



THE METROPOLITAN WATER DISTRICT
OF SOUTHERN CALIFORNIA

Date: February 2, 2023

To: Board of Directors
Member Agency Managers

From: Adel Hagekhalil, General Manager

Subject: Background Materials for the Board Retreat

This memo provides links to materials you may find useful as informational background in advance of the Board Retreat on February 13-14, 2023. Links below direct you to Metropolitan's website. To navigate to other documents referenced below click on the icon  in upper right corner to access table of contents.

“**A New Planning Era**” is the primary discussion guide to support the Board Retreat, offering some considerations and context for our work together at this moment in Metropolitan's history. (This guide is available to you in hard copy).

In addition, the links below provide further background materials that you may find valuable and relevant.

- A [White Paper prefaced the 2019 retreat](#). (This guide is available to you in hard copy).
- A **Blue Ribbon Committee Report** was presented to the Board in April 2011 after a year-long independent analysis of trends, uncertainties, and the business model.
- The [General Manager's Business Plan](#) is focused on strategic priorities, and it emphasizes **the One Water approach**.
- The Board adopted Metropolitan's [Climate Action Plan](#) in May 2022 and heard [a status update](#) in December 2022. We have also established a [CAPDash portal](#) for the public to see our targets and progress.

Included in **this financial overview** are historical views of the rate structure and rate increases, perspective on the variability of revenue and the fixed nature of costs, reserve fund projections, a breakdown of the Capital Improvement Program in the current budget, and the anticipated process for the Long Range Financial Plan.

- See more detail about how **energy costs for imported supplies** have fluctuated over time and are on the rise.

The following information focuses on the conditions and trends of our water supply sources and water resource planning.

- A broad overview of **trends and challenges in our supply sources** underscores the diversity among member agencies and the critical nature of having both of our main imported sources under stress at the same time.
- A high-level overview of the **Integrated Water Resources Plan (IRP)** presents the needs assessment and draft implementation schedule. For further detail, read the [board letter](#) and view the [presentation](#) of the findings adopted by the Board in April 2022. A [White Paper on the Purpose of the IRP](#) was presented to the Board in August 2020, which has further background on how the process has evolved since the 1990s.
- The IRP found that vulnerabilities in the State Water Project (SWP) Dependent Areas are more severe given the reduced reliability of SWP supplies and Metropolitan distribution system constraints. The Board adopted a resolution to support Equivalent Water Supply Reliability in August 2022—here are [the presentation, board letter, and resolution](#) of that action. In November 2022, staff provided [an update on drought mitigation actions](#) for the SWP Dependent Areas, and another update is expected in March 2023.
- Colorado River:
 - **Trends on the Colorado River** include declining reservoir levels that are driving anticipated decisions in the coming couple of years.
 - Here you can view the materials and the video of the recent [Board Workshop on Colorado River issues](#).
- State Water Project:
 - A few overview slides present some **trends and factors related to State Water Project supplies**.
 - The Board recently updated its Bay-Delta policies, reflected in this [presentation and board letter](#).
- **Storage strategies and conditions** are outlined in a few slides.
- Graphs of historic use levels show progress being made through **conservation and demand management** efforts.

Thank you for dedicating time to prepare for the Board Retreat. I am confident it will be an inspiring and productive discussion, and I am looking forward to it.



TABLE OF CONTENTS

February 13 & 14, 2023 Board of Directors Retreat

Metropolitan New Planning Era – Discussion Guide	4
Blue Ribbon Committee Report 2011.....	24
Metropolitan One Water Approach	171
Finance Overview	179
Energy Costs of Imported Supply.....	192
Supply Overview	198
Integrated Water Resources Plan, Assessment & Implementation.....	217
Colorado River.....	230
State Water Project	239
Storage Overview.....	247
Demand Management	255

A NEW PLANNING ERA

A Discussion Guide to Support the Board Retreat

BOARD RETREAT 2023



A New Planning Era

As the Metropolitan Water District Board of Directors convenes for a retreat February 13-14, it does so amid an ongoing drought emergency followed by a parade of atmospheric rivers that slammed California in January, overtopping some flood control structures. The amplification of weather extremes in real time provides the backdrop of the retreat's agenda and of master planning for water resources to 2045.

The retreat has three primary purposes:

1. Better understand climate impacts on water supply and the interrelated dimensions of our supplies;
2. Discuss responses to climate change and provide guidance to resource planning and to the evaluation of possible actions;
3. Begin harmonizing Metropolitan's water and financial planning efforts, resulting in fully aligned strategies; and provide targets/timelines for stages of planning.



This agenda raises serious questions for reflection and discussion. Among them:

What additional actions must Metropolitan pursue given current climate conditions to ensure reliable service to its member agencies?

Metropolitan has evolved to be more than an importer or water, such as its funding of local supplies. Given its potential to develop supplies directly or in partnerships, how should Metropolitan approach future supply needs?

How does Metropolitan make sound investment decisions during extreme climate uncertainty?

NOTES

Given the needs of Metropolitan and its member agencies for future investments, are new funding approaches needed for long-term water resilience?

How do the regional benefits of collaboration across the District best fit with and support the individual needs of a diverse set of member agencies?

Given our changing climate and current supply conditions, what role does demand management play in resilience and supply planning?

NOTES

Metropolitan's role is foundational to the future of western water. Our imported supplies come from two of the West's largest watersheds, the Sierra Nevada and the Colorado River basins. Crises in both watersheds have intensified since 2019. On the Colorado River, the Bureau of Reclamation announced last year that it seeks to reduce water use by 2 to 4 million acre-feet annually short term. Subsequently, the Basin States have been working to develop a plan to share cuts needed to protect critical river infrastructure. In California, conditions have limited State Water Project supplies to just five percent for two consecutive years and limited supplies to meet environmental needs as well — a prospect that was recently foreshadowed in Metropolitan's integrated resources planning.

The historically low supplies arriving from Northern California exposed vulnerabilities in Metropolitan's distribution system. Conveyance of Colorado River supplies to approximately a third of service area residents is constrained. The so-called "State Water Project Dependent Areas" rely on adequate supplies from Northern California, and absent them, are experiencing mandatory cutbacks while the rest of the service area is not. This is a first-ever experience for Metropolitan and challenges the district's long-standing ethic of equity and reliability for all our communities. Prospects of a region-wide allocation are possible later this year if the wet start to the winter is abruptly followed by dry weather and high temperatures. Metropolitan's reserves on the Colorado River, stored in Lake Mead, may be called upon to help maintain lake levels and cushion the impacts of likely cutbacks.

Stepping back, the fundamental purposes of Metropolitan remain the same, while its role to achieve those purposes continues to evolve. Working in concert with its 26 member agencies, our shared mission is to provide reliable and affordable water for 19 million people in six Southland counties. Reliability for all has long been our collective mission.

The task facing the Metropolitan Board is extraordinary. Planning for one of the world's largest economies has global implications. Leaders must take action for their neighbors today while pursuing projects to benefit children and grandchildren decades from now. To do so amid cascading emergency conditions is unprecedented. However, the challenge is not just to respond to the current emergency. It is to prepare for the changed conditions underlying today's drought and ensure a future water supply portfolio and delivery system that are resilient for the coming decades/century. It underscores the need for Southern California to lead the Southwest, setting a truly bold and historic example.



San Luis Reservoir 2021, photo courtesy CA DWR

Member Agency Checklist

Metropolitan planning must take place in close coordination with its 26 member agencies, all with individual perspectives and needs. The retreat provides an opportunity to share the local experience while envisioning the region's future. The following questions are intended to help facilitate that dialogue:

What are the top three priorities for your agency?

What is your recent or typical water demand (local resources as well as Metropolitan supplies)?

What risks or vulnerabilities to your water resources most concern you?

Do your resource plans anticipate changes in your Metropolitan demand for any reason?

How does your agency address affordability?

What are your current local resources?

NOTES

Climate:

CHANGED AND CHANGING

A primary purpose of the retreat is to better understand climate impacts on water supply and the interrelated dimensions of our supplies.

The challenges facing the Sierra Nevada and the Colorado River basin share much in common. Longer dry periods have put us on a trajectory toward aridification, as opposed to the drought cycles of the past. Higher temperatures cause earlier snowmelt and drier vegetation which results in less and unpredictable runoff. Wildfire, flooding and extreme heat can also have cascading impacts to power infrastructure, workforce availability and the communities Metropolitan serves.

Existing operations of vast systems of water infrastructure are ill-suited to this century's changing climate. They are governed by complex webs of water rights, contracts, and laws. Views on solutions vary dramatically. Metropolitan will receive less water from these watersheds in the decades ahead; yet the extent is simply unclear. Planning for this uncertain future begins with a review of Metropolitan's evolving circumstances as of today.



Parker Dam

The Colorado

The Colorado River is home to the nation's largest dams, Glenn Canyon in Arizona and Hoover on the Nevada-Arizona border. When the Board held its retreat in September 2019, about 10.2 million acre-feet of water was stored behind Hoover Dam. Hoover currently holds about 7.3 million acre-feet of water. Put another way, in the last three years, Hoover finds itself about 60 percent closer to reservoir levels that threaten its very ability to operate. While conditions in the Colorado have continued to get drier, water users have gradually depleted the reservoirs.

Here is where the resolution processes stand today: The federal Bureau of Reclamation, operator of the dams, has initiated separate environmental processes. One is to potentially enact additional delivery reductions before 2026. The other is to replace the existing operating guidelines that are set to expire in 2026. Reclamation has called on water users to commit to additional voluntary reductions in this interim period.

The interstate discussions continue, with Reclamation anticipating details of a shortage-sharing agreement by next summer. California last year advanced a voluntary proposal to reduce its collective use by

approximately 400,000 acre-feet annually with federal funds, a proposal that remains under development. The other states in the lower basin - Arizona and Nevada - did not advance proposals of their own but are also developing conservation program with federal funds.

Metropolitan currently holds more water in reserve behind Hoover Dam than any other water user in the lower basin. This reserve, known as Intentionally Created Surplus (ICS), has allowed the district to store water in years of extraordinary conservation actions. This year, Metropolitan is not intending to draw on this reserve. Instead, Metropolitan is planning to leave this water behind Hoover in the event it is needed to meet district obligations to maintain lake levels.

Long-term sustainability is complicated by factors beyond the existing imbalance between supply and demand. States in the upper basin have not fully used their apportionments established in 1922. Apportionments for some tribal nations remain unresolved. And the prospect of reduced river flows would challenge ongoing restoration efforts that were tied to historic flows.



Flock of Snow Geese at Delta's Twitchell Island, photo courtesy CA DWR

The State Water Project

The Sacramento-San Joaquin Delta is home to the nation's largest water diversion facilities, operated by the State Water Project and the federal Central Valley Project. The Delta is also an estuary of hemispheric importance, an important stop for millions of birds along the Pacific Flyway and for native fish species such as California's primary salmon runs. These two roles have created chronic management conflicts that are compounded by long-standing threats from flooding, aging infrastructure, and unmet needs of Delta communities.

Climate change will continue to influence California's management of the Delta to balance the needs of the environment and economy. The fundamental unresolved question is how?

Here is where three key processes stand today:

To balance the beneficial uses of water in the western Sierra, the State Water Resources Control Board (SWRCB) is updating the water quality objectives of the Bay Delta Water Quality Control Plan. Metropolitan is among a coalition of water users and other interests seeking a voluntary approach to providing additional

environmental flows and habitat restoration. A regulated solution would likely center solely on flows. SWRCB staff is evaluating both approaches. Final resolution is not expected this year.

To update SWP and CVP compliance with the federal Endangered Species Act, the Bureau of Reclamation in 2021 requested reinitiation of a consultation process with federal wildlife agencies. That process is underway. Resolution is not expected this year.

To modernize the State Water Project, the Newsom administration in January of 2020 launched the environmental review process. The resulting Delta Conveyance Project, with a draft environmental impact report (EIR) issued July 2022, has proposed two new intakes in the northern Delta and a single tunnel system to transport the supply directly to the beginning of the California Aqueduct at Bethany Reservoir. The public comment period ended Dec. 16. Many key comments focused on climate change, with perspectives ranging from maintaining the project's ability to capture stormwater to phasing out the project entirely. A final EIR could come as soon as this year, with an investment decision by Metropolitan after other permit conditions are resolved.

Southern California and Member Agency Supplies

Climate change will only exacerbate California's famously variable weather, and despite being a destination for those seeking respite from harsher winters, Southern California has the most variable weather within the state.

Here is the status of Southern California's local water supplies today: Overall, available local supplies are largely unchanged in recent decades. Losses in local supplies have been offset by gains.

On the loss side, native groundwater production is down by approximately 200,000 acre-feet since the 1990s, and the need to treat for PFAS contamination has impacted groundwater availability in some locations. Losses in the Los Angeles Aqueduct system due to a combination of hydrology and regulation have further strained the amount of supplies provided by local agencies.

Among the gains, Orange County operates the nation's largest recycled water system and San Diego County operates the nation's largest desalination facility. Were it not for local supplies incentivized in part by Metropolitan's Local Resources Program, overall local supplies would have decreased.



CRA operating at 8-pump flow

Question

What additional actions must Metropolitan pursue given current climate conditions to ensure reliable service to its member agencies?

NOTES

Adapting

TO CLIMATE CHANGE

A primary purpose of the retreat is to discuss responses to climate change and provide guidance to resource planning and to the evaluation of possible actions.

Southern California has a range of potential options for reinvesting in imported supplies, developing local sources, and lowering demands. And therein lies the challenge — identifying the right combination of actions and implementing them before they are

needed. The retreat offers the opportunity to step back and examine the many options available to the district and where they stand today. This summary is intended as an overview only and not a prioritization of options.



Local Adaptation

Distribution Improvements: The Board in August passed a resolution committing to providing equitable reliability across the service area. Potential actions include Metropolitan distribution system improvements to extend Colorado River supplies to member agencies that currently have limited access.

Recycling: Metropolitan's Pure Water Southern California Program exemplifies a new generation of major recycling projects pioneered by efforts in Orange County and currently in various stages of development throughout Southern California. Key examples include Pure Water San Diego, Los Angeles' Operation Next/Hyperion 2035 and East (San Diego) County's Advanced Water Purification Project.

Desalination: The California Coastal Commission last year approved the Doheny Desalination Project in southern Orange County. On a parallel track, Metropolitan is working with outside consulting experts to better understand the state of the technology and possible options for desalination of both ocean and brackish water sources. Ventura County has also expressed an interest in desalination as a portfolio option.

Stormwater Capture: Measure W in Los Angeles County advances an initiative to underwrite a new generation of stormwater capture projects in the coming decades. It represents an innovative multi-benefit model. Stormwater capture creates a new supply and can offset demand, while reducing urban runoff and realizing the value of Southern California's natural assets including the storage potential of local groundwater basins.

Demand Management: Conservation and efficiency are cost-effective solutions with immediate benefits. Metropolitan has advanced a model local ordinance to phase out nonfunctional turf. Financial incentives for turf removal and rebates for replacement of toilets and other devices are established programs with a potential for enhancement or expansion.

Local Resources Program: Metropolitan's long-standing Local Resources Program (LRP) provides financial incentives for member agencies to identify supply enhancements tailored to local circumstances. Supplies have varied from recycling to groundwater remediation to brackish desalination and more. LRP is one strategy for Metropolitan to advance local supplies, and as a cost control, funding for new LRP projects was removed from the current budget.

Groundwater Storage: Southern California is fortunate to have an array of groundwater basins that are prime storage opportunities. Pump and treat operations are expanding as agencies in the region recognize the potential for better utilizing the basins despite legacy contamination.

State Water Project Adaptation

Delta Conveyance Project: Adding northern Delta intakes at higher elevations has the potential to capture additional storm flows and protect supplies from some climate change impacts. Public comments on the draft environmental impact report reflect a politically charged history surrounding this proposal and its predecessors and range from phasing out SWP entirely to modernizing the system. The permitting process is ongoing.

Water Transfers: Purchasing water from willing sellers is a method of supplementing annual allocations by the SWP. Many traditional sources in the Sacramento Valley are proposing to sell supplies for environmental flows in the Voluntary Agreement process outlined above.

Sites Reservoir: Metropolitan has the highest participation rate among public water agencies that are funding the planning effort to construct an off-stream reservoir in the Sacramento Valley. Sites has the potential to provide additional dry-year water for both water supply and environmental needs. The permitting process is ongoing.

South-of-Delta Storage: Additional storage south of the Delta buffers the effects of Delta conveyance constraints and could improve deliveries to member agencies dependent on SWP supplies. Additional underground storage for Metropolitan is under development in the Antelope Valley. No surface storage planning south of the Delta is underway.

Delta Island Investments: Projects such as levee setbacks have a double benefit of providing new habitat and protecting the flow of fresh water supplies through the Delta. Additional investments have the potential to help protect these supplies amid climate change, engage community partners, and may even prove useful for carbon sequestration. Experiments such as delta smelt propagation may eventually help bolster fish populations.



Metropolitan's Bouldin Island in the Delta

Colorado River Adaptation

Interstate Investment in Pure Water Southern

California: Interstate Investment in Pure Water Southern California: Metropolitan's potential purified water project includes planning partnerships with the Southern Nevada Water Authority, the Central Arizona Project, and the Arizona Department of Water Resources. Construction of the project would potentially create new supply for all three states under a continuing partnership.

Partnerships with Agriculture: Metropolitan has numerous ongoing partnerships with the river's agricultural community to improve efficiency and fallow lands either annually or seasonally. Expanding these partnerships would be a method to provide additional supplies to Metropolitan while maintaining the river's agricultural sector.

Intentionally Created Surplus: Interim Guidelines established for the river in 2007 gave Metropolitan the ability to store, in Lake Mead, waters saved via extraordinary conservation. The guidelines expire in 2026. Maintaining an Intentionally Created Surplus program could help Metropolitan store water for both water supply and potential contributions to lake levels.

Memorandum of Understanding Commitments:

Water agencies throughout the basin have signed an MOU committing to pursuing water-saving measures such as eliminating nonfunctional turf and advancing indoor efficiencies. Participants include nearly half of Metropolitan's member agencies.

Partnerships with Tribal Communities: Tribal engagement and collaboration is critical as part of a comprehensive voluntary approach sought by Metropolitan to take a series of conservation actions to protect lake levels and critical infrastructure. Ongoing partnerships with agricultural communities and tribes provide a potential platform for water supply actions.

Federal Funding Availability: The Inflation Reduction Act of 2022 has provided a suite of potential funding opportunities throughout the Colorado River Basin. Metropolitan, for example, is exploring the pursuit of funds to eliminate nonfunctional turf in the service area as a way to reduce demands on the river. Limited funds are also available via a different program for large-scale recycling projects.

Climate Action Plan

Metropolitan's Climate Action Plan is an overarching strategy to bolster the resilience of the district's operations and minimize greenhouse gas emissions. The reduction of these emissions can also provide protection from increases in fossil fuel prices. This plan charts Metropolitan's leadership role in reducing global carbon emissions.

Community Services

Climate change effects will further stress disadvantaged communities. They comprise nearly half of all communities within the Metropolitan's service area. Effective climate change adaptation needs to reach all of Metropolitan's communities. There may be potential roles for Metropolitan to assist in this adaptation through providing additional services or assisting in system operations. This exemplifies feedback from our member agencies about the diversity in their needs and capacities.

Metropolitan Annual GHG Emissions Compared to Forecast



Elements of carbon budget dashboard offer transparency on Metropolitan's website

Questions

Metropolitan has evolved to be more than an importer of water, such as its funding of local supplies. Given its potential to develop supplies directly or in partnerships, how should Metropolitan approach future supply needs?

How does Metropolitan make sound investment decisions during extreme climate uncertainty?

Given the needs of Metropolitan and its member agencies for future investments, are new funding approaches needed for long-term water resilience?

Aligning

METROPOLITAN PLANNING

A primary purpose of the retreat is to begin harmonizing Metropolitan's water and financial planning efforts, resulting ultimately in a comprehensive Metropolitan Master Plan 2045.

Sound planning is the foundation of the Board's ability to assess where it has been and where it is going. Since 1996, Metropolitan's Integrated Resources Plan and its updates have guided evaluation of the reliability benefits resulting from various capital investment decisions. Metropolitan's biennial budgets, capital improvement plans, and 10-year financial forecasts have addressed the costs and funding associated with needed investments and ongoing operations and maintenance.

The uncertainty and volatility of climate change impacts have made both water resources and financial planning more

challenging — favoring investments that increase operational flexibility, emergency preparedness, and climate-resilient supply security. As stated earlier, establishing criteria to compare these investments is the challenge before us.

Planning amid dramatically changing circumstances - with eyes on both present needs and the next generation - requires that Metropolitan's vision of its water and financial futures be synchronized. Now is an important time to ensure that the district's vital planning processes are in alignment so that collectively, Metropolitan has a sound master plan going forward.

Water Planning Overview

Integrated Resources Plan Update: Through a scenario planning effort that looked at a range of different supply/demand futures, Metropolitan staff demonstrated the importance of contingency planning, preparing for plausible futures, and resisting assumptions based exclusively on prior experience.

The Board finished the first phase of the IRP update in March 2022 with the approval of a Needs Assessment. The assessment contained key findings related to regional storage, retail demand and demand management, imported supplies and local supply. It also established analytical tools and methods to evaluate future actions under a range of plausible assumptions. The next phase of IRP analysis has begun, which will allow Metropolitan to consider/compare the benefits of various supply options.

Drought Action/Project Portfolios: The onset of the drought emergency in the SWP dependent areas triggered an immediate effort by Metropolitan staff to begin assessing potential infrastructure improvements to improve short-, mid- and long-term reliability. The effort led to the Board in August approving a resolution “affirming a call to action and a commitment to regional reliability for all member agencies,” further stating that “the disparity in water supply reliability between member agencies is unacceptable.”

The resolution called for Metropolitan to develop a portfolio of projects and programs, in coordination with the member agencies, to address the problem of unequal access to water supply and storage assets during severe droughts. This effort is now ongoing.

Characterization of the Supply/Demand Gap:

Two planning issues have emerged during the development of the Needs Assessment and the subsequent August call to action.

The first is the potential gap between demands on Metropolitan and the available supplies going forward. The Board and staff, working together, need to consider the potential scale and spatial distribution of this gap in order develop a responsive Implementation Plan. That plan should also consider the portfolio of dependent area projects/programs slated to fulfill the August call to action.

The second is demand management. Demand management has long been successful in addressing the effects of population growth in Southern California. Now it must serve as a primary tool for the management of decreases in imported supplies as well. Focus on demand management is a necessary element of all ongoing planning processes.

Financial Planning Overview

Long-Range Financial Plan (LFRP): Metropolitan in recent years has relied on a 10-year financial forecast as its primary tool for long-range planning. The Board in conjunction with staff has committed to developing a more expansive long-range planning that provides a framework for evaluating projected costs from resource needs and their financial impact on Metropolitan. This LFRP will provide analytical tools to better evaluate investment and financing scenarios.

Rate Refinement: Metropolitan has relied upon essentially the same rate structure since 2003. Water circumstances have changed dramatically during the subsequent 20 years. Most of Metropolitan’s costs are fixed, while revenues mostly vary based on the existing flow-based rate structure. Periodically reviewing the rate structure is a standard practice to review changed conditions and consider changes to fairly allocate costs and benefits.



Local Resources Program funding supports the Fallbrook Public Utility District Groundwater Desalter.

Business Model: The 2019 Board retreat included a discussion of Metropolitan’s various roles in serving its member agencies. For some, Metropolitan is a primary wholesale water provider. For others, Metropolitan is a “backstop” provider of last resort. The emergence of the Pure Water Southern California Program represents a potential expansion of Metropolitan’s role in local supply development. Metropolitan’s business model needs to account for each role — present and future.



Pure Water SoCal demonstration facility

Aligning Financial and Water Planning

Several major investment decisions are on the horizon in the coming years. They include Pure Water Southern California, the Delta Conveyance Project, Sites Reservoir, and the Drought Action/Project portfolio. Other increasing cost pressures have emerged for the Capital Improvement Program. They include inflation and supply-chain delays, infrastructure and facility needs from desert housing to energy systems, refurbishments of aging infrastructure, pipeline replacement and cybersecurity . All these decisions will be made in consecutive phases on differing timetables. They will inform both Metropolitan’s water planning and financing needs, underscoring how water supply reliability and financial reliability must go hand in hand.

Metropolitan Master Plan 2045

Direction stemming from the retreat sets the stage for the work of the new Subcommittee on Long-Term Planning Processes and Business Modeling, which provides the Board with much-needed capacity for plan development. The resulting harmonized strategies for water and finance create an overall master plan for Metropolitan with 2045 as the horizon and with immediate action steps. The journey to alignment starts now.

Questions

How do the regional benefits of collaboration across the District best fit with and support the individual needs of a diverse set of member agencies?

Given our changing climate and current supply conditions, what role does demand management play in resilience and supply planning?

NOTES



Inspection of Casa Loma Pipeline
Seismic Upgrade Project

ABOUT METROPOLITAN

The Metropolitan Water District of Southern California is a state-established cooperative of 26 member agencies - cities, municipal water districts and one county water authority - that directly or indirectly serve 19 million people in six counties. Metropolitan imports water from the Colorado River and Northern California to supplement local supplies and helps its members develop increased water conservation, recycling, storage and other resource management programs.

The El Toro Water District expansion project extended the existing recycled distribution system and received Local Resources Project funding.

Report of the Blue Ribbon Committee

The Metropolitan Water District of
Southern California

April 12, 2011

Foreword

Dear Friends,

When the founders of the Metropolitan Water District of Southern California first met at the Huntington Hotel in Pasadena in 1928, they faced a challenging, even perilous future. Our region was testing the limits of local water supplies, but the population was growing rapidly. The Great Depression had already set in, challenging the Southland's ability to provide jobs and infrastructure for the growing population. Refusing to be deterred by such daunting challenges, the community leaders who formed the first Metropolitan Board looked boldly ahead many decades to prepare for the future of Southern California.

Today, Metropolitan and Southern California are facing similar challenges. We are experiencing the most serious economic downturn since the 1930s, continuing population growth, constraints on the imported sources that we once thought were the solution to our problems, and the uncertainties of climate change. Although some would prefer to simply debate, deny, and delay, bold vision is again summoned of us.

In September 2009, the Metropolitan Board of Directors met in retreat in Temecula and at Diamond Valley Lake to consider "MWD 2060." We considered a fascinating series of presentations that looked at the changes that we can anticipate and might be surprised by in the next 50 years. The topics included the economy, business, government, communication, agriculture, and lifestyle changes. At the end of two days of vigorous discussion, the assembled directors resolved to impanel a Blue Ribbon Committee of the best minds in academia, business, government, and public-interest organizations to explore what changes are likely to occur and how we can position Metropolitan to meet those challenges.

This report is the result of the deliberations of that Blue Ribbon Committee, a remarkable group of individuals admirably led by Robert Simonds. They have taken on the tough issues and responded thoughtfully. Their report reaffirms Metropolitan's role as the great insurance policy for our region. It recommends a renewed commitment to local resources, conservation and water efficiency, better management of water and energy resources, expanded use of economic tools, and support for new technology and new partnerships. Two themes suffuse the solutions the BRC recommends: stewardship and sustainability.

In the end, complacency is our biggest challenge and would be totally uncharacteristic of the drives that have made Southern California a global leader in so many ways. Californians are innovators and inventors by nature. Although Metropolitan has a proud record of meeting yesterday's perils, business as usual will not prepare Metropolitan and Southern California for the challenges that we are sure to face tomorrow, next year, and in coming decades. This Blue

Ribbon Committee report provides invaluable guidance to the Metropolitan Board, decisionmakers, and the broader public throughout Southern California. We hope it to be a road map for the dynamic future of our region.

Thanks to all those who have participated in peering into the future and charting a sustainable course.

Timothy F. Brick

Metropolitan Board Chair, 2006–2010

Preface

This report is the product of an independent Blue Ribbon Committee (BRC) established by the Board of Directors of Metropolitan Water District of Southern California in January 2010. The Board's purpose in establishing the BRC was to reach beyond the world of water experts (although the BRC has quite a few) and ask a diverse and broadly experienced group of regional leaders to think strategically about Metropolitan and its member agencies' future, without the constraints of current practice, rules, and laws.

The Board asked the BRC to consider trends and uncertainties over the next 50 years that could affect Metropolitan and its members in significant ways. The Board also asked the BRC to consider whether Metropolitan's present business model would be reliable, resilient, and robust under a wide range of future conditions. Finally, the Board asked the BRC to conceptualize a vision of Metropolitan's business model in 2060 that would lead to continued success in the region over these possible futures.

In explaining what the Board asked the BRC to do, it is also important to be clear about what the BRC was not asked to do and has not done. The BRC is not recommending *any* changes in programs, operations, or pricing before Metropolitan and members analyze options, consult widely, and conduct pilot tests and evaluations. The BRC also did not attempt to develop a business strategy that would be ready for near-term implementation. Nor is the BRC process or report a substitute for or alternative to Metropolitan's existing Integrated Resources Plan (IRP) process. Finally, the BRC's report is most definitely not a legislative agenda.

For more than a year, BRC members have sought to understand Metropolitan's operations and accomplishments to date and its opportunities and challenges in the future. They have done so with the single-minded goal of offering constructive comments to the leaders of Metropolitan and its member agencies to help guide the region toward a path of sustainable development and a vibrant regional economy for decades to come. In this spirit, the BRC offers the findings and recommendations in this document to Metropolitan's Board for its consideration.

The BRC welcomed public comment on its deliberations and draft documents. Comments received on later versions of the draft report were particularly constructive and informed the BRC's final stages of deliberation. We wish to thank all of the individuals who closely followed and engaged in the BRC process.

We understand that the Board will establish a review committee of members to receive, discuss, and respond to the BRC's report and recommendations. The BRC looks forward to continued engagement with the Board as it proceeds with its deliberations.

Robert Simonds

Chair, Blue Ribbon Committee, on behalf of the BRC members

Members of the Blue Ribbon Committee

Name	Current Affiliation
Robert Simonds (chair)	The Robert Simonds Company
Ruben Barrales	San Diego Regional Chamber of Commerce
Grame Barty	Australian Trade Commission
Carol Carmichael	California Institute of Technology
Yoram Cohen	University of California, Los Angeles
Mike D'Antuono	National Construction Alliance
Lucy Dunn	Orange County Business Council
Cecilia V. Estolano	Green for All
Mildred García	California State University, Dominguez Hills
Lawrence T. Geraty	La Sierra University
Gerald Gewe	Private citizen, water industry professional
John R. Hanna	Hanna and Scott; Rancho Santiago Community College District
Robert M. Hertzberg	Speaker, California State Assembly, 2000–2002; partner/vice chair, Mayer Brown LLP; co-founder/director, G24 Innovations Ltd.
John J. Lormon	Procopio, Cory, Hargreaves and Savitch
Felicia Marcus	Natural Resources Defense Council
Cynthia McClain-Hill	Strategic Counsel
Sunne McPeak	California Emerging Technology Fund

Name	Current Affiliation
Terry O'Day	Environment Now
William Patzert	California Institute of Technology National Aeronautics and Space Administration (NASA) Jet Propulsion Laboratory (JPL)
Mark Pisano	University of Southern California
Betsy Rieke	Water resources consultant
Sherry Simpson-Dean	United Nations Association, Pasadena/Foothills Chapter
Gary L. Toebben	Los Angeles Area Chamber of Commerce
Bradley H. Udall	National Oceanic and Atmospheric Administration (NOAA) Western Water Assessment Earth System Research Laboratory
Robert C. Wilkinson	University of California, Santa Barbara
Lance Williams	U.S. Green Building Council, Los Angeles Chapter
Julie Meier Wright	San Diego Regional Economic Development Corporation

Contents

Foreword	iii
Preface	v
Members of the Blue Ribbon Committee	vii
Contents	ix
Figures	xi
Tables	xiii
Executive Summary	xiv
Acknowledgments	xxix
Abbreviations	xxxi
Chapter One. Introduction	1
Chapter Two. Metropolitan's Current Business Model	7
Chapter Three. A Changing and Uncertain Future	27
Chapter Four. A Business Model for the Future	53
Chapter Five. Concluding Comments	85
Appendix A. Metropolitan's Charge to the Blue Ribbon Committee	87
Appendix B. Summary of Scenario Analysis	89
Appendix C. Report on Interviews Conducted on Behalf of the Blue Ribbon Committee	97

Figures

Figure 2.1. Map of Metropolitan’s Service Area.....	8
Figure 2.2. Relative Proportion of Water Supplies from the Colorado River Aqueduct and the State Water Project, 1980–2009.....	11
Figure 2.3. Sources of Water Supply Provided by Metropolitan to Member Agencies, 1980–2009	13
Figure 2.4. Sources of Supply and Levels of Conservation Achieved Between 1980 and 2009.....	14
Figure 2.5. Cost of Full-Service Tier 1 Treated Water, 1941–2012.....	16
Figure 2.6. Metropolitan Revenue Sources	17
Figure 2.7. Relationship Between Fixed and Variable Expenditures and Revenues	20
Figure 2.8. Historical Trends in Metropolitan’s Water Rate Stabilization Fund	21
Figure 2.9. Profile of Metropolitan’s Workforce, by Job Category	22
Figure 2.10. Profile of Metropolitan’s Workforce, by Gender and Race/Ethnicity	23
Figure 2.11. Profile of Metropolitan’s Workforce, by Age Range.....	24
Figure 3.1. Recent Historical Annual Mean Temperatures and Trend (dotted line) in California..	32
Figure 3.2. Recent Historical Annual Mean Precipitation, as a Percentage of the 55-Year Average, and Trend (dotted line) in Southern California.....	33
Figure 4.1. An Example of the Potential Benefits of Trading	70
Figure B.1: Average Year Supply and Demand and 2060 Supply Mix for the Two Scenarios.....	91

Tables

Table S.1. Summary of Metropolitan’s 2011 Business Model.....	xvi
Table S.2. Uncertain Factors That Could Affect Metropolitan’s Business Model in the Future ..	xviii
Table S.3. Vision for Metropolitan 2060.....	xxii
Table S.4. Value Proposition for Metropolitan 2060	xxiii
Table S.5. Comparison of 2011 and 2060 Metropolitan Business Models	xxiv
Table S.6. Steps to Get to 2060 Metropolitan Business Model.....	xxv
Table 2.1. Metropolitan’s Current Pricing Structure	18
Table 2.2. Summary of Metropolitan’s 2011 Business Model.....	26
Table 3.1. Definitions of Reliability, Resilience, and Robustness.....	27
Table 3.2. Local Water Supply Options for Southern California	40
Table 3.3. Uncertain Factors That Could Affect Metropolitan in the Future	47
Table 4.1. Vision for Metropolitan 2060.....	54
Table 4.2. Value Proposition for Metropolitan 2060	56
Table 4.3. Local Water Supply Options for Southern California	62
Table 4.4. Comparison of 2011 and 2060 Metropolitan Business Models.....	83
Table B.1. Two Scenarios of Future Conditions in 2060 That Metropolitan Faces	90
Table B.2. Scenario Factors and Key Results.....	93
Table B.3: Local Supply and Efficiency Assumptions Used in the Scenario Analysis	94

Executive Summary

Introduction

For more than 80 years, Metropolitan Water District of Southern California has played a foundational role in the growth and well-being of Southern California through its ability to provide reliable supplies of high-quality water to one of the most economically vibrant regions of the nation and the world. But forward-looking, successful enterprises, such as Metropolitan, must continuously reassess the assumptions underlying their business model and seek different views of their future prospects under varying scenarios, unconstrained by the particular circumstances and conflicts of the moment. In this spirit, Metropolitan's Board of Directors established the Blue Ribbon Committee (BRC) in January 2010 to look over the horizon and consider how Metropolitan might be affected over the next 50 years by potential—and significant—changes in its operating environment from natural and human factors. More specifically, Metropolitan's Board asked the BRC to “make recommendations for new business models and strategies to position Metropolitan to meet our region's water-related needs and to provide for sustainability for Southern California in the coming decades.”¹

Metropolitan's Current Business Model

Metropolitan is a public agency, established under an act of the California legislature in 1927 and incorporated in 1928. Metropolitan is now composed of 26 member agencies located in Southern California: 14 cities, 11 municipal water districts, and one county water authority. Metropolitan was established to provide its member agencies with imported water from the Colorado River that the members could not have obtained acting independently of one another. This concept was and remains Metropolitan's *value proposition* to its members: acting on its members' behalf to do what they could not do alone. For the past 20 years, its mission has been to “[p]rovide its service area with adequate and reliable supplies of high-quality water to meet present and future needs in an environmentally and economically responsible way.”²

¹ Metropolitan Board of Directors, “Ratify Membership of Blue Ribbon Committee,” letter 5G, February 9, 2010; see Appendix A. As of April 11, 2011: <http://edmsidm.mwdh2o.com/idmweb/cache/MWD%20EDMS/003705544-1.pdf>

² Metropolitan Water District of Southern California, “About MWD,” updated March 29, 2011. As of April 11, 2011: <http://www.mwdh2o.com/mwdh2o/pages/about/about01.html>

Metropolitan has implemented this value proposition and mission, providing Southern California with a reliable regional water system that has supported dramatic growth in population and the economy in the region through the importation of water, support for developing local sources of water, and water conservation. When necessary over the past 82 years, Metropolitan has adjusted its business model and operations to respond to and anticipate increasing demand for water from a growing population and economy, changes in the availability of water, and regulatory constraints on withdrawals from the Delta and Colorado River to conserve and protect ecological resources—and, in the process, ensure long-term reliability of water supplies. Metropolitan has invested in new sources of water and storage facilities and coped with major droughts. In the face of all of these changes, Metropolitan has reliably delivered water to the region.

The main document goes into each element of Metropolitan's current business model. Table S.1 summarizes key elements of this model, which include Metropolitan's value proposition and how it responds to customer demand, provides a diversified water portfolio and makes investments, and provides water services. The key elements also include how Metropolitan finances itself and prices its products and services and the manner in which it governs itself.

Table S.1. Summary of Metropolitan's 2011 Business Model

Business Model Component	Metropolitan 2011
Value proposition	• Exploit economies of scale for import infrastructure • Enable members to take actions they could not take individually • Advocate on behalf of member agencies
Customer demand	• Develop new imported supplies^a to meet growing demand • Moderate demand through conservation programs and subsidies to members
Diversified water portfolio and investments	• Provide imported water from CRA and SWP to supply about 50 percent of the region's supplies • Purchase supplemental supplies from agricultural users • Provide 1.5 MAF of regional surface storage • Subsidize local supply projects through the LRP
Provider of water services	• Lead regional integrated resource planning process • Conduct communication and education programs on water conservation
Finances and pricing	• Receive 80 percent of revenues from water sales and 20 percent from fixed charges and property taxes • Utilize average-cost pricing with limited two-tiered tariff and unbundling • Subsidize conservation and some local production
Governance and operations	• Govern with a 37-member Board of Directors • Operate as a cooperative among member agencies
Leadership in technology and workforce development	Not an explicit element
NOTE: CRA = Colorado River Aqueduct. SWP = State Water Project. MAF = million acre-feet. LRP = Local Resources Program. ^a <i>Imported supplies</i> refers to water resources originating from outside Metropolitan's service area, including, for example, water from Northern California, the Colorado River, and transfers from agricultural users.	

Confronting a Changing and Uncertain Future

Although the business model summarized in the previous section has enabled Metropolitan to remain a reliable provider of services to its members for more than 80 years,

change and variability over the next 50 years will substantially affect Metropolitan's ability to continue to do so. However, the magnitude of many of the changes and their effects are unknown; no sound scientific basis exists for determining the actual probability of most of these changes. As an alternative to guessing about these probabilities, the BRC took the perspective of approximating the risks inherent within a plausible range of these changes and uncertainties, and then considering what the impact on Metropolitan might be if these changes were to occur. These potential changes present both significant challenges and opportunities for Metropolitan and its member agencies. Table S.2 summarizes those changes relative to the main business model elements in Table S.1 and projects the likely direction of change and impact on Metropolitan's business model.

Table S.2. Uncertain Factors That Could Affect Metropolitan's Business Model in the Future

Factor Affecting Element of Business Model	Likely Direction of Trend	Potential Impact on Metropolitan and Its Members
Customer demand		
Population and demographic changes	Increasing population; increasing concentration in inland regions	Increased demand unless moderated by price signals and other conservation measures
Economic development and shifts in industrial and agricultural activities	Increasing nonagricultural economic activity; declining agriculture	Changes in supply and demand among users
Future water-use rates and attitudes toward water	Increasing water-use efficiency; public knowledge about water insufficient to meet challenges ahead	Decreased demand per capita
Water-supply portfolio and investments in infrastructure		
Regional climatic conditions	Hotter; more variable precipitation; possible declines in precipitation; decrease in snowpack	Increased demand; decreased supplies; increased flooding risks
Availability and reliability of imported water	Decreasing or highly variable supplies	Decreased supplies
Investments in Delta restoration and conveyance	Uncertain relative to alternatives	Increased cost of SWP supplies affecting future investment choices of Metropolitan and member agencies
Opportunities for local supply development	Increasing, depending on costs relative to imports	Increased regional supplies
Natural disasters and terrorism	Increasing risks	Increased likelihood of longer supply disruptions
Finances and pricing		
Fiscal condition of the public sector	Declining capacity to raise capital	Declining member interest or capability to invest in existing and new infrastructure
Infrastructure maintenance costs	Increasing	Upward pressure on prices
Energy costs	Increasing	High costs of imports and other energy-intensive local supplies
Governance and operations		
Governance, operational, and financial challenges associated with developing new local sources	Uncertain	Uncertain volume of newly developed local supplies
Member agency cohesion	Declining	More destabilizing disputes

Factor Affecting Element of Business Model	Likely Direction of Trend	Potential Impact on Metropolitan and Its Members
Members' investment priorities and capabilities	Increasing disparity among members in priorities and capabilities	Increased friction among members and between members and Metropolitan
Workforce demographics and skill mix	Wave of retirees from current workforce; increased diversity; less-skilled workforce; greater employee expectations	Difficulty attracting, recruiting, training, and hiring appropriately trained workforce

The cumulative impact on Metropolitan of the likely direction of future trends in ~~these~~ uncertainties will present significant opportunities for progress and at the same time place considerable stress on the key elements of Metropolitan's current business model. The BRC sought to understand how Metropolitan could be affected and how the current business model will need to change to be reliable, resilient, and robust as these challenges are confronted, some of which are here now.

Three key points emerged from the BRC's consideration of trends and uncertainties:

- **Imported supplies are essential under any future scenario.** For decades to come, Southern California will continue to rely on imported water from the Delta, the Colorado River, and other sources to supplement local water supplies. These local sources are presently inadequate in the aggregate to meet the region's needs; their costs span a wide range, both lower and higher than the costs of water from the SWP. Maintaining reliable imported supplies at a level that is sufficient to meet demands above those met by local sources is essential for the region's economic well-being for the foreseeable future. Further investment by SWP water users at some level will be necessary to modify the manner in which water is diverted from the Delta to the SWP and CVP aqueducts to improve reliability of water supply. It is also anticipated that further public investment, such as bond funding, will be critical to restoration of the Delta. The CRA presents its own set of challenges of aging infrastructure and impacts from increase in use of entitlements by other Colorado River Basin states and from climate change.

But the costs of maintaining and even expanding imported supplies through transfers from agricultural users or other sources will almost certainly rise in the future. As a consequence, Metropolitan will have to increase rates to cover these higher costs. Higher rates could change the value proposition for some member agencies if they find that (1) prospective local supply options have become less costly and more reliable relative to imports than is presently the case and (2) those sources are not susceptible to the same or comparable climate, regulatory, and cost impacts or disruptions as those affecting imported supplies.

The BRC finds that reduced sale of imports from whatever cause (including conservation) undermines Metropolitan's current business model, given its dependence on such sales to cover approximately 80 percent of its costs and its diminishing ability to maintain adequate water rate stabilization reserves to mitigate rate increases.

- **Local supplies and water-use efficiency will play an increasing role in the region's supply portfolio.** The Integrated Resources Plan (IRP) indicates that local supplies will likely increase in the proportion of water used in the region. Metropolitan's current business model supports this development through its LRP, which subsidizes local supply development through payments per unit of supply. The premise of the subsidy is that local resource development by some members benefits all members through greater regional reliability and reduced demands on finite imports. This approach has been successful in jumpstarting the development of more costly local resource options, such as some recycling programs, but has not added significantly to regional supplies for the past several years.

But, as the share of local production increases by necessity, the cost of these subsidies will likely exceed the current Board-imposed cap on the cost of the program; either the cap will need to be lifted or Metropolitan will need to forgo further investments. If the costs of local supply development remain high relative to imports, the incentives provided by Metropolitan might not be sufficient to overcome the barriers that exist in developing some local resources at the scale needed to meet demand. Finally, if the costs of some types of local supply projects drop relative to imports, the need for subsidization of those types will be reduced accordingly.

The BRC finds that Metropolitan's approach to helping member agencies develop local supplies through LRP subsidies has been yielding low returns over the past several years and, in the absence of modifications, is unlikely to prove adequate to meet the region's needs over the coming decades when financial conditions, particularly investment needs for the Delta, are even more challenging.

- **There are risks and opportunity costs of planning under current trend assumptions.** In many plausible future scenarios, the share of imports in the region's portfolio from the SWP and CRA is likely to decrease. Indeed, this is a near-certainty for the CRA supplies. Under these scenarios, locally developed supplies will need to increase from their current level and transfers from agricultural water users also pursued.
- *But*, if sales of imports from the SWP and CRA decline for whatever reason and the current business model remains in place, Metropolitan's revenue base will continue to erode (if needed rate increases prove to be infeasible to implement), and possibly its membership base as well. This will make it difficult for Metropolitan to maintain its

existing infrastructure and participate in the investment in a new conveyance structure, the restoration of the Delta, as well as continue to play a leading role in developing new local sources in the region.

Looking further out to 2060, the BRC finds that a wide range of economic, demographic, climate, and other conditions could prevail in which the import-focused revenue model and existing governance structure could prove constraining and impose risks to Metropolitan's long-run financial viability.

In the future, the region will continue to rely on imported supplies from the CRA and the SWP, but, at the same time, it will need to invest in local supply development and conservation in Southern California on a much larger scale than previously achieved. The challenge going forward for Metropolitan and its members is to develop a business model, and associated governance approach, that manages risks associated with investments in both imported and local resources and infrastructure, because overinvestment in one represents potential opportunity costs for the other.

For Metropolitan to offer as compelling a value proposition to its member agencies in 2060 as it has for its first 82 years of history, it will need a business model that is reliable, resilient, and robust under a wide range of future scenarios. No one can predict the future, but Metropolitan and its members can pursue a business model designed to seize opportunities to deal successfully with whatever challenges the future might hold.

Looking Out to 2060: A Business Model for the Future

With the goal of ensuring that Metropolitan is reliable, resilient, and robust in the future, the BRC looked out 50 years to help develop a new vision for Metropolitan 2060. The main document details that vision. Table S.3 summarizes the proposed 2060 vision.

Table S.3. Vision for Metropolitan 2060

Business Model Element	Metropolitan's Vision
Diversified water portfolio	Metropolitan helps the region achieve security through diversity as • provider of imported water • partner in the stewardship of the ecosystems of its source waters to assure reliability • facilitator of local supply development, potentially as a co-investor • developer and manager of regional storage • facilitator of demand management
Provider of water services	Metropolitan serves as a developer and manager of a regional system for conveyance and storage and a regional integrator of water services (e.g., storage, wheeling, and trading) as • leader in broader integrated planning and management • operator of a regionally integrated supply system to facilitate transfers and trades of water among members • catalyst for technological innovation and deployment
Financial stability	Metropolitan relies on a self-sustaining financial and pricing model using • incentives for conservation, efficiency, and local source development • revenue model that supports regional infrastructure and local supply development • exploitation of energy resources to reduce costs and diversify the revenue base
Innovations in operations and governance	Metropolitan serves as a cooperative of member agencies managed for common benefit by implementing • new partnerships with the public and private sectors • advanced and diverse workforce for expanded roles in water management and planning • advanced and effective communication strategies for consumer education and active engagement in conservation

From this combination of regional importer, integrator, facilitator, investor, and leader will come Metropolitan's new value proposition in 2060. Members have diverse interests and varying degrees of dependence on Metropolitan's current supply. Metropolitan's challenge will be to meet the different needs of its members by delivering imported and additional water and other services that members cannot economically and reliably provide for themselves. The main document details the new value proposition. Table S.4 summarizes that proposition.

Table S.4. Value Proposition for Metropolitan 2060

Manage risks	Members can better manage risks of supply shortages and demand fluctuations because Metropolitan • provides continued access to imports • spreads costs of ensuring against disruptions in imported supplies • provides region-wide access to locally developed supplies • smoothes price fluctuations through storage
Provide services	Metropolitan, drawing on the skills and expertise not only of its own staff but also of its member agencies, provides water services more efficiently and effectively than members can provide on their own because of its • risk management tools (e.g., storing, wheeling, transfers, and trading) • expert and diverse workforce • leadership on consumer-driven communications • leadership in technological innovation
Facilitate investments in local supplies	Members who develop their local supplies benefit from Metropolitan's • greater access to capital if investors have confidence in the reliability of the revenue stream • ability to facilitate projects sized to sell into a large regional market • spreading of the risks of investments by connecting to a larger system

In thinking through how to implement the new vision and value proposition, the BRC suggested changes to the current business model shown in Table S.1. Table S.5 puts the 2011 business model elements side by side with the proposed new ones. The main document presents the arguments underlying these suggested changes. Some things stay the same, but entries in bold represent enhancements or additions in the Metropolitan 2060 model. Over the long term, the new model will strengthen the financial sustainability of Metropolitan and offer member agencies a compelling value proposition that will merit their continued participation in the cooperative.

Table S.5. Comparison of 2011 and 2060 Metropolitan Business Models

Key Business Model Elements	Metropolitan 2011	Metropolitan 2060
Customer demand	• Develop new imported supplies to meet growing demand • Moderate demand through conservation programs and subsidies to members	• Meet growing demand through co-development (with member agencies and private sector) of an increasingly diverse mix of water • Moderate demand through proactive demand-management policies, including pricing and direct investment in efficiency programs
Diversified water portfolio and investments	• Provide imported water from CRA and SWP to supply about 50 percent of the region's supplies • Purchase supplemental supplies from agricultural users • Provide 1.5 MAF of regional surface storage • Subsidize local supply projects through the LRP	• Provide imported water from the CRA and the SWP • Make additional purchases of imported water • Increase region's local supplies by more than 50 percent • Increase Metropolitan investment in some local production • Increase regional groundwater and small-scale surface storage • Exploit energy resources through partnership or other means for cost savings and diversification of revenue
Provider of water services	• Lead IRP process • Communicate with public • Develop workforce to meet projected needs	• Lead IRP process • Increase communications with public and other audiences • Develop advanced workforce to meet needs of new model • Provide interregional storage and conveyance infrastructure • Facilitate transfers and trades • Co-finance conservation and local production
Finances and pricing	• Generate 80 percent of revenues from water sales, 20 percent from fixed charges and property tax • Employ average-cost pricing • Apply limited two-tiered tariff • Offer limited unbundling • Subsidize conservation and some local production	• Better align revenues with fixed and variable costs • Make revenue less dependent on sales of imports • Set prices to incentivize conservation and local production • Generate revenues from transfers, trading, and investments in local production

Key Business Model Elements	Metropolitan 2011	Metropolitan 2060
Governance and operations	Operate as a cooperative among member agencies	- Operate as a cooperative among member agencies Enter into partnerships with small groups of members and other regional organizations Lead in creating a new workforce for 21st century Lead proactive consumer-oriented communications to support conservation and efficiency
Leadership in technology and workforce development	<i>Not an explicit part of the 2011 business model</i>	Increase visibility and catalytic role in technology development for improved efficiency and other purposes Lead regional efforts to develop, train, and retain a highly-skilled and flexible workforce that reflects the region's diversity

Implementing the bolded changes to the business model will require making changes over the coming years in those areas of Metropolitan's business model. Table S.6 captures the steps in each area of the business plan the BRC identified to help get Metropolitan to the 2060 business model. The main document provides the underlying rationale for the recommended steps.

Table S.6. Steps to Get to 2060 Metropolitan Business Model

Key Business Model Elements	Next Steps	Page Where Discussion Begins in Chapter Four
Customer demand <i>Helping customers become wise water users</i>	- Evaluate selected demand-management programs in the United States and abroad to assess efficacy for testing and possible deployment - Develop and implement proactive communication strategies among members and the public to improve their understanding of the value of water and new actions to manage demand - Expand public education through investment in long-term campaigns targeting youth over the span of a generation to increase knowledge and support workforce development	56

Key Business Model Elements	Next Steps	Page Where Discussion Begins in Chapter Four
Diversified water portfolio and investments <i>Security through diversity</i>	• Endorse Metropolitan’s continued lead role in development of the Bay Delta Conservation Plan and related processes • Support California’s efforts to work collaboratively with others to use its full share of water from the Colorado River at the least cost • Evaluate the LRP and consider its benefits and costs relative to alternative approaches for encouraging regional investments in local supplies; support the direction of the IRP in encouraging partnerships to increase local supply development • Consider co-development of unsubsidized pilot projects demonstrating the viability of medium-scale local supply development • Accelerate assessments of costs and benefits of expanding small, distributed surface storage and expanded groundwater storage in the region • Invest in new out-of-basin agricultural water sources and water from conservation investments • Develop strategy for exploiting Metropolitan’s energy resources in the form of partnerships and funding opportunities for energy efficiency, energy reliability, and greenhouse-gas emission reductions	60
Provider of integrated water services <i>A “grid” for water</i>	• Identify potential major elements of a more-regionally connected system—including a review of previous studies of groundwater storage-system potential—and identify gaps in regional conveyance and storage capacity • Expand planning partners to include wastewater, flood control, and other agencies • Build capabilities to analyze the economics of integrated water-resource planning and management for the region • Evaluate the potential benefits, costs, and constraints for water trading among members, including the implementation of several pilot projects	68

Key Business Model Elements	Next Steps	Page Where Discussion Begins in Chapter Four
Finances and pricing <i>Conserve and sustain</i>	• Develop an adaptive long-range financial plan as a complement to the IRP • Initiate a process to review the current pricing structure in comparison to potential alternatives, evaluating the sustainability of the various options under a range of scenarios • Review all major cost components and apply value-engineering principles to the process of identifying opportunities for cost savings	73
Governance and operations	• Initiate an external review of governance structure • Begin a process to considering changes to the existing vision and mission statements	77
Leadership in technology and workforce development <i>Catalyst for innovation</i>	• Brand Metropolitan as a global leader on efficient and innovative water management and technologies • Consider different types of opportunities for taking a lead role in fostering a water service and technology innovative region • Begin a strategic planning process to assess needs and actions to shape a workforce that meets the needs of new business model, including new training and development programs to increase qualified personnel to meet workforce needs and reflect the region's diversity	79

Concluding Comments

Metropolitan is positioned to play a pivotal role in Southern California for decades to come. However, the present business model will not offer financial stability or enough reliability, resilience, and robustness against the range of futures that the region, Metropolitan, and its members could face in the decades ahead.

In all but the most optimistic scenarios of future economic, regulatory, demographic, and climate conditions, Metropolitan will need to work aggressively with member agencies to accelerate development of cost-effective and risk-minimizing local supplies, manage demand through conservation and efficiency gains, and minimize the impact of variable or declining imports on its revenue stream. Minor adjustments to the current business model may not yield sufficient change in long-term financial stability and member cohesion to weather the changes that are already under way, as well as cope adequately with large-scale and unanticipated disruptions.

Metropolitan will need to take concrete actions in the near future to prepare for longer-term changes so it can remain financially sustainable and valuable to its members over the long term. The next several years are the time to initiate planning of workforce and communication strategies, critical financial analyses, consultations with members and others—and then act—when neither Metropolitan nor the region is in crisis. These efforts can build on and complement the adaptive management approach embedded in the IRP process. In crises, options are not always assessed with clarity and perspective; expediency undermines strategic decisionmaking. For this reason, the BRC encourages Metropolitan’s Board to consider the suggested next steps with a sense of urgency, taking full advantage of this period of relatively favorable conditions for strategic thinking.

Metropolitan’s Board will establish a review committee of members to receive, discuss, and respond to the BRC’s report and suggestions. BRC members look forward to a continuing dialogue with the Board and leadership of member agencies as all work together toward a strong and sustainable cooperative that sets the standard of excellence and innovation in the United States and abroad.

Acknowledgments

The BRC would like to thank the Board and staff of Metropolitan for their assistance throughout the Committee's deliberations. In particular, the BRC would like to offer its gratitude to Gilbert F. Ivey, assistant general manager and chief administrative officer, and Margie Wheeler, executive strategist in the Office of the Board of Directors, for their guidance, support, and responsiveness from start to finish.

Abbreviations

AF	acre-feet
BDCP	Bay Delta Conservation Plan
BRC	Blue Ribbon Committee
CRA	Colorado River Aqueduct
CVP	Central Valley Project
DWR	Department of Water Resources
GPD	gallons per day
IID	Imperial Irrigation District
IRP	Integrated Resources Plan
LAA	Los Angeles Aqueduct
LRP	Local Resources Program
M&I	municipal and industrial water use
MAF	million acre-feet
MWh	megawatt-hour
O&M	operations and maintenance
RUWMP	Regional Urban Water Management Plan
STEM	science, technology, engineering, and mathematics
SWP	State Water Project
TAF	thousand acre-feet

Chapter One. Introduction

A reliable, resilient, and robust supply of water has always been and will always be a critical condition for a thriving economy and a sustainable environment in Southern California. More than any other institution, the Metropolitan Water District of Southern California (Metropolitan)—an organization of member water agencies throughout the region—has met the region’s water needs by doing what no individual member agency could do on its own: obtain substantial supplies of water from the Colorado River, from Northern California, and, over time, from other sources at reasonable cost and quality. Indeed, Metropolitan played a leading role in planning, financing, and building the requisite infrastructure to bring these supplies to the region.

Through its member agencies, Metropolitan now serves more than 19 million people in a region with a 2009 gross domestic product that is larger than all but 12 nations.³ By any measure, Metropolitan is a keystone institution in one of the most economically and culturally significant regions in the United States and the world. As such, Metropolitan’s continued viability as a resource to its members and the region matters to Southern California’s future as few other organizations do.

Over its distinguished 82-year history, Metropolitan has adapted to changing conditions and developed new strategies to provide reliable supplies of clean water to the region. Metropolitan has adjusted its business model and operations in response to increasing demands from a growing population and economy, to changes in the availability of water, and to regulatory constraints on withdrawals from the Colorado River and Sacramento–San Joaquin Delta. Metropolitan has also invested in new sources of water and storage facilities, coped with major droughts, and changed its revenue base from property taxes to water sales. In the face of these changes over the past 82 years, Metropolitan has reliably delivered water to the region and remained financially stable.

Preparing for an Uncertain Future

Many signs point to significant change and increasing uncertainty in the future that will have an impact on Metropolitan. The availability of water imports from the SWP and CRA might

³Appendix E to Metropolitan’s official statement dated December 16, 2010, for \$250 million in water revenue bonds, 2010 authorization, Series A (Taxable Build America Bonds).

be more constrained, costs are increasing, climatic trends appear to be diverging from long-term averages, and locally developed sources of water—including desalination, rainwater and stormwater capture and storage, and recycled water—are likely to grow in their share of the regional supply mix as technologies advance and costs decline. Also, fiscal resources for government investment and services at all levels will be strained for the foreseeable future. Metropolitan is a self-supporting enterprise that does not now depend on state or federal grants to finance projects or provide water services.⁴

Taken together, these and other factors could affect Metropolitan’s financial stability over the long term under certain scenarios. At the same time, opportunities also abound for Metropolitan and its members to shape the future through policies that will ensure that supplies meet demand, encourage conservation, stimulate investments in new technologies, spur greater efficiency in operations, and create the demand for a highly skilled and diverse workforce.

Most businesses do not need to worry about trends over the next 50 years. For example, consumer-electronics businesses can change product lines, develop a new customer base, and reposition themselves in a competitive market within months, while automobile and other manufacturing businesses can reinvent themselves within a decade or often much less. But water services are different, particularly in the arid West. The physical infrastructure of aqueducts, tunnels, and pumps capable of moving large volumes of water over hundreds of miles of rugged terrain under highly variable climatic conditions presents significant challenges and requires long lead times for planning and regulatory review. Bringing water of suitable quality to end users adds even more complexity to the challenge. And developing water sources in the region also requires the engagement and consensus of many levels of government and capital from public and private sources.

In an increasingly competitive global marketplace, economic development throughout the Southern California region depends on a near-certain assurance of long-term, reliable water supplies of sufficient quantity and quality to justify new investment in Southern California. It is critical for Metropolitan to demonstrate that it will be able to provide or enable sufficient supplies of new water to meet its member agencies’ demands and remain financially stable well into the future, not only for its own survival as an institution but also for its members and the region as a whole.

⁴ The federal government purchased the bonds that Metropolitan issued to finance the Colorado River Aqueduct (CRA), and California voters might approve a bond issue for Delta restoration, water supply reliability, statewide water system operational improvements, groundwater protection and water quality, drought relief, water recycling and water conservation, and watershed protection.

In this context, Metropolitan's Board of Directors recognized the need to closely examine the many assumptions on which Metropolitan's current business model is based and ask whether that model will be reliable, resilient, and robust enough to serve the region over a wide range of possible conditions that could arise over the next 50 years. In November 2009, the Board held a retreat called "Metropolitan 2060." More than a dozen experts described key trends and challenges in areas important to the agency, such as energy, agriculture, workforce development, population and demographic trends, environment and climate change, science and technology, and the regional economy.

Metropolitan's Charge to the Blue Ribbon Committee

To help consider how to best respond to these challenges, the Board established the Blue Ribbon Committee (BRC), which is comprised of 27 experts from the region who represent many different fields and backgrounds, including water. The Board charged the BRC to think about how to address these challenges in the long term and recommend actions that would increase Metropolitan's likelihood of success in meeting the needs of its members and the region. More specifically, the Board asked the BRC to do the following:

- Focus on the strategic trends likely to affect Metropolitan in the future and vital to the region's sustainability.
- Consider best practices in California, in the nation, and around the world for innovatively and effectively managing energy and water infrastructure, with the intent of identifying the best strategies and practices and using them to foster environmental stewardship, water reliability, and new sources of competitive advantage for Southern California.⁵
- Make recommendations for a new business model and strategies to position Metropolitan and its member agencies to meet the region's water-related needs and provide for sustainability for Southern California in coming decades.

The BRC's full mission and focus statement are provided in Appendix A. The Board asked that the BRC, in carrying out the mission, focus on six key areas: developing water options for Southern California, energy for the future, economic development and new technologies, financial sustainability, workforce, and communications.

⁵ The BRC attempted to identify best practices where they exist, for example in the area of workforce development. Looking out to 2060, the BRC made some observations and recommendations that do not include accompanying best practices for the simple reason that these best practices do not, as yet, exist.

Forward-looking and successful enterprises continuously reassess the assumptions underlying their business model and seek different views of their future prospects under varying scenarios, unconstrained by the particular circumstances of the moment. As such, the Board views the BRC's effort as separate and distinct from Metropolitan's ongoing Integrated Resources Plan (IRP) process.

How the Blue Ribbon Committee Developed Its Recommendations

The BRC met 17 times from March 2010 to April 2011 as a full group. During the summer of 2010, the BRC divided into six working groups, corresponding to the six areas identified by the Board (and noted above) as key components in Metropolitan's future. Five of the six working groups produced written reports.⁶ In addition, a separate group was formed to discuss the vision and mission of Metropolitan for 2060.

The BRC drew on diverse sources of information: data and analysis provided by Metropolitan staff; presentations by numerous experts at BRC meetings; reviews of best practices both in the United States and abroad; and the vast body of reports and academic literature on Metropolitan and the water sector more broadly.

The BRC assessed Metropolitan's current business activities and model, its governance structure and relationships with member agencies, and the economic, regulatory, and environmental conditions under which it operates. It then considered trends and uncertainties that will likely affect Metropolitan's operations, investment strategy, and relationships in the future. Given these changing and hard-to-predict future uncertainties—and the difficulty in making predictions about which are most likely to materialize—the BRC considered a range of scenarios in which Metropolitan could find itself and then assessed opportunities and risks to Metropolitan's ability to sustain itself as an organization in the absence of changes in its business and governance models.

The BRC next envisioned the type of organization Metropolitan might need to become to meet the needs for a future in which Metropolitan and its members could be significantly more involved in developing local supplies of water or conservation initiatives. The BRC then looked back from this future to make recommendations on actions that Metropolitan might consider now to prepare to thrive no matter what the future brings. This report offers the Board a

⁶ Working group reports can be found at the BRC's website under the meeting materials for October 14, 2010 (Blue Ribbon Committee, "Meeting Materials," undated web page. As of April 11, 2011: <http://www.mwdh2o.com/BlueRibbon/meeting-materials.shtml>)

framework for considering both incremental and more fundamental changes in Metropolitan's long-term strategy in the context of a new business environment.

Organization of This Report

The remainder of this report synthesizes the BRC's deliberations as a whole and within the working groups. Chapter Two describes how Metropolitan has evolved from a system builder and water-importing authority to the regional planning agency it is today, one that serves as a cooperative that ensures that members have reliable access to water at an affordable cost—goals members could not achieve individually.

Chapter Three looks forward toward 2060, examining the trends and uncertainties that present both challenges and opportunities for Metropolitan and its members. It considers the implications that these trends and uncertainties could have for key elements of Metropolitan's business model and their likely impact on operations.

Chapter Four lays out a vision for Metropolitan in 2060 and identifies some of the challenges and options organized around Metropolitan and member agencies' major decisions related to new sources of water, financing and rates, governance, and management that Metropolitan might need to take over the next decade to strengthen its ability to thrive in an uncertain future. It also offers recommendations for near-term actions the Board could take over the coming decade.

Chapter Two. Metropolitan's Current Business Model

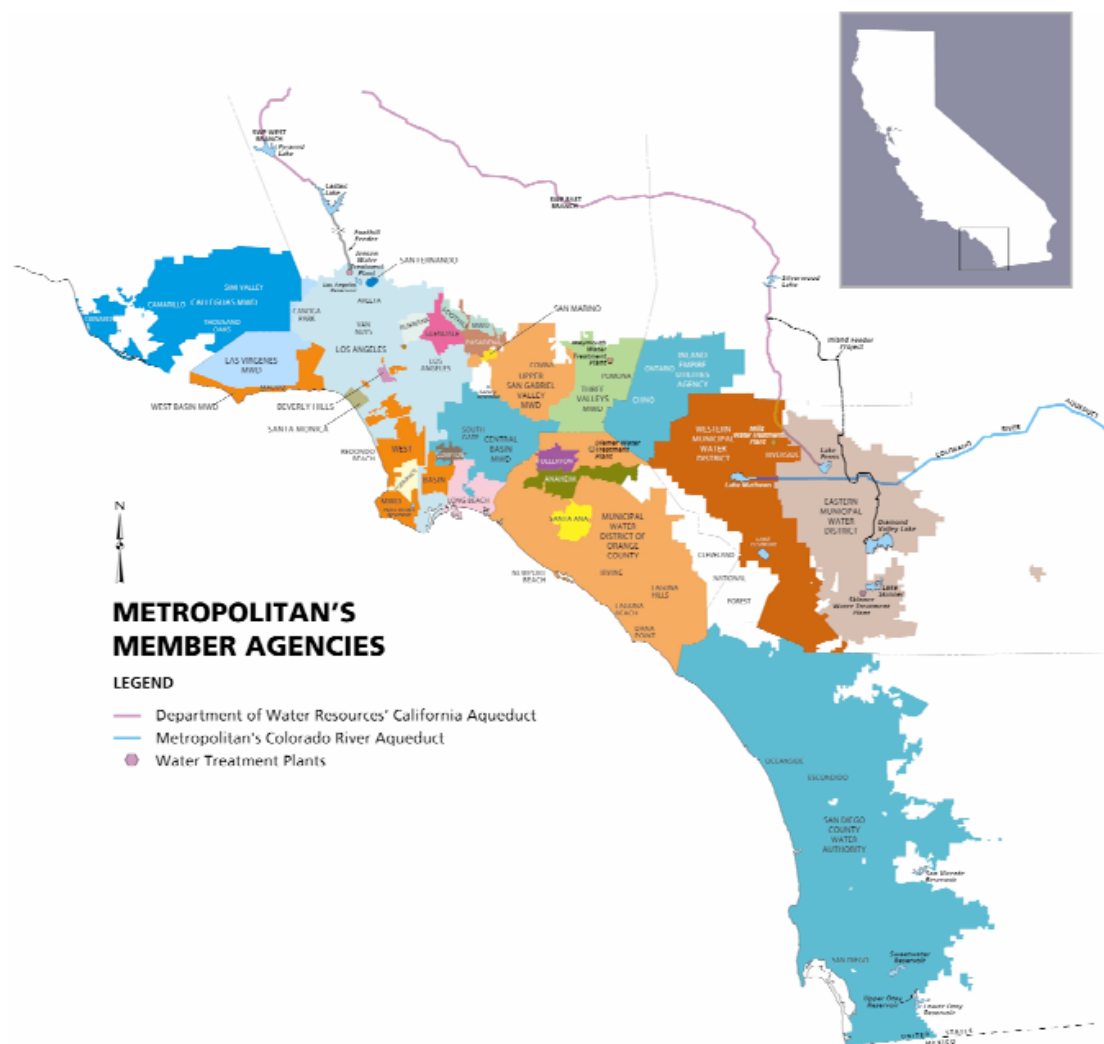
By any measure, Metropolitan has been a highly successful organization. Throughout its 82-year history, Metropolitan has adjusted its business model and operations to respond to increasing demands for water from a growing population and economy, to changes in the availability of water, and to constraints on diversions from the Colorado River and the supplies that pass through the Sacramento River and San Joaquin River Delta. Metropolitan has invested in new sources of water and storage facilities, coped with major droughts, and changed the basis of its revenue from property taxes to water sales to ensure financial stability. Moreover, in the face of all these changes, Metropolitan has maintained a high level of reliability in its deliveries of water to the region and has remained financially stable.

This chapter provides an overview of Metropolitan's current structure and the elements of its business model, including its vision and mission, value proposition, members and governance, customers, supplies and services, IRP process, finances and rate structure, infrastructure, technologies, communications, and workforce. More details on these features can be found in other publications, most recently in Metropolitan's official statement dated December 16, 2010, for \$250 million water revenue bonds, 2010 authorization, Series A (Taxable Build America Bonds) and the 2010 update to the Integrated Water Plan (IRP), dated October 12, 2010. This chapter also describes the assumptions on which Metropolitan's current business model depends.

Overview

Metropolitan is a public agency, established under an act of the California legislature in 1927 and incorporated in 1928. Metropolitan is now composed of 26 member agencies: 14 cities, 11 municipal water districts, and one county water authority located in Southern California.

Metropolitan's service area covers the southern California coastal plain (Figure 2.1), extending about 200 miles along the Pacific Ocean from the city of Oxnard on the north to the international boundary with Mexico on the south; it reaches as far as 70 miles inland from the coast and includes portions of Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura counties. The total area served is nearly 5,200 square miles.



SOURCE: Metropolitan Water District of Southern California.

Figure 2.1. Map of Metropolitan's Service Area

Metropolitan was formed to bring Colorado River water to the residents of Southern California. Today, Metropolitan imports and distributes water not only from the Colorado River through the CRA but also from Northern California through the State Water Project (SWP). It also facilitates the development of local supplies—those developed within the service area from groundwater wells, rainwater and stormwater capture, recycling, desalination, and other means. Metropolitan also develops other water resource and conservation projects throughout the state to benefit its member agencies.

Mission

In its 1927 enabling legislation, the California legislature defined Metropolitan's mission as "developing, storing and distributing water for domestic purposes."⁷ Metropolitan's Board refined and expanded this mission with its 1952 Laguna Declaration, stating that Metropolitan would "provide its service area with adequate supplies of water to meet expanding and increasing needs in the years ahead," with the aim of ensuring reliable supplies for all members. The Laguna Declaration has largely guided Metropolitan and its evolution over the past 50 years. The important core decisions about water supply have been derived from Metropolitan's mission of being a reliable supplemental water supplier for the region.

Drawing on the Laguna Declaration, the Metropolitan Board in 1992 adopted the following new mission statement: *"To provide its service area with adequate and reliable supplies of high-quality water to meet present and future needs in an environmentally and economically responsible way."*⁸ This mission statement communicates important messages about Metropolitan's business. "Provide" is the key word in the statement and implies primary responsibility for supplying water to the service area; the statement does not distinguish between imports and locally developed supplies. The terms "adequate," "reliable," and "high-quality" imply standards of performance in its water deliveries. By referencing "future needs," the mission statement implies an obligation on Metropolitan's part to plan to supply water for the long term. The mission further requires Metropolitan to meet needs in an "environmentally and economically responsible way." Metropolitan's current operations, financial structure, and planning process derive from this challenging mission, defined wholly in terms of providing water supplies. Notwithstanding the breadth and centrality of Metropolitan in its mission statement, in actual practice, Metropolitan views itself as a supplemental supplier to meet member agency demands. It has also not assumed responsibility to meet all retail demands. Its environmental responsibilities derive from its acquisition of water supplies and related structures and from the operation of its facilities.

Value Proposition

Metropolitan was originally established to provide its member agencies with imported water from the Colorado River that the members could not have obtained by acting

⁷ Metropolitan Water District, The Metropolitan Water District Act, undated annotated version. As of April 11, 2011: <http://www.mwdh2o.com/rsap/Act.pdf>

⁸ The Laguna Declaration is Section 4202 of the Metropolitan Water District Administrative Code (Metropolitan Water District, updated through March 8, 2011. As of April 11, 2011: <http://www.mwdh2o.com/rsap/adminCode.pdf>)

independently. This concept was and remains Metropolitan's value proposition to its members: acting on its members' behalf to do what they could not do alone.

Metropolitan has provided an extraordinary level of reliability and quality across its service region over the decades, under challenging conditions at times. It has maintained and continued investment in facilities and supplies, maintained a superior bond rating, engaged in a range of innovative water transfers, and pioneered local project and program investments.⁹ Metropolitan has been successful because it was able to function as a cooperative in building and operating the CRA and in promoting and financing the SWP. Through those investments, Metropolitan has been able to reliably provide water to its members at lower prices than they could have procured by themselves.

Providing this service has given Metropolitan the economic resources and stature to successfully negotiate with other government agencies to obtain the additional water that Southern California has needed to grow and to enter into its SWP contract. Metropolitan has used its excellent credit rating, status as a government agency, and revenues from water sales to obtain financing for infrastructure projects at lower prices than members would have been able to obtain on their own. Metropolitan has also provided Southern California with a degree of integrated water planning and coordination that few other regions have achieved.

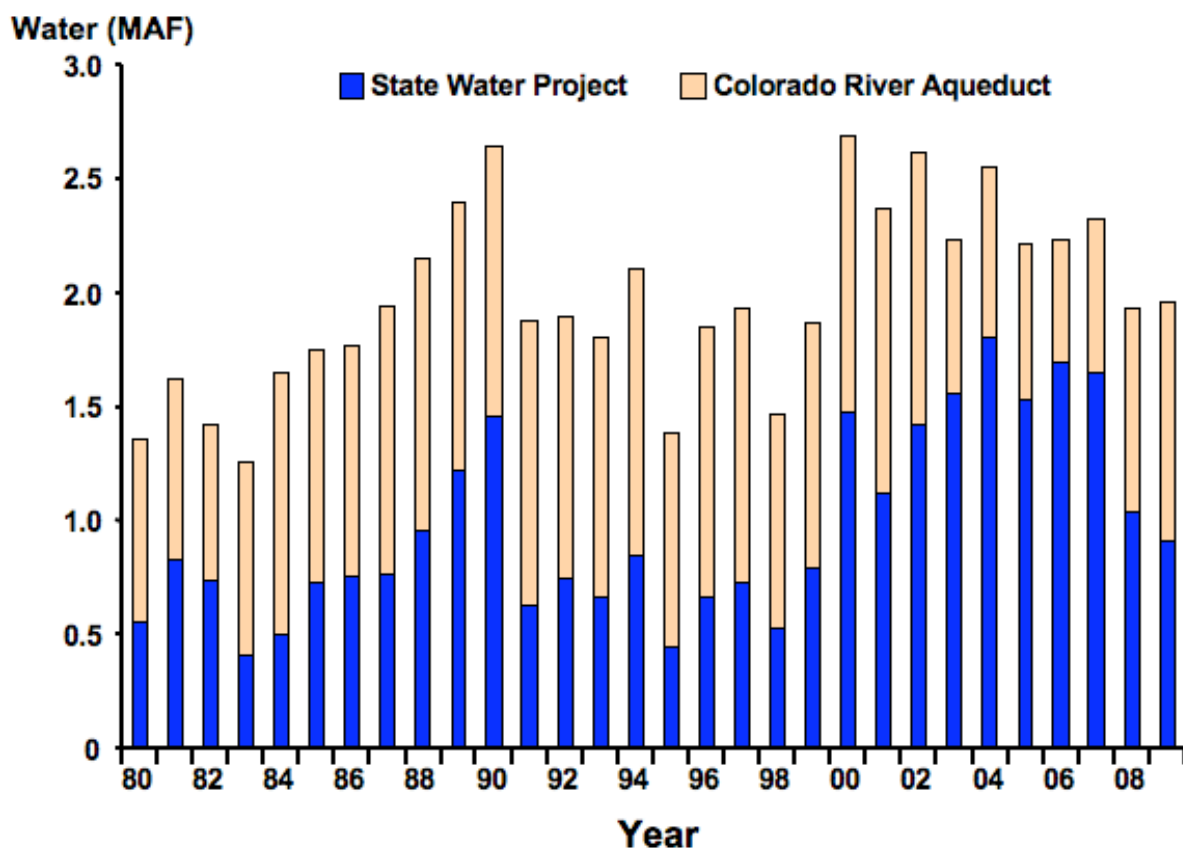
Customer Demand

Metropolitan has no retail customers. Instead, it sells treated and untreated water as a wholesaler to its member agencies, which distribute Metropolitan water, along with water from other sources, to their service areas and populations. Metropolitan's member agencies serve more than 19 million residents in 152 cities and 89 unincorporated communities—about 85 percent of the total population of Southern California. Throughout Metropolitan's service area, more than 250 retail agencies supply water to the public. Metropolitan's member agencies deliver a combination of local groundwater, local surface water, recycled water, other procured supplies, and imported water purchased from Metropolitan. For some member agencies, Metropolitan supplies all the water used in that agency's service area, while others obtain varying amounts of water from Metropolitan to supplement local supplies. In the recent past, imported water from Metropolitan has accounted for between 45 and 60 percent of the municipal, industrial, and agricultural water used within Metropolitan's service area.

⁹Metropolitan Water District of Southern California, *Integrated Resources Plan: 2010 Update*, report 1373, 2010.

Water Supply Portfolio and Investments in Infrastructure

Metropolitan's primary product is water imported through the CRA and the SWP. Figure 2.2 shows the relative contributions from those two sources since 1980. Metropolitan's delivery of water from the CRA and the SWP requires extensive regional conveyance systems. Metropolitan has also made significant investments in storage and treatment systems needed to deliver high-quality water to Southern California and distribute it where and when it is needed throughout the region. Although supplies can vary from year to year, the costs of maintaining the extensive infrastructure and servicing the debt associated with prior investments in the SWP remain fixed.



NOTE: MAF = million acre-feet.

Figure 2.2. Relative Proportion of Water Supplies from the Colorado River Aqueduct and the State Water Project, 1980–2009

On average, between 25 and 30 percent of Southern California's water supply comes from the SWP. The source of water for the SWP is diversions from the Delta, the West's largest estuary. The Delta is a complex of islands and waterways much altered by years of irrigation,

requiring ever-higher levees as the peat soil blows away and the land subsides, and much channeled to facilitate flood control, navigation, boating, and fishing.

Water from the Delta delivered through the SWP and the CVP also provides irrigation water for agriculture south of the Delta that produces a significant proportion of the fruits and vegetables grown in the United States. It provides a diverse ecosystem, including migratory routes for salmon, habitat for other aquatic as well as land species, and a critical part of the Pacific flyway. In addition, within the Delta, there are waterways for navigation and two ports.

In addition to exports from the SWP and the CVP to Southern California, some of the flows that make their way into the Delta after upstream diversion and use are committed to agricultural use within the Delta, others are diverted for use in the San Francisco Bay area, and, on average, about 50 percent flows through the Delta and out into the ocean to buffer tidal inflows of saline water and provide other environmental benefits.

Currently, the water diverted from the Delta to the SWP and the CVP flows into the Delta from the Sacramento and San Joaquin rivers and other smaller tributaries, and then through the Delta where it is diverted into the SWP and CVP aqueducts by large pumping plants at the south end of the Delta. Thus, the diversions to the south are dependent on a reliable condition in the Delta in terms of the flow of the water, the quality of the water, the capability of the existing diversion facilities to function properly, and a pathway to recovery for the fish populations in decline.¹⁰

As shown in Figure 2.3, about half the region's water demands are met through local supplies, while the other half is met with Metropolitan's imported sources. Through the Local Resources Program (LRP), Metropolitan provides incentive payments to encourage members to reduce water consumption or invest in local supplies as a way to increase overall regional water supplies and potentially reduce demands for imported water. Through 2009, Metropolitan has invested approximately \$310 million in more than 80 local water projects involving recycling and groundwater recovery. Although progress on adding new local supplies has been uneven, and indeed leveling off in the aggregate in the past several years, Metropolitan and its members have been particularly successful in achieving steady progress on conservation as shown in Figure 2.4.

¹⁰ Governor's Delta Vision Blue Ribbon Task Force, *Delta Vision: Our Vision for the California Delta*, Sacramento, Calif., 2008. As of April 11, 2011:
http://www.deltavision.ca.gov/BlueRibbonTaskForce/FinalVision/Delta_Vision_Final.pdf

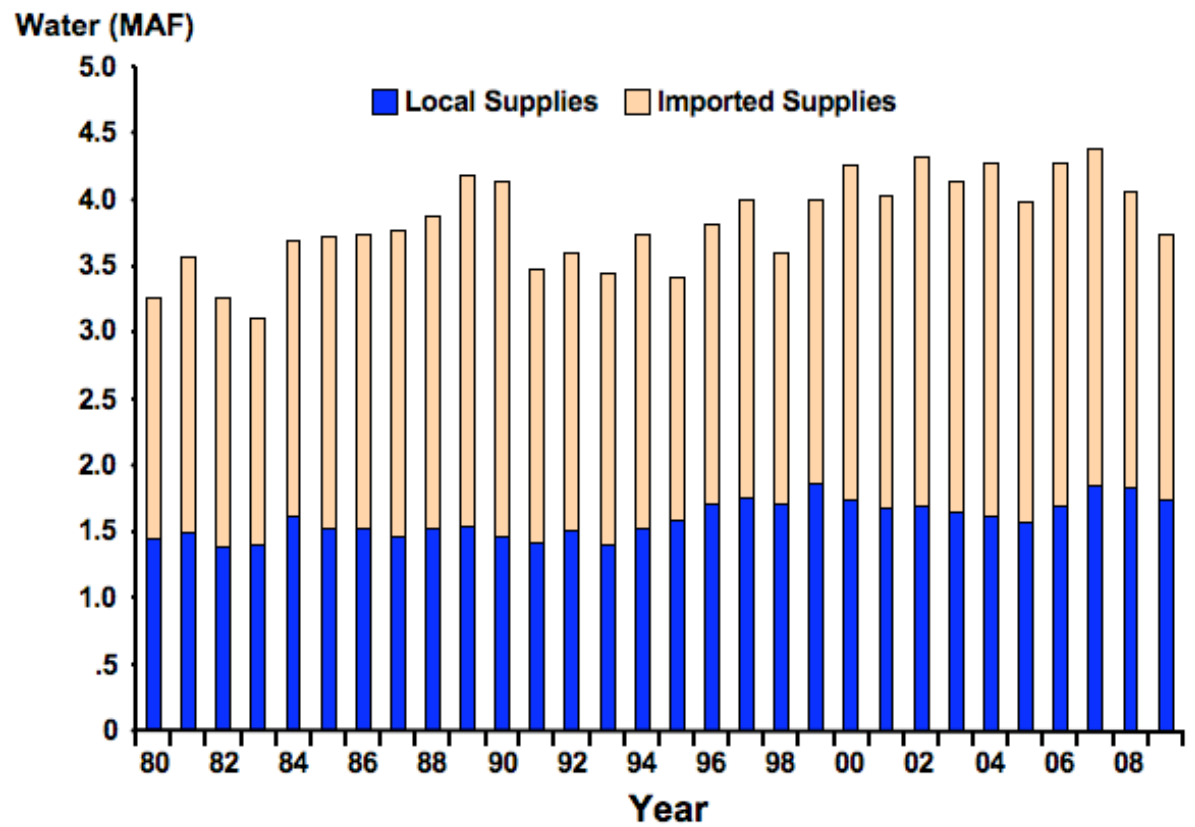
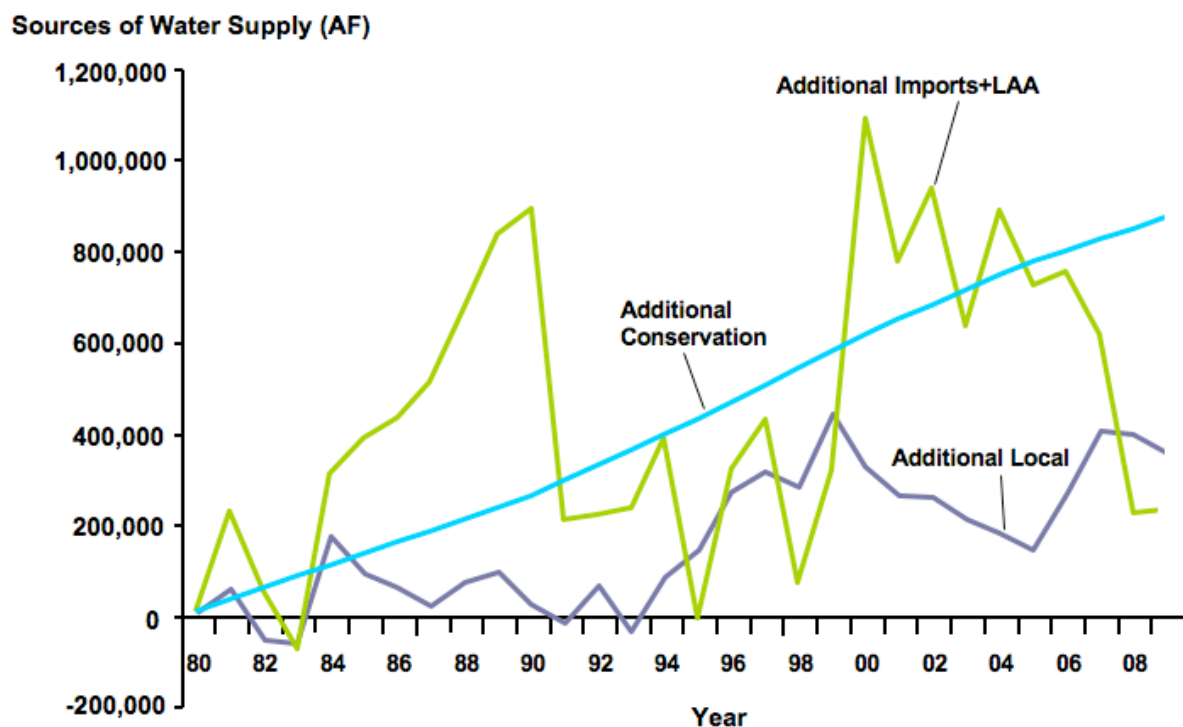


Figure 2.3. Sources of Water Supply Provided by Metropolitan to Member Agencies, 1980–2009



NOTE: AF = acre-feet. LAA = Los Angeles Aqueduct.

Figure 2.4. Sources of Supply and Levels of Conservation Achieved Between 1980 and 2009

In recent decades, Metropolitan has used water transfers from agricultural areas outside its service area to meet demands and acquired supplies by subsidizing conservation projects in agricultural districts with more senior water rights. Some farming communities in California have actively supported and participated in these strategies; others have not.

Provider of Water Services

Regional water planning is one of the most important services that Metropolitan provides to its members. In response to the droughts of the early 1990s, Metropolitan launched its initial IRP in 1996, which looked 25 years into the future. At the heart of the IRP is an assumption that Metropolitan would not develop new imported supplies but instead rely on the development of local supplies and increased conservation to accommodate growth in the region. From 1990 to 2010, this strategy has been effective as Southern California has added over 5 million new residents without an increase in imported water.

The 1996 IRP elevated conservation to a critical water supply tool for Metropolitan and called for the construction of a vast network of water storage facilities that could capture supplies

in wet years. The 2010 IRP¹¹ focuses on a water supply portfolio and adaptive management options that Metropolitan will pursue over the next 25 years to ensure a reliable supply of water. In addition, the 2010 IRP explores a buffer supply concept, portions of which would be implemented to meet unforeseen interruptions in the water supply.

The IRP sets out an adaptive management framework that acknowledges uncertainty and is intended to improve Metropolitan's capacity for integrated, region-wide planning and decisionmaking, in particular with respect to local resource development. This framework builds on Metropolitan's history in meeting regional resource needs and depends on the ability of Metropolitan and its members to finance local projects, with or without the support of Metropolitan, using traditional financial instruments and various patterns of ownership (incentivized, equity partnerships, or full ownership). The 2010 IRP includes a substantial list of local resource projects in various stages of development, representing Metropolitan's expanded role as an equity partner with member agencies on these projects.

As an example of another service, Metropolitan offers its available capacity in its conveyance facilities, a service known as *wheeling*, to member agencies to support bilateral water transfers (e.g., exchanges with the San Diego County Water Authority to facilitate its water transfer agreement with the Imperial Irrigation District [IID]).

Finances and Pricing

A full picture of Metropolitan's current financial condition can be found in the financial report accompanying the 2010 IRP.¹² In this section, we briefly discuss historical trends in water prices, pricing structure, and the Rate Stabilization Reserve Fund. The BRC was not charged with analyzing Metropolitan's current financial condition, but it did seek some level of understanding in trends in revenue and reserves derived from its current pricing model.

Historical Trends in Water Prices

Nominal and inflation-adjusted prices for full-service Tier 1 treated water are shown in Figure 2.5. After nearly ten years of stable and even slightly decreasing rates during the mid-1990s and early 2000s, rates have increased by more than 50 percent over the past four years.

¹¹ Metropolitan Water District of Southern California, *Integrated Resources Plan: 2010 Update*, report 1373, 2010.

¹² Metropolitan Water District of Southern California, *Integrated Resources Plan: 2010 Update*, report 1373, 2010.

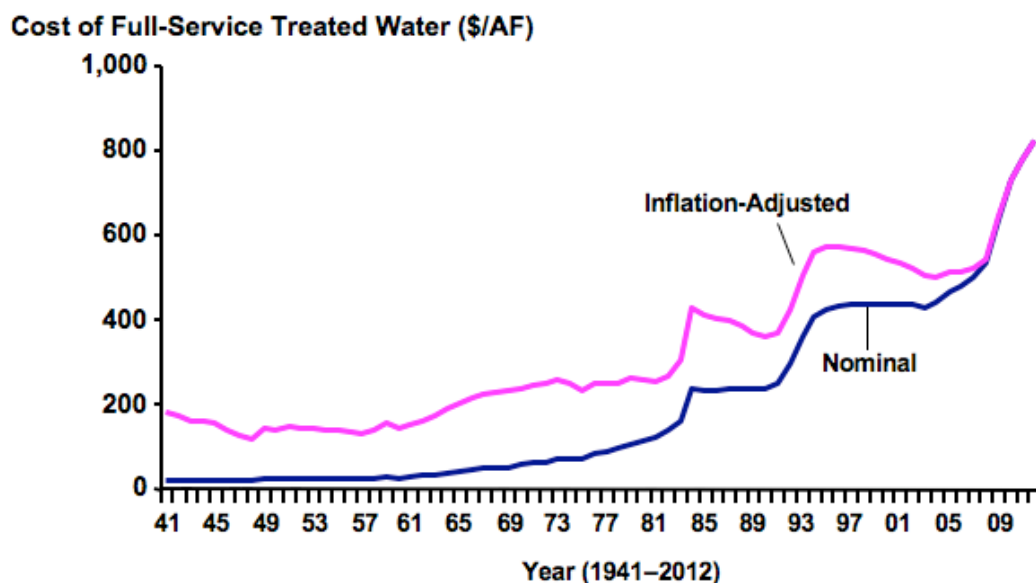


Figure 2.5. Cost of Full-Service Tier 1 Treated Water, 1941–2012

Current Revenues and Pricing Structure

Over its history, Metropolitan has followed two distinct approaches to raising revenues, as shown in the shifting of the bars over time in Figure 2.6. The state legislation enabling the creation of Metropolitan allows the district to recover costs through property taxes (the blue or bottom part of the bars). Over time, volumetric water rates (the tan or top part of the bars) have become the more important source of revenues to pay for ongoing operations, maintenance, and new capital costs, such as expanded distribution and updated water treatment. Since the early 1970s, volumetric water sales have provided most of Metropolitan's revenues.

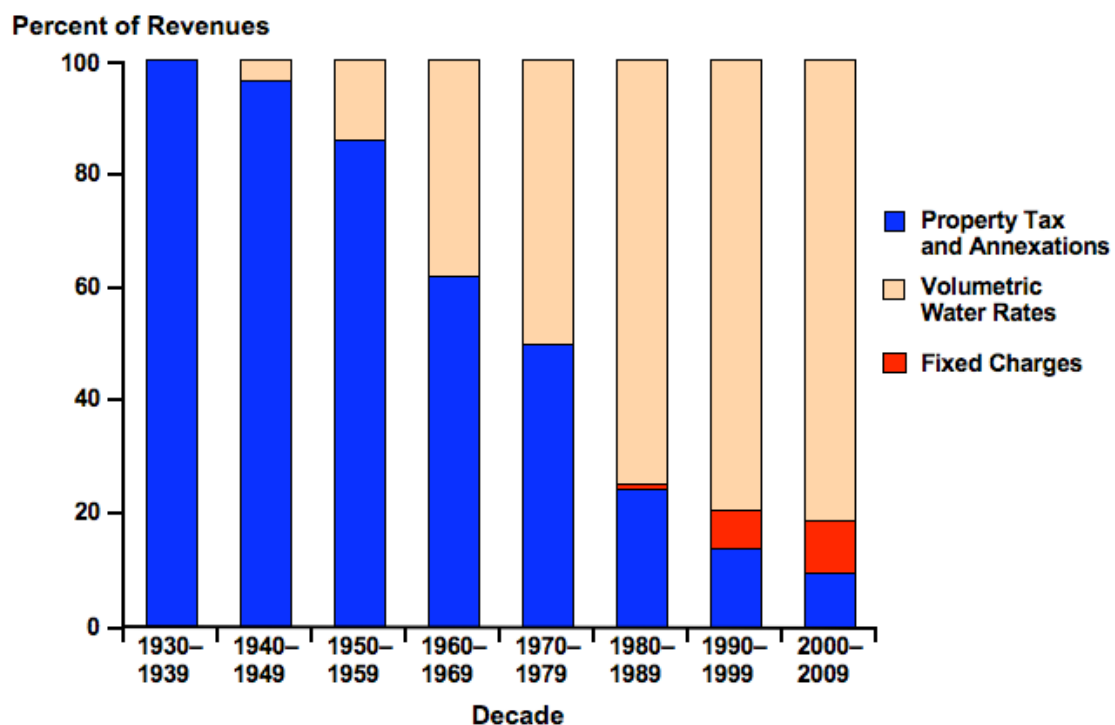


Figure 2.6. Metropolitan Revenue Sources

Almost all Metropolitan’s sales are “full service” or noninterruptible water sold for domestic and municipal uses. In years when sufficient supplies are available, Metropolitan also sells interruptible water at a discount to agricultural users and for groundwater replenishment for use during periods when supply is stressed. The cost of full-service water includes the costs of water supplies; of the conveyance and distribution system; of power to pump water through the SWP, the CRA, and the distribution system; and of Metropolitan’s conservation, water recycling, groundwater recovery and other water-management programs. Treated-water deliveries include a surcharge to cover the costs of treatment. Metropolitan also imposes a readiness-to-serve charge to cover the costs of the conveyance and distribution system that is on standby for conveyance and emergency storage service and a capacity charge to recover the cost of summertime peaking capacity within the distribution system.

In 2003, Metropolitan modified its pricing policies to unbundle the elements of the full-service rate. It implemented a rate structure with a system access rate, water stewardship rate, system power rate, and a two-tier supply rate. The Tier 1 and Tier 2 water supply rates are designed to recover Metropolitan’s water supply costs. The Tier 2 supply rate is designed to reflect Metropolitan’s costs of acquiring new supplies. Table 2.1 shows charges for Tier 1 and Tier 2 water and other charges in 2011.

Table 2.1. Metropolitan's Current Pricing Structure

Charge	Description	Tier 1 (\$/AF)	Tier 2 (\$/AF)
Tier 1 supply	Supply costs (not including costs covered by Tier 2 supply charges)	155	NA
Tier 2 supply	Reflects cost of new supplies	NA	280
System access	Partial cost recovery of building and operating the system	204	204
Water stewardship	Charge to fund member projects to foster conservation, water recycling, groundwater recovery, and other water management programs	41	41
System power	Costs of electricity used to pump water from the SWP and the Colorado River and through the distribution system	127	127
<i>Total cost of untreated water (Tier 1)</i>		527	NA
<i>Total cost of untreated water (Tier 2)</i>		NA	652
Treatment surcharge	Covers Metropolitan's water treatment costs	217	217
Total cost of treated water (Tier 1)		744	NA
Total cost of treated water (Tier 2)		NA	869

The Metropolitan Board approved this rate structure after three years of discussions among Metropolitan's staff and the staff from member agencies. Concerns about equity played an important role in shaping the outcome. The Board set the amount of water that each member agency could purchase in the Tier 1 supply rate base equal to 60 percent of the higher of (1) the member agency's highest fiscal year demand between 1989–1990 and 2001–2002, and (2) its ten-year rolling average of firm demand. Further, for each member agency executing a ten-year purchase-order commitment, the Board set a greater percentage of purchases in the lower Tier 1 equal to 90 percent of its base amount, determined as above. Over time, areas enjoying more

rapid growth were expected to pay more because of more purchases in the higher tier. Revenues from these purchases would, in turn, enable Metropolitan to secure the more expensive additional supplies. The higher second-tier supply rate was also expected to encourage investment in more expensive local projects and in conservation.

In 2010, sales of water provided 78 percent of Metropolitan's revenues. Members that had not signed a purchase order are not obligated to buy this water, although 24 of Metropolitan's 26 members have entered into such ten-year voluntary purchase orders. Ten percent of revenues came from property taxes applied to paying general-obligation bonds and SWP contract obligations; earnings from readiness-to-serve and capacity charges, interest on investments, hydroelectric power sales, and additional sources account for the rest of the revenues. In contrast, 80 percent of Metropolitan's expenditures were fixed, primarily operations and maintenance (O&M) costs and debt service, as shown in Figure 2.7.

When sales of imported Tier 1 water fall, Metropolitan's revenue declines while fixed costs remain at around 80 percent of total costs, although Metropolitan has managed to reduce its annual O&M budget by around 4 percent since 2008. Under these circumstances, Metropolitan uses the Rate Stabilization Fund to mitigate the impact on revenue and reduce the need for even higher increases in prices. As shown in Figure 2.8, the fund's balance has been declining in recent years, a consequence of the economic recession and persistent drought conditions, even as rates have increased substantially. When sales exceed planned revenue targets or the Board increases prices, as planned over the next ten years at about 5 percent annually, Metropolitan anticipates raising the fund's reserves above the minimum level prescribed by the Board. However, even steep price increases in the past several years have been insufficient to avoid continued declines in the Rate Stabilization Fund.

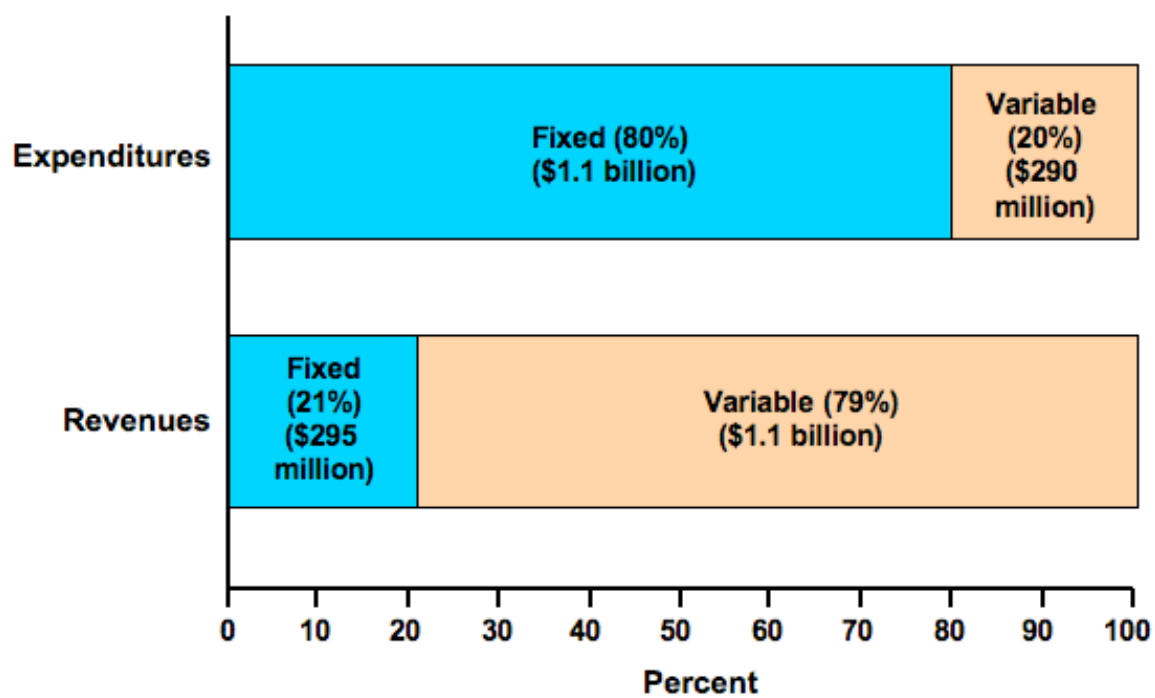


Figure 2.7. Relationship Between Fixed and Variable Expenditures and Revenues

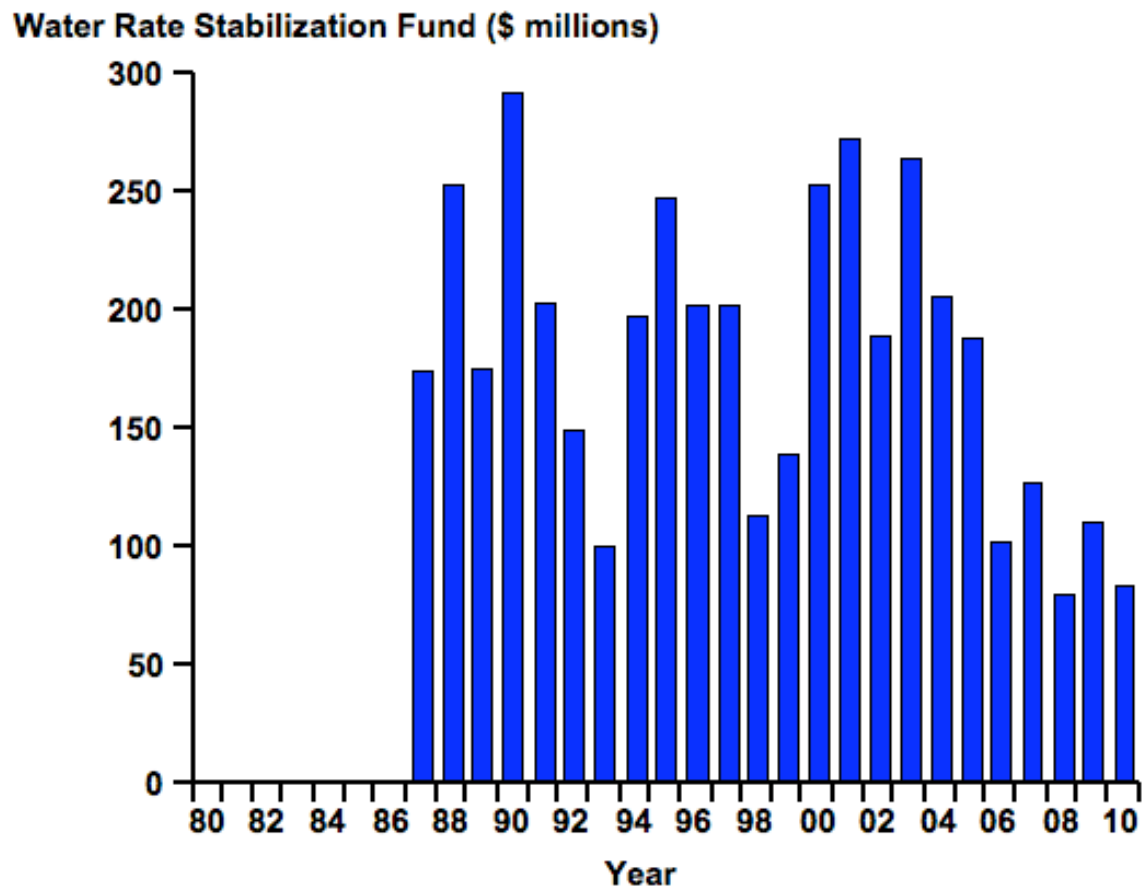


Figure 2.8. Historical Trends in Metropolitan's Water Rate Stabilization Fund

Governance and Operations

Metropolitan's governance arrangements reflect its position as the investor, owner, and operator of major infrastructure and facilities provided for the benefit of member agencies and the region as a whole. Metropolitan is governed by a 37-member Board of Directors; Board members serve without compensation. Each member agency is entitled to one director; member agencies may be entitled to additional directors based on a member agency's total assessed value of property within Metropolitan's service area. Voting by member agencies is determined by the total assessed value of property within the member agency. Day-to-day operations are directed by a general manager and other executive officers, who serve at the pleasure of the Board.

Profile of Metropolitan's Workforce

At the end of 2010, Metropolitan had around 2,000 employees who fill more than 250 specialized job functions. Metropolitan requires from its workforce a mix of traditional

engineering and operational skills to service existing infrastructure and equipment and expertise in newer analytical methods and technologies to meet increasing needs for more sophisticated planning and operations. Figure 2.9 summarizes Metropolitan's workforce of today according to broad job categories.

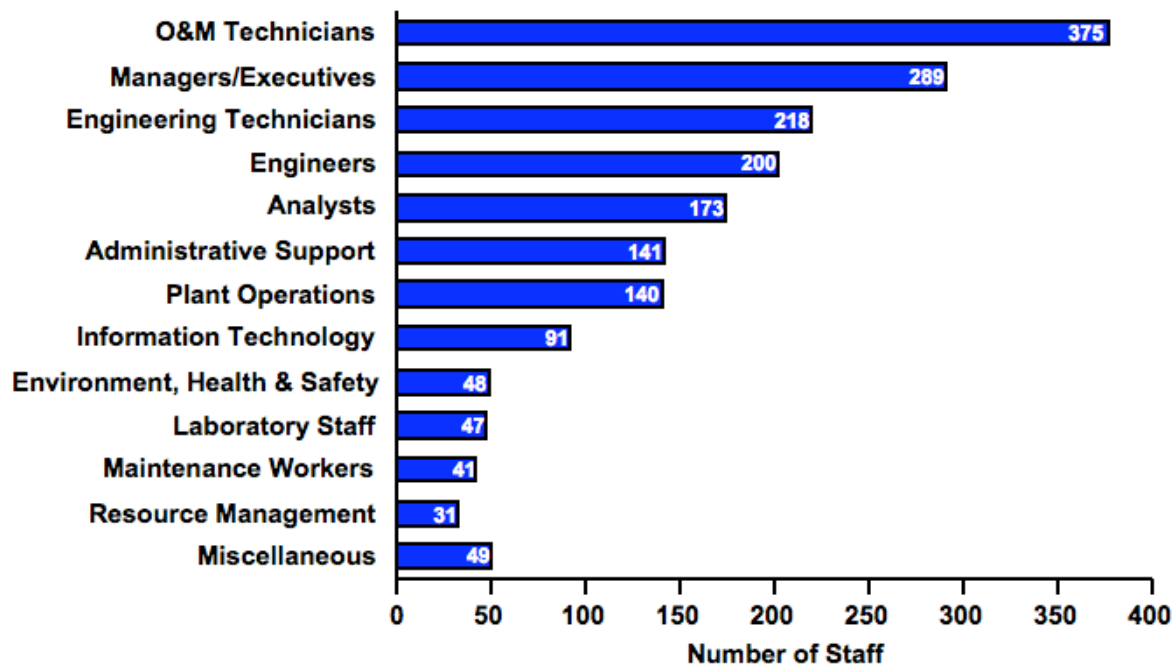


Figure 2.9. Profile of Metropolitan's Workforce, by Job Category

The demographics of Metropolitan's workforce of today by gender and race/ethnicity is summarized in Figure 2.10. Metropolitan's workforce, particularly in the higher-skilled job categories, does not fully reflect the diversity of the region. According to the most recent census data, the Hispanic population now represents the largest ethnic group (40.57 percent) in Southern California, followed by white (38.85 percent), Asian (10.19 percent), and African American (7.30 percent).¹³ Further, as shown in Figure 2.11, more than 50 percent of Metropolitan's workforce will be eligible for retirement over the next 15 years, creating a significant opportunity to reshape the workforce to meet new needs and achieve more diversity.

¹³ Southern California Association of Governments, "Census Data," undated website. As of April 8, 2011: <http://www.scag.ca.gov/census/>

Metropolitan Workforce

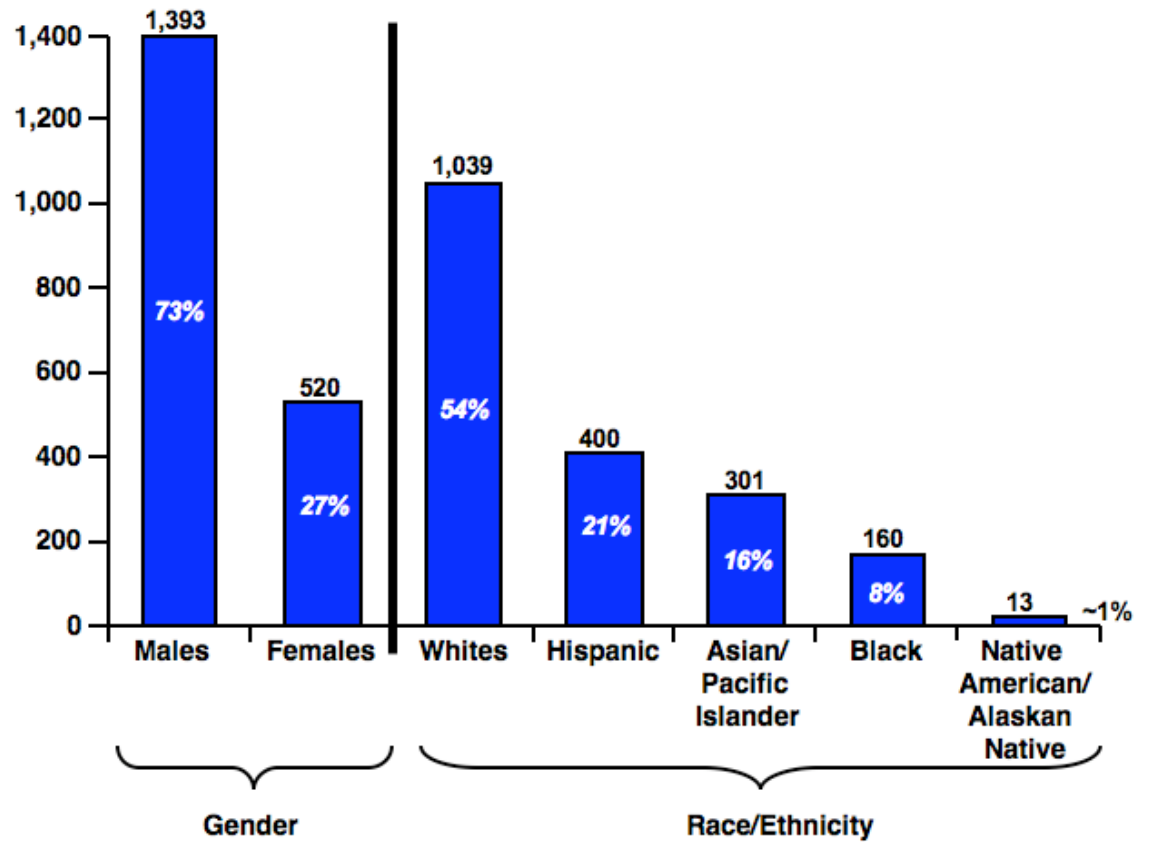


Figure 2.10. Profile of Metropolitan's Workforce, by Gender and Race/Ethnicity

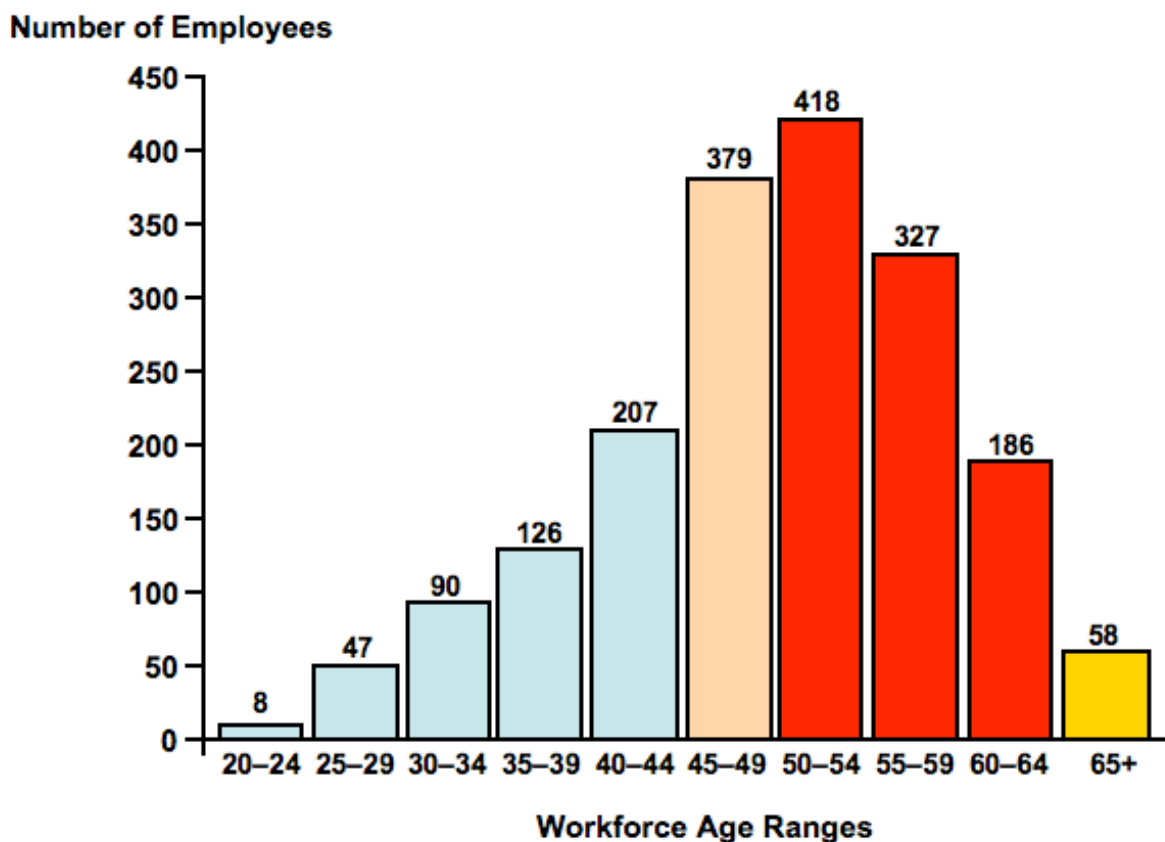


Figure 2.11. Profile of Metropolitan's Workforce, by Age Range

Communications and Outreach

Metropolitan's current communication strategy targets public-affairs specialists in its member agencies, the media, elected officials, business leaders, and stakeholders in the nonprofit sector and in other communities. The goals of this communication strategy are to highlight the need for diversified water supplies, encourage support for infrastructure investments, and ensure future reliability through conservation and local resources. Current messages include the need to fix infrastructure, conserve water and practice good water stewardship, develop local water sources, and protect the environment.

Findings

Table 2.2 summarizes key elements of Metropolitan's business model. Metropolitan's role in water planning, conservation, and local investment has provided Southern California with a level of efficiency, reliability, and diversity in its water supplies beyond those achieved by many other regions around the country. Indeed, in the view of the BRC, Metropolitan's extensive

regional operations, capital program, and IRP process are exemplary of best practices in the western United States. The absence of incentives in pricing for conservation, however, is an area in which Metropolitan lags behind other agencies in the West.

The BRC recognizes that Metropolitan, with its current portfolio of sources of water and use of financial reserves, has generally provided reliability in supplies of water to the region. However, Metropolitan's financial model depends on generating revenues that fully cover fixed and variable costs by selling CRA and SWP water to members at rates and levels of reliability that are more favorable than the costs of newly developed local sources. With steep rate increases in recent years, declines in the Rate Stabilization Reserve Fund, and reliability problems with SWP and CRA imports, the BRC finds that Metropolitan will be under increasing pressure to raise rates even higher than planned to cover its costs in challenging economic times or experience even steeper declines in its reserves.

The next chapter describes the factors and trends that the BRC believes will have a large impact on Metropolitan's operations, business model, and financial viability over the next several decades.

Table 2.2. Summary of Metropolitan's 2011 Business Model

Business Model Component	Metropolitan 2011
Value proposition	• Exploit economies of scale for import infrastructure • Enable members to take actions they could not take individually • Advocate on behalf of member agencies
Customer demand	• Develop new imported supplies to meet growing demand • Moderate demand through conservation programs and subsidies to members
Diversified water portfolio and investments	• Provide imported water from the CRA and the SWP to supply about 50 percent of the region's supplies • Purchase supplemental supplies from agricultural users • Provide 1.5 MAF of regional surface storage • Subsidize local supply projects through the LRP
Provider of water services	• Lead regional integrated resource planning (IRP) process • Conduct communication and education programs on water conservation
Finances and pricing	• Receive 80 percent of revenues from water sales and 20 percent from fixed charges and property tax • Utilize average-cost pricing with limited two-tiered tariff and unbundling • Subsidize conservation and some local production
Governance and operations	• Govern with a 37-member Board of Directors • Operate as a cooperative among member agencies
Leadership in technology and workforce development	Not an explicit element

Chapter Three. A Changing and Uncertain Future

Variability and change are constants over Metropolitan's 82-year history as it has coped with changes in the region's demography, local economy, laws, governance, and climate. As defined in Table 3.1, Metropolitan seeks to provide Southern California with a reliable regional water system that has supported dramatic growth in population and the economy in the region through the importation of water, support for developing local sources of water, and conservation. In the Southern California context, reliability includes issues of water quality. Over this time, Metropolitan has endured under difficult economic and hydrologic conditions.

Table 3.1. Definitions of Reliability, Resilience, and Robustness

Term	Definition Associated with Water Resource Management
Reliability	How much an organization provides water as expected without interruption or curtailment
Resilience	Ability of an organization to function or reconstitute its functionality under adverse conditions and provide service as expected
Robustness	Ability of an organization, executing its business model, to perform well over time under most plausible future conditions

Change and variability might be even greater over the next 50 years than during the past 82 years. However, at this time, the magnitude of many of the changes and their effects is unknown, and no sound scientific basis exists for determining the actual probability of most of these changes. As an alternative to guessing about these probabilities, the BRC took the perspective of approximating the risks inherent within a plausible range of these changes, or uncertainties, and then what the impact on Metropolitan might be if these changes were to occur. These potential changes present both significant challenges and opportunities for Metropolitan and its member agencies.

This chapter explores a broad range of short-term changes and long-term trends that could substantially affect Metropolitan's ability to become a reliable, resilient, and robust provider of services to its members. This survey draws from the efforts of the six BRC working groups referenced in Chapter One and in other sources of data noted. For each uncertainty, the BRC considered how these potential changes could affect Metropolitan's and its member agencies' operations. Metropolitan and its members will operate in a future environment determined by the cumulative effects of these many uncertain changes. This chapter considers the effect of these uncertainties on Metropolitan's current business model. The following chapter

suggests how the current business model will need to change to be more reliable, resilient, and robust when confronted with this wide range of old and new challenges.

Future Trends

Many forces will influence how Southern California and the environment for managing water will change over the coming 50 years, and some of these forces work in opposition to one another. For example, rising water demands and unplanned reduced water sales tend to lead to rising water prices, which, in turn, could moderate demand. Other forces reinforce one another, leading to significant and persistent changes. For example, investment in new local sources of supplies supports learning about new technologies with the potential to lower costs, which could, in turn, stimulate additional investment. Also, some changes are outside the control or influence of Metropolitan, while others could be shaped by the actions of Metropolitan and its member agencies.

This section describes the major forces identified and discussed by the BRC, organized around the primary elements of a business model: customer demand, Metropolitan's water supplies, and investments in infrastructure and technology. We briefly address organization and governance after discussing the other central elements of Metropolitan's business. Finally, we briefly describe the uncertainty associated with each trend and its expected effects, along with the opportunities that Metropolitan has to shape these conditions or adapt to them, and highlight potential opportunities for Metropolitan's Board.

Customer Demand

Metropolitan's customers are its member agencies, and demand for Metropolitan's water and water services is driven by the needs of these members and their customers. These customers demand water for human consumption, sanitation, fire protection, agriculture, landscaping, recreation, and industrial production. The volume of water needed to provide such services could vary in the future with new technology, changing lifestyles, and new patterns of urban development. Regional water demand will likely grow over the next 50 years as Southern California's population and economy grow, although we cannot accurately predict the rate of growth of the economy, nor can we yet predict the region's full potential to conserve based on past conditions and policies. Water-use rates—water use per household, per dollar of economic output, and per acre of cropland—will also change over time and could offset some of the growth in water use. Climatic conditions will influence the need for irrigation as well. And such factors as the fiscal stability of member agencies and the relative cost of local and imported supplies will influence member agencies' interest in obtaining water and related services from Metropolitan.

Population and Demographic Changes

Southern California's population has grown dramatically over Metropolitan's history—from 3 million in 1930 to about 20 million today.¹⁴ Demographic projections from the California Department of Finance suggest that the region's population could increase to 32 million by 2050—a 60-percent increase. As with all projections, changes in population are uncertain, but far less so than most natural phenomena, including climate change. Still, it is difficult to predict where new Southern California residents will live. For example, greater concentrations in the inland areas, trending toward single-family dwellings, could be accompanied by greater needs for water than increased concentrations in the already-developed coastal regions.

Over the long run, the availability of water can shape growth, and growth can affect demand for water. For example, Metropolitan's development of the CRA was critical in supporting the long-term expansion of Southern California's population over the mid-20th century. Today, California's urban water agencies forecast that growth in water demand will be driven primarily by projected growth in new households—projections that, in turn, are based on trends in development and constraints on land. Operating within a complex regulatory environment that may affect pursuit of some supply options, Metropolitan and member agencies plan their investments to ensure adequate reliability as the region grows. For the next 50 years, Metropolitan will have the opportunity to contribute to shaping Southern California's population growth by supporting measures to increase available water through the development of new sources and conservation and to respond to the growth in demand for water services that will occur regardless of Metropolitan's actions.

Economic Development and Shifts in Industrial and Agricultural Activities

Southern California's economy is likely to grow, but how rapidly and in what ways the economy will develop is unknown. As with population growth, this potential growth could be accompanied by increased demand for water, although some of this growth could be mitigated by shifts in industrial activities and processes and reductions in use of water by the agricultural sector. Over the past 30 years, agricultural water use in Metropolitan's service area has declined by 35 percent. By 2035, Metropolitan estimates that agricultural water use will decline by another 33 percent and account for only 4 percent of total demand. Increases in commercial and industrial demand are estimated to increase by a lesser amount than the decline in the agricultural sector.¹⁵ Predictions of economic activity 50 years out are highly speculative; a resurgence in U.S.

¹⁴Population based on year 1930 and 2000 census figures for the following counties: Imperial, Los Angeles, Orange, Riverside, San Bernardino, San Diego, Santa Barbara, and Ventura.

¹⁵Metropolitan Water District of Southern California, *Regional Urban Water Management Plan*, Los Angeles, Calif., 2010.

industrial and manufacturing activity could lead to increases in water demand by the nonresidential sector.

Future Water Use and Attitudes Toward Water

Southern California will need to make substantial financial investments in developing new sources of water if for no other reason than to increase the reliability, resilience, and robustness of the water system through diversity of resources. Increased demand could also lead to more differentiated use of water supplies of different quality over the coming decades. For example, recycled water can be used for nonpotable purposes, such as outdoor landscaping and toilet flushing. Further, shifts to more locally derived sources will likely be accompanied by increases in costs to water end users, depending on how much conservation there is in the region and advances in technologies that reduce the marginal costs of these supplies. The public will have to understand why water rates will need to increase as costs increase if Metropolitan and its member agencies are to successfully implement the policies and investments required.

However, Southern Californians' current understanding of water issues is mixed. On the one hand, there is broad recognition of water's importance to the economic vitality of the region. Further, the public has proved that it is willing to reduce water use during droughts and to participate in programs designed to reduce demand over the long term, as evidenced by the success of conservation measures during recent droughts. Cutting in the other direction, however, is the fact that, according to recent surveys, Southern Californians do not appear to fully appreciate the costs and investments necessary to provide and treat existing supplies and maintain and expand infrastructure. Although knowledge about threats to reliability and quality of future water supply is growing in many segments of the population, such knowledge is not universal.¹⁶

How attitudes will change over the next 50 years is difficult to predict, but Metropolitan and its member agencies have the opportunity to shape demand and future attitudes toward water by taking a proactive approach to demand management, communications, and outreach to consumers. In fact, they could play a significant leadership role in doing so.

¹⁶ James Pritchett, Alan Bright, Andrea Shortsleeve, Jennifer Thorvaldson, Troy Bauder, and Reagan Waskom, *Public Perceptions, Preferences, and Values for Water in the West: A Survey of Western and Colorado Residents*, Fort Collins, Colo.: Colorado Water Institute, February 2009. As of April 8, 2011: http://hdl.handle.net/10176/co:7492_ucsu6141617internet.pdf

Water Supply Portfolio and Investments in Infrastructure

Climatic conditions affect the availability, reliability, and costs of imported and most local supplies of water. Warming trends and potential changes in precipitation patterns could have significant effects on Metropolitan's supply of water. Increasing availability of some local supplies and potential declines in their costs (both in absolute terms and relative to potential increasing costs of imported supplies) are already affecting member agencies' demand for Metropolitan's imported supplies. For example, Inland Empire Utilities Agency's latest Urban Water Management Plan calls for increased recycling and groundwater replenishment to reduce its dependence on the purchase of more costly imports from Metropolitan.¹⁷ This trend is likely to accelerate in the coming decades.

Regional Climatic Conditions

Over the past century, average annual temperatures have risen in almost all regions of California and the Colorado River watershed. In California, temperatures have risen on average about 2.5 degrees Fahrenheit since 1950, as shown in Figure 3.1 which depicts the average annual temperature for California derived from measurements of weather conditions.¹⁸ The dotted line shows the trend in these data over the last 60 years. Changes in precipitation over the past 60 years have varied significantly from one year to another but have barely shown a trend, as noted by the dotted line in Figure 3.2. This figure shows the percentage of precipitation relative to average annual precipitation between 1960 and 2010. Variability in temperature and precipitation have significant impacts on Southern California water demand. For example, over the past five years, water demand has varied by between 10 and 15 percent from year to year, primarily because of variations in the weather. The economic recession that began in 2007–2008 also contributed to a downturn in demand.

¹⁷ Inland Empire Utilities Agency, *2005 Regional Urban Water Management Plan*, Chino, Calif., 2005.

¹⁸ The source of the climate data is PRISM Climate Group, "Latest PRISM Data—Feb 2011," updated May 6, 2007 [sic]. As of April 8, 2011: <http://www.prism.oregonstate.edu/>

Average Mean Temperature (F)

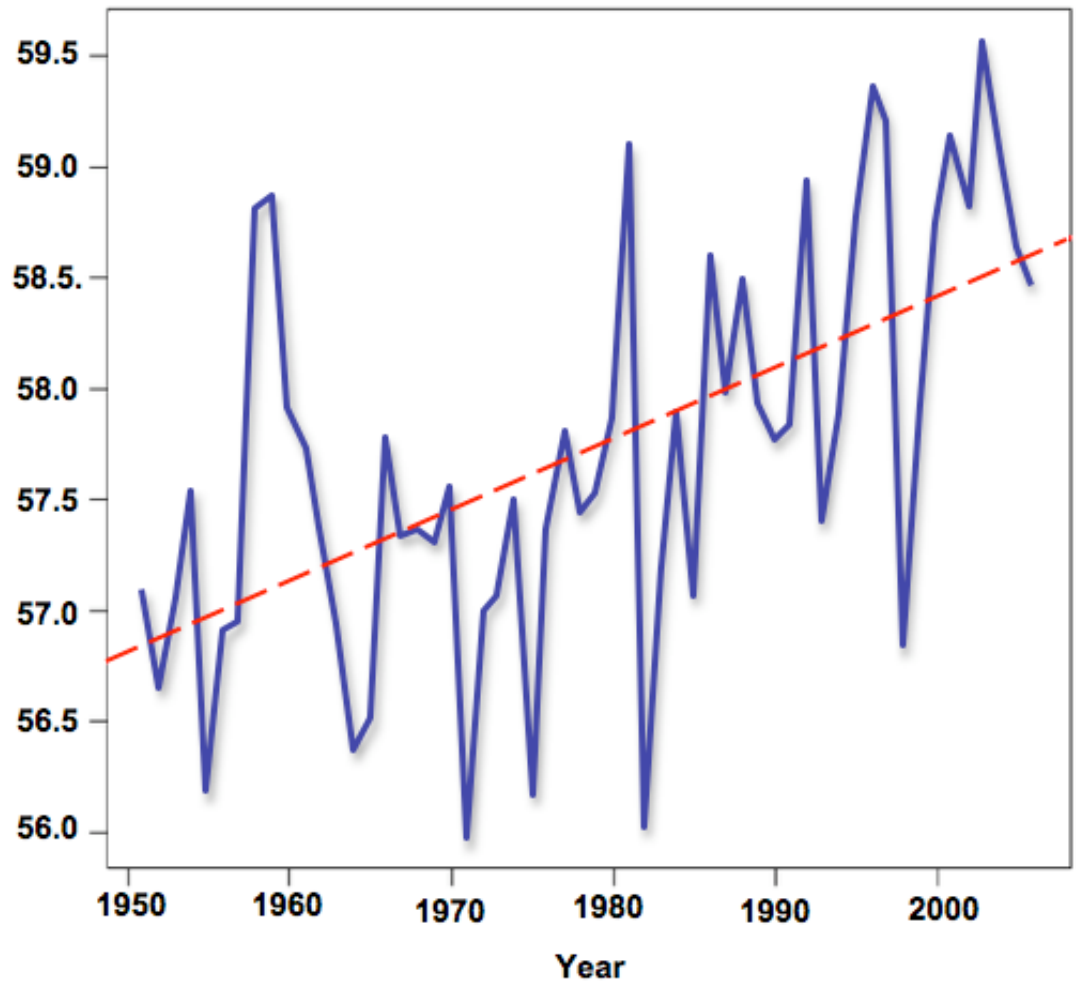


Figure 3.1. Recent Historical Annual Mean Temperatures and Trend (dotted line) in California

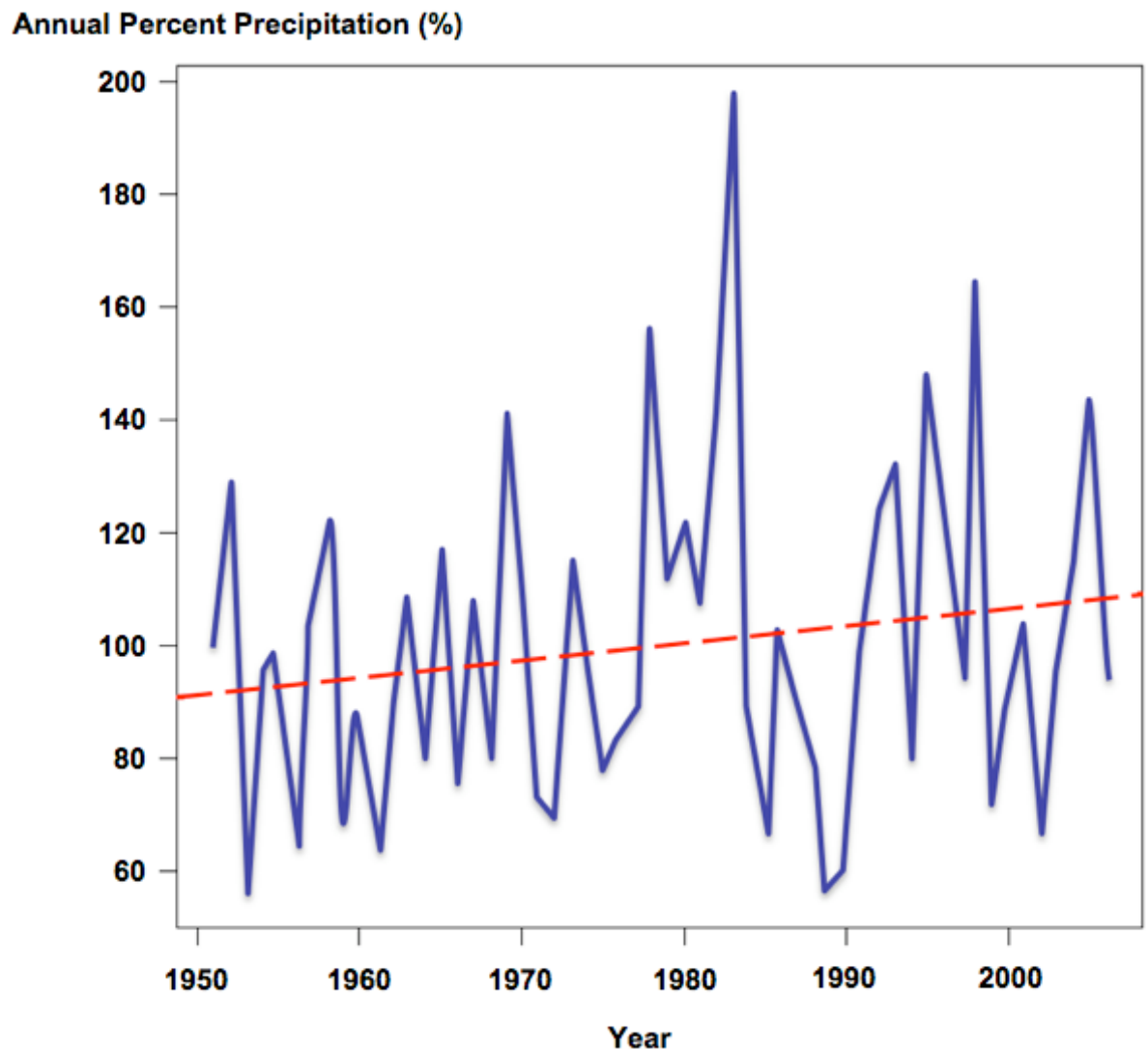


Figure 3.2. Recent Historical Annual Mean Precipitation, as a Percentage of the 55-Year Average, and Trend (dotted line) in Southern California

Climatic change can be caused by many factors; changes can be observed over years, decades, and longer. Historical and proxy records going back hundreds and, in some cases, thousands of years show that the region has experienced deep, persistent droughts far exceeding those in recent history.¹⁹ There have also been wetter periods than in the recent past.

¹⁹ Glen M. MacDonald, Konstantine V. Kremenetski, and Hugo G. Hidalgo, "Southern California and the Perfect Drought: Simultaneous Prolonged Drought in Southern California and the Sacramento and Colorado River Systems," *Quaternary International*, Vol. 188, No. 1, September 2008, pp. 11–23.

Since the 1950s, average annual global temperatures have risen.²⁰ Global greenhouse-gas concentrations in the atmosphere are certain to continue increasing as the combustion of fossil fuels increases. How global surface temperatures will respond in particular places to increases in heat-trapping gases is less certain, but the most advanced global climate models suggest that California will experience warming of several degrees Fahrenheit on an annual average basis by 2050.²¹

Climatic changes, whatever their origin, will alter the hydrologic regime on which Metropolitan's water supplies depend. Changes in the amount and timing of precipitation clearly alter runoff, groundwater recharge, and surface water availability. Rising temperatures, if they continue to persist, will change the proportion of precipitation falling as snow during the winter months and the timing of melt and river runoff.²²

As sea level continues to rise, the salinity of the tidally influenced Delta is likely to increase and could require more stringent efforts to offset the increase, such as mandates for more outflow from the Delta toward San Francisco Bay. That response would reduce the water available that could be diverted for the SWP. A rise in Delta salinity also affects the quality of Metropolitan imports from the Delta. Because Metropolitan's current practice is to blend Delta waters with higher-salinity water from the Colorado River, degraded salinity levels in imported water from the Delta in the future would adversely affect opportunities for local recycled water development and groundwater management. These changes, combined with other uncertainties, could significantly reduce the availability and reliability of Metropolitan's imports of water, as well as affect local stream and groundwater resources.

Although Metropolitan cannot affect future weather conditions, it can reduce the impact that these changes have on supplies and the demand for water in Southern California. For example, having more effective means for storing water can compensate for earlier runoff. Promoting low-water-use landscaping can reduce the proportion of water used for irrigation and lessen warming's impact on demand. In the future, Metropolitan should continue to ensure that its planning processes, including the IRP, incorporate rigorous analyses of the potential impacts of climate change.

²⁰ National Research Council, Panel on Advancing the Science of Climate Change, Board on Atmospheric Sciences and Climate, *Advancing the Science of Climate Change: America's Climate Choices*, Washington, D.C.: National Academies Press, 2010. As of April 8, 2011: http://www.nap.edu/catalog.php?record_id=12782

²¹ Edwin P. Maurer, Levi Brekke, Tom Pruitt, and Philip B. Duffy, "Fine-Resolution Climate Projections Enhance Regional Climate Change Impact Studies," *Eos, Transactions of the American Geophysical Union*, Vol. 88, No. 47, 2007, p. 504.

²² Jamie Anderson, Francis Chung, Michael Anderson, Levi Brekke, Daniel Easton, Messele Ejeta, Roy Peterson, and Richard Snyder, "Progress on Incorporating Climate Change into Management of California's Water Resources," *Climatic Change*, Vol. 87, Supp. 1, March 2008, pp. 91–108.

Availability and Reliability of Water from the Colorado River

The future availability and reliability of Metropolitan's two sources for water imports—the northern supply from the Sierra Nevada through the SWP and the original baseline supply from the CRA—are uncertain. Both these sources are already under strain, and trends in several factors suggest decreases in availability and reliability.

Under existing agreements governing operations of the CRA, Metropolitan's baseline supply from the Colorado River fills only half the aqueduct. Some current program agreements to maintain a full aqueduct through a variety of partnerships and water conservation efforts in the Coachella, Palo Verde, and Imperial Valleys could expire in the 2030s, and renewal of those agreements is uncertain. Metropolitan shares the flows of the Colorado River with six other states (Colorado, Wyoming, Utah, New Mexico, Nevada, and Arizona), Native American tribes, other California water agencies, and Mexico. The Colorado River Compact of 1922 apportioned the river between the upper basin, which includes Wyoming, Colorado, Utah, and New Mexico, where most of the flows originate, and the lower basin, which includes California, Nevada, and Arizona, where most of the use was developing. That compact was based on assumptions about the flows of the Colorado River that have proven to be too high. In addition, the Compact did not allocate any water for potential Mexican claims. As a result, we have had the persistent problem that drought and climate change are exacerbating: overallocation of the Colorado River flows.

Subsequent actions further allocated the shares of each basin among the respective states: the Upper Colorado River Compact of 1948 for the upper-basin states, and a 1963 U.S. Supreme Court decision for the lower-basin states.²³ A 1944 treaty with Mexico guaranteed a share of the river for Mexico. For many years, the overallocation problem remained relatively dormant, and California benefited by diverting water that was not used by other states. However, by the end of the 1990s, as Arizona and Nevada experienced rapid growth, each began to fully use its entitlement, and, in 2003, California was limited to its basic apportionment of 4.4 million AF annually.

To adapt to living with less water, the major water agencies in California agreed in 2003 on a water-sharing plan, which included significant agricultural-to-urban water transfers. Growth in the upper-basin states has also led to increased use of the upper-basin share of the river, although water use in those states is still well below the Compact amount. A significant drought in recent years has brought stress on the river to an historic point, exemplified by the

²³ *Arizona v. California*, 460 U.S. 605, March 9, 1964. As of April 11, 2011: <http://www.usbr.gov/lc/region/g1000/pdfiles/supctdec.pdf>

level of Lake Mead, a key storage reservoir for the lower-basin states; in the fall of 2010, Lake Mead fell to its lowest level since the reservoir was initially filled in the 1930s.²⁴

However, despite prolonged drought, the significant amount of storage on the Colorado River has provided enough supply to prevent the declaration of shortages for the river; such a declaration would reduce supplies for certain users. If such a declaration were to occur, the priority of California's entitlement protects it from any current impacts. The state's long-term supply, however, is subject to the potential reduction in availability and reliability discussed in the preceding section.

Metropolitan and the basin states have engaged in a continuous series of planning processes leading to agreements to operate the Colorado River in a way that preserves legal entitlements but provides more efficient and more flexible operations and more certainty about each user's share of the river. Those actions are a critical part of improving the reliability of the CRA supplies and of encouraging agencies to implement conservation programs to increase their water-supply reliability in a way that also includes enhancement and protection of water quality. Additionally, the basin states have partnered with the U.S. Bureau of Reclamation to fund a two-year study to evaluate options for addressing the long-term supply and demand imbalance on the Colorado River.

Investment in the Delta: Improved Water-Supply Reliability for Metropolitan and Restoration of the Delta

The Delta is in crisis. In recent years, diversions from the Delta have been severely constrained by several years of drought (below-average precipitation). In addition, the directives in the federal and California Endangered Species Acts²⁵ to protect endangered and threatened fish species have caused additional reductions in supply. Even with those constraints, populations of the protected fish are generally continuing to decline, potentially leading to more severe restrictions on diversions. In fact, the deteriorating health of the Delta ecosystem has already affected SWP deliveries to Metropolitan, with recent imports being curtailed by around 30 percent because of recent pumping restrictions issued to protect the Delta smelt and salmonid species.²⁶

The condition of the Delta is also unstable in several other ways potentially devastating to the water diversions to the SWP and the CVP. Among other issues, the 2009 SWP delivery-

²⁴ U.S. Bureau of Reclamation, "Lake Mead at Hoover Dam, Elevation (Feet)," last updated April 6, 2011. As of April 11, 2011: <http://www.usbr.gov/lc/region/g4000/hourly/mead-elv.html>

²⁵ Public Law 93-205, Endangered Species Act, December 28, 1973; California Endangered Species Act.

²⁶ Metropolitan, *Integrated Resources Plan 2010 Update*, Los Angeles, Calif., 2010.

reliability report from the California Department of Water Resources (DWR)²⁷ discusses the vulnerability of the Delta levees to earthquakes and flood. Major faults run through and in close proximity to the Delta. U.S. Geological Survey analysis of those faults leads to the conclusion that an earthquake of the magnitude 6.5 or greater has more than a 65-percent likelihood of occurring in the next 20 years. The likelihood of an earthquake of that magnitude increases with every year as additional stress is put on the faults. DWR analysis of a magnitude 6.5 earthquake indicates that it could lead to 50 levee breaks with 20 flooded islands drawing saline water further into the Delta and putting the pumping plants for SWP and CVP diversions out of commission for up to six months. Levee failures have occurred in the past due to major flood events and inadequate maintenance by local levee districts. Even without a large earthquake, the risk of levee failure remains.

Climate change contributes additional risks, including sea-level rise and more intense periods of inflow into the Delta. Sea-level rise brings higher concentrations of saline water further into the Delta, thereby decreasing the quality of the water diverted by the SWP and the CVP. The spiking of flood inflows, along with high tides, increases the risk of flooding and levee failure. Hydrologic models used by the California DWR suggest that rising temperatures and changes in precipitation patterns predicted by the leading global climate models could lead to further reductions in the availability of water for SWP deliveries, with an average decline of 10 percent by the mid-21st century and 25 percent by the end of the 21st century.²⁸

Metropolitan is playing one of the lead roles in developing a solution that separates a considerable portion of the Delta diversions for the SWP and the CVP from the vulnerabilities of the current “through-Delta-based diversion” regime, which has proved devastating to fish life. The proposed solution includes a new water-conveyance facility, under or around the Delta, diverting water from the Sacramento River south of the City of Sacramento in the northern Delta area. Some continued diversions by way of the through-Delta system are still needed to protect in-Delta water quality.

From Metropolitan’s point of view, the first priority for any new conveyance facility is greater reliability in the quantity and quality of the Delta water supplies. The increase in water supply reliability must be long term in nature, eliminating the species by species management and year-by-year issuance of the required permits from the federal and state fish agencies. That

²⁷ Department of Water Resources, State of California, *The State Water Project Delivery Reliability Report 2009*, Sacramento, Calif., August 2010. As of April 8, 2011: <http://baydeltaoffice.water.ca.gov/swpreliability/Reliability2010final101210.pdf>

²⁸ These results average over six climate models for the higher of two global emission scenarios, which appear to be more in line with current global emissions trajectories (Department of Water Resources, State of California, *The State Water Project Delivery Reliability Report 2009*, Sacramento, Calif., August 2010).

year-by-year approach has led to near-continuous litigation. The goal is a comprehensive approach to habitat protection, restoration, creation, and management to recover fish species and protect other aquatic and land species. Such an approach must comply with the many federal and state requirements and would allow for 50-year permits for withdrawals with an effective adaptive management program built into the permit terms and conditions.

Such a solution—known as the Bay Delta Conservation Plan (BDCP)—is being developed in a collaborative effort that includes state and federal resource agencies, water agencies, environmental organizations, local agencies, and other interested parties. Development of the BDCP is still a work in progress. It will be expensive. The water users, including Metropolitan, will bear full responsibility for the costs of any new or improved conveyance facilities and related improvements to mitigate environmental impacts of the facilities. Public monies will be needed for the protection, restoration, creation, and management of habitat for aquatic and land species.

The BDCP is an unprecedented plan in its geographic scope, the range of species to be protected, the planned construction of major new conveyance facilities, the extent of the investment of water user and public monies required to implement the plan, and the number of regulatory approvals that must be obtained to put the BDCP into effect and obtain the essential long-term permits. As a consequence, the BRC has been unable to evaluate the details of the planning process and the proposed solutions. However, the BRC recognizes that, under the status quo, the SWP water supply is unsustainable and that a viable long-term solution must be achieved and without delay. Chapter Four offers the BRC's recommendation to Metropolitan on next steps.

Opportunities for Local Supply Development

Another trend related to supply is the opportunity to develop local water supplies. The costs of local supplies previously thought to be economically infeasible have been declining relative to the costs of other supplies, and availability is increasing as technology improves and experience is gained. For example, the average levelized cost of desalinated seawater through reverse osmosis has declined from \$3,500 per acre-foot in 1970 to about \$1,200 per acre-foot today.²⁹ Costs and availability of water-saving devices are also becoming more favorable for adoption. It is widely expected that these trends will continue over the coming years as new technologies are developed.

Table 3.2 lists a variety of such water supply options for Southern California that the Developing New Water Options for Southern California working group explored. These options

²⁹ Greg Wetterau, principal and senior environmental engineer, CDM, "Cost Trends in Desalination," briefing to the Border Governor's Binational Desalination Conference, May 26–27, 2010. As of April 8, 2011: <http://www.watereducation.org/userfiles/GregWetterau.pdf>

are organized by the water source rather than technology, because some technologies facilitate the use of several sources. For instance, desalination can produce fresh water from both brackish groundwater and seawater, although the technology requirements differ in cost and complexity.

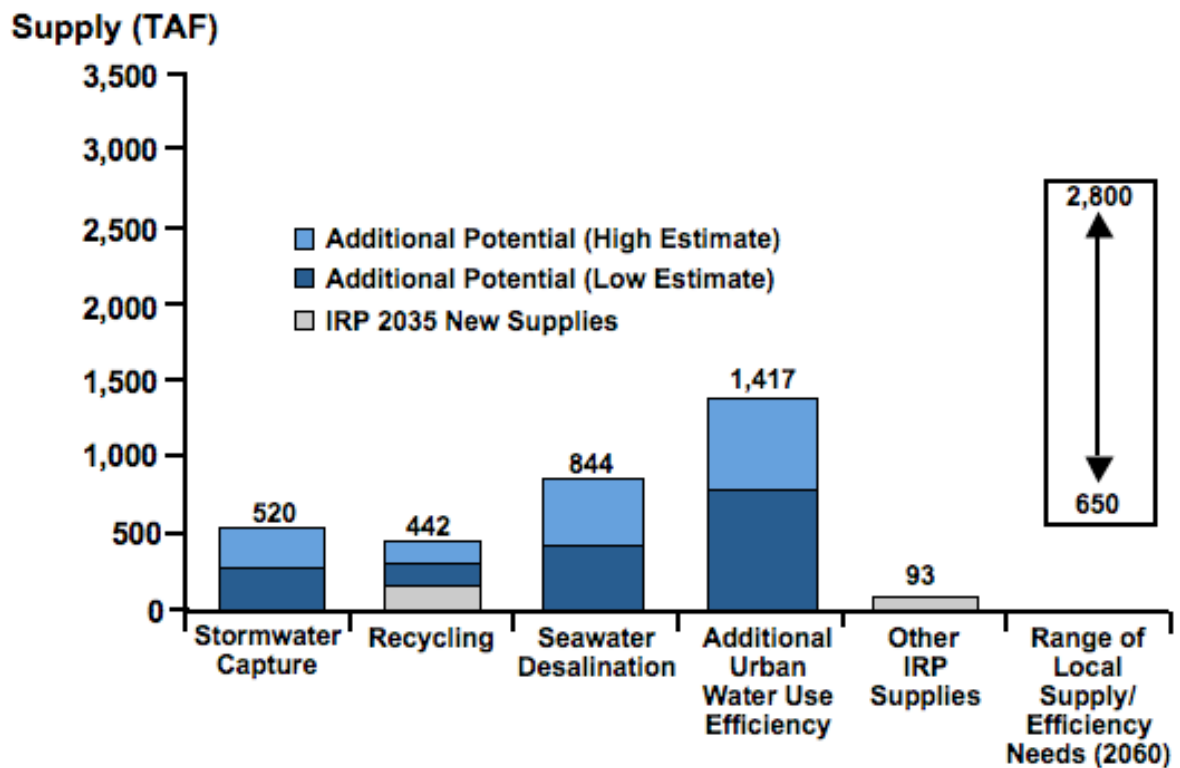
The potential options have a wide range of attributes. Some, such as efficiency, currently have low costs compared to imported water. Some, such as rainwater capture, are highly variable, with yields depending on local precipitation patterns. Other options, such as desalination of ocean water, are immune to changes in climate but face economic and other impediments to wide-scale exploitation at this time. Groundwater and conservation strategies are already in use in Southern California. Some wastewater options, such as nonpotable water and indirect potable (drinkable) water are being pursued by local agencies, while other wastewater options (e.g., so-called gray water and agricultural reuse), rainwater, and seawater have not been tapped to any great degree. Metropolitan's IRP has developed and continues to develop information about these options and evaluate their suitability for near-term development.

Table 3.2. Local Water Supply Options for Southern California

Source	Strategy	Dominant Attributes
Rainwater	Rainwater capture and use at source	Highly distributed; varying costs; not currently standardized; yield vulnerable to drought, precipitation intensity, and storage capacity
	Centralized stormwater capture, treatment, and redistribution	Potential economies of scale compared to rainwater; coordination with flood control agencies required; varying costs; yield vulnerable to drought and precipitation intensity
Groundwater	Desalination (recovery)	Cost and feasibility depend on site
	Conjunctive management	Requires significant land and facilities for groundwater spreading or injection; makes surplus local supplies available during dry periods
Wastewater	Nonpotable	Well-established; requires significant investment in distribution infrastructure; yields insensitive to drought
	Indirect potable through groundwater replenishment	Well-established; yields insensitive to drought
	Direct reuse	Social and regulatory barriers to adoption; yields insensitive to drought
Seawater	Coastal desalination	Drought-proof without supply limits; currently high cost; energy-intensive; potential environmental impacts
	Offshore desalination	Fewer environmental impacts and land-use siting challenges than coastal desalination; increased costs and technical challenges for infrastructure
Efficiency	End-use efficiency	Well-established; increasing marginal costs; reduces capacity for demand cutbacks during drought

Source	Strategy	Dominant Attributes
	Reduce system leaks and other losses (e.g., evaporation and canal seepage)	Reducing losses could affect currently receiving groundwater basins; high costs

Drawing on the scenario analysis summarized in Appendix B, Figure 3.2 indicates the potential supplies that could be added to the region's supply portfolio by 2060, including estimates for recycling and other supplies identified in the IRP, and their contribution relative to low and high estimates of demand. Increased urban water use efficiency and desalination capacity will be essential under even optimistic scenarios about future supply of imports and levels of demand in the region. The range between 650 and 2,800 TAF on the far right of Figure 3.2 corresponds to estimates of local supplies to meet projected demand under two scenarios described in Appendix B.



NOTE: TAF = thousand acre-feet.

Figure 3.2: Potential of Local Supply Options to Meet Projected Supply Needs in 2060

If local supplies were to become more cost-competitive with imported water, some member agencies might be less dependent on Metropolitan-provided water supplies and services in the future, depending on their demands and availability of local water resource development

options. However, declining relative costs of local supplies would also provide important new opportunities for Metropolitan to expand partnerships with local agencies to develop local supply as a way to ensure regional supply reliability under scenarios of rising demand and stagnant or declining imports.

Improvements in technology and local supply availability will proceed regardless of Metropolitan's actions, but the pace at which these changes occur could be accelerated through investment and partnerships by Metropolitan. How these improvements affect Metropolitan's competitiveness in providing water could be significantly influenced by Metropolitan's actions; otherwise, Metropolitan might be left behind with a shrinking customer base.

Risk of Supply Disruptions from Natural Disasters and Terrorism

Over the next 50 years, California is likely to experience at least one major seismic event. As previously noted, the state faces significant risk from earthquakes. If such an event were to happen, the Delta could be suddenly transformed. Many of the Delta islands are now below sea level because of farming of peat soils that have oxidized and subsided. A large earthquake could destabilize the levees surrounding the Delta islands, causing a surge of saltwater to fill this void from San Francisco Bay. The SWP and the Central Valley Project (CVP)—at least in their current configuration—would lose access to fresh water.

Other disruptions in Metropolitan supplies could result from earthquakes near critical conveyance facilities for the SWP or the CRA; the largest earthquakes in California's recorded history occurred along the San Andreas fault near the Edmonston Pumping Plant, which pumps SWP water nearly 2,000 feet up and over the Tehachapi Mountains. Accidental or deliberate contamination of Metropolitan's imports or the region's groundwater could also reduce supplies for many months.

These risks appear to be increasing, particularly in the Delta region. Metropolitan has hardened its regional infrastructure and has extensive emergency response plans and capabilities that can minimize its vulnerability to these increasing risks. However, until and unless Delta improvements are completed, the Delta remains vulnerable.

Finances and Pricing

Metropolitan has developed an extensive infrastructure to import, treat, store, and distribute water. It will need to continue to maintain and expand this infrastructure to ensure that its supplies remain reliable in the coming decades. The costs of some investments (such as to maintain its aqueducts and pump stations) are well understood, but other costs, such as those associated with investing in local supply development, are less well known. The costs associated

with Delta conveyance and restoration solutions are likely to be substantial but cannot be well estimated until consensus is reached on the path forward, as noted in the previous section.

Fiscal Conditions in the Public Sector

At present, the fiscal health of the state of California and many other state and local governments throughout the United States is poor and unlikely to improve any time soon.³⁰ Adding to the existing difficulty is the long-term accumulated debt of all governments that will need to be retired over the coming decades and the pressure of meeting government obligations to defined pension funds for public employees. The implication for Metropolitan and its members is that state and federal grants that are derived from general fund sources for new infrastructure and enhancements and repairs of existing facilities will be difficult to procure. Further, fiscal difficulties could add to political difficulties of further rate increases. Under these conditions, local governments might have difficulty raising capital for investments in water-related infrastructure.

Although the IRP presents a process for responding to uncertain future resource conditions, it does not specifically address the feasibility of Metropolitan and its members bringing local resources to market under conditions of financial uncertainty. This uncertainty arises partly from municipal authorities' ability to raise capital to invest in local resource projects and partly from concerns about the potential impact on their ability to service debt associated with decreased supply.³¹ The IRP also does not specifically address insufficient revenues associated with overcapacity or conservation efforts. The scale of the investments, combined with uncertainty in the financial conditions under which they would be made, raise questions about the capacity of Metropolitan's current business model and governance approach to adequately address this challenge. For example, managers of member agencies recently expressed concerns about future investment potential, noting that local projects might not "get built absent MWD [Metropolitan] investments. There is a problem of scale and cost that is not recognized. Local agencies often have difficulty building projects even if Metropolitan water per unit is more costly due to limited economies of scale at the local level, construction and performance risk, demand uncertainty, etc."³² Thus, there appears to be a disconnect between the locus of decisionmaking authority and financial capacity for investments in local resources and the regional planning

³⁰U.S. Government Accountability Office, *State and Local Governments: Fiscal Pressures Could Have Implications for Future Delivery of Intergovernmental Programs—Report to the Ranking Member, Committee on the Budget, House of Representatives*, Washington, D.C., GAO-10-899, July 2010. As of April 8, 2011: <http://www.gao.gov/new.items/d10899.pdf>

³¹See Sharlene Leurig, *The Ripple Effect: Water Risk in the Municipal Bond Market*, Boston, Mass.: Ceres, 2010. As of April 8, 2011: <http://www.ceres.org/Document.Doc?id=625>

³²Letter to BRC chair Robert Simonds dated February 16, 2011, from 21 managers of member agencies.

framework embodied in the IRP. Further, there is reason to question the efficacy of Metropolitan's pricing structure, relying as it does on sales of imports, in supporting a regional water system comprised of an increasing volume of local sources and a variety of ownership patterns.

Maintenance Costs

The need to maintain existing infrastructure will likely put upward pressure on water prices in the decades ahead. Today, Metropolitan spends approximately \$335 million in O&M costs, not including repair and rehabilitation of the infrastructure and Metropolitan's share of the costs associated with operating the SWP. O&M costs are expected to rise to almost \$544.5 million by 2020. Approximately 65 percent of these expenditures are necessary to support Metropolitan's infrastructure in Southern California, with the remaining 35 percent to be spent on Metropolitan's share of the SWP and mitigating impacts on the Delta. The plausible range of cost increases over the next 50 years is wide. Metropolitan cannot avoid incurring these significant maintenance costs but might be able to hedge against larger costs through skillful planning and aggressive use of principles of value engineering in which opportunities for cost savings are examined from multiple dimensions.

Energy Costs

Metropolitan is also likely to face higher energy costs over the next 50 years. In 2008, Metropolitan used 1.8 million megawatt-hours (MWh) for its CRA operations, and DWR used 2.6 million MWh to deliver Metropolitan's water through the SWP. The cost of the energy used for the CRA and to deliver Metropolitan's SWP water totaled \$203 million, with additional costs to support Metropolitan's retail loads for energy at facilities, such as treatment plants and headquarters. California's electricity costs are likely to continue to rise into the foreseeable future. In 2017, two favorable contracts for energy used to deliver CRA water supplies will expire and will likely be replaced with more expensive terms closer to market rates. Upward pressures on California electricity rates would also lead to rising energy costs for SWP supplies and local treatment and delivery costs, as well as local water resource projects that require pumping and treatment. Through operational changes and efficiency measures, Metropolitan could have opportunities to lower those costs.

At the same time, Metropolitan has untapped energy resources of its own in the form of gravity-driven water flows and extensive land assets, both of which could be used to generate electricity—by Metropolitan or partners, both public and private—through renewable hydropower, wind, and solar technologies. If commercially viable and cost-effective relative to alternative sources, this additional power could be used to reduce operating costs or contribute to a more diverse revenue base for Metropolitan.

Governance and Operations

Metropolitan is a cooperative whose existence depends on its members. The region has depended on the willingness and capability of its members and their customers to financially support Metropolitan's operations through property taxes and payments for water deliveries that Metropolitan provides. Changes in its individual members' financial ability to participate could significantly affect Metropolitan's viability. Diverging views of its members on how best to serve the region—for example, the role that Metropolitan plays in the development of local supplies—places and could continue to place significant stress on the organization.

Member Agency Cohesion

Throughout its history, member cohesion and cooperation have made it possible for Metropolitan to set bold agendas and accomplish remarkable engineering feats that would not have been possible if its members acted by themselves. In the dynamic and complex environment of Southern California, friction among a diverse membership is inevitable. Metropolitan's ability to provide large quantities of imported water at less cost than many local supplies has contributed to member cohesion and cooperation. The challenge for Metropolitan is to continue to provide its value proposition—helping its members accomplish through Metropolitan what they cannot do acting alone. In return, the members need to recognize the necessity of burden sharing in maintaining and expanding the infrastructure, facilities, and services on which the individual members and the region as a whole depend.

The 2010 lawsuit brought by the San Diego County Water Authority against Metropolitan³³ offers an illustration of the kind of tension that can arise in the future when member agencies perceive that Metropolitan's value proposition is becoming less attractive in light of alternative supply strategies. Given the many future challenges described in this chapter and Metropolitan's capital requirements to ensure continued reliable supplies from the SWP and the CRA along with investments in local sources, strong member agency cohesion and buy-in will be essential. Full transparency on cost allocation, subsidies, and pricing will also be integral to the sustainability of the cooperative.

Workforce Demographics and Skill Mix

Over the next 50 years, Southern California, Metropolitan, and the water industry as a whole will see a dramatic transformation in their workforce. The utility industry is facing an

³³ *San Diego County Water Authority v. Metropolitan Water District of Southern California*, Cal. Super. Case BS126888; petitioner's petition for writ of mandate, complaint for declaratory relief, and complaint for determination of invalidity filed June 11, 2010. As of April 11, 2011: <http://www.mwdh2o.com/mwdh2o/pages/legal/litigation/SDCWA-Complaint-Exhibits.pdf>

impending wave of retirements. According to a recent study by the Water Environment Research Foundation (WERF) in 2005, retiring utility workers had spent an average of 24 years at the same utility. At Metropolitan, the average tenure of an employee is nearly 19 years. Given that the average age of Metropolitan's staff has been rising, as it has with other water utilities in the United States, Metropolitan is facing the need to replace more than 50 percent of its current workforce within 15 years. Succession planning and other initiatives are under way to address this large impending turnover in the workforce, but recruiting to fill some essential jobs in the fields of environmental compliance and emergency response is already difficult.³⁴

These trends also offer opportunities for Metropolitan to reconfigure its organization for the 21st century and play a wider leadership role in the region. Metropolitan's workforce in the future will require more—highly trained science, technology, engineering, and mathematics (STEM) workers, among whom minorities have historically been underrepresented. This presents a dual challenge for Metropolitan: Not only could it have difficulty drawing a sufficient pool of talent within the region to replace retiring workers but, without intervention, it could also have difficulty achieving diversity in its future workforce.

Along with a new workforce will come a 21st-century set of expectations from new workers that could require new management approaches. Members of this workforce are likely to expect challenging work and growth opportunities, the ability to have an impact, an appropriate work–life balance, possibilities for mobile computing and telecommuting, access to information and technology, and increased diversity.

Demographic shifts in the region point toward even more economic and ethnic diversity in Southern California than seen in the later half of the 20th century. The population is shifting toward groups with historically lower levels of educational attainment at a time when the demand for more highly educated and skilled workers is increasing. Already, California ranks 18 among the nation's 20 most populous states in the share of high school graduates who go directly to college. By 2035, 30 percent of the state's population will be foreign born. Latinos are projected to become the largest ethnic group by 2020 and a majority of the state's population by 2050.

Increased competition for highly educated workers is expected with advances in such fields as biotechnology, material sciences, nanotechnologies, and other fields associated with the water industry. Over time, the forces of supply and demand in the technical workforce will balance, but near-term imbalances could coincide with the timing of changes Metropolitan will need to make as it adjusts its roles in providing water and services to its member agencies.

³⁴ Metropolitan, "Workforce for the Future," undated background paper. As of April 11, 2011: <http://www.mwdh2o.com/BlueRibbon/pdfs/Workforce-Future.pdf>

Getting in front of these challenges could help Metropolitan avoid shortfalls in staff with the necessary technical skills and experience to operate in a more complex business climate than today.

Summary of Uncertain Factors

Table 3.3 summarizes the uncertain factors described by indicating the direction of the likely trend and the potential impact that the trend could have on Metropolitan and its members.

Table 3.3. Uncertain Factors That Could Affect Metropolitan in the Future

Factor Affecting Element of Business Model	Likely Direction of Trend	Potential Impact on Metropolitan and Its Members	Page Where Discussion of Recommendations in Chapter Four Begins
Customer demand			
Population and demographic changes	Increasing population; increasing concentration in inland regions	Increased demand, unless moderated by price signals and other conservation measures	56
Economic development and shifts in industrial and agricultural activities	Increasing nonagricultural economic activity; declining agriculture	Changes in supply and demand among users	
Future water use rates and attitudes toward water	Increasing water-use efficiency; public knowledge about water insufficient to meet challenges ahead	Decreased demand per capita	
Water-supply portfolio and investments in infrastructure			
Regional climatic conditions	Hotter; more variable precipitation; possible declines in precipitation; decrease in snowpack	Increased demand; decreased supplies; increased flooding risks	60
Availability and reliability of imported water	Decreasing or highly variable supplies	Decreased supplies	
Investments in Delta restoration and conveyance	Uncertain relative to alternatives	Increased cost of SWP supplies affecting future investment choices of Metropolitan and member agencies	

Factor Affecting Element of Business Model	Likely Direction of Trend	Potential Impact on Metropolitan and Its Members	Page Where Discussion of Recommendations in Chapter Four Begins
Opportunities for local supply development	Increasing, depending on costs relative to imports	Increased regional supplies	
Natural disasters and terrorism	Increasing risks	Increased likelihood of longer supply disruptions	
Finances and pricing			
Fiscal condition of the public sector	Declining capacity to raise capital	Declining member interest or capability to invest in existing and new infrastructure	73
Infrastructure maintenance costs	Increasing	Upward pressure on prices	
Energy costs	Increasing	High costs of imports and other energy-intensive local supplies	
Governance and operations			
Governance, operational, and financial challenges associated with developing new local sources	Uncertain	Uncertain volume of newly developed local supplies	77
Member agency cohesion	Declining	More destabilizing disputes	
Members' investment priorities and capabilities	Increasing disparity among members in priorities and capabilities	Increased friction among members and between members and Metropolitan	
Workforce demographics and skill mix	Wave of retirees from current workforce; increased diversity; less skilled workforce; greater employee expectations	Difficulty attracting, recruiting, training, and hiring appropriately trained workforce	

A Case for Change

This chapter has reviewed a wide range of trends that are likely to substantially affect the environment in which Metropolitan operates. Given that the BRC's charge was to consider how Metropolitan might revise its business model to address the challenges over the next 50 years, it is useful to ask the following question: Could a sufficiently robust response to future conditions

occur within the current model, or is change required in Metropolitan's mission, strategy, or operations?

To answer this question, we summarize our key findings and consider their implications for Metropolitan's viability over the next several decades.

- **Imported supplies are essential under any future scenario.** For decades to come, Southern California will continue to rely on imported water from the Delta, the Colorado River, and other sources to supplement local water supplies. These local sources are presently inadequate in the aggregate to meet the region's needs; their costs span a wide range, both higher and lower than the cost of Tier 1 water. Maintaining reliable imported supplies at a level that is sufficient to meet demands above those met by local sources is essential for the region's economic well-being for the foreseeable future. Further investment by SWP water users at some level will be necessary to modify the manner in which water is diverted from the Delta to the SWP and CVP aqueducts to improve reliability of water supply. It is also anticipated that further public investment, such as bond funding, will be critical to restoration of the Delta. The CRA presents its own set of challenges of aging infrastructure and impacts from increase in use of entitlements by other Colorado River Basin states and from climate change.

But the costs of maintaining and even expanding imported supplies through transfers from agricultural users or other sources will almost certainly rise in the future. As a consequence, Metropolitan will have to increase rates to cover these higher costs. Higher rates could change the value proposition for some member agencies if they find that (1) prospective local supply options have become less costly and more reliable relative to imports than is presently the case and (2) those sources are not susceptible to the same or comparable climate, regulatory, and cost impacts or disruptions as those affecting imported supplies.

The BRC finds that reduced sale of imports from whatever cause (including conservation) undermines Metropolitan's current business model, given its dependence on such sales to cover approximately 80 percent of its costs and its diminishing ability to maintain adequate water rate stabilization reserves to mitigate rate increases.

- **Local supplies and water use efficiency will play an increasing role in the region's supply portfolio.** The IRP indicates that local supplies will likely increase in the proportion of water used in the region. Metropolitan's current business model supports this development through its LRP, which subsidizes local supply development through payments per unit of supply. The premise of the subsidy is that local resource development by some members benefits all members through greater regional reliability and reduced demands on finite imports. This approach has been successful in developing

some of the more costly local resource options, such as some recycling programs, but has not added significantly to regional supplies for the past several years.

But, as the share of local production increases by necessity, the cost of these subsidies will likely exceed the current Board-imposed cap on the cost of the program; either the cap will need to be lifted or Metropolitan will need to forgo further investments. If the costs of local supply development remain high relative to imports, the incentives provided by Metropolitan might not be sufficient to overcome the barriers that exist in developing some local resources at the scale needed to meet demand. Finally, if the costs of some types of local supply projects drop relative to imports, the need for subsidization of those types will be reduced accordingly.

The BRC finds that Metropolitan's approach to helping member agencies develop local supplies through LRP subsidies has been yielding low returns over the past several years and, in the absence of modifications, is unlikely to prove adequate to meet the region's needs over the coming decades when financial conditions, particularly investment needs for the Delta, are even more challenging.

- **There are risks and opportunity costs of planning under current trend assumptions.** In many plausible future scenarios, the share of imports in the region's portfolio from the SWP and CRA is likely to decrease. Indeed, this is a near-certainty for the CRA supplies. Under these scenarios, locally developed supplies will need to increase from their current level and transfers from agricultural water users also pursued.
- *But*, if sales of imports from the SWP and CRA decline for whatever reason and the current business model remains in place, Metropolitan's revenue base will continue to erode (if needed rate increases prove to be infeasible to implement), and possibly its membership base as well. This will make it difficult for Metropolitan to maintain its existing infrastructure and participate in the investment in a new conveyance structure, the restoration of the Delta, as well as continue to play a leading role in developing new local sources in the region.

Looking further out to 2060, the BRC finds that a wide range of economic, demographic, climate, and other conditions could prevail in which the import-focused revenue model and existing governance structure could prove constraining and impose risks to Metropolitan's long run financial viability.

In the future, the region will continue to rely on imported supplies from the CRA and the SWP, but, at the same time, it will need to invest in local supply development and conservation throughout the region on a much larger scale than previously achieved. The challenge going forward for Metropolitan and its members is to develop a business model, and associated governance approach, that manages risks associated with investments in both imported and local

resources and infrastructure. Overinvestment in one represents potential opportunity costs for the other.

For many aspects of these challenges, summarized in Table 3.3, opportunities exist for Metropolitan to get ahead of change rather than operate from a defensive posture. Chapter Four lays out what we believe to be a compelling view for what Metropolitan could be by 2060 and how this new Metropolitan will be able to work cooperatively with its members to successfully navigate the many future challenges outlined in this chapter.

Chapter Four. A Business Model for the Future

For Metropolitan to offer as compelling a value proposition to its member agencies in 2060 as it has for its first 82 years of history, it will need a business model that is reliable, resilient, and robust under a wide range of future scenarios. No one can predict the future, but Metropolitan and its members can pursue a business model designed to seize opportunities to deal successfully with whatever challenges the future might hold.

This chapter lays out a vision for Metropolitan in 2060 and identifies some of the challenges and options available to it as it considers changes in its financial structure and investment strategy. At the end of each section within this chapter, the BRC recommends next steps for Metropolitan's Board to consider to realize this vision for a new Metropolitan in the future.

Vision of Metropolitan 2060

As noted earlier, a vision statement offers a concise description of an end state that an organization strives to achieve by executing its mission. To frame the discussion about where Metropolitan and its members need to go in the coming decades, the BRC offers the elements of a vision for consideration, which is summarized in Table 4.1.

Metropolitan's Role as Regional Integrator

In the new environment in 2060, Metropolitan's role will be different from what it now is. In its new role, Metropolitan will serve as an integrator and manager of a complex regional water system that draws on many local sources of water and imports, while mitigating the risks associated with each source and maintaining financial stability. To meet these challenges and seize the opportunities they present, Metropolitan in 2060 could be the provider of not only water but also of water services, such as integrated planning, financing, and trading, including water transfers and exchanges for its members, which are discussed later in this chapter. It could also help lead in the building of a specialized workforce and creation of new regional employment opportunities. In addition, Metropolitan's transition could also help to foster a regional cluster of innovative companies that contribute to the region's prosperity by selling new technologies and water management services at home and abroad. This new business model will be financially sustainable with a pricing structure that sends clear, positive signals to member agencies and customers to efficiently use and conserve water and develop a portfolio of low-cost and reliable alternatives for new sources of water.

Table 4.1. Vision for Metropolitan 2060

Diversified water portfolio	Metropolitan helps the region achieve security through diversity as • provider of imported water • partner in the stewardship of the ecosystems of its source waters to assure reliability • facilitator of local supply development, potentially as a co-investor • developer and manager of regional storage • facilitator of demand management
Provider of water services	Metropolitan serves as a developer and manager of a regional system for conveyance and storage and a regional integrator of water services (e.g., storage, wheeling, and trading) as • leader in broader integrated planning and management • operator of a regionally integrated supply system to facilitate transfers and trades of water among of members • catalyst for technological innovation and deployment
Financial stability	Metropolitan relies on a self-sustaining financial and pricing model using • incentives for conservation, efficiency, and local source development • revenue model that supports regional infrastructure and local supply development • exploitation of energy resources to reduce costs and diversify the revenue base
Innovations in operations and governance	Metropolitan serves as a cooperative of member agencies managed for common benefit by implementing • new partnerships with the public and private sectors • advanced and diverse workforce for expanded roles in water management and planning • advanced and effective communication strategies for consumer education and active engagement in conservation

A new Metropolitan mission statement could more explicitly capture the ideas of providing an integrated set of services to its members to facilitate development of the most reliable and cost-effective supply mix and use of water in the region. Metropolitan will help to facilitate investments in local supply development and demand management strategies and become a partner in some of those investments.

Metropolitan's Value-Added Role as Regional Leader

Metropolitan will add value to members by providing services, such as planning, financing, facilitating transfers and trades, and advocating on behalf of its members. Central to this new model is Metropolitan's need to communicate clearly with its consumers, directly engaging them on such issues as conservation, new investments in water, and costs. It will also need to ensure that its workforce meets the needs of consumers and the requirements of operating a more diverse, complex, interconnected supply system that draws from many more sources and suppliers than Metropolitan does today.

Metropolitan will also continue its tradition of providing Southern California with strong leadership in Sacramento and Washington, D.C., on regulatory and legislative matters related to the provision, protection, and reliability of regional water supplies.

Value Proposition

This combination of regional importer, integrator, facilitator, investor, and leader will be Metropolitan's new value proposition in 2060, as shown in Table 4.2. As is the case now, members in 2060 will have diverse interests and varying degrees of dependence on Metropolitan's current supply. Metropolitan's challenge will be to meet the different needs of its members by delivering imported and additional water and other services that members could not economically and reliably provide for themselves.

If members believe they can reliably obtain sufficient supplies at lower cost and at the same or higher reliability from other sources over a wide range of climatic, economic, and fiscal conditions, their incentives to purchase supplies from Metropolitan will diminish. If Metropolitan can operate effectively and efficiently in these many modes, its members will obtain water more cheaply and reliably than if they were to operate on their own. Metropolitan will still play a critical role as the supplier of imported water to Southern California. It will remain an important representative of Southern California's water interests in the state, the Colorado River Basin, and the nation.

Table 4.2. Value Proposition for Metropolitan 2060

Manage risks	Members can better manage risks of supply shortages and demand fluctuations because Metropolitan • provides continued access to imports • spreads costs of ensuring against disruptions in imported supplies • provides region-wide access to locally developed supplies • smoothes price fluctuations through storage
Provide services	Metropolitan, drawing on the skills and expertise not only of its own staff but also of its member agencies, provides water services more efficiently and effectively than members can provide on their own because of its • risk management tools (e.g., storing, wheeling, transfers, and trading) • expert and diverse workforce • leadership on consumer-driven communications • leadership in technological innovation
Facilitate investments in local supplies	Members that develop their local supplies benefit from Metropolitan's • greater access to capital if investors have confidence in the reliability of the revenue stream • ability to facilitate projects sized to sell into a large regional market • spreading of the risks of investments by connecting to a larger system

Customer Demand: Helping Residents Become Wise Water Users

Metropolitan's shift to a value-added provider of water and water services will place demand management policies and incentives to conserve and increase efficient use on the same level as supply management. Conservation relates to reducing water use through changes in practice or behavior. *Efficiency* refers to accomplishing the same purposes with less water. Approaches to demand management include metering of various kinds, pricing incentives (including lower rates for reduced demand), and rebates for less water-intensive appliances and fixtures, to name a few. Box 4.1 lists key sources of information regarding best practices assembled by several organizations to influence demand for water.

Box 4.1. Selected Listing of Sources of Best Management Practices to Reduce Water Demand and Improve Efficiency of Use

The BRC has compiled a selected list of reports published from January 1, 2005, to the present regarding best management practices for conservation, efficiency, and reuse in the state of California in the residential, commercial, industrial, and institutional sectors.

Association of California Water Agencies

Conservation Requirements by Local Water Agencies (<http://www.acwa.com/content/public-agency-water-supply-status-and-conservation-requirements>)

California Urban Water Conservation Council

Statewide Market Survey: Landscape Water Use Efficiency—Final Report (Shel Bockman, Barbara Sirotnik, Christen Ruiz, Susan Lien Longville, and Gigi Hanna; Sacramento, Calif., June 2007. As of April 8, 2011: <http://www.cuwa.org/library/LandscapeMarketSurveyFinalRpt2007.pdf>)

California Urban Water Agencies

Urban Water Conservation Accomplishments (December 2008. As of April 8, 2011: http://www.cuwa.org/library/cuwa_conservation_report.pdf)

California Department of Water Resources

“About Water Use Efficiency,” last modified March 16, 2010. As of April 8, 2011: <http://www.water.ca.gov/wateruseefficiency/>)

Natural Resources Defense Council

Making Every Drop Work: Increasing Water Efficiency in California’s Commercial, Industrial, and Institutional (CII) Sector (Ronnie Cohen, Kristina Orteza, and Crossley Pinkstaff; New York, May 2009. As of April 8, 2011: <http://www.nrdc.org/water/cacii/>)

A Clear Blue Future: How Greening California Cities Can Address Water Resources and Climate Challenges in the 21st Century (Noah Garrison, David S. Beckman, Robert C. Wilkinson, and Richard Horner; New York, August 2009. As of April 8, 2011: <http://www.nrdc.org/water/lid/files/lid.pdf>)

Pacific Institute

California’s Next Million Acre-Feet: Saving Water, Energy, and Money (Heather Cooley, Juliet Christian-Smith, Peter H. Gleick, Michael J. Cohen, and Matthew Heberger; September 2010. As of April 8, 2011: http://www.pacinst.org/reports/next_million_acre_feet/index.htm)

Box 4.1. Selected Listing of Sources of Best Management Practices to Reduce Water Demand and Improve Efficiency of Use

Overview of Greywater Reuse: the Potential of Greywater Systems to Aid Sustainable Development, by Lucy Allen, Juliet Chrtistian-Smith and Meena Palanippian, November 2010.
http://www.pacinst.org/reports/greywater_over/index.htm

This shift in roles will also involve both educating and engaging the public in discussions about the sources and use of water in Southern California. Without information, consumers are unable to effectively engage in their stewardship responsibilities in regard to Metropolitan and water in Southern California. A proactive approach to communications will enhance Metropolitan's stature in the region, increase efforts to develop local supplies and conservation, strengthen regional cooperation and Metropolitan's effectiveness as a leader in state and national policymaking, and send clear signals to ratepayers. Thus, communications will become foundational to Metropolitan's efforts for the future – as important in their potential impact as water treatment and delivery systems.

By 2060, Southern California's consumers and citizens will need to be active participants in the wise management of water resources. Member agencies will continue to play the key role in communicating with consumers in their service areas. However, Metropolitan will need to play a central role in coordinating public information to support the regional goals of its member agencies.

Metropolitan's communication team will need to develop new tools to communicate with consumers the ways in which water can be managed. Such efforts will help consumers adapt to new pricing options, new service menus, and new water usage tracking options. Whether it is the latest generation of "smart" meters or new advances in water quality monitoring technology Metropolitan will be at the forefront of efforts to educate water consumers. Further, as a thought leader and driver of technological innovation in the water industry and workforce, Metropolitan will be branded as a leading source for public information concerning water, water delivery, development of regional supplies, and policy.

By 2060, market research and consumer education will be primary tasks for Metropolitan, going beyond the occasional consumer surveys conducted by member agencies to include new media and social networks. Marketing involves close communications with, and understanding of, market segments: understanding how people and corporations value and use water, their baseline beliefs, their price thresholds, their responses to current and new technologies, their desires for new services, and the most effective means to listen to and educate various audiences. Educating the public relies on listening to the public. With more expensive

water, the inevitable demands by consumers for greater control, discussion, and education will take on greater importance.

Coordination and collaboration with members will be necessary to augment local water supplies and constrain demand. Consumers will need information and training to be wise users of water. Reasons for partnerships, water trading, changes in price tiers, and unbundling water costs have to be communicated to many audiences—especially members, local stakeholders, and elected officials. General audiences will need access to complete, compelling information at regular intervals.

A successful business model will depend on Metropolitan remaining in the public's mind as a reliable, trusted source of information. Metropolitan's brand would be based largely on providing this service to consumers and member agencies. By providing information to several audiences, Metropolitan would do more than merely communicate; Metropolitan 2060 would brand itself as a regional provider of information and a global leader in water and innovation.

Next Steps

The BRC recommends that Metropolitan undertake an evaluation of selected demand management programs in the United States and abroad to assess the efficacy of these measures for testing and perhaps wider deployment in its service area.

The BRC does not endorse any of the specific practices in the reports included in Box 4.1. Rather, it provides this information to support the above recommendation and reinforce the observation that many opportunities exist for more extensive management of demand by all water use sectors (residential, commercial, industrial, and institutional) to which Metropolitan delivers water.

The BRC recommends that Metropolitan develop and implement proactive communication strategies among members and the public to improve the public's understanding of the value of water and new actions to manage demand.

A communication strategy will be needed for each component of the new business model to support two primary objectives. First, Metropolitan and members will benefit from a strong base of public understanding of the rationale for changes in current practices and pricing. Second, Metropolitan and members will benefit from systematic efforts to understand public attitudes toward proposed changes and public acceptance of various local supply options. A closely coordinated communication and marketing strategy with member agencies and the public would take advantage of emerging social media and distributed networks.

The BRC recommends that Metropolitan significantly expand public education through investment in long-term campaigns targeting youth over the span of a generation to increase knowledge and support workforce development.

Metropolitan and its members have a generational challenge of shaping public views about the value of water and motivating changes in behavior that will lead to higher levels of conservation, efficiency, and adaptability to a wider range of source waters. A well-executed and strategic education campaign could influence lifestyle and behavioral changes in public attitudes about the value of water and the critical value of supporting infrastructure maintenance and development. For example, a strategic communication plan might do the following:

- Improve and distribute updated water curricula in school districts throughout Southern California.
- Expand the use of social media to support education initiatives.
- Pilot-test the use of social media sites for disaster preparedness and catastrophe communications and public outreach strategies.

Water Supply Portfolio and Investments in Infrastructure: “Security Through Diversity”

In 2060, Metropolitan and its member agencies will meet their goals for reliability, resilience, and robustness by diversifying sources of supply—security through diversity. The region will continue to rely on imported supplies from the Colorado River and from the SWP. By necessity, Metropolitan and its member agencies, potentially in partnerships with the private sector, will also need to aggressively develop cost-effective local supplies to make up for supply shortfalls resulting if demand management strategies fall short or imports decline further. Metropolitan will continuously assess the risks and rates of return from *all* of these investments in imports and local supplies and the role each source needs to play in the region’s portfolio.

In the coming decades, Metropolitan will continue to underwrite programs to conserve water among members and in communities willing to sell surplus water to Metropolitan. Providing payments to farmers to leave land fallow, to plant crops that use less water, and to agree to provide water in dry years has been a cost-effective means of obtaining new supplies. These approaches benefit Metropolitan and its members by fully using the existing water conveyance system. They also reduce the cost of imported water by distributing the fixed costs of these assets over more imported water. These investments will also need to be continuously assessed for their risks and benefits.

Next Steps: Delta Restoration and Conveyance

Given the vital role the SWP plays in the Metropolitan's water supply and the breadth of benefits to California's urban and agricultural economy and the environmental health of the Delta embraced within the BDCP under development, the BRC gives its strong endorsement to a continued lead role by Metropolitan in development of the BDCP and related processes.

There is no other solution under consideration that promises long-term increased reliability for the SWP deliveries. The BRC also urges Metropolitan to continue to evaluate the benefits and costs of a new conveyance facility, the extent of Metropolitan's share of the costs of a new facility and other elements of the BDCP, and the timeline for bringing the new conveyance on line to ensure that the investment in the new facility will produce a commensurate increase in the reliability of Metropolitan's water supply.

Next Steps: Colorado River Supply

The BRC supports Metropolitan's role of continuing support for California's efforts to work collaboratively with other states, the U.S. Secretary of the Interior, and Mexico to use its full share of water from the Colorado River at least cost, thus making maximum use of the region's investment in the CRA.

Local Supply Options

Southern California will need to develop significant amounts of new local supplies and improve the efficiency of water use to accommodate a growing population and compensate for potentially declining imports, as described in Chapter Three. These new local supply options and efficiency, combined with existing imports, will increase the diversity in the region's supply and help maintain the region's water supply reliability. Table 4.3 is a modified form of Table 3.2, with a new column that highlights the role that each of the local sources could play in a diversified portfolio.

Table 4.3. Local Water Supply Options for Southern California

Source	Strategy	Role in Portfolio
Rainwater	Rainwater capture and use at source	Opportunistic storage and use at highly localized sites
	Centralized stormwater capture, treatment, and redistribution	Opportunistic storage and use of an otherwise unused supply
Groundwater	Desalination (recovery)	Additional supply
	Conjunctive management	Insurance during dry periods
Wastewater	Nonpotable	Additional supply for irrigation and industrial uses—drought-proof
	Indirect potable via groundwater replenishment	Improved groundwater yields
	Direct reuse	Additional supply—drought-proof—potentially low-cost
Seawater	Coastal desalination	Drought-proof new supply without supply limits
	Offshore desalination	Drought-proof new supply without supply limits
Efficiency	End-use efficiency	Moderation of demand
	Reduce system leaks and other losses (e.g., evaporation and canal seepage)	Reduction in supply requirements to meet demands

To both facilitate and benefit from a shift in Southern California’s supply mix toward more local supplies, Metropolitan will need a revamped investment strategy to encompass a variety of incentives and co-investment and partnership options with local agencies to develop local supplies. Although there appears to be no model that Southern California can adopt in whole, the Australian experience with a “security through diversity” strategy is worth examining, as summarized in Box 4.2.

Box 4.2. The Australian Experience

Between 1996 and 2010, Australia suffered a massive drought across the entire continent, and drought conditions persist in southwestern Australia. Nearly 75 percent of Australia's urban population simultaneously had its storage capacity reduced to less than 25 percent with the capture of runoff reduced by an additional 30 percent each year. By 2007, the country's major river system no longer flowed out to sea; production of major agricultural crops, such as rice and cotton, declined; and their associated rural communities suffered significant economic losses.

In response to these challenges, Australia has instituted an aggressive, simultaneous, and rapid response at the national, state, and local levels. Some components of this response are similar to actions the BRC envisions for Metropolitan. These included introducing water trading for agricultural users, separating farm property rights from water rights, and "security through diversity" programs by investing more than \$10 billion in eight desalination plants in six cities (the introduction of "fit-for-purpose" water, including residential water tanks, greywater that has received less or no treatment, and stormwater reuse. Actions also included significant conservation measures.

In Melbourne, these conservation programs helped reduce household water consumption from 100 to 40 gallons per person per day over the past decade. In Adelaide, even after the recent floods, the average consumption rate per day remains at around 33 gallons per day per person.

Water authorities have also invested in a "grid" of storage facilities, pipelines, and alternative supply sources to better connect different regions and agencies. It fashioned dams and a web of pipelines to connect 18 independent water utilities in a single grid. To "drought-proof" the region, it built facilities for providing water, by recycling wastewater, to use for industrial purposes, and by desalinating seawater. Production of desalinated water can be adjusted according to rain levels.

This grid now enables water transactions that have proved highly effective at moving water to where it is most needed. Even in the case of the recent Brisbane floods, this grid allowed desalination plants to deliver potable water at the flood's peak, when storage systems became ineffective.

The lesson from Australia is that the time available to react can often be less than the time to deliver a solution: Security through diversity is key. It also showed that systemic change in consumption patterns is achievable if the public—urban and agricultural users alike—understands the consequences of not doing so. The experience also established the public's willingness to place environmental considerations on the same level of concern as critical human needs and agricultural production.

If technological innovation helps to bring down the costs of local supplies relative to imports, the need for Metropolitan to subsidize such investments will be reduced. Instead, some local agencies might need assistance acquiring the financing necessary to develop the large-scale projects to meet the new supply need, connecting with other agencies and companies that might be interested in partnering or purchasing excess production, and acquiring the necessary technical expertise to design, construct, and operate new facilities.

Metropolitan can provide significant value to its members through an investment model in which Metropolitan is an active partner and co-investor in the development of local resources. Such an approach benefits individual members interested in local resource development by

providing them with access to needed capital, partners, and expertise. It also benefits other Metropolitan members by adding to regional supplies and possibly reducing pressure on costs. Finally, it benefits Metropolitan by providing new variable revenue streams that are uncorrelated to sales of imported water supplies.

Energy as a Local Resource

In 2060, energy costs will continue to play a large role in Metropolitan's overall cost structure, but large uncertainties in total costs and supply constraints will persist. Metropolitan would benefit from being proactive in seeking less energy-intensive supplies and in maximizing its implementation of conservation and energy-efficiency measures throughout its system. As described in Chapter Three, Metropolitan possesses underutilized natural resources, land assets, and gravity-driven water flows through its conveyance facilities that could be developed into usable energy through partnerships with the public and private sectors.

In 2060, Metropolitan will take full advantage of the opportunities these assets provide to reduce its own operating costs if production of electricity from its assets proves to be cost-competitive with other sources. Metropolitan will also derive benefits from a potential additional revenue stream that electricity production using its own assets might afford. Metropolitan will also work collaboratively with private- and public sector partners to fully exploit its energy-producing assets in a cost-effective and environmentally responsible manner.

It should be emphasized, however, that the BRC is not suggesting that Metropolitan necessarily enter into the energy business where and when more cost-effective and sustainable means exist to derive comparable or higher benefit.

A "Grid" for Water: Regional System of Supplies, Storage, and Conveyance

To date, imported water supplies provided by Metropolitan (between 40 to 60 percent of the region's total supplies) enter the region from the north (SWP) and east (CRA). A system of storage facilities and conveyance provides storage and transportation generally downstream to Metropolitan water users. Surface storage and some conjunctive-use programs stretch the region's supplies during dry periods.³⁵

³⁵ Conjunctive use is the integrated management of surface and groundwater resources for the purpose of deriving greater benefits than would be available if each resource were managed separately. For example, storing excess surface supplies in groundwater basins enables water managers to draw on those resources at a later time when surface supplies are insufficient to meet demand.

In 2060, an increasing proportion of the region's water will be originating locally, be it at the coast from desalination plants or throughout the basin at different groundwater basins and wastewater treatment plants. Increased diversity of sources require conveyance capacity to move supplies from their sources to where they are needed and for storage facilities to store supplies produced in one place to enable their use at a later time or different place. Improved regional and local storage and conveyance will make the entire system more reliable by mitigating the risks of shortages for a larger number of customers.

Although new investments might well be needed to bring some sources into the broader regional market, it is important to recognize that the *existing* system could move water around within Southern California *by exchange*. Since Metropolitan's distribution system already connects with all member agencies, adjustments in its deliveries could effectuate the movement of local supplies from San Diego to Ventura almost effortlessly.

An enhanced Metropolitan regional storage and conveyance system could facilitate the movement and transfer of locally sourced water among members and other water authorities in the region. Southern California now has 1.5 million AF of surface storage and 4 million AF of potential Groundwater storage. (To date, Metropolitan and its members have developed 420 TAF of this groundwater storage for conjunctive use.) By 2060, Southern California could develop an expanded, interconnected set of storage facilities ranging from small-scale surface reservoirs and groundwater basins to local cisterns owned by businesses and homeowners. Metropolitan would be the logical control center for coordinating the draw on these storage facilities to allocate water across the region, using remotely sensed data on storage levels and employing expertise in operations research to select the best storage facilities from which to draw water.

Investing in interregional storage could greatly benefit Metropolitan's members and consequently strengthen Metropolitan:

1. Interregional conveyance and storage facilities would reduce shortages of water and rationing during extended periods of drought and lessen the need for Metropolitan to increase rates during such periods to cover fixed costs.
2. Members that can develop local water sources more cheaply have an incentive to more fully develop these resources because they will have more options for selling water to other members.
3. Members that can conserve water more cheaply could potentially generate new revenue from conserving supplies.
4. Areas with growing populations could have expanded access to new supplies.
5. Metropolitan would generate more revenue from members that use its conveyance and storage facilities.

In 2060, Metropolitan and its members will offer customers a wider range of supplies of varying quality and reliability, priced to encourage the most cost-effective use of available supplies within the region. Known as “fit for purpose” in the Australian example in Box 4.2, the idea is to use both regulation and pricing—and a more extensive network of conveyance facilities and distribution pipes—to provide water of several levels of quality. Quality is then matched to the purpose of the end use. For example, water fit for human consumption need not be used for some outdoor landscaping applications and toilet flushing.

Next Steps

The BRC endorses the concept of security through diversity of supplies, including imports and locally developed sources. We further extend the diversified portfolio concept to include demand management through conservation and efficiency gains as a co-equal element to investments in new supplies.

The BRC recommends that Metropolitan undertake an evaluation of the LRP and consider its benefits and costs relative to alternative means of encouraging higher levels of regional investments in local supply development.

The BRC notes that the 2010 IRP recommends the following:

- developing partnerships with member agencies, the private sector, and other entities to co-develop medium- to large-scale local resource projects
- developing strategies for investing in small-scale but broadly distributed sources of new supply
- collaborating with member agencies on integrating their local supplies into the regional system.

To both facilitate and benefit from a shift in Southern California supply mix toward local supplies, Metropolitan will need to revise how it partners with local agencies to develop local supplies. At the core of the required changes, Metropolitan should reevaluate the current LRP, which subsidizes local supply development through payments per unit of supply developed under the premise that local resource development by some members benefits all members through increased regional supply reliability.

In the future, in place of subsidies, local agencies might need assistance acquiring the financing necessary to develop the large-scale projects to meet the new supply need, connecting with other agencies and companies that might be interested in partnering or purchasing excess production, and acquiring the necessary technical expertise to design, construct, and operate new facilities.

The BRC recommends that Metropolitan consider co-developing pilot projects with member agencies or others for local supply development that do not involve subsidies.

Metropolitan should consider implementing one or more pilot projects to facilitate learning on a small scale and with relatively low risk about its ability to accommodate a larger local-water-source focus than at present and develop specialized expertise internally. Such projects would also build confidence in Metropolitan's technical and economic decisionmaking and demonstrate an emerging competency to its members. Examples of potential pilot projects include the following:

- new water quality, flood control, and water supply initiatives
- joint partnerships on new seawater desalination facilities
- joint partnerships with local agencies with developable recycled water, brackish groundwater, and surface sources
- coordinated, targeted conservation programs with a specific member agency.

The BRC recommends that Metropolitan accelerate assessments of the costs and benefits of expanding small, distributed surface storage and expanded groundwater storage in the region.

Storage generally enhances the region's capacity to handle variability in precipitation and runoff by capturing and storing excess supplies and then releasing water during drier periods. However, not all storage is created equal. As the region's supply portfolio expands to include a greater portion of local supplies, a network of small and distributed surface storage facilities, along with substantially increased utilization of subsurface storage, would substantially increase the reliability, resilience, and robustness of the overall system. In the near term, Metropolitan should update work done on potential groundwater storage to identify key sites for new joint Metropolitan/member agency development projects.

The BRC recommends that Metropolitan invest in new out-of-basin agricultural water sources and water from conservation investments.

Metropolitan should explore the scope for augmenting available SWP and CRA deliveries through active contracting with willing sellers of water both inside and outside the service area.

- Focus on developing win/win solutions that preserve and improve agriculture and address environmental needs while providing supplies to Southern California.
- Develop and maintain sustainable partnerships for Central Valley storage and transfers by pursuing innovative and flexible operations and agreements to allow for robust adaptation.

The BRC recommends that Metropolitan assess potential partnerships and funding opportunities for energy efficiency, energy reliability, and greenhouse gas emissions reductions.

Metropolitan's property could have a very high value for private and public energy generators that wish to lease sites for power generation. Metropolitan's rights of way along its water lines might also be highly valued by private and public energy developers, generators, and utilities that wish to transport power from generation facilities to local distribution networks. In addition, Metropolitan's load profiles, whether from pumping water or running treatment and desalination plants, could provide electricity producers with unique opportunities to optimize utilization of their generation portfolios, particularly for renewable energy. Also, Metropolitan staff should examine federal and state greenhouse gas regulations and develop strategies to hedge against price and regulatory risks.

Provider of Integrated Water Services

In 2060, Metropolitan will provide much more to its member agencies than imported water supplies. It will be a provider of integrated water services, including significant new offerings in terms of integrated regional planning and brokering and managing water trades among members and outside entities.

Integrated Regional Planning and Management

If members collaborate to invest in local supplies, alternative sources of water, such as desalination, stormwater capture, rainwater capture, and recycling, they will need to have a clear view of demand and the effects of their investments on water supplies in the region as a whole. Metropolitan already integrates water resource planning for its activities and those of its members. It is the logical source for technical assistance to help members that do not have enough planning or financial capacity of their own to evaluate, build, and operate new projects, especially during a period when technologies and practices for new water supply systems are likely to evolve rapidly.

Beyond the current IRP process, Metropolitan could also help members coordinate plans with each other. For instance, Metropolitan might assist a member planning to invest in new local supplies with the intention of making some available to other members. These services could be part of a menu available to members. Members that draw on those services would best be charged for them, rather than subsuming those costs into costs paid by the entire membership.

By 2060, the integrated resource and management planning process could identify and assess synergies with other investments. Improvements in Metropolitan's conveyance and

storage systems could make possible new collaborative investments in local supplies among members or other entities. The planning process might explicitly identify regulatory, institutional, or other barriers to implementing conservation and supply options and suggest strategies for removing those barriers.

By 2060, the integrated resource and management planning process could also encourage more direct collaborative planning among entities in the region. Metropolitan could offer seed capital to members to expand their planning process to include joint planning of local supply projects among themselves and with Metropolitan, which could, in turn, lead to trading among agencies. This planning would include not only the physical project but also the business analysis of the sources of project financing and the revenue streams that would pay for it. Metropolitan would earn back the funds used for the seed capital from conveyance fees for transporting the water and fees for the financing it provides. Members would benefit financially from any project that goes forward. Only the parties that chose to participate would pay the fees that cover Metropolitan's costs. Metropolitan might administer this process by soliciting proposals for joint planning activities from members and other water agencies in the region, including flood control and wastewater agencies.

One of Metropolitan's most significant planning challenges, and its largest costs, will remain the investments it makes in the infrastructure needed to transport and store water. Over the next several decades, Metropolitan will be making decisions on large investments to upgrade major aqueducts and other facilities and expand storage in the system. It will also face higher maintenance costs as existing infrastructure ages. At the same time, members will be investing in conservation and local supplies. Making choices among alternative investments and coordinating investments among members will be one of the most challenging tasks facing Metropolitan over the next 50 years, particularly because of the costs of additional capital to finance member agency projects for those that want to pay for them.

Facilitating and Managing Transfers and Trades in Water

Member agencies that have developed local sources might periodically enjoy surpluses that they could sell to members in deficit. We refer to this type of transaction as *trading*, in which willing buyers and sellers negotiate on a price for water. This transaction need not involve changes in or relinquishment of preferential or other water rights. The focus is on "new" water produced by member agencies and incentives to achieve economies of scale in their production. Water need not be physically transported from one member to another, although that might be cost-effective in upstream-to-downstream sales. Rather, trades could be implemented by allowing a member to offer some or all of its allocation of imported water to another member. Some members might exploit economies of scale in local production and build more capacity

than they need with the intention of selling to other members more cheaply than those members could produce or procure otherwise.

We illustrate the idea of trading in Figure 4.1 with an example in which member A has an opportunity to develop a local supply source—say, a desalination plant—and has a choice of how large to size the project. It could capture economies of scale if it could double the capacity of the plant beyond the capacity required to meet its own needs. Member B's purchase agreement would enable member A to develop a project at a scale that could attract financing and achieve a positive return on its investment. Member B would benefit if the cost of member A's locally developed supply is less than the cost of the cheapest water sold by Metropolitan—and the supply carries a level of reliability required by member B. In our vision of Metropolitan as a regional integrator, Metropolitan would earn a fee by helping to facilitate the transaction and earn additional fees by arranging for water to be moved, depending on the upstream–downstream relationship between members A and B.

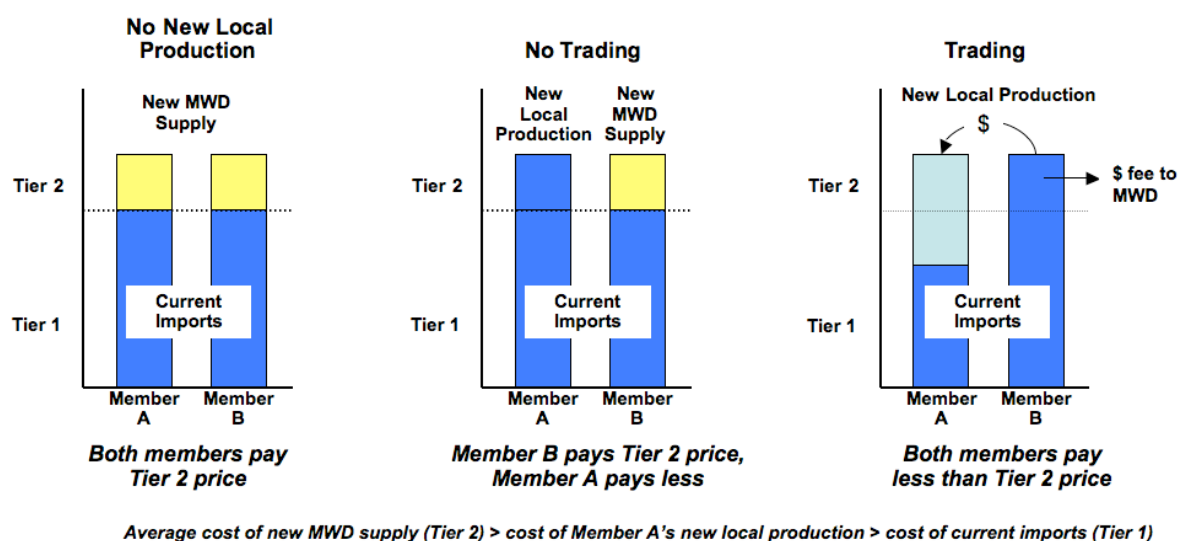


Figure 4.1. An Example of the Potential Benefits of Trading

In 2060, Metropolitan, as in the example above, could function as a market manager of a regionally connected system of pipes and storage facilities, facilitating fully transparent trading of local and imported supplies among members. Such trading could be on an annual basis, with supplies varying from year to year. Members' allocations would vary annually, depending on hydrologic conditions, drawdowns on reserves, historical allocations, access to new supplies, and other factors.

Because such trading will require using Metropolitan's infrastructure of conveyance, storage, and pumping facilities, Metropolitan is a logical choice for the role of facilitator of such trading within the region. A trading system would have to be carefully crafted and implemented

to preserve Metropolitan's financial integrity, maintain cost equity among its members, recognize member agencies' historical rights, and protect water quality within the delivery system.³⁶ However, in 2060, a well-designed trading system could provide financial incentives for members and other entities within the region to develop local supplies while providing Metropolitan with an additional source of revenue from fees it might charge for facilitating trades.

To offer these services, Metropolitan will need to have the flexibility to expand its intraregional conveyance network. It might want to be able to invest in intradistrict pipelines and pumping stations to connect a subset of current members, use its ownership of current rights of way to construct pipelines, negotiate charges for the use of pipelines (subject to wheeling laws), and possibly seek permission from members to perform a brokering role for water within Metropolitan's service area.

Trading is likely to require more integrated planning among Metropolitan, members, and other entities in the region. Trading agreements among members will need to be coordinated with investments in the system so Metropolitan's ability to move water through the region keeps pace with the geographic distribution of new local supplies and demand.

Next Steps

Metropolitan's current activities already extend beyond the provision of imported water to the region and include regional planning and integration of local supply projects into the region's portfolio. In the future, Metropolitan will need to organize itself to be more aggressive in providing these services to deliver on its value proposition to members. Expanded relationships with member agencies and new partnerships with other water agencies, business, environmental, agricultural, and other interests on planning, investments, communications, and workforce development will be vital for building a strong foundation for Metropolitan's transition to the new business model.

The BRC recommends that Metropolitan and members identify the potential major elements of a more regionally connected system, including reviewing previous studies of groundwater storage system potential and identifying gaps in regional conveyance and storage capacity.

³⁶The BRC recommendations focus on trading new sources of local supplies. Although these types of trades or other transfers might not be fully implementable now due to existing physical, political, and legal constraints, those constraints could be relaxed or lifted in the next decade. Changes might be needed in the California constitution, specific laws, and adjudicated water rights.

The near-term challenges to creating a more interconnected regional system are considerable. Metropolitan's conveyance system was not designed to service the scale of locally sourced water that might become available in the decades ahead. Making investments in pipelines, pumps, and storage facilities will be expensive and would have to be carefully planned. Metropolitan's investments in the water system would have to be well matched to the geographic distribution of new local supplies and demand and account for water quality concerns.

As part of this analysis, Metropolitan should consider the potential benefits of augmenting the IRP's current focus on identifying a list of the most cost-effective supply options with more comprehensive financial analysis that includes the sources of investment capital for alternative supply options and demand management strategies and programs, as well as the revenues various parties might expect from those investments. The process could involve more sophisticated risk management approaches. Rather than independently considering the unit cost of water from each option, the process could compare alternative portfolios of options, where each portfolio balances the differing sensitivity of alternative supplies to various types of risks.

The BRC recommends that Metropolitan expand its planning partners to include wastewater, flood control, and other agencies.

New partnerships with other agencies that manage water in the region will expand Metropolitan's capacity to implement a more integrated and efficient regional system with its members and take advantage of sources and storage facilities that could reduce regional vulnerabilities to supply disruptions.

The BRC recommends that Metropolitan build its capabilities to analyze the economics of water resource planning for the region.

Drawing on the best economic talent, Metropolitan should increase its understanding of several key issues relating to its role in the region:

- how future demand for water will grow differentially across members
- how introducing new conservation (tax credits or rebates) and pricing programs will affect water demand differently across members (e.g., the factors that will determine these demand responses)
- what the customer demand is for water of different qualities in the region
- what the costs are of supplying locally sourced water using different technologies
- which factors (such as scale, energy intensity, potential for innovations) will likely drive these technology costs in the future

- what the costs are of supplying large customers with water of different qualities that is appropriate for their end uses.

The BRC recommends that Metropolitan evaluate the potential benefits and costs of water trading among members and identify and assess the barriers to implementation that might presently exist within the region.

Metropolitan should assess the potential benefits and costs of trading new local supplies developed by members and other entities in the region, as well as seek deeper understanding into the legal and other constraints on implementation. If the analysis suggests that trading could have significant benefits over the long term, a pilot project should be initiated as a way to gain more insight into the challenges that would be faced if larger-scale implementation were to be pursued. Trading at a pilot scale could take advantage of existing conveyance and storage infrastructure and, thus, avoid significant capital investments for transport. For example, Metropolitan could:

- Work with member agencies to evaluate this system by identifying and implementing a small number of pilot trades.
- Analyze the size of likely benefits and drawbacks to members that sell and buy water during both periods of plenty and scarcity, paying careful attention to how trading could help the region both enable greater economic growth and increase the incentives from conservation.
- Articulate the role Metropolitan could play in supporting (monitoring and managing) such a market.

Finances and Pricing

For Metropolitan to survive as a cooperative, all its members must continue to perceive that the payments they make are commensurate with the value they receive in terms of reliable and affordable supplies and other services Metropolitan might offer to benefit the greater good of the region. If members find they can procure water more cheaply and reliably from other sources, they will reduce their purchases from Metropolitan. In 2060, Metropolitan's pricing structure will need to continue to provide value for the money. Further, for Metropolitan to remain financially self-sustaining, members and their customers will need to understand the true costs of maintaining, operating, and expanding the infrastructure of the regional system, and pay the full cost of the water that they consume.

While providing revenue stability over the long term, any rate structure, old or new, will also need to provide incentives to conserve water and develop new sources of supply. As discussed in Chapter Two, Metropolitan's current revenue base depends primarily on the sale of imported water. If sales decline because of increased costs, reduced or less reliable imported supplies, or reduced demand from conservation or competition, Metropolitan's revenues will decline accordingly, while fixed costs, by definition, remain the same. Without structural adjustments in the rate structure, Metropolitan would need to raise prices for imported water to make up for the shortfall in revenue, or other revenue sources would need to be found. In contrast, changes in supply and demand experienced by Metropolitan and member agencies for locally developed sources would not have the same impact on Metropolitan's revenue stream and its overall financial stability under the current rate structure unless substantially more water were to be priced at Tier 2 rates.

Over the next several decades, the relative price of imported and locally produced supplies is likely to change from the past case in which imported water was sometimes cheaper than local supplies. Advances in technology are highly likely to reduce the costs of desalination, recycling, groundwater storage, and other options; the question is how quickly those advances will occur and be commercialized, and at what prices those options become more attractive relative to the purchase of imports.

Under any scenario in the future, when sales of imports drop for whatever reason, Metropolitan's revenue base will be diminished. For this reason, the BRC believes that a renewed look at Metropolitan's future pricing structure will be foundational to Metropolitan's long-term sustainability and place of leadership in the region.

Principles of Pricing

Accordingly, future rate structures that meet Metropolitan's and its members' goals will need to incorporate the following features:

1. **Financial sustainability.** Revenues from whatever sources must be sufficient to cover the full costs of constructing, maintaining, and operating the system and providing value-added services to members. Metropolitan's system is a unique regional asset that requires broad-based regional support to thrive in the future. Under the current pricing structure, if local sources of supply provide a greater share of water in the region than they do presently, imports could become a "swing" source of water for member agencies, resulting in more volatility in Metropolitan's revenues. Some member agencies are already moving in this direction.
2. **Alignment between fixed costs and stable revenues.** Metropolitan will need to ensure that its rate structure provides a stable level of revenues to cover fixed costs,

including new infrastructure, so that Metropolitan remains financially sound. If sales of imported water become more variable or decline because of drought or reduced demand from member agencies as they develop their own alternative sources of supply, Metropolitan could find it more challenging to cover large fixed costs associated with restoring the Delta and new conveyance facilities, enhancements to the CRA, and investments elsewhere in source development, storage, and conveyance.

3. **Fairness.** The rate structure should permit Metropolitan to set prices for services, such as treatment, wheeling, and storage, that are borne primarily by those members that use these services. Rates also will need to be structured so that past contributions to investments are reflected in them. Implicit in this principle is a common understanding between member agencies and Metropolitan about the distinction between costs to be borne by all who use the system and costs for selected services that benefit a subset of Metropolitan's members. In terms of the costs of water, this principle also embodies an agreement between member agencies and Metropolitan about the criteria for determining whether and how much subsidies provided to some member agencies for local supply development yield benefits to all members.
4. **Flexibility.** Nonwater costs, such as those for energy and chemicals, form a substantial share of Metropolitan's expenditures, making up as much as one-sixth of total costs. Energy costs, in particular, have been volatile in recent years. Metropolitan's rate structure will need to have the flexibility to pass through such changes in costs, up and down, to Metropolitan's members.
5. **Incentives.** Metropolitan's rate structure should provide price-based incentives for members to conserve and develop cost-effective local sources of water, especially if future supplies of imported water fluctuate more than in the past. Under the current system, Metropolitan and member agencies promote conservation. In the future, to the extent higher prices for imports and aggressive conservation measures reduce purchases of Metropolitan's supplies by member agencies, Metropolitan's revenues could decline.
6. **Transparency.** With an increasingly complex portfolio of sources and a wider array of services, Metropolitan's members will continue to need clear breakdowns of water allocations and fixed and variable costs so they can make prudent decisions about alternative investments.

Rate structures based on these principles would encourage Metropolitan and its members to invest in the most cost-effective sources of water, encourage trading of new local supplies among members so that water is supplied cost-effectively throughout the region,

stimulate new partnerships and collaboration in financing new investments, and encourage coordinated strategic planning. Such rate structures would accurately reflect risk-adjusted costs. Members would be charged for the full costs of services they receive, including the benefits of being ensured access to water from Metropolitan when local sources might be insufficient. By incorporating risk-adjusted costs of supplies into the rate structure, members will face clear signals about the costs of different sources of supply, so that investments can be directed to the most cost-effective activities.

The adaptive management framework adopted in Metropolitan's 2010 IRP does not address the uncertainties identified by the BRC with respect to the ability of Metropolitan and its member agencies to secure capital resources to invest in local resource projects or, for that matter, in the long-term obligations for infrastructure repair and replacement of existing system elements. These uncertainties arise from possible changes in bond markets, the nature of debt obligations of the member agencies, and the political will of customers in their service areas to support additional investments. The success of the adaptive management framework depends on the ability of local resource projects to be realized in a timely and cost-effective manner. The 2010 Long-Range Finance Plan addresses Metropolitan's financial conditions but does not provide any information on the financial conditions of its member agencies or their ability to secure capital resources necessary through public-private partnerships or other means to bring local resource projects into the market.

Next Steps

The BRC recommends that Metropolitan develop an adaptive long-range financial plan as a complement to the IRP.

An expanded long-range financing plan would include a feasibility assessment, from financial and political perspectives, of likely local resource projects based on data provided by the relevant member agencies. An adaptive, integrated financial-planning framework would align the business model with the technical planning process reflected in the 2010 IRP and serve as a venue for discussing rate structures and impacts and policies for investment in local resource projects and Metropolitan's infrastructure. An adaptive, integrated financial-planning process would support the evolution of a business model that reflects the changing composition of the water-resource portfolio held by Metropolitan and its member agencies.

The BRC recommends that Metropolitan initiate a process to review its current pricing structure in comparison to potential alternatives, evaluating the sustainability of the various options under a range of scenarios, including those in which the share of imports in the regional portfolio varies relative to the share of locally developed supplies. The analysis will

include an assessment of comparative benefits, costs, impacts on equity among members, and barriers to implementation.

The most critical element of a new business model for Metropolitan is the pricing structure. Pricing options that meet most or all of the principles outlined here will need to be analyzed rigorously and tested among member agencies to fully understand the financial implications and the range of economic and behavioral responses that each of these options could elicit. Further, rigorous quantitative analysis needs to be accompanied by extensive regional consultations with members, other key stakeholders throughout the region, and the public at large.

The BRC recommends that Metropolitan review all of its major cost components and apply value-engineering principles to the process of identifying opportunities for cost savings in the near and longer terms.

Metropolitan's long-term sustainability depends not only on securing reliable water supplies of sufficient quality but also in engaging in a continuous exercise in business process improvement, scouring for opportunities to gain efficiencies and reduce operating expenses, and look for opportunities to increase productivity through technology and operational innovations. Energy efficiency might be a prime target of opportunity, and new technology for monitoring use and minimizing waste could be warranted following careful study.

Innovations in Governance and Operations

Metropolitan's historical role of bringing imported supplies to the region through large investments led to a "top-down" model of governance and relationships with its member agencies. By 2060, technological innovation and investment in new source development is likely to be largely driven by Metropolitan's member agencies and their other public- and private-sector partners. Metropolitan will to continue to take the lead in bringing imports to the region and as a regional integrator of water services. To realize this larger vision and value proposition, Metropolitan and its members will need to rebalance responsibilities so that Metropolitan's governance will include both "top-down" and "bottom-up" elements.

New Forms of Partnership

Over the next decades, conservation and local sources of water are likely to become increasingly cost-competitive with imports of water. Some members will continue to make their own investments in conservation and local supply in their service areas. In other cases, investments involving more than one member will be cheaper than investments made by single agencies. Such projects could include partnering with a coastal member agency on a new

desalination project, working with inland member agencies to exploit opportunities for wastewater recycling, or collaborating with a flood control agency to capture urban stormwater runoff in the basin. Metropolitan's management and planning skills, its ability to use its conveyance infrastructure to facilitate agreements among its members, and its access to lower-cost financing can substantially reduce the costs of such projects.

For Metropolitan to collaborate on such projects, it will need the freedom to develop new ways of partnering with members. For example, if Metropolitan uses its superior credit rating to procure financing for a project, it will need to earn a return on its investment or a payment for a loan guarantee. If the project needs an equity investor, Metropolitan might be the logical choice, in which case it needs the freedom to take equity stakes in projects, earn a competitive rate of return on those investments, and pass along the benefits of such investments to its members.

Such new arrangements could bring several benefits: System reliability would improve for all members because of reduced demand or greater availability of water throughout the region during periods of normal supply, but especially during periods of drought. The system could be perceived as more equitable because costs would be borne by those members that most directly benefit from the investment. A more equitable apportionment of future costs would reduce friction among members and make Metropolitan more financially stable.

Next Steps

Following a review of this report and its own analyses of potential changes to its business model, the BRC recommends that Metropolitan initiate an external review of its governance structure, including the composition of the Board, by-laws, and other elements identified by the Board as essential to its functioning.

This recommendation is consistent with best practices among comparable organizations to undertake a periodic strategic and objective review of its governance structure and functioning. For Metropolitan, this analysis would be most useful at such time as the Board is exploring the BRC's vision of Metropolitan in 2060 and the nearer-term implications of adapting its governance mechanisms to ensure cohesion among members and between Metropolitan and members over the long term.

The BRC recommends that Metropolitan begin a process to consider new vision and mission statements.

The antecedent to a new business model is a shared vision among the member agencies and local governments about Metropolitan's role in the region. The process of developing clear and concise statements is itself a means of building a regional consensus around a new model for Metropolitan.

Leadership in Technology and Workforce Development

Metropolitan was formed in 1928 as a solution to the then-unique problem of providing sufficient water for a rapidly developing urban region in a semi-arid climate. Developments in the next half-century are likely to provide Southern California with considerably more company, as other urban areas around the globe increasingly confront limits on their water supplies. The solutions developed by Metropolitan and its member agencies are likely to be applicable around the globe. Metropolitan's business model, combined with evolutionary and revolutionary innovations in technologies, provides Metropolitan with the opportunity to become a leader in managing water in arid urban areas. As part of this process, Metropolitan could help create an industry cluster of water technologies and management, of potential global significance in Southern California.

Metropolitan will have to develop a strategy for adopting new technologies. Metropolitan's options include waiting to see which technological innovations prove best or taking a more proactive stance exploring the adoption of new technologies. Metropolitan might choose to adopt new technologies earlier rather later. Decisions by an agency of the size of Metropolitan have profound effects on suppliers. Metropolitan might even choose to operate prototype demonstration projects before an innovation is offered on the market, as it has with ozone and other technologies. By taking a more proactive stance, Metropolitan could have a considerable effect not only on the water management problems of Southern California but also on economic development in the region.

Within the more dynamic relationship between Metropolitan and its members contained in the 2060 vision, Metropolitan could act as a partner in efforts to apply more advanced technologies to the delivery of water services to localities and the region. One of the problems innovators and entrepreneurs face is uncertainty over specifications. Metropolitan and its member agencies could set specifications about the performance they require from such products. Such explicit statements of expectations on the part of such a large customer would go a long way toward dissipating the private sector's uncertainty and the attendant risk of developing new products.

Metropolitan also has convening authority. It can act as a venue for discussions among public and private stakeholders at a stage when entrepreneurs are developing new technologies. These discussions would provide a forum where networks of providers and customers could form and messages on desired capabilities could be aired. Discussions could be held about how innovation can be most profitably directed.

Regions have come to be seen as the appropriate scale for innovation and technology-led growth. Proximity is required for success in developing early-stage technologies. Proximity fosters the emergence of local networks where knowledge is shared, a process necessary to

creating a technologically vibrant, innovative region. Regions provide a basis for using global knowledge but imbuing that knowledge with a locality that allows the region as a whole to move up the value chain.

Metropolitan could provide the focal point around which a Southern California water management and supply industry might crystallize. Beyond technologies pertaining to water supply, treatment, and conservation, other types of technologies directly affect water management and the delivery of water services. These include technologies that generate electricity and improve energy efficiency, technologies that use water more efficiently, and informatics, sensors, metrology, and management technologies that affect the ability to manage water. In acting as an active sponsor, convener, conduit for information, and possibly even technology vendor, Metropolitan could affect not only its capacity to perform its own missions but also the very nature of the region it serves.

Developing a Workforce to Meet the Vision

Critical to the successful planning and implementation of an integrated regional water service provider is a workforce that understands and embraces its more complex roles in the region. The impending high turnover of its workforce provides Metropolitan and its members with an excellent opportunity to shape its staff profile for the coming challenges. Metropolitan should take full advantage of the region's rich and diverse pool of existing talent and lay the groundwork through public-private partnerships and partnerships with regional institutions of higher learning, as well as secondary and vocational schools, to train and develop new talent.

By 2060, Metropolitan will have navigated significant changes in its workforce. New investments, maintenance practices, and operations over the next 50 years will necessitate and be made possible by changes in skills and more flexibility in responsibilities. New public partnerships with the business communities of the region will help support the changes needed to develop an educated workforce of the future, with emphasis on building competency and excellence in science, technology, engineering, and mathematics (STEM). In 2060, Metropolitan, for example, will need more employees to expand its IRP process. These employees will need to be proficient in business analysis and able to help member agencies identify the best potential local and regional partnerships. Undertaking pilot projects in intraregional water trading among members would require workers with expertise in planning, marketing, engineering, commodity trading, and finance. Communicating with Southern Californians about efficiently using water will require expertise in communicating with the public. Building contractors and gardeners, for example, will need to know how to design buildings and landscapes to manage water wisely.

Over the next 50 years, higher levels of investments in conservation and local water supplies by Metropolitan and its members could lead to the development of a sizable local

industry in water technologies and water management services in the region. By 2060, Metropolitan and its members will have invested tens of billions of dollars in local water infrastructure (grey and green), and system upgrades will contribute to job creation in the region.

Next Steps

The BRC recommends that Metropolitan brand itself as global leader on efficient and innovative water management and technologies.

As examples of actions it could take, Metropolitan could do the following:

- Create a biannual Metropolitan global forum on urban water and management.
- Expand agendas of future Metropolitan-sponsored watershed symposia and other forums to explore the evolving water–energy nexus.

The BRC recommends that Metropolitan consider different types of opportunities for taking a lead role in fostering a water service and technology innovative region.

Metropolitan could play a leading role as an early adopter of new technologies in the market, helping to affect the rate of diffusion in the region and in other markets. As examples of actions it could take, Metropolitan could do the following:

- Host prototype technology demonstration efforts.
- Partner with member agencies in their technology-adoption and demonstration efforts.
- Work with national trade associations to set clear standards for capability and performance that can guide water technology innovators and entrepreneurs.
- Work with national trade associations to set standards and determine additional steps it will take in each of the technology areas described in Table 3.1.
- Serve as a conveyer of, and venue for, meetings among entrepreneurs, innovators, researchers, investors, and water policy officials in the public, private, and academic communities for precompetitive discussions of technology and applications.
- Join state-level and regional efforts aimed at developing regional technology clusters.

The BRC recommends that Metropolitan begin a strategic planning process to assess the needs and actions to shape a workforce that meets the needs of the new business model. The plan would include new training and development programs to increase qualified and diverse personnel to meet workforce needs and reflect the region’s diversity.

Metropolitan and member agencies are already in a global competition for highly skilled workers. Collaboration among agencies in the region, as well as with the business community, in helping to “fill the pipeline” of skilled workers will be essential. To ensure that it and its members have the labor force they will require, Metropolitan should draw up a comprehensive workforce development plan in collaboration with member agencies that addresses these issues. In collaboration with its members, Metropolitan should work with the business community and colleges and universities to support and develop programs to ensure sufficient graduates in hydrology, engineering, water management, emerging water technologies, and the other skills that will be needed to run Metropolitan and its members in the coming years. To attract and retain a trained, diverse, dynamic, motivated staff, Metropolitan will need to design clear, attractive career ladders in a field that currently lacks well-established and standard job classifications.

As examples of actions Metropolitan could take on training and development, Metropolitan could do the following:

- Develop an academy for technical employee training (entry-level to senior technician).
- Develop an academy to address leadership and management needs and effective succession management processes.
- Develop regional collaborative partnerships and training programs with other member agencies and the business community.
- Partner with local community colleges and trade schools to develop and offer an industry-focused curriculum.

Benefits of the New Model to the Region, Member Agencies, and Metropolitan

Over the long term, the new model proposed in this chapter will strengthen Metropolitan’s financial sustainability and offer member agencies a compelling value proposition that will merit their continued participation in the cooperative. Table 4.4 summarizes the contrast between Metropolitan 2011 and Metropolitan 2060. Entries in bold represent enhancements or additions in the Metropolitan 2060 model.

Table 4.4. Comparison of 2011 and 2060 Metropolitan Business Models

Key Business Model Elements	Metropolitan 2011	Metropolitan 2060
Customer demand	• Develop new imported supplies to meet growing demand • Moderate demand through conservation programs and subsidies to members	• Meet growing demand through co-development (with member agencies and private sector) of an increasingly diverse mix of water • Moderate demand through proactive demand-management policies, including pricing and direct investment in efficiency programs
Diversified water portfolio and investments	• Provide imported water from CRA and SWP to supply about 50 percent of the region's supplies • Purchase supplemental supplies from agricultural users • Provide 1.5 MAF of regional surface storage • Subsidize local supply projects through the LRP	• Provide imported water from the CRA and the SWP • Make additional purchases of imported water • Increase region's local supplies by more than 50 percent • Increase Metropolitan investment in some local production • Increase regional groundwater and small-scale surface storage • Exploit energy resources through partnership or other means for cost savings and diversification of revenue
Provider of water services	• Lead IRP process • Communicate with public • Develop workforce to meet projected needs	• Lead IRP process • Increase communications with public and other audiences • Develop advanced workforce to meet needs of new model • Provide interregional storage and conveyance infrastructure • Facilitate transfers and trades • Co-finance conservation and local production

Key Business Model Elements	Metropolitan 2011	Metropolitan 2060
Finances and pricing	• Generate 80 percent of revenues from water sales, 20 percent from fixed charges and property tax • Employ average-cost pricing • Apply limited two-tiered tariff • Offer limited unbundling • Subsidize conservation and some local production	• Better align revenues with fixed and variable costs • Make revenue less dependent on sales of imports • Set prices to incentivize conservation and local production • Generate revenues from transfers, trading, and investments in local production
Governance and operations	• Operate as a cooperative among member agencies	• Operate as a cooperative among member agencies • Enter into partnerships with small groups of members and other regional organizations • Lead in creating a new workforce for 21st century • Lead proactive consumer-oriented communications to support conservation and efficiency
Leadership in technology and workforce development	<i>Not an explicit part of the 2011 business model</i>	• Increase visibility and catalytic role in technology development for improved efficiency and other purposes • Lead regional efforts to develop, train, and retain a highly-skilled and flexible workforce that reflects the region's diversity

Chapter Five. Concluding Comments

Metropolitan is positioned to play a pivotal role in Southern California for decades to come. However, the present business model will not offer enough reliability, resilience, and robustness against the range of futures that the region, Metropolitan, and its members could face in the decades ahead. In all but the most optimistic scenarios of future economic, demographic, and climate conditions, Metropolitan will need to work aggressively with member agencies to accelerate development of cost-effective and risk-minimizing local supplies, manage demand through conservation and efficiency gains, and minimize the impact of variable or declining imports on its revenue stream. Minor adjustments to the current business model are unlikely to yield sufficient change in long-term financial stability and member cohesion to weather the changes that are already under way, as well as cope adequately with large-scale and unanticipated disruptions.

Metropolitan will need to begin taking concrete actions in the near future to prepare for longer-term changes so it can remain financially sustainable and valuable to its members over the long term. The next several years are the time to initiate the planning of workforce and communication strategies, critical financial analyses, and consultations with members and others—and then act—when neither Metropolitan nor the region is in crisis. These efforts can build on and complement the adaptive management approach embedded in the IRP process. In crises, options are not always assessed with clarity and perspective; expediency undermines strategic decisionmaking. For this reason, the BRC encourages Metropolitan’s Board to consider the recommendations presented above with a sense of urgency, taking full advantage of this period of favorable conditions for strategic thinking.

The ideas and recommendations represent the BRC’s view of the direction in which Metropolitan’s Board needs to take over the long term, subject to further analysis, consultation, and public debate. For example, changes in pricing and investment strategy required to implement the vision described in Chapter Four will require years to plan, develop, and implement. All will require a high level of local, regional, and statewide collaboration and active engagement with the residents of the region, guided by a carefully considered communication plan to help pave the way for success.

Metropolitan’s Board will establish a review committee of members to receive, discuss, and respond to the BRC’s report and recommendations. The BRC looks forward to a continuing dialogue with the Board and leadership of member agencies in working together to create a strong and sustainable cooperative that sets the standard of excellence and innovation in the United States and abroad.

Appendix A. Metropolitan's Charge to the Blue Ribbon Committee

Metropolitan Board of Directors, Letter 5-G dated February 9, 2010

The mission of the Metropolitan Water District's Blue Ribbon Committee (BRC) is to make recommendations for new business models and strategies to position Metropolitan to meet our region's water related needs and to provide for sustainability for Southern California in coming decades.

The Committee will consider the best practices in California, in our nation and around the world for innovatively and effectively managing energy and water infrastructure. The intent is to identify the best strategies and practices and to use them to foster environmental stewardship, water reliability and new sources of competitive advantage for Southern California.

The recommendations will focus on strategic trends likely to impact Metropolitan in the future and vital to sustainability for our region. The Committee will focus on six key areas:

Developing New Water Options for Southern California: The BRC will consider the central importance of water supply and quality in relation to the impacts of climate change, population growth, new regulations and potential uses of new technologies. The BRC will explore integrated approaches to using imported supplies, demand management and new technologies to meet future needs and will assess experiences and best practices domestically and around the world. The BRC will consider climate adaptation [and] the ability of a system to adjust to climate change, as well as climate mitigation, actions taken to permanently eliminate or reduce the long-term risk and hazards of climate change, in its recommendations.

Energy for the Future: The BRC will consider the increasing need to actively manage Metropolitan's energy needs and resources. Metropolitan [not only will] need to control energy costs but [also] will have to ensure reliable energy supplies to transport and treat water. Metropolitan must explore a robust energy program that shifts energy from an expense to an investment, while responding to growing demands and incorporating renewable energy resources.

Economic Development and New Technologies: The BRC will consider Metropolitan's role in the region's economic development and will explore how Metropolitan can foster the development and application of new science and technologies to advance the treatment, distribution, conservation, and overall management of water and energy.

Financial Sustainability: Metropolitan must explore new energy and water supplies simultaneously as investments are being made in an aging infrastructure. The BRC will advise on sustainable business models that address how the cost of water should be best borne throughout the region and the state as well as new business partnerships and arrangements.

Workforce: The BRC will review the significant changes in the capabilities expected from the next generation of workers as well as changes in their expectations of work and make recommendations on how Metropolitan can effectively and efficiently develop the large number of skilled workers needed to replace the aging workforce throughout the water management community. The BRC will also provide insight on what Metropolitan must do to attract and maintain a skilled workforce, providing continuity and capitalizing on investments made in workforce development.

Communications: The BRC will explore how Metropolitan can enhance its public presence and integrate new media and technologies in its outreach programs. The focus will be on enhancing Metropolitan's credibility and ability to build lasting, positive relationships with all stakeholders and constituents.

Appendix B. Summary of Scenario Analysis

Two scenarios of Southern California demand and supply were developed for the BRC report. They were developed relative to the current conditions and 2035 projections for local supply development, as described by the 2010 Regional Urban Water Management Plan (RWUMP).³⁷

Two Views of the Future

Scenarios can provide a useful means of exploring the future and its implications for Metropolitan's current business model. Although trends in all the areas considered by the BRC are important, any future Metropolitan business model must address changes in the supply and demand for water. The BRC developed two different scenarios for future demand within the region, supplies of imported water, and the required new local supply development and efficiency necessary to ensure adequate reliability. The BRC then compared the estimated local resource and efficiency requirements with estimates of local resource and efficiency potential. We stress that the two scenarios are not predictions; they simply describe two potential futures intended to span a wide range of supply and demand conditions for imported water that Metropolitan could face. Given this wide range of possibilities, the Board might wish to develop a future business model sufficiently robust to allow Metropolitan, its member agencies, and the region thrive no matter which future comes to pass.

These two scenarios were first developed qualitatively, drawing on discussions with the BRC, and then quantified using Metropolitan's draft 2010 IRP and 2010 RUWMP as starting points. Although these scenarios employ specific numbers to make possible a concise quantitative description, the general conclusions are insensitive to these choices. These scenarios focus on the year 2060; they do not incorporate uncertainties in the IRP's forecasts for 2035.

One scenario describes a future in which current trends continue but unknowns do not significantly change Southern California's water landscape. This scenario reflects *moderate demand growth and sustained levels of imports*. The other scenario takes a decidedly different turn. Supply from imported sources, whether the SWP or CRA, decreases for a number of

³⁷ Metropolitan Water District of Southern California, *The Regional Urban Water Management Plan*, Los Angeles, Calif., 2010.

reasons. Demand in the service area could be higher than expected because of higher population growth and low changes in per capita consumption of water. This scenario reflects *large demand growth and reduced imports*. Table B.1 shows the key factors of the scenarios described.

Table B.1. Two Scenarios of Future Conditions in 2060 That Metropolitan Faces

Factor	Scenario: Moderate Demand, Sustained Imports	Scenario: Large Demands, Reduced Imports
Water demand	Moderate growth	Significant growth
2060 population	40% increase over 2010)	50% increase over 2010
2060 per capita urban water demand	80% of current (~142 GPD)	88% of current (~163 GPD)
Imports	Similar to today	Significant declines
2060 SWP imports	About 50% allocation (~1,000 TAF)	About 25% allocation (~500 TAF)
2060 CRA imports	Full allocation (1,250 TAF)	About 50% allocation (550 TAF)
Precipitation patterns	Similar or wetter	Drier
Delta	Ecosystem recovery and conveyance improvements	Continued decline and restrictions on pumping for export
Rulings and laws	About the same	More restrictive
Costs of local supplies relative to imports	Current trends (declining relative costs of local supplies)	Accelerating decline in relative costs of local resources
Technology	No major breakthroughs	Breakthroughs supportive of local resource development
Local supplies (over 2010 levels)	650 TAF	2,800 TAF
NOTE: GPD = gallons per day. Current per capita urban water use is 177 GPD, according to the 2010 RUWMP. Estimated local supply needs include a 250 TAF buffer (during average years) specified in the 2010 IRP. The scenario projections are based on data from Metropolitan's 2010 RUWMP. Required local supplies are calculated as the difference between the calculated scenario demands plus a supply buffer and total imports from the SWP and the CRA. The supply buffer is set to equal the difference between the modeled sum of 2010 available imports and local supplies and modeled 2010 demands.		

More Optimistic Scenario: Moderate Demand, Sustained Imports

In this more optimistic scenario, Southern California's supply of imported water remains roughly constant over the next five decades. Such a scenario might transpire if the state of California succeeds in repairing the Delta as currently planned, if the climate across the western United States—in particular, patterns of precipitation—remains similar to that of the past century, and no legal rulings or new laws reallocate significant amounts of water to environmental or other users. This scenario also assumes that the costs of imported water remain competitive with local options because Metropolitan's O&M costs increase no faster than current rates and no technological breakthroughs radically lower the cost of one or more sources of local

supplies. In this scenario, water demand increases only moderately because of population growth of 40 percent above 2010 levels, but per capita water use drops 20 percent below 2010 levels.

The left graph in Figure B.1 shows the region's 2060 water portfolio in this scenario. Much like the portfolio in the 2010 IRP, in this scenario, Southern California would obtain about 360 TAF more in local supplies than in 2010; imports would account for roughly half the region's supply.

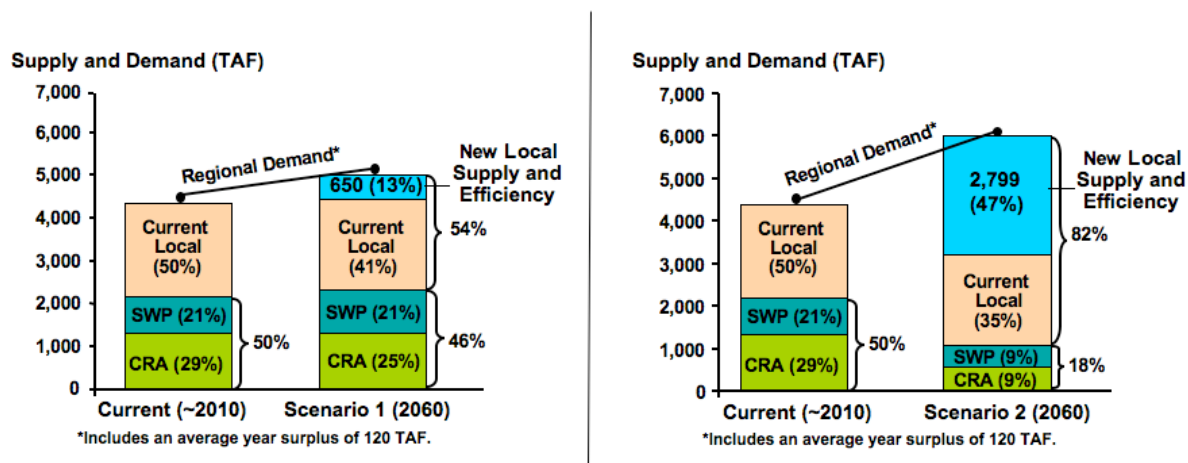


Figure B.1: Average Year Supply and Demand and 2060 Supply Mix for the Two Scenarios

More Pessimistic Scenario: Large Demand, Reduced Imports

In this more pessimistic scenario, Southern California faces significant declines in imports. Many factors might contribute to this outcome (see Table B.1 above). The state might not implement plans to restore the Delta and improve SWP yields and reliability. Prolonged and deep drought conditions might engulf the western United States, leading both SWP and CRA deliveries to decline and remain low. New laws or legal rulings might divert significant amounts of water to other uses. This scenario also assumes that the costs of imported water rise significantly compared to local supplies because of rising operating costs for Metropolitan or, if technological advances were achieved, declining costs for some types of local supplies. In this scenario, water demand increases significantly because of 50-percent growth in population, and per capita water use remains constant at 2035 levels. The right graph of Figure B.1 shows the region's 2060 water portfolio in this scenario. Imports account for less than 20 percent of demand, and the 3,010 TAF of new local supply—beyond that considered in the 2010 IRP—represents 50 percent of the region's water use.

A wide range of potential supply options are available that might help Southern California and Metropolitan develop the local supplies needed in the two scenarios presented

above. These include maximizing local rain and stormwater capture, maximizing wastewater reuse, desalinating seawater for potable use, reducing water use through efficiency, and forging new agreements with agricultural California water users to sell new supplies to Southern California. Many of these options are already part of Metropolitan's long-term plan, as articulated in its 2010 IRP and 2010 RUWMP.

Table B.2 summarizes the calculations. Demand is estimated using population projections (A), per capita water use rates for municipal and industrial uses (B), plus additional demand from the agricultural sector, Orange County seawater barrier, and groundwater replenishment (D). A planning surplus (E) for current conditions is calculated using current supply and demand balance. This surplus is assumed to increase slightly for the two scenarios (but less than implied by the 2035 IRP). Total demand (F) is the sum of the demands plus the planning surplus.

Assumptions for the SWP and CRA are provided in rows G and H. Note that the current SWP amount of 1,026,000 is set to Metropolitan's Table-A amount—actual allocations were lower. The two scenarios assume different SWP and CRA yields.

Rows I–N present current and 2035 estimates for local supplies draw from the 2010 RUWMP (2035 estimates are provided in Table 2-8 in the RUWMP). Row O totals the local supplies, and row P totals the imported (G + H) and local supplies (O). Lastly, row Q calculates the required new supplies or efficiency for the two scenarios such that supply equals demand.

Table B.2. Scenario Factors and Key Results

		Current	Scenario 1	Scenario 2
Demand				
A	Population (million people)	18.9	26.2	28.4
B	Per capita water use (M&I) (gallons per capita per day)	180	144	163
C	Demand, M&I (TAF)	3,817	4,234	5,170
D	Demand, other (TAF)	463	448	448
E	Planning surplus (TAF)	—	50	50
F	Demand, total (TAF)	4,280	4,945	5,881
Imported supply (TAF)				
G	SWP	860	1,026	513
H	CRA	1,250	1,250	550
Local supply (current + IRP supplies for 2035) (TAF)				
I	Groundwater	1,350	1,431	1,431
J	Surface water	90	102	102
K	LAA	224	230	230
L	Seawater desalination	0	0	0
M	Groundwater recovery	97	126	126
N	Total recycling	308	426	426
O	Local supplies, total	2,069	2,315	2,315
Total supply (TAF)				
P	Imported + local	4,179	4,591	3,378
Required new supplies and efficiency (TAF)				
Q	Total supply – total demand	0	650	2,799
NOTE: M&I = municipal and industrial use				

The BRC scenario analysis next considered the amount of new supply and efficiency gains that could be achieved based on a review of Metropolitan documents developed in support of the 2010 IRP and BRC. Table B.3 summarizes the new supply targeted for 2035 in the 2010 IRP along with low and high estimates for 2060 potential.

Table B.3: Local Supply and Efficiency Assumptions Used in the Scenario Analysis

Source	IRP 2035 New Supplies (TAF)	2060 Potential (Low Estimate) (TAF)	2060 Potential (High Estimate) (TAF)
Stormwater capture (above current)	—	260	520
Recycling (above current)	154	297	440
Seawater desalination	56	366	422
Urban water use efficiency (above 2035)	NA	826	1,544
Other IRP supplies (above current)	293	NA	NA

Sources for these new supply and efficiency estimates are provided below:

- Stormwater capture: Recent estimates by Metropolitan³⁸ suggest that, on average, more than 1,000 TAF of rainwater falls in the Southern California watershed and that all but 480 TAF that is captured for groundwater recharge flows into the ocean. Complete capture of this flow would thus provide 520 TAF of additional supply. This supply would be highly variable, and completely capturing all this runoff is likely infeasible. The BRC scenario analysis assumes the capture of 50 percent of this flow for the low estimate (260 TAF) and 100-percent capture for the high estimate.
- Recycling: The latest comprehensive study of water-reuse potential in Southern California identified about 750 TAF of potential water reuse.³⁹ The draft 2010 IRP calls for 464 TAF of total reuse by 2035. (Currently, reuse rates are about 324 TAF.) This suggests that an additional 286 TAF of reuse beyond the 2010 IRP would be possible. The BRC scenario analysis assumes achievement of 50 percent of this additional amount for the low estimate and 100-percent capture for the high estimate.
- Desalinating seawater for potable use: There is currently no desalinated seawater production in Metropolitan's service area, although more than 20 projects are

³⁸ Blue Ribbon Committee, *Developing New Water Options for Southern California*, undated. As of April 8, 2011: <http://www.mwdh2o.com/BlueRibbon/pdfs/Water-position.pdf>

³⁹ U.S. Bureau of Reclamation, *Southern California Comprehensive Water Reclamation and Reuse Study Phase II Final Report*, 2002.

under way in California.⁴⁰ The 2010 RUWMP states that 56 TAF of seawater desalination could be available by 2015. The 2010 IRP seawater-desalination issue paper⁴¹ identifies projects that could (if fully developed) supply an additional 370 TAF of supply for the Southern California region.⁴² This estimate is used for the 2060 low potential estimate. The potential for desalination could be larger if facility-location and environmental concerns are mitigated, the cost of seawater desalination is economically competitive relative to other sources, and the “drought-resistance” of desalination is a key driver in decisionmaking. We double the low estimate for the high estimate.

- Reducing water use through efficiency: Current California law calls for a 20-percent reduction in per capita water use by 2020. Agencies can achieve compliance through a variety of ways, which could lead to less than 20-percent reduction in water use rates by the end user.⁴³ Full compliance and continued gains beyond 2020 could save an additional 10 percent.⁴⁴ This level of savings, if applied across the entire Southern California population, would lead to 826 TAF of water savings for scenario 1. Under scenario 2, a 30-percent per capita reduction over current usage rates would save 1,544 TAF by 2060. Note that the efficiency savings are above and beyond efficiency that is specified to occur naturally, as part of the scenarios (see row B in Table B.2).
- Bringing in new supplies from other California water users: Expanded and additional agreements between Metropolitan and water users outside the Metropolitan service area but within reach of the current SWP infrastructure could increase water supplies available for Southern California. No estimate of this source is included in Figure B.1.

⁴⁰ Metropolitan, “Seawater Desalination Technical Workgroup Issue Paper,” in *Integrated Water Resources Plan 2010 Update*, Appendix A.11-1, 2010.

⁴¹ Metropolitan, “Seawater Desalination Technical Workgroup Issue Paper,” in *Integrated Water Resources Plan 2010 Update*, Appendix A.11-1, 2010.

⁴² Projects in Metropolitan’s Seawater Desalination Program could yield between 130 and 142 TAF per year. Projects outside Metropolitan’s service area could yield between 140 and 280 TAF per year. An additional amount above the 2010 RUWMP of 56 TAF is calculated by subtracting this amount from the sum of the upper range value from projects within and outside the Metropolitan service area.

⁴³ Metropolitan, *Integrated Water Resources Plan 2010 Update*, Los Angeles, Calif., 2010.

⁴⁴ H. Cooley, J. Christian-Smith, P. h. Gleick, M. J. Cohen, and M. Heberger, *California’s Next Million Acre-Feet: Saving Water, Energy, and Money*, Oakland, Calif.: Pacific Institute, 2010; P. H. Gleick, D. Haasz, C. Henges-Jack, V. Srinivasan, G. Wolff, K. K. Cushing, and A. Mann, *Waste Not, Want Not: The Potential for Urban Water Conservation in California*, Oakland, Calif.: Pacific Institute for Studies in Development, Environment, and Security, 2003.

Appendix C. Report on Interviews Conducted on Behalf of the Blue Ribbon Committee

By James A. McDermott⁴⁵

Background

The interviews on which this report is based were conducted between June 7, 2010, and August 2, 2010. Fifteen individuals were interviewed and were asked five questions. All the interviews were conducted “off the record” in order to encourage interviewees to be as candid and forthright as possible.

All the individuals interviewed have had extensive involvements in Southern California and state water issues. They understand the history, culture, and politics of water in California and especially Southern California. The diverse backgrounds of these individuals included educators, environmentalists, former water agency staff and board members, elected officials, and private-sector leaders from both for-profit and nonprofit organizations. All expressed strong opinions about the importance of planning for reliable water supplies in the 21st century and the critical role Metropolitan must continue to play going forward, not to mention the changes many of them believe Metropolitan must make in order to maintain and strengthen its role.

The following report should not be understood to imply that there was unanimous agreement on each item or that equal weight was given by every participant to every concern or suggestion that is contained herein. This report attempts to provide a broad survey of opinions taken from diverse viewpoints. With that in mind, though, it is striking to note that several common themes did emerge, and very often these themes were echoed by many of the participants.

I have also included some of the more striking and thought-provoking questions and remarks that were voiced. These do not necessarily respond directly to the five basic questions. Some of these questions and remarks were sparked by concerns that the five questions did not go to the heart of the matter or that the presuppositions behind the questions, or animating the work of the BRC, missed certain elements that were, to the participant’s mind, essential for the committee to consider in order to achieve its objectives.

A Preamble

First, it must be noted that no participant advocated dismantling or replacing Metropolitan. On the contrary several participants said that Metropolitan is one of the premier assets of Southern California, one that has played an essential role in producing the region's wealth and quality of life. Metropolitan's legacy of success, financial strength, and technical prowess are unmatched in the history of Southern California and provide a solid foundation for addressing the new century's water supply challenges.

If anything, some interviewees agreed that one of the ironic challenges facing Metropolitan springs from its history of quiet, effective success because, until recently, its successes have nearly eliminated from the public's consciousness any recognition of the challenges in supplying water to our region.

Secondly, in any discussion about changing Metropolitan, such as its business model, to what extent can the discussion be pursued if it does not include considering whether and how member agencies ought to change? What if some do not want to embrace proposed changes? For example, what if some proposals for "changing Metropolitan" entail that some member agencies' business practices and orientation to their customers and ratepayers must be affected?

These questions are put into clearer relief when one recalls that Metropolitan is a voluntary organization in the sense that there is no legal requirement to join Metropolitan. Its member agencies are unique entities with unique service areas, histories, and demands. Some are very large; others very small. Members are not required to purchase water from Metropolitan. Some rely on Metropolitan for the bulk of their water supplies, while others do not.

Changing Metropolitan, therefore, means understanding change as producing larger or smaller waves that emanate through a large field of varied organizations and communities. This reality does not mean that considerations about changing the institution are either unnecessary or doomed to frustration. On the contrary, recognizing this complexity is the first step to informing any discussion about Metropolitan's future.

As one participant observed, the watchword in any consideration about Metropolitan's future ought to be "humility." We are considering the future of a great public organization with a rightfully storied legacy whose importance to Southern California cannot be overstated.

In fact, the notion that Metropolitan might not exist in the future was raised infrequently. The usual response to that notion was the reply, "What would replace Metropolitan?" The

⁴⁵ James A. McDermott, Perspectives about the Metropolitan Water District of Southern California, December 3, 2010.

unstated answer to this question is that nothing could or should replace Metropolitan. If Metropolitan did not exist, it would have to be invented.

Metropolitan will continue to play a vital role in Southern California. Much of what follows is a discussion about how to employ Metropolitan's legacy to meet the challenges that will present themselves over the next several decades.

Five Questions

As an introduction, each person was asked to consider, since Metropolitan and its member agencies must increasingly rely on local water sources (conservation, recycling, groundwater, rainwater, and seawater), whether this meant that Metropolitan would need to shift from a producer-focused business model, which emphasizes the operation and construction of large engineering projects, to a consumer-focused model that includes a strong focus on the delivery of water services to its customers and end-user consumers.

The interviews were then structured around five questions related to this kind of business-model change:

1. *What kind of organization must Metropolitan become in order to focus more on servicing its customers?*
2. *Should Metropolitan play a leadership role in helping the Southern California become a center of innovation in new water supply and use technologies? If so, how can Metropolitan best perform this leadership role?*
3. *How can Metropolitan best help its member agencies develop new local water supplies and significantly improve their water use efficiency?*
4. *Is Metropolitan's current governance structure sufficient for the challenges of the 21st century? If not, what changes might prove useful?*
5. *Is the current mission statement appropriate for Metropolitan in the 21st century, and, if not, how should it change?*

Most participants agreed generally that Metropolitan should change or "evolve" its business model to emphasize services along with its traditional role as water importer. A fundamental dichotomy appeared around the notion of whom or what should be counted as a primary Metropolitan "customer." Everyone recognized the ultimate customers are ratepayers or consumers. Several participants were quick to add, however, that Metropolitan's 26 agencies and cities must be counted as the primary customers and that this relationship must be considered foremost as one that contemplates Metropolitan's future role.

In what follows, I attempt to adhere to this distinction by referring to Metropolitan's member agencies as its "customers," as opposed to retail and residential end users or

“consumers.” The distinctions get more complicated when it is noted that many member agencies themselves have “primary customers,” private or public water agencies and companies to which they sell or distribute water for ultimate delivery to their respective consumers.

What’s Past Is Prologue: Financial Frameworks and Reliability

Several persons emphasized that the sine qua non for successfully plotting Metropolitan’s future is to consider its past. Their point is that Metropolitan’s success has been keyed by its strong and traditionally resilient financial structure, which, in turn, has allowed the governance structure to work. Having money to do what they want is the attraction for water agencies and cities. This financial framework has been a critical attraction for member agencies. It also sustains Metropolitan’s core mission of ensuring reliable water supplies. Until relatively recently, Metropolitan has been able to recover its costs from member agencies and, ultimately, the latter’s customers and consumers through rates and property taxes in a fairly nontransparent manner, thus keeping the political costs for member agencies also low.

In considering Metropolitan’s future, therefore, one must not focus entirely on the search for new water supplies, the latest technologies, the best conservation plan, or the optimal number of member chairs in the boardroom. Developing future water policy is not simply about selecting end solutions. It is also about developing the financial structure that will sustain change. Metropolitan is a “regional wholesaler” or supplemental supplier. Its principal revenue source is water sales to member agencies; however, member agencies have no obligation to purchase water from it. This lack of an obligation to purchase water provides member agencies with, at least theoretically, the ultimate power to control the size and scope of Metropolitan’s activities.

Is Metropolitan’s traditional financial framework, based on importer/seller, still viable? “No,” said several participants. The traditional model rested on Metropolitan’s primary function of importing usually less expensive water. This model, it was claimed, has discouraged the development of local options, encouraged consumers to devalue water, and warped the relationship between Metropolitan and its member agencies. Relying only on charging higher and higher rates for imported water is not a sustainable model. The challenge is to design a financial model that is understandable and acceptable to the public and that will permit Metropolitan to simultaneously fund its ongoing operations and the changes that will be necessary to develop new sources and maintain reliability. Only within a new financial model can Metropolitan begin to plan for new projects, technologies, and a shift from the current predominant importer mind-set.

Some participants did provide clues about where to look for answers. For example, some urged Metropolitan not to underestimate the power of consumers to make rational market choices about the amount and kinds of water resources they want. Study the experiences of other

enterprises, such as gas and electric utilities. Recognize and capture the value that conservation creates for suppliers and sellers. Talk with such organizations as the Public Utilities Commission that have long experience developing rate structures. Consider new operating and financing relationships among member agencies that promote efficiencies. Supplement revenues by becoming more aggressive in exploiting Metropolitan's real estate assets through creating partnerships with wind and solar power generators.

A few participants questioned whether Metropolitan's financial framework, currently under strain from, among other causes, "successful" conservation measures (those pesky consumers), is but a temporary challenge that will be solved by the region's continuing population growth, i.e., demand.

If financial sustainability is the foundation for achieving water supply reliability, then thinking about Metropolitan's future means coming to grips with defining "reliability." Historically, Metropolitan has set a defined standard for reliability and has adopted only those operational or financial changes that either served or strengthened the standard.

Some participants were concerned about advancing new ideas for developing local water supplies and business models that would dilute or detract from meeting a defined reliability goal and a financial structure that can sustain it. As one person cautioned, any plan that relies on the public or a member agency to deliver water savings or acre-feet is "paper water." Rainwater, groundwater, wastewater, and seawater alternatives should be studied to determine costs and feasibility, but, until it is clear that any particular project will yield regional benefits and can be relied on, Metropolitan ought to carefully weigh any such investments against its existing water assets, i.e., the Colorado River and SWP.

How will the operational definition of reliability, based on growing supplies from multiple local sources, change in the 21st century? What are the public's expectations about the level of reliability? How will consumers perceive their role and responsibilities in addition to paying the bill? Undoubtedly, member agencies rely on Metropolitan's supplies of water, but what will count in the future as a reliable source or system? How will investment decisions be made? Will promising sources or technologies be shunted aside because they fail to meet a certain definition of "reliability?" Should as much emphasis be placed on "shaping demand" as is placed on "meeting demand?" The answers to these questions are more than academic. Needless to say, if the day ever comes when consumers turn the tap and water does not flow, they will demand that someone be held accountable, a criterion ever present to Metropolitan's member agencies and staff.

What Kind of Organization Must Metropolitan Become in Order to Focus More on Servicing Its Customers?

This question elicited the most responses and, more than any other question, was central to all participants' comments. The responses also focused on the relationship between Metropolitan, i.e., the central staff organization, and the member agencies it is designed to serve.

Improve Communications and Working Relationships

First and foremost was the subject of communications and working relationships between Metropolitan and its member agencies. *(To be fair, I did not interview current Metropolitan staff or Board members about this subject, and changes regarding these issues might already have been implemented.)* It was surprising to discover that not a single interviewee, including those with the closest acquaintance with Metropolitan, could describe how Metropolitan and the member agencies formally communicate with each other. The traditional avenues have been for the general manager to meet periodically, usually monthly, with general managers of member agencies, sometimes separately, sometimes in a group setting. The efficacy of this system depends on the management style of the particular general manager. The responsibility for primary communications between Metropolitan and its member agencies traditionally has been left to Board members, and, while being a critical communication avenue, the weaknesses inherent in relying primarily on the Board was noted by several participants.

There are, of course, staff interactions: Both staffs must communicate and coordinate efforts on particular projects; planning efforts, such as the IRP, require working together; certain education or media projects must be implemented jointly; and so forth. But to what extent these ad hoc interactions contribute to building better relationships between Metropolitan and the member agencies is open to question.

The following suggestions were made to improve communications and working relationships between Metropolitan and the member agencies:

- The IRP process (as distinguished from the content of the IRP) could be used as a model for how Metropolitan and agency staffs can work together on a regular basis to tackle various issues.
- Joint Metropolitan–agency staff working groups should be created and given responsibility to make Board presentations on various issues. Doing so would have the added benefit of showcasing Metropolitan and agencies working more closely together in front of the Board and help break down any sense that only Metropolitan staff control the information and recommendations being presented to the Board.

- Consider a more structured integration and collaboration between Metropolitan and the member agencies by embedding, on a regular rotating basis, agency staff at Metropolitan, and vice versa, in order to work on various projects. This could encourage and improve sharing information and perspectives by educating both staffs about local and regional concerns.

Help Member Agencies to Succeed in Their Missions

Metropolitan's legacy as a water seller and engineering titan, it was claimed, has unintentionally warped the relationship between it and its member agencies or, at the least, their relationship is too often cast in that single dimension and viewed as such by the public, the media, and the legislature. A model that describes Metropolitan as an organization designed to extract more and more money from captive customers in exchange for a dwindling resource is unlikely to be politically sustainable in the 21st century. Beyond the job of supplementing member agencies' own water supplies with imported water is the real need to help member agencies succeed in a more complicated environment.

In general, most participants said that Metropolitan can do more to help unleash the potential of member agencies and, through them, of their respective customers and consumers, and that this focus should be viewed on par with its more traditional role as builder and water importer. Since the 26 members are unique, to do so means working very closely with member agencies to understand the local realities and environmental challenges each faces, as they differ in size, water purchase needs, financial strength, consumer profile, local water sources, traditions, and reasons for having joined Metropolitan in the first place.

One participant said that the kind of organization that Metropolitan might emulate is CalRecycle, the state agency that assists cities in meeting solid-waste mandates. CalRecycle assists cities with advice on how to meet state mandates, holds numerous meetings and workshops for cities to acquaint them with changes to the law and to receive feedback and recommendations for amending the law, and acts a clearinghouse to share best practices among cities. The result has been dramatic improvements in local recycling rates, far better than what had been originally hoped for when solid-waste recycling was first mandated.

There are important tasks that Metropolitan is uniquely suited to help fulfill if the requisite goals and programs can be defined by the Board. For example, few agencies have the financial ability or staff resources, not to mention the breadth of service area, to develop and implement comprehensive regional public education campaigns about the future of our water supplies and water conservation. The need for Metropolitan to aggressively lead public education was remarked on by almost every participant. The need was couched as more than a

“feel-good” exercise. The successes of such initiatives as conservation and reuse are critically important and education will play a role as vital as rate changes and new technologies in shaping consumers’ response to change. Better-educated consumers will help strengthen system reliability.

In general, there was agreement that, as we rely more on varied local sources for water, member agencies and Metropolitan will have to “get closer” to consumers—that is, communicate with them more to understand how consumers value water, how they use it, what they expect from a water distributor, the role they want to play, and, above all else, about the choices they expect to be entitled to make.

What drives consumer demand for water? How can understanding the answer to that question help Metropolitan and member agencies right-size the supplies necessary to meet the demand? How can it assist Metropolitan in modulating the demand for water? What role does pricing play? As someone suggested, Metropolitan needs a stress test for the price/conservation relationship.

The expansion of water conservation, for example, affects not only Metropolitan’s financial structure but also its orientation to member agencies and the general public. Conservation planning and implementation relies less on top-down planning and more on bottom-up listening to consumers and responding to their market preferences—a change, some noted, that the current IRP process has yet to fully comprehend.

Provide Leadership

Part and parcel with the notion that Metropolitan has become too reactive is the notion that it must reassert itself as a leading voice in regional and statewide policy. Today, it does not seem to aspire to this role, very much in contrast to the legacy and style of its founders; however, the new era of challenges demands that Metropolitan regain that mantle. Needless to say, becoming a leader will require the collective leadership of the Board and a renewed sense of purpose and direction.

Leadership can assume different forms and serve varied ends. One participant said that Metropolitan should work to achieve (regain) stature and authority similar to effective advocacy and education organizations, such as Heal the Bay, well known and respected by the public and media for its conservation efforts on behalf of Santa Monica Bay. Being a public agency per se bestows no special authority or stature. Organizations, like people, have to earn it.

Strategically educating the public in support of Metropolitan’s mission is critical. Failing to lead on water education comes with a price, such as retarding promising technologies, e.g., water recycling. Some respondents said that Metropolitan was virtually silent as fearmongers

blocked the Los Angeles Department of Water and Power's (LADWP's) proposed recycling program. This allowed opponents to frame the message: "Toilet to Tap." It could take years to recover from this public relations damage.

People have the capacity to understand subjects that are important to them. As water prices rise and more responsibility is placed on consumers to use water more wisely, people will demand more information. Note the example of successful programs, such as ENERGY STAR ratings for electric appliances. Changing habits is as important as developing new technologies:

- Metropolitan should make more efforts to educate "influencers," i.e., elected officials, media, business, and community leaders. It should identify up-and-coming business, community, and political leaders and make special efforts to educate them about water. It needs, as someone said, "ambassadors."
- Metropolitan must become much more active in educating children about water. All successful social and health change educational movements (e.g., antismoking) target young people with school curricula and advertising.
- Metropolitan should provide more consistent public leadership for such initiatives as tax credits and rebates for new water technologies or wide-ranging programs to assist homeowners and businesses to retrofit with water-saving devices.
- Metropolitan and member agencies should take steps to positively market their "product" and defend it from private companies that sell bottled water, often relying on subtle aspersions about public water that play on the public's health concerns. Why do competitive attacks go unanswered? What message does that send to the public? One person asked whether bottled water is served at Board meetings, and, if so, why? As another person noted, it might make more sense for Metropolitan to make available to every Southern Californian a free canteen so people can fill it with tap water and not feel obliged to purchase expensive bottled water, not to mention reducing the waste from discarded plastic bottles. That is the kind of "demand" Metropolitan should encourage. Although it might seem novel to think about water in this way, it cannot escape notice that water is becoming one of the most valuable commodities in the world, with large global corporations actively seeking control of water resources and water systems. Undermining consumer confidence in the quality of water delivered by a public agency while extolling a better "product" is certainly one way for competitors to gain the public's attention. There is every reason to think that this century will see a growing battle for market dominance between "public" and "private" water.

- Educate by example. Metropolitan should consider forming a smart water use campus, including Union Station and Metro headquarters, to test and showcase water-saving devices and technologies.
- Last, public education is a critical task because, if voters and politicians do not understand the changing water system, they will be less inclined to provide Metropolitan and water agencies what they must have—namely, realistic revenue sources—in order to meet future challenges.

Should Metropolitan Play a Leadership Role in Helping Southern California Become a Center of Innovation in New Water Supply and Use Technologies? If So, How Can Metropolitan Best Perform This Leadership Role?

The short answer, most participants agreed, is “yes,” but with some caveats. No one advocated that Metropolitan should go into the business of developing new technologies in competition with the private sector. As was commented, what if Metropolitan spent large sums to develop a technology that ultimately failed? How would that be explained to ratepayers? What would be the political repercussions?

Metropolitan could explore public-private partnerships to develop and propagate new technologies; however, some urged caution, saying that, in these partnerships, there is an inevitable tension between the public sector’s service goal and the private sector’s profit goal. There was a question of whether Metropolitan has the requisite resources to evaluate and oversee new technologies or partnerships. If Metropolitan does enter into partnerships, it should set the parameters and oversee the process, which means investing the requisite staff resources to successfully perform oversight.

Some participants suggested Metropolitan should study models, such as the University of California Cooperative Extension, which marries agricultural research to the needs of farmers, or the California Institute of Technology’s high-tech incubator, which assists in transforming new inventions and discoveries into marketable products and forms ventures in cooperation with public and private organizations to boost research into new technologies and their introduction to the public. As one participant noted, ideally, Metropolitan might become an “Underwriters Laboratory” for water by working with public and private organizations in developing standards, testing and certifying, and adopting new water-creating and -saving technologies.

In terms of technology, as was noted, there are eight engineering schools in Los Angeles County alone, not to mention a wealth of public and private expertise in San Diego and the rest of Southern California. Metropolitan should reach out to these homegrown institutions to partner with them in researching and developing new technologies. This would have the added benefit, one person mentioned, of building stronger relationships with the universities Metropolitan must count on to supply it with the new scientists, engineers, finance, and marketing experts it will need in the future.

Likewise, empowering consumers to gather and conserve water can be a powerful stimulus for new inventions and marketing new technologies. If a market is created, the private sector will fill the void. What can Metropolitan learn from nonwater examples, such as the success of the iPhone, which has generated thousands of non-Apple apps? What are the platforms Metropolitan should help to develop in order to unleash the same kind of private-sector creativity?

Metropolitan should also broaden its role as an information exchange for sharing best practices with its member agencies and consumers. Innovations are occurring around the world in terms of new technologies, education and marketing initiatives, and management practices. Metropolitan should highlight promising innovations, educate the public and media about them, and encourage their adoption or adaptation, as the case may be, in service to the region's needs. Rejecting new ways to address our water future simply because they were "not invented here" is foolish.

How Can Metropolitan Best Help Its Member Agencies Develop New Local Water Supplies and Significantly Improve Their Water Use Efficiency?

Although concerns about future imported water supplies are understandable, the region does have local options to buttress traditional supplies of imported water. One participant declared that Southern California and California overall possess sufficient water resources, if we think differently and make the right investments. The challenge is not about water shortages; it is about managing our current water resources through better urban and agricultural conservation, reuse, and more efficient distribution systems.

Metropolitan, as was mentioned previously, could help member agencies by identifying, certifying, and testing on behalf of member agencies new ways to provide water more efficiently. Metropolitan can provide information about conservation technologies and work with agencies on new programs, e.g., residential rain-collection barrels modeled after solid-waste recycling, in which cities provide recycling bins to residents. Metropolitan should be active in making sure

these initiatives protect water quality. However, to be successful for Metropolitan as a whole, that assistance and collaboration must be viewed as integral to Metropolitan's mission to help agencies and consumers *create, gather, and conserve* water. That, of course, requires improving day-to-day communications and working relationships between Metropolitan staff and member agencies.

In terms of how Metropolitan can best help member agencies to develop new local supplies, those interviewed who had the most familiarity with Metropolitan said that Metropolitan must proceed with care in investing in member agencies' projects to develop new supplies or increase water use efficiency.

Fundamentally for Metropolitan, the real problem is how to make the investment decision. Investment decisions are made within a political framework. That is not meant to imply that these decisions are somehow tainted or corrupt. It does imply that a project's financial assumptions, for example, must be accepted by the staff and the Board, and anyone who has worked on large-scale development projects understands that getting to an apples-to-apples comparison is not always as simple as it might appear. How do you hold a member agency accountable for performance, getting the project built on time and on budget, and producing the amount of water or savings that were predicted? What if the project fails?

Those who commented on this question favored setting clear rules for investment decisions. Investments must make business sense and provide clear benefits, with those projects having the widest potential for creating regional benefits given priority. The most important criterion is to invest in projects that can supply water at a lower purchase price to Metropolitan than alternative investments.

Any perception that investment decisions are subject to favoritism for particular agencies over others must be avoided, a perception that some contended has a basis in Metropolitan's history. Metropolitan should not exist, they noted, only as mechanism for transferring money from agencies to subsidize other agencies' rates or projects.

In the larger scheme of things, should Metropolitan involve itself only in local projects that yield a measurable or connected "regional" benefit, however that might be defined? Interestingly, some participants said that one important consideration in thinking about the future of Metropolitan is to amend the Metropolitan Act⁴⁶ to stress the regional responsibilities of the member agencies. Is the need by some agencies for Metropolitan's assistance in developing

⁴⁶ Metropolitan, The Metropolitan Water District Act, undated annotated version. As of April 11, 2011: <http://www.mwdh2o.com/rsap/Act.pdf>

local projects and efficiency programs the lever for encouraging (or forcing) member agencies to think more regionally?

Finally, it should be mentioned that assisting local agencies in developing new water supplies did not mean for several participants solely focusing on Southern California. Although importing water could become, in the future, one of several major tasks, protecting and, where possible, securing more external supplies will remain important, and there is no reason to consider those activities to be in any way predatory or untoward, as much as some Metropolitan critics would like to tar them.

Working with the state's agricultural sector will remain an important source for supplemental supplies. After all, someone noted, there is a lot of water there. Developing win/win solutions that preserve and improve agriculture and address environmental needs while providing supplies to Southern California is a critical task. Conservation is not only a local consumer requirement but also an important statewide water management tool.

Metropolitan's responsibility for protecting Southern California's investments in the SWP and the CRA will not decrease. The competition for water resources will grow during this century. The competition will come from other states, nations, and multinational corporations. Metropolitan's success will depend more than ever on its members sticking together and working together.

Is Metropolitan's Current Governance Structure Sufficient for the Challenges of the 21st Century? If Not, What Changes Might Prove Useful?

In general, participants said, governance is important but is not the major issue facing Metropolitan. It was recognized that it is more difficult to make decisions in forums as large as the Metropolitan Board and that, over time, the water industry as a whole will have to become more efficient and agency mergers could occur. Local water agencies can do a better job serving customers, but their leadership, financial, and technical abilities vary. Metropolitan has the resources to help member agencies educate consumers, but it requires the collective leadership of the Board to set the direction. The Board of Directors is a political body that exhibits both the benefits and frustrations that come with democratic decisionmaking.

Would fewer agencies be more effective? Perhaps. A few large agencies might be more efficient in sharing resources and developing district policy; however, no one interviewed could say what the right number of agencies or Board size might be to attain those benefits, or how the process of downsizing the number of agencies would or could be accomplished.

Ultimately, the state of the relationship between Metropolitan staff and the member agencies is of critical importance. The point is not that frictions and disagreements will someday end; they will not. The real challenge is developing a new shared vision that supplements the vision that inspired Metropolitan's founders. Grappling with governance issues can be done meaningfully only within the context of understanding how a proposed governance scheme would either support or fail to support the organization's vision and mission.

Is the Current Mission Statement Appropriate for Metropolitan in the 21st Century, and, If Not, How Should It Change?

As noted previously, the appropriateness of the current mission statement did not elicit much concern from participants. Several said that it was an adequate statement that fairly portrayed what the public should expect from Metropolitan. The real question became, what is the meaning of the mission statement going forward?

The connection between considering an organization's vision in light of its mission is that a vision gives meaning to the mission statement. In the future, a future for which Metropolitan is specifically organized to inspire and create, what will it mean to provide "adequate and reliable supplies of high-quality water"? Will it mean doing more of the same, repeating the past? What will "future needs" imply? And how will supplying those needs in an "environmentally responsible way" be understood?

A Fundamental Task: Renewing the Vision

The experiences, expertise, and perspectives of each person interviewed differed, as has been noted, with some persons possessing more technical or managerial knowledge of water systems than others whose experience with water issues was acquired through political, educational, legal, or environmental backgrounds.

Notwithstanding those differences, many participants said that the fundamental challenge that Metropolitan faces lies not primarily in the realms of technology, governance, or law—even as those were acknowledged as playing vital roles in Metropolitan's future—but in first developing and agreeing on the vision that ought to animate Metropolitan through the 21st century. In other words, developing and propounding a new worldview that will set Metropolitan's strategic direction in the 21st century, just as Metropolitan's founders did in response to the challenges they faced.

What is the "world" Metropolitan wants to create, and, following on that answer, what steps must it undertake in order to realize it? Or alternatively, as one person said, before all

else—before more talk about new technologies, governance reforms, or new programs—Metropolitan must get its house in order.

The 1920s vision that animated Metropolitan's phenomenal technical and political successes as a supplemental water supplier, that helped harness the Colorado River and later the SWP in service of Southern California's water agencies, and that provided the critical assurance of reliable water supplies enabling Southern California to develop and prosper is not so much played out or obsolete as it is in need of renewal and augmentation. As remarkable as Metropolitan's accomplishments have been and continue to be, the 21st century is already demanding and will continue to demand of Metropolitan many more imaginative responses than can be gleaned solely from its inception as a water importer.

One reason commonly cited for revisiting Metropolitan's "vision" was a need to recapture a sense of common purpose, a point that was particularly important to those who decried what they saw as Metropolitan's (and "Metropolitan" as used here denotes the union of district staff and member agencies) "us versus them" atmosphere, an organizational orientation that was seen as dividing Metropolitan staff from member agencies and that produces bickering and a lack of cohesion and direction among and between member agencies, the Board of Directors, and district staff.

One source of this atmosphere was said to be based on the staff being Metropolitan-centric, forgetting or ignoring the concerns of member agencies, thereby creating a relationship that, another participant remarked, could be described as abusive. Another person commented that infighting within Metropolitan, including on its Board and among member agencies, comes with a debilitating cost—namely, fostering a reactive organization that no longer leads—a point that was illustrated by several people who agreed that state water policy is made in Northern California.

If, as someone commented, the old family feeling that used to animate Metropolitan is long gone, that does not mean that a new feeling cannot be instituted that sparks a renewed sense of Metropolitan's regional responsibilities based on an ethic that conceives member agencies as neighbors helping neighbors while also respecting the unique concerns of individual agencies.

Participants who spoke about the importance of thinking about Metropolitan's organizational vision linked it to fundamental questions about how and for what purposes the district is organized, how it develops policies and governs itself, how staff communicate and work with member agencies, how it is financed, how it anticipates and responds to change, how it is perceived by the public and the various governmental agencies with which it must work, its leadership and public education roles, and its role in guiding and encouraging technological innovation.

The ramifications of how a particular vision can broaden or constrict an organization's worldview was exemplified by some participants who criticized Metropolitan's mission as having been reduced to a "keeping the pipes filled" supplier ethic that gave undue emphasis to "upstream" water aggregation and transport and short shrift to understanding the "downstream" (end-user) demand side of water planning. This imbalance was said to warp the district's ability to foresee and comprehensively serve consumers who, more and more, are being asked to actively participate in a systemic capacity far beyond their traditional role as "consumers."

Several participants said that the supplier orientation blinds Metropolitan to fully understanding or asking crucial questions about consumer behavior and preferences. For example, it was noted that consumers have responded well to requirements to conserve more and, so far, have not rebelled en masse against higher water rates that are, in some measure, designed to encourage conservation; however, where is the demand floor? At what point will consumers say they either do not want to or cannot conserve anymore? And can conservation be encouraged effectively against a financial framework that counts savings to consumers as a loss to Metropolitan?

Other participants made the point that, although Metropolitan has cut allotments to member agencies during the drought, consumers also have achieved additional 10- to 15-percent water savings. Nobody, it was remarked, has asked what that means. Do we have enough water already? What does "having enough water" mean? Can it any longer really mean having all the water one wants, any time one wants it, for any purpose one can imagine? Is that the unstated vision and message that orients Metropolitan to Southern California? Water experts might reply, "of course not," but the question remains, how far ahead or behind is the public regarding its expectations for Metropolitan and its member agencies? Again, how far will consumers go in adapting to a new ethic? Metropolitan does not appear to be asking those questions.

One participant said that renewing the Metropolitan vision and revitalizing the mission really means a return to Metropolitan's roots—namely, "thinking big" again—but in ways that encompass new water sources, new management techniques, new technologies, and, most importantly, new roles for member agencies and consumers. Or, to put it another way, "thinking big" includes a commitment to develop a new understanding among the staff, member agencies, and, ultimately, the public, about how Metropolitan, this amalgamation of agencies and staff that has assembled incredible human, financial, and technical resources should be employed as the "tool" for enabling water agencies, their customers, and consumers to acquire, conserve, reuse, and create the water sources and services that will be needed in the 21st century.

Postscript

My initial report concluded by underscoring the need to revitalize the vision that has animated Metropolitan for more than 80 years. In order to revitalize the Metropolitan vision for 2060, what are some of questions, observations, and “lessons learned” that ought to be employed in the effort?

Approach the task from a different perspective. Rather than asking what Metropolitan wants to be in 2060, ask, *what do member agencies want Metropolitan to be in 2060?* This will necessitate each member agency to consider its own vision for 2060 and the interrelationship of that vision to others.

Reaffirm that “neighbors helping neighbors” does work. Understand and build on the success of Metropolitan’s regional approach, a success built on cooperation among cities and agencies to achieve goals that none could have achieved working independently. Metropolitan cannot survive if it devolves into the water “haves” and “have-nots.” Consider how a “regional approach” will describe and serve the needs of 2060 as opposed to 1952. Consider designing the Metropolitan partnership and operating network around the principle that an acre-foot of water developed or saved by any member agency helps every member agency. How can Metropolitan more effectively support its members in those efforts?

Effective governance starts with communication. Listen to the customers. Metropolitan’s customers are *independent* agencies with dramatically different levels of dependency on Metropolitan. They serve diverse areas and communities. How should Metropolitan, as a regional partnership, respond to those differences? A top-down “one-size-fits-all” vision cannot be responsive to the needs of 26 different agencies.

How is effective governance organized and achieved? Metropolitan “works” only when the Board, general manager, and member agency general managers are “aligned.” How to achieve alignment is the fundamental governance issue. Metropolitan must work to break down any sense of “us versus them.” In order to encourage alignment, Metropolitan should communicate more openly and effectively with the Board and agency general managers—for example, actively collaborate with agency general managers to develop Board agendas, develop joint presentations to the Board, and rely on more joint Metropolitan and agency ad hoc task forces to work on policy questions. Agency general managers have a responsibility to work together formulating draft policies and recommendations and working more closely with their respective Board representatives, especially since approximately half of the Board members have less than four years of experience. Agency general managers have a responsibility to help Board members acquire the knowledge and institutional “memory” that are prerequisites for effective governance.

To preserve independence, become more interdependent. Metropolitan's regional scope, serving a revitalized vision, can be a strength and not a threat to member agencies. Metropolitan will evolve into a more flexible network of independent partners trading and purchasing water and services in order to proactively respond to their respective consumers' demands. Markets increase independence by increasing interdependence with a network that leverages knowledge and resources to an individual agency's and partnership's mutual benefit. Markets are not perfect. Fairness demands that consideration be given to the needs of poor communities, and prudent self-interest dictates that retaining the integrity of the partnership network could demand self-sacrifice in response to extraordinary events, such as natural disasters.

Rethink "reliability." Do all member agencies want the same level of supply reliability? At what cost? What roles do increasing local supplies and conservation play in ensuring regional water reliability? Will providing future reliable water supplies depend equally, if not more, on modulating and shaping consumer demand as it does on developing new supplies? What role will educated, price-conscious consumers play in ensuring water supply reliability?

Market research and consumer education must become primary tasks. This goes far beyond the occasional consumer surveys conducted by member agencies. Contemporary marketing involves close communication with and understanding of market segments: understanding how people and corporations value and use water, their baseline beliefs, their price thresholds and barriers, their responses to current and new technologies, their desires for new services, and the most effective means to listen to and educate various audiences. Educating the public relies on listening to the public. They are two sides of the same coin. With more expensive water in the future and the inevitable demands by consumers for greater control, dialogue and education will take on even greater importance, not the least reason being the political ramifications of not doing so.

Enlarge the discussion. The public has the ultimate stake and say in Metropolitan's vision and policies. As an example, Board disputes and lawsuits about "hidden" costs and subsidies and the seeming conundrum of how to encourage the development of conservation and local supplies without damaging Metropolitan's financial structure are outgrowths of the fundamental issue that Metropolitan and its member agencies face—namely, developing a sustainable water price structure that takes into account the tension between decreasing reliance on imported water and the need to develop more local supplies, including conservation. The price of water is going to increase. Most of the general public, media, and many elected officials are ignorant about this fundamental challenge. Educate and bring the public into this discussion. Failing to openly and resolutely address this issue creates an institutional echo chamber that damages Metropolitan's ability to govern itself effectively, weakens financial stability, undermines efforts to develop local supplies and conservation, weakens regional cooperation

and Metropolitan's effectiveness as a leader in state and national policymaking, and, most importantly, sends confusing signals to ratepayers and consumers.

List of Interviewees for Blue Ribbon Committee Study

- Carl Boronkay, retired Metropolitan general manager
- Anthony J. Buzzelli, vice chair, Deloitte
- Chris Frahm, Brownstein Hyatt Farber Schreck
- Ron Gastelum, special counsel for water and energy services, Cordoba Corporation; interim executive director, Southern California Water Committee
- Lee Harrington, executive director, Southern California Leadership Council
- Richard Katz, Richard Katz Consulting; former member, California State Assembly
- Sheila Kuehl, former member, California State Senate and Assembly
- Jack Kyser, senior vice president and chief economist, Los Angeles County Economic Development Corporation
- William Luddy, Carpenters/Contractors Cooperation Committee
- Fred Muir, chief executive officer, Rose and Kindel
- Phillip Pace, president, Pace Development
- Rita Schmidt Sudman, executive director, Water Education Foundation
- Jim Thebaut, president, Chronicles Group
- Dennis Washburn, founding mayor and councilmember, City of Calabasas



Board Retreat

Metropolitan's One Water Approach



Definition

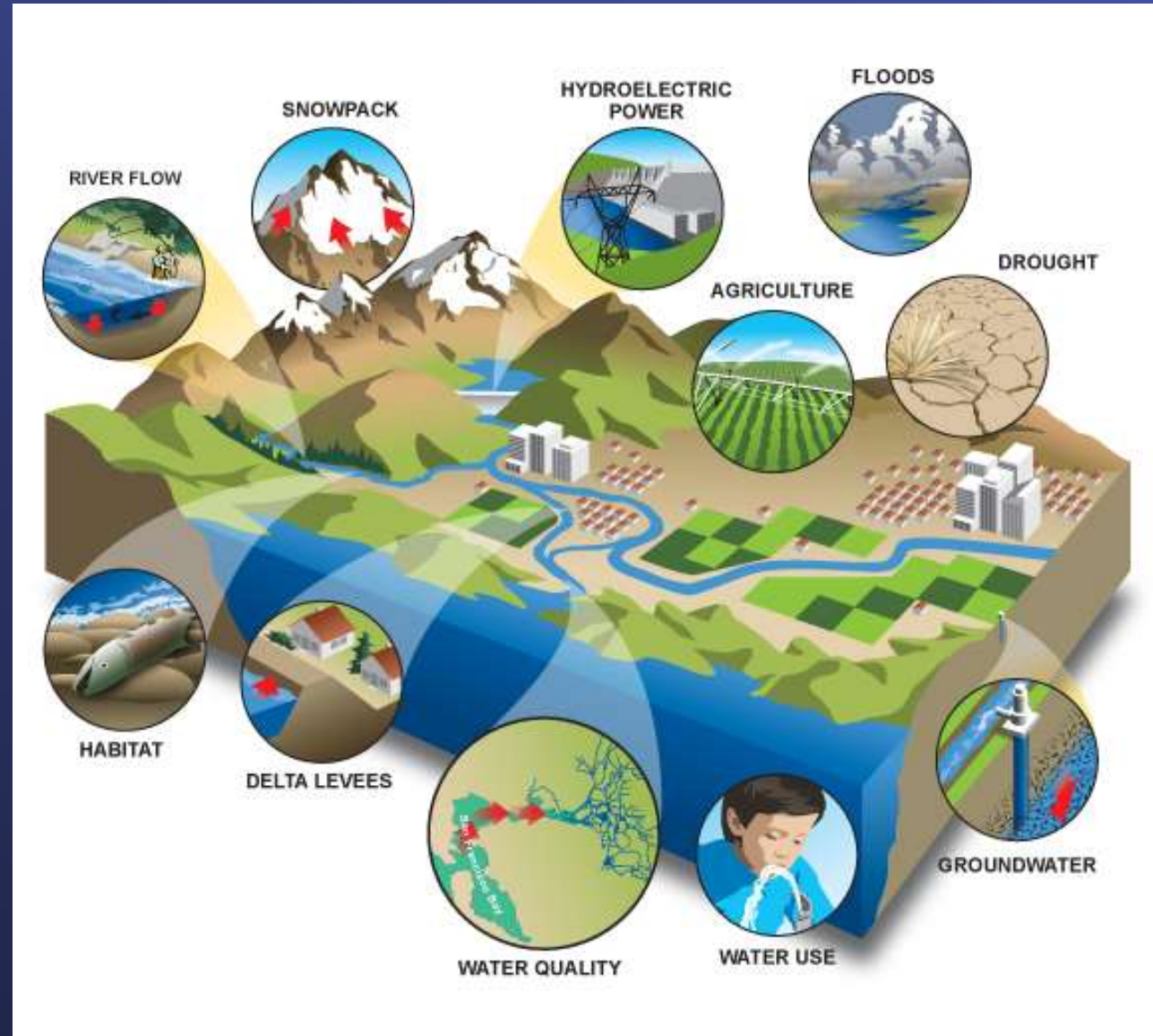


“An integrated planning and implementation approach to managing finite water resources for long-term resilience and reliability, meeting both community and ecosystem needs.”

The mission of the Metropolitan Water District of Southern California is to provide its service area with adequate and reliable supplies of high-quality water to meet present and future needs in an environmentally and economically responsible way.



Water Resources Are Connected



Source: CDWR Fact Sheet



One Water and Metropolitan

One Water Expands our Thinking

- Metropolitan's mission and activities overlap with One Water
- One Water expands Integrated Resource Planning
- One Water recognizes the value and connectedness of all water resources
- General Manager's Strategic Priorities emphasize One Water concepts

One Water is a National Movement



Across the Country and across our industry, there is a recognition that we must take a holistic approach to water supplies.

We have to plan for quality, reliability, sustainability, and affordability, all amid the disruption of climate change.

Metropolitan Is Positioned to Lead One Water

Regional Integrated System



New Local Supplies



Cooperative Structure



Cutting Edge Technology



The logo graphic consists of four concentric, teardrop-shaped outlines in shades of blue, with a solid white teardrop in the center. The text "One Water" is overlaid on this graphic.

One Water

THE METROPOLITAN WATER DISTRICT
of SOUTHERN CALIFORNIA

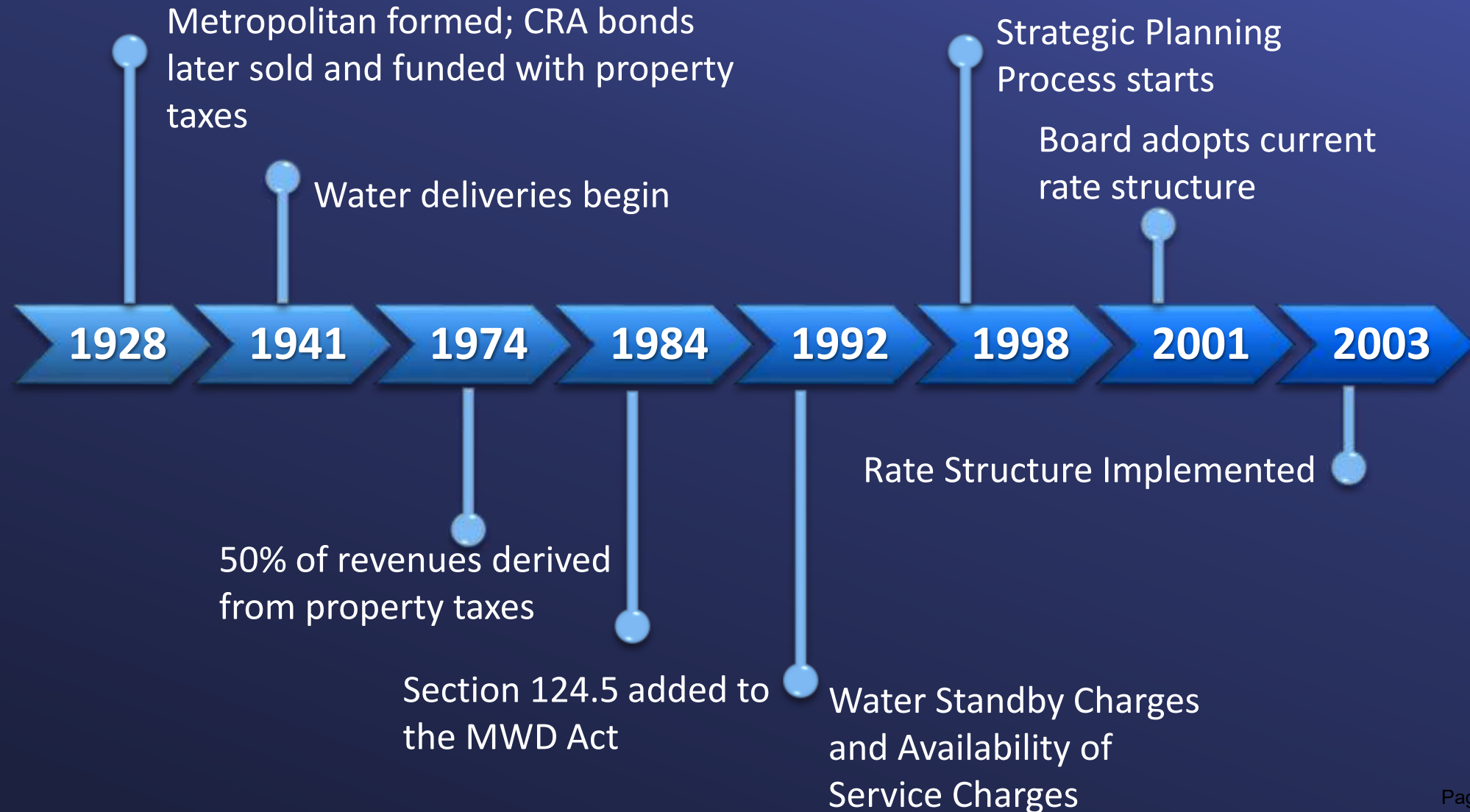




Board Retreat

Finance Overview

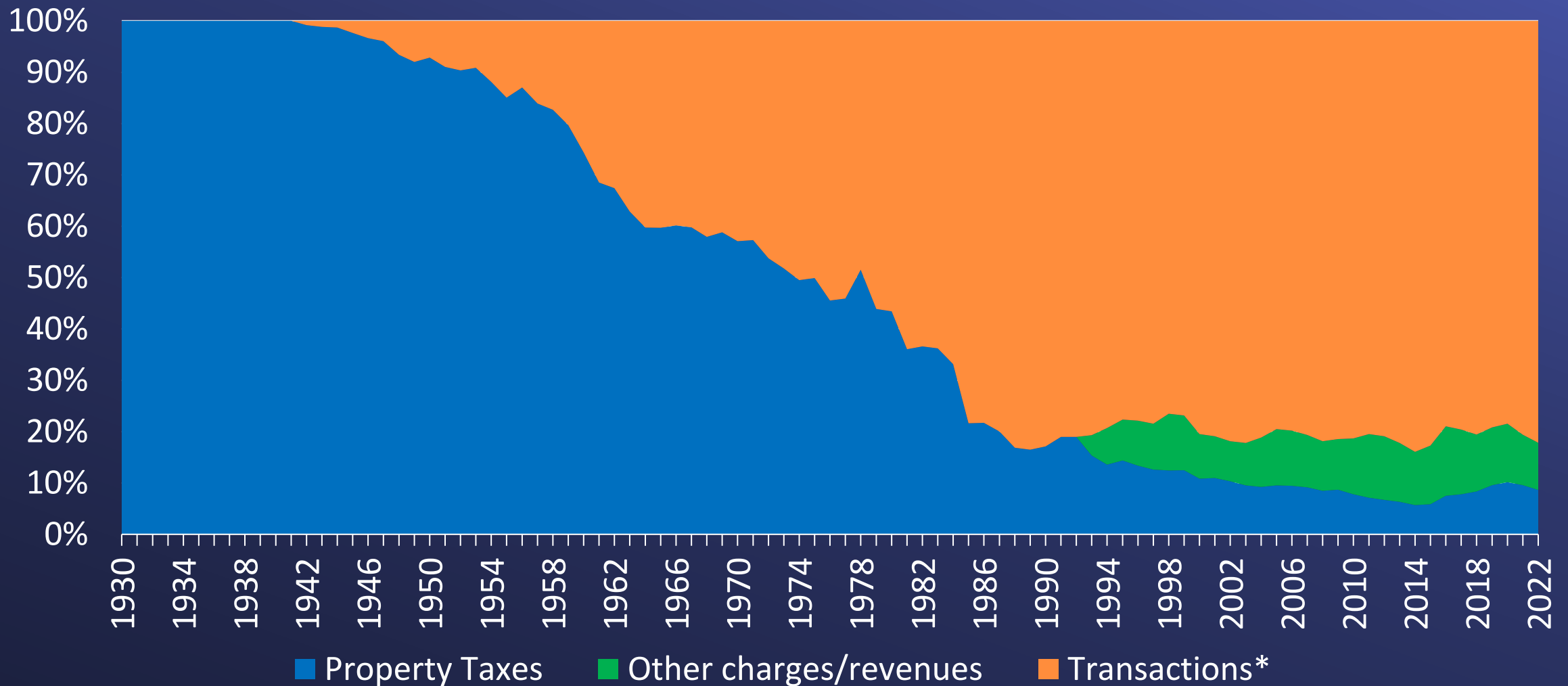
History of Rate Structure



Existing Rate Structure Framework



Historical Revenue Sources



* Includes water sales, exchanges and wheeling

Rate Structure Components

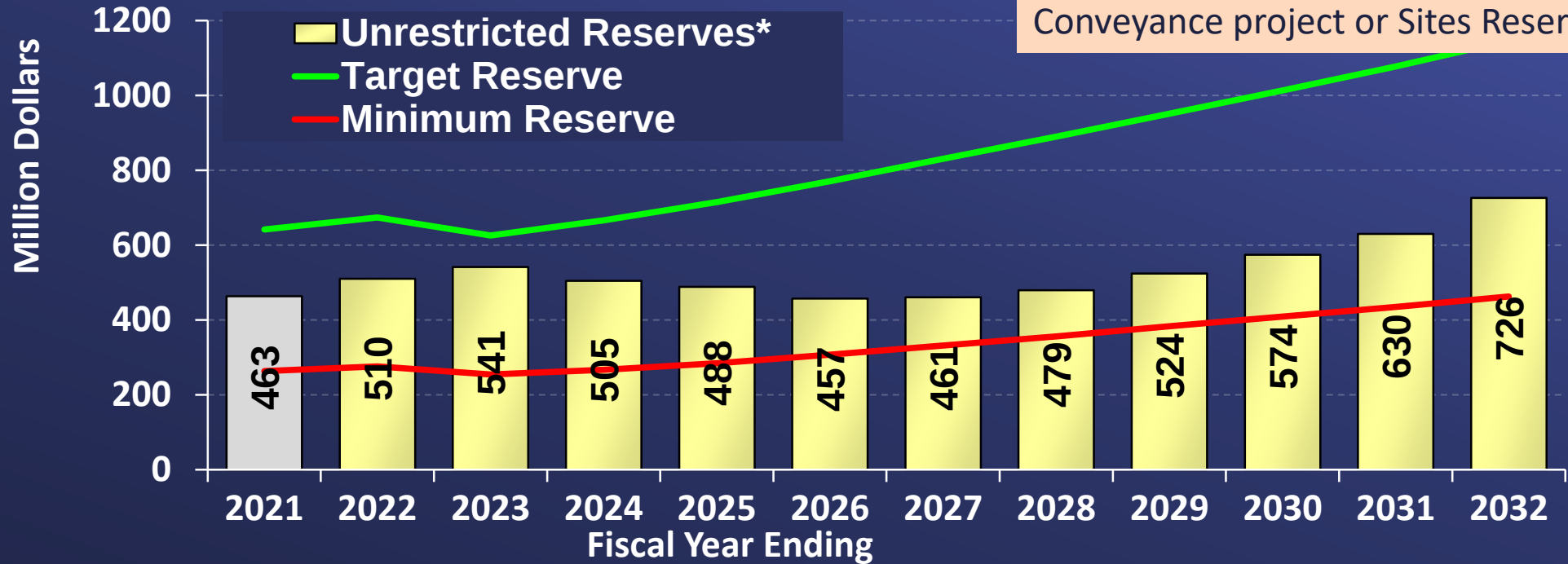
Rate Design Elements	Costs Recovered	Type of Charge
Tier 1 Supply Rate	Supply, Demand Management	Volumetric (\$/af)
Tier 2 Supply Rate	Supply, Demand Management	Volumetric (\$/af)
System Power Rate	Power	Volumetric (\$/af)
System Access Rate	C&D (Avg Capacity)	Volumetric (\$/af)
Treatment Surcharge	Treatment	Volumetric (\$/af)
Capacity Charge	Peak Dist. Capacity	Fixed (\$/cfs)
RTS Charge	C&D/Emergency Storage	Fixed (\$M)

Historic and Projected Overall Rate Increases



Biennial Budget Approved in April 2022

Long-Term projection includes \$3.7B PWSC Project but does not include a Delta Conveyance project or Sites Reservoir



Overall Rate Inc.	3.0%	4.0%	5.0%	5.0%	7.0%	6.0%	6.0%	6.0%	6.0%	5.0%	5.0%	5.0%
Water Transactions (MAF)**	1.52	1.60	1.59	1.54	1.54	1.51	1.53	1.53	1.54	1.55	1.55	1.57
Rev. Bond Cvg	2.0	1.6	1.5	1.4	1.6	1.6	1.7	1.7	1.8	1.8	1.8	1.8
Fixed Chg Cvg	2.0	1.6	1.5	1.4	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.7
PAYGO, \$M	110	135	135	135	175	175	175	175	200	200	200	200

* Revenue Remainder and Water Rate Stabilization Fund

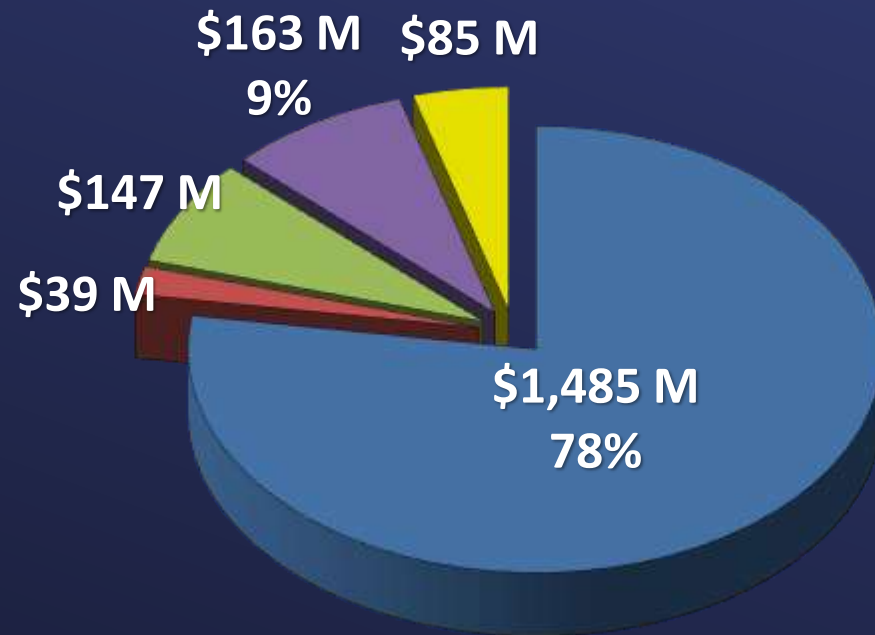
** Includes water sales, exchanges and wheeling

Revenues

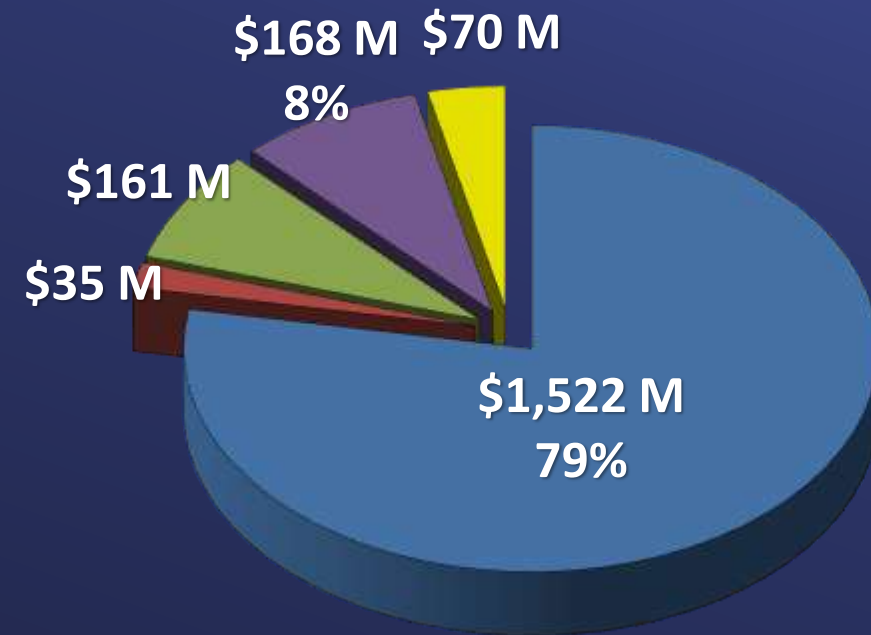
~80% revenues are variable

■ Water Transactions* ■ Capacity Charge ■ RTS Charge ■ Property Taxes ■ Misc.

FY 2022/23 - \$1.92 B



FY 2023/24 - \$1.96 B



*from water sales and exchange

Expenditures

~ 80% of expenditures are fixed

Capital Financing

State Water Contract (1)

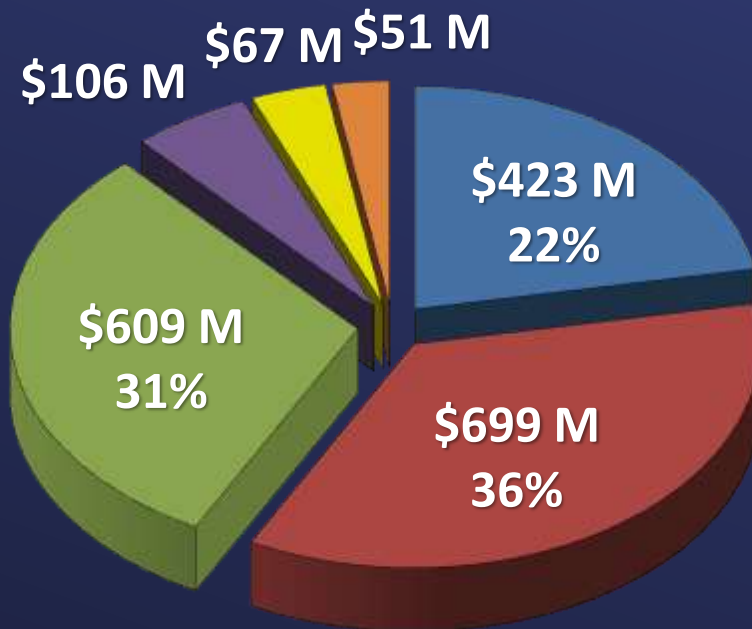
O&M (3)

Colorado River Power

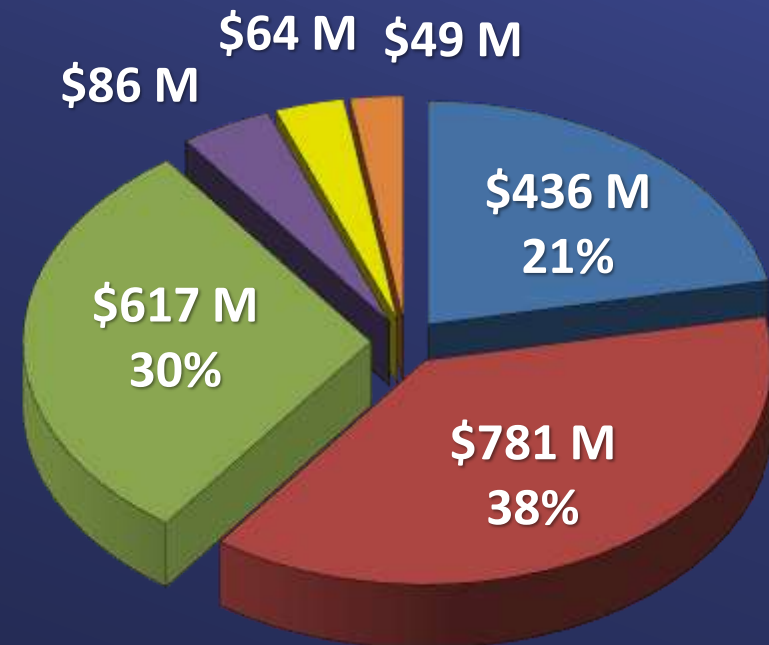
Supply Programs (2)

Demand Management (2)

FY 2022/23 - \$1.91 B



FY 2023/24 - \$1.95 B



(1) with Delta Conveyance Project planning costs

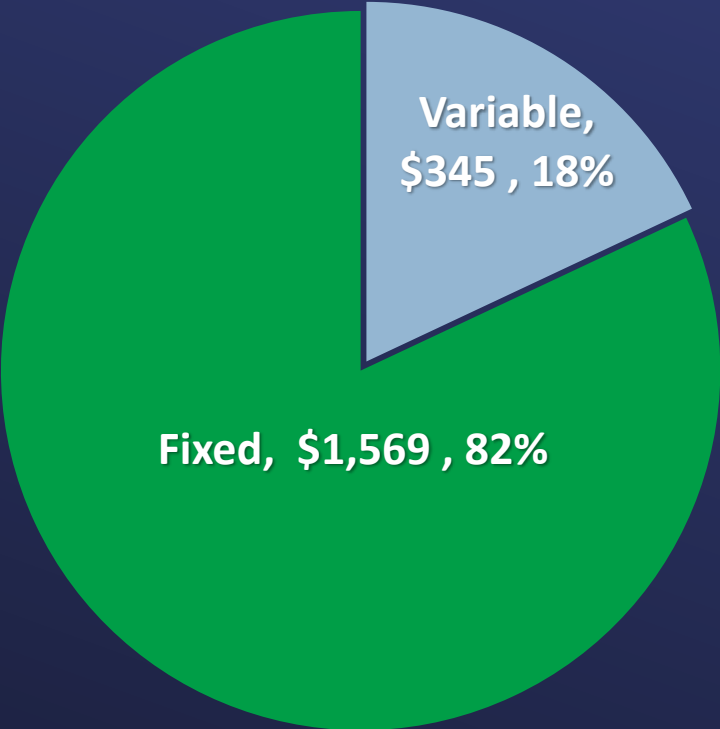
(2) cash funded portion

(3) includes planning costs for RRWP

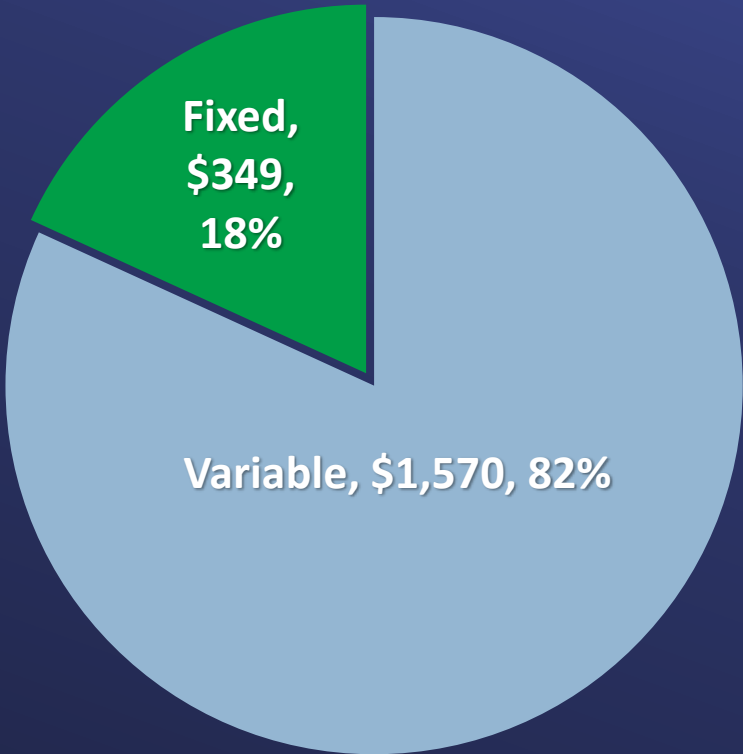
Challenge: Fixed Costs vs. Variable Revenues

2022/23 Budget

Expenditures



Revenues



Proposed CIP for FY 2022/23 - 2023/24 by Program

Programs

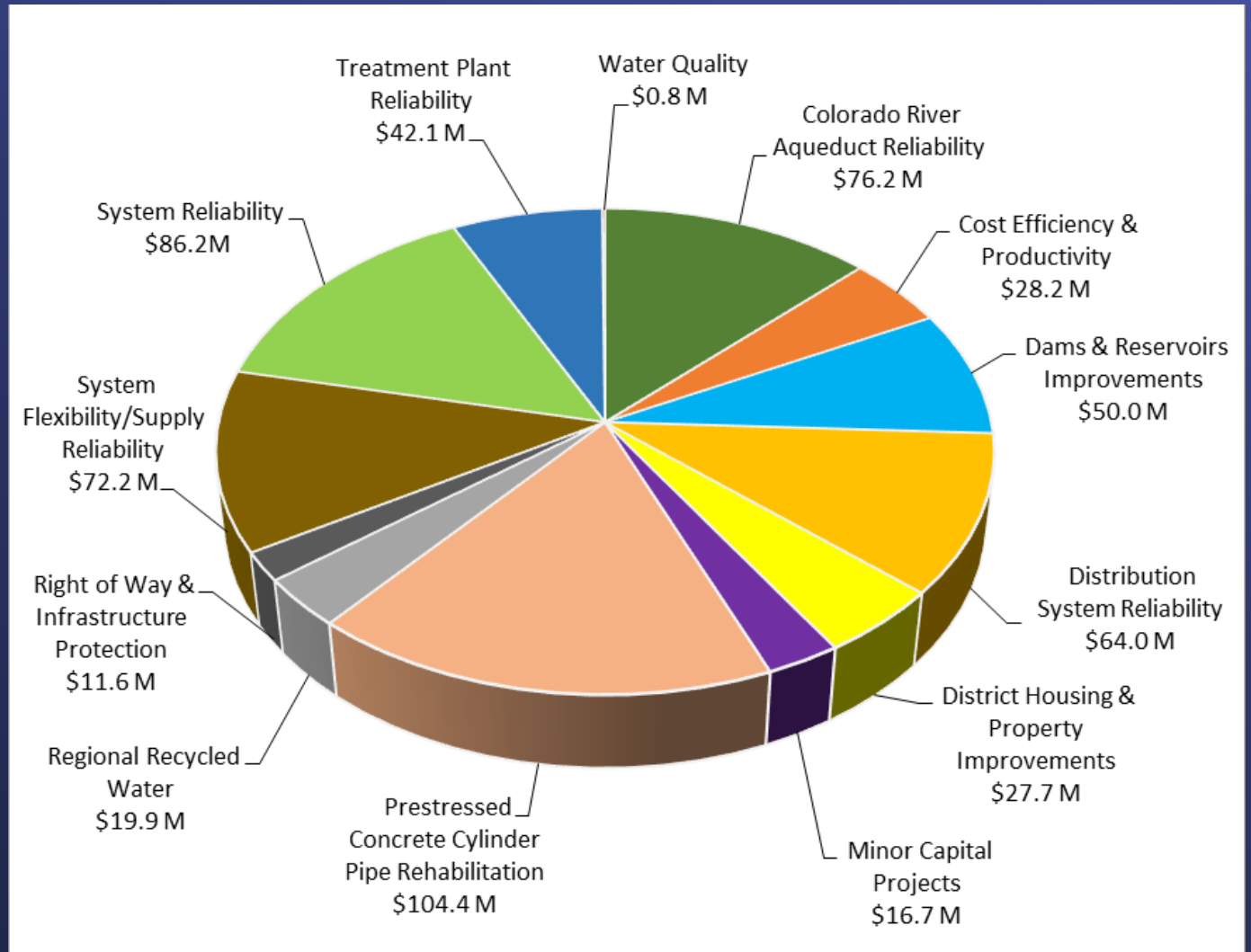
13



Projects

450*

* Excluding Minor Capital Projects



Long-Range Finance Plan - Timeline

Activity	2022			2023								
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Guiding Principles												
Outline												
Financial Policies												
Project Funding Options												
Scenario Analysis - Phase 1												
Drafting/Revising Report												
Workshops												
Workshop 1: Member Agency Managers (MAM)												
Workshop 2: Board												
Workshop 3: MAM												
Workshop 4: Board												
Board Info Item: Phase 1												
Workshop 5: MAM (Placeholder)												
Workshop 6: Board (Placeholder)												
Board Action Item: Phase 1												

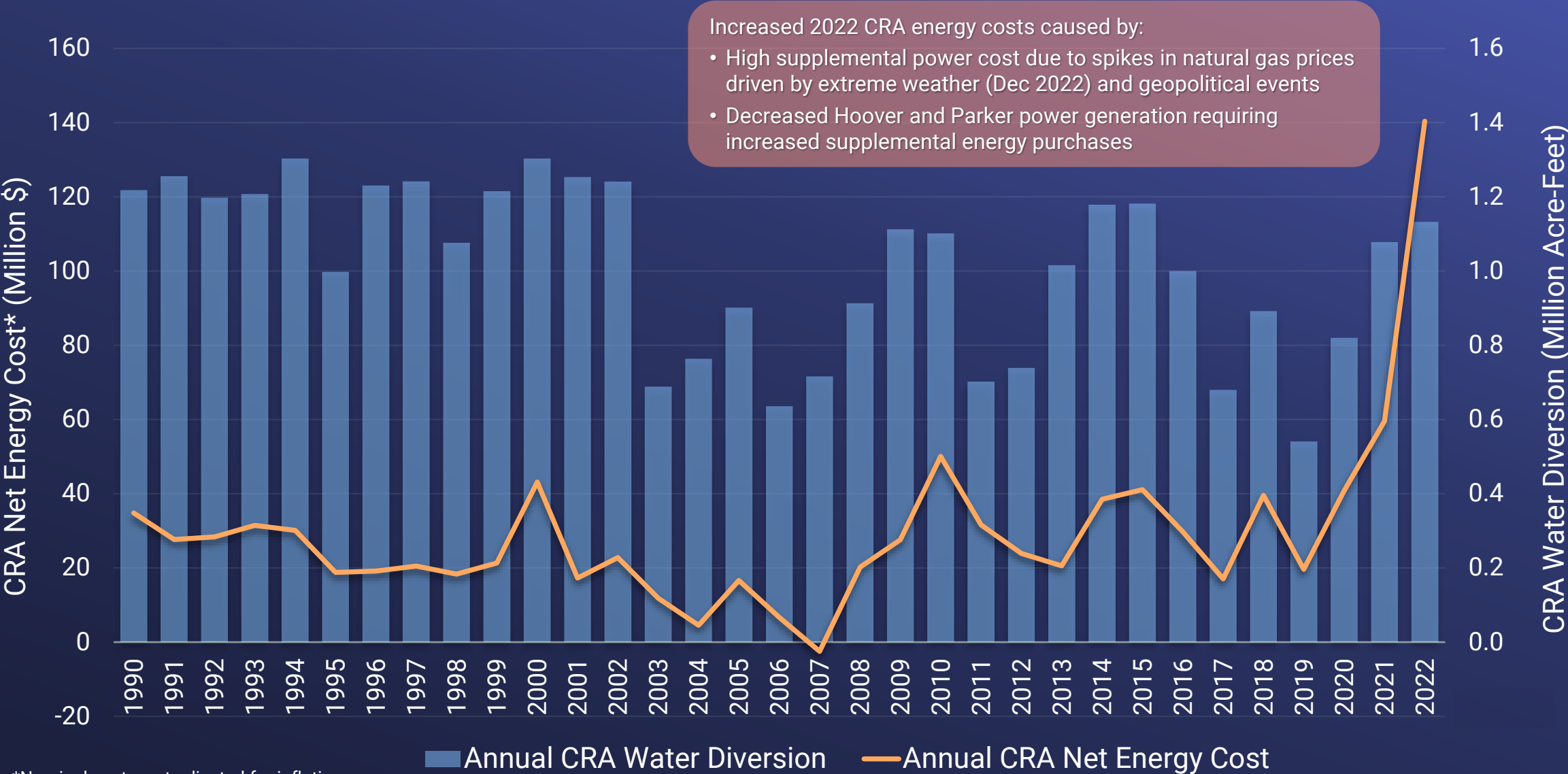




Board Retreat

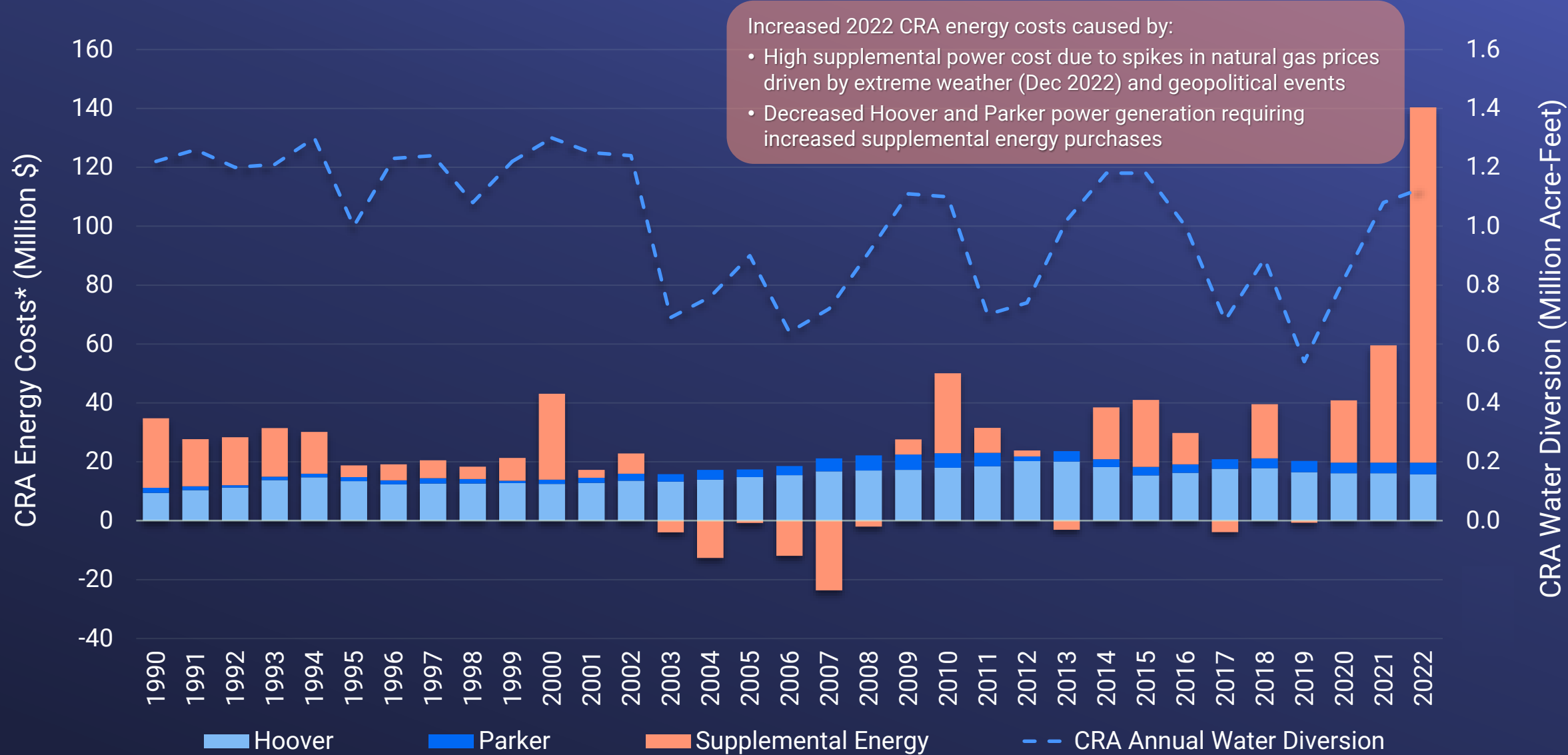
Energy Costs of Imported Supply

Colorado River Aqueduct Energy Costs, 1990-2022

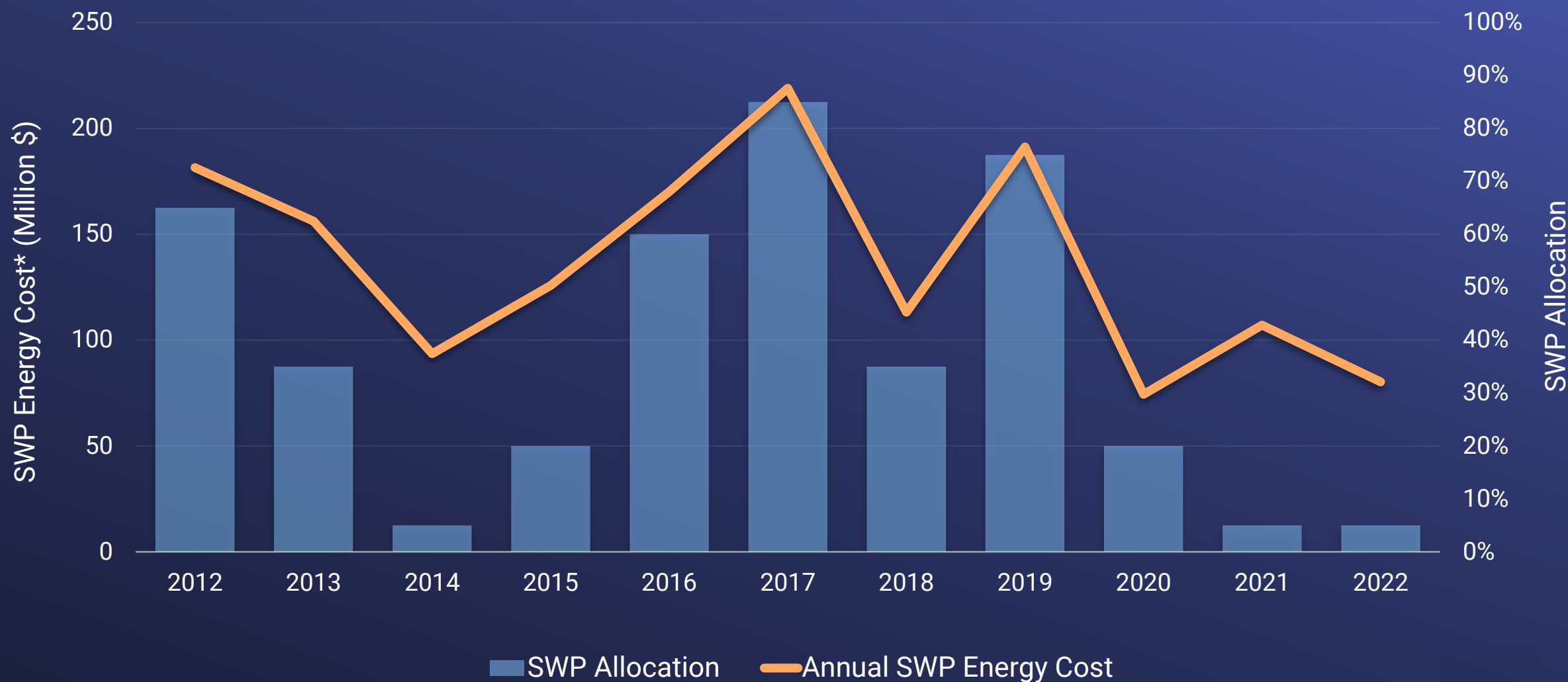


*Nominal costs, not adjusted for inflation

Colorado River Aqueduct Energy Costs, 1990-2022

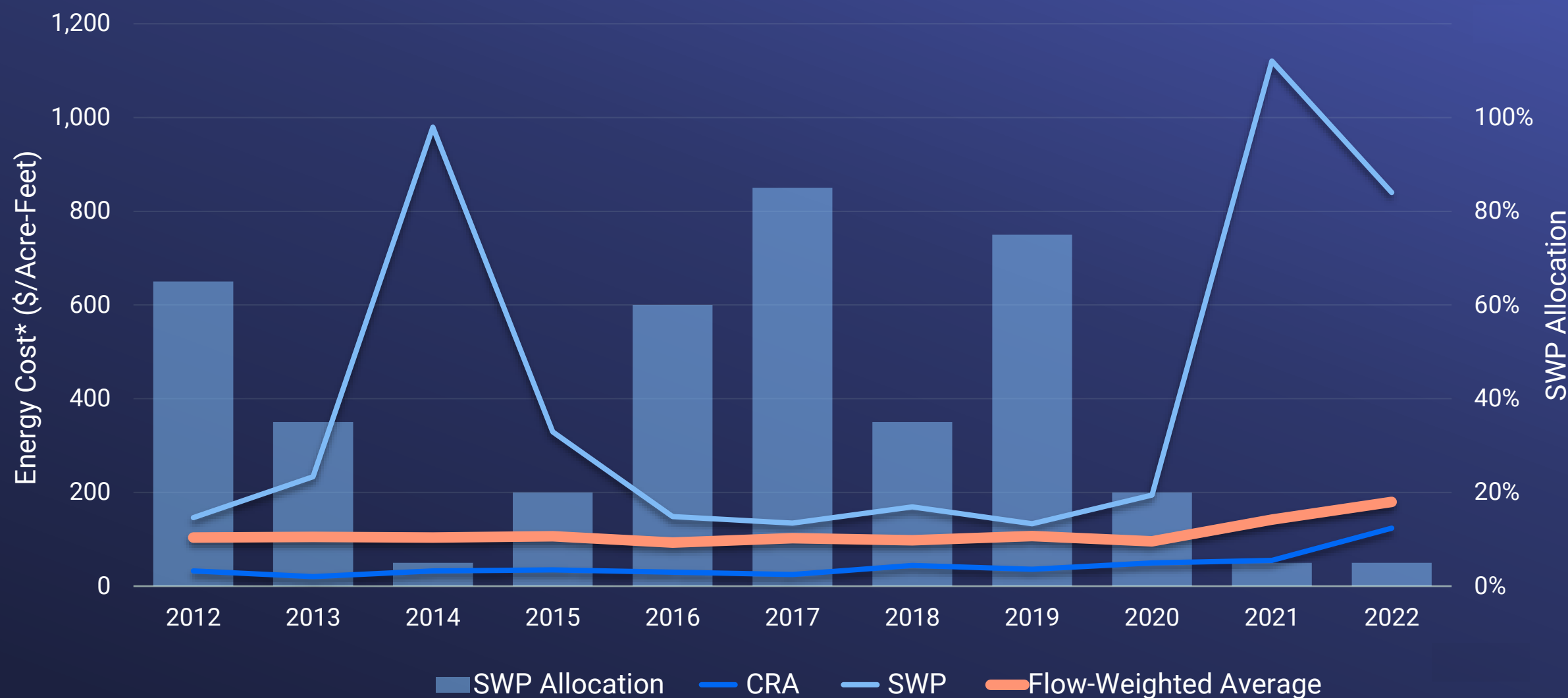


SWP Energy Costs, 2012-2022



*Cost to Metropolitan (nominal costs, not adjusted for inflation)

Imported Supply Energy Unit Cost, 2012-2022



*Nominal costs, not adjusted for inflation





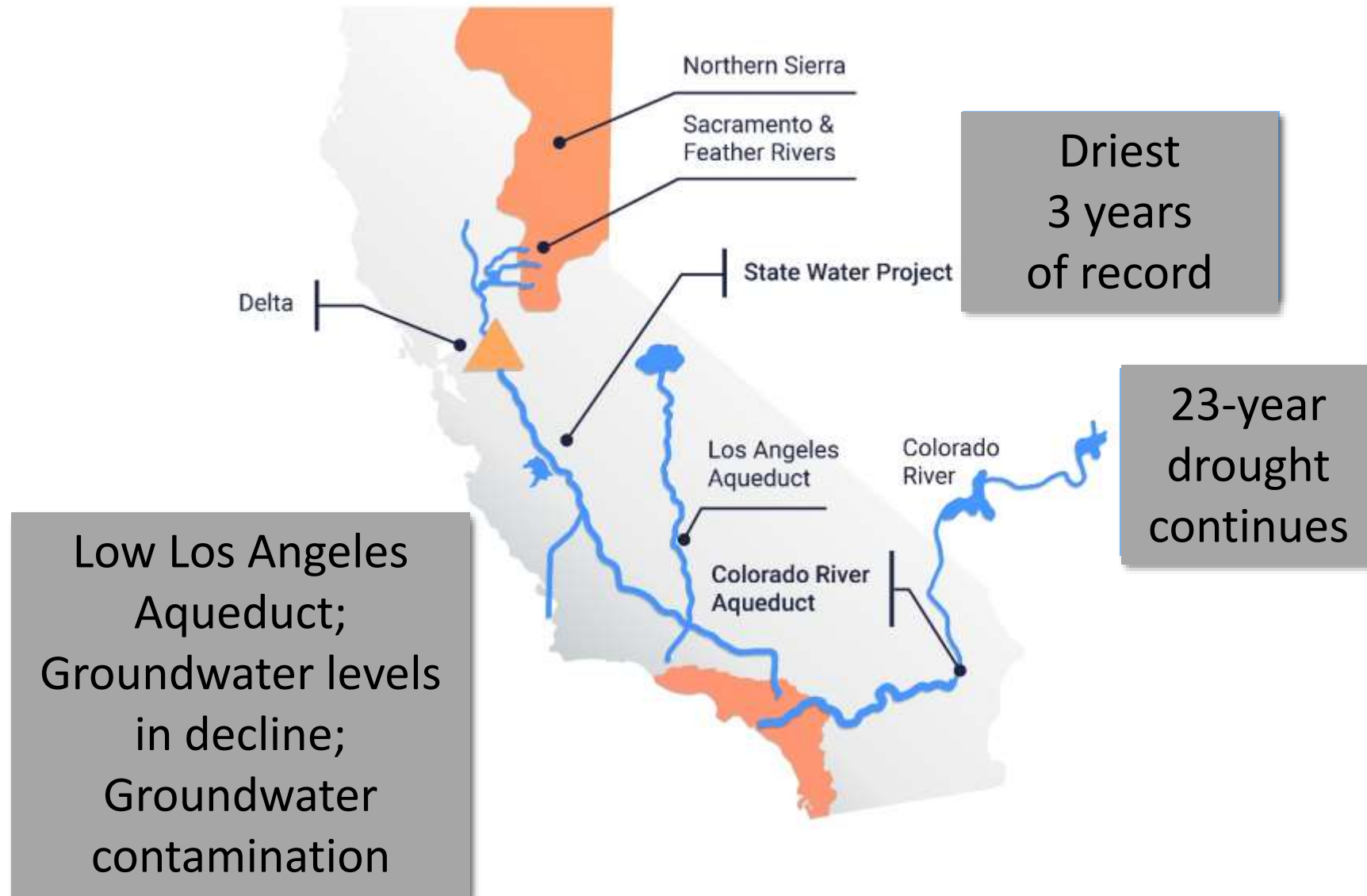
Board Retreat

Supply Overview

February 13 and 14, 2023

Challenges

Southern California's Water Sources are Stressed

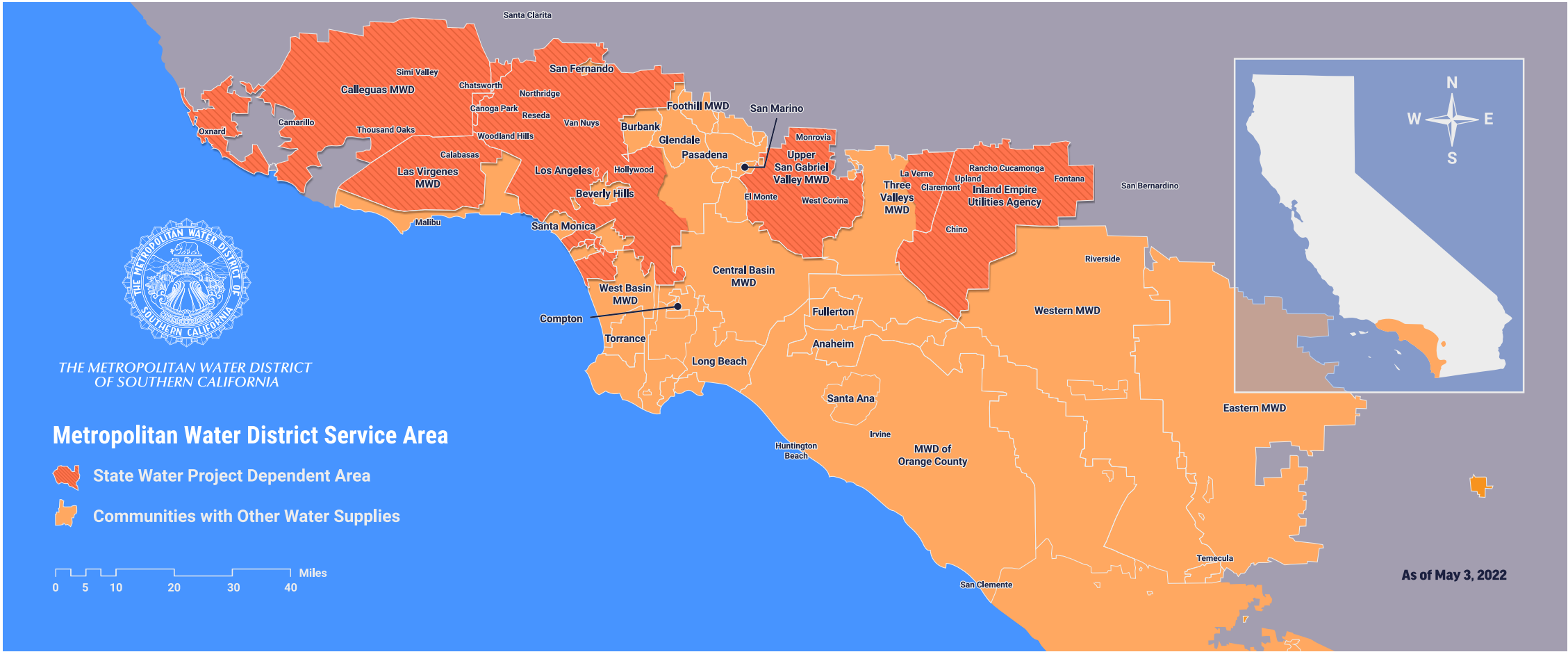


Flexible Supply System is Maxed Out



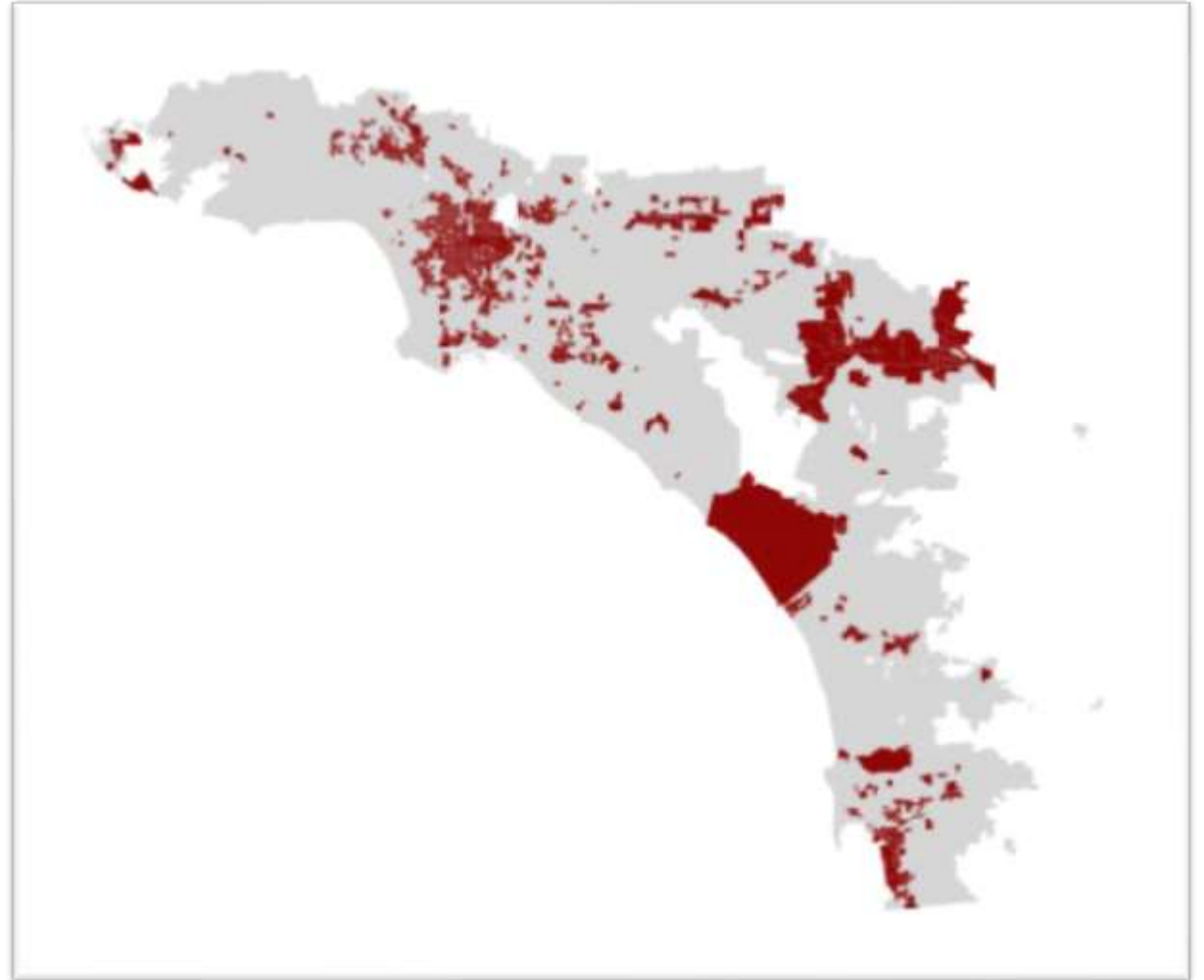
Infrastructure limits reliability when calling on Colorado River or Diamond Valley Lake

Water supply to one-third of the population was restricted



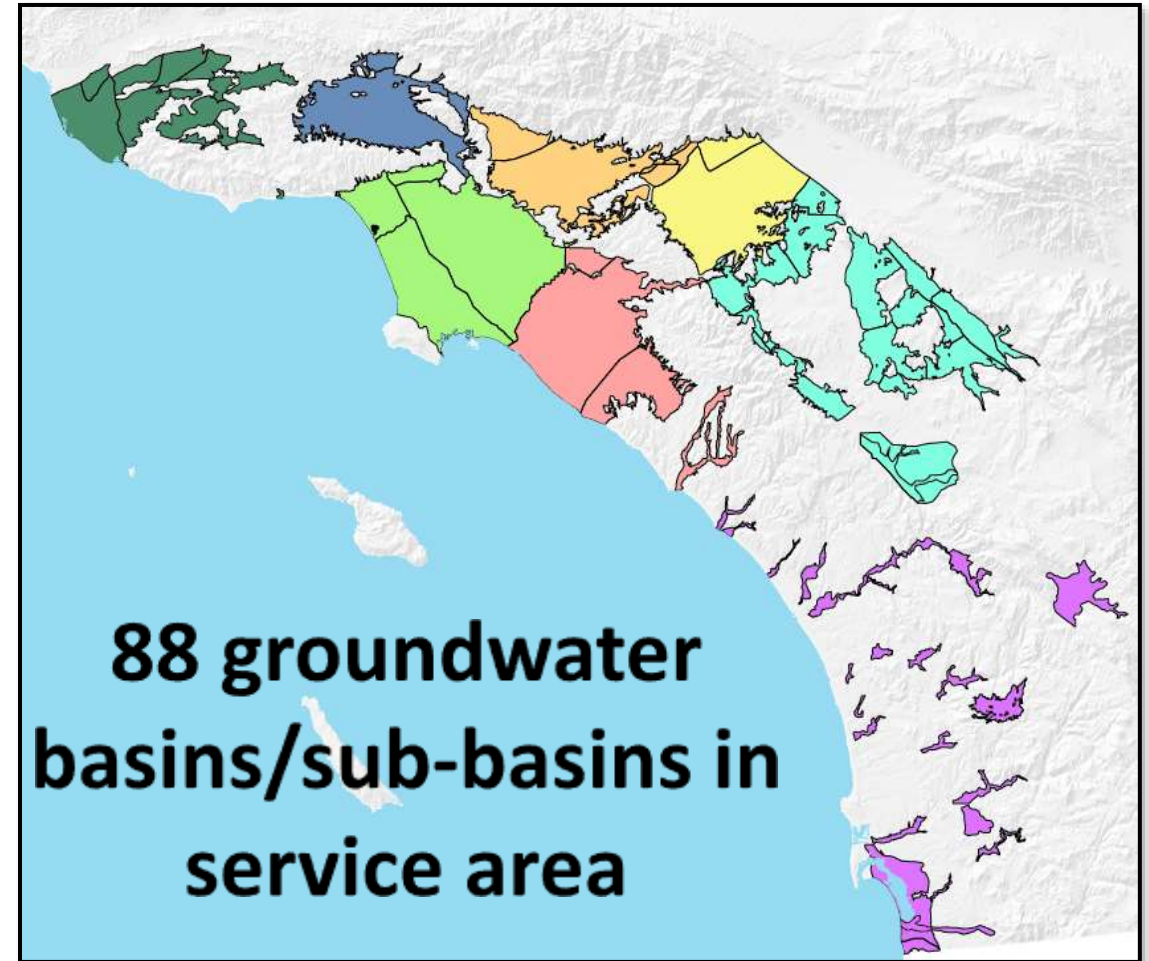
Another third of the population lives in underserved areas

- 2020 US Census data median household income (MHI)
 - Red shows tracts where household income is less than 80 percent of California's median
 - **31 percent** of the population lives in these areas



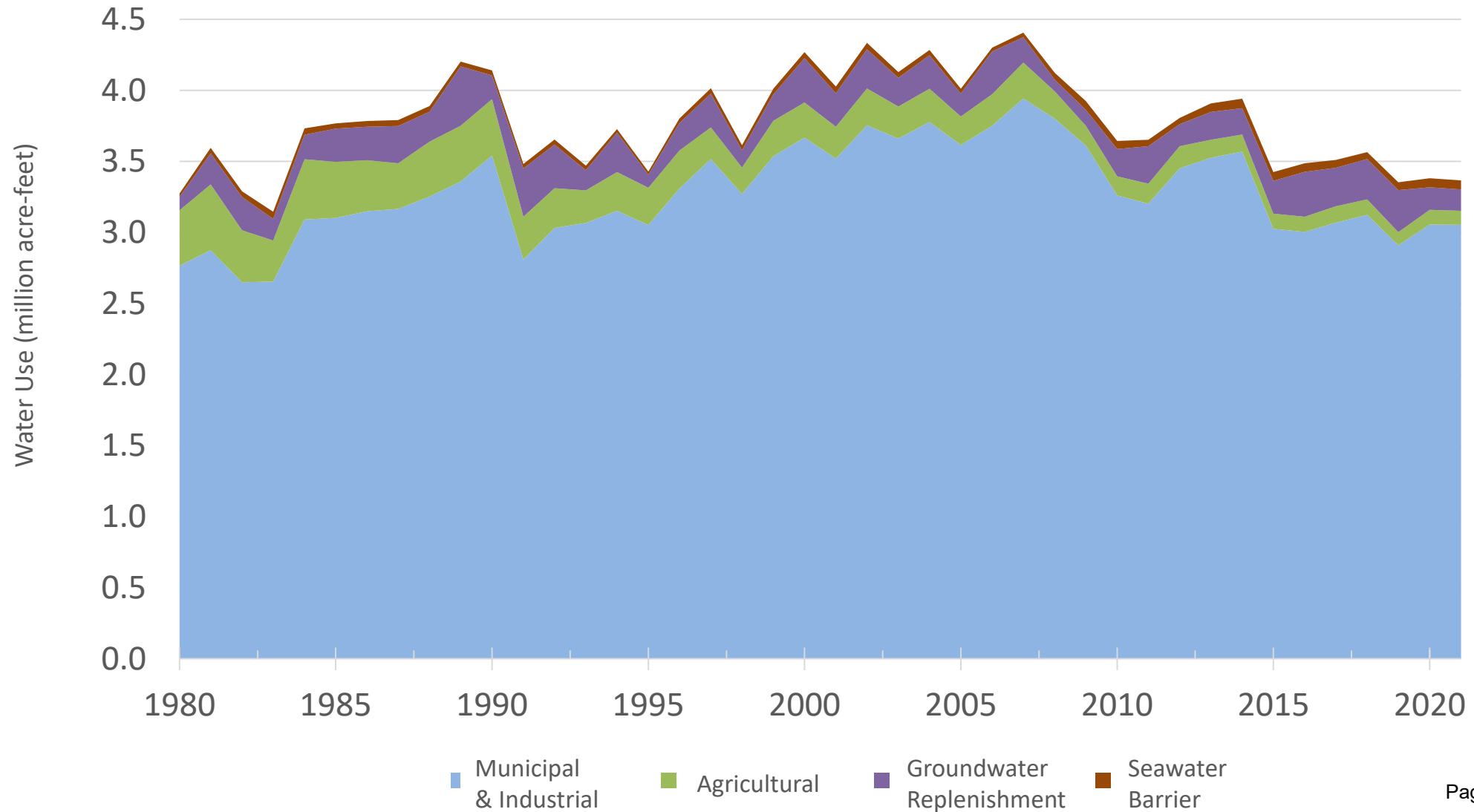
Groundwater basins support the region but are also at risk

- Groundwater provides over one-third of regional supply
- 89 percent of basins are managed or adjudicated
 - Recharge declining since 2000
 - Deficit of 1.1 MAF since 2000 (as of 2018)



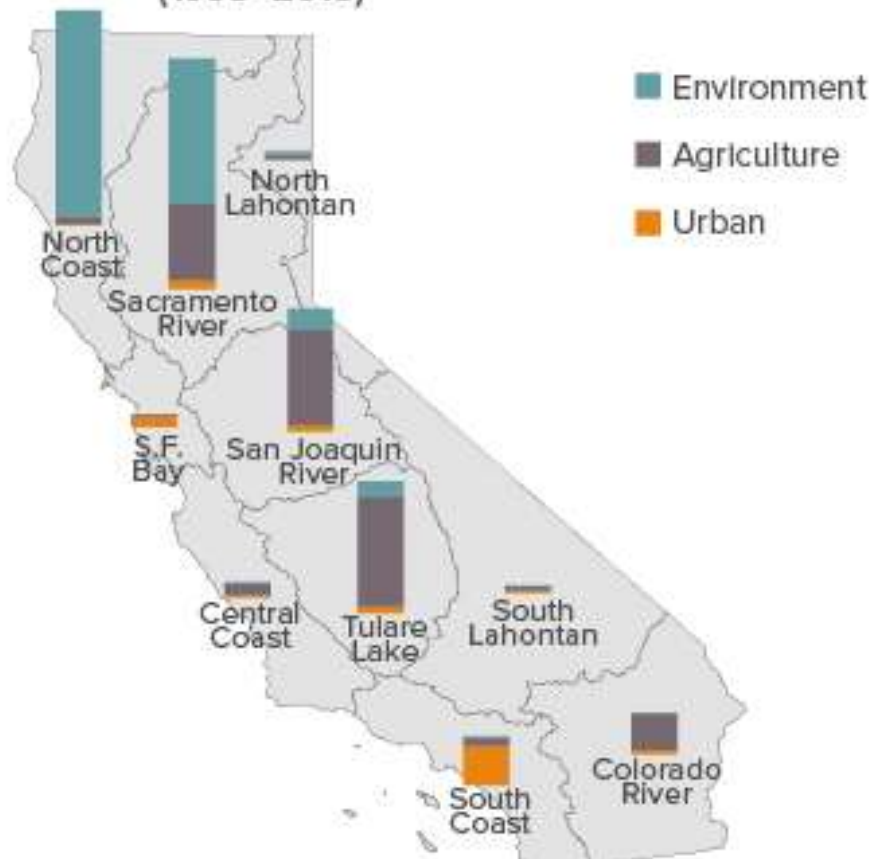
Historical Information

Water Uses in the MWD Service Area



Statewide Water Use Varies by Region and Year

Average annual applied water use
(1998–2015)

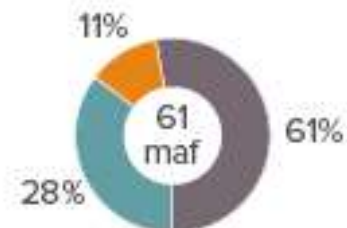


Statewide applied water use,
millions of acre-feet (maf)

Wet year (2006)



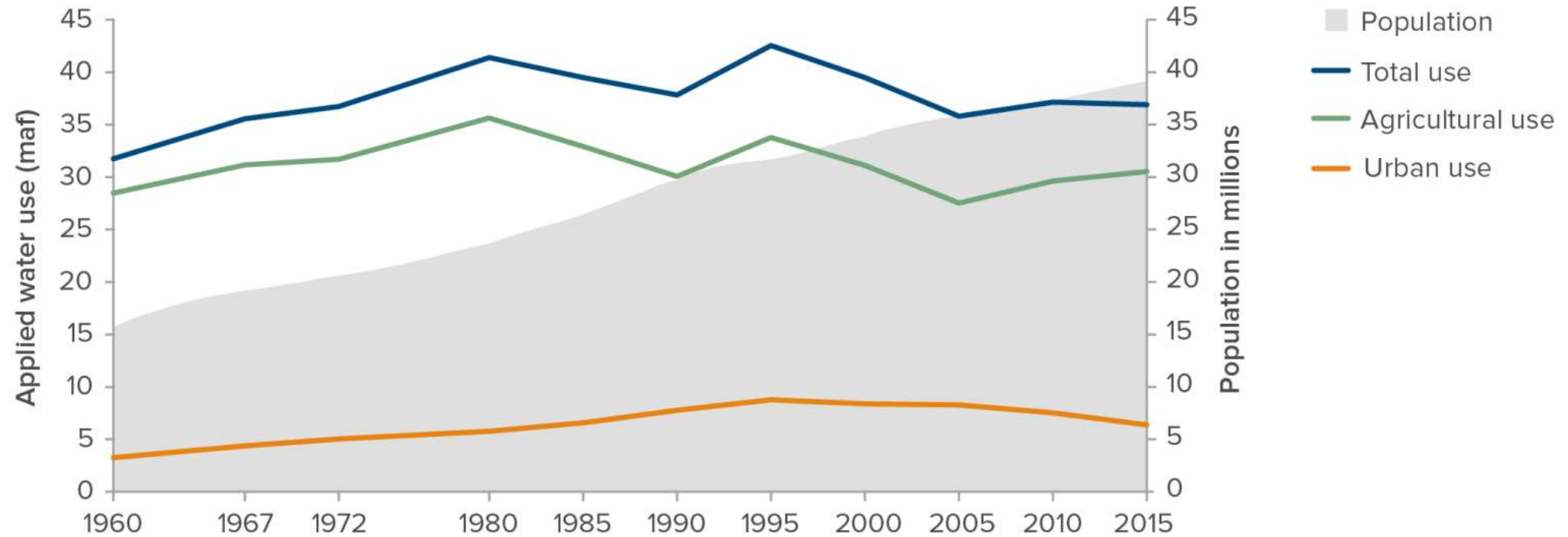
Dry year (2014)



PPIC (2019)

Page 207 of 259

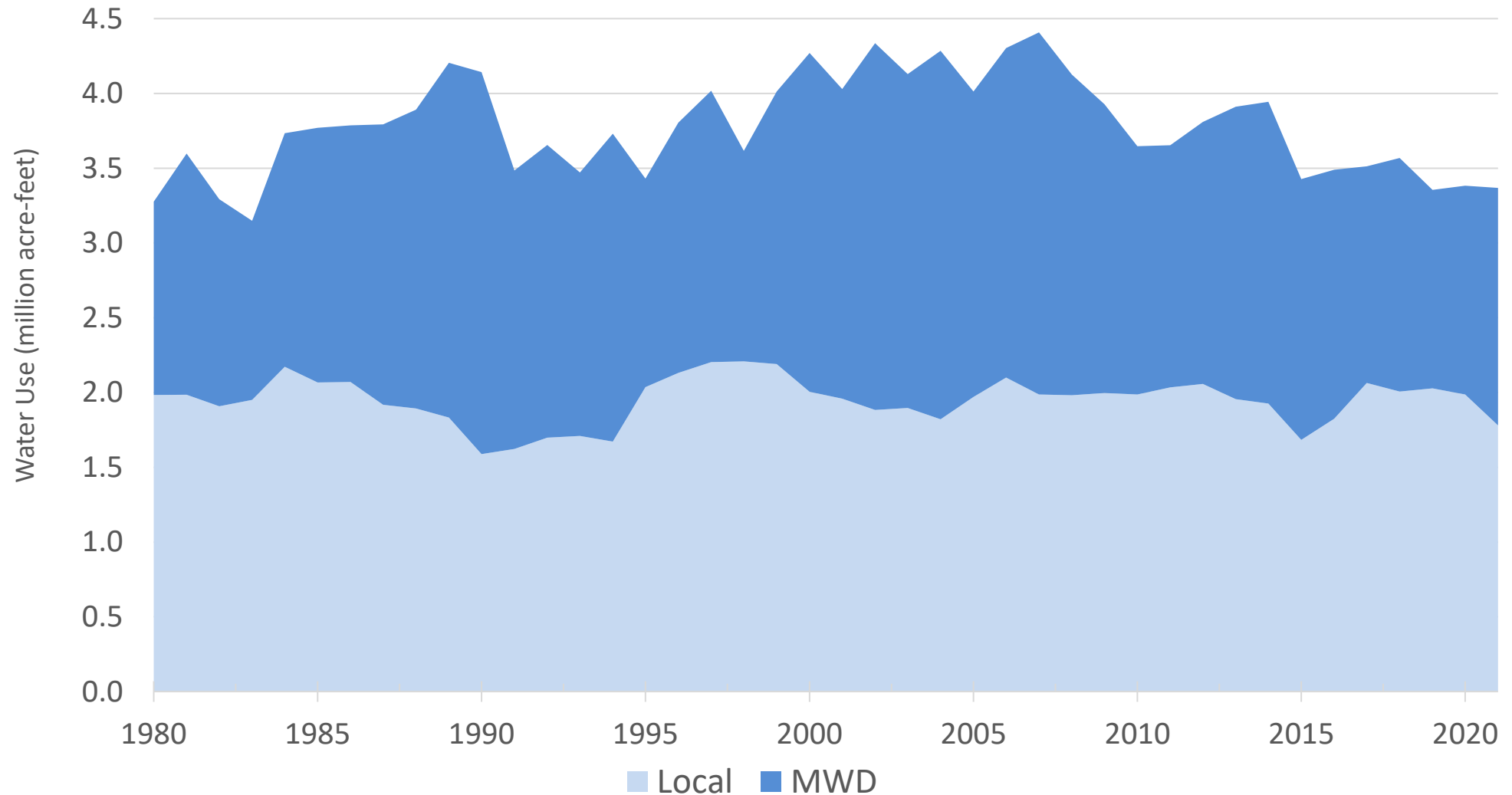
Both Agricultural and Urban Water Use Has Declined



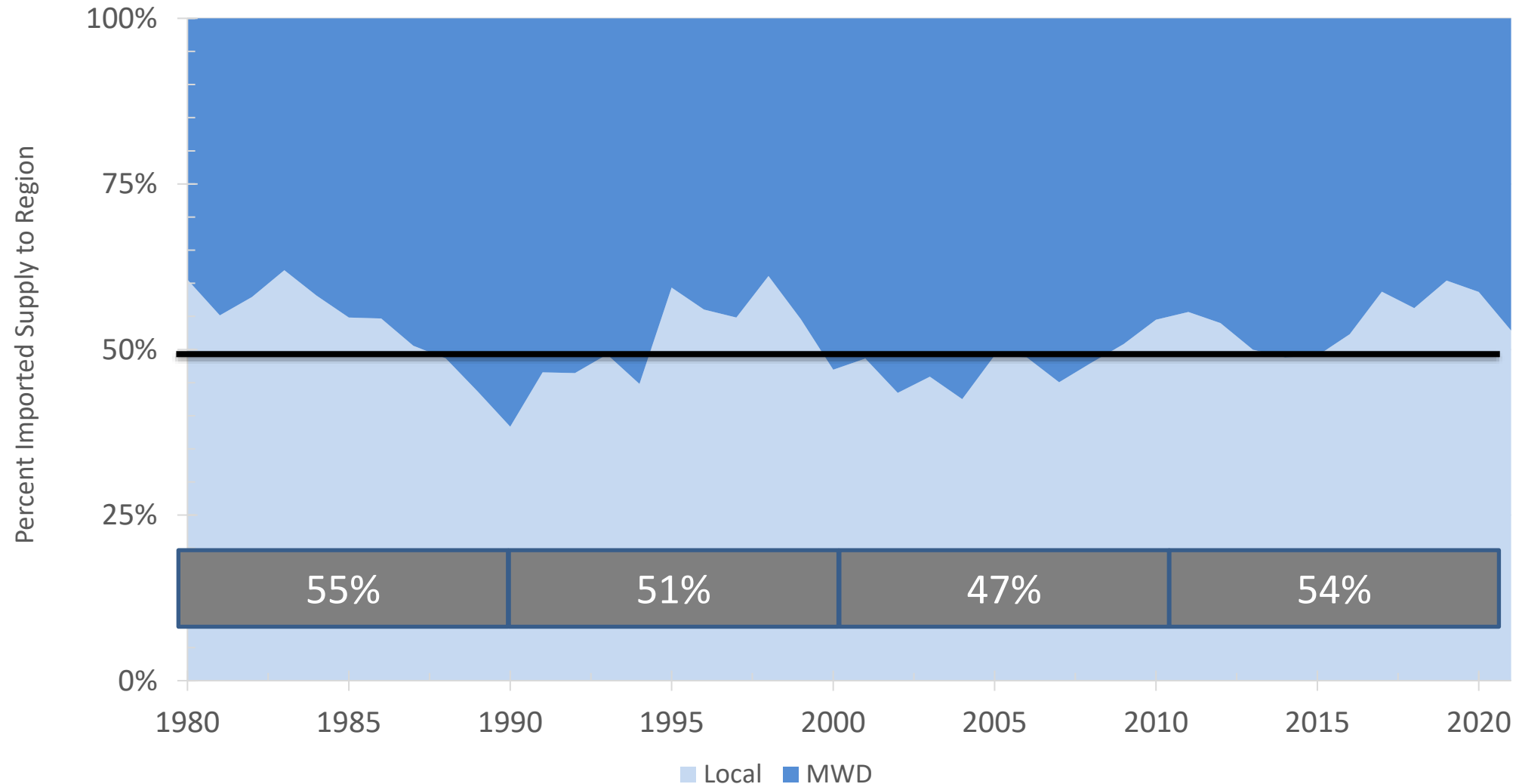
PPIC (2019)

Page 208 of 259

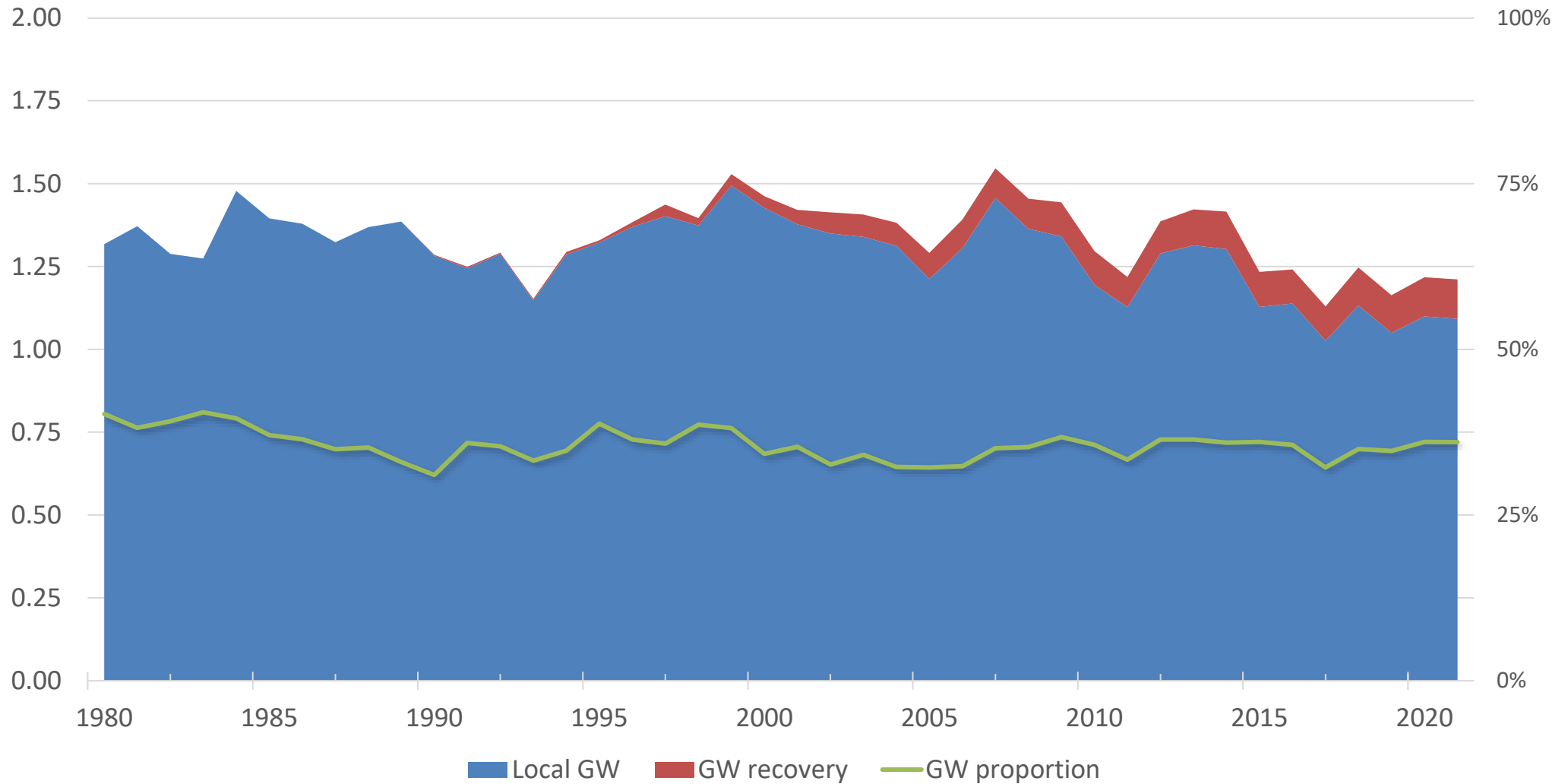
Metropolitan Service Area Local Agency & Imported Supplies



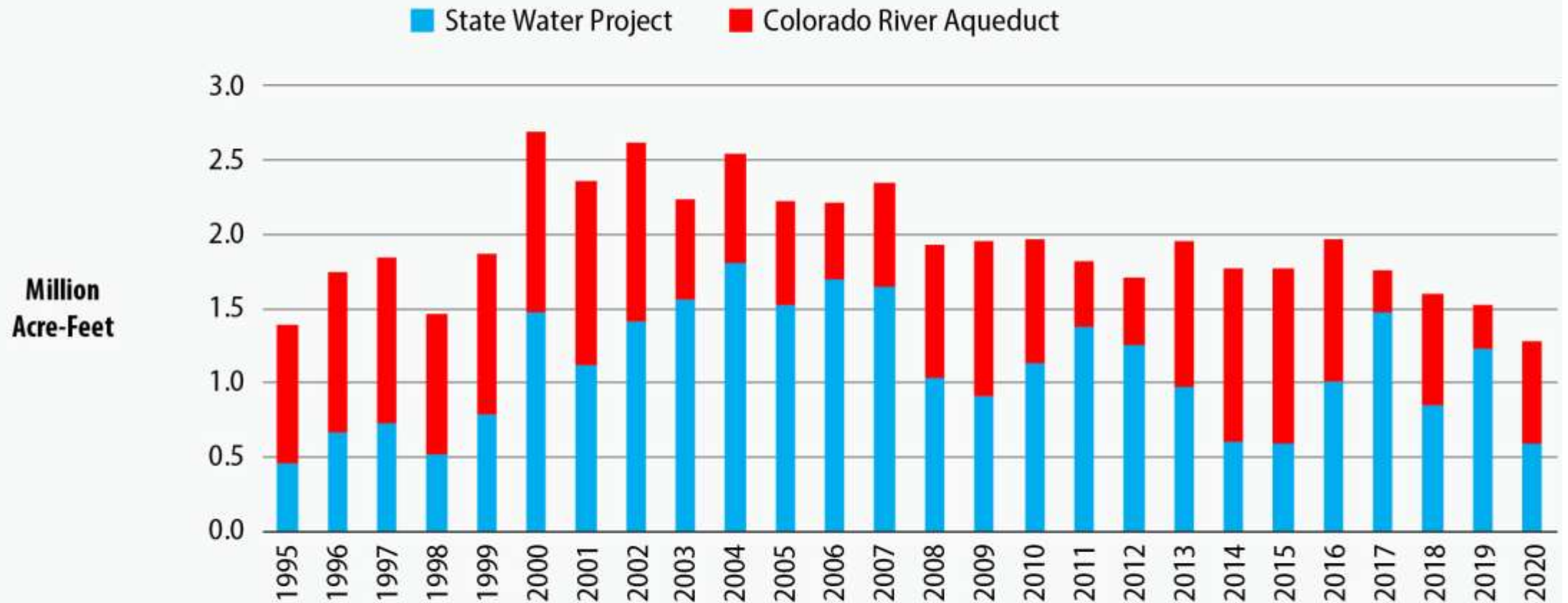
Local Agencies Supply about Half of Region's Water Needs



Groundwater Use in the Region



Imported Supply Sources



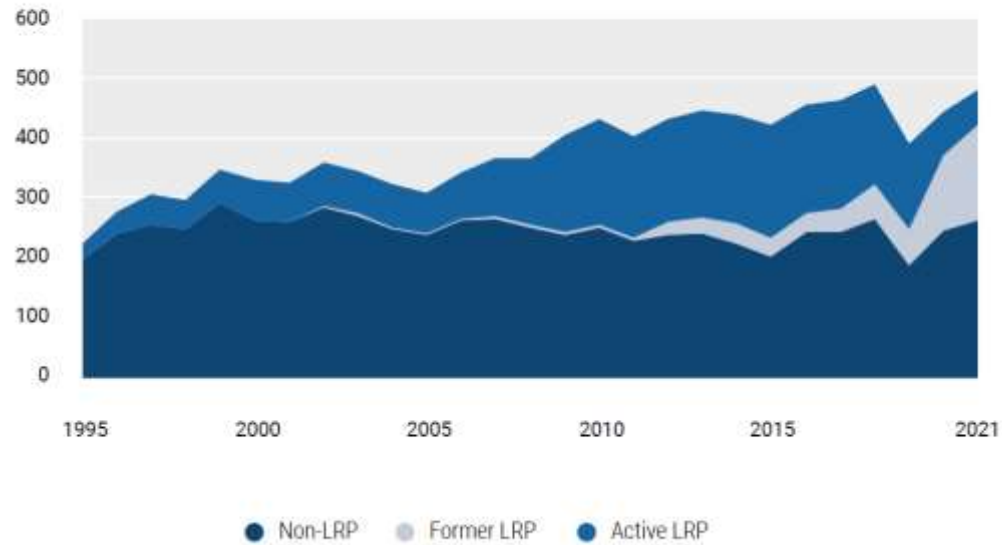
Notes:

1. State Water Project Supplies include Table A, Art. 21, Art. 14(b), Art. 12(d), Art. 12(e), Art. 55, draws from storage & carryover, DWCV & other exchanges, transfers, Drought Water Bank and Dry Year Pool Purchases, Pools A&B, Flood Water, wheeling, Port Hueneme lease, and SBVMWD Purchases.
2. Colorado River Aqueduct supplies are gross Havasu diversions less return flows, deliveries to USBR, Mexico, and storage.

Recycled Water and Groundwater Recovery

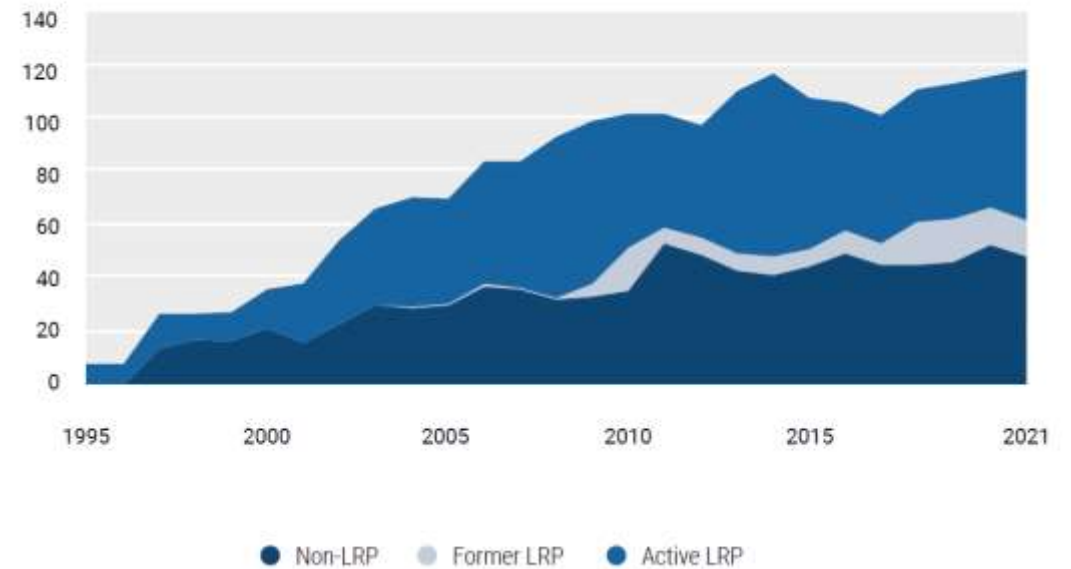
Recycled Water

Figure 1

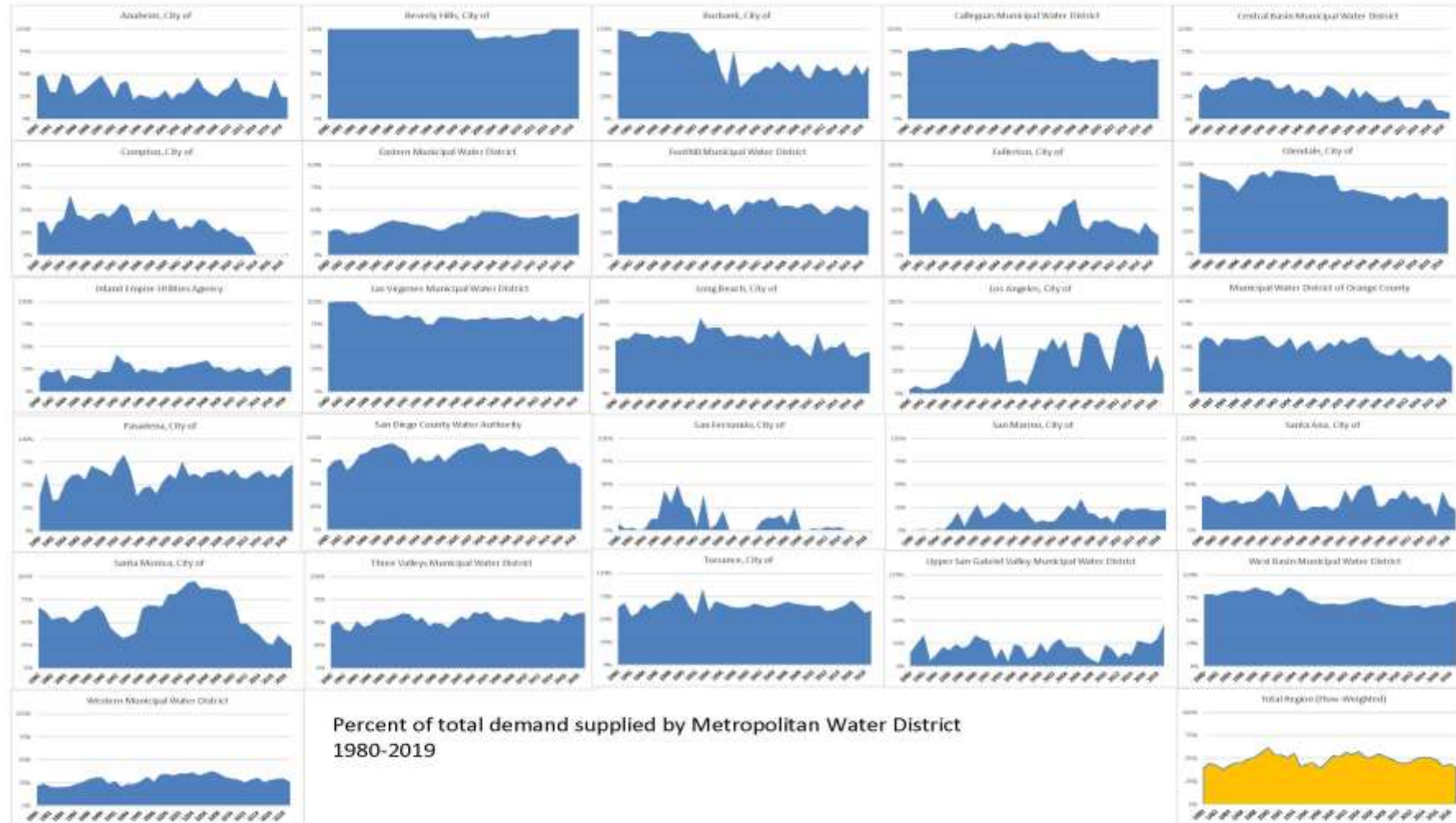


Groundwater Recovery

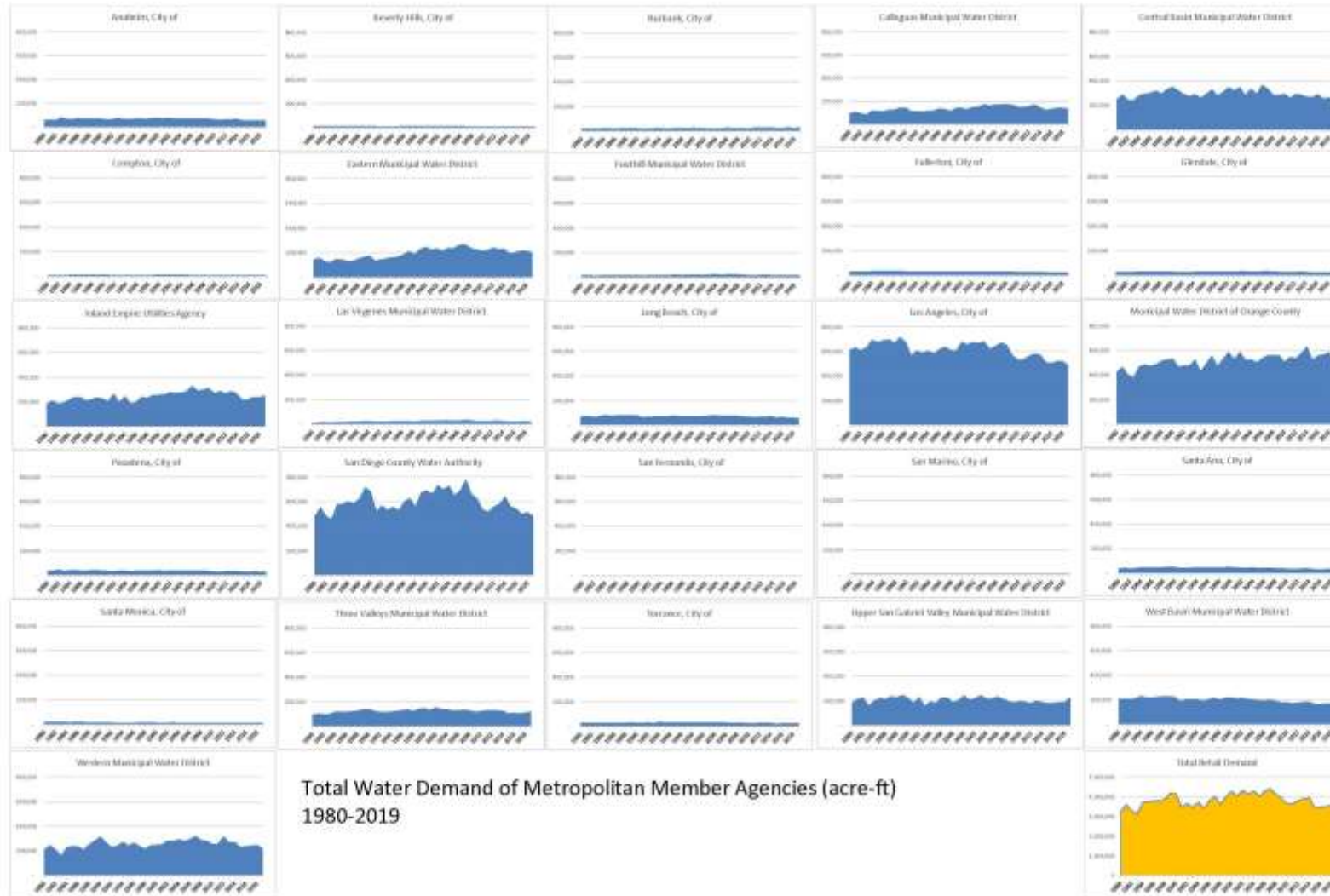
Figure 2



Varying Dependence on Metropolitan (percentage)



Varying Dependence on Metropolitan (Volume)







Board Retreat

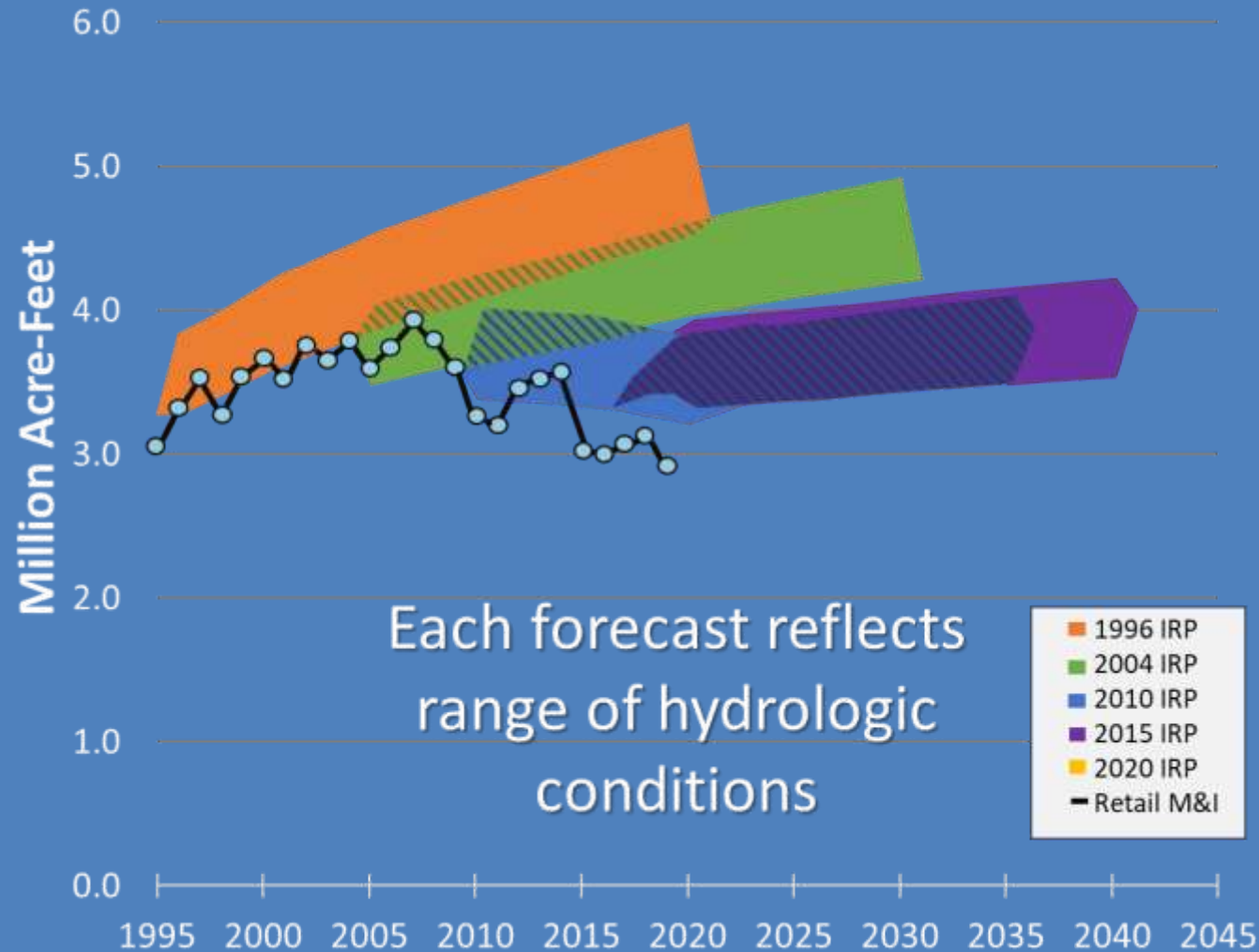
Integrated Water Resources Plan Assessment & Implementation

February 13 and 14, 2023

Integrated Water Resources Plan (IRP)

- Collaborative regional planning has evolved since first IRP in 1996
 - **Provides base of information to inform subsequent Board actions to achieve reliability**
 - **IRP guides investments and provides a common basis for evaluating a portfolio**
 - **Updated periodically**
 - **Separated into assessment and implementation phases**
 - **Directly addresses uncertainties from external drivers**

Evolution of the IRP



1996 IRP

- 1987-1992 Drought
- Preferred Resource Mix



2004 IRP

- Colorado River cutbacks
- Planning Buffer



2010 IRP

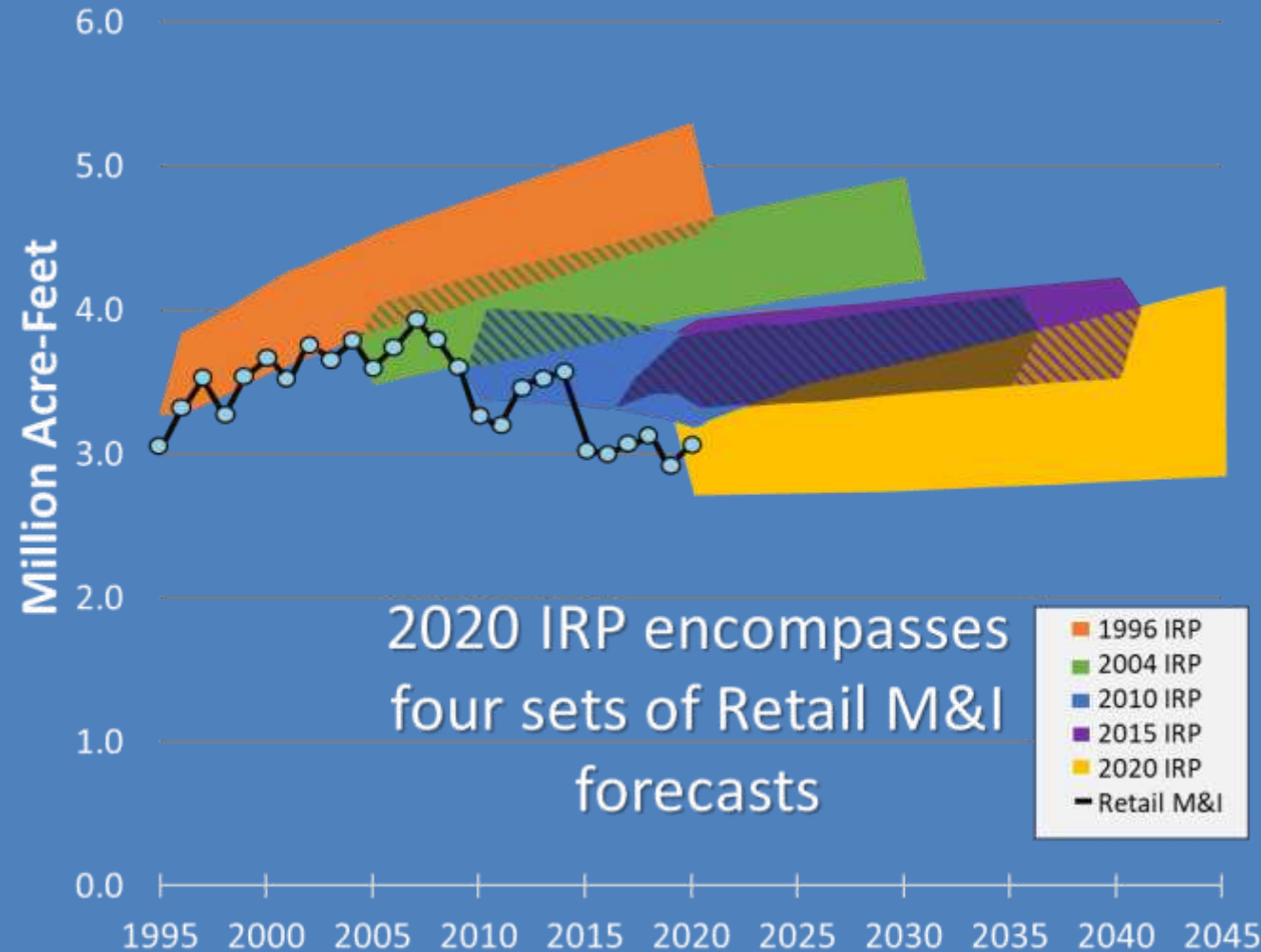
- SWP cutbacks
- Adaptive Management Strategy



2015 IRP

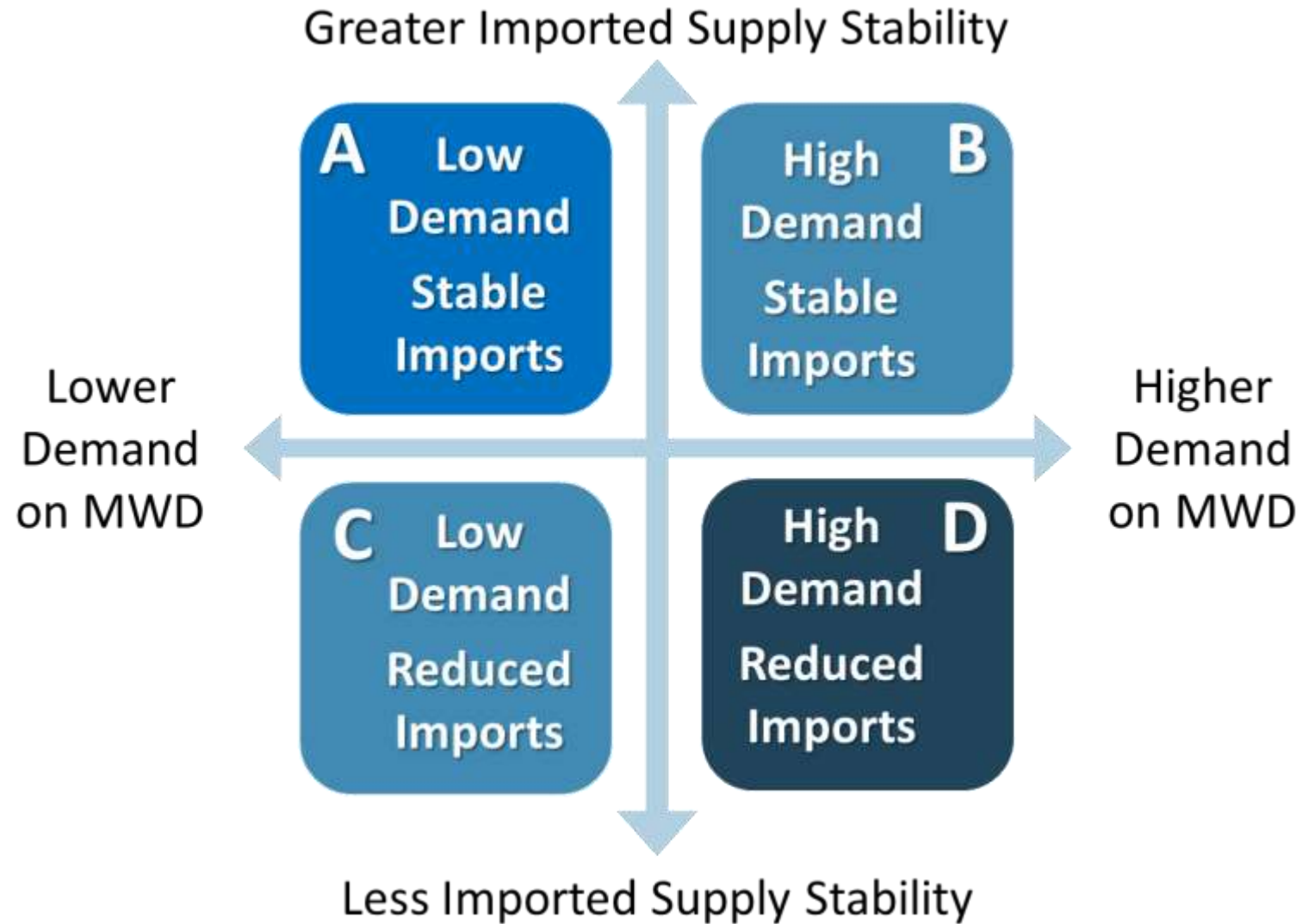
- 2012-2016 Recession and Drought
- Emphasis on outdoor conservation and local resource protection and development

Evolution of the IRP



- Scenario planning takes a step forward from prior IRPs
- Reflects a range of hydrologic conditions and incorporates a broader range of outcomes for underlying uncertainties
- Increases preparedness, improves resiliency, and manages vulnerabilities

IRP Scenario Recap

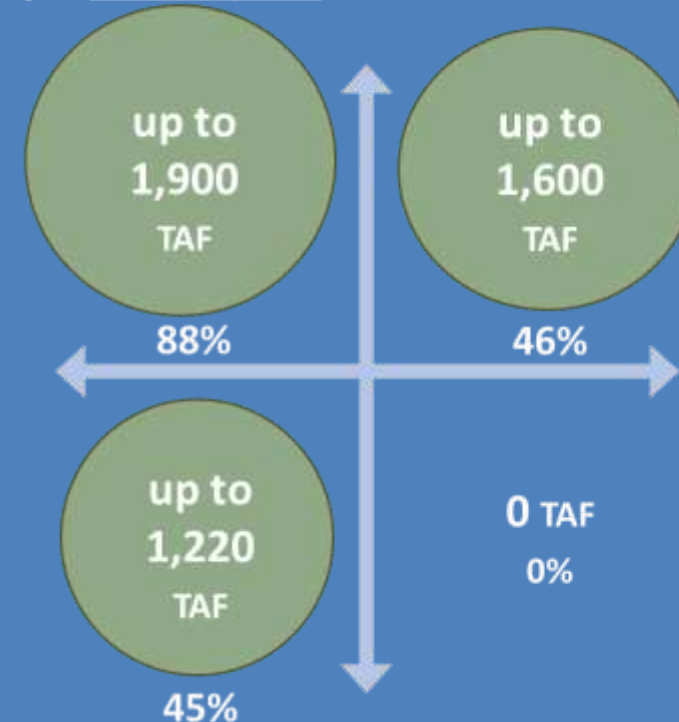


Scenarios Show Depth and Likelihood of Surplus and Shortage

*Maximum Magnitude (TAF) and Frequency (%)
of a Net Shortage in Forecast Year 2045*



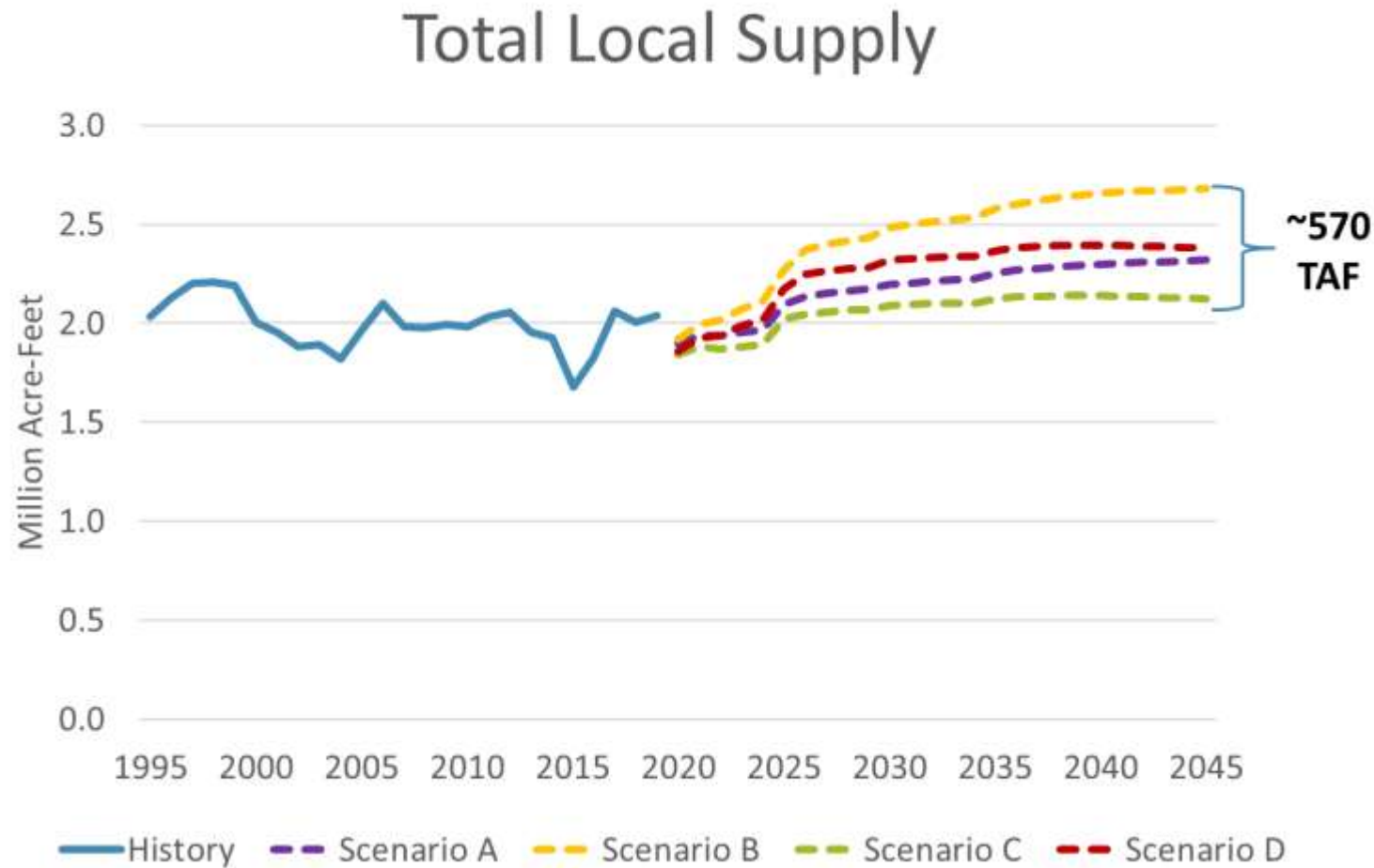
*Maximum Magnitude (TAF) and Frequency (%)
of a Net Surplus in Forecast Year 2045*



Needs Assessment Findings Fell into Seven Focused Areas

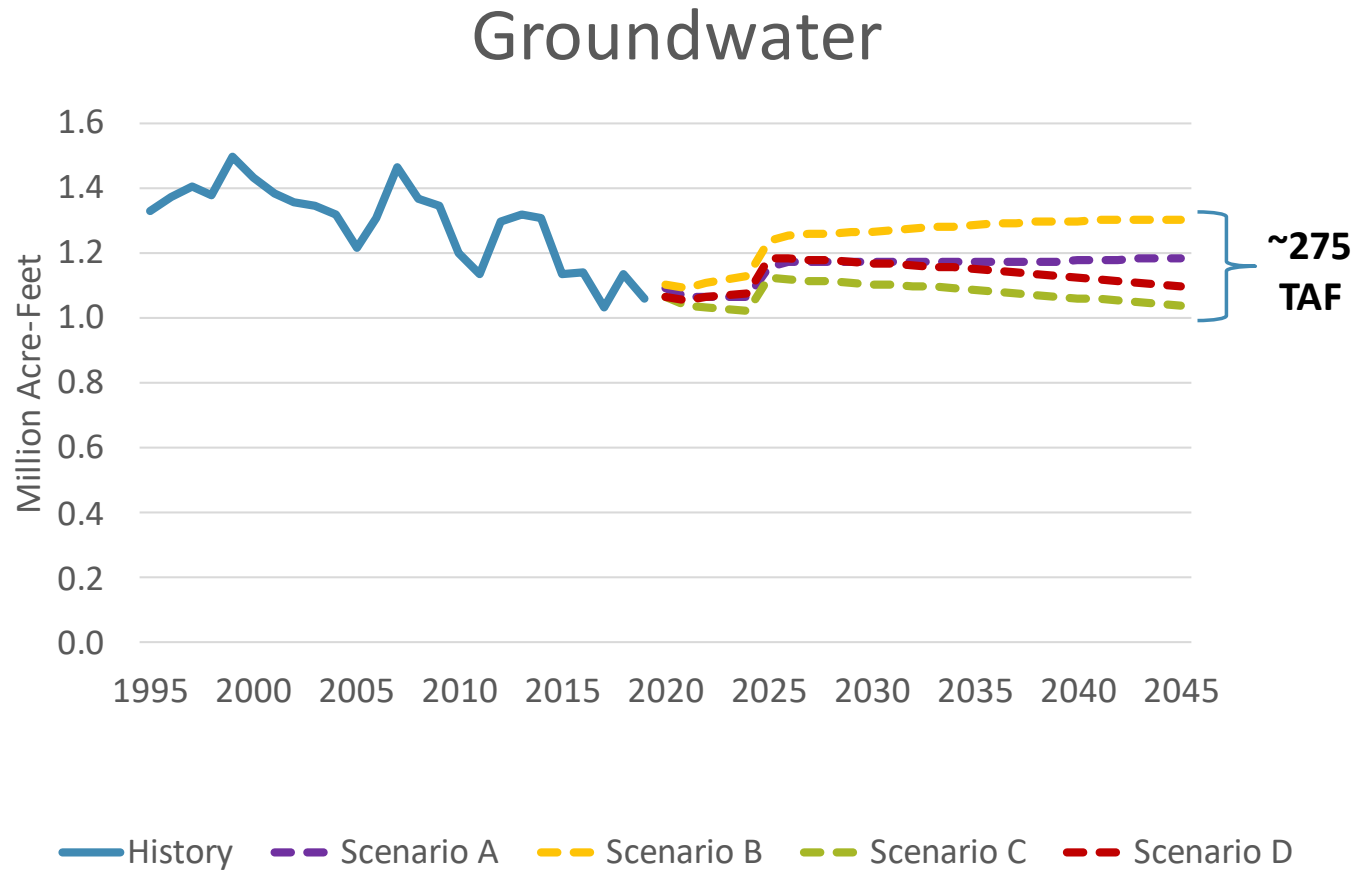


Local Agency Supply Production Is Uncertain



- There is uncertainty in future local agency supply production
- Many factors can impede or facilitate local agency supply development and production

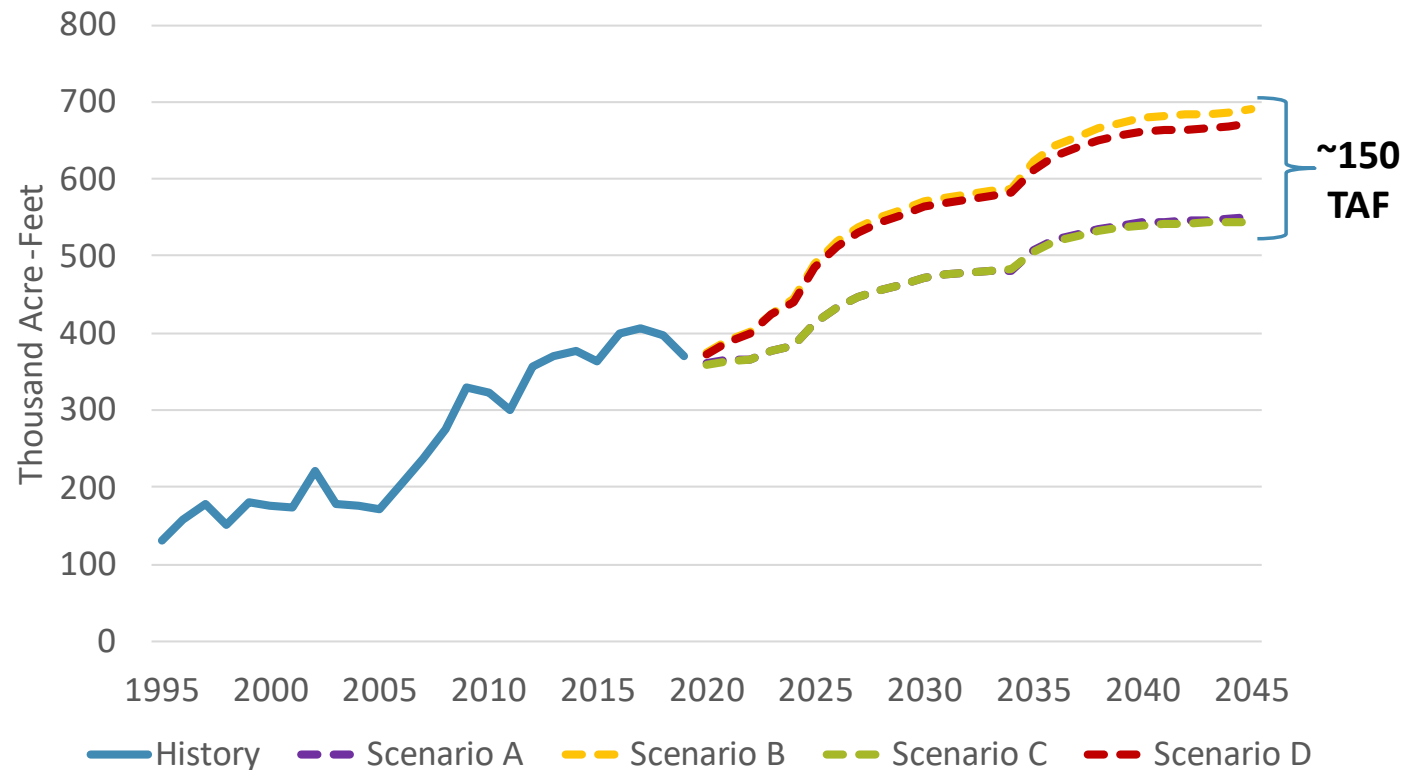
Region Depends on Healthy Groundwater Basins



- Impacts to groundwater threatens regional reliability
- There has been a decline in the past 20 years
 - Availability of imported supplies for replenishment
 - Variability in natural replenishment from rainfall
 - Emerging contaminants

Recycled Water Is a Success Story

Recycled Water

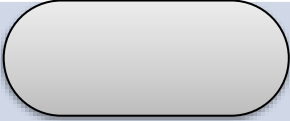
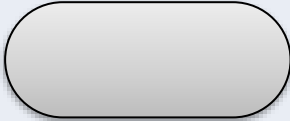
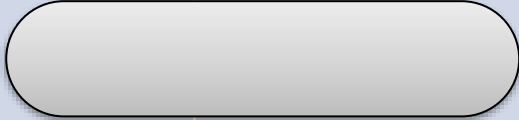
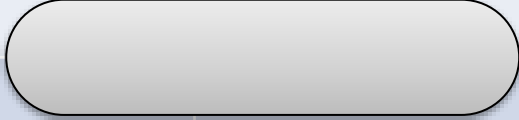


- Success with recycled water development
- Continued success may be difficult going forward
 - Availability of wastewater effluent reduced by conservation
 - Distribution system very costly
 - Rising salinity increases costs

IRP Phasing

- Phase 1 – Needs Assessment
 - Scenario Development
 - Gap Analysis
 - Portfolio Category Analysis
 - Board Adoption of IRP Findings
- Phase 2 – Implementation
 - Engage member agencies and stakeholders
 - Develop Adaptive Management Plan
 - Select robust actions through specific policy and project identification (urgent projects expedited)

IRP/One Water Implementation Schedule (under development)

Key Steps	2023 (Jan – Jun)	2023 (Jul – Dec)	2024 (Jan – Jun)	2024 (Jul – Dec)
Build consultant team				
Develop criteria				
Develop & analyze portfolios				
Engage stakeholders				
Adaptive management plan				
Finalize portfolios				





Board Retreat

Colorado River

The Colorado River Basin



Metropolitan is the Junior Priority User in California

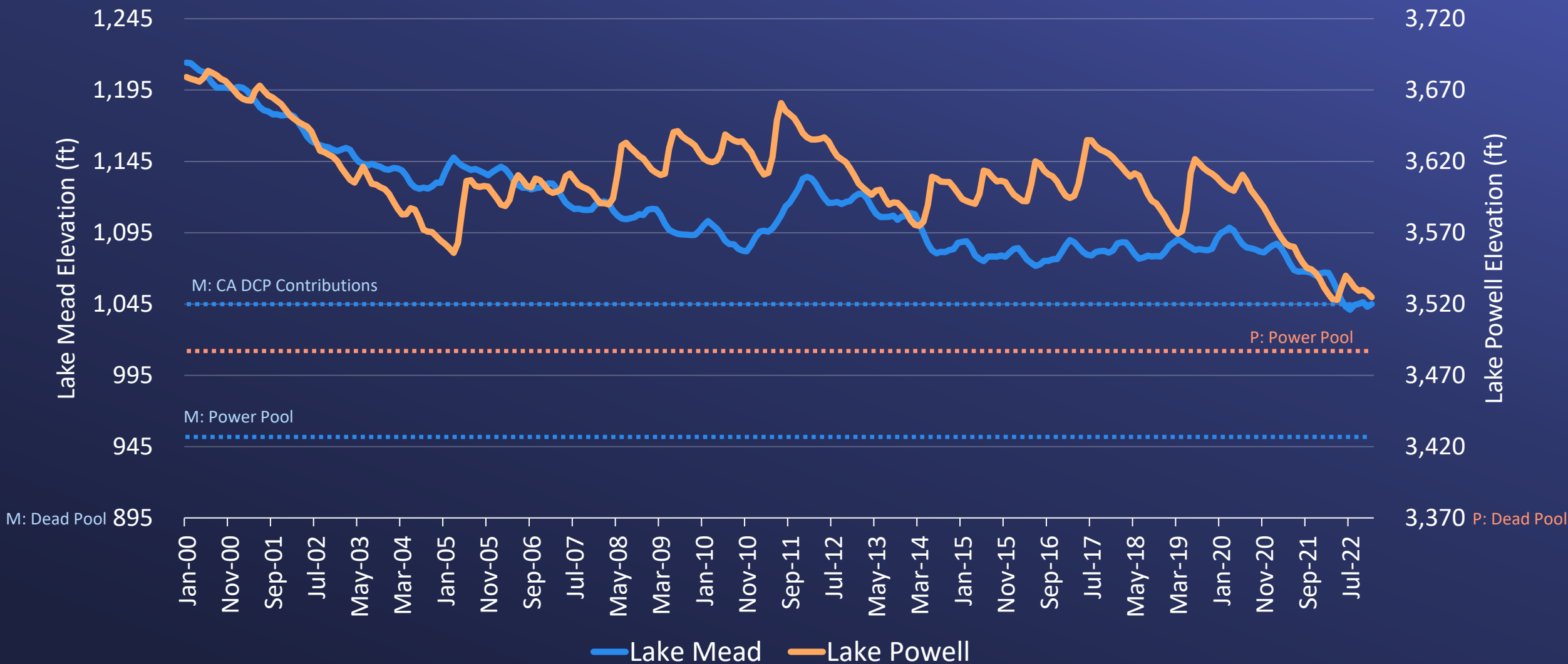
California Priority System (1931)

1. Palo Verde Irrigation District
 2. Yuma Project
 3. (a) Imperial Irrigation District
Coachella Valley Water District
(b) Palo Verde Irrigation District
 4. Metropolitan Water District
- 3.85 MAF
- 0.55 MAF

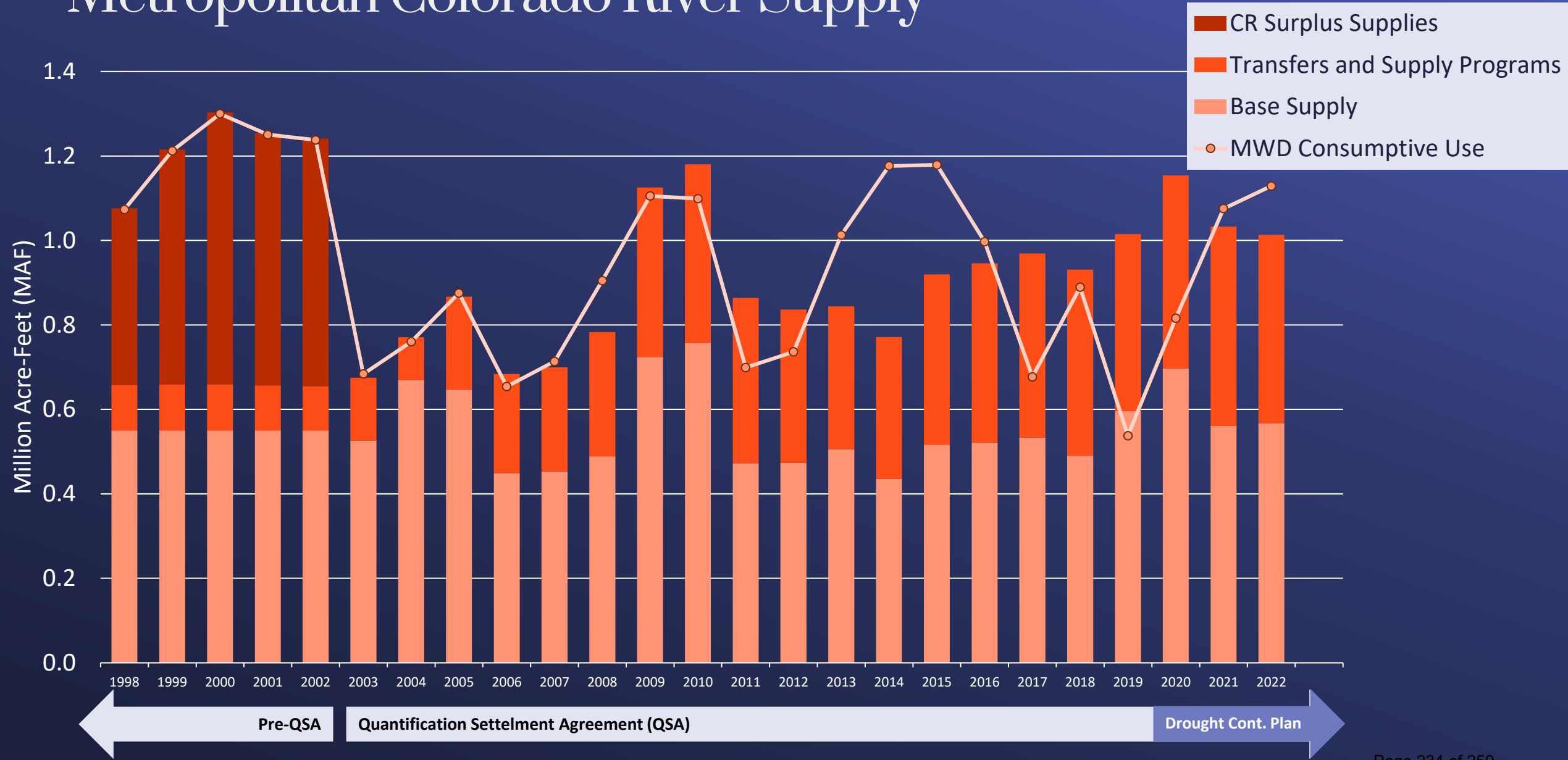
Total CA Basic Apportionment 4.4 MAF



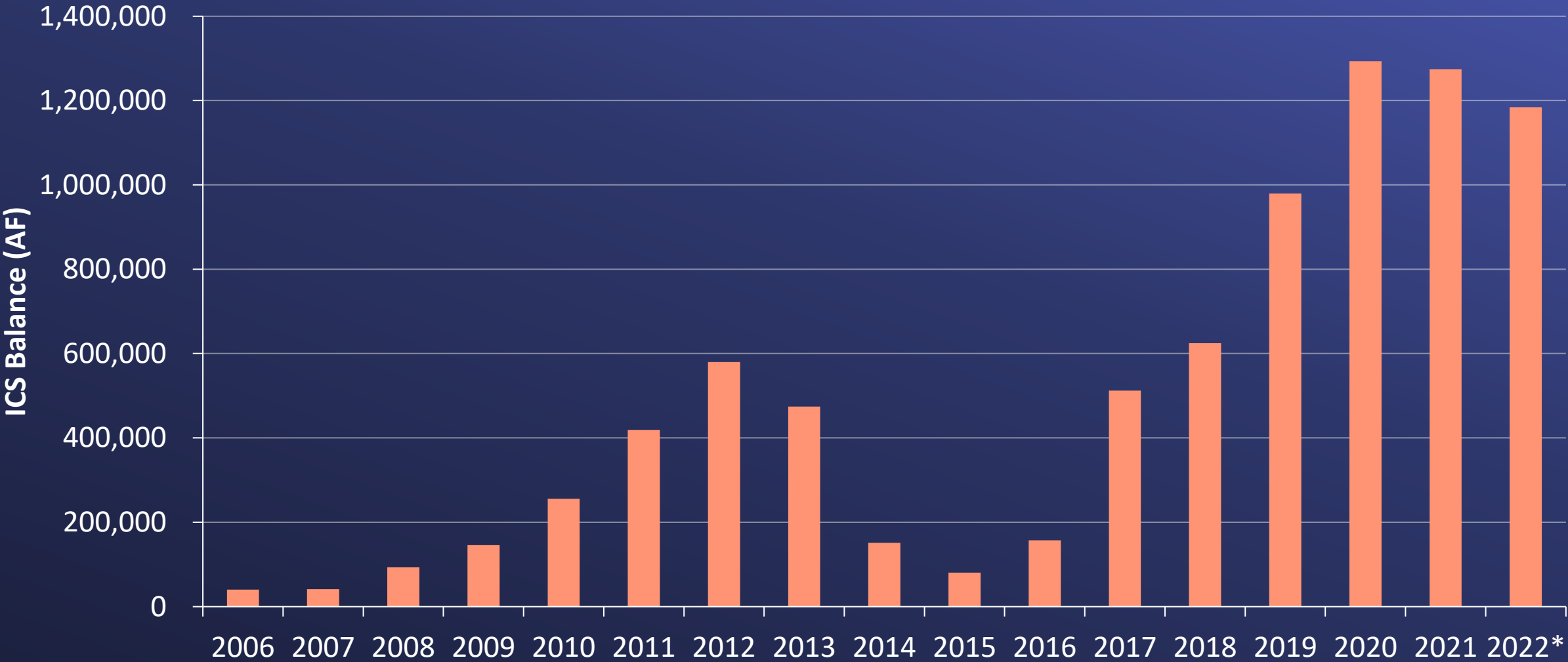
Lake Powell and Lake Mead Decline Since 2000



Metropolitan Colorado River Supply

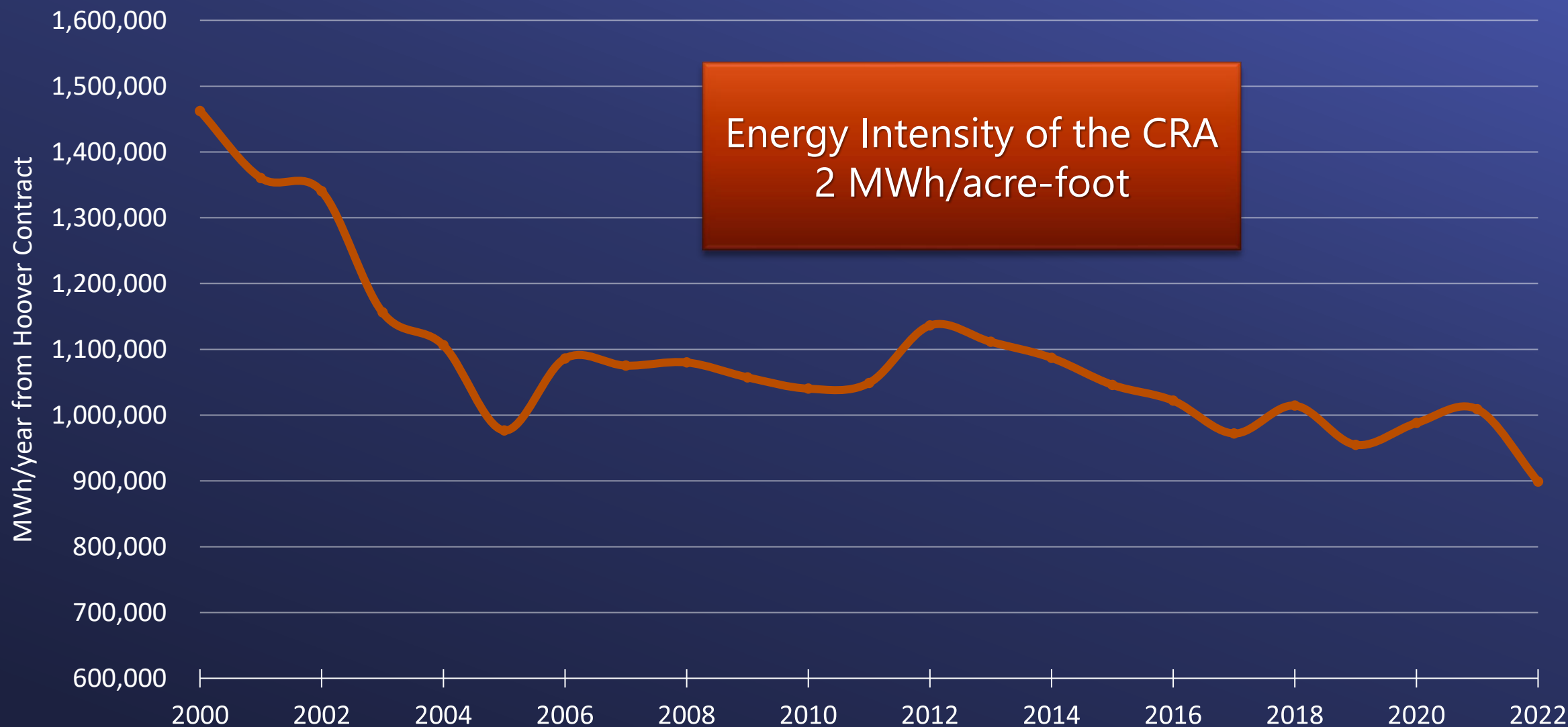


Historical Lake Mead ICS End-of-Year Storage Balance**



*Projected EOY 2022 Balance
**Includes EC ICS, System Efficiency ICS, and Binational ICS. Is inclusive of IID ICS Sub-Account.

Metropolitan's Hoover Power Resource has Declined



Anticipated Decisions through 2026

Overview of Upcoming Key Actions:

- **April 2023:** Submit comments on Draft SEIS
- **July 2023:** Approve of Implementing Agreements for SEIS ROD
- **Summer 2024:** Submit comments on Draft EIS for Post 2026-Guidelines
- **Calendar Year 2025:** Negotiate Implementing Agreements for New Guidelines
- **December 2025:** Approve Implementing Agreements for Post 2026 Guidelines





Board Retreat

State Water Project

State Water Project Reliability

The Last 20 Years



**Severe
Droughts**
Increased Duration
and Frequency



**Bay-Delta
Ecosystem**
Water Quality, Threatened &
Endangered Species



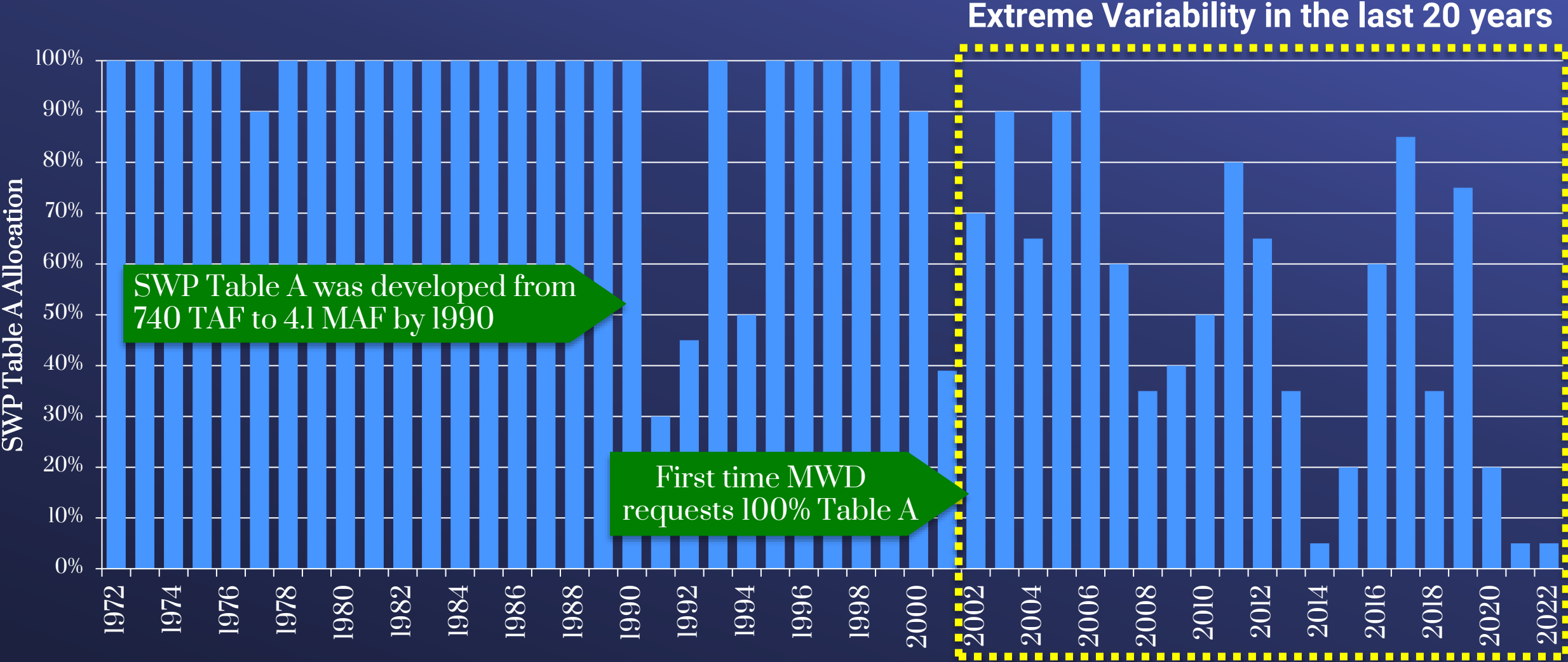
**Atmospheric
Rivers**
Shifting Runoff Patterns

Key Trends

- Highly Variable Runoff
 - Record Lows and Record Highs
- Protection of Aquatic Species and Habitats Affects Supply
- High Flow Events Present Risks and Opportunities

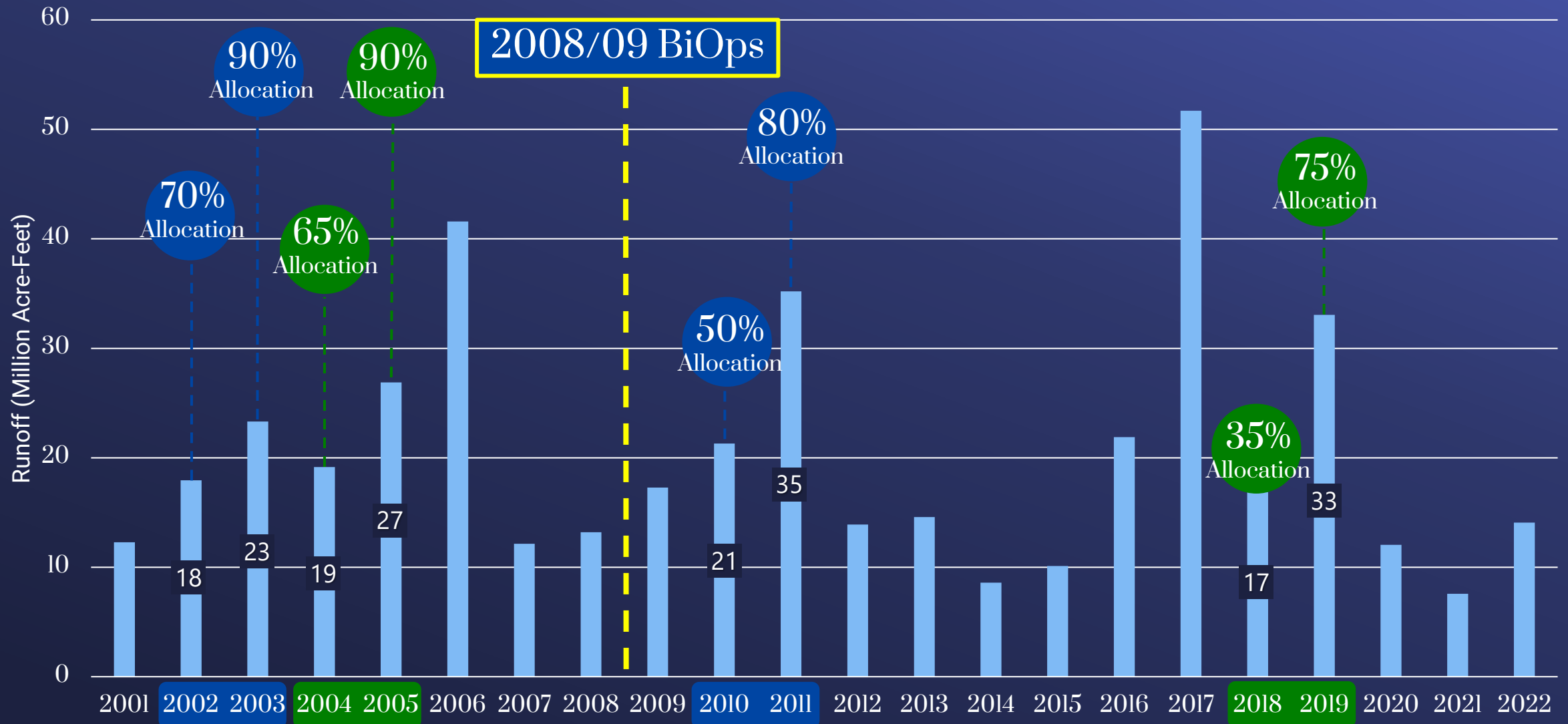


Historic State Water Project Allocations



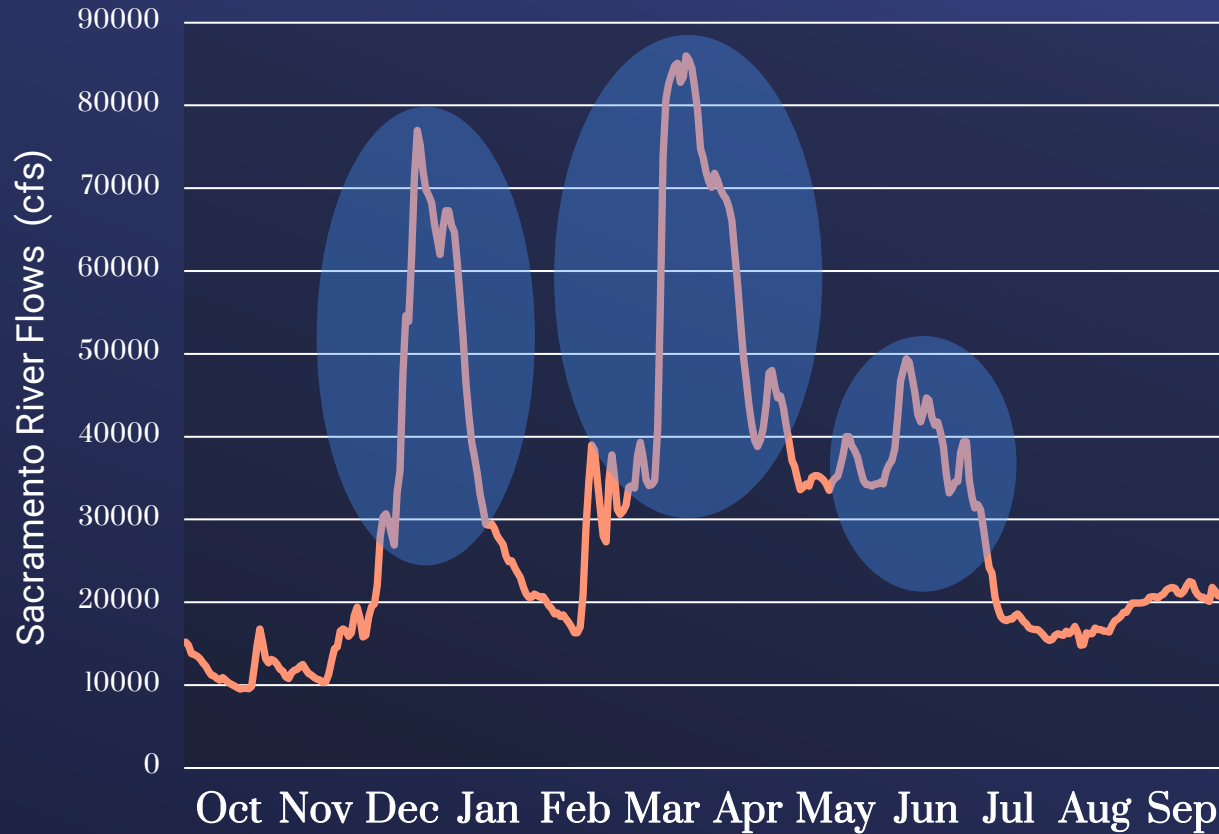
Balancing Water Supply with the Environment

Effects of Regulation

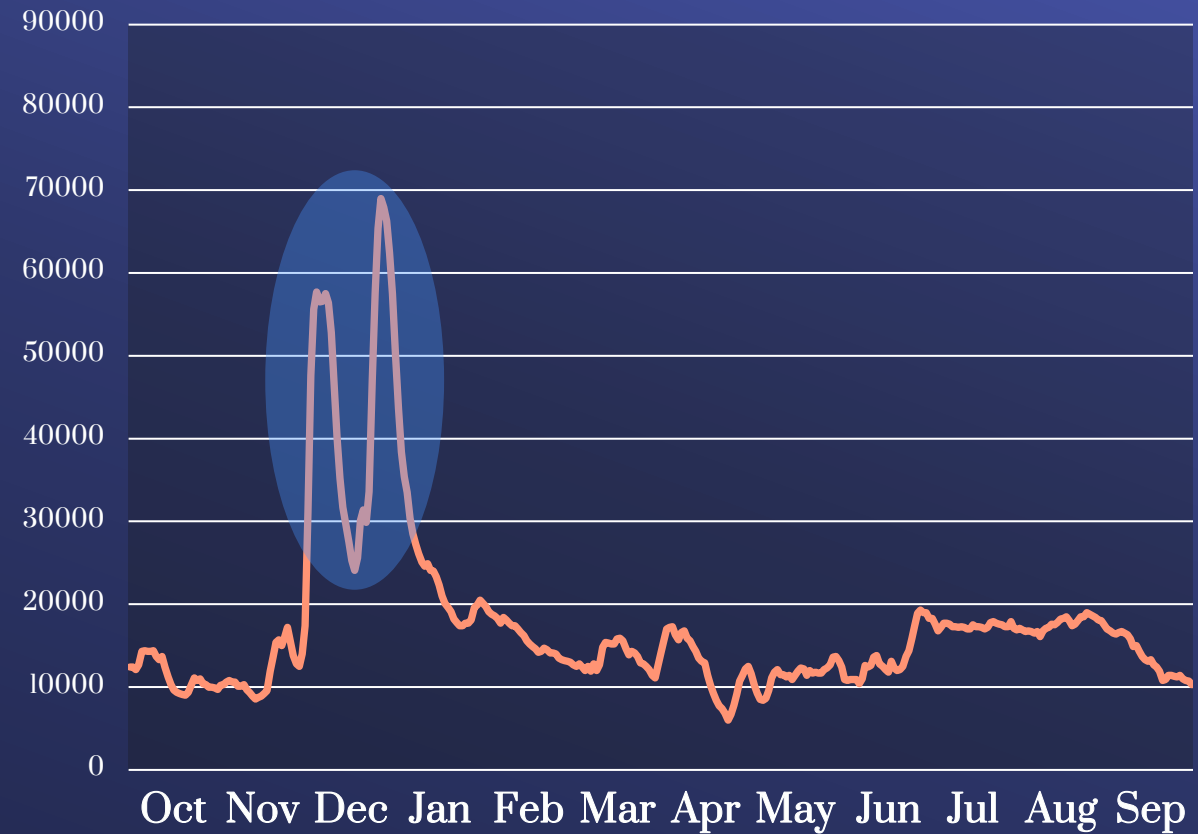


Atmospheric Rivers Present Risks and Opportunities

High Flow Events Occur in Various Water Year Types



Wet Year
(2011 Water Year)



Dry Year
(2013 Water Year)

State Water Project: Climate Adaptation Options

Current and Ongoing Discussions for Managing Risks and Uncertainties

Delta Conveyance Project



Delta Islands Investment



Water Transfers



South of Delta Storage



Sites Reservoir Project





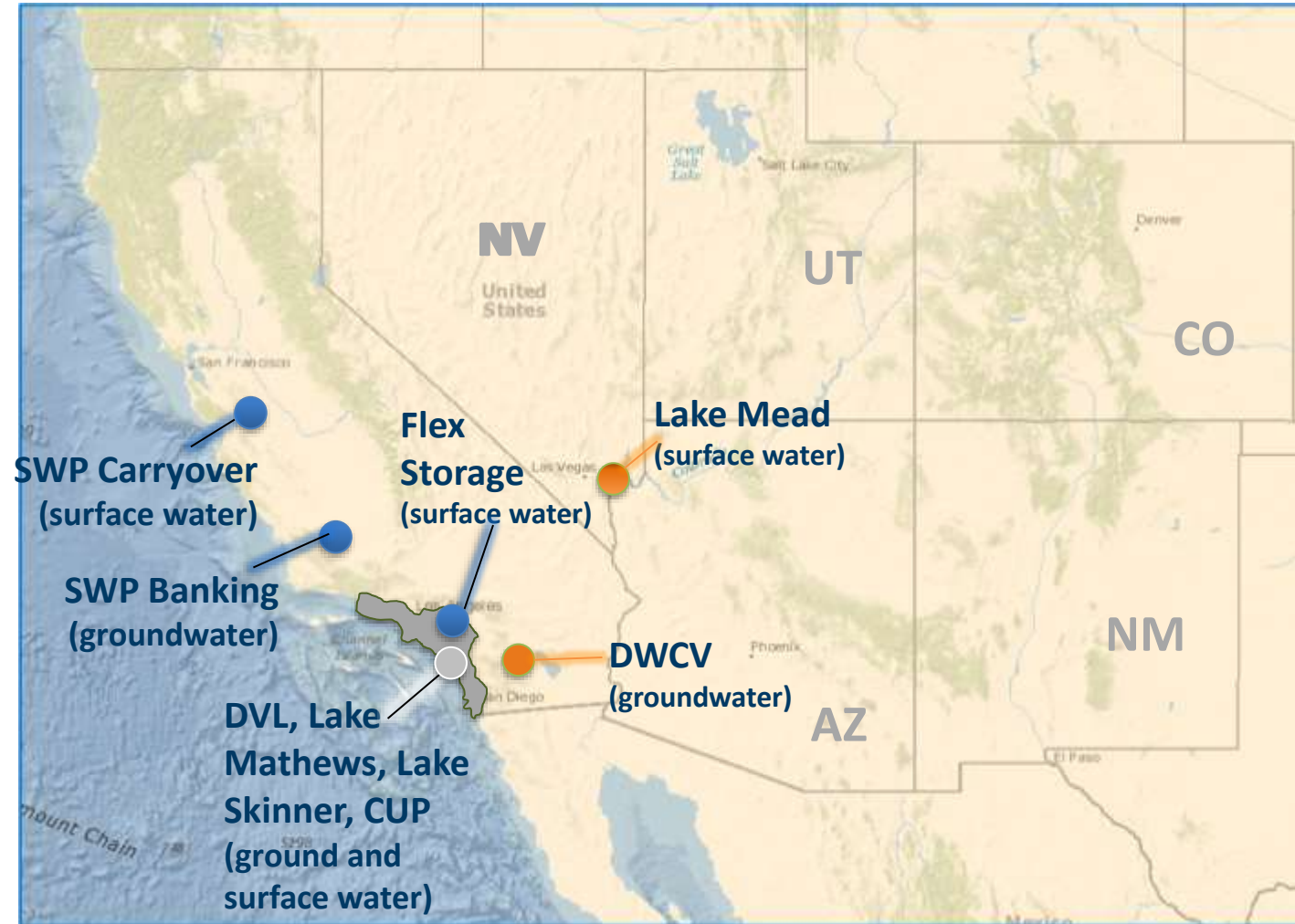


Board Retreat

Storage Overview

February 13 and 14, 2023

Diverse Storage Portfolio



Principles Guiding Storage Strategy

OPERATIONAL FLEXIBILITY

Maintain flexibility to manage storage within the total storage portfolio, not individual accounts

INVASIVE SPECIES

Regional storage managed to minimize risk of infestation

EMERGENCY STORAGE

Reserve emergency storage in Southern California reservoirs to meet demands during catastrophic events

SYSTEM RELIABILITY

Manage storage to meet demands in the entire service area, including exclusive areas

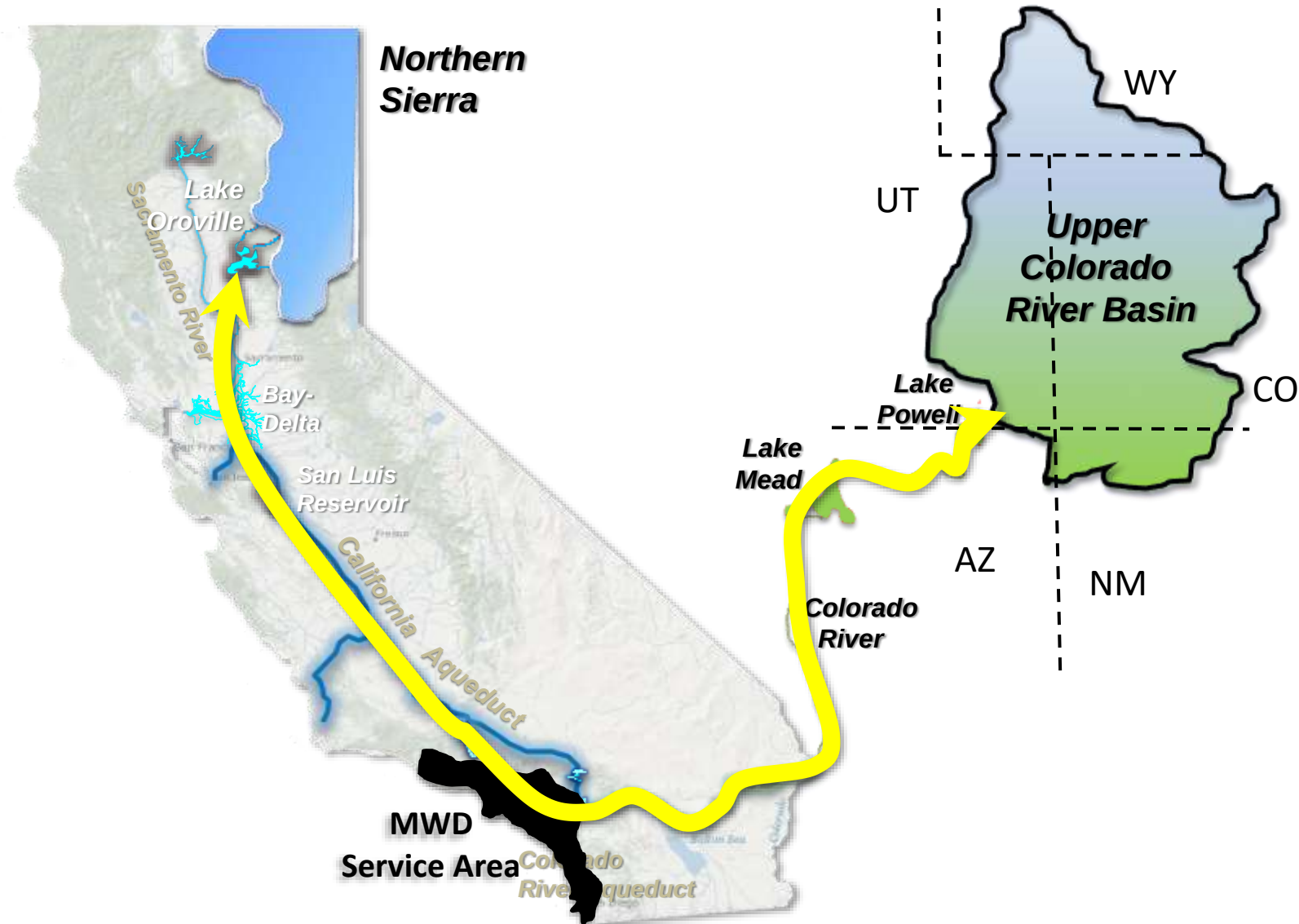
WATER QUALITY

Consider salinity goals and other constituents when blending various supplies

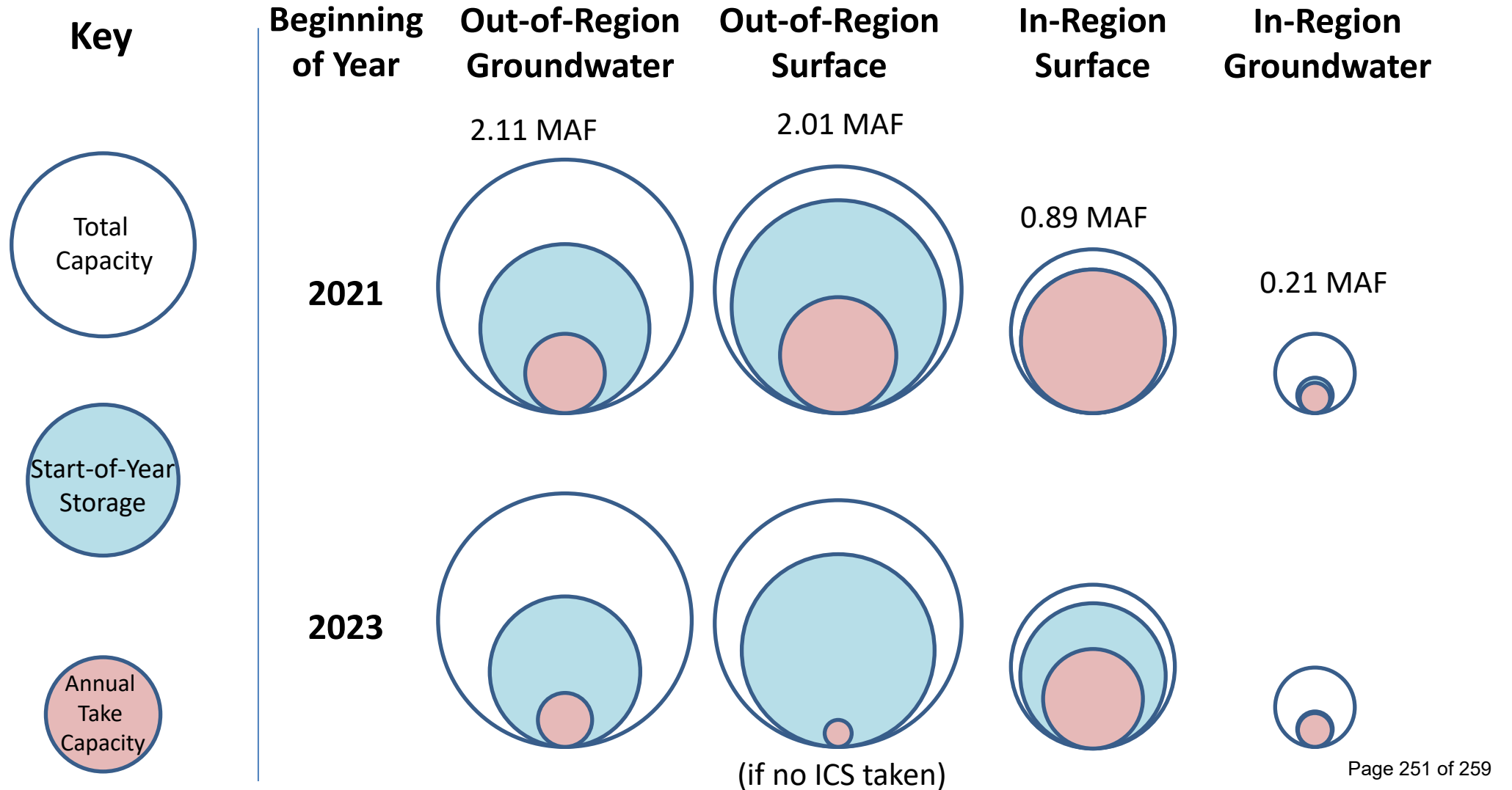
SUPPLY ALLOCATIONS

Manage regional storage to avoid or reduce the frequency of severe water supply allocations and avoid large supply allocation increases from year-to-year, to the extent practicable

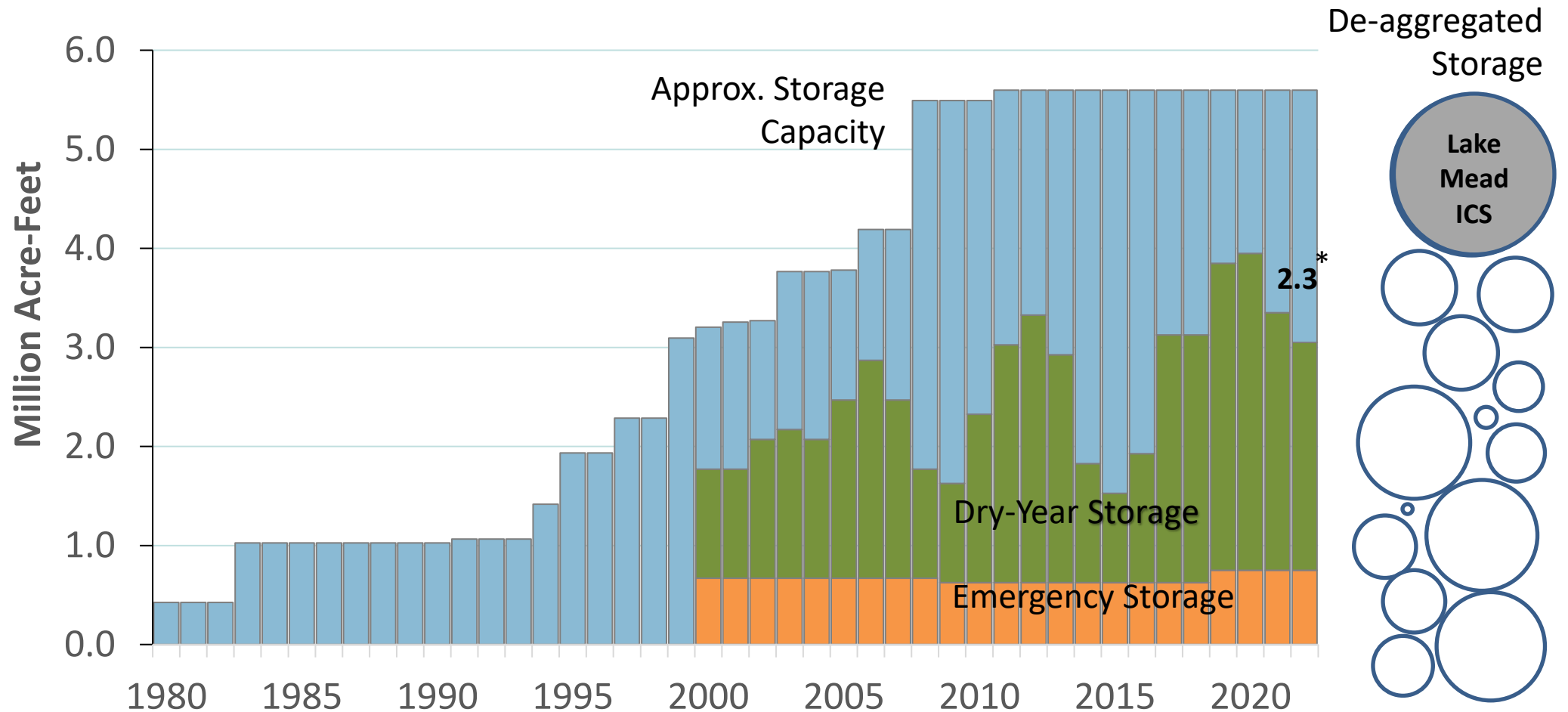
The Watersheds Connect!



Regional Storage Conditions



Many Competing Interests for Regional Storage

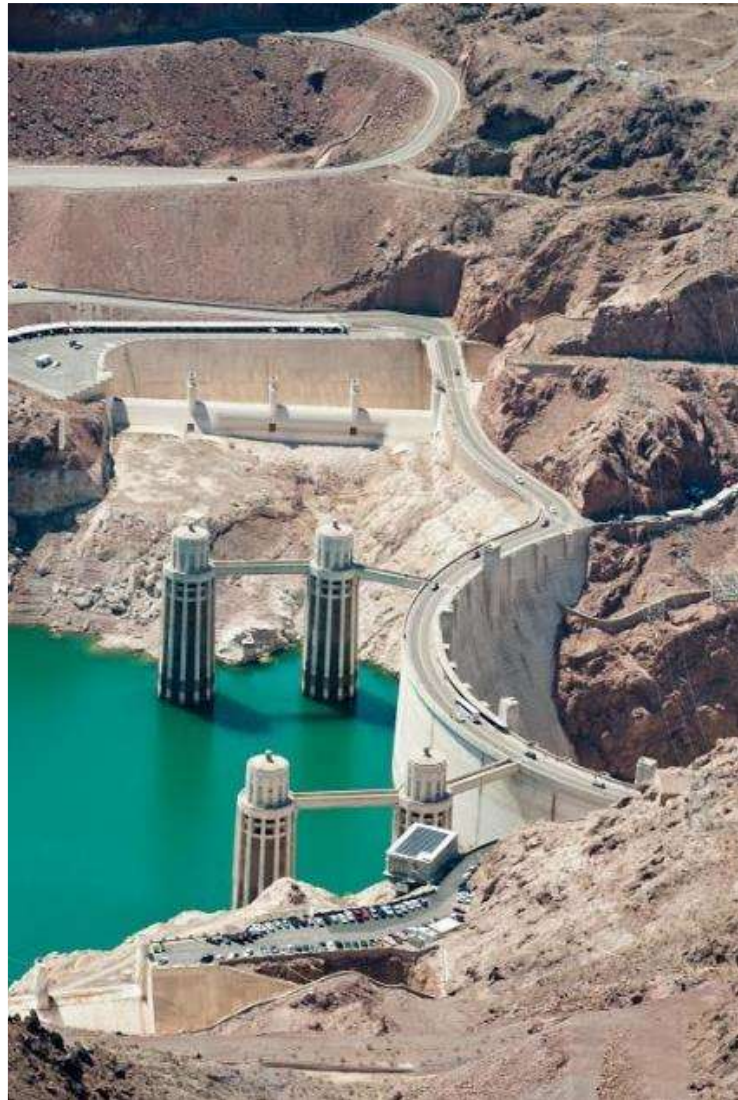


* 2022 EOY
Estimate

Longer-Term Challenge Is Colorado River



Glen Canyon Dam on Lake Powell



Hoover Dam on Lake Mead

Lake
Mead
ICS

- Provides dry-year reliability for MWD
- Protects CRA from cutbacks to meet Drought Contingency Plan obligations
- Supports elevation in Lake Mead for power and operations



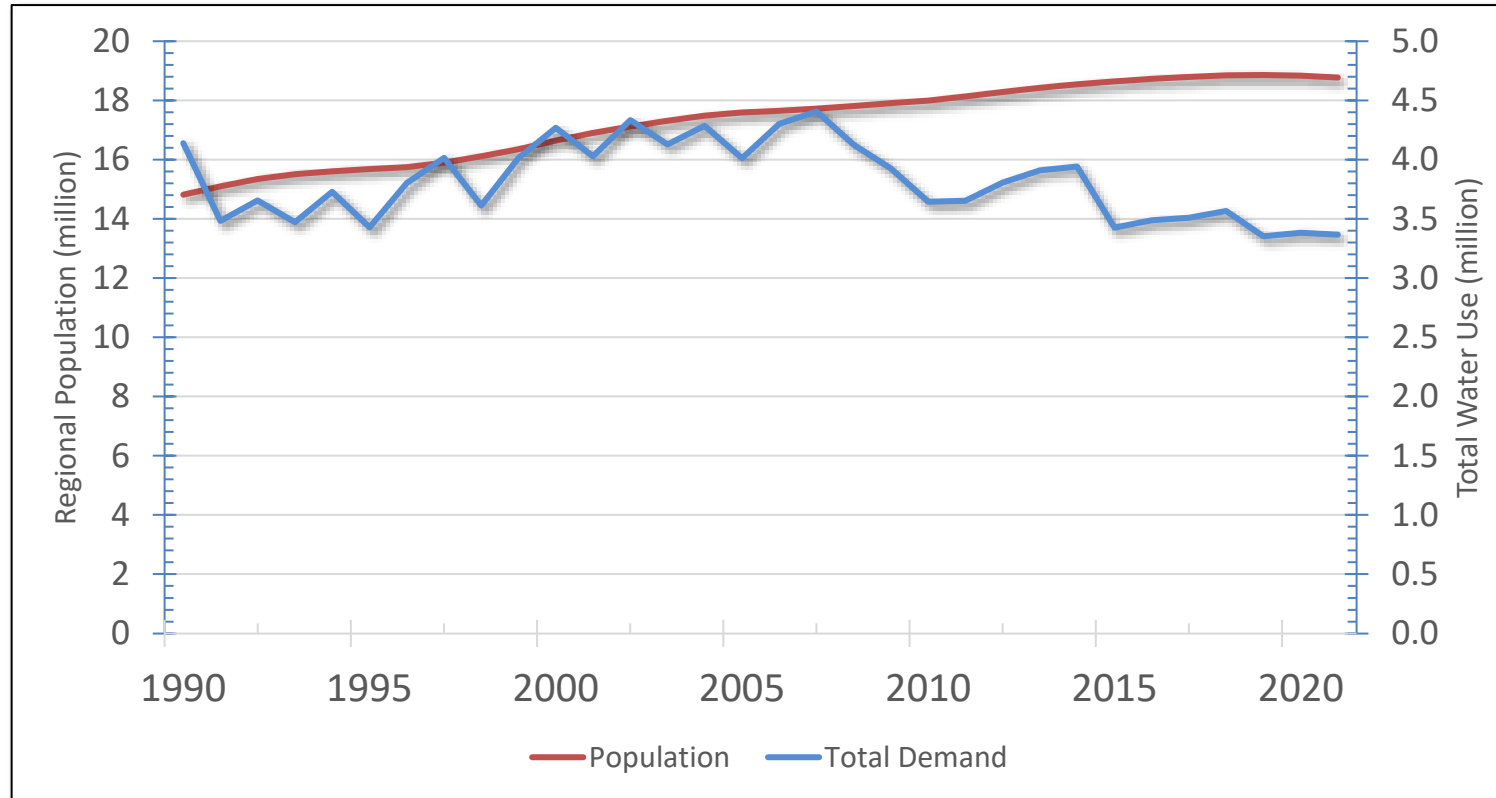


Board Retreat

Demand Management

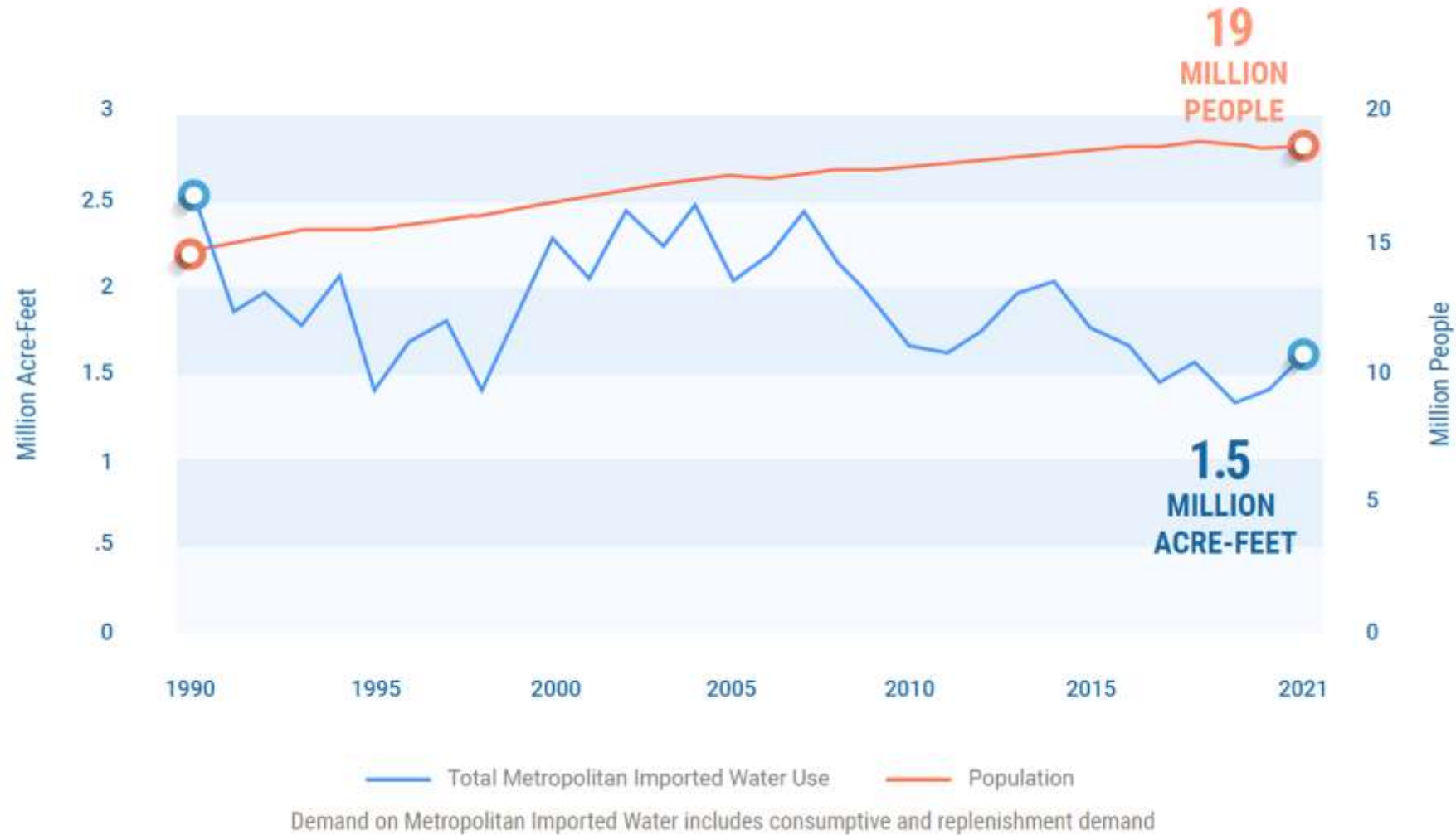
February 13 and 14, 2023

The Results Are Clear: We're Making Progress



SoCal uses less total water today than in 1990, despite a population increase of over four million people

The Results Are Clear: We're Making Progress



Regional Per Capita Water Usage Declined by Nearly 40%

