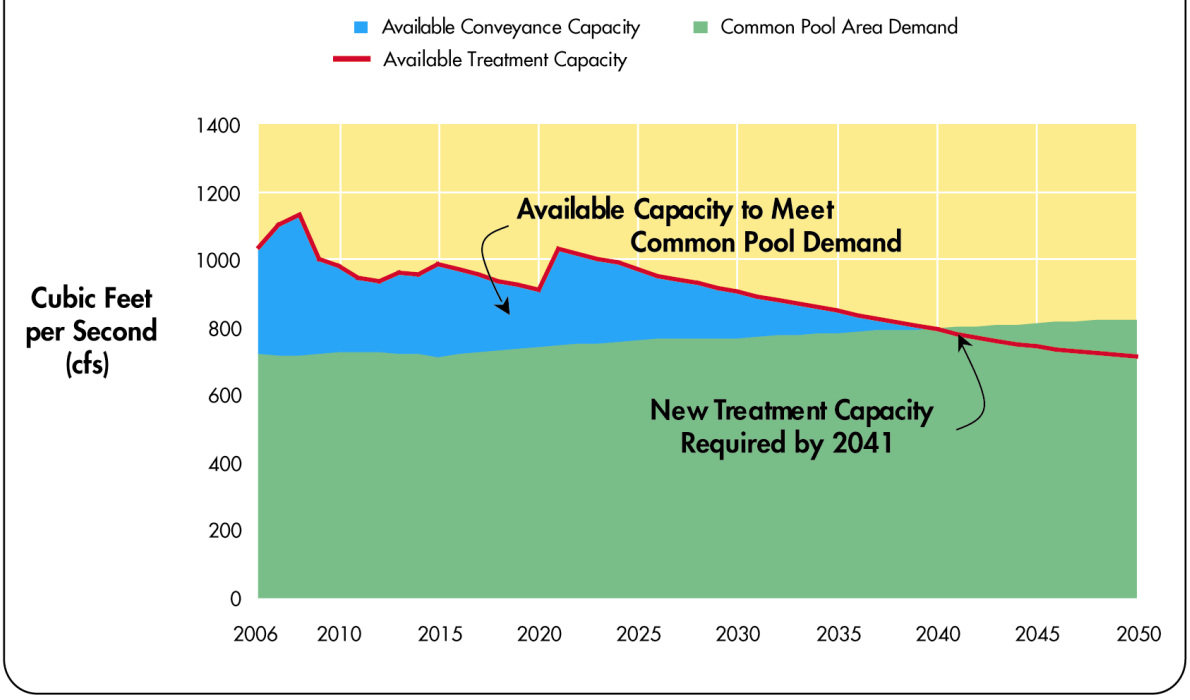
Effects on CPA Timing. The increase in Los Angeles demand upon WVF#1 lease termination will result in higher utilization of the Jensen Plant. There currently exists unused capacity in the plant to meet this additional demand. However, as the demand in the Jensen exclusive area increases over time, higher utilization of Jensen Plant for its exclusive needs would result in less treatment capacity available to meet Common Pool demand. In addition, LADWP informed Metropolitan of additional deliveries they may require from the Jensen Plant during the construction of a local reservoir cover. The delivery of up to 150 cfs during peak periods may be required off Sepulveda Feeder to augment LADWP water supply. . This would constitute a further increase in Jensen exclusive area demand. Currently, there exists enough treatment capacity in the Jensen Plant to meet these additional demands. No additional treatment facility in the Jensen exclusive area will be required. However, since there would be a higher utilization of Jensen Plant to meet an exclusive area demand, decreased amount of Jensen treated water would be available to meet demands in the Common Pool, as shown in Figure 4-21.

Figure 4-21 Projected Jensen Exclusive Area Peak Water Demand
Option of Terminating West Valley Feeder #1 Lease



With less treated water available from the Jensen plant, the timing for additional treatment facility in the Central Pool area would be moved forward by eight years from 2049 as shown in Figure 4-11 to 2041, as shown in Figure 4-22. At the end of the study period at 2050, over 100 cfs of additional treatment capacity may need to be developed to meet projected demands.

Figure 4-22 Projected Common Pool Area Peak Water Demand
Option of Terminating West Valley Feeder #1 Lease



Los Angeles Demands. The additional demands from LADWP arising from either the termination of WVF#1 lease or construction of a reservoir cover may be minimized with additional coordination. However, any increase demands from LADWP on the Jensen plant that translates to decrease in treatment capacity available to meet Common Pool demand will cause the timing for additional facility needs in the Central Pool area to move forward. Metropolitan will continue to coordinate with LADWP and the rest of West Valley agencies in developing an economic analysis for the different lease options. In the interim, extension of the WVF#1 lease to LADWP is anticipated as a near-term action item.

Calleguas Future Peak Demands. One of the main goals of Calleguas is to maintain its demand on Metropolitan supplies to within 300 cfs in order for CA-02 to accommodate total delivery of required imported supplies. Calleguas is actively coordinating the efforts within its service area to minimize increases in future peak demands to avoid requiring modifications of the Santa Susana Tunnel and its internal distribution system. Calleguas is looking at possible increases in development of local supplies and local resource projects to offset future increase in demands. In addition, Metropolitan will work with Calleguas should they choose to store additional groundwater in the North Las Posas basin to utilize the peaking option in their existing 90,000 AF storage account with the groundwater basin manager.

San Bernardino Service Area

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 23.

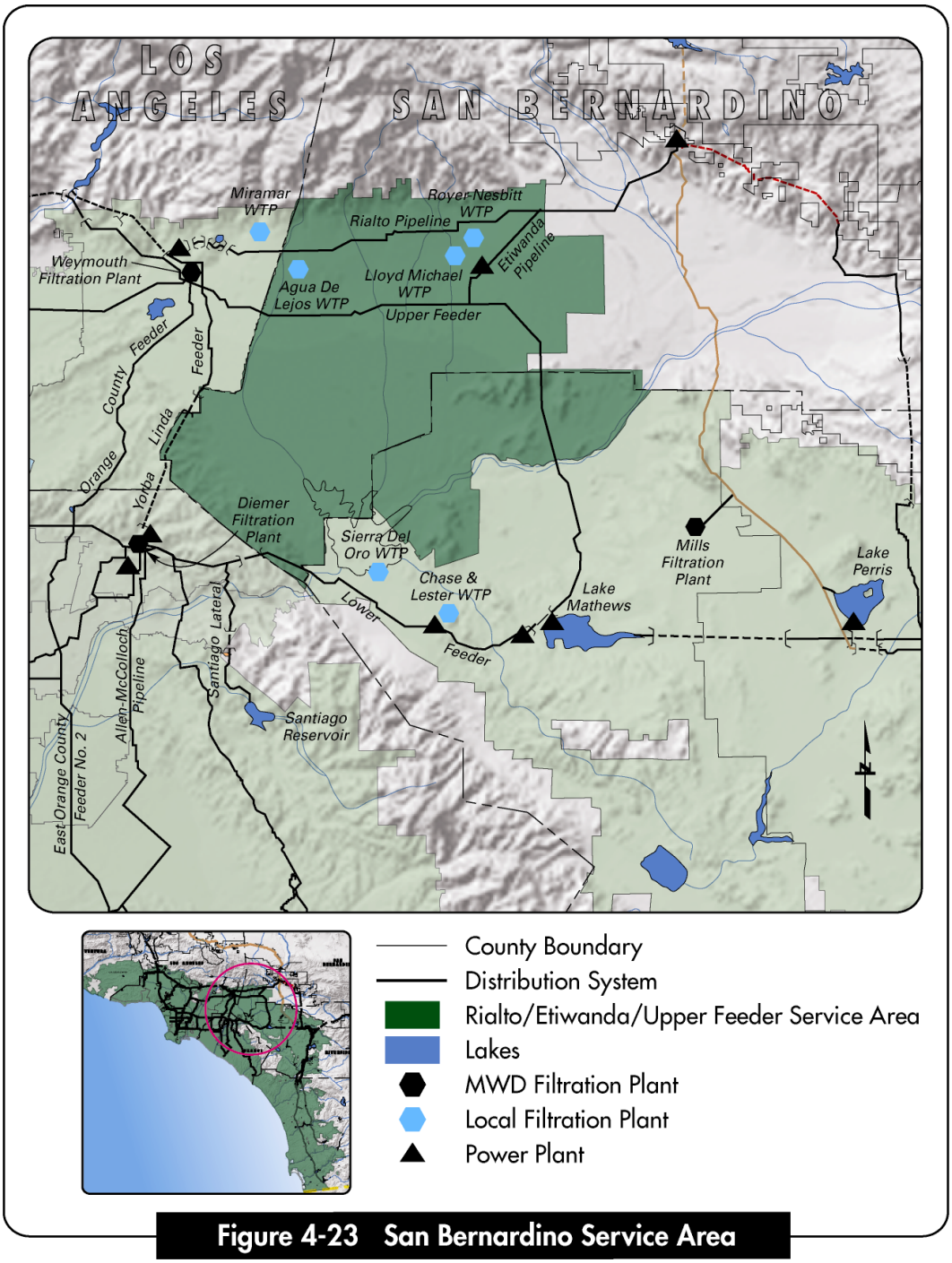


Figure 4-23 San Bernardino Service Area

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 4-6.

Table 4-6
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 Etiwanda Pipeline has demonstrated that Metropolitan can deliver more than 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.

System Demands. Forecasted demands in the exclusive areas and Common Pool were used to determine the influent flow requirements at Weymouth and Diemer treatment plants. Available capacity from the Rialto Pipeline, Upper Feeder, and Lower Feeder were evaluated to determine if sufficient conveyance capacity existed to supply the treatment plants.

Water deliveries through the Rialto/Etiwanda/Upper Feeder system serve portions of Inland Empire Utilities Agency, Western, and Three Valleys municipal water districts, as well as Metropolitan's Weymouth and Diemer filtration plants. The projected dry year untreated peak demands for the member agencies and the regional treatment plants served by the Rialto/Etiwanda/Upper Feeder system over the planning horizon ending 2030 are summarized in Table 4-7

Table 4-7
Projected Peak Demands on Metropolitan's Rialto/Etiwanda/Upper Feeder System (cfs)

Rialto/Etiwanda/ Upper Feeder Service Subarea	Peak Daily Demand					
	2006	2010	2015	2020	2025	2030
Inland Empire Utilities Agency (IEUA)	359	259	274	319	368	430
Three Valleys MWD	38	38	38	38	38	38
Western MWD	0	0	0	0	0	0
Available Conveyance to Weymouth	1057	1157	1142	1097	1048	986
Required at Weymouth	545	564	578	623	664	692
Available Conveyance to Diemer	1103	1186	1134	1045	954	863
Required at Diemer	661	585	532	567	611	639

IEUA's firm peak demands gradually increase over the planning horizon. The maximum peak demands in the Weymouth exclusive area, including demands in the Los Angeles Central city area, show a steady increase over the study period. Projected peak demand for the Diemer exclusive area varies as a function of local groundwater use and development of other local resource projects in the area.

Along the Rialto Pipeline, the projected peak demand for Metropolitan raw water to supply the Three Valleys MWD's Miramar Water Facility remains constant at its rated capacity of 38 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. For the Lower Feeder system, deliveries to Anaheim-Lenain are assumed to remain constant at its rated capacity of 23 cfs while deliveries to the Corona WTP are assumed to increase from 41 cfs to 62 cfs by 2011. The rest of the conveyance capacities are then available to meet demands in the Weymouth and Diemer plants.

System Needs. The analysis assumes that the Weymouth and Diemer treatment plants would be operating at flows required to meet peak demands in the exclusive areas and Common Pool. Under this assumption, the system of conveyance comprising of Rialto Pipeline, Upper and Lower Feeders will have enough conveyance capacity to deliver raw water during the short-term planning horizon ending 2030.

An expansion of the planning horizon to 2050 was considered to better understand the long-term limitations of the distribution system. As shown in Figure 4-24, the conveyance capacities are sufficient in meeting future Weymouth treatment plant demands through 2050.

For the Diemer plant however, the required influent flow to meet peak demands are projected to exceed existing conveyance capacity on the Rialto/Upper Feeder system by 2041, shown in Figure 4-25. Additional conveyance capacity of approximately 200 cfs may be required by 2050 to meet required flow at the Diemer plant. Future facility needs may be offset by storage along the distribution system that will reduce peaking demands.

Figure 4-24 Analysis of Rialto/Etiwanda/Upper Feeder Conveyance Capacity to meet Required Weymouth Plant Flow

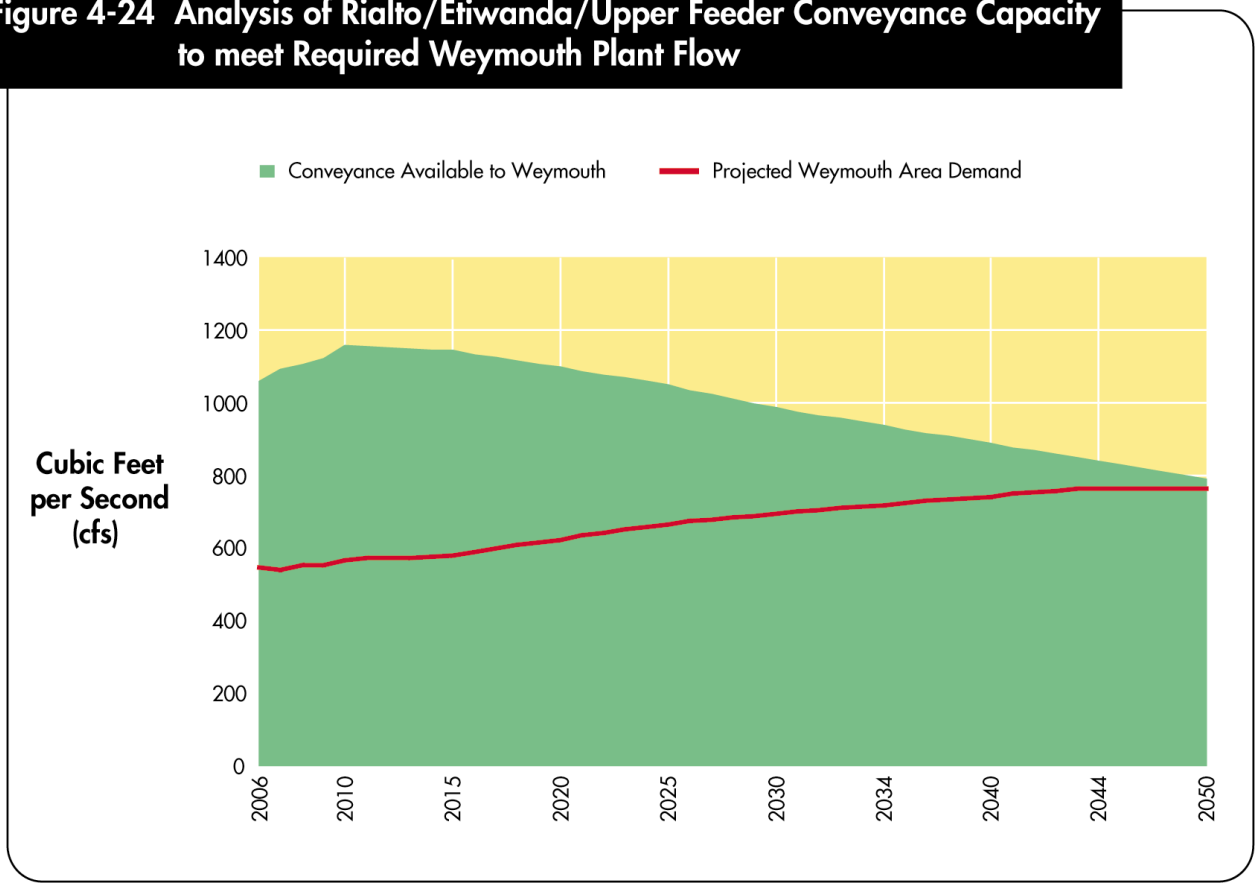
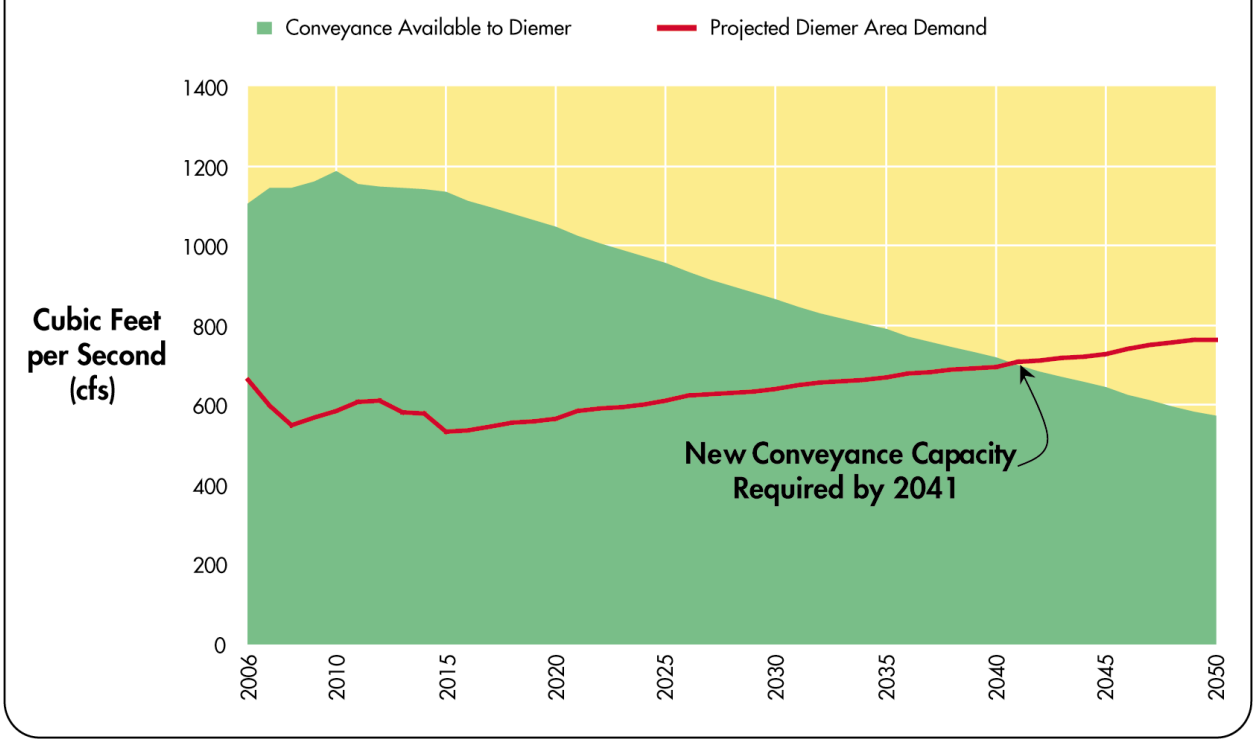


Figure 4-25 Analysis of Rialto/Etiwanda/Upper Feeder Conveyance Capacity to meet Required Diemer Plant Flow



DEVELOPMENT OF PROJECT PORTFOLIOS

5

While the previous section of this study identified potential facility needs to meet future peak demand, this section focuses on the process involved in developing and evaluating alternative project portfolios. CDM, Metropolitan's consultant, facilitated the development of the evaluation criteria and performed the analysis of individual projects and composite portfolios which are detailed in this section.

OVERALL APPROACH

Metropolitan and its member agencies crafted a process for developing and evaluating project portfolios capable of meeting facility needs identified for each planning region. While the overall evaluation process could be applied to each region, specific criteria were developed for the Riverside and San Diego portion of Metropolitan's service area because it is the only region identified with a significant system capacity shortfall in the 2050 planning period.

The IAS process for developing preferred facilities portfolios includes six steps:

- Identify the gap in system capacity needs for the planning period
- Define planning objectives and associated performance measures that will be used to compare.
- Identify local and regional (Metropolitan) projects that could help fill the gap in system capacity needs
- Combine individual local and/or regional projects into several complete portfolios
- Evaluate portfolios against a set of mutually agreed-upon objectives and relative performance
- Seek consensus on results and explore scenarios for implementation and present to the Metropolitan Board of Directors

The process and results specific to the Riverside and San Diego area are described on the following pages. Additional reference material has been provided in Appendix 14, including:

- A detailed description on the multi-variable rating technique and Criterium Decision Plus software utilized by CDM for this effort
- Summary tables providing performance data for individual projects
- Additional data and diagrams shared in IAS project workshops (e.g. project descriptions, scoring notes, project evaluations), etc.

PROCESS SUMMARY AND RESULTS

1. Identify the Gap in System Capacity (Gap Analysis)

As discussed in Section 4 of the report, Metropolitan identified a need for additional system capacity in the Riverside and San Diego areas given the projected demand for imported supplies. Assuming optimized operation of the Mills and Skinner water treatment plants, the results of the gap analysis indicated that the following additional system capacity would be needed to meet the demands in the Riverside and San Diego areas:

Year	Needed Peak Day System Capacity (cfs)
2030	154
2035	339
2040	523
2045	708
2050	894

2. Define Planning Objectives and Performance Measures

During several facilitated workshops, member agency representatives and Metropolitan staff discussed what objectives were important to consider in the evaluation of project portfolios and how project performance could be measured against these objectives.

Planning objectives defined. Planning objectives indicate the reason for developing a plan and identify major goals. Good planning objectives exhibit characteristics that are non-redundant, easily understood, measurable, and relatively few in number. Through the workshop discussions, the IAS Teams reached a consensus on the following five draft planning objectives: minimize costs, improve water quality, improve reliability, increase adaptability, and minimize implementation risk.

The implication of the selected objectives was that an ideal portfolio of projects would be the least expensive yet provide the best water quality and system reliability benefits. At the same time, the portfolio would be the most adaptable with the least implementation risk. Although it was recognized such an ideal portfolio probably did not exist, useful comparisons of alternatives could be made if performance measures were used to quantify how well each portfolio met each of the identified objectives.

Performance measures developed. Member agency representatives and Metropolitan staff worked together to refine the draft planning objectives and convert them into more specific and easily quantifiable performance measures. Broad objectives were narrowed to key aspects of the overall objective that were most applicable to the Riverside and San Diego area.

Manage Cost. This is a measure of the project portfolios' relative costs. CDM estimated project unit costs and a estimate of future implementation expenditures to help develop portfolios. The net present value (NPV) was calculated for the entire project lifecycle within the portfolios. Portfolios with lower NPVs performed well in this category.

Water Quality: Improve Salinity Balance. This performance measure quantifies how alternative portfolios improve the salt imbalance in the region. Although all projects must meet a baseline of federal and state drinking water quality standards, certain aspects of water quality and benefits vary from project to project. It was agreed that the reduction of total dissolved solids (TDS) was an important water quality criteria related to supply sustainability and a quantifiable benefit that can be evaluated for each project. The overall TDS for each portfolio was based on mass balance of the individual projects' TDS and flow. Portfolios that provided the most improvement in salinity balance received the highest rating under this objective.

Reliability: Improve System Flexibility. It was agreed the objective of improving reliability would be measured in terms of system flexibility. Performance measurements were based on each project portfolio's ability to relieve either one or both of these components:

(a) An emergency outage of a local or regional facility, or

(b) A planned Metropolitan facility shutdown

Scores for each component were generated for the project portfolios and a composite score was calculated by applying the weights assigned to each component. The overall results were normalized to 100. The greater the composite percentage for a portfolio, the better the portfolio performed.

Improve Adaptability and Sustainability. Through the IAS discussions, the draft objective of increasing adaptability was modified to address both adaptability and sustainability. This performance measure aims to qualitatively measure a portfolio's potential to be adaptive to uncertainties that arise during implementation and to sustain a specified performance in light of changing conditions such as water demand, legislation, and energy costs. A qualitative score is given on a scale of 1-5.

A higher score is given to portfolios that contain projects with the least exposure to changing conditions and that are most likely to sustain performance in meeting identified gap targets. Portfolios with some exposure to changing conditions and projects that tend to maintain sustainability of performance in meeting the identified gap will receive an average score. Portfolios with the most exposure to changing conditions and limited ability to develop solutions to adapt to change; will receive the lowest score.

Reduce Implementation Risk. The objective is to reduce the overall risk of schedule delays and/or budget increases that can affect project implementation. The performance measure evaluated several elements of implementation risk. The first element relates to CEQA compliance. Projects with complex CEQA permitting requirements score lower. The second element assesses project complexity in terms of needed technology, project siting, regulatory approvals, customer acceptance, and waste concentrate management, with the more complex projects scoring lower. The last element involves land acquisition, in which the projects with secured land scores higher. A qualitative score is given on a scale of 1-5.

Table 5-1 summarizes the IAS objectives, along with the associated performance measures. Performance measures were developed to indicate how well each objective is being achieved by the portfolio. It was recognized early in the process that some performance measures could be measured quantitatively, such as cost or water quality, while others could only be measured with a qualitative index.

Table 5-1
Refined Planning Objectives and Performance Measures

Objective	Performance Measure
Manage Cost	Net present value, ($ capital and O&M costs through the 2050)
Water quality: Improve Salinity Balance	Overall total dissolved solids, (TDS, mg/l)
Reliability: Increase system Flexibility	Ability to back-up emergency outages of local and regional facilities and planned outages of regional facilities, (1-100%)
Increase Adaptability & Sustainability	Ability to adapt to changes in demand, regulations and energy costs, (1-5)
Reduce Implementation Risk	Risk in areas of permitting, project complexity and land acquisition, (1-5)

Objective weighting. After consensus was reached regarding the definition of objectives, a weighting exercise was conducted to account for the varying levels of importance IAS participants placed on each objective. A Pair-wise comparison was selected as the weighting method. For this method, every possible pair of objectives was compared and participants choose the two most important. A tally, marked how many times an objective was selected, and a weight (normalized to 100%) was derived. The results of the weighting exercise were then averaged for three groups: Central Pool Area selections, Riverside and San Diego Area selections, and senior Metropolitan staff selections. The results are presented in Table 5-2.

Table 5-2
IAS Objective Weights

Objective	Central Pool Weighting	Riverside and SD Weighting	Metropolitan Weighting
Manage Cost	20%	15%	30%
Improve System Reliability	27%	25%	20%
Improve Water Quality (Salinity)	10%	20%	17%
Improve Adaptability	23%	20%	17%
Reduce Implementation Risk	20%	20%	16%

The results of the objective weighting are interesting in that they often reflect perceived challenges and opportunities of the participants. For example, in the Riverside and San Diego area where salinity is a major concern, participants gave improved water quality a relatively high weight (20% vs. 10% in the Central Pool area). Metropolitan senior staff, on the other hand, placed a relatively high weight on the objective to manage costs (30% vs. 15% in Riverside and San Diego area). The ratings were not averaged so that each group was able to see how the portfolios performed.

3. Identify Local and Regional Projects

Several workshops were held where member agency staff proposed local projects for consideration and supplied information on these projects to facilitate the evaluation.

For each of the projects proposed for the Riverside and San Diego area, a capacity (yield in cfs) was identified along with other information about the project that related to the selected performance measures. Where gaps existed in information, CDM worked with participants to provide values for water quality and other performance measures. These were verified and refined at subsequent workshops.

Metropolitan also provided information on regional treatment projects, which included: capacity expansion at Mills and Skinner water treatment plant, and two variations for a new regional treatment plant.

In total, over 20 projects were submitted for consideration to meet the identified 900 cfs gap for the Riverside and San Diego area (see Table 5-3). They ranged from 5 cfs desalters to 77 cfs desalination plants and from 8 cfs membrane water treatment plant expansions to new 600 cfs regional facilities.

Table 5-3
Local and Regional Projects Proposed for the Riverside and San Diego Area

Project	Yield (cfs)	Project	Yield (cfs)
E-Perris WTP Exp - phase 1	12	W-Riverside/Corona Feeder	100
E-Hemet WTP Exp - phase 1	8	W-Additional GW	30
E-Perris WTP Exp - phase 2	28	S-Seawater Desalination	77
E-Hemet WTP Exp - phase 2	42	S-Groundwater Desalination	26
E-Perris Desalter II	6	S-Groundwater Storage	33
E-Recycled Water Project	10	S-Recycled Water Projects	30
R-New GW Wells	18	M-Mills Expansion - phase 1	300
R-Recycled/Raw Water	117	M-Mills Expansion - phase 2	300
W-Lake Mathews WTP	31	M-Skinner Expansion - phase 1	300
W-Arlinton Desalter	5	M-New WTP - phase 1	600
W-Chino Desalter	8	M-New WTP - phase 2	300

Note: E = Eastern Municipal Water District, M = Metropolitan, R = Rancho California Water District, S = San Diego County Water Authority and W = Western Municipal Water District.

4. Combine Individual Local and/or Regional Projects into Complete Portfolios

After individual projects were identified and measured against performance objectives, sample portfolios were developed to facilitate additional IAS discussions. Participants considered the strategies to pursue for meeting future demands.

The requirement for each portfolio was that it would meet the identified gap for the Riverside and San Diego IAS, which was 154 cfs in 2030, 523 cfs in 2040, and 894 cfs in 2050. The goal was to arrive at a wide range of portfolios -- from 100% local projects to 100% regional projects - as well as various combinations of local and regional projects. Because the total capacity of local projects was just 581 cfs, it was not possible to develop any portfolios that comprised entirely local projects.

CDM assembled draft portfolios along a wide variety of themes to help demonstrate how various approaches impact overall performance. The following six portfolios were developed and evaluated for the Riverside and San Diego IAS:

- Under $500/acre-foot (AF) Local Projects Portfolio - An economical portfolio of local and regional projects aimed at improving TDS and water supply benefits.
- Maximum Local Projects Portfolio - This portfolio was aimed at maximizing local participation, adaptability and water TDS improvements.
- MWD Option A Portfolio - This regional portfolio was aimed at minimizing costs and implementation risks by expanding existing Metropolitan facilities.
- MWD Option B Portfolio - This regional portfolio aimed at minimizing costs and also improving reliability by constructing a new centralized facility located near multiple raw water sources (Inland Feeder and CRA).
- MWD Option C Portfolio This regional portfolio was a variation of Option B that included additional treated water conveyance capabilities to maximize the reliability benefits.
- Balanced Mix Portfolio - This portfolio of local and regional projects was aimed at achieving low overall TDS levels and a high adaptability score.

The portfolios are described further on the following pages and the top performing portfolios are shown in Figures 5-1 through 5-4.

(1) Under $500/AF Local Projects Portfolio. This portfolio assumes development of all local projects that have an average unit cost of less than $500/AF. The portfolio of local projects under this category came to a combined total of 386 cfs new capacity. The remaining gap in required treatment capacity of 514 cfs would be met with a new Metropolitan regional treatment plant located in central Riverside County.

<$500 Local Projects	Yield (cfs)
Local Projects:	
E-Perris WTP Exp - phase 1	12
E-Hemet WTP Exp - phase 1	8
E-Perris WTP Exp - phase 2	28
E-Hemet WTP Exp - phase 2	42
R-New GW Wells	18
R-Recycled/Raw Water	117
W-Lake Mathews WTP	31
W-Riverside/Corona Feeder	100
W-Additional GW	30
Regional Project:	
M-New Integrated WTP - phase 1	
TOTAL in cfs	**900**

(2) Maximized Local Projects Portfolio. This portfolio maximizes the development of all local projects regardless of cost. The portfolio of local projects came to a combined total of 581 cfs of new capacity. The remaining gap in required treatment capacity of 319 cfs will be met by expanding Metropolitan's existing Mills water treatment plant.

Maximum Local Projects	Yield (cfs)
Local Projects:	
E-Perris WTP Exp - phase 1	12
E-Hemet WTP Exp - phase 1	8
E-Perris WTP Exp - phase 2	28
E-Hemet WTP Exp - phase 2	42
R-New GW Wells	18
R-Recycled/Raw Water	117
W-Lake Mathews WTP	31
W-Riverside/Corona Feeder	100
W-Additional GW	30
W-Arlinton Desalter	5
S-Seawater Desalination	77
S-Groundwater Desalination	26
E-Perris Desalter II	6
E-Recycled Water Project	10
W-Chino Desalter	8
S-Groundwater Storage	33
S-Recycled Water Projects	30
Regional Project:	
M-Mills Expansion – phase 1	319
TOTAL in cfs	**900**

(3) MWD Option A Portfolio. This portfolio assumes the expansion of Metropolitan's Mills plant by 600 cfs and Skinner plant by 300 cfs to meet the entire 900 cfs gap by 2050. No local projects are included under this portfolio.

MWD Option A	Yield (cfs)
Regional Projects:	
M-Mills Expansion - phase 1	300
M-Mills Expansion - phase 2	300
M-Skinner Expansion - phase 1	300
TOTAL in cfs	**900**

(4) MWD Option B Portfolio. This portfolio assumes the construction of a new Metropolitan regional water treatment plant with a capacity of 900 cfs to meet the entire gap. The plant is assumed to be located in Eastern MWD's service area with a pipeline to deliver the treated water to Western MWD's service area. No local projects are included under this portfolio.

MWD Option B	Yield (cfs)
Regional Projects:	
M-New WTP - phase 1	600
M-New WTP - phase 2	300
TOTAL in cfs	**900**

(5) MWD Option C Portfolio. This portfolio assumes the construction of a new Metropolitan regional water treatment plant with a capacity of 900 cfs to meet the entire gap. The new plant will be connected to a fully networked pipeline that can provide backup capacity to both the Mills and Skinner plants. No local projects are included under this portfolio.

MWD Option C	Yield (cfs)
Regional Projects:	
M-New Integrated WTP - phase 1	600
M-New WTP - phase 2	300
TOTAL in cfs	**900**

(6) Balanced Mix Portfolio. This portfolio assumes the development of local projects that have the greatest overall benefits in terms of water quality and system reliability based on the evaluation criteria developed by the workgroup. The portfolio of local projects under this portfolio came to a combined total of 424 cfs of new capacity. The remaining gap in required treatment capacity of 476 cfs will be met with a new Metropolitan regional water treatment plant located in central Riverside County that

would also have a fully networked conveyance system to allow back-up of the Mills and Skinner plants.

Balanced Mix	Yield (cfs)
Local Projects:	
E-Perris WTP Exp - phase 1	12
E-Hemet WTP Exp - phase 1	8
R-New GW Wells	18
R-Recycled/Raw Water	117
W-Lake Mathews WTP	31
W-Riverside/Corona Feeder	100
W-Additional GW	30
W-Arlinton Desalter	5
S-Seawater Desalination	77
S-Groundwater Desalination	26
Regional Project:	
M-New Integrated WTP – phase 1	476
TOTAL in cfs	**900**

5. Evaluate Project Portfolio Against Objectives and Performance

Raw portfolio performance

The six project portfolios developed under the IAS process were evaluated using the objectives and performance measures summarized in Table 5-1. The initial, unweighted results are summarized below in Table 5-4. The following general observations were made:

- Portfolios containing both regional and lower cost local projects offered good all around performance
- Increasing the level of local projects tends to improve the TDS and adaptability benefits but decreases performance in terms of overall cost
- Regional portfolios performed well in terms of overall cost but under-performed in terms of water quality and adaptability scores
- Portfolios with a new, central regional water treatment plant performed better than portfolios that relied on expansions of existing regional facilities

Table 5-4
Summary of Performance Measures for IAS Portfolios in Riverside and San Diego

Portfolios	Total NPV	Water Quality	Reliability	Adaptability& Sustainability	Implementation
<$500 Local	$1.40 B	433	86	2.81	2.95
Maximum Local	$2.48 B	405	42	3.15	3.54
MWD Alt A	$1.03 B	500	39	2.60	4.10
MWD Alt B	$0.911B	500	79	2.60	3.10
MWD Alt C	$1.06 B	500	100	2.60	3.10
Balanced Mix	$2.17 B	414	83	2.93	2.96
Min. Score	$0.911 B	405	39	2.60	2.95
Max. Score	$2.48 B	500	100	3.15	4.10

Weighted portfolio performance.
CDM calculated the overall performance of the portfolios by inputting the individual project scores and the IAS participants weighted performance measures (as presented in Table 5-2). The results will be summarized for the following groups:

- Riverside and San Diego IAS
- Central Pool IAS
- Metropolitan Senior Staff

Note that size of the colored bars on these charts indicate the relative performance and weighting for each objective. A large bar indicates strong portfolio performance and high objective weighting. The absence of a color bar indicates there was no improvement towards this particular objective.

For example, in Figure 5-1, the large blue bar for the Balanced Mix portfolio indicates that this portfolio scored well in the area of lowering TDS levels and that this objective was highly valued by the Riverside and San Diego group. Likewise, the large red bar shown for MWD Option B indicates this portfolio scored well in terms of improving system flexibility and that this reliability objective had a high weighting for this group. The lack of a blue bar for the three regional portfolios indicates these portfolios did not provide any TDS improvements - they were assumed to meet the existing TDS target level of 500 mg/l TDS.

Figure 5-2 illustrates how the different weighting of objectives can influence the overall performance of the portfolios. The Central Pool group weighted the cost objective higher than the Riverside and San Diego group (20% vs. 15%) and weighted the water quality objective lower (10% vs. 20%). Although the Under $500 Local portfolio still scored highest, the Balanced Mix Portfolio moved from the second to third position.

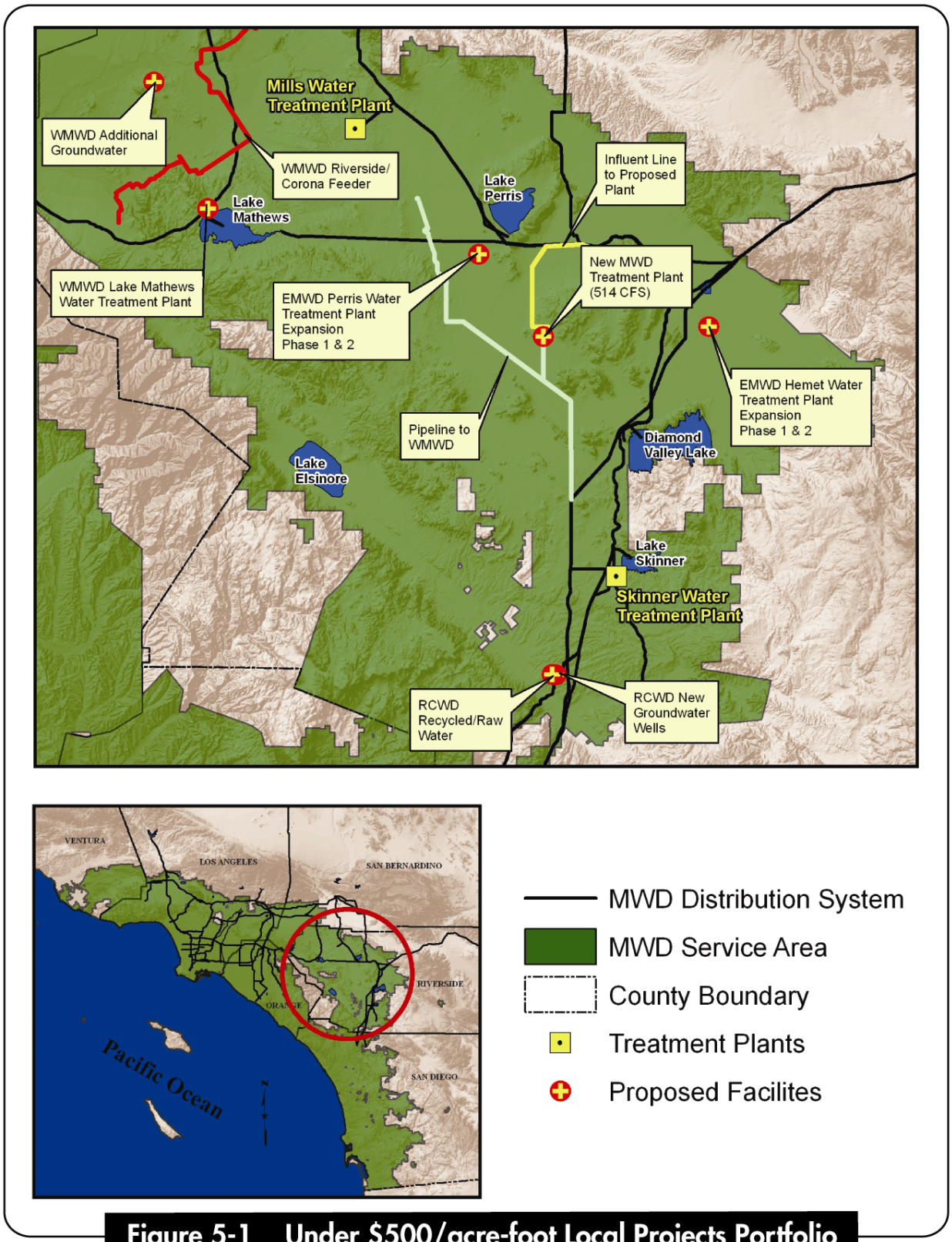
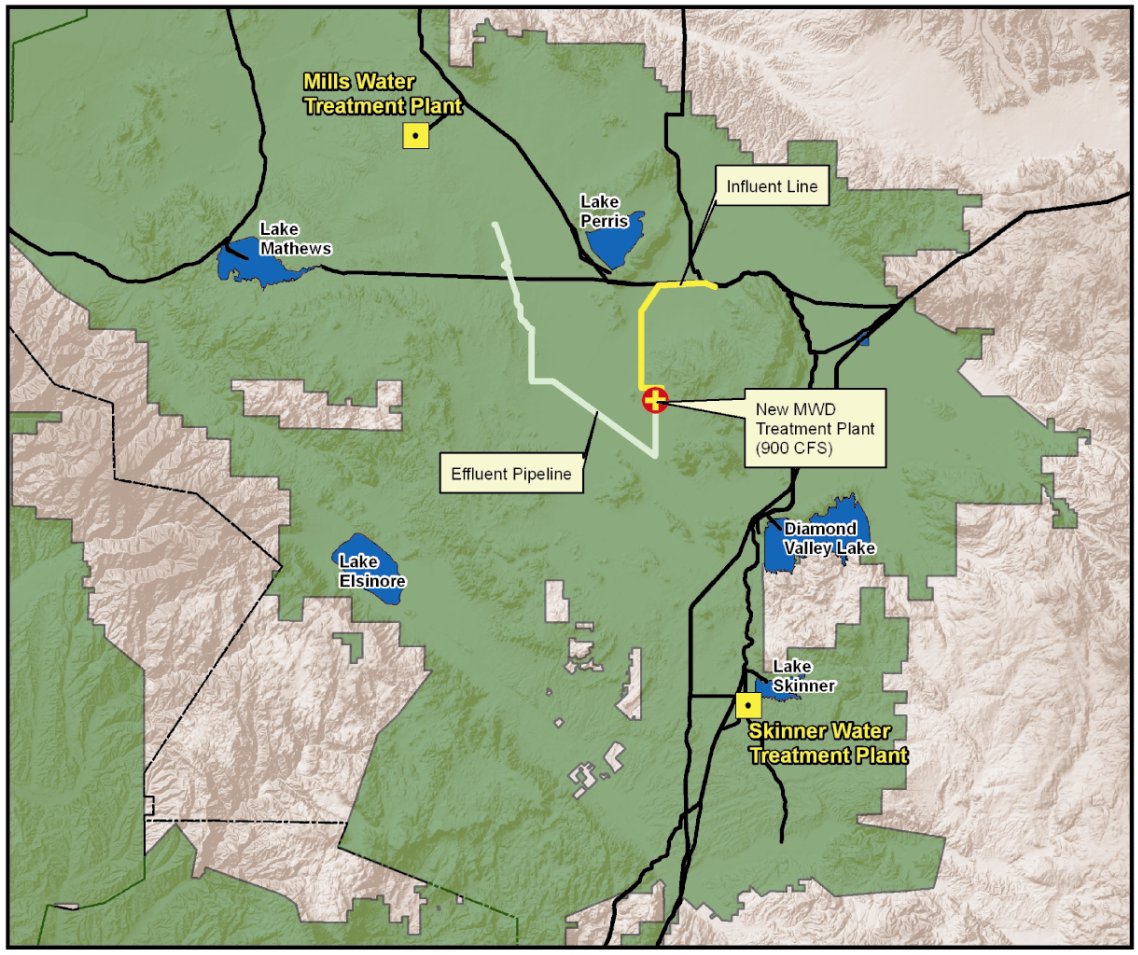
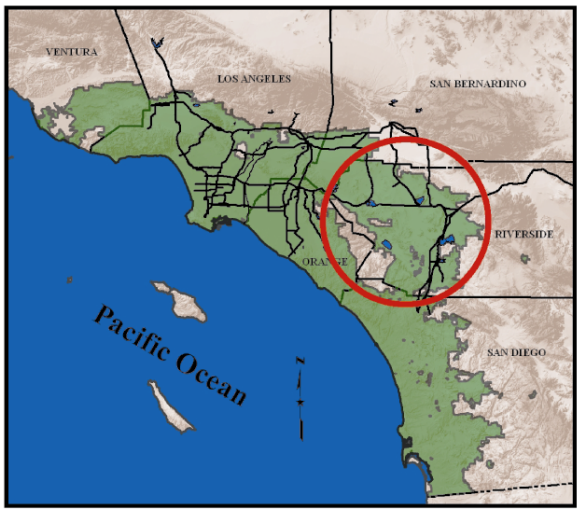


Figure 5-1 Under $500/acre-foot Local Projects Portfolio





MWD Distribution System

MWD Service Area

County Boundary

Treatment Plants

Proposed Facilities

Figure 5-2 MWD Option B Portfolio

Figure 5-3 shows an even greater change from the results of the Riverside and San Diego group resulting from Metropolitan staff's high weighting of the manage cost objective (30% vs. 20%). Again, the Under $500 Local Portfolio scored highest. However, the Balanced Mix Portfolio moved from the second to the fifth position (behind the three regional portfolios).

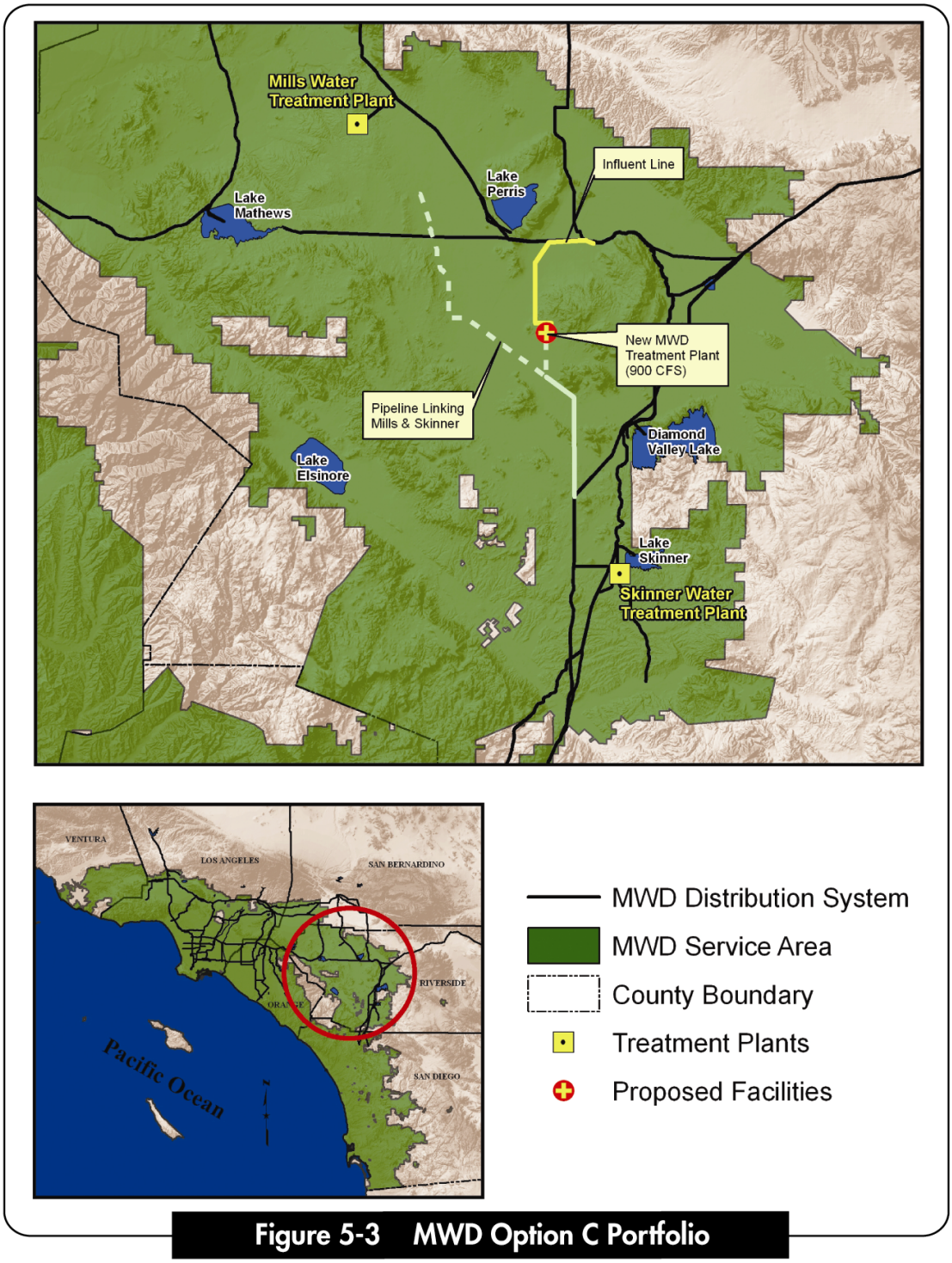


Figure 5-3 MWD Option C Portfolio

6. Seek Consensuses on Results

The portfolio evaluation results were shared with all IAS Teams in a facilitated meeting. Participants generally agreed that the CDM analysis were logical and consistent with the agreed-upon approach to portfolio evaluations.

Even with different weighting of objectives, there was consistency in the portfolio rankings between the independent IAS groups as shown in Table 5-5 below. The portfolio that consists of developing lower cost local projects (plus a centralized regional facility) to meet the gap scored highest among all stakeholders. Also, the centralized and fully networked regional portfolio scored second highest for two of the three groups. The majority of the represented agencies also agreed that the top four performing portfolios warranted further consideration.

Table 5-5
Summary Portfolio Rankings

	Rank			
Portfolio	Riverside and San Diego	Central Pool	MWD	Average
<$500 Local	1	1	1	1.0
MWD Opt. C	3	2	2	2.3
Balanced Mix	2	3	5	3.3
MWD Opt. B	4	4	3	3.7
MWD Opt. A	6	5	4	5.0
Max Local	5	6	6	5.6

Each of the proposed project portfolios requires a Metropolitan regional treatment plant to meet the capacity need by 2050. The amount of additional capacity required from a new regional treatment facility will vary depending on the amount of local supply that will be developed through the local projects identified within each portfolio.

IAS participants realize that actual local project implementation will be dictated by many factors such as cost, local reliability, grant funding opportunities, and other local initiatives and needs. Several member agencies expressed optimism on the likelihood of several local projects within the various project portfolios moving forward.

IAS participants recognized the benefits of constructing a centralized, and networked, regional facility rather than expanding the existing Mills and Skinner facilities because of the ability to provide backup capacity to both the Mills and Skinner plants.

In addition to the above-mentioned consensus conclusions, the participants agreed on the following recommendations.

(1) Agencies should move ahead and seek funding from federal, State, and existing Metropolitan incentive programs for developing the identified local projects.

(2) Annual IAS update meetings should be conducted to track and discuss local supply development and water demands on Metropolitan in order to determine the "right" timing of regional facilities.

(3) Metropolitan and member agencies should initiate land acquisition, advanced planning and design for preferred local and regional facilities to preserve these options (Note: Specific recommendations were made for Metropolitan to secure land for the centralized regional facility because there are limited sites in this region which could be lost to development in the near future).

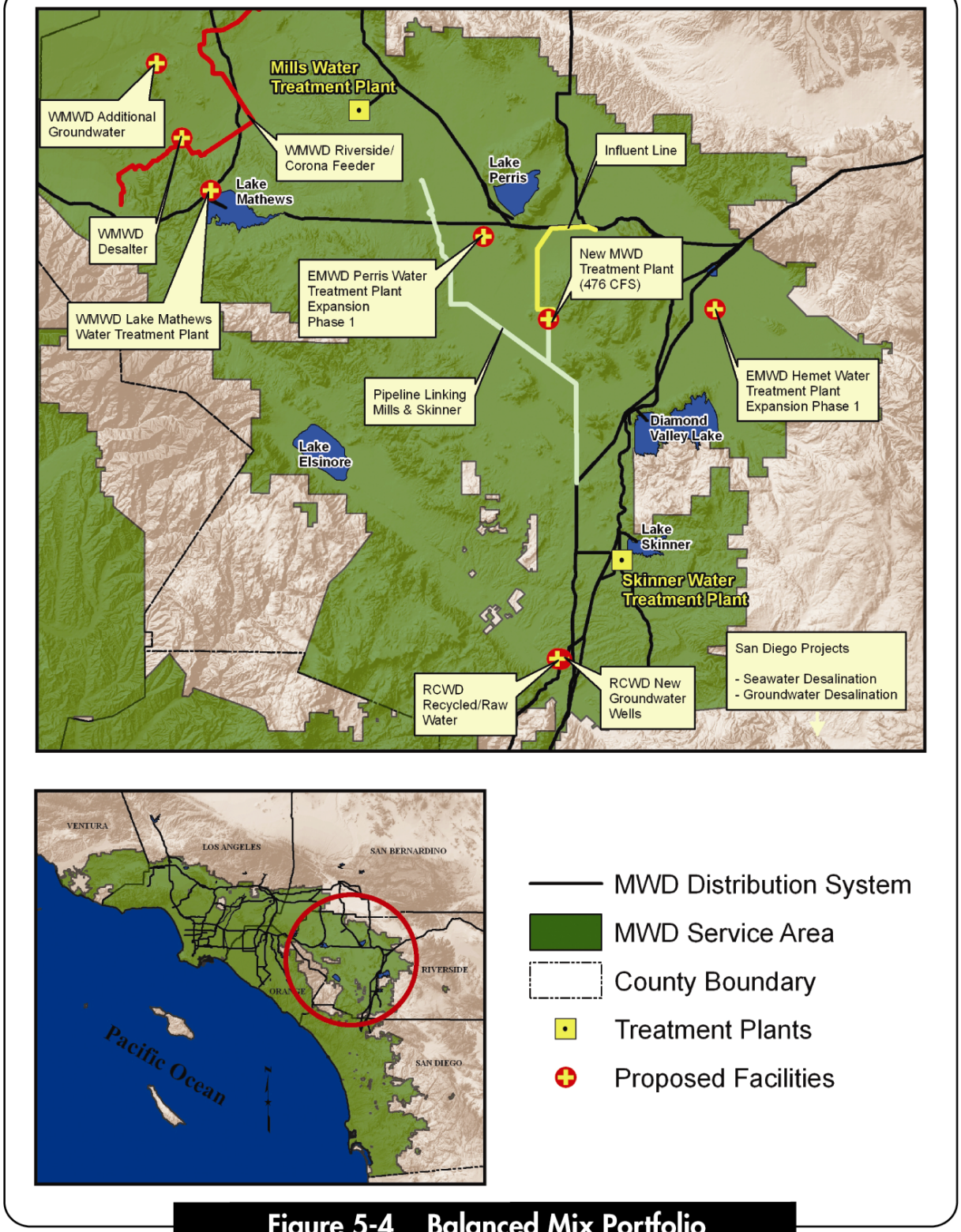


Figure 5-4 Balanced Mix Portfolio

Figure 5-5 Portfolio Rankings Based on Riverside/San Diego Objective Weights

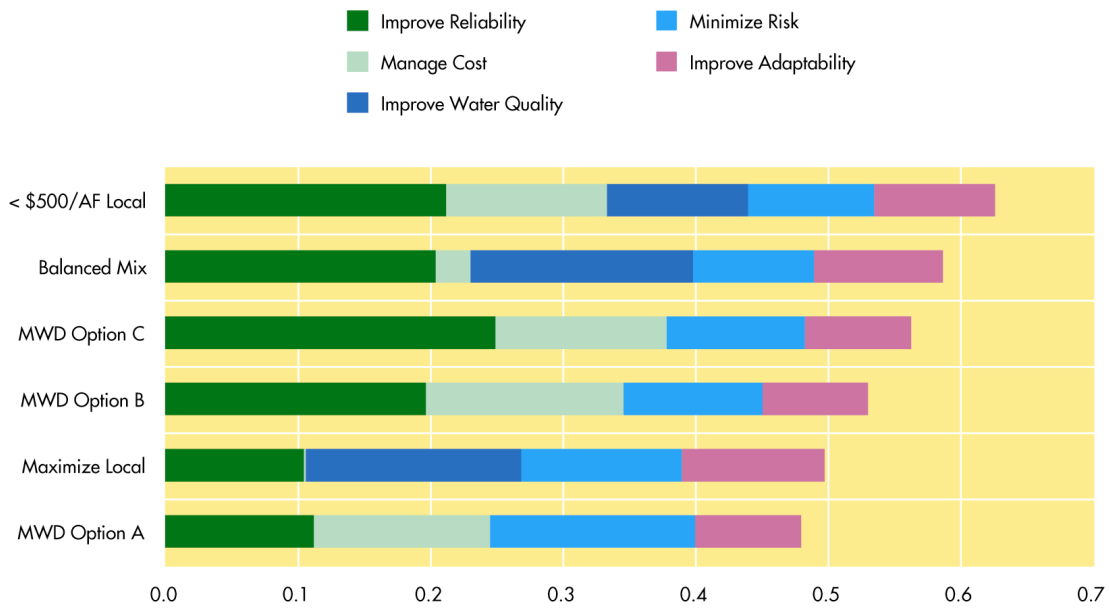


Figure 5-6 Portfolio Rankings Based on Central Pool Objective Weights

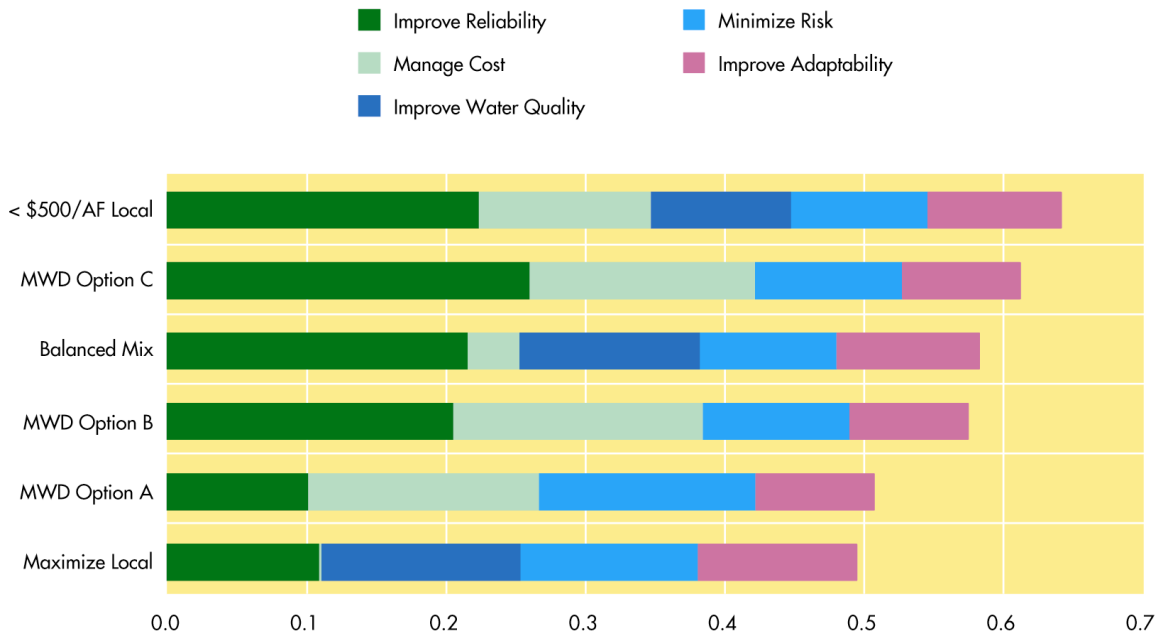
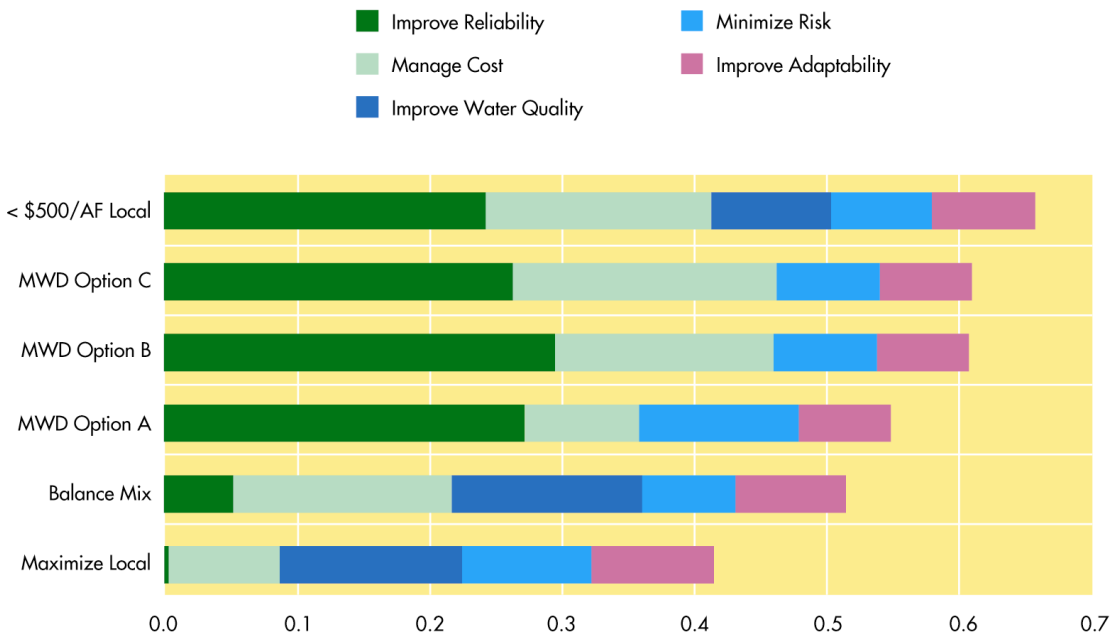


Figure 5-7 Portfolio Rankings Based on Metropolitan Senior Staff Objective Weights



FINDINGS AND RECOMMENDATIONS

6

Metropolitan operates and maintains an extensive water treatment and conveyance system to deliver an adequate and reliable supply of high quality water to its customers. Consequently, Metropolitan must continually evaluate the performance and adequacy of its facilities and review its planning policies to ensure reliable water deliveries are achieved in an economical manner. The purpose of the IAS was to take a more collaborative approach in evaluating these needs in order to strengthen local and regional partnerships and to seek optimal solutions.

This section summarizes findings and recommendations stemming from this open, cooperative IAS process.

BENEFITS OF THE IAS PROCESS

The IAS process was successful in achieving the objectives outlined in Section 1:

- **Increase collaboration between Metropolitan and Member agencies.** The IAS led to increased cooperation between agencies and sharing of data and ideas that were beneficial in moving the planning process forward and achieving consensus on technical and policy issues.
- **Promote a common understanding of key concerns of all agencies.** The technical presentations made by staff from member agencies and Metropolitan helped achieve a common understanding of important planning and operational issues and helped build a strong foundation for the technical and policy discussions that followed.
- **Achieve consensus on demand projections and facility timing assessments.** The open discussions, internal coordination, IAS Technical Panel and Expert Panel review process yielded valuable results. Participants reached a consensus on the assumptions and methodologies used for determining peak demands and assessment of system capacity needs for the different loads areas. The close coordination and improved data allowed Metropolitan staff to refine the facility timing models. This refinement was one of the key factors in adjusting the timing for the CPA project beyond the 2030 planning horizon.
- **Clarify policy issues related to facility planning**. The open policy discussions were found to be productive in addressing key concerns of member agencies and in clarifying regional obligations and aiding local agency master planning efforts. A consensus was reached on clarifications on the following areas for Metropolitan's Board to consider:
  - Reliability
  - Facility implementation
  - Service connections on conveyance facilities.

Discussions on the policy issue of potential introduction of local water into Metropolitan's treated water system will continue through the existing IAS committee.

- **Consider alternative approaches to meeting future demands (e.g., Integrating local and regional plans for facilities and operations).** The IAS project portfolio development and evaluation process was effective in identifying alternative approaches to meeting future demands and addressing the underlying intent to consider economical ways to defer large regional capital investments.

  For the Riverside and San Diego area, a portfolio containing a mix of local and regional projects scored highest and the implementation of the highest performing local projects could defer construction of a regional treatment facility.

- I**dentify areas within the service area that will need additional study.** For the Riverside and San Diego area, the IAS teams elected to move ahead with the assumption that the region could balance flows between the Mills and Skinner plants in order to defer regional investments by up to 6 years. The local and regional conveyance systems must be studied in greater detail to validate this assumption. In addition, Metropolitan will continue to coordinate with SDCWA in assessing conveyance capacity for delivering imported water supplies to meet forecasted demands in San Diego.

FINDINGS / RESULTS

Central Pool Area

Results of the analysis conducted in Section 4 indicates that the Central Pool, comprised of all areas served by the Jensen, Weymouth, and Diemer water treatment plants has adequate treatment capacity to meet supplemental peak demands through the planning horizon of 2030. Unique to this area is the Common Pool, which provides flexibility and redundancy to the area by having the ability to receive water from all three Central Pool treatment plants. The earliest indication of any need for additional treatment capacity occurs in 2045, well beyond the timeframe that necessitates any near-term action. However, Metropolitan will continue to monitor the key drivers that might affect timing for additional treatment, such as performance of local resource programs and changes to demographic forecasts.

West Valley Area

Additional conveyance facilities will be required when Metropolitan's future demand within the West Valley area exceeds the current conveyance capacity. The West Valley Area analysis indicates that sufficient conveyance capacity is available until the year 2037. Similar to the Central Pool Area, near-term action is not required at this time. However, there are ancillary issues that could affect regional operations. These issues have been evaluated and summarized in Section 4 - Description of Existing System and Needs.

San Bernardino: Rialto/Etiwanda/Upper Feeder Area

The analysis conducted in Section 4 indicates that additional conveyance capacity will not be required in the planning horizon. Required influent flow to meet peak demands at the Diemer Water Treatment Plant is projected to exceed existing conveyance capacity on the

Rialto/Upper Feeder system by 2041. Future conveyance requirements can be delayed by utilizing storage located along the conveyance system.

Riverside and San Diego Area

Results for the Riverside and San Diego region indicate that additional treatment capacity will be needed within the planning horizon. Supplemental treated water demands for the area are met from the Mills Water Treatment Plant and the Skinner Water Treatment Plant. Member agencies within this region, comprised of Eastern, Western, and the SDCWA, operate several local treatment plants to meet a significant portion of the region's retail demand. Metropolitan worked closely with Eastern, Western, and the SDCWA in determining future affects of local treatment capacity on supplemental water demands. Furthermore, to a limited extent, Eastern and Western can utilize either Mills or Skinner to meet demands that occur within a portion of their service areas, similar to the Central Pool's common pool concept. Based on internal conveyance capabilities and a completed Perris Valley Pipeline, Eastern and Western provided Metropolitan with projections on how they anticipate using available treatment capacity between the Mills and Skinner water treatment plants.

Using the current operation pattern, the Mills Exclusive area and the Skinner Exclusive area will require additional treatment capacity by 2020 and 2038, respectively. Assuming Eastern and Western are capable of balancing their demands between Mills and Skinner, the additional treatment would not occur until 2026. Table 6-1 presents a summary of findings on system facility needs for each load area.

Table 6-1
Summary of Findings on System Capacity Needs

Load Area	Timing of Facility Need	Required Facility
Central Pool	2045 in Weymouth Exclusive area 2049 in Common Pool area	Treatment capacity Treatment capacity
West Valley	2037	Conveyance capacity
San Bernardino	2041	Conveyance capacity
Riverside and San Diego	2026 (assuming balanced demands between Mills and Skinner)	Treatment capacity

RECOMMENDATIONS

Metropolitan will pursue a multi-faceted strategy to ensure facility planning objectives are met in the most effective and efficient manner. The combined effect of implementing the recommended action items for all load areas will result in meeting the region's overall projected demand. In areas where sufficient treatment and conveyance capacity is available through the planning horizon, Metropolitan will carefully monitor critical forecast variables and evaluate any changes in the drivers that affect facility timing under the right-time facility monitoring discussed in Section 2.

In areas where facility improvements are required within the planning horizon, recommended strategy will be implemented in two phases: (1) Near-term action and (2) Mid- to long-term action. The near-term actions consist of strategic elements of the Recommendation that will require immediate planning attention and implementation within 5 years. Mid- to long-term actions consist of strategic elements that are implemented throughout the planning horizon and will not require implementation until beyond 5 years. Specific timing requirements for implementing mid- to long-term actions will depend on on-going findings of the Right-Time Facility Tracking Program discussed in Section 2.

Near-Term Action

The near-term actions consist of strategic elements that will require immediate planning attention and implementation to help meet forecasted peak demands within the region. Table 6-2 presents a summary of the recommended near-term local, regional and collaborative actions.

Table 6-2
Summary of Recommended Near-term Action

Responsible Agency	Near-term Action
Member Agencies	• Implement local projects that were assumed completed within the IAS Gap Analysis. This includes projects now under construction and 21 projects that were identified to be fully designed and with appropriated funding, including: – *Calleguas (Tapo Canyon WTP)* – *Eastern (Soboba & Recycled Pipeline Reach 16)* – *Inland Empire (Chino Desalter & IEUA Regional recycle project)* – *Las Virgenes (Kanan, Mulholland & Sepulveda recycle projects)* – *MWDOC (LBCWD Well, San Clemente GW, IRWD Reclamation & SMWD Chiquita Reclamation)* – *San Diego (Encina Desalination and Carlsbad, Meadowlark, Santa Fe Valley & Woods Valley recycle projects)* – *Three Valleys (Pomona Well and Rowland, Walnut & Suburban Three Valleys recycling projects)* • Seek grant funding for high-rated local projects and secure right-of-way in advance, where necessary, to preserve these options • Identify additional supply projects within the Calleguas area • Develop plans for achieving compliance with Administrative Code Section 4503 requiring member agencies to have sufficient resources to sustain a 7-day interruption in Metropolitan deliveries
Metropolitan	• Secure right-of-way for a new regional water treatment plant in Riverside County • Monitor implementation of identified IAS local projects • Schedule annual IAS update meetings to: – *Report on the status of IAS Action items and the development of local projects* – *Discuss & evaluate newly proposed IAS projects* – *Update the target on-line dates for regional projects*
Joint Metropolitan and Member Agency	• Develop the Mills and Skinner Balanced Operating Plan • Negotiate the extension of the West Valley Feeder #1 lease • Continue policy discussions on the potential introduction of local water into Metropolitan's treated water system

The IAS team identified the level of local supply development for the facility planning analysis to include local supply projects that are existing, under construction, or fully designed with appropriated funding. Monitoring of development and implementation of these local projects will be accomplished as part of the annual IAS effort.

As discussed in Section 2, the IAS team recognized that both local and regional actions are necessary to ensure reliability to member agencies. There was a general consensus that Metropolitan would continue to make system flexibility improvements through demand-driven projects. It was also agreed that member agencies would endeavor to implement projects as necessary to comply with Metropolitan's Administrative Code Section 4503. Section 4503 requires each agency maintain sufficient resources to sustain a 7-day interruption to Metropolitan deliveries.

The remaining actions will be described by load area, as follows:

Central Pool, West Valley, and San Bernardino

Results of the system capacity analysis indicates that the Central Pool and San Bernardino areas have adequate treatment and conveyance capacity to meet supplemental peak demands through most of the planning horizon. Metropolitan will carefully monitor critical forecast variables and evaluate any changes in the drivers under the right-time facility tracking for each load area. It is anticipated that the IAS participants will conclude policy discussions regarding the issue of introducing local water into Metropolitan's treated water system.

For the West Valley area, there exists adequate conveyance capacity to meet peak demands within the next 30 years. Several near-term action items were identified that will ensure that conveyance capacity will remain sufficient to meet projected demand. The recommended near-term actions are as follows:

- Extension of West Valley Feeder No. 1 lease
- Identify additional local supply projects in Calleguas

Extension of West Valley Feeder No. 1 Lease. The Metropolitan lease of the WVF#1 to LADWP is in effect until 2012. Five-year notice is required to terminate the agreement earlier than 2012. At the end of its term, both parties can agree to extend the agreement. In recent meetings, the LADWP expressed their preference to maintain the lease on WVF#1 through the current contract term and possible renewal after 2012 so they may continue using the WVF#1 to supply approximately 100 cfs of treated water from its LAAFP or from service connection LA-25 to the western San Fernando Valley portion of their service area. Under the lease agreement, the LADWP is obligated to supply 60 cfs of emergency delivery to the West Valley area during interruption of West Valley Feeder #2 service.

Staff recommends that an economic analysis of lease terms be completed for negotiating extension beyond 2012. In the interim, a lease extension of the WVF#1 is recommended. This may also allow LADWP to resolve any capacity issues within its distribution system. Calleguas expressed the importance of the emergency delivery provision included in the lease agreement. Metropolitan also recommends continued right-time monitoring for system capacity needs to determine when Metropolitan may need to use WVF#1 capacity to deliver its imported supplies to the West Valley area.

Calleguas Additional Local Supply Development. Calleguas is actively coordinating the efforts within its service area to minimize increases in future peak demands to avoid requiring modifications of the Santa Susana Tunnel and its internal distribution system. Metropolitan will coordinate with Calleguas in identifying additional development of local supplies and local resource projects that will offset future increase in demands.

Riverside and San Diego

The near-term actions for the Riverside and San Diego Area are as follows:

- Identify and implement projects within preferred portfolios
- Secure right-of-way for new treatment plant site
- Mills and Skinner Balanced Operating Plan

Identify and Implement Projects within Portfolios. Section 5 presented an in-depth approach in the development of feasible project portfolios to meet the system capacity needs identified in Section 4. Since additional treatment capacity need was identified in the Riverside and San Diego area, Metropolitan and its member agencies developed six project portfolios from 22 local and regional projects to meet a gap of 154 cfs at year 2030 and an ultimate gap of 900 cfs at year 2050.

The IAS participants evaluated the project portfolios based on consensus definition and established weights of the different objectives developed for the process. Ranking of the project portfolios came in the following order:

- *$500/AF Local*. This portfolio assumes development of all local projects with an average unit cost of less than $500/AF. The portfolio of local projects under this category came to a combined total of 386 cfs of new treatment capacity. The remaining gap in required treatment capacity of 514 cfs will be met with a new Metropolitan treatment plant.
- MWD *Option C*. This portfolio assumes the construction of a new Metropolitan WTP with a capacity of 900 cfs to meet the entire gap. The plant is assumed to be located in Eastern MWD's service area with a pipeline to deliver the treated water to Western MWD's service area and another pipeline to deliver to the Skinner service area.
- *Balanced Mix*. This portfolio assumes the development of projects that are expected to be most successful based on the evaluation criteria developed by the workgroup. The portfolio of local projects under this alternative came to a combined total of 424 cfs of new treatment capacity. The remaining gap in required treatment capacity of 476 cfs will be met with a new Metropolitan treatment plant.
- MWD *Option B*. This portfolio assumes the construction of a new Metropolitan WTP with a capacity of 900 cfs to meet the entire gap. The plant is assumed to be located in Eastern MWD's service area with a pipeline to deliver the treated water to Western MWD's service area.
- MWD *Option A*. This portfolio assumes the expansion of Metropolitan's Mills plant by 600 cfs and Skinner plant by 300 cfs to meet the entire 900 cfs gap by 2050.

- *Maximized Local Projects Portfolio*. This portfolio maximizes the development of all local projects regardless of its cost. The portfolio of local projects came to a combined total of 581 cfs of new capacity. The remaining gap in required treatment capacity of 319 cfs will be met by expanding Metropolitan's existing Mills water treatment plant.

The IAS participants showed consistency in ranking the different project portfolios. The portfolio utilizing local projects costing less than $500/AF is most preferred. For portfolios that include development of both local and regional supplies, the local projects can be implemented incrementally as increasing peak demands dictate, as opposed to constructing a larger regional treatment plant that could have stranded capacity.

Metropolitan will continue to monitor critical forecast variables and evaluate any changes in the drivers under the right-time facility tracking to assess facility need. Staff recommends that the region pursue local projects identified in the portfolios that can be developed within the near-term period to meet the required treatment capacity. Staff also recommends further coordination with member agencies and their retail agencies to implement, facilitate, and monitor implementation of the proposed local projects.

Secure Right-of-Way. Because additional treatment capacity needs are within the planning horizon and availability of open parcels of land that meet specific design criteria is increasingly limited, the IAS participants recommended land for a regional treatment plant be secured in the near future. IAS participants have expressed consensus support for land procurement as a near-term action item. Metropolitan, as recommended in the System Overview Study, contracted the consulting services of Kennedy Jenks in 2005 to conduct a study that identifies potential sites in Western Riverside County using Geographic Information System (GIS) databases and geospatial analysis. The analysis located nine possible candidate sites for a new treatment plant site. Of the nine sites, three are currently under construction and others are in various stages of the county of Riverside planning process.

Mills and Skinner Balanced Operating Plan. By optimizing the existing combined treatment capacity of both the Skinner and Mills plants, the supplemental treated water needs of the Riverside and San Diego area can be met until 2026. This, in effect, offsets the need for additional treatment capacity in the Mills exclusive area by six years. Balancing operations between Mills and Skinner requires that Eastern and Western shift a portion of their intended deliveries from the Mills plant to the Skinner plant to meet future peak demands in the northern portion of Riverside County.

Historically, Eastern and Western relied heavily on the Mills plant to meet demands in northern Riverside. Increasing demands and limited getaway capacity at Mills required that member agencies shift a portion of their demands onto the Skinner plant. After completion of the Perris Valley Pipeline, member agencies anticipate fully utilizing the Mills plant.

The Balanced Operation approach will present the following challenges:

- Require additional getaway capacity from the Auld Valley Pipeline by maximizing existing service connection and/or installing an additional service connection
- May require local conveyance improvements to deliver additional water to Northern Riverside

- May incur pumping costs to deliver water from lower pressure-zones to higher pressure-zones
- May require member agencies to modify system operations practices
- Require preparation of a comprehensive operating strategy
- Require regional, member agency, and retail agency participation

Although preparation of the plan should occur in the near future, its implementation will be a long-term commitment for all agencies. Should the balanced operation plan prove uneconomical, alternatives will be investigated and brought back to the IAS participants for further discussion.

Mid- to Long-Term Actions

The recommended mid- to long-term actions prescribe programs that facilitate a strategic process for meeting facility planning objectives through data gathering, analysis, and monitoring. Implementing these programs will require continued collaboration between Metropolitan, member agencies, and retail agencies. In light of the critical water issues currently facing Southern California, it is essential that all water agencies work together in executing an integrated plan to meet future water needs. The following programs and monitoring plans represent a strategic bundle that utilizes regional and local water supplies, operational knowledge, and planning expertise.

Central Pool, West Valley, and San Bernardino

There are no major mid- to long-term actions anticipated for the Central Pool, West Valley, and San Bernardino areas since the system capacity analysis revealed adequate treatment and conveyance capacity to meet supplemental peak demands through most of the planning horizon within these areas.

In the Central Pool area, the analysis for system capacity needs indicates that the Central Pool Augmentation project will not be needed within the period analyzed. IAS participants generally agreed that other facility options should be considered since projected demands within the Central Pool do not justify a large-scale regional treatment plant. At the same time, Metropolitan will continue to preserve the Central Pool Augmentation (CPA) project option by securing key right-of-way as directed by Metropolitan's Board.

Implementation of North Las Posas CUP Phase 3. In the West Valley area, implementation of North Las Posas CUP Phase 3 will increase the dry, drought, and emergency yield to its full program capacity of 70,000 AFY. The increase in dry-year "take" effectively translates to a corresponding decrease in peak deliveries of Metropolitan imported supplies and results in delaying the need for additional distribution capacity to the West Valley area.

Metropolitan will carefully monitor critical forecast variables and evaluate any changes in the drivers under the right-time facility tracking for each load area.

Riverside and San Diego

The mid- to long-term actions for the Riverside and San Diego Area are as follows:

- Identify and implement preferred portfolios
- Skinner Area Local Facility Operations Study

Implement Identified Local and Regional Projects. Staff recommends continued implementation of identified local and regional projects within the portfolios to meet the long-term system capacity requirements. The ultimate system capacity need at year 2050 will be reevaluated for changes in factors affecting the demand.

Skinner Area Local Facility Operations Study. Evaluation of future treatment and conveyance needs in the Skinner Exclusive area inherently assumes that the SDCWA and its retail agencies are capable of meeting a significant portion of retail peak demands using local treatment facilities. The critical issue surrounding this assumption is whether the SDCWA and their retail agencies can store and convey adequate amounts of raw water to feed their local treatment plants and deliver treated water to areas of demand.

Timing of critical facilities such as a regional treatment plant, San Diego Pipeline 6, and expansion of conveyance between DVL and Skinner are impacted by this assumption. A further study that evaluates the SDCWA's local raw water storage and conveyance system needs to be conducted. The study will require a collaborative effort between Metropolitan, the SDCWA and its retail agencies.

Conclusion

The IAS process was successful in achieving its objectives primarily because of the high level of agency participation and collaboration. This close coordination in long-term regional planning will continue through annual IAS Update meetings and through formal IAS updates linked to the IRP.

The annual IAS meetings will allow for:

- Open policy discussions and introduction of new actions items
- Communicating the status of the implementation of local projects
- Updating demands, peaking factors and facility timing assessments
- Evaluating new local projects proposed for consideration in the preferred portfolios
- Updating the regional facility on-line dates
- Evaluating emerging planning issues

Metropolitan and its member agencies will continue to work collaboratively to develop a System Overview Study that will finalize an overall solution to meet identified system capacity needs. This study will include a consensus implementation plan consisting of regional and local projects including a detailed evaluation of impacts on Metropolitan's water rate. Determination of financial responsibilities and rate impacts will help determine final combination of regional and local project solutions.