INTEGRATED WATER RESOURCES PLAN

2003 UPDATE

Prepared by:

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

700 North Alameda Street
Los Angeles, CA 90012
(213) 217-6000

May 2004

(This page intentionally left blank)

TABLE OF CONTENTS

FOREWORD

Water is a common denominator, it ties every part of the state and every water agency together. The reason? There is no resource more socially and economically important than water. In Southern California, we also share the responsibility of ensuring we have a reliable and high quality water supply. To meet this responsibility, there has to be an integrated plan.

The framework for regional planning for southern California is the Integrated Water Resources Plan, adopted by Metropolitan Water District's board of directors in 1996. A plan of this type does three things: takes into account what we know, factors in what we can expect, and plans for uncertainties by including contingencies.

The 1996 IRP provided a 20-year resource plan that brought a balance between locally developed resources and imported supplies. It called for investments in water conservation, recycling, groundwater treatment storage and water transfers, and in return brought diversity and stability. It has proven to be a successful plan from both a planning and implementation standpoint. The 2003 IRP Update builds upon the success of the 1996 IRP.

An update was planned because Metropolitan and its member agencies wanted to ensure that the original vision that has been successful in providing reliability, diversity and flexibility for the region would continue to be successful. The IRP Update had three clear objectives: (1) to review the goals and achievements of the 1996 IRP (2) to identify changed conditions for water resource development (3) to update the resource targets through 2025.

The most significant changed conditions were the implementation successes seen in the form of regional conservation savings and Member Agencies plans for increased local supply development. Goals for deliveries from the State Water Project and Colorado River Aqueduct were also refined. This type of introspection and innovative planning also highlighted the need for infrastructure improvements to ensure the continued reliability of our distribution, treatment and storage systems.

The bottom line conclusion from the IRP Update is that the resource targets from the 1996 IRP, factored in with changed conditions, will continue to provide for 100 percent reliability through 2025. However, the region's reliability can be reinforced through continually maintaining contingency plans.

Contingency planning has served the region well in recent years. Our diverse resource mix gave Southern California the flexibility to withstand operational interruptions like the rehabilitation of the Colorado River Aqueduct in 2003, and unforeseen reductions in flow due to historically dry conditions. Even with these challenges, Metropolitan was able to set aside 500,000 acre-feet of water in storage.

The reason that the planning has been on target is because of the involvement, cooperation, and commitment of Metropolitan's member agencies. The collaborative development of the IRP and the extensive public outreach conducted on the draft IRP Update Report underlines the important partnerships that exist. As the responsibility for supply reliability is shared, so too is the success.

Phillip J. Pace
Chairman of the Board

Ronald R. Gastelum
Chief Executive Officer

EXECUTIVE SUMMARY

BACKGROUND

Reliability. Affordability. Water Quality. Diversity.
Flexibility. Environmental & Institutional Constraints

These six objectives were the drivers behind the 1996 Integrated Resources Plan (IRP) developed by Metropolitan Water District of Southern California (Metropolitan) in concert with its member agencies. The purpose of the IRP was to establish regional targets for the development of water resources including conservation, local supplies, State Water Project supplies, Colorado River Aqueduct supplies and water drawn from regional storage and purchased through water transfers.

THE 1996 IRP PROCESS

Metropolitan's Board of Directors set the direction and vision for the 1996 IRP. The IRP process was a collaborative effort drawing input from many groups including Metropolitan's Board, an IRP workgroup (comprised of Metropolitan staff, member agency and sub-agency managers, as well as groundwater basin managers), and representatives from the environmental, agricultural, business and civic communities. It was important that the IRP be a collaborative process because its viability was contingent on the success of local projects and local plans in achieving their individual target goals for resource management and development.

RESULTS OF THE 1996 IRP PROCESS

The outcome of the 1996 IRP was a "Preferred Resource Mix" which would ensure Metropolitan and its member agencies would meet their full service retail demands without interruption through 2020. Metropolitan's Board of Directors formally adopted the IRP in January 1996

SCOPE OF THE 2003 IRP UPDATE

In November 2001 the Metropolitan Board of Directors adopted a workplan to update the 1996 IRP to focus on changed conditions, and extend the planning horizon in order to comply with new water planning legislation linking land use decisions to water supply availability. The IRP Update had three objectives:

1. To review the goals and achievements of the 1996 IRP
2. To identify changed conditions for water resource development
3. To update the resource targets through 2025

FINDINGS AND CONCLUSIONS

1. **Changed Conditions:** The most significant changed conditions are higher conservation savings and Member Agencies plans to increase local supply development. Together these changes cause projected Metropolitan demands in

2020 to drop as much as 500,000 acre-feet in a dry year, compared to the 1996 IRP. Other major changed conditions include:

a. Board-revised goals for the State Water Project
b. Board-revised goals for the Colorado River Aqueduct
c. More stringent water quality regulations
d. Evolving resource implementation risk

2. **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.

3. **Buffer Supply:** Although current resource targets do not need to be modified, 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. As such, the buffer serves as a contingency measure to help ensure regional reliability and to mitigate against implementation risk. Partial or full implementation of the supply buffer is dependent on the progress in developing planned projects, and ongoing decisions by the Board of Directors.

4. **Updated Resource Targets**: With the recognition of changed conditions and the addition of the proposed buffer, the Region's resource targets have changed. Table ES – 1 summarizes the proposed new targets for each major resource, including an added 500,000 acre-feet split between recycling, groundwater recovery and desalination, and Central Valley/State Water Project storage and transfers. Collectively, these updated resource targets provide the supply buffer of 500,000 acre-feet.

Table ES - 1: Updated Resource Targets (with Supply Buffer)

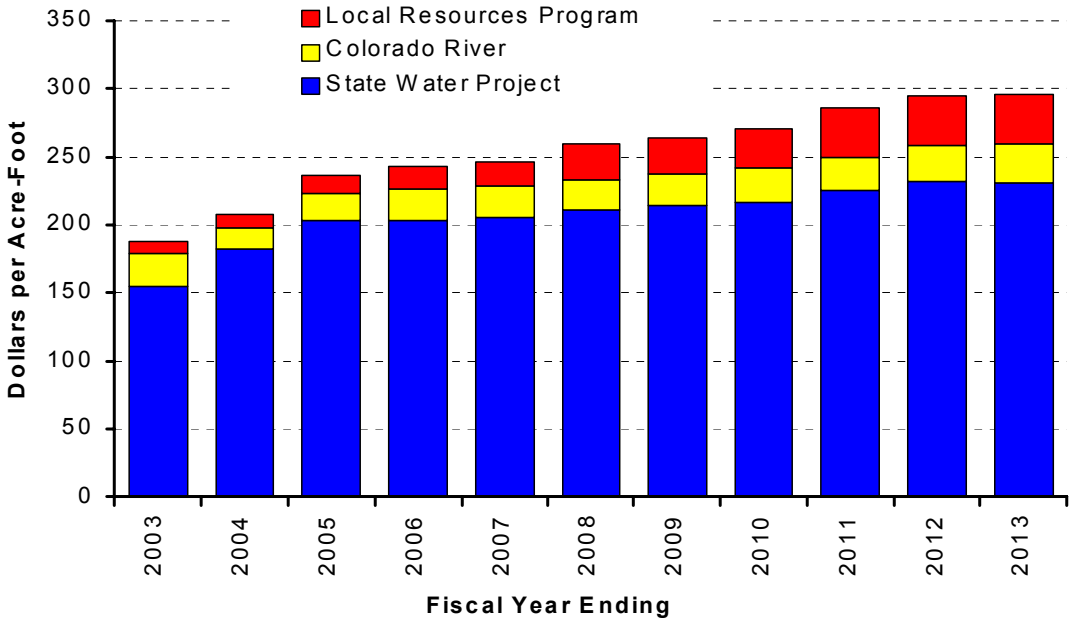
	1996 IRP 2020	IRP Update 2020	Change	IRP Update 2025
Conservation	882,000	1,028, 000	+145,600	1,107,000
• Recycling, • Groundwater Recovery • Desalination	500,000	750,000	+250,000 (buffer)	750,000
Colorado River Aqueduct *	1,200,000	1,250,000	+50,000	1,250,000
State Water Project	593,000	650,000	+57,000	650,000
Groundwater Conjunctive Use	300,000	300,000	0	300,000
CVP/SWP Storage and Transfer	300,000	550,000	+250,000 (buffer)	550,000
MWD Surface Storage **	620,000	620,000	0	620,000

* The 1,250,000 acre-feet supply from the Colorado River Aqueduct is a target for specific year types when needed. Metropolitan is not depending upon a full aqueduct in every year.
** Target for Surface Storage represents the total amount of water that can be extracted from storage,

FUNDING THE IRP

As additional imported supplies, local projects, conservation, storage and transfers are developed to meet the goals set forth in the IRP Update, associated costs are also expected to increase. In order to fund the projects and programs envisioned in this report, Metropolitan's rates are forecast to increase between $76 and $100 per acre-foot between 2004 and 2013, depending on Metropolitan's water sales. This forecast is consistent with Metropolitan's Long Range Finance Plan. Figure ES – 1 shows how each element contributes to the expected rate increases.

Figure ES - 1: Estimated Rate Impact of IRP



In addition, Metropolitan will continue to invest in water distribution and treatment infrastructure. Changes in water rates and charges are necessary to support the investments, and operations and maintenance essential to meet Metropolitan's and its member agencies' reliability objectives. The rate projections shown in Figure ES-1 incorporate planned investments in infrastructure.

IMPLEMENTATION APPROACH

There is no single cornerstone for regional supply reliability. Because of this, the region has developed an integrated resource plan that depends on many sources of supply. Achieving the continued reliability forecasted by the IRP rests on the shoulders of member and local agencies, as well as Metropolitan. Through this IRP Update, Metropolitan, the member agencies, and numerous local agencies will be able to provide reliable water supplies through continued investment in the region's water supplies.

Metropolitan's implementation approach for achieving the goals of the IRP Update is summarized in each of the resource categories found in Section 4 of the main report. Many of the programs and resources are in place or have been developed by Metropolitan and the member agencies. Additional programs have been identified for future development. A summary of the programs Metropolitan has developed or are in development/identified for implementation are shown in Table ES - 2. A comprehensive description of Metropolitan's implementation approach is contained in the Report on Metropolitan's Water Supplies issued on March 25, 2003. In order to ensure that the resource target implementation occurs, Metropolitan will complete an annual IRP Implementation Report and will revisit the IRP more comprehensively on a five-year IRP Update schedule. Both are described in the following section.

Table ES - 2: IRP Update Resource Status

Target	Programs and Status
• **Conservation**	***Current*** - Conservation Credits Program - 1992 Plumbing Codes - Southern California Heritage Landscape Program* ***In Development or Identified*** - Innovative Conservation Program - Innovative Supply Program
• **Recycling** • **GW Recovery** • **Desalination**	***Current*** - LRP Program ***In Development or Identified*** - Additional LRP Requests for Proposals - Seawater Desalination Program

Target	Programs and Status
• **SWP**	***Current*** - SWP Deliveries - San Luis Carryover Storage (Monterey Agreement) - Environmental Water Account ***In Development or Identified*** - Sacramento Valley Water Management Agreement - CALFED Delta Improvement Program
• **CRA**	***Current*** - Base Apportionment - IID/MWD Conservation Program - Coachella and All American Canal Lining Programs (to SDWCA & San Luis Rey) - Hayfield Storage Program** - PVID Land Management Program ***In Development or Identified*** - Lower Coachella Storage Program - Chuckwalla Storage Program - Central Arizona Banking Program - QSA Programs & Interim Surplus Guidelines
• **In Region Dry-Year Surface Water Storage**	***Current*** - DVL, Mathews, Skinner - SWP Terminal Reservoirs (Monterey Agreement)
• **In Region Groundwater Conjunctive Use**	***Current*** - North Las Posas - Cyclic Storage - Replenishment Deliveries - Proposition 13 Programs (short-listed) ***In Development or Identified*** - Raymond Basin GSP - Proposition 13 Programs (wait-listed) - Expanding existing programs - New groundwater storage programs
• **CVP/SWP Storage and Transfers** • **Spot Transfers and Options**	***Current*** - Arvin Edison Program - Semitropic Program - San Bernardino Valley MWD Program - Kern Delta Program - Desert Water/Coachella Valley Advanced Storage - Spot Market transfers and options - Mojave Storage Demonstration Project - North Kern Storage Program (pilot) ***In Development or Identified*** - San Bernardino Valley MWD Conjunctive Use Program - Kern Water Banking Program - Other San Joaquin Valley Programs

*Program savings not currently quantified.

**Program has been implemented with approximately 72,000 acre-feet in storage and extraction facilities are under construction.

PLANNING CYCLE

Metropolitan leads, participates in, and produces a number of planning studies and reports on a regular basis. Table ES - 3 shows the approximate timetables for the major processes and the type of requirement, legal or internal, which drive the process.

The IRP is the basis for Metropolitan's other planning and reporting documents. The 1996 IRP determined, through a comprehensive stakeholder process, what the guiding principles should be for building a long-term water resource plan, and the development targets under that plan. The 2003 IRP Update Report not only contains refinements to the development targets, but also establishes two schedules for regular reporting and updating the IRP in the future. The first is an annual IRP Implementation Report that will provide regular reporting to the Board on the status and progress of resource implementation. The second is a regular five-year schedule for the future IRP Updates, coincident with Metropolitan's filing of the Regional Urban Water Management Plan, as prescribed by the California Water Code. Metropolitan's other planning processes build upon the resource development targets.

Table ES - 3: Metropolitan Planning and Reporting Cycles

Report	Requirement / Type	Year							
		1999	2000	2001	2002	2003	2004	2005	2006
Regional Urban Water Management Plan	State Law / Report		X					X	
Annual Report to the California State Legislature on Achievements in Conservation, Recycling, and Groundwater Recharge (SB 60 Report)	State Law / Report		X	X	X	X	X	X	X
Report on Metropolitan's Water Supplies	Internal Policy / Report				X	X	*As Needed to Reflect Changes*		
IRP Implementation Report	Internal Policy / Report			X	X		X	X	X
IRP Update	Internal Policy / Planning Process					X			X
System Overview Study	Internal Policy / Planning Process						X		
Water Surplus and Drought Management Plan	Internal Policy / Planning Process	X					X		
*Salinity Management Study**	Internal Policy / Planning Process	X							
Long-Range Financial Plan	Internal Policy / Planning Process	X					X		

* Future Study release will be contingent upon completion of: (a)USBR Salinity Study of Lower Colorado (b) Inland Feeder (c) Delta Improvement Program

(This page intentionally left blank)

SECTION 1- INTRODUCTION

BACKGROUND

In the mid 1990s, Metropolitan faced growing demands and increasing competition for existing water supplies. Metropolitan and its member agencies responded to this challenge with an Integrated Resource Planning (IRP) Process that would develop a comprehensive water resources strategy to provide the region with a reliable and affordable water supply for the next 25 years. The IRP process ensures water reliability to support a strong economy and a healthy quality of life by addressing the threat of periodic shortages. Metropolitan's Board of Directors formally adopted the IRP in January 1996.

The IRP is intended to be a dynamic process that allows for response to any changes in water supply or demand. In keeping with this approach, Metropolitan's Board adopted the workplan for the IRP Update in November 2001.

THE 1996 IRP PROCESS

Metropolitan's original IRP was developed as a two-phase process over a two-and-a-half year period. Phase 1 included data gathering, analysis, and decision-making. Major accomplishments during this phase were: (1) defining resource management and business principles; (2) determining the reliability targets for the region; (3) projecting water demands; and (4) identifying resource options. Phase 2 focused on developing a Preferred Resource Mix and evaluating coordinated local water management efforts.

Metropolitan's Board of Directors set the direction and vision for the 1996 IRP. The IRP planning process was open and participatory involving Metropolitan, its member agencies, other water resource agencies, environmental interests, and the general public. Because of the diverse needs and interdependencies of the various entities in the region, the success of the IRP was contingent on a transparent and interactive decision-making process that involved the major stakeholders.

IRP Workgroup

The IRP Workgroup consisted of Metropolitan staff, member agency and local retail agency managers, and the groundwater basin managers. This IRP Workgroup met more than 35 times and spent hundreds of hours reviewing the analyses developed by Metropolitan staff and providing technical guidance.

Regional Assemblies

Major milestones in the process were established by a series of three regional assemblies held in October 1993, June 1994, and March 1995. These gatherings marked the first time that Metropolitan's senior management, board of directors, and member agency managers convened to collectively discuss strategic direction and

regional water solutions. Participants at these assemblies also included general managers from the groundwater providers, as well as invited public representatives. Each assembly produced a written Assembly Statement documenting areas of consensus and identifying areas where divergent views remained unresolved.

Public Forums and Member Agency Sponsored Workshops

In addition to the IRP Workgroup and three regional assemblies, six regional public forums and several member agency workshops were held to facilitate broader public input into the planning process. More than 450 people attended the public forums, representing business, environmental, community, agricultural, and water interests from throughout the state.

RESULTS OF THE 1996 IRP PROCESS

When Metropolitan's Board of Directors initiated the IRP Process they established six main policy objectives to be met: reliability, affordability, water quality, diversity, flexibility, and sensitivity to environmental and institutional constraints. Feasible resource options were identified, examined, and combined into various strategies or "mixes" which were measured against the IRP objectives. The eventual result of this process was the selection of the Preferred Resource Mix that balanced local and imported supplies.

The Preferred Resource Mix established regional targets for the development of water resources including Conservation, Local Supplies, State Water Project (SWP), Colorado River, Regional Storage and Central Valley transfers. It reflected the most comprehensive strategy on how the region should achieve an affordable level of water supply reliability, while establishing assurance that full-service demands at the retail level would be satisfied under all "foreseeable hydrologic conditions" through 2020. The reliability goal allowed for intermittent interruptions to non-firm discounted rate supplies sold under the Seasonal Storage Program and the Interim Agricultural Water Program. For the purposes of analysis, "foreseeable hydrologic conditions" was understood to mean "under historical hydrology". At the time of the 1996 IRP, the range of recorded historical hydrology spanned from 1922 through 1991.

The most important product of the IRP Process was a regional planning framework for making future decisions about resource development. This framework supports the ability of Metropolitan service area to plan for reduced risk through diversification, and remain flexible in response to uncertain future demands. The1996 IRP also recognized that the plan should be revisited and adjusted periodically to keep pace with uncertainty and changing conditions.

SCOPE OF THE 2003 IRP UPDATE

In November 2001, after Metropolitan's Strategic Plan, Rate Restructuring, and IRP Review were completed, the Metropolitan Board adopted a specific scope and action plan to update the 1996 IRP.

In addition to extending the planning horizon from 2020 to 2025, the IRP Update set out to accomplish three major objectives:

- *Provide a review of the resource development goals and current implementation achievements of the 1996 IRP*
- *Identify significant changed conditions affecting water resource development since the adoption of the 1996 IRP*
- *Evaluate the reliability of the IRP Preferred Resource Mix through 2020, adjust targets as needed to reflect changed conditions, and extend resource targets through 2025*

IRP UPDATE PROCESS

In November 2001, Metropolitan's Board directed staff to produce an update of the 1996 IRP to examine any changed conditions since the original report, and to recommend specific modifications as warranted. In the past year and a half, Metropolitan staff has presented its interim findings to the Water Planning, Quality, and Resources Board Committee through eight reports. In January 2003, a workshop was held for Metropolitan's Board to discuss final IRP recommendations and policy questions.

Table 1 - 1: Metropolitan's Water Planning, Quality, and Resources Board Committee/ Board Workshop

Year	Month	Meeting
2001	November	MWD Board directs staff to produce IRP Update work-plan
2002	January	***Oral Report to Board Committee***: IRP Report Card
	February	***Oral Report to Board Committee****:* Qualitative Changed Conditions
	March	***Oral Report to Board Committee****:* Quantitative Changed Conditions and Introduction of Buffer
	April	***Oral Report to Board Committee****:* Analytic Method, Quantitative Buffer, and adjusted scope
	May	***Oral Report to Board Committee****:* Status on the IRP Update
	June	***Oral Report to Board Committee****:* Stating preliminary conclusion of reliability through 2025 and requesting time with Member Agencies to resolve buffer issue
	November	***Oral Report to Board Committee****:* Updated IRP targets with buffer
2003	January	***Oral Report to Board Committee***: Final IRP Recommendation with policy question
		Board Workshop: Final IRP Recommendation with policy question

STAKEHOLDER PARTICIPATION

In keeping with the open, participatory process established with the 1996 IRP, the IRP Update relies upon valuable input from a diverse group including member agency managers, local retail agency managers, groundwater basin managers, the Southern California Water Dialogue Group, and individuals. In addition, coordination meetings were held with the Santa Ana Watershed Project Authority (SAWPA), an agency including representation comprised of Inland Empire Utilities Agency, Eastern Municipal Water District, San Bernardino Valley Municipal Water District, Western Municipal Water District, and Orange County Water District Meetings were also held with the Northern Group of member agency managers and the Central/West Basin Caucus, a group of board members and staff from the Central/West Basin sub-agencies. In addition, Metropolitan's participation with the State Water Project contractors and other stakeholder forums in the CALFED process and DWR's Water Plan Update have provided further opportunity to gain valuable input into the development of the IRP Update.

Significant input and guidance were gleaned from these meetings, which allowed for an open forum to discuss and evaluate the IRP Update. This process also has directly involved Metropolitan's member agency managers and their staff through numerous IRP meetings and status reports at both member agency managers meetings and member agency meetings held throughout the last year and a half. In addition, Metropolitan sent out two IRP Report Cards tracking the update progress, solicited member agency input and verification on Local Supply Information, and also encouraged and incorporated comments to draft versions of this 2003 IRP Update Report.

Table 1 - 2: Stakeholder Participation

Year	Month	Meeting
2001	November December	***SAWPA Meeting:*** Review and discuss IRP Update process ***Northern Caucus Meeting***: Review and discuss IRP Update process
2002	January	• ***Member Agency Managers Meeting***: Review and discuss Jan. Board Report • Sent out **IRP Report Card #1** • ***SAWPA Meeting:*** Review and discuss IRP Update progress
	February	• ***Member Agency Managers Meeting***: Review and discuss Feb. Board Report • Request member agency input/verification on Local Supply Information • ***SAWPA Meeting:*** Review and discuss IRP Update progress
	March	• ***Member Agency Managers Meeting:*** Review and discuss March Board Report • ***SAWPA Meeting:*** Review and discuss IRP Update progress

Year	Month	Meeting
	April	• ***Member Agency Meeting:*** Reviewed initial conclusions of IRP and Buffer • ***SAWPA Meeting:*** Review and discuss IRP Update progress • ***Central /West Basin Caucus Meeting:*** Review and discuss IRP Update progress • ***Southern California Water Dialogue:*** Review and discuss IRP Update progress
	May	• ***Member Agency Managers Meeting:*** Review and discuss May Board Report • ***SAWPA Meeting:*** Review and discuss IRP Update progress
	September	• ***Member Agency Technical Review Meeting***: Reviewed Resource Assumptions • Sent out **IRP Report Card #2**
	October	• ***Member Agency Managers Meeting:*** Review and discuss local data and buffer scenario
	November	• ***Member Agency Managers Meeting:*** Review and discuss Nov. Board Report • ***Member Agency Advisory Meeting:*** Reaching consensus on buffer
2003	January	***Member Agency Managers Meeting***: Review Final IRP Recommendation with policy question
	August	Sent out draft 2003 IRP Update Report for member agency review/comment.
	September	• ***Member Agency Managers Meeting***: Review Draft IRP Update Report • ***Member Agency Workshop:*** Review Draft IRP Update Report

IRP Update Outreach

As part of the IRP Update process, Metropolitan, in conjunction with its member agencies, conducted extensive public outreach meetings throughout April and June 2004. The purpose of the outreach process was to continue the cooperative effort between Metropolitan, its member agencies, and the public. During these meetings Metropolitan staff and member agencies presented the 2003 IRP Update and the plan for water supply reliability. The meetings provided the opportunity to share and receive valuable input.

Table 1 - 3: IRP Update Outreach Process

Date (2004)	Member Agency / Organization	Audience
Apr 1	MWDOC (Event #1)	Water Policy Forum
Apr 7	Western MWD Cal Fed Outreach	Board, public
Apr 7	Eastern MWD	Board, public, local officials Constituents
Apr 8	City of Long Beach – IRP Forum	Water Commissioners

Date (2004)	Member Agency / Organization	Audience
Apr 19	Central Basin MWD/West Basin MWD	Local constituents, elected officials, public
Apr 20	LADWP – Southern California Water Dialog	Elected officials, environmental interested, public, LADWP staff, DWR staff
Apr 22	MWDOC – IRP Forum (Event #2)	Member Agencies, public, local officials, staff
Apr 22	City of Beverly Hills	Commissioners, staff
Apr 27	San Diego County Water Authority	Board, local Agencies, general public
Apr 28	Three Valleys/IEUA	Local officials, staff, Board, local agencies
May 14	MWDOC - Event # 3 Water Advisory Committee of Orange County	Board Members, elected officials, city staff, community members
May 19	Foothill MWD	Board, local Agencies, general public
May 19	West Basin Water Association	Local Boards, elected officials, staff, community leaders
May 24	Calleguas and Las Virgenes	Board, local Agencies, general public
June 24	City of Pasadena	Board, general public

The outreach process provided an effective forum for communicating the message of the 2003 IRP Update to our member agencies and the public. Throughout the course of the fifteen public meetings, the majority of inquiries received were related to the clarification of points from the report. Staff revised sections of the report where appropriate, in response to comments. Table A2 – 4 summarizes the major categories of input received and the manner in which they were addressed.

Table 1 - 4: IRP Outreach Feedback

Categories of Major Comments/Questions	Manner in which addressed
The Supply Buffer -Implementation Process	-Incorporated comment in Report
Rate Projections	-Clarification provided
Population Projections	-Clarification provided
Desalination	-Clarification provided
IRP Review Process	-Clarification provided
Colorado River Aqueduct - Reflect Current Status	-Incorporated comments in Report
Water Transfers	-Clarification provided
Local Resource Program	-Incorporated comments in Report

SECTION 2 – ANALYTICAL METHODS

1996 IRP PREFERRED RESOURCE MIX

Background

The 1996 IRP produced a comprehensive water resource development strategy, referred to as the "Preferred Resource Mix," which provides the region with reliable and affordable water supplies through 2020. This strategy is documented in Volume 1 of Southern California's Integrated Water Resources Plan, Report Number 1107, March 1996.

Analytical Approach

Several steps were taken to develop this strategy with extensive technical modeling and discussion through the IRP workgroups and workshops.

Step One:

Determine the potential shortfall between retail demand and imported and local supply through 2020.

Step Two:

Identify feasible options to offset potential shortages. Options examined included the development of: conservation, water recycling, groundwater recovery, seawater desalination, groundwater storage, surface storage, and imported supplies.

Step Three:

Assemble the feasible resource options into different water resource mixes, and evaluate those mixes against the six objectives of reliability, affordability, reduced risk, water quality, and environmental and institutional constraints.

These steps were taken during what was considered Phase 1 of the IRP process beginning in June 1993. Three broad resource mixes resulted from the Phase 1 analysis: (1) an Emphasis Import Mix, which relied heavily on the development of imported supplies and regional storage infrastructure to meet future demands; (2) an Emphasis Local Mix, which relied primarily on the development of water recycling, groundwater recovery, and seawater desalination to meet future demands; and (3) an Intermediate Resource Mix, which included balanced investments in both local and imported supply development.

Phase 2 began in June 1994 to develop Southern California's Preferred Resource Mix by building on the analysis of Phase 1. During Phase 2, the Intermediate Resource Mix was refined into the Preferred Resource Mix. The Preferred Resource Mix set regional targets for resource development designed to yield approximately 5,800,000 acre-feet if a critical drought year were to occur in 2020. Regional retail water demand under that

same condition was estimated to be 6,100,000 acre-feet. The 300,000 acre-foot gap between the targeted supply development and demand is expected to be met by spot and option water transfers.

In total, the Preferred Resource Mix was found to satisfy the1996 IRP stated water supply reliability objective of 100 percent full service water demands at the retail level, under foreseeable hydrologic conditions.

2003 IRP UPDATE RELIABILITY MODELING

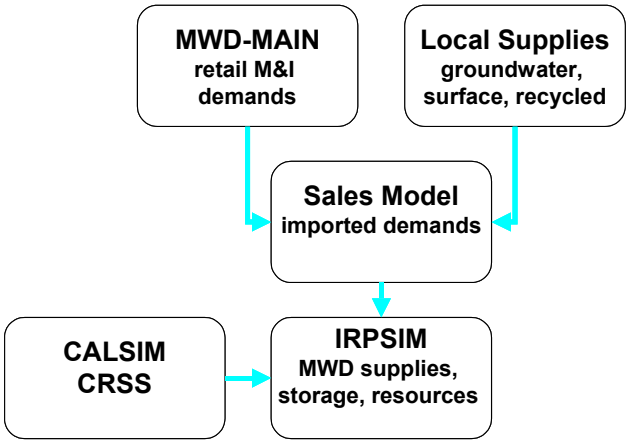
Background

The 1996 IRP evaluated reliability and resource options using a series of planning models. These basic models and related datasets, improved and updated with current information, are used in the 2003 IRP Update to evaluate the 1996 IRP targets and changed conditions described in this report.

IRPSIM is Metropolitan's primary tool for evaluating regional reliability, storage operations, and resource opportunities, but a number of other models must be used before IRPSIM analysis can be performed. These models include:

MWD-MAIN:	Retail urban water demand projections
MWD Sales Model:	Local supply and imported demand projections
CALSIM/DWRSIM:	SWP imported supplies
CRSS:	Colorado River Aqueduct (CRA) imported supplies
IRPSIM:	Reliability and resource evaluation

In general, retail demand and conservation projections are developed for each member agency with MWD-MAIN. Metropolitan's Sales Model combines these retail demand projections with estimates of future local supplies to develop a forecast of Metropolitan and other imported demands. IRPSIM integrates projections of Metropolitan demands with projections of SWP supplies (CALSIM/DWRSIM) and CRA supplies (CRSS). The graphic shows how these models are interconnected.



Documentation on MWD-MAIN is contained in Appendix 1 of this report and in Metropolitan's 2000 Regional Urban Water Management Plan. Detailed descriptions of the Sales Model, CALSIM, and CRSS are beyond the scope of this report but can be found in other Metropolitan, Department of Water Resources (DWR), and Bureau of Reclamation studies. The following is a brief description of IRPSIM.

IRPSIM Reliability Modeling

Metropolitan originally developed IRPSIM for evaluating the resource options in the 1996 IRP. IRPSIM uses a modeling method known as sequentially indexed Monte-Carlo simulation. In short, the model integrates projections of Metropolitan's demands and imported water supplies for each forecast year and adjusts each independent projection up or down, based on an assumed pattern of future weather drawn from the historic record. For instance, if Metropolitan expected the weather over the next 21 years (2004-2025) to be the same as the last 21 years (1982-2003), then IRPSIM would adjust the projected 2004 demands and supplies using the historical 1982 hydrology, and adjust the projected 2005 demands and supplies using the historical 1983 hydrology, and so on.

Metropolitan cannot predict the weather for any forecast year. Instead, IRPSIM cycles through historical years of hydrology to generate a probability distribution of reliability for each forecast year. In this way, Metropolitan can evaluate the probability of being in shortage or surplus for each forecast year, given the range in historical hydrology. This method of sequential analysis is effective in capturing the operation of storage resources that are drawn upon and refilled based on supplies and demands. Metropolitan's approach is consistent with industry practices used by other agencies in their resource planning. Both DWR and the Bureau of Reclamation use historical weather for long-term planning.

2003 IRP Update Analysis

The reliability analysis for this report was performed in 2002 and captures most of the changed conditions since the 1996 IRP. In the 1996 IRP, the range of historical hydrologic conditions spanned from 1922-1991. For the 2003 IRP Update, the range was extended by seven years to include conditions through 1998. The goal of the analysis was to evaluate Metropolitan's reliability with the existing IRP targets (or Board policy if more recent) under the changed conditions. As a result, the analysis is based on the best information available on demands, supplies, resources, and operating assumptions, as they existed in the spring of 2002. All aspects of Metropolitan's water resource portfolio are included in the analysis, such as groundwater storage operations, Diamond Valley Lake (DVL), Inland Feeder, and other existing and committed Metropolitan resources. Supplies and water transfers from a Quantification Settlement Agreement (QSA) are assumed to be in effect.

A note about the modeling: as stated previously, the objective of the modeling was to determine the impact and need of resources that are used to meet regional demands that remain after the use of traditional local supplies like groundwater, surface water, and Los Angeles Aqueduct supplies. All of these traditional local supplies, as well as the retail demand forecasts, have also had changes in assumptions since the 1996 IRP. These changes, listed in the appendices on retail demand and local supply, affect the need for supplemental resources, but were treated as assumptions and input for the purposes of modeling.

The following Resource Targets section discusses some of the resource assumptions embedded in IRPSIM. The results of the IRPSIM analysis are discussed in the Analysis and Findings section of this report.

Water Quality Assumptions

The water quality analysis of the IRP Update focused on meeting federal drinking water regulations at Metropolitan's treatment plants and meeting a maximum estimated salinity of 500 mg/L. Blend restrictions were used in IRPSIM to approximate the mix of SWP and CRA supplies needed to achieve these often-competing goals.

Most federal drinking water regulations for Metropolitan treated water deliveries are met through filtration and chemical treatment at Metropolitan's treatment plants. Metropolitan has five treatment plants: two that receive exclusively SWP water, and three that receive a blend of State Project and Colorado River water.

The SWP exclusive plants deliver water that meets federal regulations for disinfection by-products through regulation that called for a non-reversible commitment to institute an accepted treatment process to eliminate hazardous by-products. In December 2001, Metropolitan made that commitment to install ozonation at these two plants.

The blended plants, Skinner, Diemer, and Weymouth, meet federal guidelines through managing the blend of State Project and Colorado River water until treatment improvements are made. These blend restrictions limit the amount of State Project water as a percent of total treated water in the plant. Blend restrictions will ease based on the implementation of two treatment improvements, which are phase-in at each plant. Phase 1 calls for advance coagulation to be installed in 2005 for Skinner and 2006 for Diemer and Weymouth. Phase 2 calls for the installation of a treatment process equivalent to ozonation at Skinner, Diemer, and Weymouth in 2007, 2009, and 2009 respectively. The blend restriction for each of these dates and plants is given below. While Metropolitan's maximum capacity to manage State Project water at the blended treatments will be higher at time, low estimates of blend capabilities were used to assure compliance.

Table 2- 1: Assumed Blend Restrictions for Skinner, Diemer and Weymouth

Maximum State Project Water Blend			
	30% Blend	**65% Blend**	**100% Blend**
Skinner	Until 2005	2005-2007	Beyond 2007
Diemer	Until 2006	2006-2009	Beyond 2009
Weymouth	Until 2006	2006-2009	Beyond 2009

The IRPSIM model used these blend restrictions as rules that could not be violated, therefore all results of the reliability study reflect restricted water use due to water quality. The salinity goal was approximated in the study by restricting the minimum State Project blend to 25 percent.

(This page intentionally left blank)

SECTION 3 – RESOURCE TARGETS

CONSERVATION

Background

Since the early 1990s, Metropolitan and its member agencies have earned national recognition as leaders in water conservation. This strong commitment to water conservation is reflected in the 1996 IRP, which considered conservation a "core" water supply and established initial targets for regional conservation savings.

Metropolitan's focus on water conservation stems from challenges that the region faced in the 1987-1992 California drought. These concerns, along with technical advancements in water-efficient fixtures, fostered a heightened public and water agency awareness and acceptance of conservation. It provided Metropolitan a new cost-effective option to bolster water supply reliability. Today, Metropolitan and its member agencies are pushing the envelope of water conservation technology with a portfolio of innovative conservation programs. Metropolitan and nearly all of its member agencies are signatories to the California Urban Water Conservation Council's Memorandum of Understanding Regarding Water Conservation in California, and have pledged to implement the Best Management Practices (BMP) for urban water conservation.

Issues

Unlike traditional water supplies, conservation reduces water demand in ways that are not easily measured or metered. Demand is reduced through changed consumer behaviors and savings from water-efficient fixtures like ultra-low-flow toilets and showerheads. In order to quantify conservation savings, as well as projections, estimates are made using specially designed models. These models were used for both the 1996 IRP targets and 2003 IRP Update projections.

Conservation savings are commonly estimated from a base-year water use profile. Metropolitan uses 1980 as the base year because California introduced a new plumbing code that promoted fixture-based (hardware) conservation in 1980. Between 1980 and 1990, an estimated 250,000 acre-feet were saved as the result of the 1980 plumbing code and water rate increases. These savings, known as pre-1990 savings, are included in the 1996 IRP target as well as the current estimate of achieved savings.

<u>Reporting Conservation</u>

Metropolitan differentiates conservation savings in four ways:

- Active: *savings* from Metropolitan and member agency-funded conservation programs, *also* known as BMPs

- *Passive*: savings from the Metropolitan-sponsored 1992 California plumbing *code*

- *Price Effects: savings due to increases in retail water rates and conservation-oriented rate structures since 1990*

- *Pre-1990*: savings from the 1980 California plumbing codes and price effects from the 1980 to 1990 price increases

A key issue with evaluating conservation savings is untangling the relationship between active and passive conservation. The distinction between what is an active versus passive conservation savings can be difficult to define, especially when there are active programs for fixtures that are reinforced by plumbing codes. For this report, active and passive conservation are reported together.

Metropolitan does not currently assign a savings value for public awareness campaigns and conservation education because changes in attitude are difficult to measure. It is generally accepted that these programs prompt people to install water saving fixtures, and therefore have a residual benefit increasing the effectiveness of companion conservation programs.

Changed Conditions

Metropolitan updated its 1996 IRP conservation projections with:

1. Updated water savings estimates for high-efficiency fixtures
2. Explicit handling of price-effect savings
3. An updated set of demographic projections affecting the savings rates
4. New projections of active conservation
5. The realization that active and passive savings are interrelated

The combined effect of these changes is an increase in the projections of total conservation from the 1996 IRP.

1996 IRP and 2003 IRP Update Targets

The 1996 IRP set 2020 conservation targets of 882,000 acre-feet. This long-term target and the intervening years were originally based on an estimate of regional BMP compliance and estimates of passive conservation. The 2003 IRP Update contains a projection of regional conservation based on actual and projected implementation of water saving devices. Based on the current projections for 2020 savings, the region is expecting 1,028,000 acre-feet by 2020. These projections are in excess of the original BMP estimates, and include expected BMP compliance. Because of the nature of conservation (it results in a lower “realized” demand for water), the projection is represented as the new “target” for total conservation. In addition, the IRP Update includes a 2025 conservation projection of 1,107,000 acre-feet of savings. The following table (Table 3 - 1) shows the 1996 IRP conservation projection and the 2003 IRP Update:

Table 3 - 1: Conservation Targets (Acre-Feet)

Category	FY03	2010	2020	2025
2003 IRP Update	654,000	865,000	1,028,000	1,107,000
1996 IRP Target	571,000	738,000	882,000	N/A*

*The 1996 IRP Update did not set resource targets for 2025

Implementation Approach

Metropolitan's implementation approach for achieving the revised conservation target includes continuing to support the member agencies in developing cost-effective BMP-oriented active conservation programs, and developing new, innovative programs that address water use unique to the region. Metropolitan's stewardship charge within the rate structure will provide a continued funding mechanism for active programs. Metropolitan will continue to seek state and federal funding in conjunction with the member agencies. Conservation implementation, including passive and price-effect savings, is contained in Table 3 - 2 below.

Table 3 - 2: Conservation Savings Status (Acre-Feet)

Category	2020	Status
Active & Passive Savings	483,000	Current
Price Effect Savings	250,000	Current
Pre-1990 Savings	250,000	Current
System Losses/Other	45,000	Current
S.C Heritage Landscape	NQ	Current
Innovative Conservation	NQ	Current
Innovative Supply Program	NQ	Identified
Total Conservation: 2020	**1,028,000**	

NQ equals: Savings potential not quantified

Active Conservation – Conservation Credits Program

As a signatory to the California Urban Water Conservation Council's Memorandum of Understanding Regarding Water Conservation in California, Metropolitan has pledged to implement a prescribed set of urban water conservation BMPs. In practice, many of Metropolitan's conservation programs exceed BMP requirements. The region's commitment to conservation is represented by a $290 million investment by Metropolitan and its member agencies in conservation programs since 1990.

The cornerstone of Metropolitan's conservation program is the Conservation Credits Program. Under this program, Metropolitan contributes either one-half the program cost, or $154 per acre-foot of water conserved, whichever is less, to assist member agencies in exploring new program opportunities.

Passive Conservation from Plumbing Codes

Plumbing codes are among the most effective tools for reducing water use and have been critical to achieving the IRP goals. Plumbing codes reap long-term benefits. Each year, a percentage of existing non-conserving fixtures are replaced and new water-efficient housing units come on-line.

Metropolitan played a key role in supporting California's 1992 point-of-purchase plumbing code, which affects toilets (1.6 gallons per flush), showerheads (2.5 gallons per minute), urinals (1.0 gallon per flush) and faucets. Within Metropolitan's service area, the cities of Los Angeles, San Diego, and Santa Monica have passed retrofit-on-resale ordinances to accelerate fixture replacement beyond the plumbing codes. These code-like ordinances require that all non-conserving toilets and showerheads be replaced with water-efficient models when a property is sold. All three cities support their retrofit-on-resale ordinances with rebates.

Price-Effect Conservation

Numerous demand studies have shown that retail water rates and rate structures can be effective in promoting water savings. Consumers respond to price increases by reducing discretionary water use and by installing water-conserving devices. As retail rates within the region increase, and as water agencies adopt conservation-oriented rate structures, Metropolitan expects discretionary household and commercial & industrial water use to decrease. This reduction was modeled and incorporated into the 2003 IRP Update as a source of conservation.

The resulting price effects savings for the region are estimated to be 155,000 acre-feet in FY 2003, and 250,000 acre-feet per year by 2020. Most of the savings are expected to come from reductions in outdoor irrigation, which is the major discretionary component of residential and commercial use.

Other Programs

Metropolitan has implemented several new active conservation programs whose conservation savings estimates have not yet been quantified. As these programs are established, water use data will be evaluated to obtain savings estimates. These programs include a new outdoor landscape water use program and implementation of new water savings devices from the Innovative Conservation Program.

Southern California Heritage Landscape Program

In 2002, Metropolitan launched a public outreach campaign targeting outdoor water use. The campaign, coordinated with participating member agencies, included funding for the promotion of efficient residential watering through irrigation controllers, a watering index to assist in estimating efficient watering times, and a native and California-friendly plant program. These programs were expanded in 2003 and 2004 with an extensive media and outreach campaign and the launch of a consumer-oriented outdoor conservation savings Web site.

The landscape program is expected to reduce summer and fall outdoor water use. The actual savings rate will be measured, but are not included in the IRP Update's resource goals. Quantifying the potential savings is complicated because of possible overlaps with other programs – some of the outdoor savings may reduce the impact of price savings, or reduce the demand for recycled water. Further study is needed to investigate these issues.

Innovative Conservation Program

Metropolitan's Innovative Conservation Program (ICP) began in October 2001 with a request for proposals for new conservation technologies. The 2001 ICP identified two promising new technologies: X-ray machine recyclers and water brooms. Long-term penetration of these devices into the service area is unknown; therefore no savings have been incorporated at this time. In 2002, Metropolitan issued another ICP request for proposal, which is in the selection process. The new technologies identified by the ICP program are expected to generate significant additional savings, which will be quantified at a later date and have not been included in this IRP Update report.

Many additional conservation programs and ideas receive Metropolitan funding in support of IRP goals but are not included in this report. A detailed description of these programs is contained in Metropolitan's 2000 Regional Urban Water Management Plan and Metropolitan's *2003 Annual Report to the California State Legislature on Achievements in Conservation, Recycling and Groundwater Recharge*.

LOCAL RESOURCES - RECYCLING, GROUNDWATER RECOVERY, SEAWATER DESALINATION

Background

The 1996 IRP Preferred Mix called for a diverse portfolio of imported supplies and locally developed resources. At first glance, local resources development may appear to benefit only the overlying areas that directly receive the produced water supply. However, they are in fact regional resources that provide benefits by offsetting regional imported water demands and making the net additional imported water available to the entire service area.

To achieve a balanced mix, the IRP set targets and committed funding and implementation plans for development of member agency wastewater recycling (recycling), and groundwater recovery supplies. The 1996 IRP recognized seawater desalination as a potential resource, but the high cost estimates at the time precluded setting targets for future development.

Metropolitan currently funds recycling and groundwater recovery projects through the Local Resources Program (LRP). The LRP is a performance-based incentive program and has been instrumental in helping the region implement the 1996 IRP local resource targets. Metropolitan has invested over $121 million and partnered with member agencies on 53 recycling projects and 22 groundwater recovery projects. Member and retail agencies have also funded a significant number of local projects without Metropolitan funding, many of which pre-date Metropolitan's LRP program.

Issues

An important issue uncovered in IRP Update meetings with member agencies was the significant amount of future recycling that will be dedicated to groundwater replenishment and use in seawater barriers (non-consumptive or non-direct use). Metropolitan's 1996 IRP recycling target was set for direct use recycling (urban or agricultural) that directly offset a potable water demand. Many member agencies report recycled water for replenishment and seawater barrier to support their continued or increasing groundwater production. This report considers direct use of recycled water toward the local resources IRP target. Recycled water for groundwater replenishment and seawater barrier is reflected in local groundwater production.

Changed Conditions

The status of locally planned recycling and groundwater recovery projects change from year to year. Metropolitan periodically surveys its member agencies for planned LRP-related projects in order to coordinate local supply projections with agency plans. Planned projects move on or off the books for several reasons, including changes in long-term strategies, regulations, funding priorities, and new opportunities. This dynamic nature of local supply plans account for much of the change since the 1996 IRP.

Other changes since the 1996 IRP include the following:

- Decreases in the estimated cost of seawater desalination
- Faster than expected development of groundwater recovery supplies
- Decreased offset of potable supplies by recycled water due to higher than projected local recycling production dedicated to non-direct uses, such as groundwater replenishment and seawater barriers

1996 IRP and 2003 IRP Update Targets

The 1996 IRP targets for recycling and groundwater recovery projects were set at 300,000 acre-feet by 2000, 410,000 acre-feet by 2010, and 500,000 acre-feet by 2020. The recycling targets included pre-existing non-direct use supplies, but were intended to be for direct uses – consumptive urban and agricultural water supply. In FY 2002, recycling and groundwater recovery programs generated 251,000 acre-feet. While the target was narrowly missed for 2000, the region is expected to meet the 2010 and 2020 targets. Meeting the targets will require the region to produce 159,000 acre-feet of additional local project and/or seawater desalination supply by 2010 and 249,000 acre-feet by 2020. Overall, the region has developed about 50 percent of the 1996 IRP local resources target for 2020.

The 1996 IRP targets for direct use recycling, groundwater recovery, and desalination are shown in Table 3 - 3. These targets are still in effect for the 2003 Update analysis, even with the higher than projected development of local resources.

Table 3 - 3: Recycling, Groundwater Recovery, and Desalination Targets (Acre-Feet)

Source	2005	2010	2020	2025
2003 IRP Update	355,000	410,000	500,000	500,000
1996 IRP Targets – Total	355,000	410,000	500,000	N/A
• *1996 IRP – Recycling*	*310,000*	*360,000*	*450,000*	N/A
• *1996 IRP – GWR*	*45,000*	*50,000*	*50,000*	N/A
• *1996 IRP – Desalination*	*0*	*0*	*0*	N/A

Implementation Approach

Metropolitan's projection of the regional implementation of direct use recycling, groundwater recovery, and seawater desalination exceed the 1996 IRP goals. Although the recycling for direct use target is missed by over 50,000 acre-feet in 2020, the difference is covered with projected increases in groundwater recovery and seawater desalination (Table 3 - 4).

Table 3 - 4: Recycling, Groundwater Recovery, and Seawater Desalination Status in 2025 (Acre-Feet)

Source	Supply Range		Status
Recycling (Direct Use)	335,000	335,000	Current & Under Development
Groundwater Recovery	81,000	81,000	Current & Under Development
Seawater Desalination*	126,000	150,000	Under Development

*Metropolitan's current target for recycling, groundwater recovery, and desalination can accommodate 150,000 acre-feet of seawater desalination.

Funding Mechanisms

Between 1986 and 1990, Metropolitan's contribution to local projects was a minimum of $75 per acre-foot of production. In April 1990, Metropolitan's Board increased the contribution to $154 per acre-foot, and again in 1995 to a maximum of $250 per acre-foot.

In 1998, under a new innovative approach, Metropolitan issued a competitive Request for Proposals (RFP) for up to 53,000 acre-feet of new annual local project supplies. The goal of the RFP was to develop enough new recycling and groundwater recovery production to achieve the IRP targets and take advantage of competition to achieve regional cost savings. The RFP process assessed a number of different factors in selecting the optimal mix of local resources projects for funding, and brought forth the most cost-effective projects yielding regional benefits. The weighted average cost of the selected projects under the competitive process was about $110 per acre-foot of production.

Future targets for recycling production identified in the IRP Update will likely use a similar competitive process. Metropolitan issued a subsequent RFP in May 2003 targeting 65,000 acre-feet of new supply to meet targets under the 1996 IRP for water recycling and groundwater recovery production.

Seawater Desalination Implementation

Recent improvements in membrane technology and new plant siting strategies have reduced costs, and may make seawater desalination a potential supply option for the region. In 2001, Metropolitan issued a competitive RFP for seawater desalination projects with the goal of developing up to 50,000 acre-feet per year. In light of the enthusiastic response to the proposals submitted under the RFP, this report includes a revised local resources target that can accommodate a seawater desalination goal of 150,000 acre-feet.

STATE WATER PROJECT

Background

The SWP consists of a series of pump stations, reservoirs, aqueducts, tunnels, and power plants operated by the state of California Department of Water Resources (DWR). This statewide water supply infrastructure provides water to 29 urban and agricultural agencies throughout California. The original State Water Contract called for an ultimate delivery capacity of 4,230,000 acre-feet, with Metropolitan holding a contract of 2,011,500 acre-feet.

More than two-thirds of California's drinking water, including all water supplied by the SWP, passes through the San Francisco-San Joaquin Bay-Delta (Bay-Delta). For decades, the Bay-Delta system has experienced water quality and supply reliability challenges due to both variable hydrology and environmental standards that limit pumping operations in the Bay-Delta.

Issues

The 1996 IRP assumed that without investments to improve conditions in the Bay-Delta, the amount of water available to Metropolitan, as projected under the withdrawn State Water Resources Control Board (SWRCB) water rights Decision-1630, would decrease due to additional environmental and fishery standards that would have to be imposed on water project operations. Without intervention, it was assumed that the decreases would lower Metropolitan's SWP yield to 171,000 acre-feet by 2005 under a repeat of a 1977 hydrologic condition, which is the driest single drought year on record for the SWP watershed area.

In 1995, the SWP began operations based on the new criteria agreed to under the historic 1994 Bay-Delta Accord (Accord). Under the Accord and the subsequent water rights decision, the 1977 hydrologic scenario for SWP supply was improved to 418,000 acre-feet.

Changed Conditions

Metropolitan's strategy is to increase overall yield on the SWP while minimizing impacts to the Bay-Delta ecosystem. Maximizing deliveries to storage programs in wetter years will help achieve these goals.

Metropolitan's Board set new goals for SWP supply with the adoption of CALFED Policy Principles in August 1999. In addition to committing Metropolitan to pursue water quality objectives, the principles called for the development of a 650,000 acre-foot minimum dry-year supply from the SWP by 2020. Metropolitan's policy objectives also include an average 1,500,000 acre-feet of supply to Metropolitan, exclusive of transfers and storage programs along the SWP.

In August 2000, CALFED reached a critical milestone when the Record of Decision (ROD) for the Programmatic Environmental Impact Report/Impact Statement was approved. The ROD identifies implementation plans for Stage 1,the first seven years of what is expected to be a multi-year improvement program in the Bay-Delta. The ROD included a provision for studying a diversion upstream of the Bay-Delta and a facility to convey water through the Delta, but it did not include plans for an isolated transfer facility. This represents a changed condition from the 1996 IRP, which set SWP targets in line with a Bay-Delta fix.

1996 IRP and 2003 IRP Update Targets

The following table shows the targets for the SWP through 2025.

Table 3 - 5: State Water Project Supply* Targets (Acre-Feet)

	2003	2010	2020	2025
2003 IRP Update	418,000	463,000	650,000	650,000
1996 IRP Target	283,000	593,000	593,000	N/A

***** This table includes only SWP Contract Table A Allocation and Improvements, under a repeat of 1977 hydrology. It does not include San Luis Carryover Storage made available through the Monterey Amendment, or SWP water available from Desert Water Agency and Coachella Valley Water District as part of the DW/CV Advance Delivery Agreement.

Implementation Approach

Metropolitan's implementation approach for the SWP depends on the full usage of the current State Water Contract provisions (Table A basic contract amount, Article 21 interruptible supplies, Turnback Pool provisions, etc.) and the outcome of a number of negotiated agreements and their implementation. These include CALFED, the Sacramento Valley Water Management (Phase 8 Settlement) Agreement, The Monterey Amendment, and the Delta Improvement Program. Each one of these stakeholder processes or agreements involves substantial Metropolitan and member agency staff involvement to represent regional interests. Metropolitan is committed to working collaboratively with DWR, SWP contractors, and other stakeholders to ensure the success of these extended negotiations and programs, summarized in Table 3 - 6.

Table 3 - 6: State Water Project Supplies
Status: 2020 – 2025 Resources (Acre-Feet)

Program	Supply Range		Status
SWP Deliveries	418,000	1,741,000	Current
San Luis Reservoir Carryover	75,000	200,000	Current
CALFED & Delta Improvement Program	200,000	200,000	Under Development
Sacramento Valley Water Management Agreement	45,000	45,000	Under Development

CALFED and Delta Improvement Program

In 1994, a collaboration of stakeholder and governmental interests came together and put their historic differences aside to develop a comprehensive, long-term plan for managing California's Bay-Delta. Out of that process, the CALFED Bay-Delta Record of Decision emerged in August 2000 with clear mandates to improve water quality and supply reliability, and enhance the ecological health of the Bay-Delta. In 2003-04, discussions among stakeholder interests and state/federal agency representatives were held to move CALFED from planning to implementation. These discussions set the stage for the development of the proposed Delta Improvement Program of 2004.

The key benefits of the proposed Delta Improvement Program for urban Southern California include:

- Additional opportunities for member agencies to acquire replenishment water (96,000-168,000 af/yr);
- Enhanced access to voluntary water transfers upstream of the Delta as foreseen in the Record of Decision;
- Continued Endangered Species Act assurances and supply reliability through implementation of a long-term Environmental Water Account;
- Achievement of SWP supply goals for 2020 adopted by the Metropolitan Water District Board in the Southern California Integrated Resource Plan;
- Improved Delta export water quality (20 to 30 percent reduction in peak monthly bromides and salt concentrations); and
- Enhanced operation of the diversified portfolio of supplies developed over the past decade in the Integrated Resource Plan.

Sacramento Valley Water Management (Phase 8 Settlement) Agreement

Metropolitan also has been working to ensure that all Bay-Delta water users equitably share the responsibility of meeting flow requirements. In December 2002, all of the parties signed a settlement agreement known as, "The Sacramento Valley Water Management Agreement" or "Phase 8 Settlement Agreement." The agreement, which resulted from the SWRCB Bay-Delta Water Rights Phase 8 proceedings, include work plans to develop and manage water resources to meet Sacramento Valley in-basin needs, environmental needs under the SWRCB's Water Quality Control Plan, and export supply needs for water demands and water quality.

This agreement is comprised of about 60 water supply and system improvement projects by 16 entities in the Sacramento Valley. Approximately 185,000 acre-feet per year of yield are expected from conjunctive use projects in the Sacramento Valley. Approximately 45,000 acre-feet of this water would come to Metropolitan through its SWP allocation.

Based on the work plans for CALFED's Bay-Delta Program and the Sacramento Valley Management Agreement, potential annual and dry-year supply capabilities are projected to be 45,000 acre-feet in 2010, and 200,000 acre-feet by 2015 and beyond. These projections do not reflect Metropolitan's improved flexibility in managing SWP supplies for drought mitigation as a result of the Monterey Amendment provisions of the State Water Contract.

Monterey Amendment

The Monterey Amendment, executed by DWR and most of the State Water Contractors in 1995 and 1996, primarily addressed the allocation of SWP water in times of shortage and dealt with a number of other issues that facilitated more water management flexibility for Contractors. Although legal action challenging the validity of the Monterey Amendment has occurred, a settlement has been reached and a revised Environmental Impact Report is being prepared.

Each of the above implementation approaches contributes to Metropolitan's long-term SWP strategy.

COLORADO RIVER AQUEDUCT

Background

Metropolitan was formed with a primary mission to secure and deliver Colorado River water to Southern California as a supplementary supply to local supplies. In 1928, Metropolitan began to construct, and in 1941 to operate, the Colorado River Aqueduct (CRA) so that Colorado River Water could be delivered to Southern California.

One of Metropolitan's most valuable assets is a contract with the federal government that provides a basic apportionment of 550,000 acre-feet per year of Colorado River water. Historically, Metropolitan has also possessed a priority for an additional 662,000 acre-feet per year depending upon the availability of surplus supplies. The U.S. Secretary of the Interior determines the availability of surplus water. In 1988, Metropolitan entered into an agreement to fund water efficiency improvements to the service area of the Imperial Irrigation District (IID) in exchange for the right to divert the estimated amount of water conserved. This agreement, which is effective through 2033, provides up to 110,000 acre-feet per year to Metropolitan.

Water supplies from the Colorado River have been the topic of negotiation and intense debate over the past century; this debate continues today. By a 1964 U.S. Supreme Court decree (*Arizona v California and the Boulder Canyon Project Act*), California is required to limit its annual use to 4.4 million acre-foot basic annual apportionment of Colorado River water plus any available surplus. To keep California at 4.4 million acre-feet Metropolitan reduces its level of diversions in years when no surplus is available.

Issues

To help California live within its basic apportionment of Colorado River water, the Colorado River water users from California developed "California's Colorado River Water Use Plan". Also known as the "California Plan" and the "4.4 Plan", the plan characterizes how California would develop a combination of programs that would allow California to meet the 1964 Supreme Court decree and limit annual use of Colorado River water to 4.4 million acre-feet per year plus any available surplus water.

A critical component of California's Colorado River Water Use Plan was the completion of a Quantification Settlement Agreement (QSA) between the California agencies. This agreement establishes the baseline water use for each of the agencies, and thus facilitates the transfer of water from agricultural agencies to urban uses.

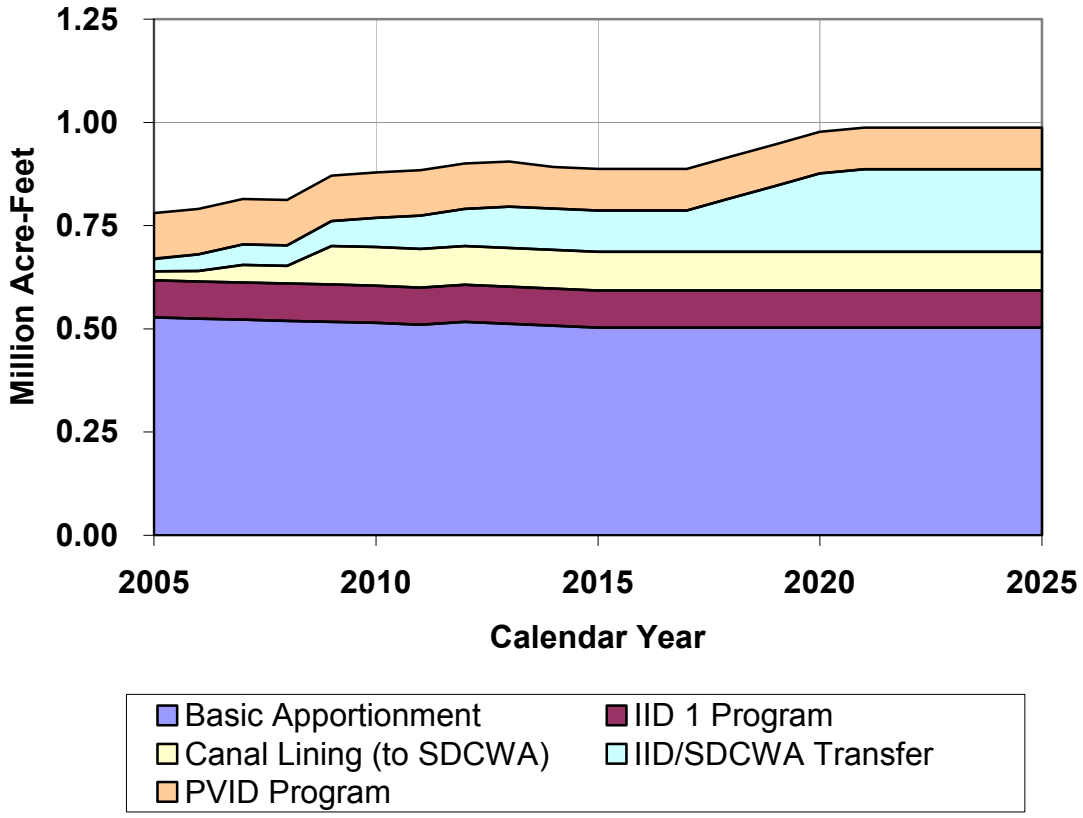
Changed Conditions

The 1996 IRP recognized explicitly that program development along the CRA and in other Colorado River user service areas would play an important part in reaching the target of 1,200,000 acre-feet per year of deliveries when needed. The implementation approach addressed the specific areas of additional water conservation with California

agricultural agencies; storing water out of state in Arizona; land management in the Palo Verde Irrigation District; storing water in vacant capacity of Lake Mead; using other entitlement holder's unused apportionments; and using surplus water as declared by the Secretary of the Interior. Subsequent to the 1996 IRP, the Metropolitan Board also adopted a Colorado River policy that increased the annual target by 50,000 acre-feet to a total of 1,250,000 acre-feet, when needed for use by the region.

On October 10, 2003, representatives from Metropolitan, IID, and Coachella Valley Water District (CVWD) executed the QSA and several other related agreements. Parties involved include the San Diego County Water Authority (SDCWA), the California Department of Water Resources (DWR), the California Department of Fish and Game, the U.S. Department of the Interior and the San Luis Rey Indian Water Rights Settlement Parties. The QSA supports Metropolitan's development plans for CRA deliveries. The QSA allows for the agricultural conservation, land management, and potential surplus water availability that were identified in the 1996 IRP. These provisions impact Metropolitan's expected deliveries of Colorado River water. The following graphic shows the expected deliveries from the CRA as a result of the completion of the QSA, and existing supply enhancement programs.

Figure 3 – 1: Projected Water Supplies of Existing CRA Programs



Note: Does not include programs under development.

1996 IRP and 2003 IRP Update Targets

The target for the CRA in the 1996 IRP was set at 1,200,000 acre-feet per year. The long-term target for the CRA based on the IRP Update is 1,250,000 acre-feet per year to meet regional demands when needed. Metropolitan also needs these supplies to manage regional storage conditions and water quality. Metropolitan recognizes that, in the short-term, programs are not yet in place to provide the full target, even with the adoption of the QSA. The QSA provides a solid foundation towards developing the programs that will help accomplish the long-term CRA target. These programs will be implemented over time. The following table (Table 3 - 7) shows the targets for the CRA, with the updated 2003 IRP targets illustrating the expected development of supplies over time.

Table 3 - 7: Colorado River Aqueduct Targets* (Acre-Feet)

	2003	2010	2020	2025
2003 IRP Update	684,000	879,000	1,250,000	1,250,000
1996 IRP Target	1,200,000	1,200,000	1,200,000	N/A

* Metropolitan's target for the CRA is to have 1,250,000 acre-feet of supply from the Colorado River when needed. Metropolitan expects to receive less than a full aqueduct in normal years

Implementation Approach

Metropolitan's long-term goal remains to produce 1,250,000 acre-feet of supply when needed. The QSA provides a solid foundation for development of those supplies. This section describes the current and identified resources (summarized in Table 3 - 8) that Metropolitan and SDCWA can develop to meet this goal.

Table 3 - 8: Colorado River Aqueduct Deliveries
Status: 2020-2025 Resources (Acre-Feet)

Program	Supply	Status
Base Apportionment	550,000	Current
IID/MWD Conservation Program	90,000	Current
Coachella & All-American Canal Lining Projects (to SDWCA & SLR)*	93,700	Current
SDCWA/IID Transfer*	200,000	Current
PVID Land Management Program	111,000	Current
Off-Aqueduct Storage • Hayfield Storage Program	100,000	Current**
Off-Aqueduct Storage • Lower Coachella Storage Program • Chuckwalla Storage Program • Central Arizona Banking	150,000 150,000 To Be Determined	Under Development

* Although SDCWA will take delivery of the water from this program, the water will be conveyed through Metropolitan's facilities.
** Program has been implemented with approximately 72,000 acre-feet in storage and extraction facilities are under construction

In order to achieve the regional long-term development targets for the CRA, Metropolitan has identified a number of programs. With the QSA, three of those programs are now clarified and have become current programs with defined program yields. These programs are: the IID/San Diego County Water Authority Transfer, the Coachella and All-American Canal Lining programs (to SDCWA and SLR Indian Tribe), and the IID/MWD Conservation Program. In addition, the Palo Verde Land Management and Crop Rotation Program has been completed, and the Hayfield Groundwater Storage Program also continues along its implementation schedule. All together, these programs are projected to provide up to 540,000 acre-feet of dry year deliveries. The QSA provides for a more straightforward implementation of these programs, as well as a direct clarification of the beneficiaries of the programs. Water from the Coachella and All-American Canal Lining programs and the IID/San Diego County Water Authority Transfer will directly benefit the San Diego County Water Authority. While these supplies are not Metropolitan's supplies, they are delivered by Metropolitan and will serve demands in Metropolitan's service area.

Other programs that could be developed by 2025 include groundwater storage programs in the Chuckwalla and Lower Coachella Valleys and a program with the state of Arizona to store surplus water along the Central Arizona Project. Together, these programs provide a potential for 450,000 acre-feet in dry years.

The following is a short description of the programs identified above:

Coachella and All-American Canal Lining Projects

The concrete lining of portions of the earthen All-American and Coachella Canals is scheduled to begin in 2004. The water that is conserved by the lining projects will be made available for diversion through Metropolitan's Colorado River Aqueduct. When the project was first developed, Metropolitan was to receive the majority of conserved water from the lining projects, with a smaller amount being made available to the San Luis Rey Indian Reservation. As part of the QSA negotiations in 2003, Metropolitan's share of the canal lining projects and resulting water savings were transferred to the San Diego County Water Authority. In return for the additional water supply, SDCWA agreed to pay Metropolitan to transport all transferred water through the Colorado River Aqueduct in accordance with Metropolitan's established rates. The canal lining projects are scheduled for completion in 2009. When completed, the projects will conserve about 94,000 acre-feet per year, of which 77,000 acre-feet will be made available to SDCWA, with smaller amounts available during the construction period.

IID/San Diego County Water Authority Transfer

With the execution of the QSA on October 10, 2003, a water transfer from Imperial Irrigation District to SDCWA commenced, with 10,000 acre-feet being transferred in 2003. During the initial years of the transfer, in order to minimize any impacts of the transfer to the Salton Sea, IID will provide water for the transfer through a land fallowing program. Each year the amount of water transferred from IID to SDCWA will increase. After 2015, the water will be conserved through agricultural conservation efforts, and the

quantity of transfer water will increase to 200,000 acre-feet annually. SDCWA will take delivery of the water through Metropolitan's Colorado River Aqueduct and pay fees in accordance with Metropolitan's established rate structure.

Palo Verde Land Management and Crop Rotation Program

In May 2004, Metropolitan's Board authorized a 35-year land management, crop rotation and water supply program with the Palo Verde Irrigation District. Under the program, selected farmers in PVID will be paid to reduce their water use by not irrigating a portion of their land. A maximum of 25 percent of lands within PVID can be used for the program in any given year. Under the terms of the QSA, any water savings within the PVID service area would be made available to Metropolitan. The program is scheduled to begin partial implementation during 2004, and when fully implemented is estimated to provide up to 111,000 acre-feet annually to Metropolitan.

Hayfield Groundwater Storage Program

Metropolitan's board approved the Hayfield Groundwater Storage Program in June 2000. The program will allow CRA water to be stored in the Hayfield Groundwater Basin in east Riverside County (about 50 miles east of Palm Springs) for future withdrawal and delivery to the CRA. As of 2003, there are 72,000 acre-feet in storage. Facilities to allow extraction of stored water are currently under development.

Arizona Water Bank

Interstate off-stream water banking of Colorado River water provides an added water management opportunity for meeting the needs of Arizona, California and Nevada. In 1992, Metropolitan reached an agreement with the Central Arizona Water Conservation District to allow unused Colorado River water to be stored in Central Arizona aquifers. The Southern Nevada Water Authority also participates in the program. This water can be recovered at Metropolitan's discretion.

Chuckwalla Groundwater Storage Program

Under the proposed Chuckwalla Groundwater Storage Program, Colorado River water would be stored in the Upper Chuckwalla Groundwater Basin for future delivery to the Colorado River Aqueduct. The basin is also located in Riverside County about 70 miles east of Palm Springs. A feasibility study was approved by Metropolitan's Board in June 2000. A $250,000 grant from the California Department of Water Resources was awarded to Metropolitan for a portion of the feasibility study. The anticipated benefits of this program echo those of the Hayfield Groundwater Storage Program, but development of the project is subject to the outcome of the feasibility study which takes into account the availability of surplus Colorado River water. Metropolitan staff is currently analyzing water quality data for this program and will make a determination based on the feasibility study in 2005.

Lower Coachella Valley Groundwater Program

Metropolitan, in conjunction with Coachella Valley Water District and Desert Water Agency, is currently looking at the feasibility of a conjunctive use storage program in the Lower Coachella groundwater basin. The basin, which is currently in an over-drafted condition, has the potential to provide a total storage capacity for Metropolitan of 500,000 acre-feet. The Lower Coachella Program would have the advantage of using the All American and Coachella canals to deliver water for storage, preserving capacity in the CRA for service area demands.

The QSA also provides for two additional sources of water supply for Metropolitan. Metropolitan has an agreement with DWR to receive water made available by IID through 2017 in amounts increasing up to 250,000 acre-feet per year with a 1,600,000 acre-foot cap. The actual amount available to Metropolitan will depend on whether the California Secretary of Resources has determined that the transfer of this water is consistent with the preferred alternative for Salton Sea restoration. The execution of the QSA also reinstated the Interim Surplus Guidelines (ISG), which were suspended when the original agreement deadline passed. Through 2016, California could receive surplus water from the river; the annual amount depends on the storage level of Lake Mead. Because of a five-year drought in the Colorado River watershed, the amount of surplus water available to Metropolitan has been substantially reduced from earlier projections. Additionally, if Metropolitan chooses to divert any additional surplus water, it may be obligated to participate in a shortage-sharing program with the State of Arizona. Because of the risks associated with this shortage-sharing obligation, Metropolitan did not divert special surplus water in 2003 that was available through the ISG and does not plan to divert special surplus in 2004. Metropolitan's current plans for resource development do not rely upon surplus water from the ISG; the option to take the surplus water, should it become available, provides additional water management flexibility.

Metropolitan will continue to pursue the programs identified above to meet the target of 1,250,000 acre-feet per year when needed.

IN-REGION SURFACE WATER STORAGE

Background

With the completion and filling of Diamond Valley Lake (DVL) and the flexible storage provisions of the SWP Monterey Amendment, Metropolitan has exceeded the in-region dry-year storage capacity identified in the 1996 IRP.

Storage at DVL significantly improves Metropolitan's ability to manage wet/dry year hydrologic cycles of imported supplies. In combination with the Inland Feeder, to be completed in 2007, DVL will allow Metropolitan to take full advantage of variable SWP allocations and to manage fluctuating Colorado River supplies.

Issues

There are several approaches for comparing surface water storage targets between the 1996 IRP and 2003 IRP Update. While reservoir storage capacity is a simple comparison, dry-year yield is not. After the 1996 IRP, Metropolitan established general long-term storage guidelines in the *1999 Water Surplus and Drought Management* (WSDM) study. The WSDM plan provides for flexibility during dry years, allowing Metropolitan to use storage for managing water quality, hydrology, and SWP issues. Dry-year surface storage yields have been characterized in several ways, including delivery capabilities over two and three-year dry periods. The approach used in the IRP Update assumes dry-year surface storage can be used as needed and as available within the WSDM planning framework.

Changed Conditions

Based on an updated emergency storage calculation for 2020, there will be more surface water available in DVL for dry-year production as compared to the 1996 IRP. The updated calculation accounts for lower projected demands in 2020 and assumes that the emergency storage need is allocated to other regional reservoirs first, with the remainder allocated to DVL. As regional demands grow, the dedicated dry-year storage in DVL is expected to gradually decline to the 1996 IRP target of 400,000 acre-feet by 2030.

Another issue is the characterization of the flexible storage available in the SWP terminal reservoirs. The *2003* Report *on Metropolitan's Water Supplies* assumes that up to 50 percent of the available SWP flexible storage could be used in a repeat of a single dry year event, such as the 1977 hydrology. In the IRP Update Report, dry-year surface production, including Monterey storage, is not limited in this way. Instead, Metropolitan's reliability modeling determines the availability of stored surface water supplies in each forecast year based on historical hydrology.

1996 IRP and 2003 IRP Update Targets

The 1996 IRP identified a 2020 in-region surface water target of 620,000 acre-feet of dry year storage - 400,000 acre-feet of dry year storage in DVL, and about 220,000 acre-feet available through the Monterey Amendment in the SWP terminal reservoirs (Castaic and Perris). This target remains the same for the 2003 IRP Update.

Table 3 - 9: In-Region Dry-Year Surface Storage Targets (Acre-Feet)*

	2010	2020	2025
2003 IRP Update Carryover Storage	620,000	620,000	620,000
1996 IRP Target	620,000	620,000	N/A

* Note: the table shows the usable storage capacity, not total stored supply.

Implementation Approach

Metropolitan has met or exceeded the 1996 IRP target for dry-year surface storage. By 2025, Metropolitan will have between 454,300 and 866,000 acre-feet of dry year carryover storage capacity in DVL, Lake Mathews, and Lake Skinner, and between 110,000 and 219,000 acre-feet of capacity in the SWP terminal reservoirs (Table 3 - 10).

Table 3 - 10: In-Region Dry-Year Surface Storage Status in 2025 (Acre-Feet)

Program	Supply Range		Status
Metropolitan Surface Storage (DVL, Lake Mathews, Lake Skinner)	454,300	866,000	Current
SWP Flexible Storage	110,000	219,000	Current

IN-REGION GROUNDWATER STORAGE

Background

Groundwater basins within Metropolitan's service area, like available surface storage, can provide significant operational flexibility to the water supply system in Southern California. Conjunctive use is an important part of maintaining and enhancing the reliability of these basins. Local water management has included the conjunctive use of surface water and groundwater since the 1950s. Conjunctive use can be an even more important part of the region's supply reliability in the future. Currently, more than 70 recharge facilities are replenishing Southern California's water basins.

Issues

Metropolitan has found that a ratio of groundwater storage capacity to delivery capability of three to one generally allows for maximizing storage use, under historical hydrologic variation, while minimizing capital cost. In other words, for every 3,000 acre-feet of groundwater storage capacity, there should be 1,000 acre-feet of delivery capability. Most of Metropolitan's groundwater programs have this ratio as a goal while the programs are under development.

Changed Conditions

Major changed conditions since the 1996 IRP include broadening of Metropolitan's groundwater programs from rate discount-based storage programs to include contractual-based programs and the availability of bond funding for local groundwater storage projects. The advantage of contractual storage programs is the ability for Metropolitan to call upon the storage when needed, increasing the regional benefit of the stored water.

Since the 1996 IRP, additional groundwater funding mechanisms have become available. In 2000, Proposition 13 appropriated $45 million for groundwater conjunctive use projects in Metropolitan's service area. Another $200 million was made available based on a competitive bid process for additional local groundwater storage and recharge projects throughout California. In 2002, Chapters 7 and 8 of Proposition 50 also made available $76 million and $500 million, respectively, towards State water supply reliability and water management programs. Proposition 50 grants will be made available in a competitive-bid process similar to Proposition 13.

1996 IRP and 2003 IRP Update Targets

The 1996 IRP identified the need for about 200,000 acre-feet per year of dry-year yield from in-region groundwater storage by 2000, 275,000 acre-feet by 2010, and 300,000 acre-feet by 2020. These targets are still in effect.

Table 3 - 11: In-Region Groundwater Storage Targets (Acre-Feet)

Program	2010	2020	2025
2003 IRP Update	275,000	300,000	300,000
1996 IRP Target	275,000	300,000	N/A

Implementation Approach

Moving forward, Metropolitan is developing contractual storage arrangements with groundwater basins throughout the region. During dry years, Metropolitan will be able to call on participating agencies to draw upon previously stored supplies in place of imported deliveries. The imported water saved becomes available for other member agencies.

The development of conjunctive use programs is often complicated by the demands of institutional, legal, environmental, and private stakeholders. Even so, Metropolitan has successfully implemented contractual conjunctive use programs in six groundwater basins in four counties. The lessons learned in these early successes would be invaluable in developing additional identified programs to meet the 1996 IRP Target. A summary of current and identified conjunctive use programs is contained in Table 3 - 8 below and in the following sections.

Table 3 - 8: In-Region Groundwater Storage Status 2020 & 2025 (Acre-Feet)

Program	Supply	Status
North Las Posas	70,000	Current
Long-term Seasonal Storage	100,000	Current
Proposition 13 Programs • City of Long Beach • Inland Empire • Orange County • Foothill • Three Valleys	61,000	Current
Proposition 13 Programs (in progress) • San Diego County • Lakewood • Compton	~3,000	Under Development
Raymond Basin	25,000	Under Development
Additional Programs • Elsinore Valley GSP • San Gabriel Basin CUP • Three Valleys • Expansion of existing programs and new programs	111,000	Under Development

North Las Posas

The first contractual conjunctive use project developed by Metropolitan is the North Las Posas groundwater storage program. This program was developed in partnership with the Calleguas Municipal Water District, and will ultimately yield 70,000 acre-feet per year of dry-year supply. Metropolitan currently has 30,000 acre-feet of stored water and 12,000 acre-feet of withdrawal capacity available through the program. By 2005, about 47,000 acre-feet of dry-year withdrawal capacity will be available with an additional 23,000 acre-feet of withdrawal capacity available left to be developed.

Proposition 13 Projects

Metropolitan also is negotiating additional contractual conjunctive use agreements in Raymond Basin and for programs receiving partial funding through Proposition 13. These programs are expected to be in place by 2010, producing 25,000 acre-feet per year and 64,000 acre-feet per year of dry-year supply, respectively.

Metropolitan issued a RFP for the Proposition 13 programs and developed a short-listed set with an expected yield of 64,000 acre-feet per year. Several Proposition 13 projects have been signed, including programs with the city of Long Beach, Inland Empire Utilities Agency, Municipal Water District of Orange County, Foothill Municipal Water District, and Three Valleys Municipal Water District. Together, these programs will ultimately yield over 61,000 acre-feet of dry year supply. Other programs are in the works in San Diego, Riverside, and Los Angeles counties.

Cyclic Storage

Metropolitan can currently draw upon 50,000 acre-feet per year of dry-year supply from cyclic storage accounts with several member agencies. Cyclic storage agreements allow Metropolitan to deliver replenishment water into a groundwater basin in advance of agency demands. Agencies can then take a transfer of water from storage accounts when they incur a replenishment obligation to the basin. These types of agreements have been in place since the early 1970s, but may be closed by 2020. Metropolitan will be developing programs that have call provisions for extraction in dry years when replenishment is not available.

Interruptible Long-term Replenishment Program

Metropolitan's interruptible long-term replenishment program also provides a dry-year benefit. According to the provisions of Metropolitan's 1999 WSDM Plan, Metropolitan, during dry years, can cut replenishment deliveries an estimated 100,000 acre-feet for a minimum of two years while participating member agencies maintain normal groundwater withdrawals. After a dry period is over, these agencies buy extra replenishment water and restore their basins to pre-drought levels. Between cyclic and replenishment storage, Metropolitan can count on 150,000 acre-feet of reliable dry-year supplies from existing incentive rate programs. By 2020, this number may be reduced to 100,000 acre-feet after the cyclic accounts are closed.

Identified Programs

Additional programs have been identified for potential development in the future. These include two programs wait-listed in the Proposition 13 Conjunctive Use RFP:

- The Elsinore Valley Groundwater Water Storage Program with Elsinore Valley and Western Municipal Water District
- The San Gabriel Basin Conjunctive Use Project with Three Valleys Municipal Water District

Metropolitan also may consider expanding the existing programs at some time in the future. Beyond 2010, Metropolitan has the potential to develop additional dry-year storage programs with the issuance of additional RFPs.

CENTRAL VALLEY/STATE WATER PROJECT TRANSFERS AND STORAGE

Background

A major goal of the 1996 IRP was to develop additional supply reliability through the California Aqueduct by entering into flexible storage and transfer agreements with Central Valley Project (CVP) and SWP contractors. Metropolitan's strategy has been to focus on voluntary programs designed to improve regional reliability while benefiting those selling the water or providing storage. This strategy, along with a coordinated focus on developing programs, has enabled Metropolitan to exceed its 2010 CVP/SWP storage and transfer target in 2003.

Issues

Reporting the benefits of many of the storage and transfer programs is an issue because delivery capabilities are often tied to SWP allocation. For instance, the transfer component of the San Bernardino Valley program varies from 20,000 acre-feet to 80,000 acre-feet depending on the SWP allocation. While these programs can be represented exactly in Metropolitan models, assumptions must be made to simplify reporting.

Changed Conditions

Metropolitan's success in developing dry-year storage and transfer agreements is the result of changes since the IRP. These changes include:

- Dedicating Metropolitan staff to identifying and developing transfer and storage programs
- A recognition by some Central Valley agriculture interests that participation in transfer programs is a good business practice

- More cooperation between Metropolitan and DWR in facilitating spot transfers and options

- More cooperation between Metropolitan and the Federal government in facilitating spot transfers and options

1996 IRP and 2003 IRP Update Targets

The 1996 IRP target for CVP/SWP transfer and storage programs is 300,000 acre-feet per year of dry-year supply by 2010. This target is preserved for the 2003 IRP Update analysis, and the resources needed to achieve it are under development.

Table 3 - 13: Central Valley and State Water Project Storage and Transfer Targets (Acre-Feet)

	2010	2020	2025
2003 IRP Update Target	300,000	300,000	300,000
IRP Target	300,000	300,000	N/A

Implementation Approach

Metropolitan has eight major storage and transfer programs available for meeting dry-year needs. Additional programs are in development as demonstration projects. Metropolitan can meet the remainder of its CVP/SWP target through spot transfers and options, as projected in the IRP. The following sections describe Metropolitan's implementation approach of the CVP/SWP programs:

Table 3 - 9: CVP/SWP Storage and Transfer Programs Status: 2020 & 2025 Resources (Acre-Feet)

Program	Dry Year Supply	Status
Semitropic	107,000	Current
Arvin-Edison	90,000	Current
San Bernardino Valley MWD Transfer and Storage	70,000	Current
Kern Delta WD	50,000	Current
Desert Water WA & Coachella Valley WD	12,300	Current
Market Transfer Options	Variable	Current
Mojave Storage Program	35,000	Current
North Kern Storage Program	30,000	Current
Additional Storage/Transfers • Kern Water Banking Program • San Bernardino Valley MWD Conjunctive Use Program • Other San Joaquin Valley Programs	125,000	Under Development

Semitropic and Arvin-Edison

Metropolitan has developed programs with the Semitropic and Arvin-Edison Water Storage Districts with a combined storage capacity of about 600,000 acre-feet. When fully developed, they are expected to deliver 197,000 acre-feet per year assuming a 10-month delivery schedule.

San Bernardino Valley Transfer and Storage Program

In 2001, Metropolitan developed a combined transfer and storage program with the San Bernardino Valley Municipal Water District (San Bernardino). The San Bernardino transfer program has a delivery capability ranging from 20,000 acre-feet to 80,000 acre-feet depending on the hydrological conditions. In addition, the agreement allows Metropolitan to store up to 50,000 acre-feet of transfer water for use in dry years. In wet years, the San Bernardino transfer and storage programs can produce up to 130,000 acre-feet.

Kern-Delta Water District

Metropolitan has also developed a program with the Kern-Delta Water District for 250,000 acre-feet of storage, producing 50,000 acre-feet of dry-year yield. The program was approved in November 2002 with a program term of 25 years.

Desert Water /Coachella Valley Advanced Delivery Program

Another program available to Metropolitan is an advanced delivery program with the Desert Water Agency (DWA) and Coachella Valley Water District (CVWD). Under existing agreements, Colorado River supplies are delivered to DWA and CVWD in exchange for their SWP Contract Table A allocations. Metropolitan has the option of delivering additional supplies in advance with a yield of up to 18,000 acre-feet in dry years.

Spot Transfers and Options

In addition to the storage and transfer programs described, Metropolitan expects to meet the remainder of its target through additional dry-year transfers and spot market purchases. Metropolitan demonstrated this capability in 2003 by purchasing about 120,000 acre-feet of CVP and SWP supplies through spot transfers and calling upon options. In wet and normal years Metropolitan may also consider cost-effective transfers at competitive prices when storage is available.

Additional Storage/Transfer Programs

Metropolitan has identified several other transfer opportunities. Two of these, the Mojave Storage Program and the North Kern Storage Program, are in a pilot stage. Additional program opportunities exist with the San Bernardino and other agencies in the San Joaquin Valley. While the number and scope of these programs is still being worked out, they have the potential of producing up to 190,000 acre-feet by 2020.

In total, Metropolitan has the potential for exceeding the 300,000 acre-feet dry-year yield target with contractual storage and transfer programs alone. The additional capabilities provided by spot market transfers and options will ensure that Metropolitan meets the 300,000 acre-foot target for CVP/SWP transfer supplies.

RESOURCE TARGET SUMMARY

The 1996 IRP set supply targets that have guided the region's resource development. Together, Metropolitan and the member agencies are successfully implementing the Preferred Resource Mix. This is evident in the number of programs that have been developed or are in progress. Still more programs have been identified by both Metropolitan and the member agencies to meet the IRP targets. A summary of the programs Metropolitan has developed or are in development/identified for implementation is in Table 3 - 10.

Table 3 - 10: IRP Update Resource Status

Target	Programs and Status
• **Conservation**	***Current*** - Conservation Credits Program - 1992 Plumbing Codes - Southern California Heritage Landscape Program* ***In Development or Identified*** - Innovative Conservation Program - Innovative Supply Program
• **Recycling** • **GW Recovery** • **Desalination**	***Current*** - LRP Program ***In Development or Identified*** - Additional LRP Requests for Proposals - Seawater Desalination Program
• **SWP**	***Current*** - SWP Deliveries - San Luis Carryover Storage (Monterey Agreement) - Environmental Water Account ***In Development or Identified*** - Sacramento Valley Water Management Agreement - CALFED Delta Improvement Program & Napa Negotiations

Target	Programs and Status
• **CRA**	***Current*** - Base Apportionment - IID/MWD Conservation Program - Coachella and All American Canal Lining Programs (to SDWCA & SLR) - Hayfield Storage Program** - PVID Land Management Program ***In Development or Identified*** - - Lower Coachella Storage Program - Chuckwalla Storage Program - Central Arizona Banking Program - QSA Programs & Interim Surplus Guidelines
• **In Region Dry-Year Surface Water Storage**	***Current*** - DVL, Mathews, Skinner - SWP Terminal Reservoirs (Monterey Agreement)
• **In Region Groundwater Conjunctive Use**	***Current*** - North Las Posas - Cyclic Storage - Replenishment Deliveries - Proposition 13 Programs (short-listed) ***In Development or Identified*** - Raymond Basin GSP - Proposition 13 Programs (wait-listed) - Expanding existing programs - New groundwater storage programs
• **CVP/SWP Storage and Transfers** • **Spot Transfers and Options**	***Current*** - Arvin Edison Program - Semitropic Program - San Bernardino Valley MWD Program - Kern Delta Program - Desert Water/Coachella Valley Advanced Storage - Spot Market transfers and options - Mojave Storage Demonstration Project - North Kern Storage Program (pilot) ***In Development or Identified*** - San Bernardino Valley MWD Conjunctive Use Program - Kern Water Banking Program - Other San Joaquin Valley Programs

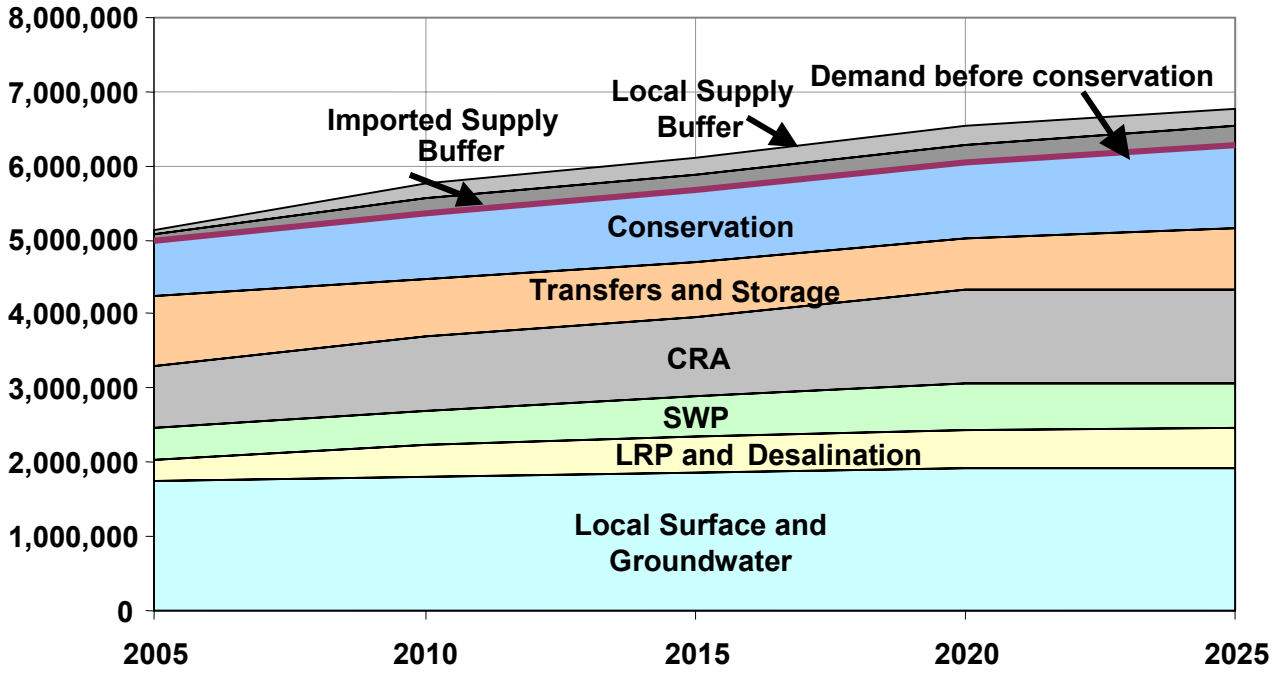
*Program savings not currently quantified.
**Program has been implemented with approximately 72,000 acre-feet in storage and extraction facilities are under construction.

Dry-Year Resource Mix

With the 1996 IRP and board-revised resource targets discussed in this section, Metropolitan's service area is reliable through 2025. Figure 3 – 1 shows how the Region's current resources and the IRP targets meet dry-year demands through 2025. Metropolitan and the member agencies have agreed that a buffer supply is necessary to

insure the region against resource implementation uncertainty. The buffer supply and reliability tests performed for the 2003 IRP Update are discussed in the next section.

Figure 3 - 2: 2003 IRP Update – Dry-Year Demand and Supplies with Buffer



SECTION 4 – RESULTS AND ANALYSIS

RELIABILITY STUDIES

Overview

A major finding of the IRP Update is that Metropolitan is reliable through 2025 given the existing IRP Targets, planned resources, and changed conditions described in this report.

The reliability through 2025 was demonstrated with two methods:

- Assessing the need for dry-year transfers on the Colorado River, CVP/SWP storage and transfers, and spot transfers with the projected resource mix
- Evaluating how many additional years of reliability are provided by the projected resource mix in: 2005, 2010, 2015, 2020, and 2025 with and without the 500,000 acre-feet planning buffer supply

Assumptions

The reliability analysis for the IRP Update was performed using Metropolitan's IRPSIM. Details of this modeling are found in the Analytical Methods section of this report. The analysis assumes that all goals of the 1996 IRP and subsequent board policies are implemented and that local supplies are available in the timelines indicated by the member agencies.

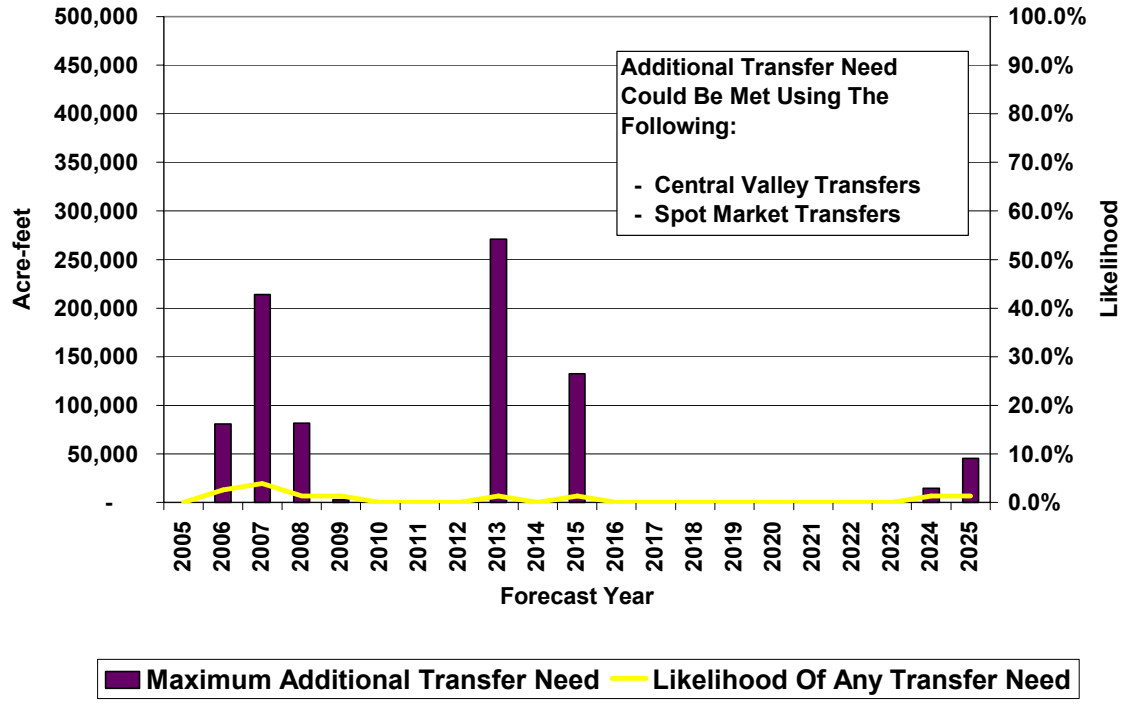
CRA transfers and storage are limited to two additional programs totaling 300,000 acre-feet (approximately 150,000 acre-feet per program) above current investments. This brings modeled dry-year supply from the CRA up to 1,250,000 acre-feet. CVP/SWP storage and transfers are limited to 300,000 acre-feet total (represented by a 90,000 acre-feet cap in the analysis). Spot transfers are unconstrained.

Transfer Needs Analysis

Under this scenario, the Metropolitan service area remains reliable through 2025 with varying needs for supplemental supply filled by spot market purchases

Figure 4 - 1 indicates the probability of need and the amount of transfers above current levels of development for CRA and CVP/SWP storage and transfer programs, but within the 1996 IRP Targets. Metropolitan would have a maximum forecasted annual transfer need of 271,000 acre-feet through 2025. The analysis shows that the peak need for transfers occurs during a 1977 hydrology. In addition, water transfers would also provide an effective supply buffer that would be available to mitigate uncertainties and risks.

Figure 4 - 1: Total Additional Transfers Needed To Ensure Reliability

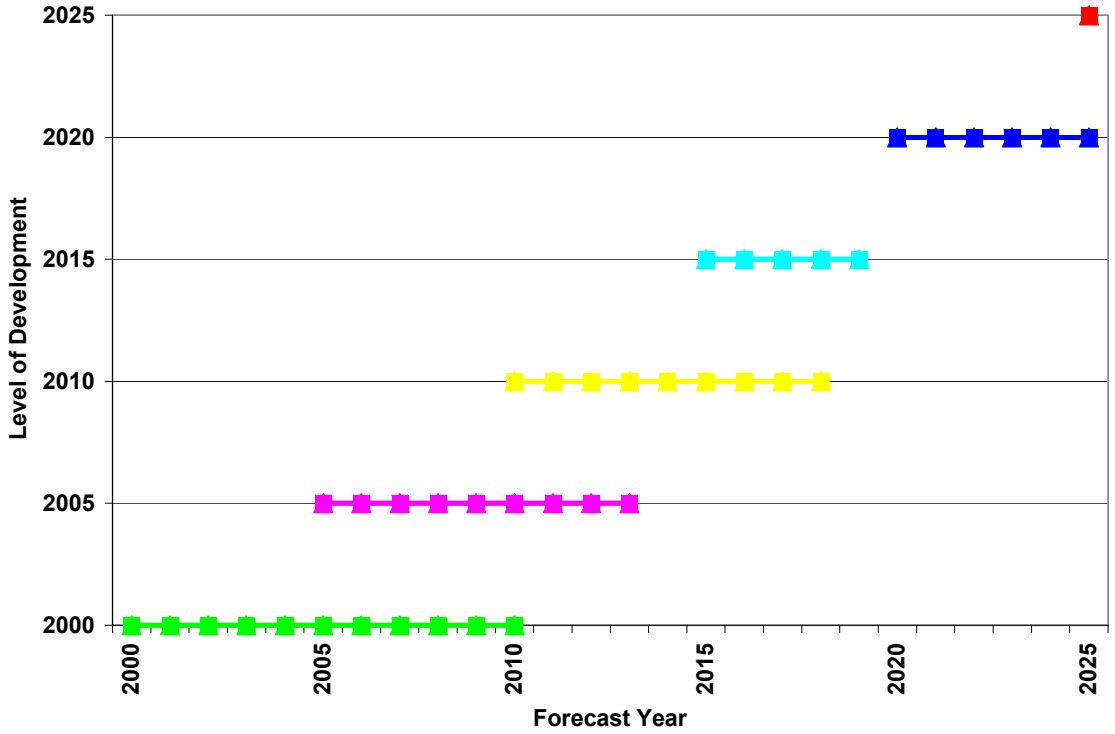


Additional Years of Reliability with 1996 IRP Targets

The 1996 IRP Resource Targets for 2020 provide just enough resources to carry the region through 2025.

This analysis tested how many additional years of reliability Metropolitan would have if a resource mix in a future year – 2010 for example – is fixed (Figure 4-2). This test was performed for 2005, 2010, 2015, and 2020 using the projected resource mix and 1996 IRP Targets as described above.

Figure 4 - 2: Additional Years of Reliability with Current Targets and Changed Conditions



Summary of Reliability Findings

The IRP Update reliability analysis shows that no changes to the 1996 IRP resource targets are necessary to extend the IRP through 2025, other than those targets that have been revisited by Metropolitan's Board. A significant contributor to this result is the increased projection of local supplies provided by the member agencies.

FUNDING THE IRP

This section briefly summarizes the expected cost increases and corresponding rate increases as additional imported supplies, local projects, conservation and water transfers and storage are developed to meet the goals set forth in this report. In addition to these expenditures Metropolitan will continue to invest in water distribution and treatment infrastructure. The forecast is consistent with Metropolitan's Long Range Finance Plan, and extends to fiscal year 2012/13.

Water Sales Forecast

For financial planning purposes, it is expected that demand for Metropolitan supplies will decline from about 2.3 million acre-feet in 2003/04 to about 2.1 million acre-feet in 2012/13, based on full implementation of the resource targets for conservation and local resources. For the past five years, demands for imported water from Metropolitan have

been higher than average due to dry weather in Southern California. Also, continued investment in local resources, primarily water recycling and seawater desalination will result in an additional 255,000 acre-feet of local supply by 2013. Increased local supplies reduce the need for imported water and therefore, Metropolitan's expected water sales.

Local Resources and Conservation

The Local Resources Program and conservation are fundamental elements of the IRP. Metropolitan's cost for funding these programs currently amounts to about $46 million. By 2012/13 Metropolitan's funding for conservation, recycling, and desalination is expected to increase by $45 million - almost 100 percent. The yield from the LRP is expected to increase from 138,000 acre-feet in 2003/04 to 394,000 acre-feet in 2012/13.

Imported Supplies

Colorado River

The cost of power associated with the delivery of Colorado River supplies is expected to average about $21 million dollars through 2012/13. Table 4-1 shows the cost of power and the anticipated expenditures by Metropolitan for additional Colorado River supplies over the next ten years. Metropolitan's average water rate will increase by $14 per acre-foot by 2013 as a result of the expenditures for Colorado River programs.

Table 4-1: Cost of Imported Supplies
(Millions of Dollars)

Fiscal Year Ending	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Colorado River											
Power	47	25	18	20	20	21	21	24	21	21	24
Storage	0	0	3	2	2	2	2	2	2	2	2
IID Conservation	6	11	11	12	12	12	13	13	13	14	14
PVID[1]	-	0	11	13	9	6	6	6	6	5	5
State Purchase[2]	-	-	2	4	6	7	7	9	10	12	17
Total	**53**	**36**	**45**	**51**	**49**	**48**	**49**	**54**	**52**	**55**	**63**
$/AF	23	15	20	23	22	22	23	25	25	26	29
State Water Project											
SWP	343	406	430	417	429	438	445	449	460	473	475
Option Transfers	2	2	2	2	2	2	2	2	2	2	2
Central Valley Transfers/Storage	-	20	15	14	12	8	6	6	7	8	8
SBVMWD	8	(3)	4	4	4	4	4	4	4	4	4
Total	**353**	**425**	**450**	**437**	**447**	**451**	**457**	**461**	**473**	**487**	**489**
$/AF	155	183	202	203	206	211	215	216	225	232	230

[1] Upfront payments are not included since they are paid from Water Transfer Funds
[2] Purchase of IID water sold to state as part of QSA

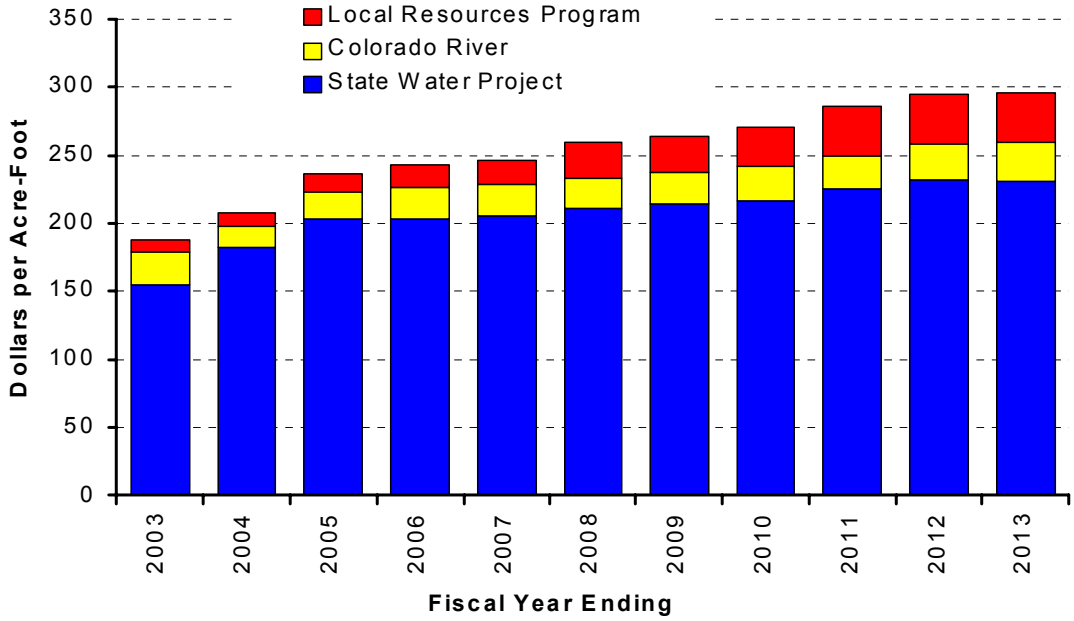
State Water Project Supplies, Storage and Transfers

SWP deliveries to Metropolitan are expected to average around 1.5 million acre-feet through 2012/13. Water delivered over the SWP includes deliveries of Metropolitan's Table A amounts, carryover supplies, water transfers, and exchanges. Table 4-1 shows the forecast of expenditures for SWP programs, as well as the forecast of SWP costs through 2012/13. Water transfers and storage programs are expected to average about $15 million over this period. SWP costs, including the cost of power, are expected to increase from $406 million to $475 million in 2012/13. As a result of changes in the cost of power and expenditures on additional water transfers and storage projects needed to meet the IRP targets, Metropolitan's average water rate will increase by $47 per acre-foot.

Summary of Rate Impacts

In order to fund the projects and programs envisioned in the IRP, Metropolitan's average rate is expected to increase between $76 and $100 per acre-foot over the next ten years depending on the actual level of Metropolitan's sales. These rate impacts are based on expected sales under average hydrologic conditions. Figure 4-3 illustrates how each element – Colorado River, State Water Project and Transfers, and Local Resources – contribute to the expected rate increases. The basic strategies of diversification and flexibility remain the foundation of the IRP, and are reflected in the reasonable costs and rates forecast for the next ten years.

Figure 4 - 3: Rate Impact of the 2003 IRP Update



RISK AND THE SUPPLY BUFFER

The reliability analysis performed for the IRP Update showed that the 1996 IRP targets were sufficient to provide regionally reliability through 2025. During the course of the IRP Update, two new areas of concern were identified that could have an impact on the region's supply reliability: (1) increasingly stringent water quality regulation, and (2) evolving resource implementation risk.

The analysis of increased water quality regulation emphasizes the periodic need for Colorado River water or storage to offset the total organic carbon and bromide levels in State Water supplies through blending, until 2009 when all of Metropolitan's treatment plants have been retrofitted. This means that Southern California will depend on varying amounts of Colorado River supplies to meet water quality goals as well as to meet demand, depending on the water quality of the SWP. Beyond 2009, increasingly stringent water quality regulations also pose additional uncertainties.

Planning for water supply reliability is also complicated by risk and uncertainty beyond what is addressed by analyzing hydrologic variation. Water supply reliability in the Metropolitan service area through 2025 and beyond depends on many factors, including the successful maintenance and implementation of local and imported water supply projects described in previous sections of this report. Realistically, some projects envisioned for the region may not progress according to planned schedules, or in some cases may not be completed. There is also the possibility of additional uncertainty in regional growth and water demand projections that must also be considered.

To address these uncertainties, some of which are increasingly difficult to quantify, the concept of developing a planning buffer was introduced during the IRP Update Process. The recommended resource targets for the IRP Update include the planning buffer targets, and specify an increase of 500,000 acre-feet of resource development. The identification of the planning buffer will help the region to be better prepared to manage uncertainties inherent in the planning process.

The size of the planning buffer is a consensus-based figure derived from three independent methodologies:

- Metropolitan's 1999 WSDM Plan showed that Metropolitan had developed supplies 10 years in advance of expected demands

- The planning and construction period for supply project development, which includes potential legal challenges, is approximately 10 years

- Analysis of plans for new and replacement supplies suggests that a 500,000 acre-foot buffer, which is approximately 10 percent of water demand with conservation in 2025, covers implementation risks

Metropolitan's Preferred Resource Mix from the IRP Update will now include a planning buffer of 500,000 acre-feet, which will be drawn from equal increases in local resource

targets and from Central Valley transfers. To boost local supply development, Metropolitan will increase its recycling, groundwater recovery, and desalination goals by 250,000 acre-feet. The program will have an updated 2025 target of 750,000 acre-feet for recycling, groundwater recovery, and seawater desalination.

The updated target for Central Valley transfers will increase 250,000 acre-feet for a 2025 target of 550,000 acre-feet. The diversification between local project supplies and imported water from Central Valley transfers will be restricted to no less than 40 percent and no more than 60 percent from any one category.

The development and implementation of the buffer is intended to manage uncertainties as they unfold, and to ensure that the region is able to meet the reliability goal set by the IRP. Implementing the planning buffer in an efficient way requires ongoing monitoring of the implementation and production of all supplies in the resource mix. Staff recommends that an IRP Implementation Report be provided to the Board on an annual basis. This report will detail the status of regional resources and the progress of projects that are being implemented. The cyclical nature of the IRP Implementation Report will serve as a decision step to ensure that regional investments are being made, implemented, and adjusted in a timely fashion. It will provide an important safety net to guard against over-implementation of resources and ensure that regional financial resources are being used effectively.

The rate forecast shown in Figure 4-3 illustrates the upper-bound of rate implications if the full local portion of the buffer was funded. In addition, it does not imply that actions by the Board on the IRP Update would automatically lead to the full implementation of the supply buffer

SECTION 5 – CONCLUSIONS

SUMMARY OF 2003 IRP UPDATE AND CHANGED CONDITIONS

Objectives

The IRP Update had three objectives:

1. To review the goals and achievements of the 1996 IRP
2. To identify changed conditions for water resource development
3. To update the resource targets through 2025

Changed Conditions

The dynamic nature of water supply planning has already been discussed. Projections of demand and supply change over time as new information and technology becomes available, and as resource plans and priorities change.

Since the IRP Update was initiated in 2001, three sales forecasts have been completed, two in-depth local supply surveys have been performed, and numerous resource programs have been completed or identified while some have been abandoned. The long-term status of the Colorado River supplies has been a critical uncertainty throughout the development of the IRP Update.

Changed conditions since the 1996 IRP include:

1. Lower projected retail water demands
2. Higher projected local water resource development
3. Lower projected dry-year Metropolitan demands
4. Board-revised targets for the SWP and CRA
5. More stringent water quality regulations, and recognition of implementation risks

A major changed condition in the IRP Update is lower Metropolitan demands compared to the 1996 IRP. The drop in projected Metropolitan demands in 2020 is caused by lower retail demands coupled with higher local supplies, and is one of the primary reasons the current targets provide reliability through 2025.

IRP Targets

Changes in resource targets since the 1996 IRP are summarized in

Table 5 - 1. The recommended buffer supply is incorporated through increases in the target for local supplies to 750,000 acre-feet and CVP/SWP storage and transfers to 550,000 acre-feet. The changes in the CRA and SWP are related to Board directives. Table 5–2 summarizes how the revised resource targets change over time.

Table 5 - 1: Updated Resource Targets (with Supply Buffer)

	1996 IRP 2020	2003 Update 2020	Change	2003 Update 2025
Conservation	882,000	1,027,600	+145,600	1,107,000
• Recycling • Groundwater Recovery • Desalination	500,000	750,000	+250,000 (buffer)	750,000
Colorado River Aqueduct*	1,200,000	1,250,000	+50,000	1,250,000
State Water Project	593,000	650,000	+25,000	650,000
Groundwater Conjunctive Use	300,000	300,000	0	300,000
CVP/SWP Storage and Transfer w/Buffer	300,000	550,000	+250,000 (buffer)	550,000
MWD Surface Storage **	620,000	620,000	0	620,000

* The 1,250,000 acre-feet supply from the Colorado River Aqueduct is a target for specific year types when needed. Metropolitan is not expecting a full aqueduct in every year.
** Target for Surface Storage is for total storage capacity, not dry year withdrawal yield.

Table 5 – 2: Summary of IRP Update Targets (Acre-feet)

	2010	2020	2025
Conservation	865,200	1,027,600	1,106,900
Local Production*	1,808,966	1,911,193	1,922,608
Total Local Projects**	410,000	750,000	750,000
Groundwater Conjunctive Use	275,000	300,000	300,000
State Water Project	463,000	650,000	650,000
Colorado River Aqueduct	1,001,000	985,000	1,005,000
CVP/SWP Storage and Transfers**	300,000	550,000	550,000
MWD Surface Storage***	620,000	620,000	620,000
Total Supplies with Planning Buffer	**5,743,166**	**6,793,793**	**6,904,508**

* Includes groundwater and surface production and imported supplies from the LA Aqueduct
** Target includes 250,000 acre-foot planning buffer in years 2020 through 2025
*** Represents annual production, not the total storage capacity

Reliability

The results of the IRP Update analysis show that the current resource targets, coupled with the changed conditions discussed in this report, are sufficient for Metropolitan to be 100 percent reliable in 2020. The reliability test also shows that the current resource targets are sufficient to attain supply reliability out to 2025. This is possible because of the changed targets and conditions, including lower Metropolitan demands. As a result, the current resource goals are sufficient to extend the IRP through 2025.

This finding is demonstrated by the additional years of reliability for projected levels of resource development, as shown in Table 5 - 3. For instance, if the region developed its planned resources out to 2010 and then held them fixed, the region would be reliable until 2018.

Table 5 - 3: Additional Years of Reliability with Current Targets and Changed Conditions

Projection Year	2000	2005	2010	2015	2020	2025
Years of Reliability	10	8	8	4	5	1

Planning Supply Buffer

Although the current targets do not require updating, the IRP Update did identify two new areas of concern: (1) increased water quality regulation, and (2) evolving resource implementation risk.

Water Quality Risk

The analysis of increased water quality regulation emphasizes the periodic need for Colorado River water or storage to offset the total organic carbon and bromide levels in State Water Project supplies through blending, until 2009 when all of Metropolitan's treatment plants will be retrofitted. This means that Southern California will be depending on varying amounts of these supplies to meet water quality goals as well as to meet demand depending on the water quality of the SWP. Beyond 2009 increasingly stringent water quality regulations also pose additional uncertainties.

Implementation Risk

Metropolitan and the member agencies have agreed in principle that a planning buffer supply is necessary to hedge against evolving resource implementation risks and demand uncertainty. The size of the buffer supply, 500,000 acre-feet, was derived using three independent methodologies. The 500,000 acre-feet buffer is equal to approximately 10 percent of projected retail water demand in 2025. Metropolitan recommends that the 500,000 acre-feet buffer be split between imported and local supplies.

On the local side, there is approximately 250,000 acre-feet of risk in local supply projections based on the cost of local supplies that would not be regionally funded under the original goals of the 1996 IRP. Therefore, Metropolitan recommends increasing the recycling, groundwater recovery, and seawater desalination target from 500,000 acre-feet to 750,000 acre-feet in 2025. Metropolitan also recommends increasing the 1996 IRP target for CVP/SWP storage and transfers from 300,000 acre-feet to 550,000 acre-feet to develop the imported portion of the buffer.

PLANNING AND REPORTING CYCLES

Metropolitan leads, participates in, and produces a number of planning studies and reporting functions on a regular basis. Table 5 - 4 shows the approximate timetables for the major processes and the requirement, legal or internal, which drive the process.

The 1996 IRP determined, through a comprehensive stakeholder process, the principles for building a long-term water resource plan, and the development targets under that plan. The 2003 IRP Update Report, not only contains refinements to the regional supply development targets, but also sets two schedules for regular reporting and updating the IRP in the future. The first is an annual IRP Implementation Report that will provide regular reporting to the Board on the status and progress of resource implementation. The second is a regular five-year schedule for future IRP Updates, coincident with Metropolitan's filing of the Regional Urban Water Management Plan, as prescribed by the California Water Code.

Other planning processes that are important but separate from the IRP process use the resource development targets identified by the IRP. For example, the *System Overview Study* determines the distribution system requirements needed to deliver water under the resource development targets from the IRP. Another example is the *Water Surplus and Drought Management Plan*. This plan, also known as the WSDM Plan, provides the framework for the shorter-term operations of Metropolitan's water resources. The WSDM Plan provides the planning that ensures that the long-term resources plan described by the IRP works under shorter-term conditions and operations.

Metropolitan also issues periodic reports that are generally reporting the resource development targets and the progress of implementation. For example, the *Report on Metropolitan's Water Supplies*, issued annually, shows the maximum supply capability of the resources implemented as a result of the IRP in a manner that can be used to assist agencies in complying with growth legislation. In the future, some of the planning processes and reporting functions should be consolidated for efficiency, but they will continue to be closely tied to the long-term resources plan.

Table 5 - 4: Metropolitan Planning and Reporting Cycles

Report	Requirement / Type	Year							
		1999	2000	2001	2002	2003	2004	2005	2006
Regional Urban Water Management Plan	State Law/Report		X					X	
Annual Report to the California State Legislature on Achievements in Conservation, Recycling, and Groundwater Recharge (SB 60 Report)	State Law/Report		X	X	X	X	X	X	X
Report on Metropolitan's Water Supplies	Internal Policy / Report				X	X	*As Needed to Reflect Changes*		
IRP Implementation Report	Internal Policy / Report			X	X		X	X	X
IRP Update	Internal Policy / Planning Process					X			X
System Overview Study	Internal Policy / Planning Process						X		
Water Surplus and Drought Management Plan	Internal Policy / Planning Process	X					X		
*Salinity Management Study**	Internal Policy / Planning Process	X							
Long-Range Financial Plan	Internal Policy / Planning Process	X					X		

* Future Study release will be contingent upon completion of: (a) USBR Salinity Study of Lower Colorado; (b) Inland Feeder; and (c) Delta Improvement Program

NEXT STEPS

The 2003 IRP Update process showed a need for additional study, as well as improvements in reporting and monitoring the implementation progress. The following is a list of areas that Metropolitan intends to improve on and implement over the coming years. Improvements in these areas will help to prepare Metropolitan and the region for the next look at updating the IRP.

- Growth projections and demand changes
- Local supply targets for groundwater, surface, and Los Angeles Aqueduct supplies
- Reporting process for IRP target implementation
- Coordination and verification of local supply production and plans
- Risk analysis technique for buffer supply assessment
- Extended hydrologic impacts

Metropolitan and its member agencies are set to collaborate on the process needed to comply with the *California Urban Water Management Planning Act*. The Act requires a report to be submitted to the State of California by December 2005. Although this process is not Metropolitan's guiding planning process, Metropolitan will take steps to assume effective data exchange and verification with its members and their retail agencies. At the same time, Metropolitan staff intends to research and improve modeling and assessment techniques in the areas of variability and risk to supply development.

An issue that also needs to be resolved in the next IRP Update concerns the estimates of retail water demand, local groundwater, local surface, and Los Angeles Aqueduct supplies. In both the 1996 and in the 2003 IRP Update, these estimates did not have associated targets. However, they did contribute to the changed conditions. Retail demand estimates have decreased since the 1996 IRP, largely due to changes in the region's official growth forecast. Local groundwater, surface water, and Los Angeles Aqueduct supplies have also changed since the 1996 IRP. Those changes were captured and accounted for in the reliability analysis performed in this process, but these supplies are not measured against a target. Future updates need to address this in order to maintain the validity of all of the resource development targets.

APPENDIX 1 - WATER DEMAND PROJECTIONS

Retail Water Demand

Water demand in the Metropolitan service area has experienced several discernable trends in the past ten years. Southern California emerged from a severe economic recession in the mid-1990s. Despite a sustained recovery that has led to a robust economy, the intense development of long-term conservation programs and increases in pricing have succeeded in suppressing growth in normal year per capita water demands. Metropolitan projects that aggregate water demand will continue along this trend; per capita water demand will not return to its pre-drought levels.

MWD-MAIN

To forecast urban retail water demands, Metropolitan uses the MWD-MAIN Water Use Forecasting System. MWD-MAIN is a model combining statistical and end-use methods that has been adapted to conditions in Southern California. The statistical portion of the model incorporates 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) into statistically estimated water demand models to produce forecasts of water demand. The end-use component of the model derives estimates of conservation by adding additional information on how that water is used - the end uses.

MWD-MAIN features a separate unique model for each sector. In the residential sector, the forecasts of water demand per dwelling unit are ultimately combined with the forecasts of dwelling units from the regional planning agencies to yield an estimate of total sector water demand. Similarly, in the nonresidential sector, water use per employee is combined with forecasts of employment to yield an estimate of total non-residential water demand.

Regional Growth Projections

The SCAG and SANDAG demographic projections used in the retail demand forecast are developed primarily for transportation planning, air quality management, and other regional planning purposes. The SCAG and SANDAG forecasts provide a linkage to local development and land use plans through the inclusion of sub-regional general plans, and through extensive input and feedback from cities and counties. Final plans adopted by SCAG and SANDAG are supported by environmental documentation.

The SCAG and SANDAG projections currently used by Metropolitan extend to 2020. Metropolitan contracted with the Center for Continuing Study of the California Economy (CCSCE) and SCAG to extend these projections to 2050. CCSCE developed unofficial projections for the six counties served by Metropolitan from national projections produced by the US Census Bureau. Member agency demographics for 2050 were then derived using SCAG's Geographic Information System based allocation models.

Demographics for interim years such as 2025 were interpolated from the 2020 SCAG/SANDAG projections and the 2050 estimates developed by CCSCE.

Conservation

In addition to accounting for future demographic trends, Metropolitan's water demand forecasts incorporate current and future water demand management (conservation) efforts. In 1991, Metropolitan signed a Memorandum of Understanding Regarding Urban Water Conservation in California (MOU). The MOU commits Metropolitan to implement a number of long-term water conservation measures referred to as Best Management Practices (BMPs).

The MWD-MAIN model embeds a detailed accounting of water conservation, distinguishing between:

Passive 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.

Active Conservation - Water saved directly as a result of conservation programs by water agencies (including implementation of Best Management Practices). This form of conservation is unlikely to occur without agency action.

Price-effect Conservation - Water saved by retail customers attributable to the effect of changes in the real (inflation-adjusted) price of water. There may be some overlap between this form of conservation and the previous two. For example, increased water prices might induce a consumer to take part in one of the active conservation programs run by the providing agency.

Metropolitan's demand projections account for the effects of the conservation BMPs, including projected changes in the price of water. The forecast is based on expected BMP participation. Some of the region's retail agencies are not BMP signatories and some BMPs are not cost-effective in Metropolitan's service area.

Metropolitan Water Demands

Forecasting retail demand is the first step in projecting Metropolitan demands (the need for imported water). As a regional water wholesaler, Metropolitan must also consider the development of local supplies within the service area in order to forecast imported demands.

One of the major changed conditions identified in the IRP Update analysis is a lower projection of Metropolitan demands in 2020 compared to the 1996 IRP. The drop in demand is caused by updated projections of retail demands and local supplies. These changed projections include:

- Lower retail demands
- Higher conservation savings

- Higher direct use recycling, groundwater recovery and desalination production
- Higher groundwater production

Table A1-1 contains a summary of the changes to the retail demands and local supplies. The largest changes occurred in the projections of local supplies and conservation. Retail demands before conservation change as the result of lower growth projections from SCAG. Local supplies projections have increased due to a better accounting of local projects drawn from member agency 2000 UWMPs and close coordination with member agency staff. After accounting for these changes, direct use of Metropolitan demands drop by over 500,000 acre-feet compared to the 1996 IRP.

Table A1 - 1: Metropolitan Dry-Year Demand Changes - 1996 IRP vs. 2003 Update

Category	1996 IRP	2003 Update	Change
Retail Demand - Before Conservation	*6,083,978*	*6,046,510*	*-37,468*
Conservation	*882,000*	*1,027,600*	*145,600*
Total Retail Demands with Conservation	**5,201,978**	**5,018,910**	**-183,068**
Direct Use LRP and Desalination	*500,000*	*533,156*	*33,156*
Local Surface and Groundwater	*1,618,571*	*1,911,193*	*292,622*
Total Local Supply – Direct Use	**2,118,571**	**2,444,349**	**325,778**
Total MWD Direct Use Demand	**3,083,407**	**2,574,561**	***-508,846***

(This page intentionally left blank)

APPENDIX 2 – LOCAL SUPPLY ASSUMPTION

Table A2 - 1: Total Local Supply for Consumptive Uses – Dry Year
(Excludes non-consumptive recycling; includes groundwater recovery)

Member Agency	2003**	2010	2020	2025	2003-2025
Anaheim	60,442	64,587	73,080	74,846	14,404
Beverly Hills	2,800	2,800	2,800	2,800	0
Burbank	20,536	20,536	20,536	20,536	0
Calleguas	28,973	45,148	46,680	46,680	17,707
Central Basin	179,387	184,225	187,000	187,000	7,613
Compton	6,100	6,100	6,100	6,100	0
Eastern	168,388	178,535	184,639	184,639	16,251
Foothill	8,140	8,140	8,140	8,140	0
Fullerton	24,602	25,028	25,955	26,698	2,096
Glendale	8,447	11,935	11,975	11,975	3,528
Inland Empire	172,492	197,843	237,970	237,970	65,478
Las Virgenes	5,740	8,000	9,600	9,600	3,860
Long Beach	29,875	32,819	37,025	37,025	7,150
Los Angeles	281,056	317,593	329,165	330,373	49,317
MWDOC	281,747	334,539	361,948	373,457	91,710
Pasadena	13,700	15,200	15,300	15,300	1,600
San Diego	95,370	112,553	183,255	183,255	87,885
San Fernando	3,600	3,600	3,600	3,600	0
San Marino	6,150	6,150	6,150	6,150	0
Santa Ana	39,564	41,178	45,196	46,385	6,821
Santa Monica	3,455	3,615	3,615	3,615	160
Three Valleys	68,990	71,300	74,600	74,600	5,610
Torrance	9,500	9,500	9,500	9,500	0
Upper San Gabriel	176,375	181,450	188,700	188,700	12,325
West Basin	73,750	86,000	92,500	92,500	18,750
Western	204,336	233,220	265,520	265,520	61,184
Total of All Agencies	**1,973,514**	**2,201,594**	**2,430,549**	**2,446,964**	**473,450**

** 2003 represents model estimate

Table A2 - 2: Total Groundwater Production (Consumptive) – Dry Year
(Includes groundwater recovery supplies)

Member Agency	2003*	2010	2020	2025	2003-2025
Anaheim	60,442	64,587	73,080	74,846	14,404
Beverly Hills	2,800	2,800	2,800	2,800	0
Burbank	13,836	13,836	13,836	13,836	0
Calleguas	20,165	23,088	22,120	22,120	1,955
Central Basin	174,000	174,000	174,000	174,000	0
Compton	6,100	6,100	6,100	6,100	0
Eastern	144,138	149,035	143,639	143,639	-499
Foothill	7,670	7,670	7,670	7,670	0
Fullerton	24,602	25,028	25,955	26,698	2,096
Glendale	6,657	9,925	9,925	9,925	3,268
Inland Empire	146,667	158,333	175,000	175,000	28,333
Las Virgenes	0	0	0	0	0
Long Beach	24,000	24,000	24,000	24,000	0
Los Angeles	131,250	138,250	138,250	138,250	7,000
MWDOC	243,746	271,539	293,948	299,457	55,711
Pasadena	13,700	15,200	15,300	15,300	1,600
San Diego	16,762	34,360	59,500	59,500	42,738
San Fernando	3,600	3,600	3,600	3,600	0
San Marino	6,150	6,150	6,150	6,150	0
Santa Ana	39,092	40,678	44,656	45,845	6,753
Santa Monica	3,175	3,335	3,335	3,335	160
Three Valleys	52,700	52,700	52,700	52,700	0
Torrance	2,000	2,000	2,000	2,000	0
Upper San Gabriel	152,630	154,100	156,200	156,200	3,570
West Basin	55,000	55,000	55,000	55,000	0
Western	199,660	227,800	260,100	260,100	60,440
Total of All Agencies	**1,550,543**	**1,663,114**	**1,768,864**	**1,778,071**	**227,528**

* 2003 represents model estimate

Table A2 - 3: Total Surface Water (Consumptive) – Dry Year

Member Agency	2003*	2010	2020	2025	2003-2025
Anaheim	0	0	0	0	0
Beverly Hills	0	0	0	0	0
Burbank	0	0	0	0	0
Calleguas	0	0	0	0	0
Central Basin	0	0	0	0	0
Compton	0	0	0	0	0
Eastern	2,000	2,000	2,000	2,000	0
Foothill	350	350	350	350	0
Fullerton	0	0	0	0	0
Glendale	0	0	0	0	0
Inland Empire	18,870	18,870	18,870	18,870	0
Las Virgenes	0	0	0	0	0
Long Beach	0	0	0	0	0
Los Angeles	0	0	0	0	0
MWDOC	7,000	9,000	7,000	8,000	1,000
Pasadena	0	0	0	0	0
San Diego*	60,832	46,025	46,025	46,025	-14,807
San Fernando	0	0	0	0	0
San Marino	0	0	0	0	0
Santa Ana	0	0	0	0	0
Santa Monica	0	0	0	0	0
Three Valleys	5,900	5,900	5,900	5,900	0
Torrance	0	0	0	0	0
Upper San Gabriel	15,000	15,000	15,000	15,000	0
West Basin	0	0	0	0	0
Western	0	0	0	0	0
Total of All Agencies	**109,952**	**97,145**	**95,145**	**96,145**	**-13,807**

* 2003 represents model estimate

Table A2 - 4: Los Angeles Aqueduct (Consumptive) – Dry Year

Member Agency	2003*	2010	2020	2025	2003-2025
Anaheim	0	0	0	0	0
Beverly Hills	0	0	0	0	0
Burbank	0	0	0	0	0
Calleguas	0	0	0	0	0
Central Basin	0	0	0	0	0
Compton	0	0	0	0	0
Eastern	0	0	0	0	0
Foothill	0	0	0	0	0
Fullerton	0	0	0	0	0
Glendale	0	0	0	0	0
Inland Empire	0	0	0	0	0
Las Virgenes	0	0	0	0	0
Long Beach	0	0	0	0	0
Los Angeles	144,912	143,088	142,265	143,473	-1,439
MWDOC	0	0	0	0	0
Pasadena	0	0	0	0	0
San Diego	0	0	0	0	0
San Fernando	0	0	0	0	0
San Marino	0	0	0	0	0
Santa Ana	0	0	0	0	0
Santa Monica	0	0	0	0	0
Three Valleys	0	0	0	0	0
Torrance	0	0	0	0	0
Upper San Gabriel	0	0	0	0	0
West Basin	0	0	0	0	0
Western	0	0	0	0	0
Total of All Agencies	**144,912**	**143,088**	**142,265**	**143,473**	**-1,439**

* 2003 represents model estimate

Table A2 - 5: Recycling M & I (Consumptive) – Dry Year

Member Agency	2003*	2010	2020	2025	2003-2025
Anaheim	0	0	0	0	0
Beverly Hills	0	0	0	0	0
Burbank	6,700	6,700	6,700	6,700	0
Calleguas	8,808	22,060	24,560	24,560	15,752
Central Basin	5,387	10,225	13,000	13,000	7,613
Compton	0	0	0	0	0
Eastern	22,250	27,500	39,000	39,000	16,750
Foothill	120	120	120	120	0
Fullerton	0	0	0	0	0
Glendale	1,790	2,010	2,050	2,050	260
Inland Empire	6,955	20,640	44,100	44,100	37,145
Las Virgenes	5,740	8,000	9,600	9,600	3,860
Long Beach	5,875	8,819	13,025	13,025	7,150
Los Angeles	4,894	25,055	37,450	37,450	32,556
MWDOC	31,000	54,000	61,000	66,000	35,000
Pasadena	0	0	0	0	0
San Diego	17,775	32,168	52,730	52,730	34,955
San Fernando	0	0	0	0	0
San Marino	0	0	0	0	0
Santa Ana	472	500	540	540	68
Santa Monica	280	280	280	280	0
Three Valleys	10,390	12,700	16,000	16,000	5,610
Torrance	7,500	7,500	7,500	7,500	0
Upper San Gabriel	8,745	12,350	17,500	17,500	8,755
West Basin	18,750	31,000	37,500	37,500	18,750
Western	4,676	5,420	5,420	5,420	744
Total of All Agencies	**168,107**	**287,047**	**388,075**	**393,075**	**224,968**

* 2003 represents model estimate

Table A2 - 6: Seawater Desalination (Consumptive) – Dry Year

Member Agency	2003*	2010	2020	2025	2003-2025
Anaheim	0	0	0	0	0
Beverly Hills	0	0	0	0	0
Burbank	0	0	0	0	0
Calleguas	0	0	0	0	0
Central Basin	0	0	0	0	0
Compton	0	0	0	0	0
Eastern	0	0	0	0	0
Foothill	0	0	0	0	0
Fullerton	0	0	0	0	0
Glendale	0	0	0	0	0
Inland Empire	0	0	0	0	0
Las Virgenes	0	0	0	0	0
Long Beach	0	0	1,000	1,000	1,000
Los Angeles	0	0	12,000	12,000	12,000
MWDOC	0	0	28,000	28,000	28,000
Pasadena	0	0	0	0	0
San Diego	0	28,000	56,000	56,000	56,000
San Fernando	0	0	0	0	0
San Marino	0	0	0	0	0
Santa Ana	0	0	0	0	0
Santa Monica	0	0	0	0	0
Three Valleys	0	0	0	0	0
Torrance	0	0	0	0	0
Upper San Gabriel	0	0	0	0	0
West Basin	0	5,000	20,000	20,000	20,000
Western	0	0	0	0	0
Total of All Agencies	**0**	**33,000**	**126,000**	**126,000**	**126,000**

* 2003 represents model estimate

Table A2 - 7: Groundwater Recovery – Dry Year
(Already incorporated into groundwater)

Member Agency	2003*	2010	2020	2025	2003-2025
Anaheim	0	0	0	0	0
Beverly Hills	2,600	2,600	2,600	2,600	0
Burbank	10,500	10,500	10,500	10,500	0
Calleguas	0	0	0	0	0
Central Basin	900	900	900	900	0
Compton	0	0	0	0	0
Eastern	3,360	3,360	3,360	3,360	0
Foothill	350	900	1,600	1,600	1,250
Fullerton	0	0	0	0	0
Glendale	0	0	0	0	0
Inland Empire	3,755	4,000	4,000	4,000	245
Las Virgenes	750	750	750	750	0
Long Beach	0	0	0	0	0
Los Angeles	0	0	0	0	0
MWDOC	12,221	29,971	29,971	29,971	17,750
Pasadena	0	0	0	0	0
San Diego	7,700	10,100	10,100	10,100	2,400
San Fernando	0	0	0	0	0
San Marino	0	0	0	0	0
Santa Ana	0	0	0	0	0
Santa Monica	1,800	1,800	1,800	1,800	0
Three Valleys	3,600	3,600	3,600	3,600	0
Torrance	2,000	2,400	2,400	2,400	400
Upper San Gabriel	0	0	0	0	0
West Basin	2,200	3,400	3,400	3,400	1,200
Western	16,755	20,100	20,100	20,100	3,345
Total of All Agencies	**68,492**	**94,381**	**95,081**	**95,081**	**26,589**

* 2003 represents model estimate

Table A2 - 8: Recycling for Groundwater Replenishment (Non-consumptive) – Dry Year

Member Agency	2003*	2010	2020	2025	2003-2025
Anaheim	0	0	0	0	0
Beverly Hills	0	0	0	0	0
Burbank	0	0	0	0	0
Calleguas	0	0	0	0	0
Central Basin	45,000	45,000	45,000	45,000	0
Compton	0	0	0	0	0
Eastern	0	0	0	0	0
Foothill	0	0	0	0	0
Fullerton	0	0	0	0	0
Glendale	0	0	0	0	0
Inland Empire	500	28,000	28,000	28,000	27,500
Las Virgenes	0	0	0	0	0
Long Beach	0	0	0	0	0
Los Angeles	2,500	10,000	10,000	10,000	7,500
MWDOC	5,000	45,000	37,000	37,000	32,000
Pasadena	0	0	0	0	0
San Diego	600	4,000	6,000	6,000	5,400
San Fernando	0	0	0	0	0
San Marino	0	0	0	0	0
Santa Ana	440	535	672	672	232
Santa Monica	0	0	0	0	0
Three Valleys	0	0	0	0	0
Torrance	0	0	0	0	0
Upper San Gabriel	2,500	10,000	10,000	10,000	7,500
West Basin	0	0	0	0	0
Western	0	0	0	0	0
Total of All Agencies	**56,540**	**142,535**	**136,672**	**136,672**	**80,132**

* 2003 represents model estimate

Table A2 - 9: Recycling for Seawater Barrier (Non-consumptive) – Dry Year

Member Agency	2003*	2010	2020	2025	2003-2025
Anaheim	0	0	0	0	0
Beverly Hills	0	0	0	0	0
Burbank	0	0	0	0	0
Calleguas	0	0	0	0	0
Central Basin	0	0	0	0	0
Compton	0	0	0	0	0
Eastern	0	0	0	0	0
Foothill	0	0	0	0	0
Fullerton	0	0	0	0	0
Glendale	0	0	0	0	0
Inland Empire	0	0	0	0	0
Las Virgenes	0	0	0	0	0
Long Beach	0	0	0	0	0
Los Angeles	0	0	0	0	0
MWDOC	5,000	28,000	36,000	36,000	31,000
Pasadena	0	0	0	0	0
San Diego	0	0	0	0	0
San Fernando	0	0	0	0	0
San Marino	0	0	0	0	0
Santa Ana	0	0	0	0	0
Santa Monica	0	0	0	0	0
Three Valleys	0	0	0	0	0
Torrance	0	0	0	0	0
Upper San Gabriel	0	0	0	0	0
West Basin	12,500	17,500	17,500	17,500	5,000
Western	0	0	0	0	0
Total of All Agencies	**17,500**	**45,500**	**53,500**	**53,500**	**36,000**

* 2003 represents model estimate

Table A2 - 10: Total Local Supply (Consumptive and Non-consumptive) – Dry Year

Member Agency	2003*	2010	2020	2025	2003-2025
Anaheim	60,442	64,587	73,080	74,846	14,404
Beverly Hills	2,800	2,800	2,800	2,800	0
Burbank	20,536	20,536	20,536	20,536	0
Calleguas	28,973	45,148	46,680	46,680	17,707
Central Basin	224,387	229,225	232,000	232,000	7,613
Compton	6,100	6,100	6,100	6,100	0
Eastern	168,388	178,535	184,639	184,639	16,251
Foothill	8,140	8,140	8,140	8,140	0
Fullerton	24,602	25,028	25,955	26,698	2,096
Glendale	8,447	11,935	11,975	11,975	3,528
Inland Empire	172,992	225,843	265,970	265,970	92,978
Las Virgenes	5,740	8,000	9,600	9,600	3,860
Long Beach	29,875	32,819	37,025	37,025	7,150
Los Angeles	283,556	327,593	339,165	340,373	56,817
MWDOC	291,747	407,539	434,948	446,457	154,710
Pasadena	13,700	15,200	15,300	15,300	1,600
San Diego	95,970	116,553	189,255	189,255	93,285
San Fernando	3,600	3,600	3,600	3,600	0
San Marino	6,150	6,150	6,150	6,150	0
Santa Ana	40,004	41,713	45,868	47,057	7,053
Santa Monica	3,455	3,615	3,615	3,615	160
Three Valleys	68,990	71,300	74,600	74,600	5,610
Torrance	9,500	9,500	9,500	9,500	0
Upper San Gabriel	178,875	191,450	198,700	198,700	19,825
West Basin	86,250	103,500	110,000	110,000	23,750
Western	204,336	233,220	265,520	265,520	61,184
Total of All Agencies	**2,047,554**	**2,389,629**	**2,620,721**	**2,637,136**	**589,582**

* 2003 represents model estimate

Table A2 - 11: Summary of MWD Funded Local Resource Programs

Member Agency	Number of Funded Projects	Total Contract Yield
Beverly Hills	1	2,600
Burbank	2	3,594
Calleguas MWD	2	15,300
Central Basin MWD	6	15,124
Eastern MWD	4	15,890
Foothill MWD	1	1,600
Glendale	3	2,825
Inland Empire	2	17,500
Las Virgenes MWD	3	3,550
Long Beach	2	4,450
Los Angeles	3	8,510
MWDOC	17	68,474
Santa Ana	1	800
Santa Monica	2	2,080
SDCWA	20	57,261
Three Valleys MWD	2	1,016
Torrance	1	2,400
West Basin MWD	3	73,924
Western MWD	3	20,100
Total of All Agencies	**78**	**316,998**

Table A2 - 12: Existing and Committed Local Resource Programs

Member Agency	Project Name	Project Type	Contract Yield	Funding
Beverly Hills	Beverly Hills Desalter	Groundwater Recovery	2,600	GRP
Burbank	Burbank Lake Street GAC Plant	Groundwater Recovery	2,744	GRP
Burbank	Burbank Reclaimed Water System Expansion Project	Recycled Water	850	LRP
Burbank	Burbank/Lockheed Valley Plant	Groundwater Recovery	0	Locally Funded
Burbank	Caltrans	Recycled Water	0	Locally Funded
Burbank	Media City Center	Recycled Water	0	Locally Funded
Burbank	PSD Power Plant	Recycled Water	0	Locally Funded
Calleguas MWD	Conejo Creek Diversion Project	Recycled Water	14,000	LPP
Calleguas MWD	Oak Park/North Ranch Water Reclamation Project	Recycled Water	1,300	LPP
Central Basin MWD	Alamitos Barrier Reclaimed Water Project	Recycled Water	3,024	LRP
Central Basin MWD	Bellflower Reclamation Project	Recycled Water	0	Locally Funded
Central Basin MWD	Century Reclamation Program (3)	Recycled Water	10,500	LRP
Central Basin MWD	Cerritos Reclaimed Water Expansion Project	Recycled Water	260	LPP
Central Basin MWD	Cerritos Reclamation Project	Recycled Water	0	Locally Funded
Central Basin MWD	Juan Well Filter Facility	Groundwater Recovery	900	LRP
Central Basin MWD	Lakewood Water Reclamation Project	Recycled Water	440	LPP
Central Basin MWD	Montebello Forebay	Recycled Water	0	Locally Funded
Central Basin MWD	Rio Hondo Water Reclamation Program (3)	Recycled Water	0	LRP
Eastern MWD	Eastern Regional Reclaimed Water System	Recycled Water	4,830	LPP Projects
Eastern MWD	EMWD Reach I Phase II	Recycled Water	1,700	LPP Projects
Eastern MWD	Hemet/SJ Regional Reclamation - Direct	Recycled Water	0	Locally Funded
Eastern MWD	Lake Elsinore Make Up Water	Recycled Water	0	Locally Funded
Eastern MWD	Menifee Basin Desalter	Groundwater Recovery	3,360	GRP
Eastern MWD	Moreno Valley Regional Reclamation	Recycled Water	0	Locally Funded
Eastern MWD	Perris Valley Regional Reclamation	Recycled Water	0	Locally Funded
Eastern MWD	Rancho California Reclamation (Existing non-LPP)	Recycled Water	0	Locally Funded
Eastern MWD	Rancho California Reclamation Expansion	Recycled Water	6,000	LPP Projects
Eastern MWD	Temecula Valley Regional Reclamation	Recycled Water	0	Locally Funded
Foothill MWD	Glenwood Nitrate	Groundwater Recovery	1,600	LPP

Member Agency	Project Name	Project Type	Contract Yield	Funding
Foothill MWD	La Canada-Flintridge Country Club	Recycled Water	0	Locally Funded
Glendale	Glendale Brand Park Reclaimed Water Project (4)	Recycled Water	0	LRP
Glendale	Glendale Verdugo-Scholl Canyon Reclaimed Water Project (4)	Recycled Water	2,225	LRP
Glendale	Glendale Water Reclamation Expansion Project	Recycled Water	600	LPP
Glendale	Power Plant Project	Recycled Water	0	Locally Funded
Inland Empire	California Institution for Men	Recycled Water	0	Locally Funded
Inland Empire	Carbon Canyon Reclamation Project	Recycled Water	13,500	LPP
Inland Empire	Chino Basin Desalter No. 1 - IEUA	Groundwater Recovery	4,000	GRP
Inland Empire	El Prado Park and Golf Course	Recycled Water	0	Locally Funded
Inland Empire	Ontario Golf Course and Westwind Park	Recycled Water	0	Locally Funded
Inland Empire	Upland Hills Country Club	Recycled Water	0	Locally Funded
Inland Empire	Western Hills Country Club	Recycled Water	0	Locally Funded
Las Virgenes MWD	Calabasas Reclaimed Water System Expansion	Recycled Water	700	LPP
Las Virgenes MWD	Calabasas System	Recycled Water	0	Locally Funded
Las Virgenes MWD	Las Virgenes Reclamation Project	Recycled Water	2,700	LPP
Las Virgenes MWD	Las Virgenes Valley System	Recycled Water	0	Locally Funded
Las Virgenes MWD	Two Wells in Westlake	Groundwater Recovery	0	Locally Funded
Las Virgenes MWD	Westlake Wells - Tapia WRF Intertie	Groundwater Recovery	150	LRP
Long Beach	Long Beach Reclamation Expansion Phase I	Recycled Water	2,750	LPP
Long Beach	Long Beach Reclamation Project	Recycled Water	1,700	LPP
Long Beach	Long Beach Reclamation Project	Recycled Water	0	Locally Funded
Long Beach	THUMS	Recycled Water	0	Locally Funded
Los Angeles	Cal Trans (5 & 134 Fwys)	Recycled Water	0	Locally Funded
Los Angeles	East Valley - Phase I	Recycled Water	0	Locally Funded
Los Angeles	Griffith Park	Recycled Water	0	Locally Funded
Los Angeles	Hansen Area Water Recycling Project	Recycled Water	0	Locally Funded
Los Angeles	Harbor Water Recycling Project	Recycled Water	5,000	LRP
Los Angeles	Los Angeles Greenbelt Project	Recycled Water	1,610	LPP
Los Angeles	Los Angeles Greenbelt Project - MCA	Recycled Water	0	Locally Funded
Los Angeles	MGM/SONY Building	Recycled Water	0	Locally Funded
Los Angeles	Sepulveda Basin Water Reclamation Project	Recycled Water	1,900	LPP

Member Agency	Project Name	Project Type	Contract Yield	Funding
MWDOC	Capistrano Beach Desalter	Groundwater Recovery	1,300	GRP
MWDOC	Capistrano Valley Non-Domestic Water System Expansion	Recycled Water	2,895	LRP
MWDOC	Development of Non-Domestic Water System Expansion Ladera	Recycled Water	2,772	LRP
MWDOC	El Toro Existing	Recycled Water	0	Locally Funded
MWDOC	Green Acres Reclamation Project - Coastal	Recycled Water	800	LRP
MWDOC	Green Acres Reclamation Project - MWDOC	Recycled Water	5,400	LRP
MWDOC	Irvine Desalter	Groundwater Recovery	6,700	GRP
MWDOC	Irvine Ranch Michelson Expansion	Recycled Water	0	Locally Funded
MWDOC	Irvine Ranch Part 1 Expansion	Recycled Water	0	Locally Funded
MWDOC	Irvine Ranch Reclamation Project	Recycled Water	10,000	LPP
MWDOC	IRWD Reclaimed Well 78	Groundwater Recovery	0	Locally Funded
MWDOC	Los Alisos WD	Recycled Water	0	Locally Funded
MWDOC	Mesa Consolidated Colored Water Treatment Facility	Groundwater Recovery	11,300	LRP
MWDOC	Moulton Niguel Phase 4 Reclamation System Expansion	Recycled Water	1,276	LRP
MWDOC	Moulton Niguel Reclamation Project	Recycled Water	8,000	LPP
MWDOC	Moulton Niguel WD Existing	Recycled Water	0	Locally Funded
MWDOC	OCWD Groundwater System - recharge	Recycled Water	0	Locally Funded
MWDOC	OCWD Groundwater System - seawater barrier	Recycled Water	0	Locally Funded
MWDOC	OCWD WF21 Above 12-yr. Average	Recycled Water	0	Locally Funded
MWDOC	San Clemente Water Reclamation Project	Recycled Water	4,000	LPP
MWDOC	San Juan Desalter	Groundwater Recovery	4,800	GRP
MWDOC	Santa Margarita Reclamation Expansion Project	Recycled Water	3,600	LPP
MWDOC	Santa Margarita WD - Oso	Recycled Water	0	Locally Funded
MWDOC	South Laguna Reclamation Expansion Project	Recycled Water	700	LPP
MWDOC	South Laguna Reclamation Project	Recycled Water	860	LPP
MWDOC	Trabuco Canyon Reclamation Expansion Project	Recycled Water	800	LPP
MWDOC	Trabuco Canyon Reclamation Project (Existing)	Recycled Water	0	Locally Funded
MWDOC	Tustin Desalter	Groundwater Recovery	3,271	GRP
MWDOC	Water Factory 21 Blend	Groundwater Recovery	0	Locally Funded
Santa Ana	Green Acres Reclamation Project - Santa Ana	Recycled Water	800	LRP
Santa Monica	Dry Weather Runoff Reclamation Facility	Recycled Water	280	LRP

Member Agency	Project Name	Project Type	Contract Yield	Funding
Santa Monica	Santa Monica GW Treatment Plant	Groundwater Recovery	1,800	GRP
Santa Monica	Santa Monica Water Gardens	Recycled Water	0	Locally Funded
SDCWA	Camp Pendleton	Recycled Water	0	Locally Funded
SDCWA	Encina Basin Water Reclamation. Project – Phases I and II (5)	Recycled Water	5,000	LRP
SDCWA	Encina Basin Water Reclamation Project Phase I (5)	Recycled Water	0	LRP
SDCWA	Encina Water Pollution Control Facility Reclamation Project (2)	Recycled Water	165	LPP
SDCWA	Escondido Regional Reclaimed Water Project	Recycled Water	2,800	LRP
SDCWA	Fairbanks Ranch	Recycled Water	0	Locally Funded
SDCWA	Fallbrook Reclamation Project	Recycled Water	1,200	LRP
SDCWA	Lower Sweetwater Desalter Phase I	Groundwater Recovery	3,600	GRP
SDCWA	North City Water Reclamation Project	Recycled Water	17,500	LRP
SDCWA	Oceanside Desalter Phase I (1)	Groundwater Recovery	2,000	GRP
SDCWA	Oceanside Desalter Phase I and II (1)	Groundwater Recovery	6,500	GRP
SDCWA	Oceanside Water Reclamation Project	Recycled Water	300	LPP
SDCWA	Olivenhain Recycled Project - SE Quadrant	Recycled Water	1,788	LRP
SDCWA	Otay Recycled Distribution Expansion Project	Recycled Water	8,515	LRP
SDCWA	Otay Water Reclamation Project	Recycled Water	1,500	LRP
SDCWA	Padre Dam Reclaimed Water System Phase I	Recycled Water	850	LRP
SDCWA	Ramona/Santa Maria Water Reclamation Project	Recycled Water	1,600	LPP
SDCWA	Rancho Santa Fe (Existing)	Recycled Water	0	Locally Funded
SDCWA	Rancho Santa Fe Reclaimed Water System	Recycled Water	220	LPP
SDCWA	RDDMWD Recycled Water Program	Recycled Water	648	LRP
SDCWA	San Elijo Water Reclamation System	Recycled Water	1,600	LRP
SDCWA	San Pasqual Reclamation Project	Recycled Water	1,100	LRP
SDCWA	San Vincente	Recycled Water	0	Locally Funded
SDCWA	Santa Maria - Phase A	Recycled Water	0	Locally Funded
SDCWA	Santee - Phase A	Recycled Water	0	Locally Funded
SDCWA	Shadowridge Reclaimed Water System	Recycled Water	375	LPP
SDCWA	South Bay Water Reclamation Project (excluding Otay)	Recycled Water	0	Locally Funded
SDCWA	Valley Center - Phase A	Recycled Water	0	Locally Funded
SDCWA	Whispering Palms	Recycled Water	0	Locally Funded

Member Agency	Project Name	Project Type	Contract Yield	Funding
Three Valleys MWD	City of Industry Reclaimed System - Phase A	Recycled Water	0	Locally Funded
Three Valleys MWD	Pomona Nitrate	Groundwater Recovery	0	Locally Funded
Three Valleys MWD	Pomona Reclamation Project	Recycled Water	0	Locally Funded
Three Valleys MWD	Rowland GW Treatment Project	Groundwater Recovery	516	GRP
Three Valleys MWD	Walnut Valley Reclamation Expansion Project (2)	Recycled Water	500	LPP
Three Valleys MWD	Walnut Valley Reclamation Project	Recycled Water	0	Locally Funded
Torrance	Madrona Desalter (Goldsworthy)	Groundwater Recovery	2,400	GRP
Upper SGVMWD	California Country Club	Recycled Water	0	Locally Funded
Upper SGVMWD	Puente Hills/Rose Hills	Recycled Water	0	Locally Funded
Upper SGVMWD	San Gabriel Valley Recycled Water Demonstration Project	Recycled Water	0	Locally Funded
West Basin MWD	Sepulveda Desalter	Groundwater Recovery	2,400	GRP
West Basin MWD	West Basin Desalter No. 1	Groundwater Recovery	1,524	GRP
West Basin MWD	West Basin Water Reclamation Program	Recycled Water	70,000	LPP
Western MWD	Arlington Desalter	Groundwater Recovery	6,100	LPP
Western MWD	Chino Basin Desalter No. 1 – Western	Groundwater Recovery	4,000	GRP
Western MWD	Ellsinore Valley/Horse Thief Reclamation	Recycled Water	0	Locally Funded
Western MWD	Ellsinore Valley/Railroad Canyon Reclamation	Recycled Water	0	Locally Funded
Western MWD	Indian Hills Reclamation Project	Recycled Water	0	Locally Funded
Western MWD	March AFB Reclamation Project	Recycled Water	0	Locally Funded
Western MWD	Santa Rosa Water Reclamation Facility	Recycled Water	0	Locally Funded
Western MWD	Temescal Basin Desalting Facility	Groundwater Recovery	10,000	LRP
Total of All Agencies			**316,998**	

(1) Oceanside Phase I agreement will be combined with Oceanside II agreement.
(2) The LPP agreement for these projects has terminated.
(3) On July 1, 1999, the Rio Hondo project was combined with Century Reclamation Program.
(4) On July 1, 1999, the Glendale Brand Park project was combined with Glendale Verdugo-Scholl project.
(5) On July 1, 2000, the LRP agreement for Encina Basin Phase I was combined with New LRP agreement for Encina Basin Phase 2.

APPENDIX 3 – IRPSIM OUTPUT

Table A3 - 1: IRPSIM Output - Drought Reliability Test
1924 – 1934

Forecast Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Hydrology Year	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Hydrologic Conditions											
Southern California Year Type	Dry	Dry	Wet	Wet	Dry	Dry	Normal	Wet	Normal	Wet	Normal
Sacramento River Index D1630 Year Type*	Dry	Dry	Dry	Wet	Normal	Dry	Dry	Dry	Dry	Dry	Dry
Demands											
Retail Demand	4,613,044	4,651,232	4,543,626	4,578,290	4,858,417	4,832,610	4,834,923	4,859,995	4,854,491	4,963,965	5,054,591
Long-term/Replenishment Demand	284,736	286,064	288,540	291,220	294,111	296,800	296,699	296,573	296,748	296,577	296,664
Total Demand	4,897,780	4,937,296	4,832,166	4,869,510	5,152,528	5,129,410	5,131,622	5,156,568	5,151,239	5,260,542	5,351,255
Local Supplies											
Goundwater Production	1,622,783	1,633,514	1,582,984	1,593,704	1,667,892	1,673,419	1,646,939	1,623,115	1,648,707	1,626,065	1,658,028
L. A. Aqueduct Production	115,808	214,542	237,809	394,445	195,964	155,548	151,882	118,202	360,049	172,752	136,610
Advanced Technology Production	632,551	642,364	651,178	660,992	670,804	709,528	710,528	711,528	712,528	713,528	714,528
Surface Production	90,729	78,574	112,723	148,872	143,803	107,785	97,408	129,701	138,697	145,921	143,718
Total Local Supply	2,461,871	2,568,994	2,584,694	2,798,013	2,678,463	2,646,280	2,606,757	2,582,546	2,859,981	2,658,266	2,652,884
Total MWD Demand	2,435,910	2,368,301	2,247,472	2,071,497	2,474,066	2,483,131	2,524,865	2,574,020	2,291,258	2,602,277	2,698,371
MWD Supply Sources											
Colorado River Supplies											
Base Supply Programs	1,094,348	1,094,561	636,074	694,292	732,050	782,009	1,152,504	831,634	820,997	827,546	825,812
Hayfield & DWCV Programs (Net Operations)	-124	58,439	-58,451	-3,201	-320	177,991	-177,991	173,366	175,258	172,454	174,188
PVID	97,000	97,000	97,000	25,000	25,000	111,300	25,000	111,300	25,000	111,300	111,300
Additional CRA Programs	0	0	0	0	0	0	0	0	0	0	0
Net Colorado River Supply	1,191,224	1,250,000	674,623	716,091	756,730	1,071,300	999,513	1,116,300	1,021,255	1,111,300	1,111,300
State Water Project Supplies											
Base Supply Programs	1,032,752	1,039,539	1,578,026	1,886,708	1,809,950	1,147,991	1,571,496	991,366	1,250,003	960,454	1,019,188
Carryover (Takes)	200,000	0	0	0	200,000	200,000	0	0	0	0	0
Carryover (Puts To Program)	0	0	0	-200,000	-200,000	0	0	0	0	0	0
Net State Water Project Supply	1,232,752	1,039,539	1,578,026	1,686,708	1,809,950	1,347,991	1,571,496	991,366	1,250,003	960,454	1,019,188
Additional Water Surplus And Drought Management Actions (Storage Programs Show Net Operations)											
SWP Transfer Programs	20,000	20,000	20,000	20,000	20,000	20,000	20,000	42,908	20,000	42,013	43,714
Diamond Valley Lake	-8,066	58,762	-25,176	-105,519	-20,000	43,840	-66,144	150,315	0	88,155	57,075
SWP Storage Programs	0	0	0	-507	-50	0	0	219,513	0	168,704	160,241
Long-term Demand Cuts	0	0	0	0	0	0	0	53,618	0	66,000	66,000
In-Region Contractual Groundwater	0	0	0	0	0	0	0	0	0	165,651	234,000
DWR Reservoirs	0	0	0	0	0	0	0	0	0	0	6,854
Agricultural Demand Cuts	0	0	0	0	0	0	0	0	0	0	0
Remaining Targeted Central Valley Transfer Produ	0	0	0	0	0	0	0	0	0	0	0
Remaining Spot Water Needed	0	0	0	0	0	0	0	0	0	0	0
Total Additional WSDM Actions	11,934	78,762	-5,176	-86,026	-50	63,840	-46,144	466,354	20,000	530,523	567,884
Remaining Shortage	0	0	0	0	0	0	0	0	0	0	0
Remaining Surplus	0	0	0	245,276	92,564	0	0	0	0	0	0

Figure A3 - 1: IRPSIM Output - Total Storage
2015 – 2025 Forecast: 1924 – 1934 Hydrologic Sequence

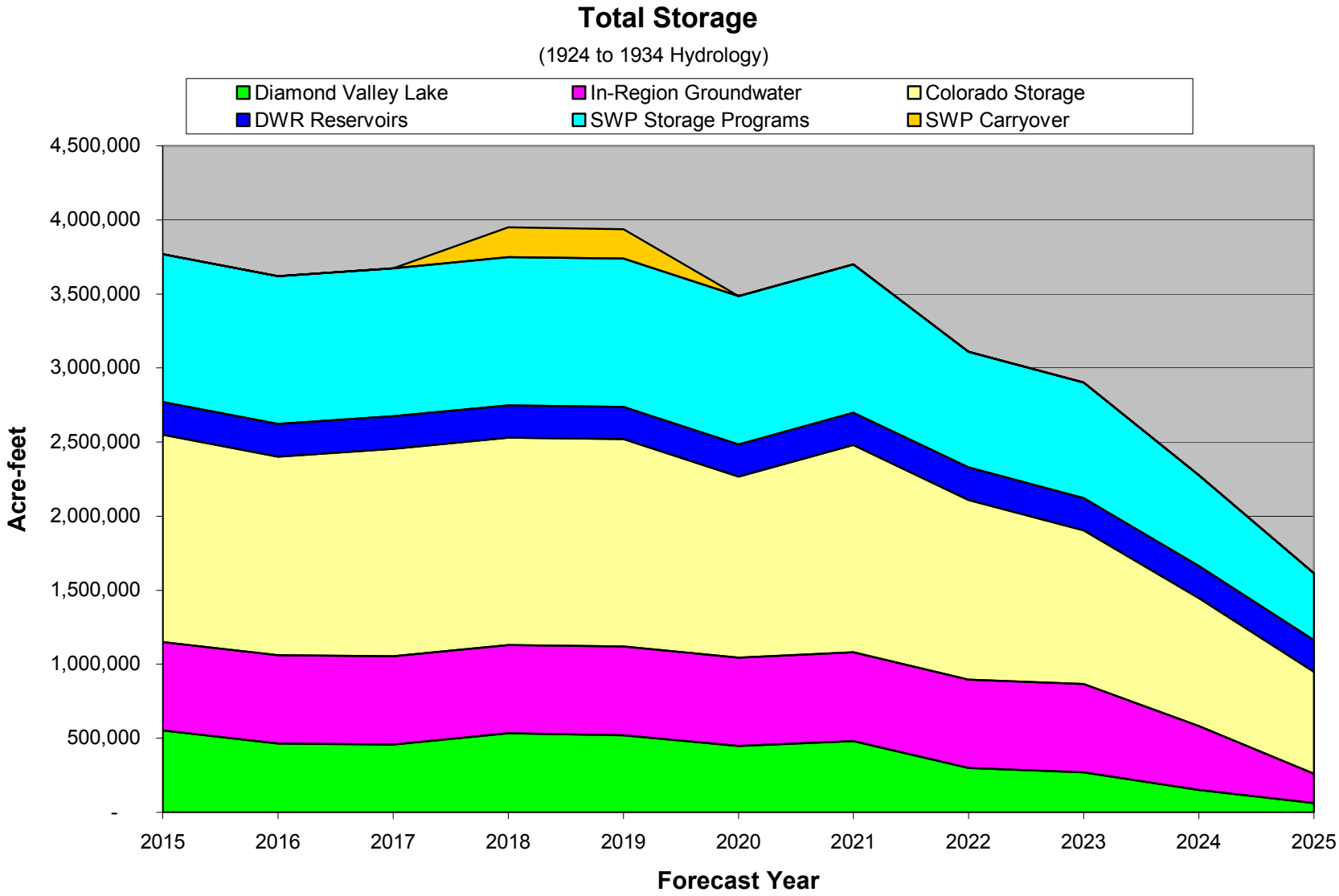
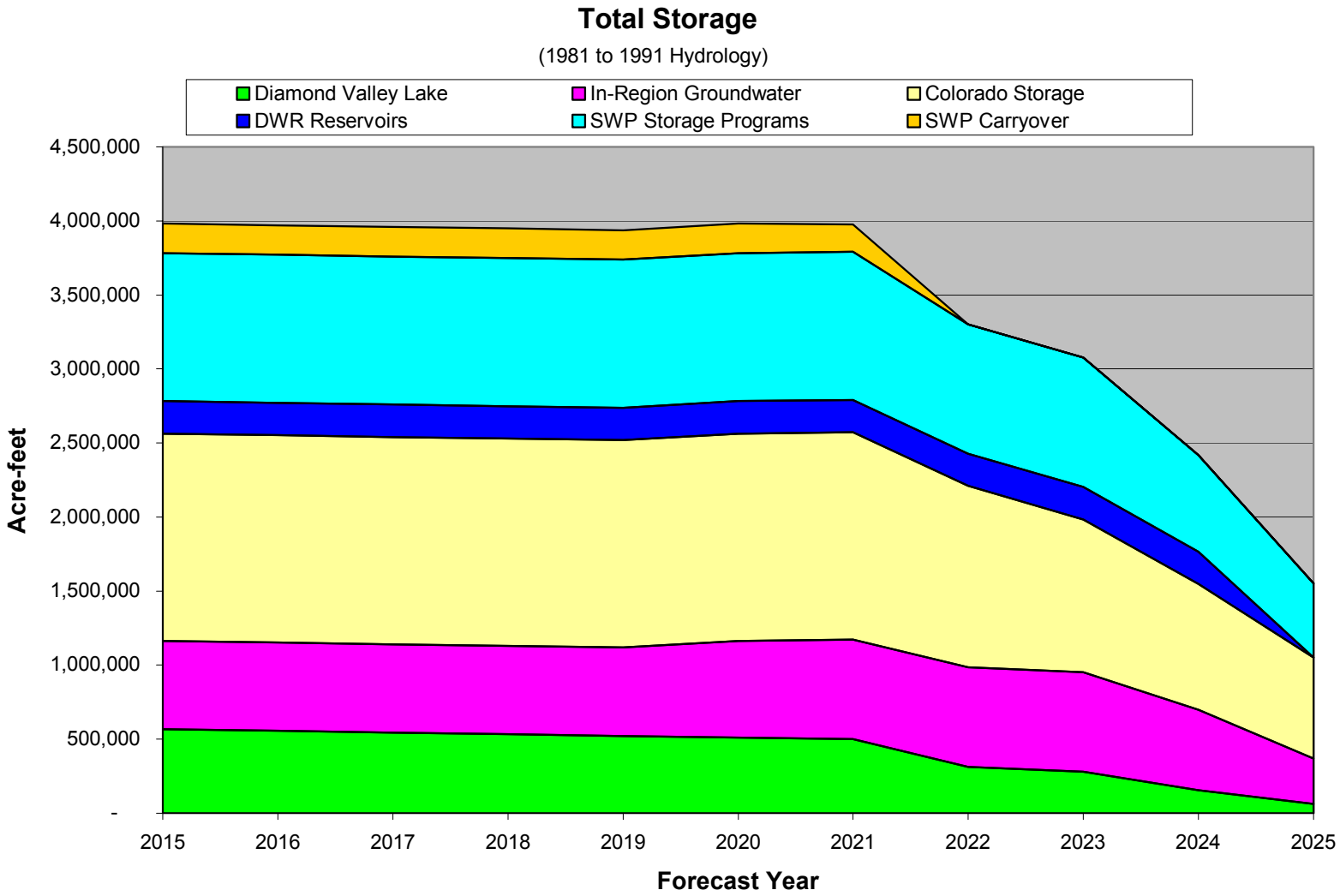


Table A3 - 2: IRPSIM Output - Drought Reliability Test
2015 – 2025 Forecast: 1981 – 1991 Hydrologic Sequence

Forecast Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Hydrology Year	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Hydrologic Conditions											
Southern California Year Type	Normal	Normal	Wet	Dry	Dry	Wet	Normal	Normal	Dry	Dry	Normal
Sacramento River Index D1630 Year Type*	Dry	Wet	Wet	Wet	Dry	Wet	Dry	Dry	Dry	Dry	Dry
Demands											
Retail Demand	4,661,720	4,437,698	4,219,166	4,909,935	4,850,993	4,768,078	4,890,914	4,983,574	5,147,630	5,237,478	5,068,636
Long-term/Replenishment Demand	284,676	285,948	288,208	291,427	294,106	296,593	296,783	296,729	296,880	296,839	296,645
Total Demand	4,946,396	4,723,646	4,507,374	5,201,362	5,145,099	5,064,671	5,187,697	5,280,303	5,444,510	5,534,317	5,365,281
Local Supplies											
Goundwater Production	1,600,991	1,601,597	1,567,064	1,666,752	1,665,839	1,617,869	1,651,420	1,653,447	1,687,600	1,693,077	1,657,732
L. A. Aqueduct Production	283,499	500,000	500,000	438,645	368,294	472,569	182,088	154,173	156,559	110,555	167,736
Advanced Technology Production	632,551	642,364	651,178	660,992	670,804	709,528	710,528	711,528	712,528	713,528	714,528
Surface Production	173,619	150,652	182,117	189,513	146,377	112,932	121,251	118,046	86,460	72,733	88,478
Total Local Supply	2,690,660	2,894,613	2,900,359	2,955,902	2,851,314	2,912,898	2,665,287	2,637,194	2,643,147	2,589,893	2,628,474
Total MWD Demand	2,255,735	1,829,033	1,607,014	2,245,461	2,293,786	2,151,775	2,522,409	2,643,111	2,801,363	2,944,425	2,736,807
MWD Supply Sources											
Colorado River Supplies											
Base Supply Programs	629,928	621,257	195,800	695,843	727,030	1,144,350	1,149,553	830,934	807,458	818,328	832,779
Hayfield & DWCV Programs (Net Operations)	-518	-52	-5	-1	0	0	0	174,066	194,542	181,672	167,221
PVID	97,000	97,000	97,000	25,000	25,000	25,000	25,000	111,300	70,821	111,300	111,300
Additional CRA Programs	0	0	0	0	0	0	0	0	0	0	0
Net Colorado River Supply	726,410	718,205	292,795	720,842	752,030	1,169,350	1,174,553	1,116,300	1,072,821	1,111,300	1,111,300
State Water Project Supplies											
Base Supply Programs	1,758,172	1,921,743	2,072,700	1,834,157	1,979,970	1,647,650	1,671,447	1,015,066	1,708,542	1,272,672	783,221
Carryover (Takes)	200,000	200,000	200,000	200,000	200,000	200,000	200,000	183,967	0	0	0
Carryover (Puts To Program)	-200,000	-200,000	-200,000	-200,000	-200,000	-200,000	-183,967	0	0	0	0
Net State Water Project Supply	1,758,172	1,921,743	2,072,700	1,834,157	1,979,970	1,647,650	1,687,480	1,199,033	1,708,542	1,272,672	783,221
Additional Water Surplus And Drought Management Actions (Storage Programs Show Net Operations)											
SWP Transfer Programs	20,000	20,000	20,000	20,000	20,000	20,000	20,000	43,594	20,000	51,051	36,883
Diamond Valley Lake	-20,000	-20,000	-20,000	-20,000	-20,000	-20,000	-20,000	156,213	0	94,053	62,973
SWP Storage Programs	-191	-20	-3	0	0	0	0	127,970	0	219,039	154,065
Long-term Demand Cuts	0	0	0	0	0	0	0	0	0	66,000	66,000
In-Region Contractual Groundwater	0	0	0	0	0	-56,000	-19,000	0	0	130,309	234,000
DWR Reservoirs	0	0	0	0	0	0	0	0	0	0	219,000
Agricultural Demand Cuts	0	0	0	0	0	0	0	0	0	0	24,135
Remaining Targeted Central Valley Transfer Produ	0	0	0	0	0	0	0	0	0	0	45,231
Remaining Spot Water Needed	0	0	0	0	0	0	0	0	0	0	0
Total Additional WSDM Actions	-191	-20	-3	0	0	-56,000	-19,000	327,777	20,000	560,452	842,287
Remaining Shortage	0	0	0	0	0	0	0	0	0	0	0
Remaining Surplus	228,656	810,895	758,478	309,538	438,214	609,225	320,624	0	0	0	0

Figure A3 - 2: IRPSIM Output - Drought Reliability Test
1981 – 1991



APPENDIX 4 – FUNDING THE INTEGRATED RESOURCES PLAN

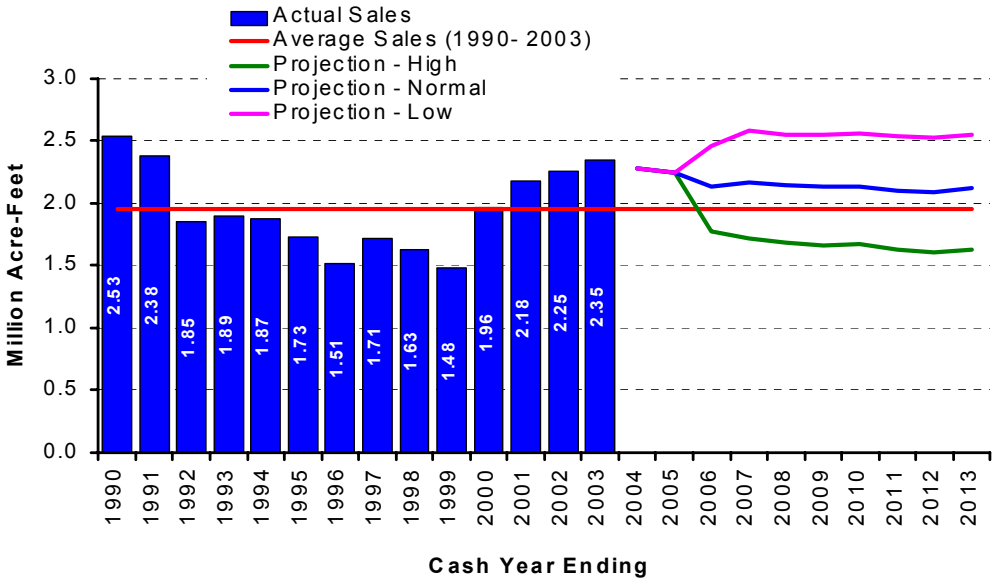
This appendix summarizes the funding requirements of the Integrated Resources Plan and the impacts on Metropolitan's water rates and charges. There are three broad elements of the IRP – (1) existing imported resources (the Colorado River and State Water Project), (2) Metropolitan's incentive payments for local projects and conservation, and (3) expenditures for water transfers and storage resources (including local groundwater projects). In addition to these expenditures, Metropolitan will continue to invest in water distribution and treatment infrastructure. This appendix describes the rate impacts associated with the water resource investments contemplated in the update, including changes in water rates associated with the additional local and imported supplies necessary identified as part of the buffer. The forecast period is consistent with that of Metropolitan's Long Range Finance Plan, and extends to fiscal year 2012/13.

WATER SALES FORECAST

For financial planning purposes, it is expected that demand for Metropolitan supplies will decline from about 2.3 million acre-feet in 2003/04 to about 2.1 million acre-feet in 2012/13. There are two primary reasons for this change. First, current water demands have been high due to dry weather in Southern California. Over the past five years, rainfall has been below average, leading to higher retail demands and reduced water levels in groundwater basins, surface reservoirs and other local supplies. As a result, demand for imported water from Metropolitan has been higher than average. The financial forecast is based on a return to average local weather conditions and retail demands, recovery in local supplies, and a reduced demand for imported water. Second, in addition to a reduction in overall demand due to a return to average weather conditions, the IRP contemplates continued investment in local resources, primarily water recycling and seawater desalination. By 2013, these investments will result in an additional 255,000 acre-feet of local supply. These local supplies reduce the need for imported water and expected water sales by Metropolitan.

Figure A4 - 1 shows historic and forecast water sales. Since 1989/90, Metropolitan sales have averaged 1.95 million acre-feet. Since 1999/00, sales have increased from 1.95 million acre-feet to just over 2.3 million acre-feet in 2002/03. As noted above, expected sales are forecast to drop from those levels to about 2.1 million acre-feet by 2012/13. Under dry conditions, sales in any of the next 10 years could be as high as 2.5 million acre-feet, and as low as 1.7 million acre-feet in a very wet year.

Figure A4 – 1: Water Sales (MAF)

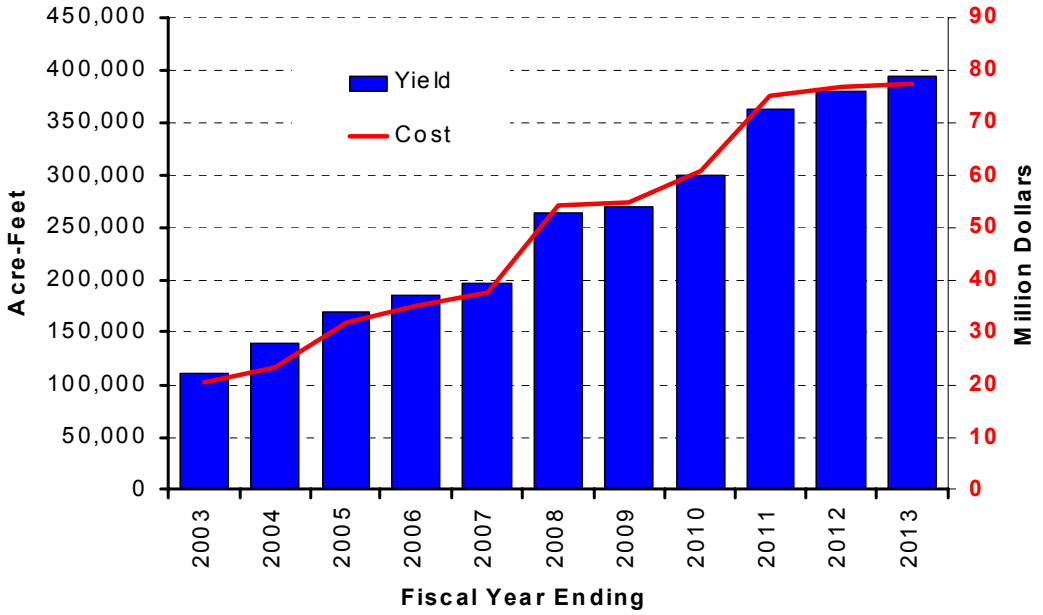


LOCAL RESOURCES

Local resources, including groundwater recovery, water recycling, seawater desalination, and conservation are fundamental parts of the IRP. Financial incentives by Metropolitan will support local projects that are expected to develop 255,000 acre-feet of new supplies by 2012/13. These investments result in additional water supply, but just as importantly, defer the need for Metropolitan to construct new treatment and distribution capacity.

Metropolitan's cost for funding local resources including conservation, recycling and groundwater recovery currently amounts to $46 million. These payments are funded through the Water Stewardship Rate, which is charged for every acre-foot of water delivered by Metropolitan. By 2012/13 Metropolitan's funding for conservation, recycling, and desalination is expected to increase by $45 million - almost 100 percent. The increase is attributable to the need to finance the additional yield from existing and committed projects under Metropolitan's Local Resources Program (LRP), as well as the yield from new projects anticipated as part of implementing the IRP. While there are a number of projects that could be funded, the IRP does not identify the specific projects required for development. The IRP provides a target for local resource development. As a result, the yield from the LRP is expected to increase from 138,000 acre-feet in 2003/04 to 394,000 acre-feet in 2012/13. The IRP and rate forecast include 156,000 acre-feet of supply from water recycling and seawater desalination by 2012/13. As part of the rate forecast and the ten-year financial forecast, 126,000 acre-feet of this new supply is assumed to come from proposed desalination projects. Figure A4 - 2 shows the expected supply from projects funded under the LRP and the associated cash flow to support that yield. As a result of these investments, Metropolitan's Water Stewardship Rate is expected to increase from $25/acre-foot in 2005 to $50/acre-foot in 2013.

Figure A4 – 2: Local Resource Programs

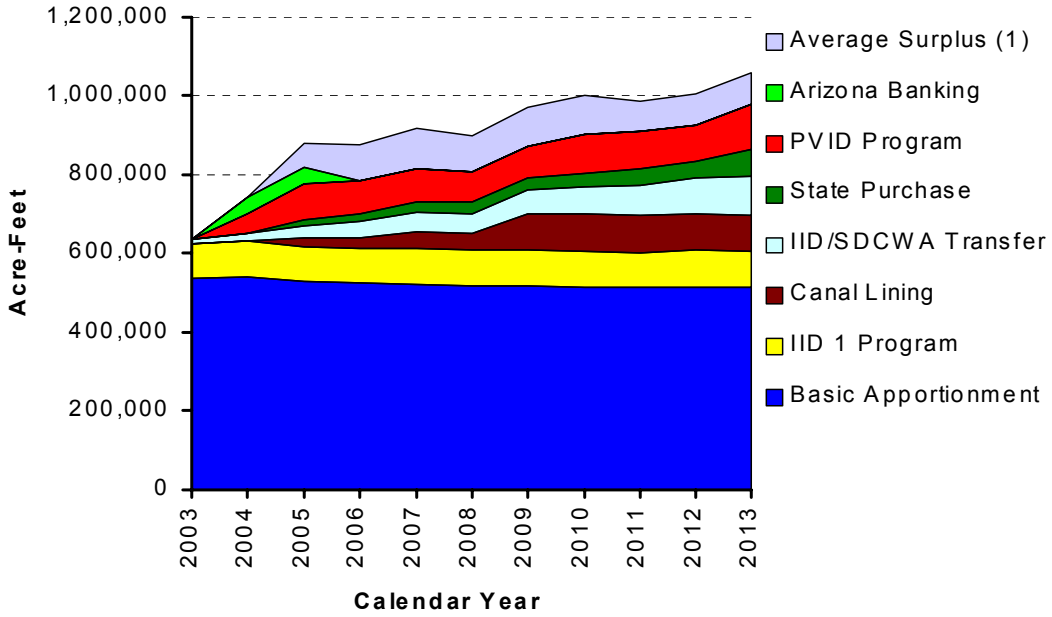


IMPORTED SUPPLIES

Colorado River

In October 2003, Metropolitan and the other California contractors (with the exception of the Palo Verde Irrigation District) executed the Quantification Settlement Agreement (QSA). The QSA lays out a framework for transferring water from agricultural uses to urban needs. The execution of the QSA provides for the opportunity for Metropolitan to access "special surplus" supplies under the Interim Surplus Guidelines, if hydrological conditions on the river improve. Figure A4 - 3 shows the different projects that will be delivered through the Colorado River Aqueduct. Of note is the fact that the transfer between the Imperial Irrigation District and the San Diego County Water Authority will move through the Colorado River Aqueduct and will be delivered through Metropolitan's system to San Diego. The San Diego County Water Authority will be responsible for all costs associated with the transfer and will pay Metropolitan's rates for transporting the water. In addition, San Diego will pay the established rates for moving those supplies developed from the lining of the All American Canal and Coachella Canal. While these supplies are not Metropolitan supplies, they are delivered by Metropolitan and will serve demands in Metropolitan's service area. Further, the water sales shown in Figure A4 - 1 include these deliveries of Colorado River supplies to San Diego, although Metropolitan's revenues from these deliveries will be for rates related to transportation and water stewardship (and will not include the supply cost.)

Figure A4 - 3: Colorado River Supplies



(1) Average surplus under Interim Surplus Guidelines, Metropolitan may or may not access this water depending on hydrology.

The cost of power associated with the delivery of Colorado River supplies is expected to average about $21 million dollars through 2012/13. Table A4 - 1 shows the cost of power and the anticipated expenditures by Metropolitan for additional Colorado River supplies over the next ten years. Metropolitan's average water rate will increase by $14 per acre-foot by 2013 as a result of the expenditures for Colorado River programs.

Table A4 - 1: Cost of Imported Supplies (Millions of Dollars)

Fiscal Year Ending	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Colorado River											
Power	47	25	18	20	20	21	21	24	21	21	24
Storage	0	0	3	2	2	2	2	2	2	2	2
IID Conservation	6	11	11	12	12	12	13	13	13	14	14
PVID (1)	-	0	11	13	9	6	6	6	6	5	5
State Purchase (2)	-	-	2	4	6	7	7	9	10	12	17
Total	**53**	**36**	**45**	**51**	**49**	**48**	**49**	**54**	**52**	**55**	**63**
$/AF	23	15	20	23	22	22	23	25	25	26	29
State Water Project											
SWP	343	406	430	417	429	438	445	449	460	473	475
Option Transfers	2	2	2	2	2	2	2	2	2	2	2
Central Valley Transfers/Storage	-	20	15	14	12	8	6	6	7	8	8
SBVMWD	8	(3)	4	4	4	4	4	4	4	4	4
Total	**353**	**425**	**450**	**437**	**447**	**451**	**457**	**461**	**473**	**487**	**489**
$/AF	155	183	202	203	206	211	215	216	225	232	230

(1) Upfront payments are not included since they are paid from Water Transfer Fund
(2) Purchase of IID water sold to state as part of QSA

State Water Project Supplies, Storage and Transfers

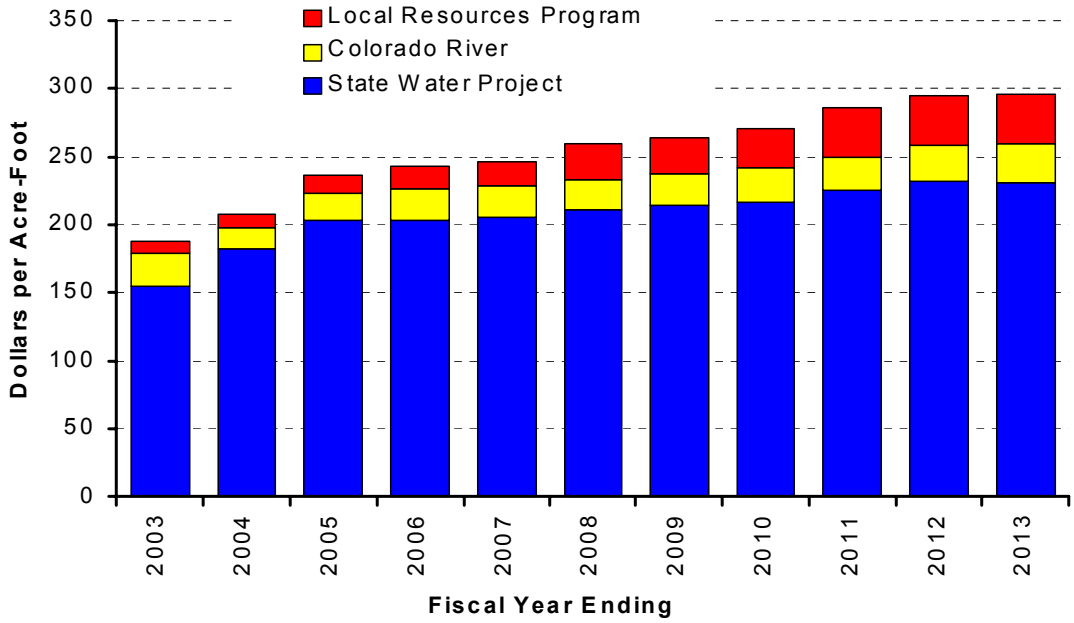
Delivery of water over the State Water Project (SWP) system to Metropolitan is expected to average around 1.5 million acre-feet through 2012/13. Water delivered via the SWP California Aqueduct includes deliveries of Metropolitan's Table A amounts, carryover supplies, water transfers, and exchanges. Metropolitan has executed a number of contracts with Central Valley and Sacramento Valley water districts for storage and transfers. These programs include option-based transfers, whereby Metropolitan pays an upfront payment for the right to exercise an option to take water later in the year, if conditions warrant. In addition, Metropolitan has executed long-term storage and transfer programs, where Metropolitan funds infrastructure improvements in exchange for the right to store water in groundwater basins for future use during dry years. Table A4 - 1 shows the forecast of expenditures for such SWP programs, as well as the forecast of SWP costs through 2012/13.

The rate impact of water transfers may be mitigated through options and wet year purchases when lower market prices are expected. As shown in Table A4 - 1, water transfers and storage programs are expected to average about $15 million over this period. SWP costs, including the cost of power to pump the water on the project, are expected to increase from $406 million to $475 million in 2012/13. As a result of changes in the cost of power and expenditures on additional water transfers and storage projects needed to meet the IRP targets, Metropolitan's average water rate will increase by $47 per acre-foot.

SUMMARY OF RATE IMPACTS

In order to fund the projects and programs envisioned in the IRP Metropolitan's average rate is expected to increase by $88 per acre-foot over the next ten years, as shown in Figure A4 - 4. These rate impacts are based on expected sales under "normal" or average hydrologic conditions. In addition, this forecast is consistent with the Capital Investment Plan developed as part of the last System Overview Study. The impacts of changes in local supply development, demand, and water quality regulations are not included in these estimates. For example, if demand for Metropolitan supplies were to be 100,000 acre-feet higher per year (a change of less than 5 percent), the impact of the IRP would be about $12 per acre-foot less. Conversely, a change in the opposite direction (100,000 acre-feet lower demands due to weather) would result in a similar $12 per acre-foot increase in these projections.

Figure A4 - 4: Estimated Rate Impact of IRP



As seen in Figure A4 - 4, each of the elements – Colorado River, State Water Project and Transfers, and Local Resources – contribute to the expected rate increases necessary to meet Metropolitan's and the member agencies' reliability objectives. Investments in local supplies help to ensure reliable deliveries by reducing stress on the import delivery system, while investments in additional water transfers (particularly option-based transfers) provide necessary redundancy at relatively low cost. The basic strategies of diversification and flexibility remain the foundation of the IRP, and are reflected in the reasonable costs and rates forecast for the next ten years. Metropolitan's rates are forecast to increase between three and five percent on an annualized basis from 2003 to 2013, while supporting the investments and operating and maintenance costs necessary to meet the region's needs for a reliable, high quality supply of water.

APPENDIX 5 – 2003 CHANGES TO MAJOR ASSUMPTIONS AND IMPACTS TO IRP UPDATE CONCLUSIONS

BACKGROUND

The IRP Update process was conducted over the course of two years. The process was initiated in December 2001 following the completion of the IRP Review. The reliability analysis that formed the basis for assessing the resource development targets for the IRP Update was performed during the calendar year 2002, using the major planning assumptions and changed conditions up to that time. However, as stated in the report, financial impacts and water rate analyses in this report were done using updated information. This appendix is intended to describe the major changes that have taken place and to show the impact of those changes on the reliability analyses presented in the report.

MAJOR CHANGES IN ASSUMPTIONS

Metropolitan conducts regular internal reviews of assumptions on retail demand and local supply conditions and projections based on annual surveys and exchanges of information with the member agencies. Metropolitan also regularly assesses the changes in assumptions for the major imported supplies from the State Water Project and the Colorado River Aqueduct. In total, these changes result in changes in both the need for supplemental water supplies, and the assumed mix of those supplemental water supplies. Table A5 - 1 below shows the near and long-term changes in assumptions that affect the demand for Metropolitan's water supplies by major resource category.

Table A5 - 1 Changes: Rate Impact Analysis versus 2003 IRP Update Resource Analysis (Acre-Feet)*

Local Supply Changes	2005	2010	2020	2025
Local Groundwater Production	(80,820)	(60,855)	(89,655)	(86,580)
Local Surface Production	(11,511)	86	2,086	1,086
Los Angeles Aqueduct	(24,654)	(24,496)	(24,972)	(24,971)
Recycling for M&I and AG	(24,321)	(56,955)	(74,542)	(78,166)
Recycling for GW Replenishment	(13,250)	(51,235)	(30,307)	(30,132)
Recycling for Seawater Barrier	10,192	15,524	7,524	7,524
Seawater Desalination	-	66,800	113,800	113,800
Total Local Supply Changes	**(144,364)**	**(111,132)**	**(96,067)**	**(97,440)**
Retail Demand w/o Conservation*	30,046	(10,219)	(9,394)	(9,032)
Total Conservation	0	0	0	0
Total Demand on Metropolitan**	**171,399**	**107,557**	**106,497**	**107,279**

* Parenthesis indicates a reduction

**Replenishment and Sea Water Barrier demands are not included in Retail Demand.

IMPACTS TO RELIABILITY ANALYSIS

The overall effect of the changes in assumptions that are detailed in Table A5 - 1 is to increase the need for additional imported water supplies in the short term, and to decrease the need in the long-term. Most of the short-term impact is due to significant changes in local supply production from surface and groundwater sources. For example, Table A5-1 shows groundwater production estimates have decreased between the time of the IRP Update analysis and today. Much of this decrease is associated with groundwater basin storage level recovery efforts that have decreased groundwater production yield for some member agencies, and with dry conditions affecting the surface production capability of some member agencies. Most of the long-term impact can be characterized as resulting from increased development of local supplies by member agencies and a clarification of the programs and water supply from the Quantification Settlement Agreement. When the analysis for the IRP Update was originally conducted, the final outlook of the QSA was speculative in nature. As a result of the final agreement on the QSA being signed by the major parties, a clearer picture of Colorado River Aqueduct supplies and programs has emerged. This clarification of supplies, in combination with higher local supply development from the buffer, reduces the need for additional supplemental water supplies through 2025. Figure A5– 2 shows a low probability of need for additional supplemental water supplies before 2010. This probability is reduced to zero beyond 2010 due to the development of supplies and benefit of water supply programs under the QSA. Figure A5 – 3 shows the hydrologic sequence for years 2005-2025 that result in the largest need for additional supplemental water supply. The maximum need is approximately 900,000 AF occurring during the two-year period of 2008-2009.

Figure A5–2: Probability of Additional Transfer Need

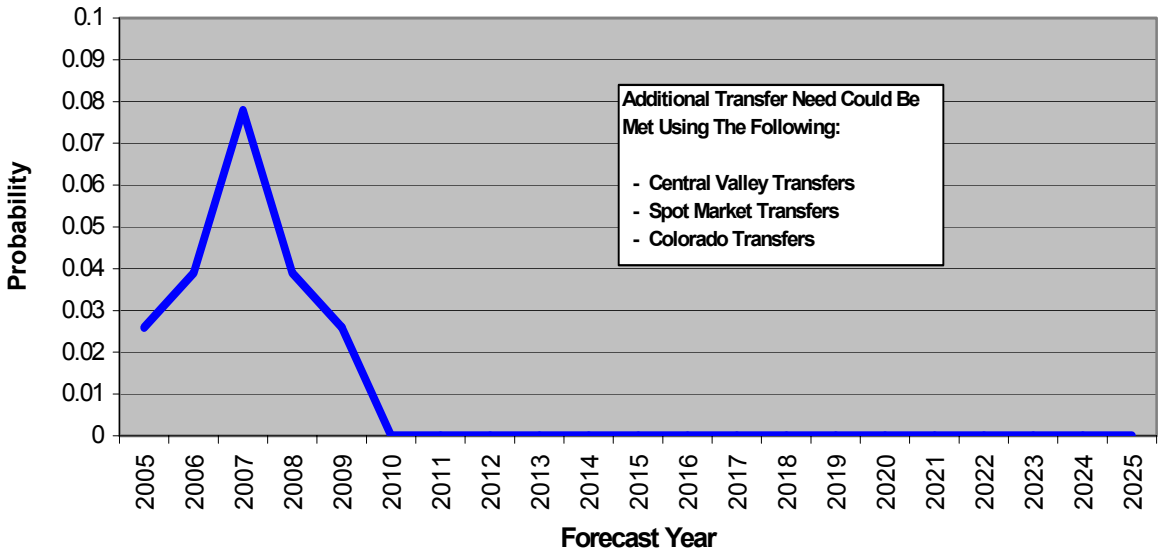


Figure A5 - 3: Sample Metropolitan Supply & Demand Scenario (Trace Begins With A 1988 Hydrology In 2005)