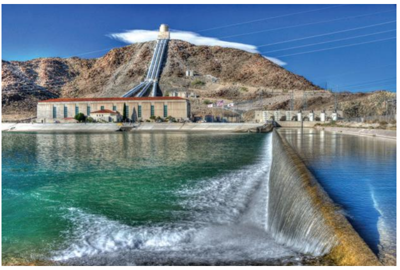
URBAN WATER MANAGEMENT PLAN

JUNE 2016



THE METROPOLITAN WATER DISTRICT
OF SOUTHERN CALIFORNIA

2015

URBAN WATER MANAGEMENT PLAN

JUNE 2016

WATER TOMORROW
Planning for the Future

*THE METROPOLITAN WATER DISTRICT
OF SOUTHERN CALIFORNIA*

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LIST OF ABBREVIATIONS

Abbreviation	**Terms**
Units of Measurement	
AF	Acre-Feet
AFY	Acre-feet per Year
TAF	Thousand Acre-Feet
MAF	Million Acre-Feet
cfs	Cubic feet per second
GPCD	Gallons per Capita per Day
MGD	Million gallons per Day
mg/L	Milligrams per liter
µg/L	Micrograms per liter
ng/L	Nanograms per liter
pCi/L	Picocuries per liter
kWh	Kilo-Watt Hour
Acronyms	
AGWA	Association of Ground Water Agencies
AMPAC	American Pacific Corporation
AVEK	Antelope Valley East Kern Water Agency
AWE	Alliance for Water Efficiency
AWWA	American Water Works Association
BDCP	Bay Delta Conservation Plan
BMPs	Best Management Practices
CAWCD	Central Arizona Water Conservation District
CBM	Condition-based maintenance
CCL3	Contaminant Candidate List 3
CCP	Conservation Credits Program
CCWD	Contra Costa Water District
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CII	Commercial, Industrial, and Institutional
CMMS	Computerized Maintenance Management System
CO_2	Carbon Dioxide
CPE	Comprehensive Program Evaluation
CRA	Colorado River Aqueduct
CUWCC	California Urban Water Conservation Council
CVP	Central Valley Project
CVWD	Coachella Valley Water District
CY	Calendar Year
D/DBP	Disinfectants/Disinfection Byproduct
DBP	Disinfection Byproduct
DDW	The SWRCB's Division of Drinking Water
DFW	Department of Fish and Wildlife
DLR	Detection Level for purposes of Reporting
DMM	Demand Management Measure
DOE	U.S. Department of Energy

LIST OF ABBREVIATIONS

Abbreviation	**Terms**
DPC	Delta Protection Commission
DPR	Direct Potable Reuse
DTSC	California Department of Toxic Substances Control
DVL	Diamond Valley Lake
DWA	Desert Water Agency
DWCV	Desert Water Agency/Coachella Valley Water District
DWR	California Department of Water Resources
ECLO	Existing Conveyance and Low Outflow
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ELPH	Equivalent Level of Public Health Protection
ESA	Endangered Species Act
ET_o	Evapotranspiration
FWUA	Friant Water Users Authority
FY	Fiscal Year
GHG	Greenhouse Gas Emissions
GRP	Groundwater Recovery Program
GWRS	Groundwater Replenishment System
HECW	High Efficiency Clothes Washer
HET	High Efficiency Toilet
HTC	Hyatt/Thermalito Complex
ICP	Innovative Conservation Program
ICS	Intentionally Created Surplus
IEUA	Inland Empire Utilities Agency
IID	Imperial Irrigation District
IPR	Indirect Potable Reuse
IRP	Integrated Water Resources Plan
JWPCP	Joint Water Pollution Control Plant
LAA	Los Angeles Aqueduct
LADWP	Los Angeles Department of Water and Power
LRP	Local Resources Program
M&I	Municipal & Industrial
MCL	Maximum Contaminant Level
MFR	Multi-family Residential
MLPA	Marine Life Protected Area
MOU	Memorandum of Understanding
MWD	Metropolitan Water District
MWD-EDM	Metropolitan's Econometric Demand Model
MWDOC	Municipal Water District of Orange County
MWELO	Model Water Efficient Landscape Ordinance
MWQI	Municipal Water Quality Investigations
NASA	National Aeronautics and Space Administration
NDEP	Nevada Division of Environmental Protection
NDMA	N-nitrosodimethylamine
NEPA	National Environmental Policy Act

LIST OF ABBREVIATIONS

Abbreviation	**Terms**
NERT	Nevada Environmental Response Trust
NMFS	National Marine Fisheries Services
OCWD	Orange County Water District
OEHHA	Office of Environmental Health Hazard Assessment
OMP&R	Operation, Maintenance, Power and Replacement
PG&E	Pacific Gas & Electric
PHG	Public Health Goal
polyDADMAC	polydiallyldimethylammonium chloride
PPCP	Pharmaceutical/Personal Care Product
PPRs	Present Perfected Rights
PVID	Palo Verde Irrigation District
QMCP	Quagga Mussel Control Program
QSA	Quantification Settlement Agreement
RDM	Robust Decision Making
RPAs	Reasonable and Prudent Alternatives
RTP-12	2012-2035 Regional Transportation Plan/Sustainable Communities Strategy
RTS	Readiness-to-Serve
SANDAG	San Diego Association of Governments
SAR	System Access Rate
SARI Line	Santa Ana Regional Interceptor Line
SB X7-7	Senate Bill X7-7, Water Conservation Act of 2009
SCAG	Southern California Association of Governments
SCWC	Southern California Water Committee
SDCWA	San Diego County Water Authority
SDP	Seawater Desalination Program
Series 13	SANDAG Series 13: 2050 Regional Growth Forecast
SFR	Single-Family Residential Model
SNMP	Salt and Nutrient Management Plan
SNWA	Southern Nevada Water Authority
SPR	System Power Rate
SRCSD	Sacramento Regional County Sanitation District
SWC	State Water Contractors
SWP	State Water Project
SWRCB	State Water Resources Control Board
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TVMWD	Three Valleys Municipal Water District
UCMR2	Unregulated Contaminant Monitoring Regulation 2
USBR	U.S. Department of the Interior, Bureau of Reclamation
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Services
UWMP	Urban Water Management Plan
VOC	Volatile Organic Compound
WRD	Water Replenishment District of Southern California

LIST OF ABBREVIATIONS

Abbreviation	Terms
WSAP	Water Supply Allocation Plan
WSDM Plan	Water Surplus and Drought Management Plan
WSR	Water Stewardship Rate
WUCA	Water Utility Climate Alliance
WUE	Water Use Efficiency
YCWA	Yuba County Water Agency

Phrases

2015 IRP Update	2015 Integrated Water Resources Plan, Water Tomorrow
Act	Urban Water Management Planning Act
Arvin-Edison	Arvin-Edison Water Storage District
Bay-Delta	San Francisco Bay/Sacramento-San Joaquin Delta
Conservancy	Sacramento-San Joaquin Delta Conservancy
Council	Delta Stewardship Council
Delta	Sacramento/San Joaquin River Delta
Forum	Colorado River Basin Salinity Control Forum
Kern Delta	Kern Delta Water District
Metropolitan	The Metropolitan Water District of Southern California
Metropolitan Act	Metropolitan Water District Act
Plan	Urban Water Management Plan
Policy	State Recycled Water Policy
Regional Board	Regional Water Quality Control Board
Sanitation District	County Sanitation District No. 2 of Los Angeles County
Science Board	Delta Independent Science Board
Semitropic	Semitropic Water Storage District
Urban MOU	California urban Water Conservation Council Memorandum of Understanding Regarding Water Conservation in California

Summary of Compliance

SB X7-7	
Water Code § 10608.36 – Assessment of Measures, Programs, and Policies	Assess present and proposed future measures, programs, and policies to help achieve water use reduction targets • Metropolitan's actions to help achieve the urban per capita water use reduction pursuant to the goals set forth in SB X7-7 are discussed in Sections 3.4, 3.5, and 3.7.
Agency Coordination	
Water Code § 10620(d)(2) Coordination with Appropriate Agencies	Describe the coordination of the plan preparation. • See Section 5.
Water Code § 10620(f) - Describe Resource Maximization / Import Minimization Plan	Discuss how water management tools and options are used to maximize resources and minimize the need to import water. • Metropolitan's planning strategy within the IRP and adaptive implementation approach are discussed in Section 2 and provide an overview of the water management tools and options. See pages 2-1 through 2-9. • Further details are provided in Sections 1.4 (conservation, page 1-23), 3.4 (demand management and conservation, pages 3-30 through 3-45), and 3.5 (recycling, groundwater recovery, and desalination, pages 3-46 through 3-63.)
Water Code § 10621(b) - City and County Notification and Participation	Notify any city or county within service area of Urban Water Management Plan (UWMP) review & revision at least 60 days before public hearing. May consult with and obtain comments from notified cities and counties. • Notification and participation are discussed in Section 5, pages 5-1 through 5-10, and Appendix 10, DWR Table 10-1.
Water Code § 10621(d) – Plan Submittal to Department of Water Resources (DWR)	Each urban water supplier shall update and submit its 2015 plan to the department by July 1, 2016 • Submission of the 2015 UWMP by the July 1, 2016 deadline is detailed in Section 5.
Contents of UWMP	
Water Code § 10631(a) - Service Area Information	Describe service area of supplier • Service area is discussed on Section 1.2, pages 1-6 through 1-10 and shown in Figure 1-1. Include current and projected population • Population is discussed in Section 1.3 and shown in Table 1-1, Figure 1-2, and Figure 1-3. • Population analysis is discussed in Appendix 1, page A.1-4. Projections are on page A.1-9, Table A.1-2. • Current and projected population are shown in Appendix 10, DWR Table 3-1. Population projections must be based on data from state, regional or local service agency projections • See footnote Table A.1-2, page A.1-9. Describe climate characteristics that affect water management • See Section 1.3, pages I-14 through I-16, Figure 1-5, and Table 1-4, and Section 2.6, pages 2-26 through 2-29. Describe other demographic factors affecting water management • See Section 1.3, pages I-13 through 1-14 and Appendix 1.

Summary of Compliance

Water Code § 10631(b) - Water Sources	Identify existing and planned water supply sources Provide existing and planned water supply quantities • Current supplies and quantities are described in Section 1.4, pages 1-18 through 1-28. • Historic and current water supplies are described in Appendix 2. • Planned water supplies and quantities are discussed in Section 2, and details are provided in Appendix 3, and particularly in Table A.3-7, pages A.3-48 through A.3-60. • See Appendix 10, DWR Table 6-8 and 6-9.
Water Code § 10631(b)(1-4) - If Groundwater Identified as Existing or Planned Source	• Metropolitan does not supply or plan to supply groundwater. However, Metropolitan does use groundwater basins for groundwater banking. • See Section 3.6 and Appendix 2 (pages A.2-4 through A.2-5) and Appendix 3 (pages A.3-43 through A.3-46) for discussions of issues related to groundwater basins. • See Section 4 for salinity issues related to groundwater basins.
Water Code § 10631(c)(1) - Reliability of Supply	Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage • Section 2.3, pages 2-13 through 2-17 and the discussions presented under the Colorado River Aqueduct (CRA) and State Water Project (SWP), Sections 3.1 and 3.2. Provide data for an average water year, single-dry water year, and multiple-dry water years • Section 2, Tables 2-4 through 2-6, pages 2-15 through 2-17. • See Appendix 10, DWR Table 7-1.
Water Code § 10631(c)(2) - Water Sources Not Available on a Consistent Basis	Describe plans to supplement or replace inconsistent sources with alternative sources or water Demand Management Measures (DMMs) • For discussion of Metropolitan's recent and near-term drought response actions, see Section 1.4, pages 1-22 through 1-28. • For a discussion on water DMMs, see Section 2.1, pages 2-2 through 2-5, and Section 3.4, pages 3-30 through 3-45. • For discussion on how Metropolitan plans to meet Southern California's water supply needs in the future and supplement or replace inconsistent sources, see Sections 2 and 3.
Water Code § 10631(d) - Transfer or Exchange Opportunities	Describe short term and long term exchange or transfer opportunities • Section 1.4 (augmenting water supplies), pages 1-24 through 1-26. • Section 3.1 (pages 3-2 through 3-9) describes plans for banking, exchange and transfer opportunities along the Colorado River and Aqueduct. • Section 3.2 (pages 3-10 through 3-23) describes plans for banking, exchange and transfer opportunities within the State Water Project. • Section 3.3 (pages 3-24 through 3-29) describes plans for banking, exchange and transfer opportunities within the Central Valley/State Water Project. • Section 3.6 (pages 3-64 through 3-67) describes plans for banking, exchange and transfer opportunities within the local region. • Further details are provided in Appendix 3, particularly Table A.3-7 on pages A.3-48 through A.3-60.

Summary of Compliance

Water Code §§ 10631(e)(1) and (2) - **Past, Current, and Projected Water Use**	Quantify past, current, and projected water use by sector in five-year increments • See Section 1.3, page 1-14 and Figure 1-4 for historical retail water demands. • Past, current, and future water uses are shown in Appendix 1, Table A.1-13 on page A.1-13. Water uses by sector and county are shown in Tables A.1-6 through A.1-11 on pages A.1-11 through A.1-13. Water demands by sector are shown in DWR Tables 4-1, 4-2, and 4- 3, on pages A.10-3 and A.10-4. Identify and quantify sales to other agencies • See Section 1.3, page 1-13 and Figure 1-4 for historical retail water demands. • Historic sales are presented in Table A.2-2 on page A.2-3. • Metropolitan does not project sales by individual agency. However, total projected sales/demands to other agencies are shown in Section 2.2, pages 2-6 through 2-12.
Water Code §§ 10631(e)(1)(J), (e)(3)(A)&(B) – **Distribution System Water Loss**	Quantify distribution system water loss for most recent 12-month period available • Section 2.6, page 2-26, Appendix 7, Table A.7-1, and Appendix 10 (DWR Table 4-4).
Water Code § 10631(e)(4)(A) and (B) – **Water Savings Estimate**	Water savings estimated to result from adopted codes, standards, ordinances, or transportation and land use plans Provide citations to the codes, standards, ordinances, or transportation and land use plans used to make projections Indicate extent that water use projections consider savings from codes, standards, ordinances, or transportation and land use plans. • See discussion on estimating demands and code based conservation in Section 2, page 2-6 and Appendix 6.
Water Code §§ 10631(f)(2), 10631(i) – Description of Supplier's Water Demand Management Measures, Distribution System Asset Management, Assistance Programs; Option for CUWCC Members	Provide narrative description of items in §10631(f)(1)(B)(ii), (iv), (vi), and (vii), distribution system asset management, and wholesale supplier assistance programs • See discussion on metering, Section 3.4, page 3-37. • See discussion on public education and outreach, Section 3.4, pages 3-32 through 3-35. • See discussion on water conservation programs, Section 3.4, pages 3-35 through 3-37. CUWCC members deemed to be in compliance with Water Code §10631(f) by complying with Dec. 10, 2008 MOU and submitting annual reports required by Section 6.2 of that MOU • See CUWCC filings in Appendix 8. • See discussion on demand management and conservation, Section 3.4, pages 3-30 through 3-42. • See discussion on distribution system asset management, Section 3.4, pages 3-43 through 3-45. • See discussion on assistance programs to retail water agencies (rebate programs, public education and outreach, and other efforts to reduce water demand), Section 3.4, pages 3-32 through 3-42.

Summary of Compliance

Water Code § 10631(g) - Planned Water Supply Projects and Programs	Detailed description of expected future supply projects & programs to meet projected water use Timeline for each proposed project or program Quantification of each projects average yield (AFY) Quantification of each projects single dry-year yield (AFY) Quantification of each projects multiple dry-year yield (AFY) • Section 3.1 (pages 3-2 through 3-9) describes plans for banking, exchange and transfer opportunities along the Colorado River and Aqueduct. • Section 3.2 (pages 3-10 through 3-23) describes plans for banking, exchange and transfer opportunities within the State Water Project. • Section 3.3 (pages 3-24 through 3-29) describes plans for banking, exchange and transfer opportunities within the Central Valley/State Water Project. • Section 3.6 (pages 3-64 through 3-67) describes plans for banking, exchange and transfer opportunities within the local region. • Further details are provided in Appendix 3, particularly Table A.3-7 on pages A.3-48 through A.3-60. • See Appendix 10, DWR Table 6-7.
Water Code § 10631(h) - Opportunities for Development of Desalinated Water	Describe opportunities for development of desalinated water, including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply • See discussion on groundwater recovery and seawater desalination in Section 1.4, pages 1-20 through 1-22, and Section 3.5, pages 3-46 through 3-63. • See Appendix 5, Table A.5-2 on pages A.5-9 through A.5-11 for a list of existing and conceptual groundwater recovery projects and their ultimate yield/capacity. • See Appendix 5, Table A.5-3 on page A.5-12 for a list of conceptual, planned, and under construction seawater desalination projects.
Determination of Demand Management Measures Implementation	
Water Code § 10631(i) - Members of CUWCC Deemed in Compliance with §10631(f)	CUWCC members must comply with MOU re Urban Water Conservation in California (Dec. 10, 2008) and submit required annual reports • Metropolitan is a CUWCC member. • 2011-2014 BMP annual updates are included in Appendix 8. • See discussion in Section 3.4.

Summary of Compliance

Water Code § 10631(j) – If Supplier Receives or Projects Receiving Water from a Wholesale Supplier	Urban water suppliers that rely on wholesale agency for water source must provide wholesale agency with water use projections in 5-year increments to 20 years or as far as data is available. Wholesaler to provide existing and planned water supply availability projections, by source, and planned water supply quantities to member agencies • See discussions on Metropolitan and member agency coordination for the IRP Process in Sections 2 and 5. • See Appendix 3, Table A.3-7, and Appendix 10, DWR Table 2-4.
Water Code § 10631.1 - Projected Water Use for Low-Income Housing	Water use projections for single-family and multi-family residential housing for lower income household • This is incorporated with the retail demand forecast, as reflected in Section 2 and Appendix 1.
Water Code § 10631.2 – Voluntary Calculation or Estimation of Energy Intensity of Urban Water Systems	May include any of the following: estimated amount of energy for extraction or diversion (from sources), conveyance, treatment, distribution, and storage of water, and any other appropriate energy-related information • Estimate of the amount of energy used and energy intensity is presented in Appendix 9. • See Section 3.8 for discussion of Metropolitan's Energy Management Initiative.
Water Shortage Contingency Plan	
Water Code § 10632 - Water Shortage Contingency Analysis of Elements within Water Supplier's Authority **Water Code § 10632(a)(1) - Stages of Action**	Provide stages of action in response to water supply shortages Provide the water supply conditions for each stage Includes plan for up to 50 percent reduction in water supply • Documentation of the stages of action Metropolitan would undertake to address up to 50 percent reduction in its water supplies and a catastrophic interruption in water supplies is included in its Water Surplus and Drought Management (Section 2.4) and Water Supply Allocation Plans (Section 2.4 and Appendix 4), in the discussion of the implementation of its Water Supply Allocation Plan in Section 1.4, page 1-26, in the discussion of its Water Shortage Contingency Analysis in Section 2.4, pages 2-18 through 2-23, in the discussion of its Water Supply Condition Framework in Section 2.4, pages 2-20 through 2-21, and in the discussion of its Emergency Storage Requirement developed under its catastrophic supply interruption plan in Section 2.5, page 2-24. • See Appendix 10, DWR Table 8-1,
Water Code § 10632(a)(2) - Three-Year Minimum Water Supply	Identify driest 3-year historic sequence Estimated minimum water supply available for each of the next three years • Metropolitan has projected its supply capabilities for each of the next three years 2016 through 2018 under a multiple dry year hydrology (based on a repeat of 1990-1992 hydrology, which represents the three years of shortest supplies). See Section 1.4, page 1-28, Table 1-7 on page 1-28, and Appendix 10, DWR Table 8-4.

Summary of Compliance

Water Code § 10632(a)(3) - **Preparation for Catastrophic Water Supply Interruption**	Actions to prepare for and implement during catastrophic water supply interruption Provide catastrophic supply interruption plan and summarize Emergency Response Plan Regional power outage Earthquake Delta levee failure Aqueduct failure • See Sections 2.5 and 2.6, pages 2-24 through 2-29.
Water Code § 10632(a)(4) - **Prohibitions on End Users**	List the mandatory prohibitions against specific water use practices during water shortages (i.e., prohibiting use of potable water for street cleaning) • Not applicable to Metropolitan because prohibitions against specific water use practices are enforced on end users and are not within Metropolitan's authority as a wholesaler.
Water Code § 10632(a)(5) - Consumption Reduction Methods	List the consumption reduction methods the water supplier will use to reduce water use in the most restrictive stages with up to a 50 percent reduction in water supply. • See Section 1.4, pages 1-22 through 1-28, for a description of Metropolitan's recent and near-term drought response actions. • Section 2.4 for Metropolitan's Water Surplus and Drought Management Plan • Section 2.4 and Appendix 4 for Water Supply Allocation Plan. • See Section 3.4 for a description of Metropolitan's demand management through conservation.
Water Code § 10632(a)(6) - **Penalties or Charges**	List penalties or charges for excessive use, where applicable • Not applicable to Metropolitan because enforcing penalties or charges for excessive use by end users is not within Metropolitan's authority as a wholesaler. However, Metropolitan's WSDM Plan and WSAP are described in Section 2.4. • Metropolitan's WSAP is attached in Appendix 4.
Water Code § 10632(a)(7) - Revenue and Expenditure Impacts	Describe how actions and conditions impact revenues and expenditures Describe proposed measures to overcome the revenue and expenditure impacts, such as development of reserves and rate adjustments • See Section 2.7, pages 2-30 through 2-36, and Appendix 4.
Water Code § 10632(a)(8) - Water Shortage Contingency Resolution or Ordinance	Attach a copy of the draft water shortage contingency resolution or ordinance. • Not applicable to Metropolitan. The WSDM Plan, Water Supply Condition Framework, and WSAP adopted to deal with water shortages are discussed in Section 2.4, pages 2-18 through 2-23. The WSAP is also included as Appendix 4.
Water Code § 10632(a)(9) - Water Use Reduction Measuring Mechanism	Provide mechanisms for determining actual reductions in water use • Metropolitan's water sales are metered. See Section 3.4.

Summary of Compliance

Water Code § 10632(b) – Water Features	Analyze and define water features artificially supplied with water separately from swimming pools and spas when developing water shortage contingency analysis • Not applicable to Metropolitan because prohibitions against specific water use practices are enforced on end users and are not within Metropolitan's authority as a wholesaler.
Recycled Water Plan	
Water Code § 10633 - Recycled Water as Potential Water Source; Agency Coordination	Provide information, to the extent available, on recycled water and its potential as a water source in the supplier's service area. Coordinate plan preparation with local water, wastewater, groundwater, and planning agencies within supplier's service area. • See Section 1.4, pages 1-20 through 1-26, Section 3.5, pages 3-46 through 3-63, Tables 3-12 and 3-13 on page 3-63, Appendix 2, pages A.2-8 through A.2-9, and Appendix 5, Table A.5-1. • Coordination of the plan preparation is discussed in Section 5.
Water Code § 10633(a) - **Wastewater System Description**	Describe the wastewater collection and treatment systems in the supplier's service area Quantify the volume of wastewater collected and treated • Not applicable to Metropolitan because it does not collect or treat the wastewater generated within its service area. Instead, Metropolitan provides a general narrative description of the wastewater collection and treatment systems operated by others in its service area. • See Section 3.5, pages 3-46 through 3-63, Table 3-8 on page 3-47, Tables 3-12 and 3-13 on page 3-63, Appendix 2, pages A.2-8 through A.2-9, and Appendix 5, Table A.5-1.
Water Code § 10633(a) through (d) - Wastewater Disposal and Recycled Water Uses	Describes methods of wastewater disposal in the supplier's service area • Not applicable to Metropolitan because it does not dispose of wastewater within its service area. Instead, Metropolitan provides a general narrative description of wastewater disposal by others in its service area. • See Section 3.5, pages 3-47 through 3-48. Describe quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project. • Not applicable to Metropolitan because it does not treat or discharge recycled water. Instead, Metropolitan provides a general narrative description of the treatment and discharge of recycled water by others in its service area. • See Section 3.5, pages 3-48 through 3-49. Describe the current type, place and quantity of use of recycled water in supplier's service area Describe and quantify potential uses of recycled water Determination of technical and economic feasibility of serving the potential uses • Not applicable to Metropolitan because it does not use recycled water in its service area. Instead, Metropolitan provides a general narrative description of the use of recycled water by others in its service area, including potential uses and the technical and economic feasibility of serving the potential uses of recycled water • See Section 3.5, pages 3-46 through 3-63, Section 4, page 4-6, Appendix 2, pages A.2-8 through A.2-9, and Table A.5-1.

Summary of Compliance

Water Code § 10633(e) - Projected Uses of Recycled Water	Projected use of recycled water in service area • See Section 2, Tables 2-1 through Table 2-3, pages 2-10 through 2-12 and Section 3.5. Compare UWMP 2010 projections with UWMP 2015 actual use of recycled water • The 2010 RUWMP, Tables 2-6, 2-7, and 2-8 included the following projections for recycled water use in 2015: 408 TAF for a single dry year; 400 TAF for a multiple dry year; and 404 TAF for an average year. In 2015, actual recycled water use is estimated at 414 TAF, as discussed in Table 3-12 on page 3-63 and Appendix 2, page A.2-8 of this 2015 UWMP. • See Appendix 10, DWR Table 6-5.
Water Code §§ 10633(f), (g) – Actions to Encourage Use of Recycled Water **Plan to Optimize Use of Recycled Water**	Describe actions, including financial incentives, that might be taken to encourage recycled water uses Describe projected results of these actions in terms of acre-feet of recycled water used per year Provide a plan to optimize the use of recycled water in the supplier's service area • Metropolitan provides a general narrative description of the actions it takes to encourage recycled water uses in its service area • See Section 1.4, pages 1-20 through 1-22, 1-24, Table 1-6, Section 3.5, pages 3-46 through 3-63, Tables 3-12 and 3-13 on page 3-63, and Appendix 5, Table A.5-1.
Water Quality Impacts on Reliability	
Water Code § 10631(c)(2) - Water Sources Not Available at a Consistent Level of Use	Discuss plans to supplement or replace with alternative sources or DMMs any water source that may not be available at a consistent level of use given specific water quality factors • See Section 2.1, pages 2-2 through 2-5, and Section 3.4, pages 3-30 through 3-45, for water DMMs. • See Section 3.2, SWP Water Quality, pages 3-18 through 3-19, 3-23. • See Section 4, Water Quality, pages 4-1 through 4-17.
Water Code § 10634 - Water quality impacts on availability of supply	Discuss water quality impacts by source upon water management strategies and supply reliability • See Section 3.2, SWP Water Quality, pages 3-18 through 3-19, 3-23. • See Section 4, Water Quality, pages 4-1 through 4-17.
Water Service Reliability	
Water Code § 10635(a) - Supply and Demand Comparison: Normal Water Year	Compare the projected normal water supply to projected normal water use over the next 20 years, in 5-year increments. • For projected water use, see Section 2, Table 2-3, page 2-12. • For projected water supply, see Table 2-6, page 2-17 and Table A.3-7 in Appendix 3, pages A.3-48 through A.3-60, and Appendix 10, DWR Table 7-2.
Water Code § 10635(a) - Supply and Demand Comparison: Single-Dry Year Scenario	Compare the projected single-dry year water supply to projected single-dry year water use over the next 20 years, in 5-year increments. • For projected water use, see Section 2, Table 2-1, page 2-10. • For projected water supply, see Table 2-4, page 2-15 and Table A.3-7 in Appendix 3, pages A.3-48 through A.3-60, and Appendix 10, DWR Table 7-3.

Summary of Compliance

Water Code § 10635(a) - Supply and Demand Comparison: Multiple-dry Year Scenario	Project a multiple-dry year period occurring between 2015-2020 and compare projected supply and demand during those years Project a multiple-dry year period occurring between 2021-2025 and compare projected supply and demand during those years Project a multiple-dry year period occurring between 2026-2030 and compare projected supply and demand during those years Project a multiple-dry year period occurring between 2031-2035 and compare projected supply and demand during those years • Metropolitan has projected multiple dry year periods for years ending in "0" or "5". Its planning for multiple dry years is based on the three years of shortest supplies (1990-1992 hydrology). The results presented in Section 2 for multiple dry years are for an average of three years with this extreme hydrology. • For projected water use, see Section 2, Table 2-2, page 2-11. • For projected water supply, see Table 2-5, page 2-16 and Table A.3-7 in Appendix 3, pages A.3-48 through A.3-60. • See Appendix 10, DWR Table 7-4.
Water Code § 10635(b) – Plan Submittal to Cities and Counties	Supplier to provide portion of plan on water service reliability to cities and counties within its service area no later than 60 days after plan submittal. • Provision of Plan to cities and counties is described in Section 5.
Water Code § 10641 – Consultations with public agency, state agency or experts	Supplier may consult with and obtain comments from any public agency, state agency, or any person with special expertise as to water demand management methods and techniques • Stakeholder, state agency, public agency, and expert participation, consultation, outreach, comments, and notification are described in Section 5.
Water Code § 10642 – Public Hearing; Notice; Adoption	Encourage involvement of diverse social, cultural & economic community groups prior to and during plan preparation • See Section 5, pages 5-1 through 5-11. Prior to adoption, plan available for public inspection and hold public hearing • See Section 5, pages 5-5 and 5-11. Provide proof of public hearing and notice • See Section 5, page 5-10. Provide meeting notice to any city or county in service area • See Section 5, page 5-9, and Appendix 10, DWR Table 10-1. After hearing, plan adopted as prepared or as modified after hearing. • See Section 5, page 5-11.

Summary of Compliance

Water Code §§ 10615, 10643 – Plan Implementation	Include in plan strategy and time schedule for implementation Implement plan in accordance with the schedule set forth in the plan • Metropolitan has conducted a review of its planning progress through the 2015 IRP Update, discussed in Section 2. In addition, in each section, Metropolitan has included an "Achievement to Date" that discusses progress towards its planning goals, and discusses current issues and potential problems with continued implementation of the plan. • Section 3 summarizes the implementation plan and continued progress in developing a diversified resource mix consistent with the IRP to meet the region's water supply needs DMM Programs • Metropolitan is a member of CUWCC, and has submitted its recent BMP reports to the CUWCC to comply with the UWMP requirements. In addition, Metropolitan has discussed its conservation plan and approach in Section 3.4. Individual conservation programs are discussed on pages 3-30 through 3-42.
Water Code § 10644(a)(1) –Plan Submittal	Submit to DWR, the California State Library, and any city or county within service area copy of plan no later than 30 days after adoption. • Plan submission is described in Section 5.
Water Code § 10644(a)(2) – Plan shall include any Standardized Forms, Tables, or Displays specified by DWR	Submit plan electronically Include in plan DWR standardized forms, tables, or displays • Plan submission is described in Section 5. • DWR standardized tables for wholesale urban water agencies are completed and presented in Appendix 10.
Water Code § 10645 – Plan Available for Public Review	No later than 30 days after plan submittal, the supplier and DWR to make the plan available for public review during normal business hours. • Posting of Plan on Metropolitan's website for public review is described in Section 5.

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Executive Summary

Metropolitan's 2015 Urban Water Management Plan (UWMP) has been prepared in compliance with Water Code Section 10608.36 of SB X7-7, which was enacted in 2009, and Sections 10610 through 10656 of the Urban Water Management Planning Act (Act), which were added by Statute 1983, Chapter 1009, and became effective on January 1, 1984. This Act requires that every urban water supplier providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually prepare and adopt, in accordance with prescribed requirements, an urban water management plan.

The Act requires urban water suppliers to describe and evaluate sources of water supply, efficient uses of water, demand management measures, implementation strategy and schedule, and other relevant information and programs. Urban water suppliers are required by the Act to update their UWMP and submit a complete plan to the California Department of Water Resources (DWR) every five years. An UWMP is required in order for a water supplier to be eligible for DWR administered state grants and loans and drought assistance.

As with Metropolitan's previous plans, the 2015 UWMP does not explicitly discuss specific activities undertaken by its member agencies unless they relate to one of Metropolitan's water demand or supply management programs. Presumably, each member agency will discuss these activities in its UWMP.

The information included in the 2015 UWMP represents the most current and available planning projections of supply capability and demand developed through a collaborative process with the member agencies. Metropolitan's Board recently adopted the 2015 Integrated Water Resources Plan, Water Tomorrow (2015 IRP Update), which represents Metropolitan's comprehensive planning process and will serve as Metropolitan's blueprint for long-term water reliability, including key supply development and water use efficiency goals.

Factors Considered

The Act requires reporting agencies to describe their water reliability under a single dry-year, multiple dry-year, and average year conditions, with projected information in five-year increments for 20 years. The factors used to evaluate Metropolitan's supply and demand balance for the 2015 UWMP are presented below. Some of the considerations and resulting projections may change as Metropolitan's planning progresses. These changes may be reflected in future updates of the UWMP.

Demand Projections

Within Metropolitan's service area, retail water demands can be met with local supplies or imported supplies. Metropolitan's supply reliability evaluation focuses on the future demands for Metropolitan's imported supplies. The expected firm demand on Metropolitan is the difference between total demands, adjusted for conservation, and projected total local supplies. Thus, in order to project the regional need for imported water, Metropolitan starts with a projection of total demand including retail Municipal and Industrial (M&I), retail agricultural, seawater barrier, and replenishment demands, determines the adjustments from total conservation, and subtracts the total local supplies that are available to meet a portion of those demands.

Total Demands

Metropolitan updates its retail M&I projection periodically based on the release of official regional demographic and economic projections. The projections of retail M&I water demands used in the 2015 UWMP are based on data from the following reports:

- Southern California Association of Governments (SCAG) 2012 Regional Transportation Plan/Sustainable Community Strategy (April 2012)
- San Diego Association of Governments (SANDAG) Series 13: 2050 Regional Growth Forecast (October 2013)

The SCAG and SANDAG regional growth forecasts are the core assumptions that drive the estimating equations of the retail demand forecasting in Metropolitan's Econometric Demand Model (MWD-EDM). SCAG's and SANDAG's projections undergo extensive local review, incorporate zoning information from city and county general plans, and are supported by Environmental Impact Reports.

Retail agricultural demands consist of water use for irrigating crops. Metropolitan's member agencies estimate agricultural water use based on many factors, including farm acreage, crop types, historical water use, and land use conversion. Each member agency estimates its agricultural demands differently, depending on availability of information. Metropolitan relies on member agencies' estimates of agricultural demands for the 2015 UWMP.

Metropolitan also includes in its assessment of total demands the local groundwater requirements for seawater barrier and groundwater basin replenishment. Seawater barrier demands represent the amount of water needed to hold back seawater intrusion into the coastal groundwater basins. Replenishment demands represent the amount of water that member agencies plan to use to replenish the groundwater basins as available. Metropolitan relies on member and groundwater management agencies' projections for these demands.

Total Conservation

Projected regional water demand is adjusted to account for water conserved by Best Management Practices from active, code-based, and price-effect conservation. Active conservation levels are derived by calculating water savings from all active program device-based savings installed to date. Code-based conservation levels are derived by calculating water savings from devices covered by existing water conservation ordinances and plumbing codes, including the state Model Water Efficient Landscape Ordinance, with replacement and new construction rates driven by demographic growth consistent with SCAG and SANDAG land use and transportation plans used to derive retail demand. Price-effect conservation is derived by calculating water savings by retail customers attributable to the effect of changes in the real (inflation adjusted) price of water.

Water use reduction under Senate Bill 7 (SB X7-7) (see description below) is factored into local water supplies. This has been done to recognize the fact that one method of compliance with SB X7-7 is the development of recycled water in addition to conservation.

Total Local Supplies

Projections of local supplies are based on information gathered from a number of sources including past urban water management plans, Metropolitan's annual local production surveys, and communications between Metropolitan and member agency staff. The projections include groundwater and surface water production, recycled water and recovery of contaminated or degraded groundwater (funded under the Metropolitan's Local Resources Program, as well as local agency funded programs), and seawater desalination. The local supply projections presented in demand tables for the 2015 UWMP include existing projects that are currently producing water, projects that are under construction, and Metropolitan's IRP local supply targets included as programs under development.

The total local supplies presented in the 2015 UWMP also include Los Angeles Aqueduct deliveries and non-Metropolitan water supplies imported by or exchanged with member agencies from sources outside of Metropolitan's service area.

Water Use Reduction Achievement in 2015

On November 10, 2009, the state Legislature passed Senate Bill 7 as part of the Seventh Extraordinary Session, referred to as SB X7-7 or the Water Conservation Act of 2009. This law is the water conservation component to the historic Delta legislative package, and seeks to achieve a 20 percent statewide reduction in urban per capita water use in California by December 31, 2020. According to Water Code § 10608.36, wholesale agencies are required to include in their UWMPs an assessment of present and proposed future measures, programs, and policies that would help achieve the water use reductions required under SB X7-7. Urban wholesale water suppliers are not required to comply with the target-setting and reporting requirements of SB X7-7.

As a wholesale water agency, Metropolitan is not required to establish or report on an urban water use reduction target. However, Metropolitan's regional conservation programs are designed to assist member agencies and retail water suppliers in the service area to comply with SB X7-7. Therefore, Metropolitan monitors the progress of its service area. Also, in compliance with SB X7-7, Metropolitan assesses its actions, programs, and policies to help achieve the water use reductions required by SB X7-7.

Based on an analysis of population, demand, and the methodologies for setting targets described in the legislation, Metropolitan's baseline is 181 GPCD and the 2020 reduction target is 145 GPCD. From 2011-2014, there was a slight increase in per capita water use explained in part by continued economic recovery and drier weather as compared to previous years. With mandatory restrictions from the state, Water Supply Allocation from Metropolitan and retail water suppliers, the 2015 gallons per capita per day (GPCD) is 131, a 28 percent reduction from the baseline.

Over the next five years, Metropolitan will periodically assess water supply conditions and trends in per capita demand within its service area and evaluate potential programs to ensure attainment of the goal. Metropolitan also continues to provide support for retail agency efforts through technical assistance, legislation, code and standards updates, and potential financial incentives where needed for market transformation to increase water use efficiency.

Supply Capabilities

The 2015 UWMP reports on Metropolitan's water reliability and identifies projected supplies to meet the long-term demand within its service area. Metropolitan's supply capabilities are evaluated using the following assumptions:

Hydrologic Conditions and Reporting Period

The 2015 UWMP presents Metropolitan's supply capabilities from 2020 through 2040 under the three hydrologic conditions specified in the Act: single dry-year (represented by a repeat of 1977 hydrology), multiple dry-year (represented by a repeat of 1990 to 1992 hydrologies), and average year (represented by the average of 1922 to 2012 hydrologies).

Colorado River Aqueduct Supplies

Colorado River Aqueduct (CRA) supplies include supplies that would result from existing and committed programs and from implementation of the Quantification Settlement Agreement (QSA) and related agreements. The QSA establishes the baseline water use for each of the agreement parties and facilitates the transfer of water from agricultural agencies to urban uses. A detailed discussion of the QSA is included in Section 3. Colorado River Water Management Programs are potentially available to supply additional water up to the CRA capacity of 1.2 MAF on an as-needed basis.

State Water Project Supplies

State Water Project (SWP) supplies are estimated using the 2015 SWP Delivery Capability Report distributed by DWR in July 2015. The 2015 Delivery Capability Report presents the current DWR estimate of the amount of water deliveries for current (2015) conditions and conditions 20 years in the future. These estimates incorporate restrictions on SWP and Central Valley Project (CVP) operations in accordance with the biological opinions of the U.S. Fish and Wildlife Service and National Marine Fisheries Service issued on December 15, 2008, and June 4, 2009, respectively. Under the 2015 Delivery Capability Report with existing conveyance and low outflow requirements scenario, the delivery estimates for the SWP for 2020 conditions as percentage of Table A amounts are 12 percent, equivalent to 257 TAF for Metropolitan, under a single dry-year (1977) condition and 51 percent, equivalent to 976 TAF for Metropolitan, under the long-term average condition.

In dry, below-normal conditions, Metropolitan has increased the supplies received from the California Aqueduct by developing flexible Central Valley/SWP storage and transfer programs. Over the last two years under the pumping restrictions of the SWP, Metropolitan has worked collaboratively with the other contractors to develop numerous voluntary Central Valley/SWP storage and transfer programs. The goal of these storage/transfer programs is to develop additional dry-year supplies that can be conveyed through the California Aqueduct during dry hydrologic conditions and regulatory restrictions.

Storage

A key component of Metropolitan's water supply capability is the amount of water in Metropolitan's storage facilities. Storage is a major component of Metropolitan's dry-year resource management strategy. Metropolitan's likelihood of having adequate supply capability to meet projected demands, without implementing the Water Supply Allocation Plan, is dependent on its storage resources.

In developing the supply capabilities for the 2015 UWMP, Metropolitan assumed the current (2015) storage levels at the start of simulation and used the median storage levels going into each of the five-year increments based on the balances of supplies and demands. Under the median storage condition, there is an estimated 50 percent probability that storage levels would be higher than the assumption used, and a 50 percent probability that storage levels would be lower than the assumption used. All storage capability figures shown in the 2015 UWMP reflect actual storage program conveyance constraints. It is important to note that under some conditions, Metropolitan may choose to implement the WSAP in order to preserve storage reserves for a future year, instead of using the full supply capability. This can result in impacts at the retail level even under conditions where there may be adequate supply capabilities to meet demands.

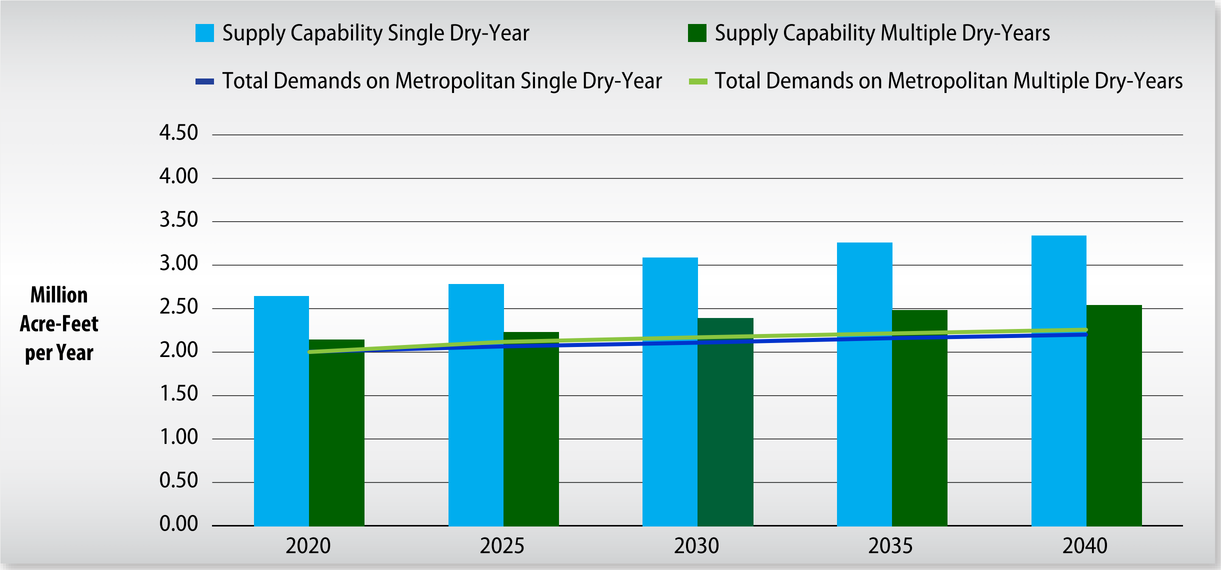
Findings of the 2015 Urban Water Management Plan

The 2015 UWMP provides a comprehensive summary of Metropolitan's demand and supply outlook through 2040. As a reporting document, the UWMP will be updated every five years to reflect changes in water demand and supply projections.

The 2015 UWMP satisfies all the reporting requirements mandated by the Act. The key reporting points of this 2015 UWMP are as follows:

- Metropolitan has supply capabilities that would be sufficient to meet expected demands from 2020 through 2040 under single dry-year and multiple dry-year hydrologic conditions, as presented in Figure ES-1, as well as average year hydrologic conditions.
- Metropolitan has comprehensive plans for stages of actions it would undertake to address up to a 50 percent reduction in its water supplies and a catastrophic interruption in water supplies through its Water Surplus and Drought Management and Water Supply Allocation Plans. Metropolitan also developed an Emergency Storage Requirement to mitigate against potential interruption in water supplies resulting from catastrophic occurrences within the Southern California region, including seismic events along the San Andreas fault. In addition, Metropolitan is working with the State on the Delta Risk Management Strategy to reduce the impacts of a seismic event in the Delta that would cause levee failure and disruption of SWP deliveries.
- Metropolitan will continue investments in water use efficiency measures to help the region achieve the 20 percent per person potable water use reduction by 2020.
- Metropolitan has plans for supply implementation and continued development of a diversified resource portfolio including programs in the CRA, SWP, Central Valley storage and transfers programs, local resource projects, and in-region storage that enables the region to meet its water supply needs.
- Metropolitan has a collaborative process for its planning initiatives, including the preparation of the 2015 UWMP.

Figure ES -1 Supply Capabilities under Single Dry-Year and Multiple Dry-Year Hydrologies



Note:
1. Supply capabilities are derived using the simulated median storage level going into each of five-year increments based on the balances of supplies and demands. Under the median storage condition, there is an estimated 50 percent probability that storage levels would be higher than the assumption used, and a 50 percent probability that storage levels would be lower than the assumption used.
2. Under some conditions, Metropolitan may choose to implement the WSAP in order to preserve storage reserves for a future year, instead of using the full supply capability. This can result in impacts at the retail level even under conditions where there may be adequate supply capabilities to meet firm demands.
3. All storage capability figures shown in the 2015 UWMP reflect actual storage program conveyance constraints.

Introduction 1

1.1 Introduction to this Document and the Agency

Organization of this Document

This report complies with the Urban Water Management Planning Act of 1984 (Act). In addition to complying with the Act, this report details Metropolitan's current situation and how it will meet the challenges of the future. This document contains five sections. The first section is the Introduction that defines Metropolitan in terms of governance, structure, and current water supply status. This section also briefly outlines how Metropolitan will meet current and future challenges. The second section describes Metropolitan's planning activities and explains how the agency will manage the region's water resources to ensure a reliable water supply for the region. The third section describes the actions Metropolitan has taken to implement the plans outlined in Section 2 and lists future programs and activities. The fourth section addresses the issue of water quality and steps taken to deliver high-quality water to Metropolitan's service area. The last section details the public outreach component integrated with Metropolitan's planning processes. Appendices that include supporting documents for this report are at the conclusion of this report. The sections are further described in detail below:

Section 1 - Introduction

In addition to demonstrating how this report complies with the Act, the 2015 Urban Water Management Plan (UWMP) details Metropolitan's current situation and outlines its plan for meeting the challenges of the future. The Introduction section includes:

- Discussion of the Act and Metropolitan's reporting responsibilities under the Act;
- Introduction to Metropolitan and description of its formation, purpose, service area, member agencies, and governance;
- Historical and demographic information on Metropolitan's service area;
- Discussion of Metropolitan's current condition, challenges, and resource planning strategies; and
- Evaluation of Metropolitan's supply capabilities for the next three years under a multiple dry-year scenario.

Section 2 - Planning for the Future

The Planning for the Future section discusses how Metropolitan plans to meet Southern California's water needs in the future. The section highlights the importance of Integrated Water Resources Planning by summarizing Metropolitan's planning processes over the years and emphasizes the need for Metropolitan to implement adaptive planning strategies that will prepare the region to deal with uncertainties. This section also includes:

- Evaluation of regional water demand under single dry-year, multiple dry-year, and average year conditions for years 2020 through 2040;

- Evaluation of supply capabilities under single dry-year, multiple dry-year, and average year conditions for years 2020 through 2040;
- Discussion of water shortage contingency analysis though the Water Surplus and Drought Management Plan and the Water Supply Allocation Plan;
- Discussion of other supply reliability risks including climate change; and
- Discussion of the different elements of Metropolitan's rate structure and revenue management.

Section 3 – Implementing the Plan

The Implementing the Plan section summarizes Metropolitan's progress in developing a diversified resource mix that enables the region to meet its water supply needs. The investments that Metropolitan has made and its continuing efforts in many different areas coalesce toward its goal of long-term supply reliability for the region. This section includes:

- Discussion of resources and program development for the CRA, SWP, Central Valley/SWP storage and transfers programs, conservation, local resources program (groundwater recovery, recycling, desalination), and groundwater; and
- Discussion of Metropolitan's measures, programs, and policies to help meet the SB X7-7 goal of 20 percent water use reduction by 2020 and the region's progress in meeting this target.

Section 4 - Water Quality

The Water Quality section identifies key regional water quality issues and discusses the protection of the quality of source water and development of water management programs that maintain and enhance water quality. This section also includes:

- Discussion of water quality issues of concern, constituents of emerging concern, and water quality programs that Metropolitan has undertaken to protect its water supplies.

Section 5 – Coordination and Public Outreach

The Coordination and Public Outreach section presents the processes undertaken in the development of the 2015 IRP Update and 2015 UWMP with the public and other stakeholders. It provides a list of all meetings and workshops conducted to promote and achieve consensus and collaborative planning. Included in this section are the public notification letters and announcements distributed by Metropolitan as required by the Act and a copy of the Metropolitan resolution adopting and approving the 2015 UWMP for submittal to DWR.

Appendices

The appendices provide detailed background on the information presented in the 2015 UWMP.

Appendix 1 - Demand Forecast

Appendix 2 - Existing Regional Water Supplies

Appendix 3 - Justifications for Supply Projections

Appendix 4 - Water Supply Allocation Plan

Appendix 5 - Local Projects

Appendix 6 - Conservation Estimates and Water Savings from Codes, Standards, and Ordinances

Appendix 7 - Distribution System Water Losses

Appendix 8 - Recent CUWCC Filings

Appendix 9 - Metropolitan's Energy Intensity Calculations, Including Conveyance and Distribution Generation

Appendix 10 - DWR's Standardized Tables

Urban Water Management Planning Act

This report has been prepared in compliance with Water Code Sections 10610 through 10656 of the Urban Water Management Planning Act (Act), which were added by Statute 1983, Chapter 1009, and became effective on January 1, 1984. This Act requires that "*every urban water supplier shall prepare and adopt an urban water management plan*" (Water Code § 10620(a)). An "urban water supplier" is defined as a supplier providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually (Water Code § 10617). These plans must be filed with the California Department of Water Resources (DWR) every five years. However, the 2015 plans must be submitted to DWR by July 1, 2016. The Act's requirements include:

- Detailed evaluation of the supplies necessary to meet demands over at least a 20-year period, in five-year increments, for a single dry water year, in multi-year droughts, and during average year conditions;
- Documentation of the stages of actions an urban water supplier would undertake to address up to a 50 percent reduction in its water supplies;
- Description of the actions to be undertaken in the event of a catastrophic interruption in water supplies; and
- Evaluation of reasonable and practical efficient water uses, recycling, and conservation activities.

In addition, Water Code § 10608.36 requires wholesale agencies to include in their UWMPs an assessment of present and proposed future measures, programs, and policies that would help achieve water use reduction targets.

Changes in the Act Since 2010

Since 2010, several amendments have been made to the Act. The following is a summary of the significant changes in the Act that have occurred from 2010 to the present:

- Changes the deadline for water suppliers to submit their 2015 UWMPs to DWR to July 1, 2016 (Water Code § 10621(d)).
- Adds "distribution system water loss" to the list of past, present, and projected future water uses that the UWMP is to quantify to the extent that records are available and over the same 5-year increments described in Water Code § 10631(a). (Water Code § 10631(e)(1)(J)). For the 2015 UWMP, the distribution system water loss must be quantified for the most recent 12-month period available. For all subsequent updates, the distribution system water loss must be quantified for each of the 5 years preceding the plan update. (Water Code § 10631(e)(3)(A)). The distribution system water loss quantification must be reported in accordance with a worksheet approved or developed by DWR through a public process. The water loss quantification worksheet must be based on the water system balance methodology developed by the American Water Works Association (AWWA) (Water Code § 10631(e)(3)(B)).
- If available and applicable to an urban water supplier, water use projections may display and account for the water savings estimated to result from adopted codes, standards, ordinances, or transportation and land use plans identified by the urban water supplier, as

applicable to the service area (Water Code § 10631(e)(4)(A)). To the extent that an urban water supplier reports the information described in § 10631(e)(4)(A), an urban water supplier shall do both of the following: (1) provide citations of the various codes, standards, ordinances, or transportation and land use plans used in making the projections; and (2) indicate the extent that the water use projections consider savings from codes, standards, ordinances, or transportation and land use plans. Water use projections that do not account for these water savings shall note that fact (Water Code § 10631(e)(4)(B)).

- Requires plans by retail water suppliers to include a narrative description that addresses the nature and extent of each water demand management measure (DMM) implemented over the past 5 years. The narrative must describe the water DMMs that the supplier plans to implement to achieve its water use targets pursuant to Water Code § 10608.20 (Water Code § 10631(f)(1)(A)). The narrative must also include descriptions of the following water DMMs: water waste prevention ordinances, metering, conservation pricing, public education and outreach, programs to assess and manage distribution system real loss, water conservation program coordination and staffing support; and other DMMs that have a significant impact on water use as measured in GPCD, including innovative measures, if implemented (Water Code § 10631(f)(1)(B).
- Requires plans by wholesale water suppliers to include a narrative description of metering, public education and outreach, water conservation program coordination and staffing support, and other DMMs that have a significant impact on water use as measured in GPCD, including innovative measures, if implemented, as well as a narrative description of their distribution system asset management and wholesale supplier assistance programs (Water Code § 10631(f)(2)).
- Adds the voluntary reporting in the UWMP of any of the following information: an estimate of the amount of energy used: (1) to extract or divert water supplies; (2) to convey water supplies to water treatment plants or distribution systems; (3) to treat water supplies; (4) to distribute water supplies through the distribution system; (5) for treated water supplies in comparison to the amount used for non-treated water supplies; and (6) to place water into or to withdraw water from storage; and (7) any other energy-related information the urban water supplier deems appropriate (Water Code § 10631.2(a)). DWR included in its UWMP guidance a methodology for the voluntary calculation or estimation of the energy intensity of urban water systems (Water Code § 10631.2(b)).
- Requires urban water suppliers to submit plans or amendments to plans electronically and to include any standardized forms, tables, or displays specified by DWR (Water Code § 10644(a)(2)).

Senate Bill 7 of the Seventh Extraordinary Session of 2009, Water Conservation in the Delta Legislative Package

In addition to changes to the Act, the state Legislature passed Senate Bill 7 as part of the Seventh Extraordinary Session, referred to as SB X7-7, on November 10, 2009, which became effective February 3, 2010. This law was the water conservation component to the historic Delta legislative package, and seeks to achieve a 20 percent statewide reduction in urban per capita water use in California by December 31, 2020. This implements the Governor's similar 2008 water use reduction goals. The law requires each urban retail water supplier to develop urban water use targets to help meet the 20 percent goal by 2020, and an interim urban water reduction target by 2015.

The bill states that the legislative intent is to require all water suppliers to increase the efficiency of use of water resources and to establish a framework to meet the state targets for urban water conservation called for by the Governor. The bill establishes methods for urban retail water suppliers to determine targets to help achieve increased water use efficiency by the year 2020. The law is intended to promote urban water conservation standards consistent with the California Urban Water Conservation Council's adopted best management practices.

An urban retail water supplier may update its 2020 urban water use target in its 2015 UWMP (Water Code § 10608.20(g)).

Urban wholesale water suppliers are not required to perform all of the target-setting and reporting requirements of SB X7-7. However, wholesale agencies must include in their UWMPs an assessment of present and proposed future measures, programs, and policies that would help achieve the water use reductions required under this law (Water Code § 10608.36).

Metropolitan addresses in Sections 3.4, 3.5, and 3.7 the actions it is taking to help urban retail water suppliers to achieve the urban per capita water use reduction pursuant to the goals set forth in SB X7-7.

Metropolitan's Compliance with the Urban Water Management Planning Act

As with Metropolitan's previous plans, this Plan does not explicitly discuss specific activities undertaken by member agencies unless they relate to one of Metropolitan's water demand or supply management programs. Presumably, each member agency will discuss these activities in its Urban Water Management Plan, but elements of this Plan do not necessarily have to be adopted by the urban water suppliers or the public agencies directly providing retail water.

DWR Guidance

In 2010, DWR provided a guidebook to aid water suppliers in developing their urban water management plans. These materials helped water suppliers to comply with the law and DWR staff to review submitted plans for regulatory compliance. The 2010 guidebook consisted of two parts: (1) preparing a UWMP – specific guidance for addressing UWMP requirements in the Water Code; and (2) UWMP supporting information – a detailed discussion of specific subjects or supporting documents related to preparing a UWMP. The 2010 guidebook also included a checklist for cross-referencing sections of the respondent water supplier's plan with the relevant sections of the Water Code to confirm that it addressed all relevant provisions of the Act.

In March 2016, DWR issued the Final 2015 UWMP Guidebook for Urban Water Suppliers. The 2015 guidebook has been updated from the 2010 version to reflect new legislation and to group the Water Code requirements by topic. As part of the guidebook, DWR has developed standardized tables for the reporting and submittal of UWMP data to DWR. As mentioned above, water suppliers are required to use these standardized tables for electronic submittal of their UWMPs to DWR to satisfy the new legislative requirement (Water Code § 10644(a)(2)). For the 2015 UWMP, Metropolitan electronically submitted the standardized tables to the designated DWR portal. In addition, Metropolitan included the standardized submittals in this Plan as Appendix 10.

The 2015 guidebook includes a voluntary checklist to show reporting of required elements to assist DWR with its review of the submitted UWMP. Included in the beginning of this Plan is a compliance checklist, organized by Water Code section, which summarizes Metropolitan's response to the requirements of the Water Code and indicates where each required element can be found in the Plan.

1.2 The Metropolitan Water District of Southern California

Formation and Purpose

The Metropolitan Water District of Southern California (Metropolitan) is a public agency organized in 1928 by a vote of the electorates of 13 Southern California cities. The agency was enabled by the adoption of the original Metropolitan Water District Act (Metropolitan Act) by the California Legislature "for the purpose of developing, storing, and distributing water" to the residents of Southern California. The Metropolitan Act also allows Metropolitan to sell additional water, if available, for other beneficial uses. In 1992, the Metropolitan Board of Directors adopted the following 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."*

The first function of Metropolitan was building the Colorado River Aqueduct (CRA) to convey water from the Colorado River. Deliveries through the aqueduct to member agencies began in 1941 and supplemented the local water supplies of the Southern California member cities. In 1960, to meet growing water demands in its service area, Metropolitan contracted for additional water supplies from the State Water Project (SWP) via the California Aqueduct, which is owned and operated by DWR. SWP deliveries began in 1972. Metropolitan currently receives imported water from both of these sources: (1) Colorado River water via the CRA, and (2) the SWP via the California Aqueduct.

Service Area

Metropolitan's service area covers the Southern California coastal plain. It extends about 200 miles along the Pacific Ocean from the city of Oxnard on the north to the international boundary with Mexico on the south, and it reaches as far as 70 miles inland from the coast (Figure 1-1). The total area served is approximately 5,200 square miles, and it includes portions of Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura counties. Table 1-1 shows that although only 14 percent of the land area of the six Southern California counties is within Metropolitan's service area, nearly 85 percent of the populations of those counties reside within Metropolitan's boundaries.

Member Agencies

Metropolitan is currently composed of 26 member agencies, including 14 cities, 11 municipal water districts, and one county water authority. Metropolitan is a water wholesaler with no retail customers. It provides treated and untreated water directly to its member agencies.

Metropolitan's 26 member agencies deliver to their customers a combination of local groundwater, local surface water, recycled water, and imported water purchased from or exchanged with Metropolitan. For some member agencies, Metropolitan supplies almost all the water used within that agency's service area, while others obtain varying amounts of water from Metropolitan to supplement local supplies. Over the last ten years (from 2006-2015), Metropolitan has provided between 50 and 60 percent of the municipal, industrial, and agricultural water used in its service area. The remaining water supply comes from local wells, local surface water, recycling, the city of Los Angeles' aqueducts from the Owens Valley/Mono Basin east of the Sierra Nevada, and water conserved by the Imperial Irrigation District and the All-American and Coachella Canal Lining Projects for the San Diego County Water Authority which is exchanged for water supplies delivered by Metropolitan. Member agencies also implement conservation programs that can be considered part of their supplies.

Some member agencies provide retail water service, while others provide water to the local area as wholesalers. Table 1-2 shows Metropolitan's member agencies and the type of service that they provide. As shown in the table, 15 member agencies provide retail service to customers, 9 provide only wholesale service, and 2 provide a combination of both. Throughout Metropolitan's service area, approximately 250 retail water suppliers directly serve the population.

Metropolitan's member agencies serve residents in 152 cities and 89 unincorporated communities. Table 1-3 shows the member agencies of Metropolitan, as well as the cities and communities served by those member agencies. Figure 1-1 also shows the geographical area served by the member agencies.

Currently, member agencies receive water from Metropolitan at various delivery points, and pay for service through a rate structure made up of multiple components. The majority of these components consist of uniform volumetric rates, and the majority of the revenue is collected through a tiered volumetric supply charge. The second tier of this rate is set at the cost of developing new supplies. Metropolitan's pricing and rate structure are described in detail in Section 2.7.

To aid in planning future water needs, member agencies advise Metropolitan in April of each year of how much water they anticipate they will need during the next five years. In addition, Metropolitan works with its member agencies to forecast future water demands.

Table 1-1
July 1, 2015 Area and Population in the Six Counties of Metropolitan's Service Area

County	Total County	In Metropolitan Service Area	Percent in Metropolitan
Land Area (Square Miles)			
Los Angeles County	4,061	1,408	35%
Orange County	789	699	89%
Riverside County	7,208	1,057	15%
San Bernardino County	20,052	242	1%
San Diego County	4,200	1,420	34%
Ventura County	1,845	365	20%
Metropolitan's Service Area	**38,155**	**5,191**	**14%**
Population (Persons)			
Los Angeles County	10,192,000	9,267,000	91%
Orange County	3,165,000	3,153,000	100%
Riverside County	2,331,000	1,679,000	72%
San Bernardino County	2,128,000	839,000	39%
San Diego County	3,276,000	3,169,000	97%
Ventura County	853,000	633,000	74%
Metropolitan's Service Area	**21,945,000**	**18,740,000**	**85%**

Table 1-2
Metropolitan's Member Agencies and Type of Water Service Provided

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

Table 1-3
Member Agencies

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

Municipal Water Districts (11)		**Member Cities (14)**			**County Water Authorities (1)**
Calleguas	Orange County	Anaheim	Glendale	San Marino	
Central Basin	Three Valleys	Beverly Hills	Long Beach	Santa Ana	
Foothill	Upper San Gabriel Valley	Burbank	Los Angeles	Santa Monica	San Diego
Inland Empire	West Basin	Compton	Pasadena	Torrance	
Eastern	Western	Fullerton	San Fernando		
Las Virgenes					

Cities within Member Agencies

Calleguas MWD
- *Camarillo*
- *Camarillo Heights*
- *Fairview*
- *Lake Sherwood Valley*
- *Las Posas*
- *Moorpark*
- *NAWS Point Mugu*
- *NCBC Port Hueneme*
- *Oak Park*
- *Oxnard*
- *Port Hueneme*
- *Santa Rosa Valley*
- *Simi Valley*
- *Somis*
- *Thousand Oaks*

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

Foothill MWD
- *Altadena*
- *La Cañada Flintridge*
- *La Crescenta*
- *Montrose*

Inland Empire
- *Chino*
- *Chino Hills*
- *Fontana*
- *Montclair*
- *Ontario*
- *Rancho Cucamonga*
- *Upland*

Eastern MWD
- *Good Hope*
- *Hemet*
- *Homeland*
- *Juniper Flats*
- *Lakeview*
- *Mead Valley*
- *Menifee*
- *Moreno Valley*
- *Murrieta*
- *Murrieta Hot Springs*
- *Nuevo*
- *North Canyon Lake*
- *Perris*
- *Quail Valley*
- *Romoland*
- *San Jacinto*
- *Sun City*
- *Temecula*
- *Valle Vista*
- *Winchester*

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

MWD of Orange County
- *Aliso Viejo*
- *Brea*
- *Buena Park*
- *Capistrano Beach*
- *Corona Del Mar*
- *Costa Mesa*
- *Coto De Caza*
- *Cypress*
- *Dana Point*
- *Fountain Valley*
- *Garden Grove*
- *Huntington Beach*
- *Irvine*
- *Laguna Beach*
- *Laguna Hills*
- *Laguna Niguel*
- *Laguna Woods*
- *La Habra*
- *Lake Forest*
- *La Palma*
- *Leisure World*
- *Los Alamitos*
- *Mission Viejo*
- *Monarch Beach*
- *Newport Beach*
- *Orange*
- *Placentia*
- *Rancho Santa Margarita*
- *San Clemente*
- *South Laguna*

MWD of Orange County (cont.)
- *San Juan Capistrano*
- *Seal Beach*
- *Stanton*
- *Tustin*
- *Tustin Foothills*
- *Villa Park*
- *Westminster*
- *Yorba Linda*

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

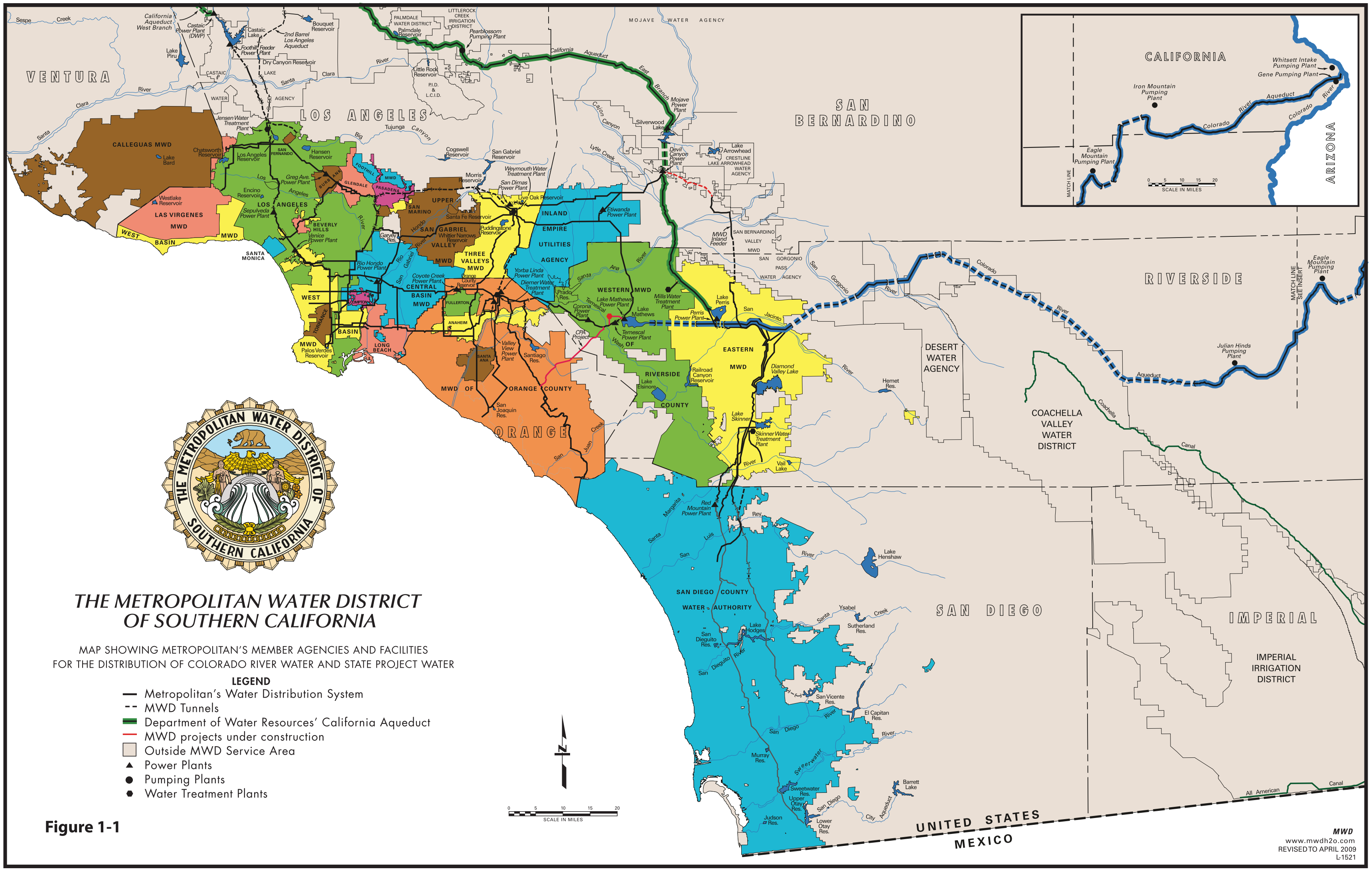
Upper San Gabriel Valley MWD
- *Arcadia*
- *Avocado Heights*
- *Baldwin Park*
- *Bradbury*
- *Citrus*
- *Covina*
- *Duarte*
- *El Monte*
- *Glendora*
- *Hacienda Heights*
- *Industry*
- *Irwindale*
- *La Puente*
- *Mayflower Village*
- *Monrovia*
- *Rosemead*
- *San Gabriel*
- *South El Monte*
- *South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

West Basin MWD
- *Alondra Park*
- *Carson*
- *Culver City*
- *El Segundo*
- *Gardena*
- *Hawthorne*
- *Hermosa Beach*
- *Inglewood*
- *Ladera Heights*
- *Lawndale*
- *Lennox*

West Basin MWD (cont.)
- *Lomita*
- *Malibu*
- *Manhattan Beach*
- *Marina Del Rey*
- *Palos Verdes Estates*
- *Rancho Palos Verdes*
- *Redondo Beach*
- *Rolling Hills*
- *Rolling Hills Estates*
- *Ross-Sexton*
- *Topanga Canyon*
- *West Athens*
- *West Hollywood*

Western MWD of
Riverside County
- *Bedford Heights*
- *Canyon Lakes*
- *Corona*
- *Eagle Valley*
- *El Sobrante*
- *Jurupa*
- *Lake Elsinore*
- *Lake Mathews*
- *March AFB*
- *Murrieta*
- *Norco*
- *Riverside*
- *Rubidoux*
- *Temecula*
- *Temescal Canyon*
- *Woodcrest*

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



THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

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

LEGEND

- — Metropolitan's Water Distribution System
- - - MWD Tunnels
- 🟩 Department of Water Resources' California Aqueduct
- 🟥 MWD projects under construction
- ☐ Outside MWD Service Area
- ▲ Power Plants
- ● Pumping Plants
- ● Water Treatment Plants

Figure 1-1

Board of Directors and Management Team

Metropolitan's Board of Directors currently consists of 38 directors. The Board consists of at least one representative from each member agency, with each agency's assessed valuation determining its additional representation and voting rights. Directors can be appointed by the chief executive officer of the member agency or be elected by a majority vote of the governing body of the agency. Metropolitan does not compensate directors for their service. The Board includes business, professional, and civic leaders. Board meetings are generally held on the second Tuesday of each month and are open to the public.

Throughout its history, the Board has delegated certain tasks to Metropolitan staff, which are codified in Metropolitan’s Administrative Code. In addition, Metropolitan has developed policy principles to help achieve its mission to provide adequate and reliable supplies of high-quality water in an environmentally and economically responsible way. These policies can be found in a variety of documents including: specific policy statements, the Administrative Code, Board-adopted policy principles, and letters submitted to the Board. Policy statements are also embedded in formal Board meeting discussions and recorded in meeting minutes. The policies established by the Board are subject to all applicable laws and regulations. The management of Metropolitan is under the direction of its General Manager, who serves at the discretion of the Board, as do Metropolitan's General Auditor, General Counsel, and Ethics Officer.

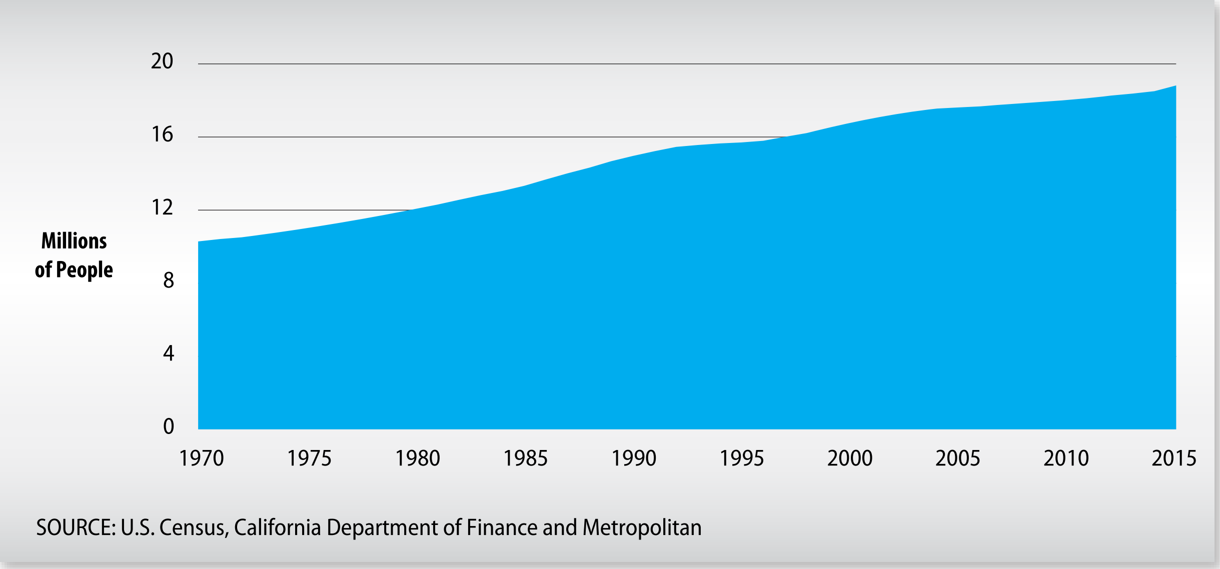
1.3 Metropolitan Service Area Historical Information

Population

In 1990, the population of Metropolitan's service area was approximately 15.0 million people. By 2015, it had reached an estimated 18.7 million, representing almost half of the state's population. In the past, annual growth has varied from about 200,000 annually in the 1970s and early-to-mid-1980s to more than 300,000 annually in the late 1980s. Population growth slowed due to economic recession during the early 1990s to just over 50,000 in 1995, before again rising to more than 250,000 per year in the period 1999 through 2002. Growth has generally averaged 120,000 persons per year during the last 10 years from 2006 to 2015. Figure 1-2 shows the service area population growth from 1970-2015.

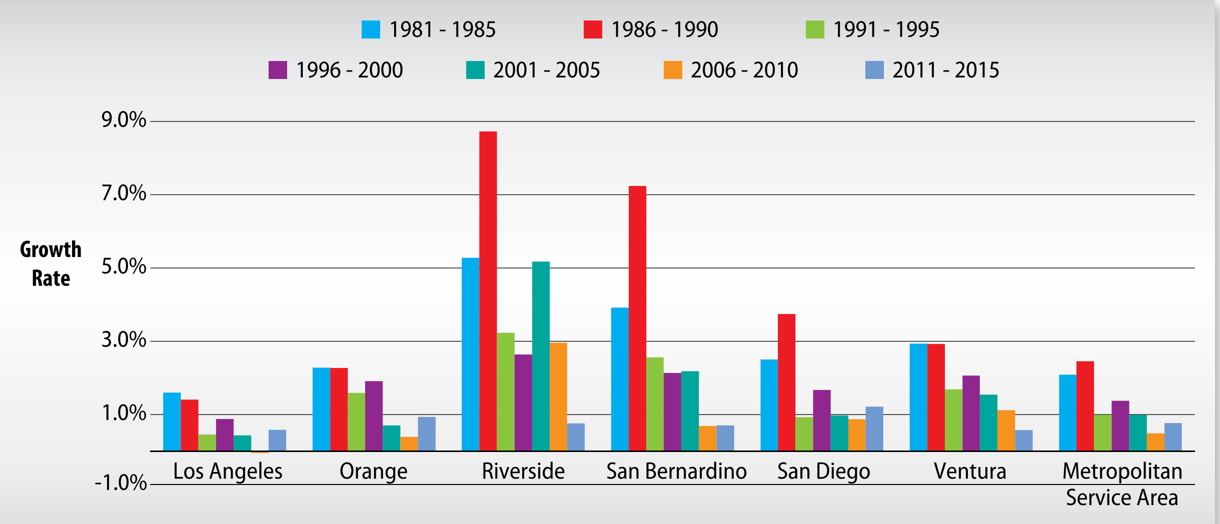
The most populated cities within Metropolitan's service area are Los Angeles (largest city in the state), San Diego (second largest in the state), Long Beach, Anaheim, Santa Ana, and Riverside. The Department of Finance State Population Report from May 2015 reports biggest numeric increases occurring in the cities of Los Angeles and San Diego, consistent with their larger population base. Figure 1-3 shows the 5-year growth rates for the six counties within Metropolitan’s service area. As can be seen from this figure, there has been an overall increase in population growth rate in the last 5 years. Appendix 1 presents a detailed discussion of the demographic trends in Southern California and their impacts on regional demand forecasts.

Figure 1-2 Service Area Population Growth 1970-2015



SOURCE: U.S. Census, California Department of Finance and Metropolitan

Figure 1-3 Average Annual Population Growth Rates in Metropolitan's Service Area



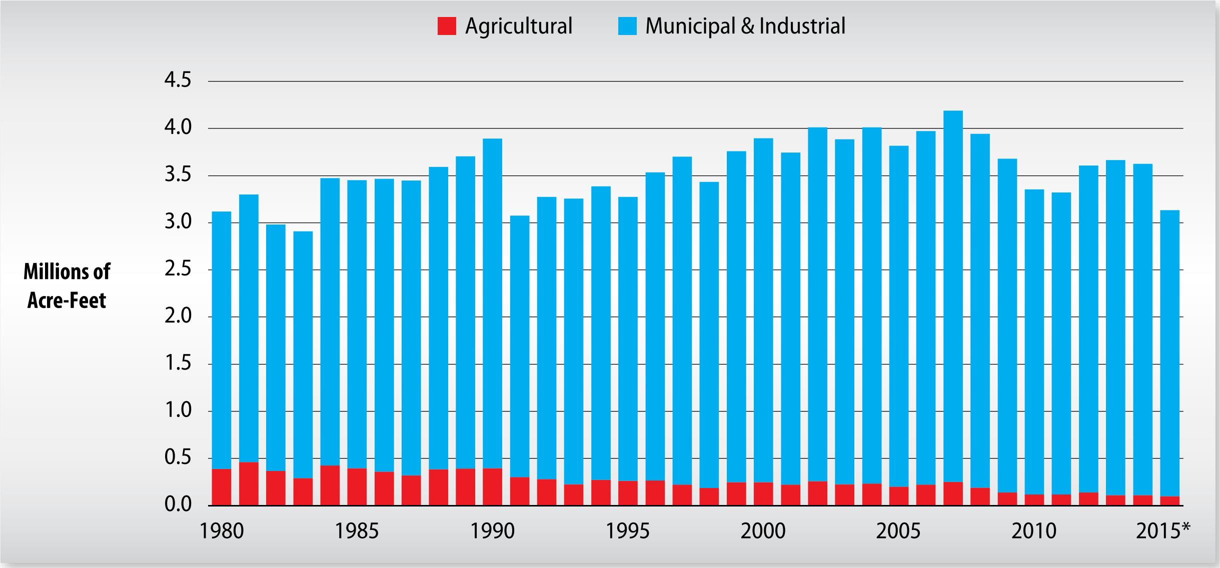
SOURCE: U.S. Census, California Department of Finance and Metropolitan

Historical Retail Water Demands

Figure 1-4 presents historical retail water demands on a calendar year basis in Metropolitan's service area. Since 1980, retail water demands varied from 2.9 million acre-feet (MAF) in 1983 to nearly 4.2 MAF in 2007. Due to the economic recession, drought impacts, conservation, and mandatory water use restrictions, demands declined to 3.1 MAF in 1991. Demand remained below the peak level as a result of continuing effects from the recession and the drought coupled with a number of wet years and ongoing conservation efforts. In 2000, retail demands reached 3.9 MAF, surpassing the early peak level for the first time in a decade. Since 2000, retail demands reached a new peak level in 2007 with nearly 4.2 MAF. Calendar year 2007 was the driest year since 1989, with precipitation measured at 5.66 inches in Downtown Los Angeles. Since the peak retail demand in 2007, a decrease in demand was observed during the economic recession of 2008-2012. Starting in 2012, the severe drought in California led to a massive conservation campaign and water use restriction by the State, Metropolitan, and local water agencies resulting in a decrease in demand in 2015.

In 2015, about 97 percent of the retail demands were used for municipal and industrial purposes (M&I), and 3 percent for agricultural purposes. The relative share of agricultural water use has declined due to urbanization and market factors, including the price of water. Agricultural water use accounted for 19 percent of total regional water demand in 1970, 12 percent in 1980, 10 percent in 1990, and 3.5 percent in 2010.

Figure 1-4 Retail Demand in Metropolitan's Service Area



* 2015 estimated based on best available data as of October 2015.

Climate and Rainfall

As Figure 1-5 shows, Metropolitan's service area encompasses three major climate zones. Table 1-4 reports the 30-year (1985-2014) average temperature, rainfall, and evapotranspiration (expressed as Et_o) information for representative locations within those three zones.

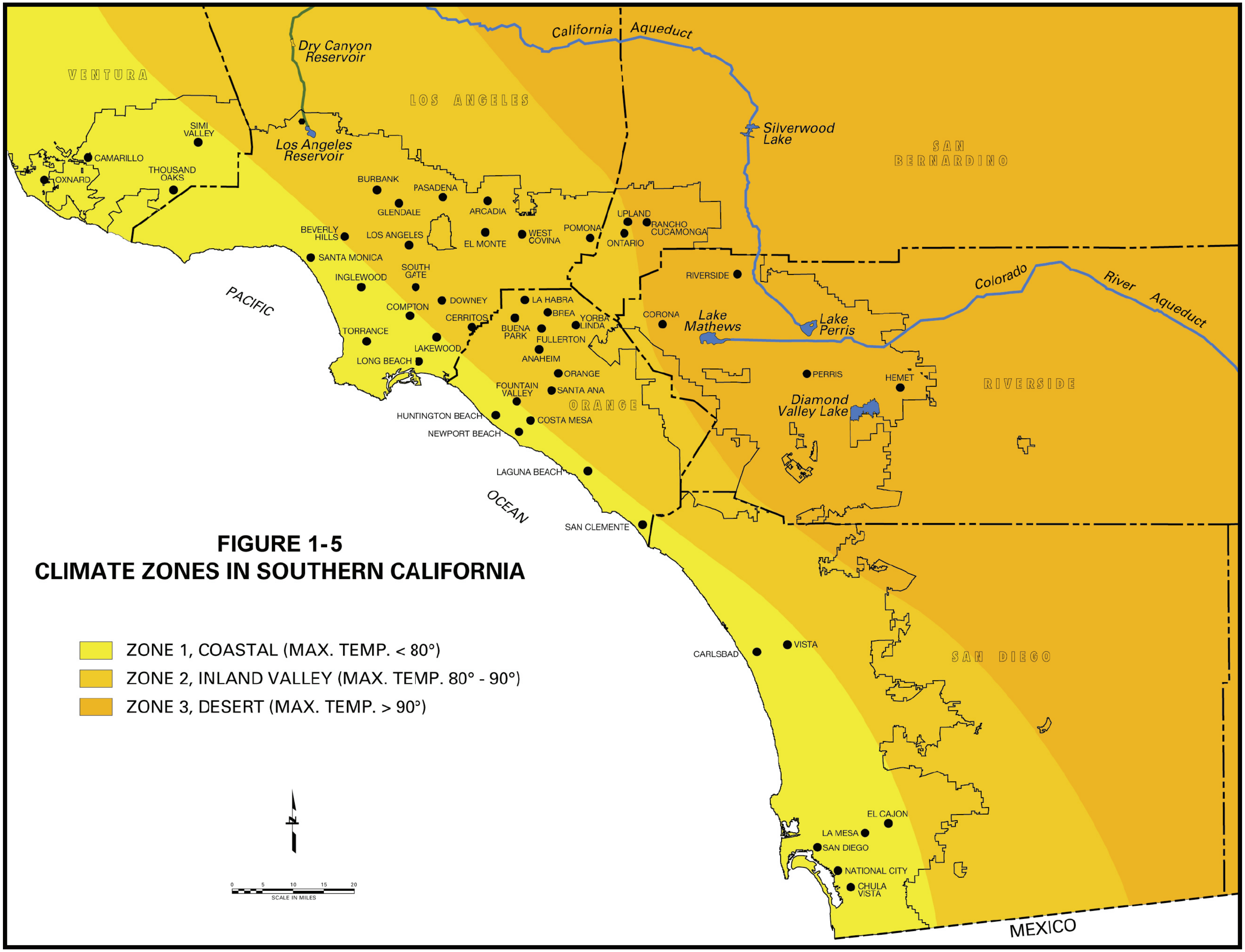


FIGURE 1-5
CLIMATE ZONES IN SOUTHERN CALIFORNIA

Table 1-4 Weather Variables in Three Zones in Metropolitan's Service Area

30-year Average (1985-2014)

Average Temperature	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Los Angeles County[1]	58.06	58.54	60.62	63.52	65.96	68.87	72.62	73.44	72.20	68.19	62.46	57.38	65.15
Riverside County[2]	57.15	57.75	59.42	61.66	63.62	65.70	69.02	70.53	69.67	66.44	61.39	56.66	63.25
San Diego County[3]	54.01	54.85	57.76	61.83	66.19	70.76	75.80	76.54	73.31	66.43	58.69	52.97	64.09

30-year Average (1985-2014)

Average Precipitation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Los Angeles County[1]	2.99	4.08	2.16	0.80	0.33	0.08	0.03	0.02	0.18	0.73	1.16	2.64	15.20
San Diego[2]	1.83	2.20	1.47	0.75	0.19	0.07	0.03	0.01	0.13	0.58	0.94	1.66	9.85
Riverside[3]	2.18	3.07	1.59	0.70	0.20	0.07	0.03	0.01	0.12	0.63	0.71	1.86	11.16

Et$_o$[4]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Los Angeles County	2.2	2 7	3 7	4 7	5 5	5 8	6 2	5 9	5 0	3 9	2 6	1 9	50.1
San Diego	2.5	2 9	4 2	5 3	5 9	6 6	7 2	6 9	5 4	4 1	2 9	2 6	56.4
Riverside	2.1	2 4	3 4	4 6	5 1	5 3	5 7	5 6	4 3	3 6	2 4	2 0	46.5

1. Temperature and precipitation data are from the National Oceanic and Atmospheric Administration, USC Station KCQT. Last updated July 1, 2015.
2. Temperature and precipitation data are from the National Oceanic and Atmospheric Administration, Riverside Station KNOC. Last updated July 1, 2015.
3. Temperature and precipitation data are from the National Oceanic and Atmospheric Administration, San Diego Airport Station KSAN. Last updated July 1, 2015.
4. Eto values are from Model Water Efficient Landscape Ordinance, September 10, 2009, Appendix A: Reference Evapotranspiration (Eto) Table.
   Eto values were derived from: 1) California irrigation Management Information System (CIMIS); 2) Reference Evapotranspiration Zone Map, UC Department of Land, Air and Water Resources and California Department of Water Resources 1999; 3) Reference Evapotranspiration for California, UC Department of Agriculture and Natural Resources, 1987, Bulletin 1922; and 4) Determining Daily Reference Evapotranspiration, UC Cooperative Extension, Division of Agriculture and Natural Resources, 1987, Publication Leaflet 21426.

1.4 Current Conditions

Current Challenges

Metropolitan faces a number of challenges in providing adequate, reliable, and high quality supplemental water supplies for southern California. One of those challenges is dry hydrologic conditions that can have a significant impact on Metropolitan's imported water supply sources. This section offers a brief discussion of Metropolitan's current challenges, current available resources, short-term supply outlook, and recent and near-term actions to meet these challenges.

Dry conditions persisted into 2015, resulting in a fourth consecutive dry year for California. The year began with the driest January on record. The peak of the snowpack season traditionally occurs on April 1; however, in 2015, the snowpack peaked in January at only 17 percent of the April 1 average measurement, resulting in the earliest and lowest snowpack peak in recorded history. The statewide snowpack was all but gone by April 1, 2015, and registered a record low of 5 percent of average for that day. This dry hydrology produced only 51 percent of average runoff for the water year and consequently kept state reservoirs below average storage levels. As a result, Metropolitan only received 20 percent of its contract water supplies from the State Water Project (SWP) in 2015.

In 2015, the Upper Colorado River Basin snowpack peaked in March at 76 percent of normal. Runoff for that basin measured 94 percent of normal due to above normal rainfall in May, June and July, which averted a Colorado River shortage condition for 2016. This allowed Metropolitan to implement new water management programs and bolster supplies in 2015. The Colorado River, however, is experiencing a 16-year drought causing total storage levels in that system to steadily decline and increasing the likelihood of shortage in future years beyond 2016. The restrictions on water use generated a record demand for water-saving rebates and refocused efforts to increase development of local water resources.

Sacramento-San Joaquin River Delta Issues

The Sacramento-San Joaquin River Delta (Bay-Delta) is the hub of California's water supply and is critically important to the entire state. About 30 percent of Southern California's water supply moves across the Bay-Delta. The Bay-Delta's declining ecosystem, caused by a number of factors that include agricultural runoff, predation of native fish species, urban and agricultural discharge, changing ecosystem food supplies, and overall system operation, has led to reduction in water supply deliveries. SWP delivery restrictions due to regulatory requirements resulted in the loss of about 1.5 MAF of supplies to Metropolitan from 2008 through 2014, reducing the likelihood that regional storage can be refilled in the near-term. Operational constraints will likely continue until a long-term solution to the problems in the Bay-Delta is identified and implemented.

In April 2015, the Brown Administration announced California WaterFix, as well as a separate ecosystem restoration effort called California EcoRestore. Together, the California WaterFix and California EcoRestore will make significant contributions toward achieving the coequal goals of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem established in the Sacramento-San Joaquin Delta Reform Act of 2009. A detailed description of the Bay-Delta issues is included in Section 3.2.

Water Supply Conditions

The water conditions that the region faced in 2015 were shaped by supply conditions and resource actions that occurred in the preceding years, including several extraordinary events, such as:

- Historic drought in California leading to record low contract supplies available from the SWP in 2014 (5 percent of contract supplies) and in 2015 (20 percent of contract supplies);
- An extended 16 year drought in the Colorado River watershed that has decreased storage levels in Lake Mead and Lake Powell to 38 percent and 51 percent of capacity, respectively, at the end of November 2015 and keeping storage below surplus levels despite an ease in drought conditions in 2014 and 2015;
- Groundwater basins and local reservoirs dropping to very low operating levels due to record-dry hydrology in Southern California;
- Restrictions of SWP deliveries by federal court orders due to endangered Delta smelt and salmon which resulted in the combined loss of approximately 3 MAF of SWP supplies between 2008 and 2014. These losses have impacted Metropolitan's ability to meet demands and refill regional storage;
- In 2014, Lake Oroville storage dropped within 10 TAF of its lowest operating levels since the historic drought of 1977; and
- Supply availability in the Los Angeles Aqueduct system continues to be affected by both the drought and environmental mitigation efforts related to Owens Lake and the Lower Owens River.

These dry hydrologic conditions and reduced imported water supplies have led to significant withdrawals from Metropolitan's storage reserves, including Diamond Valley Lake (DVL) and its groundwater banking and conjunctive use programs to meet scheduled water deliveries. During the 2007-2009 drought, Metropolitan withdrew a combined 1.2 MAF from storage reserves to balance supplies and demands. In 2014 alone, Metropolitan withdrew 1.1 MAF from dry-year storage to balance supplies and demands because of the historic low final SWP allocation in that year.

In addition, challenges such as the detection of the quagga mussel in the Metropolitan's CRA supplies and increasingly stringent water quality regulations to control disinfection byproducts exacerbate the water supply condition and underscore the importance of flexible and adaptive regional planning strategies.

Current Available Resources

Metropolitan's primary purpose is to provide a supplemental supply of water for domestic and municipal uses at wholesale rates to its member public agencies. Metropolitan's principal sources of water are the SWP and the Colorado River. Metropolitan's robust planning strategy continues to balance available local and imported water resources and member agencies' demands within Metropolitan's service area.

A. Imported Supplies

Metropolitan receives water from the SWP through the California Aqueduct and from the Colorado River through the Colorado River Aqueduct (CRA). Figure 1-6 shows the historic annual deliveries from the SWP and the CRA.

Colorado River

The Colorado River was Metropolitan's original source of water after Metropolitan's establishment in 1928. Metropolitan has a legal entitlement to receive water from the Colorado River under a permanent service contract with the Secretary of the Interior. The CRA, which has a capacity of 1.2 MAF a year, is owned and operated by Metropolitan. It transports water from Lake Havasu, at the border of the state of California and Arizona, approximately 242 miles to its terminus at Lake Mathews in Riverside County.

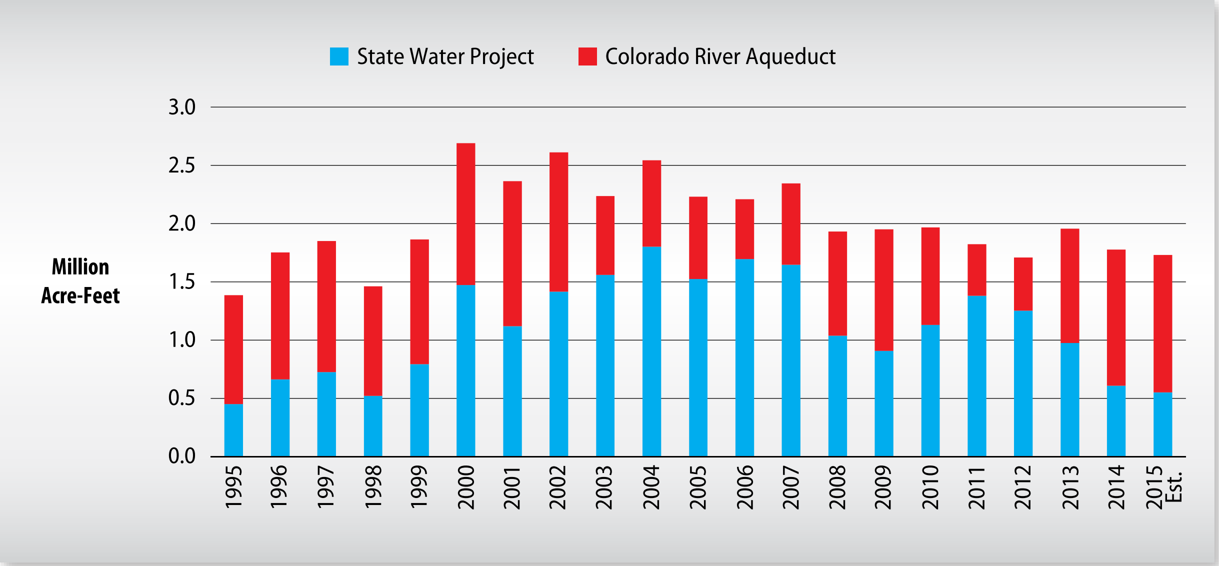
Over the years, Metropolitan increased reliable supply from the CRA through programs that it helped fund and implement including: farm and irrigation district conservation programs, improved reservoir system operations, land management programs, and water transfers and exchanges through arrangements with agricultural water districts in southern California, San Diego County Water Authority, and entities in Arizona and Nevada that use Colorado River water, and the U.S. Department of the Interior, Bureau of Reclamation (USBR). A detailed discussion of availability of Colorado River water for delivery to Metropolitan is described in Section 3.1.

State Water Project

Metropolitan imports water from the SWP, owned by the state of California and operated by the California Department of Water Resources (DWR). This project transports Feather River water stored in and released from Oroville Dam and conveyed through the Bay-Delta, as well as unregulated flows diverted directly from the Bay-Delta south via the California Aqueduct to four delivery points near the northern and eastern boundaries of Metropolitan's service area.

In 1960, Metropolitan signed a contract with DWR for SWP water supplies. Metropolitan is one of 29 agencies that have long-term contracts for water service from DWR, and is the largest agency in terms of the number of people it serves (nearly 19 million), the share of SWP water that it has contracted to receive (approximately 46 percent), and the percentage of total annual payments made to DWR by agencies with State water contracts (approximately 53 percent in 2015). A more detailed discussion of the SWP supplies is provided in Section 3.2.

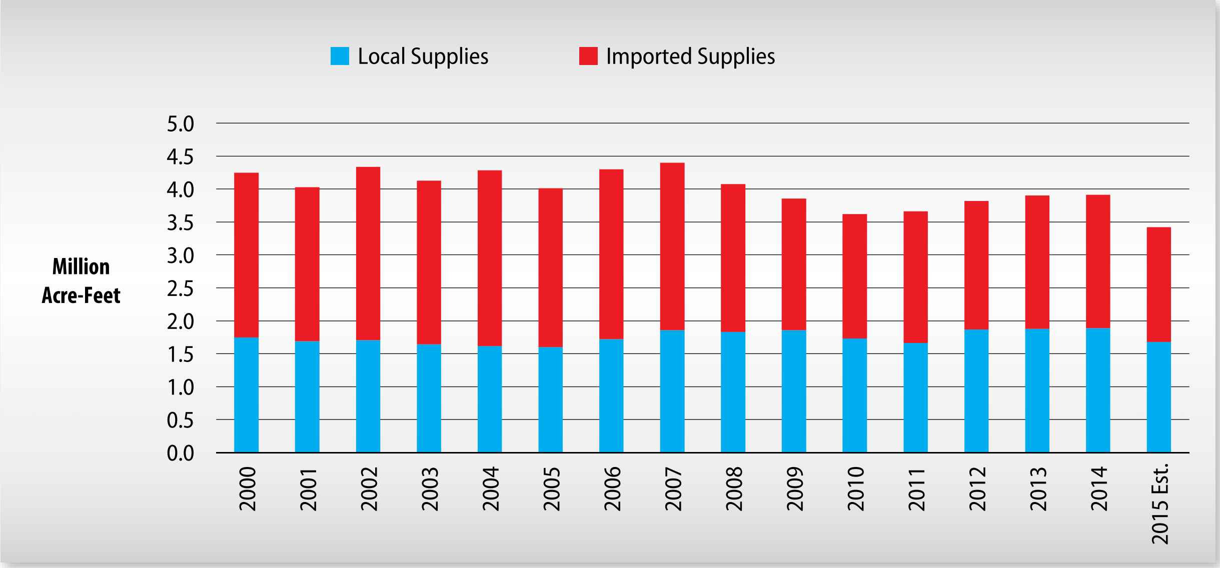
Figure 1-6 Imported Water Supplies in Metropolitan's Service Area



B. Local Supplies

Approximately 50 percent of the region's water supplies come from resources controlled or operated by local water agencies. These resources include water extracted from local groundwater basins, catchment of local surface water, non-Metropolitan imported water supplied through the Los Angeles Aqueduct, and Colorado River water exchanged for Metropolitan supplies. Figure 1-7 shows the historic annual use of local and imported water suppplies within Metropolitan's service area.

Figure 1-7 Annual Regional Water Supplies in Metropolitan's Service Area



Groundwater

The groundwater basins that underlie the region provide nearly 35 percent of the water supply in Southern California. The major groundwater basins provide an annual average supply of approximately 1.35 MAF. Natural recharge of the groundwater basins is supplemented by active recharge of captured stormwater, recycled water, and imported water to support this level of annual production.

Estimates indicate that available storage space in the region's groundwater basins in mid-2015 is approximately 4.8 MAF. Successive dry years have resulted in groundwater depletions that will need to be replaced with natural recharge during wet years and active spreading of captured stormwater, recycled water, and imported water. Groundwater basin managers and water suppliers have taken steps to store water in advance of dry years to soften the potential impact on groundwater aquifers and to maintain reliable local water supplies during dry years.

Recycling, Groundwater Recovery, and Seawater Desalination

Recycling and groundwater recovery are local resources that add balance to Southern California's diverse water portfolio. In addition to replenishment groundwater basins described above, water recycling provides extensive treated wastewater for applicable municipal and industrial uses. Common uses of recycled water include landscape irrigation, agricultural irrigation, and commercial and industrial applications. Groundwater recovery employs additional treatment techniques to effectively use degraded groundwater supplies that were previously not considered viable due to high salinity or other contamination.

While water recycling and groundwater recovery projects in the Southern California region are primarily developed by local water agencies, many newer projects have been developed with financial incentives provided through Metropolitan's Local Resources Program (LRP). The LRP is a performance-based program that provides incentives to expand water recycling and support recovery of degraded groundwater. In 2015, the regional water production from water recycling and groundwater recovery totaled approximately 530 TAF, of which 244 TAF was developed with Metropolitan funding assistance. A detailed discussion of recycling and groundwater recovery is presented in Section 3.5.

Seawater desalination represents a significant opportunity to diversify the region's water resource mix with a new, locally-controlled, reliable potable supply. Metropolitan supports seawater desalination to its member agencies by providing technical assistance, regional facilitation of research and information exchanges, and financial incentives through the LRP.

In the fall of 2015, the San Diego County Water Authority (SDCWA) began operation of the largest seawater desalination facility in the United States. The 56 TAF project will meet about eight percent of San Diego's demands and add a new, drought-resistant supply to the region. Seawater desalination is discussed in more detail in Section 3.5.

Surface Water

In addition to the groundwater basins, local agencies maintain surface reservoir capacity to capture local runoff. The average yield captured from local watersheds is estimated at approximately 104 TAF per year. The majority of this supply comes from reservoirs within the service area of the SDCWA.

Los Angeles Aqueduct

Although the Los Angeles Aqueduct (LAA) imports water from outside the region, Metropolitan classifies water provided by the LAA as a local resource because it is developed and imported by a local agency (the Los Angeles Department of Water and Power). This resource is estimated to provide approximately 260 TAF per year on average, which may be reduced to approximately 27 TAF during a historical dry period for a year like 2015.

Imperial Irrigation District / San Diego County Water Authority Transfer

The SDCWA has executed an agreement with the Imperial Irrigation District (IID) under which IID is transferring water to SDCWA. Since this supply is developed and transferred through an agreement by a local agency (SDCWA), Metropolitan also classifies this water as a local resource. Currently, the water transferred by IID is made available by SDCWA to Metropolitan for diversion at Lake Havasu. Metropolitan provides a matching volume of water to SDCWA by exchange. Under the transfer, 100 TAF was transferred and exchanged with Metropolitan in 2015. The transfer volumes increase beginning in 2018 in accordance with an annual build-up schedule, reaching 205 TAF in 2021 and stabilizing at 200 TAF annually in 2023. Currently, the water is being conserved through land fallowing and on-farm efficiency conservation arrangements made by IID with its customers. By 2017, all of the transferred water should be made available through efficiency conservation measures.

Coachella and All-American Canal Lining Projects

The Coachella Canal Lining Project consists of a 35-mile concrete-lined canal, including siphons, which replaced an earthen canal. The project was completed in December 2006. The project is conserving 30,850 AF annually. The All-American Canal Lining Project consists of a concrete-lined canal constructed parallel to 23 miles of earthen canal. Two reaches of the project were placed in service in 2008 with the third reach placed in service in 2009. In 2010, this project began conserving 67,700 AF annually.

Pursuant to the QSA and related agreements, the 98,550 AF of water resulting from these projects annually is allocated as follows in 2015: 16,000 AF to Metropolitan, 80,200 AF to SDCWA, and up to 2,350 AF for Coachella Canal Lining Project mitigation, with the amount not needed for mitigation becoming available to SDCWA. The water is made available at Lake Havasu for diversion by Metropolitan, and by exchange, Metropolitan delivers a volume of water to SDCWA equal to the amount made available by SDCWA to Metropolitan. Metropolitan classifies the portion of the supply exchanged with SDCWA as local resources.

Table 1-5 shows the projected local supplies estimated for average and dry years for 2020, 2030, and 2040.

Table 1-5
Local Supplies for Average and Dry Years
(Acre-Feet)

	2020		2030		2040	
	Average Year[1]	Dry Year[2]	Average Year	Dry Year	Average Year	Dry Year
Local Groundwater						
From Natural Recharge	1,011,000	1,007,000	1,004,000	1,005,000	1,005,000	1,006,000
Replenishment	292,000	298,000	297,000	297,000	297,000	297,000
Local Projects						
Groundwater Recovery	143,000	139,000	163,000	162,000	167,000	167,000
Recycling	436,000	427,000	486,000	482,000	509,000	507,000
Seawater Desalination	51,000	56,000	51,000	56,000	51,000	56,000
Local Runoff Stored	110,000	102,000	110,000	102,000	110,000	102,000
Los Angeles Aqueduct	261,000	113,000	264,000	125,000	268,000	133,000
IID-SDCWA Transfer and Canal Linings	274,000	274,000	282,000	282,000	282,000	282,000
Total	**2,578,000**	**2,416,000**	**2,657,000**	**2,511,000**	**2,689,000**	**2,550,000**

[1] Average Year is based on 1922 through 2012.

[2] Dry Year is based on Multiple Dry Years (1990-92)

Metropolitan's Recent and Near-term Drought Response Actions

Metropolitan progressively addressed the challenges of water shortages caused by the unprecedented drought since 2012. Metropolitan took actions that include: (1) Increasing water conservation by expanding outreach, adding devices, and increasing incentives to residents, (2) Increasing local resources by providing incentives for on-site recycled water hook-up and increasing incentives for the LRP, (3) Augmenting water supplies through water transfers and exchanges, (4) Improving return capability of storage programs,

(5) Modifying Metropolitan's distribution system to enhance Colorado River water delivery, and (6) Implementing the Water Supply Allocation Plan to distribute the limited imported supplies and preserve storage reserves.

Increasing Water Conservation

When the most recent drought period started in 2012 and progressed into 2013, Metropolitan recognized the need to increase the efficiency and effectiveness of its conservation program. In September 2013, Metropolitan's Board added several new initiatives to its conservation program to target water reduction by public agencies, landscaping, fitness centers, and the commercial and multi-family housing sectors. In addition, rebates became available for new devices - soil moisture sensor system, plumbing flow control valves, and rain barrels – and increased incentives were provided for high-efficiency toilets (HETs) that are more efficient than the low-flush toilets sold in the market.

In January 2014, Governor Edmund G. Brown Jr. issued a drought emergency proclamation calling for Californians to reduce their water use by 20 percent and for water agencies to implement water shortage plans. In response to the governor's drought proclamation, Metropolitan ramped up conservation efforts in Southern California. In February 2014, Metropolitan declared a Water Supply Alert, calling upon local cities and water agencies to immediately implement extraordinary conservation measures and institute local drought ordinances. In addition, Metropolitan significantly expanded its water conservation and outreach programs and doubled funding for conservation incentive programs to $40 million.

In April 2014, the governor issued a second proclamation, asking the state to redouble drought actions and directing the SWRCB to adopt emergency regulations to implement the directive. Accordingly, the SWRCB adopted outdoor water restrictions on July 15, 2014 that targeted outdoor urban water use that would normally increase under the hot and dry conditions. In May 2014, Metropolitan increased its turf removal incentives from $1 to $2 per square foot; increased the funding for incentives for rain barrels and recycled water hookups; and continued funding rebates for high efficiency toilets to speed up conversion from non-conserving toilets.

In July 2014, Metropolitan launched a $5.5 million outreach campaign, the largest in Metropolitan's history. The campaign seeks to raise awareness of the drought and urges residents and businesses to save water. The campaign features multiple media platforms, including radio and television, with enhanced outreach to the region's ethnic communities. Activity on Metropolitan's bewaterwise.com® website quadrupled as a result of the campaign. Metropolitan's conservation programs saw record-breaking increases in applications for rebates. It is clear that Southern California is responding to these calls for increased conservation efforts. Metropolitan is committed to doing its part in promoting water-use efficiency and increasing local supplies while collaborating with other stakeholders to protect critical reserves. As a result of the strong response to its conservation incentive program, Metropolitan again increased its conservation budget to a total of $100 million in December 2014.

On April 1, 2015, Governor Brown issued an Executive Order (Order) calling for a 25 percent reduction in consumer water use in response to the historically dry conditions throughout the State of California. As a wholesale water agency providing a supplemental water supply to its member agencies, Metropolitan is not subject to the requirements of the Governor's Order, which applies to retail water agencies. However, in May 2015, Metropolitan again increased funding for its conservation program to a total amount of $450 million over fiscal years 2014-15 and 2015-16 due to strong response to the incentive program and to assist retail agencies in the service area to meet their mandatory water reduction targets established by the SWRCB. Turf removal is the most popular element of Metropolitan's conservation incentive program, and it is expected to result in 172 million square feet of turf removed and water savings of 800 TAF over the next ten years.

Increasing Local Resources

Since 1982, Metropolitan has assisted local agencies in the development of water recycling and groundwater recovery under the LRP. In light of hot and dry conditions in 2013 and the low SWP allocation in 2014, Metropolitan worked with member agencies to identify constraints to local resources development and proposed refinements to the LRP.

In February 2014, Metropolitan's Board approved the On-site Retrofit Pilot Program to offer incentives to modify existing water users' potable water systems to utilize recycled water. In October 2014, Metropolitan's Board approved the LRP refinements to support further development of local resources, which included increasing the maximum incentive amount, offering alternate incentive payment structures, including on-site recycled water retrofit costs, including other water resources (such as seawater desalination and stormwater), and providing reimbursable services for Metropolitan's technical assistance.

Augmenting Water Supplies

Augmenting water supplies through water transfers and exchanges is an element of Metropolitan's IRP to mitigate water shortages during dry periods.

The Colorado River System has been suffering from the effects of drought since 2000, leading to substantially decreased water levels in both Lakes Mead and Powell. In March 2014, Metropolitan's Board approved entering into an agreement with the Central Arizona Water Conservation District, Denver Water, Southern Nevada Water Authority (SNWA), and the United States to establish a two-year pilot program to compensate entitled users of the Colorado River water for voluntary reductions in water use, including fallowing of agricultural lands.

Metropolitan also entered into several agreements to improve Metropolitan's operational flexibility in 2015:

- In January 2015, Metropolitan's Board authorized an exchange of up to 50,000 acre-feet with Westside Mutual Water Company and Kern County Water Agency. This one-for-one exchange provides water at a time in the year when SWP supplies are expected to be low and provides flexibility on timing of returning water.
- In September 2015, Metropolitan's Board authorized an amendment to the operational storage agreement with SNWA and the Colorado River Commission of Nevada allowing Metropolitan access to additional Colorado River water during 2015. Metropolitan would pay SNWA $44.375 million for 150,000 AF of water apportioned to but not used by SNWA during 2015. When SNWA requests return of water stored under this amendment, SNWA would reimburse Metropolitan for the costs paid for the initial delivery of water.
- In November 2015, Metropolitan's Board authorized entering into agreements with Antelope Valley-East Kern Water Agency (AVEK) to develop exchange and storage programs for SWP supplies. This would be an uneven exchange: for every two acre-feet provided to Metropolitan, AVEK would receive back one acre-foot in the future. Metropolitan may also store at least 30,000 AF of its SWP supplies in wet years in the Antelope Valley groundwater basin.

Improving Return Capabilities of Storage Programs

Metropolitan has a number of storage programs with water agencies along the California Aqueduct that would allow it to store SWP supplies during surplus conditions and to have stored water returned when needed. In 2015, Metropolitan provided up-front capital costs to its water management program partners to build infrastructure to improve the return capabilities of several storage programs.

- In September 2014, Metropolitan's Board authorized providing capital funds to Semitropic Water Storage District to enhance the pumpback capacity of the Semitropic Groundwater Storage Program by 13,200 AFY. The capital costs would be reimbursed to Metropolitan should Semitropic market the added capacity to another party after Metropolitan has at least one year of recovery capability.
- In March 2015, Metropolitan's Board authorized entering into agreement with Arvin Edison Water Storage District to restore 2,500 AFY of return capability by replacing groundwater wells of the Arvin Edison/Metropolitan Water Management Program. The capital costs will be reimbursed as credits to future Program costs.
- Also in March 2015, Metropolitan's Board authorized entering into agreement with Kern-Delta Water District to improve the return reliability of the Kern-Delta Water District Water Management Program. The improvement includes a pipeline that would reduce losses when Kern River supplies are delivered for exchange. Metropolitan's upfront costs will be more than offset through an elimination of put regulation fees on the next 20,000 AF delivered into the Program.

Modifying Metropolitan's Distribution System

As a result of ongoing extraordinary dry conditions throughout the state of California, the SWP allocation for calendar year 2014 was five percent, which represents about 96,000 acre-feet of SWP Table A water allocation for Metropolitan, the lowest in the history of the SWP. Although Metropolitan has been utilizing storage reserves to help bridge the gap between the low SWP supplies and the demand for SWP water, a number of extraordinary operational actions were taken in 2014 to deliver available Colorado River water and DVL storage supplies to areas that ordinarily only receive SWP supplies.

Metropolitan modified its normal operations in several areas of the system to deliver Colorado River water to areas as far west as the cities of Thousand Oaks and Calabasas, as well as other locations within Metropolitan's system, some of which had not received Colorado River water for extended periods since the completion of the SWP in the early 1970s. System modifications have also been implemented to increase system flexibility to deliver Colorado River water and DVL water into new areas of the system.

- In April 2014, Metropolitan's Board authorized the project to interconnect between the Inland Feeder and the Lakeview Pipeline, near San Jacinto, California. This project was completed in October 2014, and allowed Metropolitan to serve water from multiple sources, such as DVL, to the Mills Treatment Plant in Riverside.
- In May 2014, Metropolitan's Board authorized enhancing water supply reliability in the West Valley area by rehabilitating a pump station and constructing flow control modifications to the outlet of the Jensen Water Treatment Plant. This project allowed the West Valley area, which was served normally by SWP water only, to receive blended supplies from the SWP and the CRA.

Additionally, several Metropolitan member agencies made modifications within their own local systems to maximize the use of more readily available Colorado River water and DVL supplies, to further reduce the use of scarce SWP supplies.

Implementing the Water Supply Allocation Plan

Metropolitan's Water Supply Allocation Plan (WSAP) was developed in 2008. The WSAP was developed to fairly distribute a limited amount of water supply and applies it through a detailed methodology to reflect a range of local conditions and needs of the region's retail water consumers. Metropolitan's Board authorized the implementation of the WSAP for the period of July 2009 through April 2011 in response to the drought and low storage reserves.

Dry periods resumed in 2012. In 2014, California was challenged with a third year of severe drought. Metropolitan managed its operations through significant use of regional storage reserves. It was anticipated that end of year total dry year storage reserves would approach levels similar to those when the WSAP was first implemented in 2009. On December 9, 2014, Metropolitan's Board approved adjustments to the formula for calculating member agency supply allocations for future implementation of the WSAP. On April 14, 2015, Metropolitan's Board approved implementation of the WSAP at a Level 3 Regional Shortage Level, effective July 1, 2015 through June 30, 2016. The WSAP allows member agencies the flexibility to choose among various local supply and conservation strategies to help ensure that demands on Metropolitan stay in balance with limited supplies. More details of the WSAP are included in Section 2.4 and Appendix 4.

As of December 2015, Metropolitan has observed an approximate 23 percent reduction in deliveries to member agencies under the WSAP for the rolling 12-month period ending December 31, 2015.

Table 1-6 gives a timeline of Metropolitan's Board authorization for the above actions. It shows Metropolitan's progressiveness and adaptation to changing water supply conditions.

Table 1-6
Recent Metropolitan's Board Drought Response Actions

Year	Month	Actions
2013	September	Authorized new conservation program initiatives and devices for rebates
2014	February	Declared Water Supply Alert Doubled conservation budget to $40 million Approved incentives for on-site recycled water retrofit
	March	Authorized a pilot program to fund water use efficiency measures for increasing Colorado River storage
	April	Authorized and appropriated funds for final design of drought response to enhance water supply reliability for the Henry J. Mills Water Treatment Plant
	May	Increased turf removal incentives from $1 to $2 per square foot Added rebates for new devices including rain barrels Authorized projects to enhance water supply reliability in the West Valley Area
	September	Authorized improvement of the return capacity of the Semitropic Groundwater Storage Program
	October	Authorized refinements to the Local Resources Program to encourage and expedite local resource production
	December	Increased the conservation incentive budget to a total of $100 million
2015	January	Authorized an exchange of up to 50,000 AF with water agencies in Kern County to enhance Metropolitan's operational flexibility in 2015
	March	Authorized projects to improve return capacity from storage programs with Arvin Edison Water Storage District and Kern-Delta Water District
	April	Declared Water Supply Allocation and approved the implementation of Water Supply Allocation Plan at a Regional Shortage Level 3 effective July 1, 2015 through June 30, 2016
	May	Increased conservation incentive budget to a total of $450 million
	September	Authorized an amendment to the operational agreement with SNWA and the Colorado River Commission of Nevada allowing Metropolitan access to additional Colorado River water during 2015
	November	Authorized entering into storage and exchange agreements with Antelope Valley-East Kern Water Agency

Short-term Supply Outlook

Metropolitan evaluated the short-term supply outlook during each of the next three years from 2016 through 2018 and determined the minimum water supplies available based on the driest three-year historic sequence of 1990 through 1992. This analysis incorporates the actual storage levels at the beginning of 2015 and the forecasted supplies and demands under a multiple dry-year sequence. This evaluation of supply capabilities also takes into account the actual storage program conveyance constraints. Table 1-7 shows the projected yields of the in-region storage and imported supplies from the SWP and CRA, for both current programs and those under development. Detailed descriptions of the current programs and programs under development are included in Appendix 3.

For this supply capability evaluation, SWP supplies are estimated using the 2015 SWP Delivery Capability Report distributed by DWR in July 2015. The 2015 Capability Report base scenario represents the current DWR estimate of the amount of water deliveries for current conditions. These estimates incorporate restrictions on SWP and Central Valley Project (CVP) operations in accordance with water quality objectives established by the State Water Resources Control Board and the biological opinions of the U.S. Fish and Wildlife Service and National Marine Fisheries Service issued on December 15, 2008, and June 4, 2009, respectively.

Metropolitan's forecast shows that under a multi-dry year hydrology, Metropolitan could face reduced supply capability during the next three years. This places considerable emphasis on developing robust short-term actions that will increase supply reliability to Metropolitan's service area.

Table 1-7
Multiple Dry-Year
Supply Capability[1]
Repeat of 1990-1992 Hydrologies
(acre-feet per year)

Forecast Year	2016	2017	2018
Current Programs			
In-Region Storage	93,000	40,000	5,000
California Aqueduct[2]	770,000	491,000	673,000
Colorado River Aqueduct[3]	934,000	958,000	964,000
Subtotal of Current Programs	***1,797,000***	***1,489,000***	***1,642,000***
Programs Under Development			
In-Region Storage	8,371	17,530	26,633
California Aqueduct	50,000	50,000	50,000
Colorado River Aqueduct	80,000	80,000	80,000
Subtotal of Proposed Programs	***138,371***	***147,530***	***156,633***
Maximum Metropolitan Supply Capability	**1,935,371**	**1,636,530**	**1,798,633**

[1] Represents supply capability for resource programs under listed year type.

[2] California Aqueduct includes Central Valley transfers and storage program supplies conveyed by the aqueduct.

[3] Colorado River Aqueduct includes water management programs, IID-SDCWA transfer and exchange and canal lining projects.
Maximum CRA deliveries limited to 1.20 MAF including IID-SDCWA transfer and exchange, and canal lining projects.

Planning for the Future

2

The purpose of this section is to show how Metropolitan plans to meet Southern California's water supply needs in the future. In its role as supplemental supplier to the Southern California water community, Metropolitan faces ongoing challenges in meeting the region's needs for water supply reliability and quality. Increased environmental regulations and competition for water from outside the region have resulted in changes in delivery patterns and timing of imported water supply availability. At the same time, the Colorado River watershed has experienced a protracted drought since 2000.

As described in the previous chapter, the water used in Southern California comes from a number of sources. From 2006 through 2015, Metropolitan has provided 50 percent to 60 percent of the water needs in its service area from the Colorado River via the CRA, and from the Sacramento-San Joaquin River Watershed via the SWP. As Metropolitan continues to face various water supply challenges, development of adaptable strategies for managing resources to meet the range of estimated demands into the future and for adjusting to changing resource conditions is ongoing.

Metropolitan's continued progress in developing a diverse resource mix enables the region to meet its water supply needs. The investments that Metropolitan has made and its ongoing efforts in many different areas coalesce toward its goal of long-term regional water supply reliability. Metropolitan's actions have been focused on the following:

- Pursuing long-term solutions for the Delta
- Developing storage programs related to the SWP and the Colorado River
- Developing storage and groundwater management programs within the Southern California region
- Increasing conservation
- Increasing water recycling, groundwater recovery, and seawater desalination
- Developing water supply management programs outside of the region

Metropolitan has undertaken a number of planning initiatives over the years. This section summarizes these efforts, which include the Integrated Water Resources Plan (IRP), three IRP Updates, the Water Surplus and Drought Management Plan, and the Water Supply Allocation Plan. Collectively, they provide a policy framework guidelines and resource targets for Metropolitan to ensure regional water supply reliability.

While Metropolitan coordinates regional supply planning through its inclusive IRP process, Metropolitan's member agencies also conduct their own planning analyses – including their own urban water management plans – and may develop projects independently of Metropolitan. Appendix 5 shows a list of potential local projects provided to Metropolitan by its member agencies.

2.1 Integrated Water Resource Planning

In 1993, Metropolitan commenced an Integrated Water Resources Planning process as the beginning of a new era of regional reliability planning. As this planning process began, Metropolitan held a series of three regional assemblies from 1993 through 1995 addressing strategic planning issues. Attendance at these regional assemblies included Metropolitan's Board, Metropolitan's senior management, member agency managers, local retail water providers, groundwater basin managers, and invited public representatives. The purpose of these regional assemblies was to gain consensus on resource policy issues, provide direction for future work, and to endorse regional objectives, principles, and strategies.

A key outcome of the regional assemblies was the establishment and adoption of water supply principles which provided critical guidance for the development and adoption of future Metropolitan IRPs. In summary, these principles state:

- No water supplier in Southern California is an isolated, independent entity unto itself, and all, to varying degrees, are dependent upon a regional system of water importation, storage, and distribution.
- Metropolitan is Southern California's lead agency in regional water management, having the responsibility for importing water from outside the region and convening dialogues on regional water issues, encouraging local water development and conservation, advocating the region's interests to the state and federal governments, and leading the region's water community.
- Water suppliers at all levels have a responsibility to promote a strong water ethic both within the water community and among the public, developing plans through open processes, committing to achieving adopted regional goals and strategies, and committing to a policy of equity and fairness in development and implementation of water management programs.

These regional assemblies laid the foundation for Metropolitan's integrated regional planning path from 1996 to the present. This path has guided Metropolitan's water resources strategy from the initial adoption of the Metropolitan's IRP in 1996 to successive IRP updates in 2004, 2010, and 2015.

The 1996 IRP

Metropolitan's IRP established a long-term, comprehensive water resources strategy to provide the region with a reliable and affordable water supply. One of the fundamental outcomes of the 1996 IRP was the implementation of a diverse portfolio of resource investments in both imported and in-region supplies, and in water conservation measures. The 1996 IRP further emphasized the construction and creation of a network of water storage facilities, both below and above ground.

The 1996 IRP process identified cost-effective solutions that offered long-term reliability to the region. Having identified the need for a portfolio of different supplies to meet its demands, the 1996 IRP analyzed numerous resource portfolios seeking to find a "Preferred Resource Mix" that would provide the region with reliable and affordable water supplies through 2020. The analysis determined the best mix of resources based on cost-effectiveness, diversification, and reliability. Establishing the "Preferred Resource Mix" was an integral part of the 1996 IRP, and subsequent updates have continued to focus on how best to diversify Metropolitan's water portfolio and establish the broad resource targets for the region.

The 2004 IRP Update

The 2004 IRP Update reviewed the goals and achievements of the 1996 IRP, identified the changed conditions for water resource development, and updated resource development targets through 2025. These targets included increased conservation savings and planned increases in local supplies. The 2004 IRP Update also explicitly recognized the need to handle uncertainties inherent in any planning process. Some of these uncertainties include:

- Fluctuations in population and economic growth
- Changes in water quality regulations
- Discovery of new chemical contaminants
- Regulation of endangered species affecting sources of supplies
- Changes in climate and hydrology

As a result, a key component of the 2004 IRP Update was the addition of a 10 percent "planning buffer." The planning buffer identified additional supplies, both imported and locally developed, that could be implemented to address uncertainty in future supplies and demands.

The 2010 IRP Update

In keeping with this reliability goal of meeting full-service demands at the retail level under all foreseeable hydrologic conditions, the 2010 IRP Update sought to stabilize Metropolitan's traditional imported water supplies and establish additional water resources to withstand California's inevitable dry cycles and growth in water demand. Metropolitan acknowledged the increasing impact that emerging challenges such as environmental regulations, threats to water quality, climate change, and economic unknowns and the uncertainty that these challenges would have on planning for a reliable, high quality, and affordable water supply. By 2010, the Colorado River had experienced below-average precipitation conditions for most of the previous decade, and the SWP was facing historic regulatory cutbacks that significantly reduced its supplies that pass through the Sacramento-San Joaquin Delta in Northern California. Recognizing that the conditions for developing and maintaining water supply reliability had changed, Metropolitan set out not only to update the IRP, but also to examine how best to adapt to the new water supply paradigm.

Adaptive Management Strategy

The 2010 IRP Update specifically planned for uncertainty with a range of adaptive management strategies that both meets demands under observed hydrology and responds to future uncertainty. The plan provided solutions by developing diverse and flexible resources that perform adequately under a wide range of future conditions. Specifically, the adaptive management strategy was a three-component plan that included the following:

- Core Resources Strategy – Designed to maintain reliable water supplies under known conditions. The Core Resources Strategy represented baseline efforts to manage water supply and demand conditions. This strategy was based on "what we know today," including detailed planning assumptions about future demographic scenarios, water supply yields, and a range of observed historical weather patterns. Under this strategy, Metropolitan and its member agencies would advance water use efficiency through conservation and recycled water, along with further local supply development such as groundwater recovery and seawater desalination. Metropolitan would also stabilize traditional imported supplies from the Colorado River and Northern California.

- Uncertainty Buffer – A suite of actions which help to mitigate short-term changes. The 2010 IRP set goals for a range of potential buffer supplies to protect the region from possible shortages in a cost-effective manner, starting with a further expansion of water use efficiency on a region-wide basis. The buffer would enable the region to adapt to future circumstances and foreseeable challenges that were not assumed under the Core Resources Strategy, such as short-term loss of local supplies or regulatory restrictions.
- Foundational Actions – Strategies for additional water resources to augment the core or buffer supplies. Foundational Actions were designed to prepare the region by determining viable alternative supply options for long-range planning. These preparatory actions, including feasibility studies, technological research, and regulatory review, were designed to lay the foundation for potential alternative resource development.

The 2015 IRP Update

Since the 2010 IRP, drought in California and across the southwestern United States has put the IRP adaptive management strategy to the ultimate stress test. Dry conditions in California have persisted into 2015, resulting in a fourth consecutive year of drought. The year 2015 began with the driest January on record, resulting in the earliest and lowest snowpack peak in recorded history at only 17 percent of the traditional snowpack peak on April 1st. In the ten years since 2006, there were only two wet years, with the other eight years having been below normal, dry, or critically dry. The Colorado River watershed has also experienced an extended reduction in runoff. Within Southern California, continuing dry conditions have impacted the region's local supplies, including its groundwater basins.

Southern California has a remarkable, unparalleled tradition of meeting its water challenges as a single cohesive region. Metropolitan serves as both importer of water and regional water planner. For the past generation, the IRP has served as the reliability road map for the region.

Throughout 2015, Metropolitan engaged in a comprehensive process with its Board of Directors and member agencies to review how conditions have changed since the 2010 IRP Update and to establish targets for achieving regional reliability, taking into account known opportunities and risks. Areas reviewed in the 2015 IRP Update include demographics, hydrologic scenarios, water supplies from existing and new projects, water supply reliability analyses, and potential resource and conservation targets. Metropolitan's Board of Directors adopted the 2015 IRP Update on January 12, 2016. [1]

The 2015 IRP Update approach explicitly recognizes that there are remaining policy discussions that will be essential to guiding the development and maintenance of local supplies and conservation. Following adoption of the 2015 IRP Update and its targets for water supply reliability, Metropolitan has begun a process to address questions such as how to meet the targets for regional reliability, what are local and what are regional responsibilities, how to finance regional projects, etc. This discussion will involve extensive interaction with Metropolitan's Board of Directors and member agencies, with input from the public.

Findings and Conclusions

The findings and conclusions of the 2015 IRP Update are:

- Action is needed – Without the investments in conservation, local supplies, and the California WaterFix targeted in the 2015 IRP Update, Metropolitan's service area would experience unacceptable level of shortage allocation frequency in the future.

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[1] http://www.mwdh2o.com/PDF_About_Your_Water/2015_IRP_Update_Report.pdf

- Maintain Colorado River supplies – The plan to stabilize deliveries at 900,000 AF in a typical year will require more than 900,000 AF of planned actions.
- Stabilize SWP supplies – A collaborative approach with state and federal agencies to pursue better science for resolving questions about SWP operations and advancing coequal goals of Delta restoration and statewide water supply reliability in the near term. Also work collaboratively with state and federal agencies in the California WaterFix and EcoRestore efforts.
- Develop and protect local supplies and water conservation – The 2015 IRP Update embraces and advances the regional self-sufficiency ethics by increasing the targets for additional local supplies and conservation. These targets are discussed in detail in Section 3 of this UWMP.
- Maximize the effectiveness of storage and transfers – Rebuilding Metropolitan's supply of water reserves is imperative when the drought is over. A comprehensive water transfer approach that takes advantage of water when it is available will help to stabilize and build storage reserves, increasing the ability for Metropolitan to meet water demands in dry years.
- Continue with the adaptive management approach – The IRP is updated periodically to incorporate changed conditions, and an implementation report is prepared annually to monitor the progress in resources development. The 2015 IRP Update also includes Future Supply Actions that would advance a new generation of local supplies through public outreach; development of legislation and regulation; technical studies and support; and land and resource acquisitions.

2.2 Estimating Demands on Metropolitan

The Urban Water Management Planning Act requires that three basic planning analyses be conducted to evaluate supply reliability. The first is a water supply reliability assessment requiring development of a detailed evaluation of the supplies necessary to meet projected demands over at least a 20-year period. This analysis is to consider average, single-year, and multi-year drought conditions. The second is a water shortage contingency plan which documents the actions that would be implemented in addressing up to a 50 percent reduction in an agency's supplies. Finally, a plan must be developed specifying the steps that would be taken under a catastrophic interruption in water supplies.

To address these three requirements, Metropolitan developed estimates of future demands and supplies from local sources and from Metropolitan sources based on 91 years (1922-2012) of historic hydrology. The 91-year period was chosen because the USBR modeling for Colorado River supplies is only available for a period starting in 1922 and ending in 2012. Supply and demand analyses for the single-dry and multiple-dry year cases were based on conditions affecting the SWP as this supply availability fluctuates the most among Metropolitan's sources of supply. Using the same 91-year period of the SWP supply availability, 1977 is the single driest year and 1990-92 is the driest 3 consecutive years for SWP supplies to Metropolitan. In addition, staff analysis of the 8-river index indicated that 1977 is the single driest year and 1990-92 is the lowest 3 consecutive dry years from 1922 through 2015. The 8-river index is used widely by DWR and other water agencies as an estimate of the unimpaired runoff (or natural water production) of the Sacramento and San Joaquin River basins, which are sources of water for the SWP.

Demand Forecast

Metropolitan developed its demand forecast by first estimating total retail demands for its service area and then factoring out water savings attributed to conservation.[2] Projections of local supplies then were derived using data from current and expected local supply programs and the IRP Local Resource Program Target. The resulting difference between total demands net of conservation and local supplies is the expected regional demands on Metropolitan supplies. These various estimates are shown in Tables 2-1 through 2-3. Major categories used in these tables are defined below.

Total Demands

Total demands are the sum of retail demand for M&I and agricultural, seawater barrier demand, and replenishment demand. Total demands represent the total amount of water needed by the member agencies. Total demands include:

- <u>Retail Municipal and Industrial (M&I) Demand</u> — Retail M&I demands represent the full spectrum of urban water use within the region. These include residential, commercial, industrial, institutional, and un-metered water uses. The demographic and economic data used in developing these forecasts were taken from the Southern California Association of Governments' (SCAG) 2012 Regional Transportation Plan/Sustainable Community Strategy (April 2012) and from the San Diego County Association of Governments' (SANDAG) Series 13: 2050 Regional Growth Forecast (October 2013). The SCAG and SANDAG regional growth forecasts are the core assumptions that drive the estimating equations in Metropolitan's Econometric Demand Model (MWD-EDM). SCAG's and SANDAG's projections undergo extensive local review and incorporate zoning information from city and county general plans and are backed by Environmental Impact Reports.

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[2] Information generated as part of this analysis is contained in Appendix 1.

Impacts of potential annexation are not included in the demand projections for the 2015 UWMP. However, Metropolitan's Review of Annexation Procedures concluded that the impacts of annexation within the service area beyond 2020 would not exceed two percent of overall demands.

- Retail Agricultural Demand — Retail agricultural demands consist of water use for irrigating crops. Member agencies estimate agricultural water use based on many factors, including farm acreage, crop types, historical water use, and land use conversion. Each member agency estimates its agricultural demand differently, depending on the availability of information. Metropolitan relies on member agencies' estimates of agricultural demands for the 2015 UWMP.
- Seawater Barrier Demand — Seawater barrier demands represent the amount of water needed to hold back seawater intrusion into the coastal groundwater basins. Groundwater management agencies determine the barrier requirements based on groundwater levels, injection wells, and regulatory permits.
- Storage Replenishment Demand — Storage replenishment demands represent the amount of water member agencies plan to use to replenish their groundwater basins or surface reservoirs in order to maintain sustainable basin/reservoir heath and production. For the 2015 UWMP, replenishment deliveries are not included as part of firm demands.

Conservation Adjustment

Savings from conservation reduces total retail demand. Conservation savings consists of the following:

- Code-Based Conservation — Water savings resulting from plumbing codes and other institutionalized water efficiency measures. Sometimes referred to as "passive conservation," this form of conservation would occur as a matter of course without any additional financial incentives from water agencies. Water savings from codes, standards, and ordinances are discussed in Appendix 6.
- Active Conservation — Water saved as a direct result of programs and practices directly funded by a water utility (e.g., measures outlined by the California Urban Water Conservation Council's "Best Management Practices"). Active conservation is unlikely to occur without agency action.
- Price Effect Conservation — Reductions in customer use attributable to changes in the real (inflation adjusted) cost of water. Because water has a positive price elasticity of demand, increases in water price will decrease the quantity demanded.
- Pre-1990 Savings — Conservation savings are commonly estimated from a base-year water-use profile. Beginning with the 1996 IRP, Metropolitan identified 1980 as the base year for estimating conservation because it marked the effective date of a new plumbing code in California requiring toilets in new construction to be rated at 3.5 gallons per flush or less. Between 1980 and 1990, Metropolitan's service area saved an estimated 250,000 acre-feet per year as the result of this 1980 plumbing code and unrelated water rate increases. Within Metropolitan's planning framework, these savings are referred to as "pre-1990 savings."

Local Supplies

Local supplies represent water produced by the member agencies to meet their total demands. Local supplies are a key component in determining how much Metropolitan supply is needed. Projections of local supplies relied on information gathered from a number of sources including past urban water management plans, Metropolitan's annual local production surveys, and communications between Metropolitan and member agency staff. Local supplies include:

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

The local supplies projections presented in demand tables include existing projects currently producing water, projects under construction, and Metropolitan's IRP Local Supply targets. The method for including local supply projects begins with an inventory of local supplies that have been identified within Metropolitan's service area. Appendix 5 contains the inventory of local supplies by type of supply, and includes a classification that shows the current stage of development for each supply in the inventory. The stages of development included in Appendix 5 are: Existing, Under Construction, Fully Designed with Appropriated Funds, EIR/EIS Certified, Feasibility, and Conceptual. The project inventory in Appendix 5 was updated and completed as part of the 2015 IRP Update survey completed by Metropolitan's member agencies in April and July 2015.

Projects, potential supply yields, and online dates from the local supply inventory in Appendix 5 are used in two ways. First, projects that are classified as Existing or Under Construction are included in forecasts that reflect local supply production that is expected to occur without any additional development actions from Metropolitan or the local agencies. Projects in these categories of development are included here because they have a higher level of certainty. Second, projects that are classified as Fully Designed with Appropriated Funds, EIR/EIS Certified, Feasibility, and Conceptual are considered, along with the associated information on supply yield and online dates, as the potential projects that could be developed and go toward meeting IRP Local Supply targets described in Metropolitan's IRP. The IRP Local Supply targets are characterized in forecasts and tables that include Programs Under Development, which are described in Appendix 3.3 in the IRP Development Targets Section under In-Basin Storage and Supplies. It is anticipated that a combination of regional and local approaches will be required in order to meet the IRP Local Supply targets. The local supply inventory provides a connection of the IRP Local Supply targets with potential projects that have been identified, but not developed to a point of relative certainty. The inventory of potential projects is important, as historical implementation, timing, and ultimate production of local supply projects in the service area have fallen short of projections. This is increasingly true with the projects in the less than certain Feasibility and Conceptual categories. It is important that the inventory of potential projects is greater than the IRP Local Supply targets for new local supply, as the development of projects in the inventory will also be needed under conditions where other existing local supplies are lost or their yields are reduced.

Determining Demands on Metropolitan

Metropolitan serves imported water to its 26 member agencies. For most member agencies, they have other sources of water produced locally from groundwater basins, surface reservoirs, the LAA, recycled water projects, groundwater recovery projects, and seawater desalination projects. When local supplies are not enough to meet retail demands, member agencies purchase imported water from Metropolitan to meet their needs.

In determining demands for imported water, Metropolitan developed its Sales Model to calculate the difference between total forecasted retail demands and local supply projections. The balance is the demand on Metropolitan's imported water supply. The Sales Model calculates the difference between forecasted demands and projected local supplies after factoring in climate impacts. The Sales Model employs a modeling method using historical hydrologic conditions from 1922 to 2012 to simulate the expected demands on Metropolitan supplies based on hydrologic conditions. Each hydrologic condition results in one possible outcome for the forecast year in the planning horizon. For example, each forecast year, such as 2020, has 91 possible outcomes, one for each historical hydrology year during the period 1922 to 2012. This method of modeling produces a distribution of outcomes ranging from the driest to the wettest years within this historical period.

The Sales Model forecasts three types of demands on Metropolitan:

1. Consumptive Use – Metropolitan's supplies that are used to meet retail M&I demand.
2. Seawater Barrier – Imported water needed to hold back seawater intrusion into the coastal groundwater basins.
3. Replenishment – Water for groundwater or reservoir replenishment, when available, to meet replenishment demands.

For additional information on Metropolitan's demand forecast, see Appendix 1.

Table 2-1
Metropolitan Regional Water Demands
Single Dry-Year

(Acre-Feet)

		2020	2025	2030	2035	2040
A.	**Total Demands**[1]	**5,234,000**	**5,409,000**	**5,549,000**	**5,679,000**	**5,808,000**
	Retail Municipal and Industrial	4,739,000	4,874,000	5,016,000	5,148,000	5,279,000
	Retail Agricultural	131,000	168,000	164,000	162,000	160,000
	Seawater Barrier	72,000	72,000	72,000	72,000	72,000
	Storage Replenishment	292,000	295,000	297,000	297,000	297,000
B.	**Total Conservation**	**1,056,000**	**1,127,000**	**1,200,000**	**1,263,000**	**1,339,000**
	Existing Active (through 2015)[2]	210,000	196,000	184,000	166,000	159,000
	Code-based	381,000	423,000	462,000	497,000	532,000
	Price-Effect[3]	215,000	258,000	304,000	350,000	398,000
	Pre-1990 Conservation	250,000	250,000	250,000	250,000	250,000
C.	**Total Local Supplies**	**2,447,000**	**2,497,000**	**2,523,000**	**2,538,000**	**2,550,000**
	Groundwater	1,304,000	1,302,000	1,302,000	1,302,000	1,302,000
	Surface Water	107,000	107,000	107,000	107,000	107,000
	Los Angeles Aqueduct	127,000	127,000	127,000	127,000	127,000
	Seawater Desalination	56,000	56,000	56,000	56,000	56,000
	Groundwater Recovery	143,000	157,000	163,000	165,000	167,000
	Recycling[4]	436,000	466,000	486,000	499,000	509,000
	Other Imported Supplies[5]	274,000	282,000	282,000	282,000	282,000
D.	**Total Metropolitan Demands**	**1,731,000**	**1,784,000**	**1,826,000**	**1,878,000**	**1,919,000**
	Consumptive Use	1,560,000	1,616,000	1,658,000	1,710,000	1,751,000
	Seawater Barrier	5,000	2,000	2,000	2,000	2,000
	Replenishment	166,000	166,000	166,000	166,000	166,000

Notes:
All units are acre-feet unless specified, rounded to the nearest thousand.
Totals may not sum due to rounding.

[1] Growth projections are based on SCAG 2012 Regional Transportation Plan and SANDAG Series 13 2050 Regional Growth Forecast.

[2] Does not include future active conservation savings. 1990 is base year.

[3] Includes un-metered water use savings.

[4] Excludes Santa Ana River base flow, which is used for recharge of Orange County groundwater basin and reflected in the Groundwater production numbers.

[5] IID/SDCWA transfer and canal linings.

Table 2-2
Metropolitan Regional Water Demands
Multiple Dry-Year

(Acre-Feet)

		2020	2025	2030	2035	2040
A.	**Total Demands**[1]	**5,199,000**	**5,450,000**	**5,601,000**	**5,732,000**	**5,865,000**
	Retail Municipal and Industrial	4,701,000	4,920,000	5,063,000	5,197,000	5,332,000
	Retail Agricultural	128,000	164,000	169,000	166,000	164,000
	Seawater Barrier	72,000	72,000	72,000	72,000	72,000
	Storage Replenishment	298,000	294,000	297,000	297,000	297,000
B.	**Total Conservation**	**1,056,000**	**1,127,000**	**1,200,000**	**1,263,000**	**1,339,000**
	Existing Active (through 2015)[2]	210,000	196,000	184,000	166,000	159,000
	Code-based	381,000	423,000	462,000	497,000	532,000
	Price-Effect[3]	215,000	258,000	304,000	350,000	398,000
	Pre-1990 Conservation	250,000	250,000	250,000	250,000	250,000
C.	**Total Local Supplies**	**2,416,000**	**2,487,000**	**2,511,000**	**2,535,000**	**2,550,000**
	Groundwater	1,305,000	1,302,000	1,302,000	1,302,000	1,303,000
	Surface Water	102,000	102,000	102,000	102,000	102,000
	Los Angeles Aqueduct	113,000	129,000	125,000	131,000	133,000
	Seawater Desalination	56,000	56,000	56,000	56,000	56,000
	Groundwater Recovery	139,000	155,000	162,000	165,000	167,000
	Recycling[4]	427,000	461,000	482,000	497,000	507,000
	Other Imported Supplies[5]	274,000	282,000	282,000	282,000	282,000
D.	**Total Metropolitan Demands**	**1,727,000**	**1,836,000**	**1,889,000**	**1,934,000**	**1,976,000**
	Consumptive Use	1,547,000	1,668,000	1,721,000	1,766,000	1,808,000
	Seawater Barrier	6,000	2,000	2,000	2,000	2,000
	Replenishment	174,000	166,000	166,000	166,000	166,000

Notes:
All units are acre-feet unless specified, rounded to the nearest thousand.
Totals may not sum due to rounding.
[1] Growth projections are based on SCAG 2012 Regional Transportation Plan and SANDAG Series 13 2050 Regional Growth Forecast.
[2] Does not include future active conservation savings. 1990 is base year.
[3] Includes un-metered water use savings.
[4] Excludes Santa Ana River base flow, which is used for recharge of Orange County groundwater basin and reflected in the Groundwater production numbers.
[5] IID/SDCWA transfer and canal linings.

Table 2-3
Metropolitan Regional Water Demands
Average Year
(Acre-Feet)

		2020	2025	2030	2035	2040
A.	**Total Demands[1]**	**5,219,000**	**5,393,000**	**5,533,000**	**5,663,000**	**5,793,000**
	Retail Municipal and Industrial	4,725,000	4,859,000	5,001,000	5,133,000	5,264,000
	Retail Agricultural	130,000	167,000	163,000	161,000	160,000
	Seawater Barrier	72,000	72,000	72,000	72,000	72,000
	Storage Replenishment	292,000	295,000	297,000	297,000	297,000
B.	**Total Conservation**	**1,056,000**	**1,127,000**	**1,200,000**	**1,263,000**	**1,339,000**
	Existing Active (through 2015)[2]	210,000	196,000	184,000	166,000	159,000
	Code-based	381,000	423,000	462,000	497,000	532,000
	Price-Effect[3]	215,000	258,000	304,000	350,000	398,000
	Pre-1990 Conservation	250,000	250,000	250,000	250,000	250,000
C.	**Total Local Supplies**	**2,578,000**	**2,631,000**	**2,657,000**	**2,674,000**	**2,689,000**
	Groundwater	1,303,000	1,301,000	1,301,000	1,301,000	1,302,000
	Surface Water	110,000	110,000	110,000	110,000	110,000
	Los Angeles Aqueduct	261,000	264,000	264,000	266,000	268,000
	Seawater Desalination	51,000	51,000	51,000	51,000	51,000
	Groundwater Recovery	143,000	157,000	163,000	165,000	167,000
	Recycling[4]	436,000	466,000	486,000	499,000	509,000
	Other Imported Supplies[5]	274,000	282,000	282,000	282,000	282,000
D.	**Total Metropolitan Demands**	**1,586,000**	**1,636,000**	**1,677,000**	**1,726,000**	**1,765,000**
	Consumptive Use	1,415,000	1,468,000	1,509,000	1,558,000	1,597,000
	Seawater Barrier	5,000	2,000	2,000	2,000	2,000
	Replenishment	166,000	166,000	166,000	166,000	166,000

Notes:
All units are acre-feet unless specified, rounded to the nearest thousand.
Totals may not sum due to rounding.

[1] Growth projections are based on SCAG 2012 Regional Transportation Plan and SANDAG Series 13 2050 Regional Growth Forecast.

[2] Does not include future active conservation savings. 1990 is base year.

[3] Includes un-metered water use savings.

[4] Excludes Santa Ana River base flow, which is used for recharge of Orange County groundwater basin and reflected in the Groundwater production numbers.

[5] IID/SDCWA transfer and canal linings.

2.3 Water Supply Reliability

After estimating demands for single dry year, multiple dry years, and average years, the water reliability analysis requires urban water suppliers to identify projected supplies to meet these demands. Table 2-4 summarizes the sources of supply for the single dry year (1977 hydrology), while Table 2-5 shows the region's ability to respond in future years under a repeat of the 1990-92 hydrology. Table 2-5 provides results for the average of the three dry-year series rather than a year-by-year detail because most of Metropolitan's dry-year supplies are designed to provide equal amounts of water over each year of a three-year period. These tables show that the region can provide reliable water supplies under both the single driest year and the multiple dry-year hydrologies. Table 2-6 reports the expected situation on average over all of the historic hydrologies from 1922 to 2012. Appendix 3 contains detailed justifications for the sources of supply used for this analysis.

Metropolitan's supply capabilities are evaluated using the following assumptions:

Colorado River Aqueduct Supplies

CRA supplies include supplies that would result from existing and committed programs and from implementation of the QSA and related agreements. The QSA establishes the baseline water use for each of the agreement parties and facilitates the transfer of water from agricultural agencies to urban uses. A detailed discussion of the QSA is included in Section 3.1. Colorado River transactions are potentially available to supply additional water up to the CRA capacity of 1.2 MAF on an as-needed basis.

State Water Project Supplies

SWP supplies are estimated using the 2015 SWP Delivery Capability Report distributed by DWR in July 2015. The 2015 SWP Delivery Capability Report presents current DWR estimates of the amount of water deliveries for current (2015) conditions and conditions 20 years in the future. These estimates incorporate restrictions on SWP and Central Valley Project (CVP) operations in accordance with the biological opinions of the U.S. Fish and Wildlife Service and National Marine Fisheries Service issued on December 15, 2008, and June 4, 2009, respectively. Under the 2015 SWP Delivery Capability Report with existing conveyance and low outflow requirements scenario, the delivery estimates for the SWP for 2020 conditions as percentage of Table A amounts are 12 percent, equivalent to 257 TAF for Metropolitan, under a single dry-year (1977) condition and 51 percent, equivalent to 976 TAF for Metropolitan, under long-term average condition.

The goal for the 2015 IRP Update for SWP supplies is to manage flow and export regulations in the near term and ultimately to achieve a long-term Bay-Delta solution. This goal involves continued engagement in collaborative science-based approaches to manage regulations in the near-term and continued participation in the long-term California WaterFix and the California EcoRestore efforts. This approach targets an average of 984 TAF of SWP supplies in the near-term and 1.2 MAF of supplies on average starting in 2030 when the long-term Delta solution is assumed to be in place. More detailed description of SWP supplies is included in Section 3.2.

In dry and below-normal conditions, Metropolitan has increased the supplies received from the California Aqueduct by developing flexible Central Valley/SWP storage and transfer programs. Further descriptions of these programs can be found in Section 3.3.

Storage

A key component of Metropolitan's water supply capability is the amount of water in Metropolitan's storage facilities. Over the past two decades, Metropolitan has developed a large regional storage portfolio that includes both dry-year and emergency storage capacity. Storage is a key component of water management. Storage enables the capture of surplus amounts of water in normal and wet climate and hydrologic conditions when it is plentiful for supply and environmental uses. Stored water can then be used in dry years and in conditions where augmented water supplies are needed to meet demands. Metropolitan's resource analysis model considers all the capacities and constraints of its storage facilities and programs and simulates the fill and withdrawal of these facilities through the 91 hydrologic conditions from 1922-2012.

Table 2-4
Single Dry-Year
Supply Capability[1] and Projected Demands
Repeat of 1977 Hydrology

(Acre-feet per year)

Forecast Year	2020	2025	2030	2035	2040
Current Programs					
In-Region Supplies and Programs	693,000	774,000	852,000	956,000	992,000
California Aqueduct[2]	691,000	712,000	723,000	749,000	749,000
Colorado River Aqueduct					
Total Supply Available[3]	1,451,000	1,457,000	1,456,000	1,455,000	1,454,000
Aqueduct Capacity Limit[4]	*1,200,000*	*1,200,000*	*1,200,000*	*1,200,000*	*1,200,000*
Colorado River Aqueduct Capability	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Capability of Current Programs	**2,584,000**	**2,686,000**	**2,775,000**	**2,905,000**	**2,941,000**
Demands					
Total Demands on Metropolitan	1,731,000	1,784,000	1,826,000	1,878,000	1,919,000
IID-SDCWA Transfers and Canal Linings	274,000	282,000	282,000	282,000	282,000
Total Metropolitan Deliveries[5]	**2,005,000**	**2,066,000**	**2,108,000**	**2,160,000**	**2,201,000**
Surplus	**579,000**	**620,000**	**667,000**	**745,000**	**740,000**
Programs Under Development					
In-Region Supplies and Programs	43,000	80,000	118,000	160,000	200,000
California Aqueduct	20,000	20,000	198,000	198,000	198,000
Colorado River Aqueduct					
Total Supply Available[3]	155,000	125,000	75,000	25,000	25,000
Aqueduct Capacity Limit[4]	*0*	*0*	*0*	*0*	*0*
Colorado River Aqueduct Capability	0	0	0	0	0
Capability of Proposed Programs	**63,000**	**100,000**	**316,000**	**358,000**	**398,000**
Potential Surplus	**642,000**	**720,000**	**983,000**	**1,103,000**	**1,138,000**

[1] Represents Supply Capability for resource programs under listed year type.

[2] California Aqueduct includes Central Valley transfers and storage program supplies conveyed by the aqueduct.

[3] Colorado River Aqueduct includes programs, IID-SDCWA transfer and exchange and canal linings conveyed by the aqueduct.

[4] Maximum CRA deliveries limited to 1.20 MAF including IID-SDCWA transfer and exchange and canal linings.

[5] Total demands are adjusted to include IID-SDCWA transfer and exchange and canal linings. These supplies are calculated as local supply, but need to be shown for the purposes of CRA capacity limit calculations without double counting.

Table 2-5
Multiple Dry-Year
Supply Capability[1] and Projected Demands
Repeat of 1990-1992 Hydrology
(Acre-feet per year)

Forecast Year	2020	2025	2030	2035	2040
Current Programs					
In-Region Supplies and Programs	239,000	272,000	303,000	346,000	364,000
California Aqueduct[2]	664,000	682,000	687,000	696,000	696,000
Colorado River Aqueduct					
Total Supply Available[3]	1,403,000	1,691,000	1,690,000	1,689,000	1,605,000
Aqueduct Capacity Limit[4]	*1,200,000*	*1,200,000*	*1,200,000*	*1,200,000*	*1,200,000*
Colorado River Aqueduct Capability	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Capability of Current Programs	**2,103,000**	**2,154,000**	**2,190,000**	**2,242,000**	**2,260,000**
Demands					
Total Demands on Metropolitan	1,727,000	1,836,000	1,889,000	1,934,000	1,976,000
IID-SDCWA Transfers and Canal Linings	274,000	282,000	282,000	282,000	282,000
Total Metropolitan Deliveries[5]	**2,001,000**	**2,118,000**	**2,171,000**	**2,216,000**	**2,258,000**
Surplus	**102,000**	**36,000**	**19,000**	**26,000**	**2,000**
Programs Under Development					
In-Region Supplies and Programs	36,000	73,000	110,000	151,000	192,000
California Aqueduct	7,000	7,000	94,000	94,000	94,000
Colorado River Aqueduct					
Total Supply Available[3]	80,000	75,000	50,000	25,000	25,000
Aqueduct Capacity Limit[4]	*0*	*0*	*0*	*0*	*0*
Colorado River Aqueduct Capability	0	0	0	0	0
Capability of Proposed Programs	**43,000**	**80,000**	**204,000**	**245,000**	**286,000**
Potential Surplus	**145,000**	**116,000**	**223,000**	**271,000**	**288,000**

[1] Represents Supply Capability for resource programs under listed year type.

[2] California Aqueduct includes Central Valley transfers and storage program supplies conveyed by the aqueduct.

[3] Colorado River Aqueduct includes programs, IID-SDCWA transfer and exchange and canal linings conveyed by the aqueduct.

[4] Maximum CRA deliveries limited to 1.20 MAF including IID-SDCWA transfer and exchange and canal linings.

[5] Total demands are adjusted to include IID-SDCWA transfer and exchange and canal linings. These supplies are calculated as local supply, but need to be shown for the purposes of CRA capacity limit calculations without double counting.

Table 2-6
Average Year
Supply Capability[1] and Projected Demands
Average of 1922-2012 Hydrologies
(Acre-feet per year)

Forecast Year	2020	2025	2030	2035	2040
Current Programs					
In-Region Supplies and Programs	693,000	774,000	852,000	956,000	992,000
California Aqueduct[2]	1,555,000	1,576,000	1,606,000	1,632,000	1,632,000
Colorado River Aqueduct					
Total Supply Available[3]	1,468,000	1,488,000	1,484,000	1,471,000	1,460,000
Aqueduct Capacity Limit[4]	*1,200,000*	*1,200,000*	*1,200,000*	*1,200,000*	*1,200,000*
Colorado River Aqueduct Capability	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Capability of Current Programs	**3,448,000**	**3,550,000**	**3,658,000**	**3,788,000**	**3,824,000**
Demands					
Total Demands on Metropolitan	1,586,000	1,636,000	1,677,000	1,726,000	1,765,000
IID-SDCWA Transfers and Canal Linings	274,000	282,000	282,000	282,000	282,000
Total Metropolitan Deliveries[5]	**1,860,000**	**1,918,000**	**1,959,000**	**2,008,000**	**2,047,000**
Surplus	**1,588,000**	**1,632,000**	**1,699,000**	**1,780,000**	**1,777,000**
Programs Under Development					
In-Region Supplies and Programs	43,000	80,000	118,000	160,000	200,000
California Aqueduct	20,000	20,000	268,000	268,000	268,000
Colorado River Aqueduct					
Total Supply Available[3]	5,000	25,000	25,000	25,000	25,000
Aqueduct Capacity Limit[4]	*0*	*0*	*0*	*0*	*0*
Colorado River Aqueduct Capability	0	0	0	0	0
Capability of Proposed Programs	**63,000**	**100,000**	**386,000**	**428,000**	**468,000**
Potential Surplus	**1,651,000**	**1,732,000**	**2,085,000**	**2,208,000**	**2,245,000**

[1] Represents Supply Capability for resource programs under listed year type.

[2] California Aqueduct includes Central Valley transfers and storage program supplies conveyed by the aqueduct.

[3] Colorado River Aqueduct includes programs, IID-SDCWA transfer and exchange and canal linings conveyed by the aqueduct.

[4] Maximum CRA deliveries limited to 1.20 MAF including IID-SDCWA transfer and exchange and canal linings.

[5] Total demands are adjusted to include IID-SDCWA transfer and exchange and canal linings. These supplies are calculated as local supply, but need to be shown for the purposes of CRA capacity limit calculations without double counting.

2.4 Water Shortage Contingency Analysis

In addition to the Water Supply Reliability analysis addressing average year and drought conditions, the Act requires agencies to document the stages of actions that they would undertake in response to water supply shortages, including up to a 50 percent reduction in their water supplies. Metropolitan has captured this planning in its Water Surplus and Drought Management (WSDM)[2] Plan which guides Metropolitan's planning and operations during both shortage and surplus conditions. Furthermore, Metropolitan developed the Water Supply Allocation Plan (WSAP)[3], which provides a standardized methodology for allocating supplies during times of shortage.

Water Surplus and Drought Management Plan

Metropolitan's Board adopted the WSDM Plan in April 1999, which provides policy guidance for managing regional water supplies to achieve the reliability goals of the IRP and identifies the expected sequence of resource management actions that Metropolitan will execute during surpluses and shortages to minimize the probability of severe shortages and reduce the possibility of extreme shortages and shortage allocations. Unlike Metropolitan's previous shortage management plans, the WSDM Plan recognizes the link between surpluses and shortages, and it integrates planned operational actions with respect to both conditions.

WSDM Plan Development

Metropolitan and its member agencies jointly developed the WSDM Plan during 1998 and 1999. This planning effort included more than a dozen half-day and full-day workshops and more than three dozen meetings between Metropolitan and member agency staff. The result of the planning effort is a consensus plan that addresses a broad range of regional water management actions and strategies.

WSDM Plan Principles and Goals

The guiding principle of the WSDM Plan is to manage Metropolitan's water resources and management programs to maximize management of wet year supplies and minimize adverse impacts of water shortages to retail customers. From this guiding principle came the following supporting principles:

- Encourage efficient water use and economical local resource programs
- Coordinate operations with member agencies to make available as much surplus water as possible for use in dry years
- Pursue innovative transfer and banking programs to secure more imported water for use in dry years
- Increase public awareness about water supply issues

The WSDM plan also declared that if mandatory import water allocations become necessary, they would be calculated on the basis of need, as opposed to any type of historical purchases. The WSDM plan contains the following considerations that would go into an allocation of imported water:

- Impact on retail consumers and regional economy
- Investments in local resources, including recycling and conservation

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[2] Metropolitan Water District of Southern California. *Water Surplus and Drought Management Plan,* Report No. 1150, August, 1999.

[3] Metropolitan Water District of Southern California, Water Supply Allocation Plan, December 2014.

- Population growth
- Changes and/or losses in local supplies
- Participation in Metropolitan's non-firm (interruptible) programs
- Investment in Metropolitan's facilities

WSDM Plan Implementation

Each year, Metropolitan evaluates the level of supplies available and existing levels of water in storage to determine the appropriate management stage. Each stage is associated with specific resource management actions designed to: (1) avoid an Extreme Shortage to the maximum extent possible; and (2) minimize adverse impacts to retail customers if an Extreme Shortage occurs. The current sequencing outlined in the WSDM Plan reflects anticipated responses based on detailed modeling of Metropolitan's existing and expected resource mix.

Surplus Stages

Metropolitan's supply situation is considered to be in surplus as long as net annual deliveries can be made to water storage programs. The WSDM Plan further defines four surplus management stages that guide the storage of surplus supplies in Metropolitan's storage portfolio. Deliveries for storage in DVL and in SWP terminal reservoirs continue through each surplus stage provided there is available storage capacity. Withdrawals from DVL for regulatory purposes or to meet seasonal demands may occur in any stage. Deliveries to other storage facilities may be interrupted, depending on the amount of the surplus.

Shortage Stages

The WSDM Plan distinguishes between Shortages, Severe Shortages, and Extreme Shortages. Within the WSDM Plan, these terms have specific meanings relating to Metropolitan's ability to deliver water to its customers.

Shortage: Metropolitan can meet full-service demands and partially meet or fully meet interruptible demands, using stored water or water transfers as necessary.

Severe Shortage: Metropolitan can meet full-service demands only by using stored water, transfers, and possibly calling for extraordinary conservation.

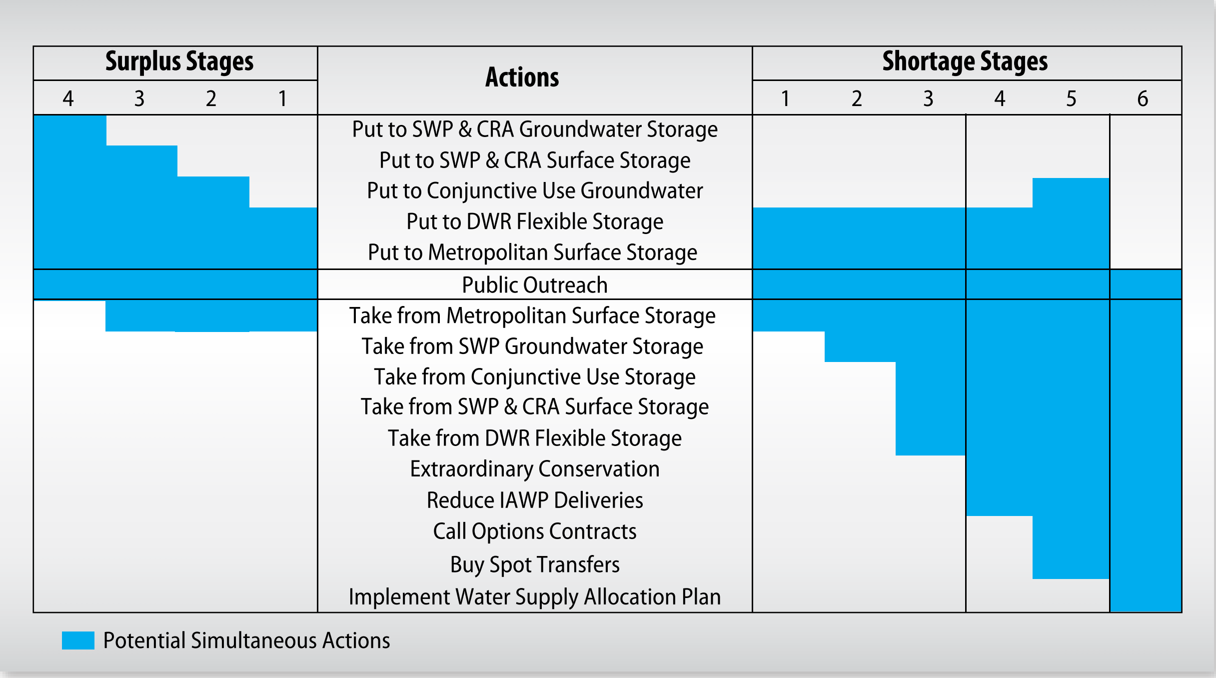
Extreme Shortage: Metropolitan allocates available supply to full-service customers.

The WSDM Plan also defines six shortage management stages to guide resource management activities. These stages are not defined merely by shortfalls in imported water supply, but also by the water balances in Metropolitan's storage programs. Thus, a 10 percent shortfall in imported supplies could be a stage one shortage if storage levels are high. If storage levels are already depleted, the same shortfall in imported supplies could potentially be defined as a more severe shortage.

When Metropolitan must make net withdrawals from storage to meet demands, it is considered to be in a shortage condition. Under most of these stages, Metropolitan is still able to meet all end-use demands for water. For shortage stages 1 through 3, Metropolitan will meet demands by withdrawing water from storage. At shortage stages 4 and 5, Metropolitan may undertake additional shortage management steps, including issuing public calls for extraordinary conservation and exercising water transfer options, or purchasing water on the open market.

Figure 2-1 shows the actions under surplus and shortage stages and when an allocation plan would be necessary to enforce mandatory cutbacks. The overriding goal of the WSDM Plan is to avoid reaching Shortage Stage 6, an Extreme Shortage.

Figure 2-1 Resource Stages, Anticipated Actions, And Supply Declarations



Surplus Stages				Actions	Shortage Stages					
4	3	2	1		1	2	3	4	5	6
🟦				Put to SWP & CRA Groundwater Storage						
🟦	🟦			Put to SWP & CRA Surface Storage						
🟦	🟦	🟦		Put to Conjunctive Use Groundwater					🟦	
🟦	🟦	🟦	🟦	Put to DWR Flexible Storage	🟦	🟦	🟦	🟦	🟦	
🟦	🟦	🟦	🟦	Put to Metropolitan Surface Storage	🟦	🟦	🟦	🟦	🟦	
🟦	🟦	🟦	🟦	Public Outreach	🟦	🟦	🟦	🟦	🟦	🟦
	🟦	🟦	🟦	Take from Metropolitan Surface Storage	🟦	🟦	🟦	🟦	🟦	🟦
				Take from SWP Groundwater Storage		🟦	🟦	🟦	🟦	🟦
				Take from Conjunctive Use Storage			🟦	🟦	🟦	🟦
				Take from SWP & CRA Surface Storage			🟦	🟦	🟦	🟦
				Take from DWR Flexible Storage			🟦	🟦	🟦	🟦
				Extraordinary Conservation				🟦	🟦	🟦
				Reduce IAWP Deliveries				🟦	🟦	🟦
				Call Options Contracts					🟦	🟦
				Buy Spot Transfers					🟦	🟦
				Implement Water Supply Allocation Plan						🟦

🟦 Potential Simultaneous Actions

Water Supply Condition Framework

Consistent with the WSDM Plan, Metropolitan's Board adopted a Water Supply Condition Framework in June 2008. The purpose of the framework is to communicate the urgency of the region's water supply situation and the need for further water conservation practices. The framework is intended to encourage proactive steps to reduce the region's water demand to mitigate the need for more severe actions, up to and including implementation of the WSAP to allocate water supply shortages to member agencies. The framework has four conditions, each calling for an increasingly heightened level of conservation response:

- Baseline Water Use Efficiency
- Condition 1: Water Supply Watch
- Condition 2: Water Supply Alert
- Condition 3: Water Supply Allocation

Table 2-7 below shows the framework and the associated conservation actions.

Table 2-7
Water Supply Condition Framework

	Water Supply Condition Framework
Baseline Water Use Efficiency	Ongoing conservation, outreach, and recycling programs to achieve permanent reductions in water use and build storage reserves.
Condition 1: Water Supply Watch	Local agency voluntary dry-year conservation measures and use of regional storage reserves.
Condition 2: Water Supply Alert	Regional call for cities, counties, member agencies and retail water agencies to implement extraordinary conservation through drought ordinances and other measures to mitigate use of storage reserves.
Condition 3: Water Supply Allocation	Implement Metropolitan's Water Supply Allocation Plan.

The drought periods of 2007-2011 and 2012-2015 provide an example of how the Water Supply Condition Framework is used. In June 2008, Metropolitan's Board declared a Condition 2: Water Supply Alert to highlight that storage reserves were dropping and that drought conditions were building, corresponding to WSDM shortage stages 1-5. In April 2009 and again in April 2010, Metropolitan's Board moved deeper into a Condition 3: Water Supply Allocation, corresponding to an extreme shortage stage 6 in the WSDM Plan. The April 2010 Water Supply Allocation condition was later terminated by Metropolitan's Board in April 2011 when hydrologic conditions improved during the 2010/2011 water year. The region returned to the Baseline Water Use Efficiency condition following the improvement in water supply. As dry conditions returned in 2012 and 2013, Metropolitan returned to using regional storage and sponsoring outreach efforts with member agencies to encourage voluntary conservation. In 2014, record dry and hot conditions significantly impacted the water resources of both the State of California and Metropolitan. In light of these conditions, which precipitated the January 2014 Emergency Drought Declaration by Governor Brown, Metropolitan's Board declared a Condition 2: Water Supply Alert in February 2014 to again provide public messaging and to urge local water agencies within Metropolitan's service area to adopt and enact water savings ordinances. Extremely dry conditions continued in 2015. In support of the Governor's Executive Order B-29-15 calling for 25 percent reductions in statewide consumer water use, Metropolitan's Board declared a Condition 3: Water Supply Allocation in April 2015.

Water Supply Allocation Plan

The WSAP provides a formula for allocating available water supplies to the member agencies in case of extreme water shortages within Metropolitan's service area. The WSAP was approved by Metropolitan's Board in February 2008 and has since been implemented three times, most recently in April 2015. The WSAP was developed in consideration of the principles and guidelines described in the WSDM Plan, with the objective of creating an equitable needs-based allocation. The WSAP formula seeks to balance the impacts of a shortage at the retail level for shortages of Metropolitan supplies of up to 50 percent. The formula takes into account growth, local investments, changes in supply conditions, and the demand hardening aspects of non-potable recycled water use and the implementation of conservation savings programs.

Water Supply Allocation Plan Development

Between July 2007 and February 2008, Metropolitan staff worked jointly with Metropolitan's member agencies to develop the WSAP. Throughout the development process, Metropolitan's Board was provided with regular progress reports on the status of the WSAP. The WSAP was adopted at the February 12, 2008 Board meeting. Since the WSAP's adoption in 2008, Metropolitan has worked extensively with the member agencies to periodically review the WSAP formula. Following Board-directed formal review of the WSAP at 12 months after initial implementation and at 3 years after initial adoption, the Board approved adjustments to the WSAP formula on August 17, 2010, and September 13, 2011. In light of drought conditions, Metropolitan staff convened a member agency working group between July and November 2014 to revisit the WSAP before possible implementation in 2015. On December 9, 2014, the Board approved additional adjustments to the formula.

The WSAP Formula

The WSAP formula is calculated in three steps: base period calculations, allocation year calculations, and supply allocation calculations. The first two steps involve standard computations, while the third step contains specific methodology developed for the WSAP.

Step 1: Base Period Calculations

The first step in calculating a water supply allocation is to estimate water supply and demand using a historical base period with established water supply and delivery data. The base period for each of the different categories of demand and supply is calculated using data from fiscal years (July through June) ending 2013 and 2014.

Step 2: Allocation Year Calculations

The next step in calculating the water supply allocation is estimating water needs in the allocation year. This is done by adjusting the base period estimates of retail demand for population growth and changes in local supplies.

Step 3: Supply Allocation Calculations

The final step is calculating the water supply allocation for each member agency based on the allocation year water needs identified in Step 2. There are a number of adjustments that go into a member agency's water supply allocation. Each element and its application in the allocation formula are discussed in detail in Metropolitan's WSAP.

Annual Reporting Schedule on Supply/Demand Conditions

Managing Metropolitan's water supply resources to minimize the risk of shortages requires timely and accurate information on changing supply and demand conditions throughout the year. To facilitate effective resource management decisions, the WSDM Plan includes a monthly schedule for providing supply/demand information to Metropolitan's senior management and Board, and for making resource allocation decisions. Table 2-8 shows this schedule.

Table 2-8
Schedule of Reporting and Water Supply Allocation Decision-Making

Month	Information Report/Management Decision
January	Initial supply/demand forecasts for year
February - March	Update supply/demand forecasts for year
April - May	Finalize supply/demand forecasts Management decisions re: Contractual Groundwater and Option Transfer Programs Board decision re: Need for Extraordinary Conservation
October - December	Report on Supply and Carryover Storage

2.5 Catastrophic Supply Interruption Planning

The third type of planning needed to evaluate supply reliability is a catastrophic supply interruption plan that documents the actions necessary for a catastrophic interruption in water supplies. For Metropolitan, this planning is captured in the analysis that went into developing the Emergency Storage Requirements.

Emergency Storage Requirements

Metropolitan established its criteria for determining emergency storage requirements in the October 1991 Final Environmental Impact Report for the Eastside Reservoir, which is now named Diamond Valley Lake. These criteria were again discussed in the 1996 IRP. Metropolitan's Board approved both of these documents.

Emergency storage requirements are based on the potential of a major earthquake damaging the aqueducts that transport Southern California's imported water supplies (SWP, CRA, and Los Angeles Aqueduct). The adopted criteria assume that damage from such an event could render the aqueducts out of service for six months. Therefore, Metropolitan has based its planning on a 100 percent reduction in these imported supplies for a period of six months, which is a greater shortage than required by the Act.

To safeguard the region from catastrophic loss of water supply, Metropolitan has made substantial investments in emergency storage. The emergency plan outlines that under such a catastrophe, non-firm service deliveries would be suspended, and firm supplies to member agencies would be restricted by a mandatory cutback of 25 percent from normal-year demand levels. At the same time, water stored in surface reservoirs and groundwater basins under Metropolitan's program would be made available, and Metropolitan would draw on its emergency storage, as well as other available storage. In addition to DVL, Metropolitan has access to emergency storage at its other reservoirs, and at the SWP terminal reservoirs, and in its groundwater conjunctive use storage accounts. With few exceptions, Metropolitan can deliver this emergency supply throughout its service area via gravity, thereby eliminating dependence on power sources that could also be disrupted by a major earthquake. The WSDM Plan shortage stages will guide Metropolitan's management of available supplies and resources during the emergency to minimize the impacts of the catastrophe. Additional discussion of emergency storage is included in Appendix A.3.3.

Electrical Outages

Metropolitan has also developed contingency plans that enable it to deal with both planned and unplanned electrical outages. These plans include the following key points:

- In event of power outages, water supply can be maintained by gravity feed from regional reservoirs such as DVL, Lake Mathews, Castaic Lake, and Silverwood Lake.
- Maintaining water treatment operations is a key concern. As a result, all Metropolitan treatment plants have backup generation sufficient to continue operating in the event of supply failure on the main electrical grid.
- Valves at Lake Skinner can be operated by the backup generation at the Lake Skinner treatment plant.
- Metropolitan owns mobile generators that can be transported quickly to key locations if necessary.

2.6 Other Supply Reliability Risks

Metropolitan provides water to a broad and heterogeneous service area with water supplies from a variety of sources and geographic regions. Each of these demand areas and supplies has its own unique set of benefits and challenges. Among the challenges Metropolitan faces are the following:

Supplies

- The region and Colorado River Basin have been experiencing drought conditions for multiple years. In the past 16 years (2000-2015), there have been only three years when the Colorado River flow has been above average. The last above-average year was 2011, when the unregulated water year inflow to Lake Powell was 139 percent of average.
- Endangered species protection and conveyance needs in the Sacramento-San Joaquin River Delta System have resulted in operational constraints that are particularly important because pumping restrictions impact many water resource programs – SWP supplies and additional voluntary transfers, Central Valley storage and transfers, in-region groundwater storage, and in-region surface water storage.
- Changing climate patterns are predicted to shift precipitation patterns and possibly affect water supply.
- Difficulty and implications of environmental review, documentation, and permitting for multi-year transfer agreements, recycled water projects, and seawater desalination plants.
- Public perception of recycled water use.
- Opposition to local seawater desalination projects from environmental groups and community organizations.

Operations and Water Quality

- The cost and use of energy and greenhouse gas emissions.
- Water quality regulations and issues like the quagga mussels within the CRA. Controlling the spread and impacts of the quagga mussels will require more extensive maintenance and reduced operational flexibility.
- Salt and concentrate balance from a variety of sources.

Demand

- Fluctuations in population and economic growth.
- Uncertain location of growth.
- Uncertain housing stock and density.
- Changes in outdoor water use patterns.

The challenges posed by continued population growth, environmental constraints on the reliability of imported supplies, and new uncertainties imposed by climate change demand that Metropolitan assert the same level of leadership and commitment to taking on large-scale regional solutions to providing water supply reliability. New solutions are potentially available in the form of dramatically improved water-use efficiency, indirect and direct potable use of recycled water, and large-scale application of ocean desalinization.

Distribution System Water Losses

Metropolitan followed the AWWA Water Audit methodology to track all sources of water and uses of water within its system. The AWWA Water Audit methodology quantifies real and apparent water system losses in an agency's distribution system. Section 10631(e)(3)(A) of the California Water Code requires that the 2015 Urban Water Management Plan update quantify distribution system water losses for the most recent 12-month period available.

For the distribution system water losses assessment, Metropolitan included its water balance audit for calendar years 2014 and 2013. In addition, Metropolitan also included a memorandum that provides water balance assessment for year 2012.

The results of Metropolitan's audit showed that the total amount of distribution system water losses in 2014 was approximately 6.4 TAF. A detailed discussion of Metropolitan's distribution system water losses for 2014 is included in Appendix 7 and summarized in Table A.7-1. In addition to the distribution system losses described in the AWWA tables, Metropolitan estimates that 37 TAF was lost from reservoir evaporation occurring in Lake Mathews, Lake Skinner, and DVL during CY 2014.

Climate Change

Climate change adds its own uncertainties to the challenges of planning. Metropolitan's water supply planning has been fortunate in having almost one-hundred years of hydrological data regarding weather and water supply. This history of rainfall data has provided a sound foundation for forecasting both the frequency and the severity of future drought conditions, as well as the frequency and abundance of above-normal rainfall. But, weather patterns can be expected to shift dramatically and unpredictably in a climate driven by increased concentrations of carbon dioxide in the atmosphere. These changes in weather significantly affect water supply planning, irrespective of the debate associated with the sources and cause of increasing concentrations of greenhouse gasses. As a major steward of the region's water supply resources, Metropolitan is committed to performing its due diligence with respect to climate change.

Potential Impacts

While uncertainties remain regarding the exact timing, magnitude, and regional impacts of these temperature and precipitation changes, researchers have identified several areas of concern for California water planners. These include:

- Reduction in Sierra Nevada snowpack;
- Increased intensity and frequency of extreme weather events; and
- Rising sea levels resulting in
    - Impacts to coastal groundwater basins due to seawater intrusion;
    - Increased risk of damage from storms, high-tide events, and the erosion of levees; and
    - Potential pumping cutbacks on the SWP and Central Valley Project (CVP).

Other important issues of concern due to global climate change include:

- Effects on local supplies such as groundwater;
- Changes in urban and agricultural demand levels and patterns;
- Impacts to human health from water-borne pathogens and water quality degradation;
- Declines in ecosystem health and function; and
- Alterations to power generation and pumping regimes.

Metropolitan's Activities Related to Climate Change Concerns

Resource Planning

Under the 2015 IRP Update, Metropolitan recognizes additional risks and uncertainties from a variety of sources:

- Water quality
- Climate change
- Regulatory and operational changes
- Project construction and implementation issues
- Infrastructure reliability and maintenance
- Demographic and growth uncertainty

Any of these risks and uncertainties, should they occur individually or collectively, may result in a negative impact to water supply reliability. While it is impossible to know how much risk and uncertainty to guard against, the region's reliability will be more secure with a long-term plan that recognizes risk and provides resource development to offset that risk. Some risk and uncertainty will be addressed by following the findings of the 2015 IRP Update. But there are other risks that may take longer to manifest, like climate change or shifts in demographic growth patterns that increase or move the demands for water.

Metropolitan has established an intensive, comprehensive technical process to identify key vulnerabilities. This Robust Decision Making (RDM) approach was used with the 2010 IRP Update. The RDM approach can show how vulnerable the region's reliability is to longer-term risks and can also establish "signposts" that can be monitored to see when critical changes may be happening. Signposts include monitoring the direction of ever-changing impacts from improved Global Climate Models, and housing and population growth patterns. The RDM approach will be revisited with the new resource reliability targets identified in the 2015 IRP Update. Initial 2015 IRP analysis indicated an additional 200,000 AF of water conservation and local supplies may be needed to address these risks. This additional supply goal will be considered when examining implementation policies and approaches as the IRP process continues.

Knowledge Sharing and Research Support

Metropolitan is an active and founding member of the Water Utility Climate Alliance (WUCA). WUCA consists of ten nationwide water providers collaborating on climate change adaptation and greenhouse gas mitigation issues. As a part of this effort, WUCA pursues a variety of activities on multiple fronts.

Member agencies of WUCA annually share individual agency actions to mitigate greenhouse gas emissions to facilitate further implementation of these programs. WUCA also monitors development of climate change-related research, technology, programs, and federal legislation.

In addition to supporting federal and regional efforts, WUCA released a white paper entitled "Options for Improving Climate Modeling to Assist Water Utility Planning for Climate Change" in January 2010. The purpose of this paper was to assess Global Circulation Models, identify key aspects for water utility planning, and make seven initial recommendations for how climate modeling and downscaling techniques can be improved so that these tools and techniques can be more useful for the water sector. Another recent WUCA publication related to water planning is: “Embracing Uncertainty: A Case Study Examination of How Climate Change is Shifting Water Utility Planning” (2015). A fundamental goal of this recent white paper is to provide water professionals with practical and relevant examples, with insights from their peers, on how and why to modify planning and decision-making processes to better prepare for a changing climate.

In addition to these efforts, the member agencies of WUCA annually share individual agency actions to mitigate greenhouse gas emissions to facilitate further implementation of these programs. At a September 2009 summit at the Aspen Global Change Institute, WUCA members met with global climate modelers, along with federal agencies, academic scientists, and climate researchers, to establish collaborative directions to progress climate science and modeling efforts. WUCA continues to pursue these opportunities and partnerships with water providers, climate scientists, federal agencies, research centers, academia and key stakeholders.

Metropolitan also continues to pursue knowledge sharing and research support activities outside of WUCA. Metropolitan regularly provides input and direction on California legislation related to climate change issues. Metropolitan is active in collaborating with other state and federal agencies, as well as non-governmental organizations, on climate change related planning issues. The following list provides a sampling of entities that Metropolitan has recently worked with on a collaborative basis:

- USBR
- U.S. Army Corps of Engineers
- AWWA Research Foundation
- National Center for Atmospheric Research
- California Energy Commission
- California Department of Water Resources

Quantification of Current Research

Metropolitan continues to incorporate current climate change science into its planning efforts. A major component of the current IRP update effort is to explicitly reflect uncertainty in Metropolitan’s future water management environment. This involves evaluating a wider range of water management strategies, and seeking robust and adaptive plans that respond to uncertain conditions as they evolve over time, and that ultimately will perform adequately under a wide range of future conditions. The potential impacts and risks associated with climate change, as well as other major uncertainties and vulnerabilities, have been incorporated into the update. Overall, Metropolitan’s planning activities strive to support the Board adopted policy principles on climate change by:

- Supporting reasonable, economically viable, and technologically feasible management strategies for reducing impacts on water supply,
- Supporting flexible “no regret” solutions that provide water supply and quality benefits while increasing the ability to manage future climate change impacts, and
- Evaluating staff recommendations regarding climate change and water resources under the California Environmental Quality Act (CEQA) to avoid adverse effects on the environment.

Implementation of Programs and Policies

Metropolitan has made great efforts to implement greenhouse gas mitigation programs and policies for its facilities and operations. To date, these programs and policies have focused on:

- Exploring water supply/energy relationships and opportunities to increase efficiencies;
- Participating in The Climate Registry, a nonprofit greenhouse gas emissions registry for North America that provides organizations with the tools and resources to help them calculate, verify, report, and manage their greenhouse gas emissions in a publicly transparent and credible way;
- Acquiring "green" fleet vehicles, and supporting an employee Rideshare program;
- Developing solar power at both the Skinner water treatment plant (completed) and the Weymouth water treatment plant (in progress); and
- Identifying and pursuing development of "green" renewable water and energy programs that support the efficient and sustainable use of water.

Metropolitan also continues to be a leader in efforts to increase regional water use efficiency. Metropolitan has worked to increase the availability of incentives for local conservation and recycling projects, as well as supporting conservation Best Management Practices for industry and commercial businesses.

2.7 Pricing and Rate Structures

Revenue Management

A high proportion of Metropolitan's revenues come from volumetric water rates. Water sales revenues are approximately 80 percent of Metropolitan's total revenues. As a result, Metropolitan's revenues vary according to regional weather and the availability of statewide water supplies. In dry years, local demands increase, and Metropolitan may receive higher than anticipated revenues due to increased sales volumes. In contrast, in wet years, demands decrease, and revenues drop due to lower sales volumes. In addition, statewide supply shortages such as those in 2009 and 2015 also affect Metropolitan's revenues. Such revenue surpluses and shortages could cause instability in water rates. To mitigate this risk, Metropolitan maintains financial reserves, with a minimum and target balance, to stabilize water rates during times of reduced water sales. The reserves hold revenues collected during times of high water sales and are used to offset the need for revenues during times of low sales.

Another way to mitigate rate increases is by generating a larger portion of revenues from fixed sources. Metropolitan currently has two fixed charges, the Readiness-to-Serve Charge (RTS) and the Capacity Charge. Metropolitan also collects tax revenue from taxable property within its boundaries. The revenues from fixed charges generate approximately 18 percent of all Metropolitan revenues. RTS revenues have been increasing gradually, from $136 million in fiscal year 2011-12, to $155.5 million in fiscal year 2015-16.

Finally, Metropolitan generates revenue from interest income, hydroelectric power sales, and miscellaneous income such as rents and leases. For the last five fiscal years, these averaged approximately three percent of all Metropolitan revenues. These internally generated revenues are referred to as revenue offsets and reduce the amount of revenue that needs to be collected from rates and charges.

Elements of Rate Structure

This section provides an overview of Metropolitan's rate structure. The different elements of the rate structure are discussed below and summarized in Table 2-9.

System Access Rate (SAR)

The SAR is a volumetric system-wide rate levied on each acre-foot of water that moves through the Metropolitan system. All system users (member agency or third party) pay the SAR to use Metropolitan's conveyance and distribution system. The SAR recovers the cost of providing conveyance and distribution capacity to meet average annual demands.

Water Stewardship Rate (WSR)

The WSR recovers the costs of providing financial incentives for existing and future investments in local resources including conservation and recycled water. These investments or incentive payments are identified as the "demand management" service function in the cost of service process. The WSR is a volumetric rate levied on each acre-foot of water that moves through the Metropolitan system.

System Power Rate (SPR)

The SPR recovers the costs of energy required to pump water to Southern California through the SWP and CRA. The cost of power is recovered through a uniform volumetric rate. The SPR is applied to all deliveries to member agencies.

Treatment Surcharge

The treatment surcharge recovers the costs of providing treated water service through a uniform, volumetric rate. The treatment surcharge recovers all costs associated with providing treated water service, including commodity, demand, and standby related costs.

Capacity Charge

The capacity charge is levied on the maximum summer day demand placed on the system between May 1 and September 30 for a three-calendar year period. Demands measured for the purposes of billing the capacity charge include all firm demands, including wheeling service and exchanges.

The capacity charge is intended to pay for the cost of peaking capacity on Metropolitan's system, while providing an incentive for local agencies to decrease their use of the Metropolitan system to meet peak day demands and to shift demands into lower use time periods. Over time, a member agency will benefit from local supply investments and operational strategies that reduce its peak day demand on the system in the form of a lower total capacity charge.

Readiness-To-Serve Charge (RTS)

The costs of infrastructure projects needed to provide service, including emergency storage and those costs related to the conveyance and distribution system that are available but not used on average, are recovered by the RTS.

The RTS is allocated to the member agencies based on each agency's proportional share of a ten-year rolling average of all firm deliveries. A ten-year rolling average leads to a relatively stable RTS allocation that reasonably represents an agency's potential long-term need for standby service under different demand conditions. Member agencies may choose to have a portion of their total RTS obligation offset by standby charge collections levied by Metropolitan on behalf of the member agency. These standby charges are assessed on parcels of land within the boundaries of a given member agency.

Tier 1 Supply Rate

The costs of maintaining existing supplies and developing additional supplies are recovered through a two-tiered pricing approach. The Tier 1 Supply Rate recovers the cost of maintaining a reliable amount of supply. Each member agency has a predetermined amount of water that can be purchased at the lower Tier 1 Supply Rate. Purchases in excess of this limit will be made at the higher Tier 2 Supply Rate.

Tier 2 Supply Rate

The Tier 2 Supply Rate reflects Metropolitan's cost of purchasing water transfers north of the Delta. The Tier 2 Supply Rate encourages the member agencies and their customers to maintain existing local supplies and develop cost-effective local supply resources and conservation.

Table 2-9
Rate Structure Components

Rate Design Elements	Service Provided/ Costs Recovered	Type of Charge
System Access Rate	Conveyance/Distribution (Average Capacity)	Volumetric ($/AF)
Water Stewardship Rate	Conservation/Local Resources	Volumetric ($/AF)
System Power Rate	Power	Volumetric ($/AF)
Treatment Surcharge	Treatment	Volumetric ($/AF)
Capacity Charge	Peak Distribution System Capacity	Fixed ($/cfs)
Readiness-To-Serve Charge	Conveyance/Distribution/Emergency Storage(infrastructure necessary to provide service)	Fixed ($Million)
Tier 1 Supply Rate	Supply	Volumetric ($/AF)
Tier 2 Supply Rate	Supply	Volumetric ($/AF)

The following tables provide further information regarding Metropolitan's rates. Table 2-10 summarizes the rates and charges effective January 1, 2014, January 1, 2015, and January 1, 2016. Average costs by member agency will vary depending upon an agency's RTS allocation, Capacity Charge, and relative proportions of treated and untreated Tier 1, and Tier 2 water purchases. Table 2-11 provides the details of the Capacity Charge, calculated for calendar year 2016.

Table 2-12 provides the details of the Readiness-to-Serve Charge calculation for calendar year 2016 by member agency. Table 2-13 provides the current Purchase Order commitment quantities that member agencies will purchase from Metropolitan over the 10-year period starting January 2015 through December 2024. Tier 1 annual average limits for each member agency are also shown in this table.

Table 2-10
Metropolitan Water Rates and Charges

Effective	Jan 1, 2014	Jan 1, 2015	Jan 1, 2016
Tier 1 Supply Rate ($/AF)	$148	$158	$156
Tier 2 Supply Rate ($/AF)	$290	$290	$290
System Access Rate ($/AF)	$243	$257	$259
Water Stewardship Rate ($/AF)	$41	$41	$41
System Power Rate ($/AF)	$161	$126	$138
Full Service Untreated Volumetric Cost ($/AF)			
Tier 1	$593	$582	$594
Tier 2	$735	$714	$728
Treatment Surcharge ($/AF)	$297	$341	$348
Full Service Treated Volumetric Cost ($/AF)			
Tier 1	$890	$923	$942
Tier 2	$1,032	$1,055	$1,076
Readiness-to-Serve Charge ($M)	$166	$158	$153
Capacity Charge ($/cfs)	$8,600	$11,100	$10,900

Table 2-11
Capacity Charge Detail Calendar Year 2016

	Peak Day Demand (cfs) (May 1 through September 30) Calendar Year				
Agency	2012	2013	2014	3-Year Peak	Calendar Year 2016 Capacity Charge ($10,900/cfs)
Anaheim	38.3	31.3	34.0	38.3	$417,470
Beverly Hills	32.7	30.8	30.6	32.7	$356,430
Burbank	20.9	19.7	22.6	22.6	$246,340
Calleguas	224.0	228.7	240.8	240.8	$2,624,720
Central Basin	74.5	73.6	61.0	74.5	$812,050
Compton	2.3	2.9	0.0	2.9	$31,610
Eastern	237.2	267.4	239.2	267.4	$2,914,660
Foothill	17.6	18.9	19.9	19.9	$216,910
Fullerton	24.4	20.0	22.2	24.4	$265,960
Glendale	41.5	44.9	43.7	44.9	$489,410
Inland Empire	126.7	153.9	144.0	153.9	$1,677,510
Las Virgenes	41.9	43.2	46.1	46.1	$502,490
Long Beach	60.4	66.9	67.8	67.8	$739,020
Los Angeles	512.9	767.1	782.5	782.5	$8,529,250
MWDOC	398.6	379.4	443.1	443.1	$4,829,790
Pasadena	52.1	52.5	48.5	52.5	$572,250
San Diego	961.5	967.4	1,138.2	1,138.2	$12,406,380
San Fernando	2.8	4.9	0.0	4.9	$53,410
San Marino	5.3	6.1	7.3	7.3	$79,570
Santa Ana	19.2	19.6	17.5	19.6	$213,640
Santa Monica	19.7	22.7	15.2	22.7	$247,430
Three Valleys	133.0	178.6	151.4	178.6	$1,946,740
Torrance	36.2	34.1	33.5	36.2	$394,580
Upper San Gabriel	15.2	16.1	45.4	45.4	$494,860
West Basin	222.6	230.2	217.5	230.2	$2,509,180
Western	193.7	198.6	176.6	198.6	$2,164,740
Total	3,515.3	3,879.5	4,058.5	4,196.0	$45,736,400

Totals may not foot due to rounding

Table 2-12

Readiness-to-Serve Charge (by Member Agency) Calendar Year 2016

Member Agency	Rolling Ten-Year Average Firm Deliveries (Acre-Feet) FY2004-05 to FY2013-14	RTS Share	12 months @ $153 million per year (1/16-12/16)
Anaheim	21,646	1.26%	1,931,624
Beverly Hills	11,468	0.67%	1,023,387
Burbank	12,769	0.74%	1,139,430
Calleguas MWD	110,216	6.43%	9,835,288
Central Basin MWD	53,106	3.10%	4,739,002
Compton	2,222	0.13%	198,301
Eastern MWD	98,854	5.77%	8,821,351
Foothill MWD	9,999	0.58%	892,228
Fullerton	9,902	0.58%	883,599
Glendale	20,157	1.18%	1,798,733
Inland Empire Utilities Agency	60,390	3.52%	5,389,007
Las Virgenes MWD	22,702	1.32%	2,025,866
Long Beach	33,643	1.96%	3,002,172
Los Angeles	297,705	17.36%	26,566,040
Municipal Water District of Orange County	220,916	12.88%	19,713,676
Pasadena	21,506	1.25%	1,919,148
San Diego County Water Authority	377,077	21.99%	33,648,901
San Fernando	122	0.01%	10,914
San Marino	1,000	0.06%	89,227
Santa Ana	13,091	0.76%	1,168,155
Santa Monica	10,146	0.59%	905,408
Three Valleys MWD	66,509	3.88%	5,935,016
Torrance	18,514	1.08%	1,652,136
Upper San Gabriel Valley MWD	18,292	1.07%	1,632,281
West Basin MWD	128,160	7.47%	11,436,461
Western MWD	74,439	4.34%	6,642,650
Metropolitan Total	1,714,552	100.00%	$153,000,000

Totals may not foot due to rounding

Table 2-13
Purchase Order Commitments and Tier 1 Limits (by Member Agency) January 2015 through December 2024

Member Agency	Annual Average Tier 1 Maximum	Purchase Order Commitment (acre-feet)
Anaheim	24,439	148,268
Beverly Hills	13,380	89,202
Burbank	16,776	108,910
Calleguas MWD	118,228	788,185
Central Basin MWD[1]	71,770	
Compton[1]	3,372	
Eastern MWD	117,585	783,898
Foothill MWD	11,773	73,312
Fullerton	11,299	75,322
Glendale	26,222	174,809
Inland Empire Utilities Agency	93,283	398,348
Las Virgenes MWD	24,358	162,387
Long Beach	51,804	263,143
Los Angeles	373,623	2,033,132
Municipal Water District of Orange County	321,635	2,144,233
Pasadena	22,965	153,102
San Diego County Water Authority[1]	393,542	
San Fernando[1]	629	
San Marino	1,442	9,610
Santa Ana	19,617	80,858
Santa Monica[1]	7,406	
Three Valleys MWD	80,687	537,916
Torrance	19,204	128,027
Upper San Gabriel Valley MWD	67,228	110,077
West Basin MWD	135,417	902,783
Western MWD	105,784	705,224
Total	2,133,468	9,870,746

[1] No Purchase Order; Tier 1 maximum is annual, not cumulative.

Totals may not foot due to rounding.

Implementing the Plan

3

This section summarizes Metropolitan's implementation plans and continued progress in developing a diversified resource mix that enables the region to meet its water demands under a wide range of possible future conditions. The investments that Metropolitan has made and its on-going efforts in many different areas coalesce toward its goal of long-term regional water supply reliability. Many of the resource programs discussed are already successfully implemented. Others will take more time to execute. Considerations are also in place for emerging integrated supplies, which could augment sources of regional water supply from non-traditional sources. In addition, water demand reductions brought about by legislative mandates could also affect the landscape of future supply planning and implementation. The following sections discuss each of these programs, presenting both successes to date and the programs that are still underway.

Metropolitan's IRP implementation approach has been consistent with the Governor's California Water Action Plan that was released in January of 2014. The Governor's Plan is discussed briefly below.

California Water Action Plan

California Water Action Plan: Actions for Reliability, Restoration and Resilience, was released by Governor Brown in January 2014. A collaborative effort of the California Natural Resources Agency, the California Environmental Protection Agency, and California Department of Food and Agriculture, the California Water Action Plan was developed to meet three broad objectives: more reliable water supplies, the restoration of important species and habitat, and a more resilient, sustainably managed water resources system (water supply, water quality, flood protection, and environment) that can better withstand inevitable and unforeseen pressures in the coming decades.

Over the next five years, the actions outlined below are designed to move California toward more sustainable water management by providing a more reliable water supply for farms and communities, restoring important wildlife habitat and species, and helping the state's water systems and environment become more resilient.

1. Make conservation a California way of life;
2. Increase regional self-reliance and integrated water management across all levels of government;
3. Achieve the co-equal goals for the Delta;
4. Protect and restore important ecosystems;
5. Manage and prepare for dry periods;
6. Expand water storage capacity and improve groundwater management;
7. Provide safe water for all communities;
8. Increase flood protection;
9. Increase operational and regulatory efficiency; and
10. Identify sustainable and integrated financing opportunities.

3.1 Colorado River Aqueduct

The goal for CRA supplies is to maintain current supplies and programs, while also maintaining flexibility through dry-year programs and storage. This goal involves protecting existing supply and storage programs in the face of risks that could impact CRA supplies in the future. To accomplish this goal, the 2015 IRP Update targets are to develop sufficient base supply programs to ensure that a minimum of 900 TAF of diversions are available when needed, and to ensure access to 1.2 MAF of supplies in dry years through flexible programs and storage.

Background

Metropolitan was established to obtain an allotment of Colorado River water, and its first mission was to construct and operate the CRA. Under its contracts with the federal government, Metropolitan has a basic entitlement of 550 TAF per year of Colorado River water. Metropolitan also holds a fifth priority for an additional 662 TAF per year that exceeds California's 4.4 MAF per year basic apportionment, and another 180 TAF per year when surplus flows are available. Metropolitan can obtain water under the fifth priority from:

- Water unused by the California holders of priorities 1 through 3
- Water saved by the Palo Verde land management, crop rotation, and water supply program, or
- When the U.S. Secretary of the Interior makes available either or both:
    - Surplus water, and
    - Water apportioned to, but unused by, Arizona and/or Nevada.

To satisfy a condition imposed by Congress in the Boulder Canyon Project Act, California's legislature enacted the Limitation Act in 1929, agreeing to limit consumptive use of Colorado River water to 4.4 MAF per year, plus not more than one-half of any excess or surplus waters unapportioned by the Colorado River Compact. The 1931 Seven Party Agreement provides the basis for the priorities among California's contractors to use of Colorado River water made available to California. Palo Verde Irrigation District (PVID), the Yuma Project (Reservation Division), Imperial Irrigation District (IID), and Coachella Valley Water District (CVWD), collectively the "agricultural entities", and Metropolitan are the entities that currently hold the priorities. These priorities are included in the contracts that the Department of the Interior executed with the California agencies in the 1930s for delivery of water from Lake Mead. The first four priorities total 4.4 MAF per year. Metropolitan has the fourth priority of 550 TAF to California's basic apportionment and the fifth priority to 662 TAF per year. Under priorities 1 through 3, an amount not to exceed 3.85 MAF was apportioned to the agricultural entities for beneficial consumptive use. The Seven Party Agreement did not specify individual quantities for each of the first three priorities; rather, the amount of water available under the third priority was limited to the amount unused by the holders of priorities 1 and 2 on designated areas of land. This lack of quantification among the agricultural priorities posed an obstacle to the acquisition of water from the agricultural entities for use in Metropolitan's service area.

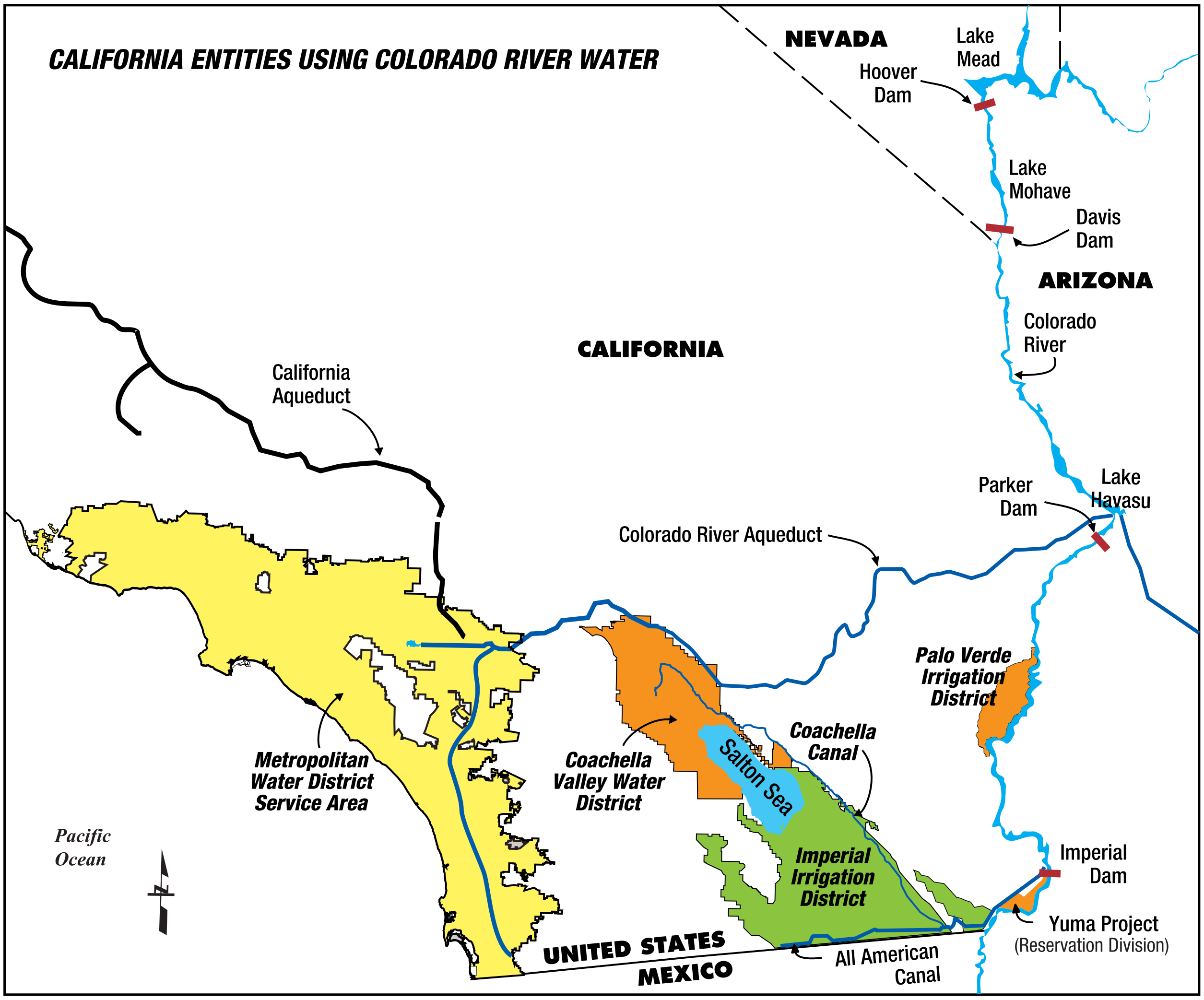
The Consolidated Decree issued in 2006 by the U.S. Supreme Court in *Arizona v. California*, preceded by a 1964 decree, confirmed the allocation of 4.4 MAF per year to California. This limit effectively reduced Metropolitan's dependable supply of Colorado River water to its fourth priority amount of 550 TAF per year. A 1979 decree quantified present perfected rights (PPRs) to the use of Colorado River water by certain Indian reservations, federal wildlife refuges, and other users. Some, but not all of these PPRs, are encompassed by the Seven Party Agreement. Consumptive use under these non-encompassed PPRs, known as "Miscellaneous and Indian

PPRs," could reach as much as 61 TAF annually. Since 1985, these PPR holders have used less than 20 TAF annually. Because over 5.362 MAF of Colorado River water were already allocated by California's Seven Party Agreement, it was not clear which rights would be affected by the use of these non-encompassed PPRs.

For a period following the Court's 1964 ruling, Metropolitan's fifth priority rights were satisfied with water allocated to, but unused by, Arizona and Nevada. With the commencement of Colorado River water deliveries to the Central Arizona Project in 1985, the availability of Colorado River water to meet Metropolitan's needs was determined on a year-by-year basis. At that time, no formal guidelines existed to determine whether surplus water would be available. Decisions regarding surplus water availability were to be made at the discretion of the Secretary of the Interior. As a result, the year-to-year availability of Colorado River water to Metropolitan was uncertain.

Figure 3-1 shows the major aqueducts within southern California including those from the Colorado River, and entities within the state having rights to use water from the Colorado River.

Figure 3-1



Changed Conditions

California's Colorado River Water Use Plan and the Quantification Settlement Agreement

Metropolitan and the State of California acknowledged that Metropolitan would obtain less water from the Colorado River in the future than Metropolitan had in the past, but the lack of clearly quantified water rights hindered efforts to promote water management projects. The Secretary of the Interior asserted that California's users of Colorado River water had to limit their use to a total of 4.4 MAF per year, plus any available surplus water. Under the auspices of the state's Colorado River Board, these users developed a draft plan to resolve the problem, which was known as "California's Colorado River Water Use Plan" or the "California Plan." It characterized how California would develop a combination of programs to allow the state to limit its annual use of Colorado River water to 4.4 MAF per year plus any available surplus water. The 2003 QSA among IID, CVWD, and Metropolitan is a critical component of the California Plan. It establishes the baseline water use for each of the agencies, facilitates the transfer of water from agricultural agencies to urban uses, and specifies that IID, CVWD, and Metropolitan would forbear use of water to permit the Secretary of the Interior to satisfy the uses of the PPRs not covered by the Seven Party Agreement.

On November 5, 2003, IID filed a validation action in Imperial County Superior Court, seeking a judicial determination that thirteen agreements associated with the QSA are valid, legal, and binding. Other lawsuits also were filed challenging the execution, approval, and subsequent implementation of the QSA on various grounds. All of the QSA cases were coordinated in Sacramento County Superior Court. After more than a decade of litigation, the final challenges to the QSA were dismissed, and the agreements were upheld.

SDCWA is participating in two QSA-related projects that are providing additional water supplies to that agency.[4] The water conserved by these projects is made available to Metropolitan, resulting in increased amounts of Colorado River water being diverted into the CRA. In exchange, Metropolitan is delivering an amount of water equal to the amount conserved for SDCWA. Federal law allocates a portion of the water available as a result of the Coachella and All-American Canal lining projects for the benefit of parties, including five Indian Bands, involved in litigation over water rights to the San Luis Rey River in San Diego County once certain conditions have been satisfied. Metropolitan has agreed to exchange that water and provide an equal amount of water to the United States for use by the San Luis Rey Settlement Parties, and SDCWA has agreed to convey the water when capacity is available for use within the Settlement Parties' service areas. As the Settlement Parties have not yet satisfied the conditions required to receive the benefit of those supplies, Metropolitan has utilized this water. The remainder of the water available as a result of the canal lining projects is exchanged with SDCWA.

In 2005, Metropolitan entered into a settlement agreement in *Arizona v. California* with the Quechan Indian Tribe and other parties. The Tribe uses Colorado River water on the Fort Yuma Indian Reservation. Under the settlement agreement, the Tribe, in addition to the amounts of water decreed for the benefit of the Reservation in the 1964 decree, is entitled to (a) an additional 20 TAF of diversions from the Colorado River, or (b) the amount necessary to supply the consumptive use required for irrigation of a specified number of acres, and for the satisfaction of related uses, whichever is less. Of the additional water, 13 TAF became available to the Tribe in 2006. An additional 7 TAF becomes available to the Tribe in 2035. Metropolitan and the Tribe agreed that Metropolitan would provide incentive payments to the Tribe to limit

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[4] These projects, the SDCWA/IID transfer and the Coachella and All-American canal lining projects, will be discussed in SDCWA's Urban Water Management Plan.

proposed development and utilization of their lands which would increase the tribal diversion of any of the additional water each year, thereby allowing the water to be diverted by Metropolitan.

Current Dry Condition

The Colorado River Basin has been experiencing a prolonged drought, where runoff above Lake Powell has been below average for twelve of the last sixteen years. Within those sixteen years, runoff in the Colorado River Basin above Lake Powell from 2000 through 2007 was the lowest eight-year runoff on record. While runoff returned to near normal conditions during 2008-2010, drought returned in 2012 with runoff in 2012 being among the four driest in history. During these drought conditions, Colorado River system storage has decreased to 50 percent of capacity.

Quagga Mussels

Quagga mussels were discovered in January of 2007 in Lake Mead and rapidly spread downstream to the Lower Colorado River. The presence and spawning of quagga mussels in the Lower Colorado River and in reservoirs located in southern California poses an immediate threat to water and power systems serving more than 25 million people in the southwestern United States. Quagga mussels (*Dreissena bugensis*) are a related species to the better-known zebra mussels (*Dreissena polymorpha*) and are indigenous to the Ukraine. They were introduced to the Great Lakes in the 1980s from fresh-water ballast of a transoceanic ship traveling from Eastern Europe. Although the introduction of these two species into drinking water supplies does not typically result in violation of drinking water standards, invasive mussel infestations can adversely impact aquatic environments and infrastructure. If unmanaged, invasive mussel infestations have been known to severely impact the aquatic ecology of lakes and rivers; clog intakes and raw water conveyance systems; reduce the recreational and aesthetic value of lakes and beaches; alter or destroy fish habitats; and render lakes more susceptible to deleterious algae blooms.

Implementation Approach

Metropolitan's planning strategy recognized explicitly that program development would play an important part in reaching the target level of deliveries from the CRA. The implementation approach explored a number of water conservation programs with water agencies that receive water from the Colorado River or are located in close proximity to the CRA. Negotiating the QSA was a necessary first step for all of these programs. On October 10, 2003, after lengthy negotiations, representatives from Metropolitan, IID, and CVWD executed the QSA and other related agreements. Parties involved also included SDCWA, the California Department of Water Resources (DWR), the California DFW, the U.S. Department of the Interior, and the San Luis Rey Settlement Parties. One of those related agreements was the Colorado River Water Delivery Agreement: Federal Quantification Settlement Agreement which specifies to which agencies water will be delivered under priorities 3a and 6a of the Seven Party Agreement during its term.

Metropolitan has identified a number of programs that could be used to achieve the regional long-term development targets for the CRA, as shown in Table 3-1. Metropolitan has entered into or is exploring agreements with a number of agencies as described in this section. In addition, Appendix 3 provides a detailed discussion of these programs and describes whether the programs are being implemented, are deferred, or are under investigation.

Colorado River Water Management Programs

Imperial Irrigation District / Metropolitan Water District Conservation Program

Under agreements executed in 1988 and 1989, Metropolitan has funded water efficiency improvements within IID's service area in return for the right to divert the water conserved by those investments. Under this program, IID implemented a number of structural and non-structural measures, including the lining of existing earthen canals with concrete, constructing local reservoirs and spill-interceptor canals, installing non-leak gates, and automating the distribution system. Other implemented programs include the delivery of water to farmers on a 12-hour rather than a 24-hour basis and improvements in on-farm water management through the installation of drip irrigation systems. Through this program, IID has conserved an additional 105 TAF per year on average upon completion of program implementation. Execution of the QSA and amendments to the 1988 and 1989 agreements resulted in changes in the availability of water under the program, extending the term to 2078 if the term of the QSA extends through 2077 and guaranteeing Metropolitan at least 85 TAF per year. The remainder of the conserved water is available to CVWD when needed.

Palo Verde Land Management, Crop Rotation, and Water Supply Program

In May 2004, Metropolitan's Board authorized a 35-year land management, crop rotation, and water supply program with PVID. Under the program, participating farmers in PVID are paid to reduce their water use by not irrigating a portion of their land. A maximum of 29 percent of the lands within the Palo Verde Valley can be fallowed in any given year. Under the terms of the QSA, water savings within the PVID service area are made available to Metropolitan. This program provides up to 133 TAF of water to be available to Metropolitan in certain years. In 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, and 2014 approximately 108.7, 105.0, 72.3, 94.3, 120.2, 116.3, 122.2, 73.7, 32.8, and 43.0 TAF of water, respectively, were saved and made available to Metropolitan. In March 2009, Metropolitan and PVID entered into a one-year supplemental fallowing program within PVID that provided for the fallowing of additional acreage, with savings of 24.1 TAF in 2009 and 32.3 TAF in 2010.

Management of Metropolitan-Owned Land in Palo Verde

In 2001, Metropolitan acquired 8,946 acres of irrigable farmland within the Palo Verde Irrigation District (PVID). These lands were leased to growers and were eventually enrolled in the PVID Land Management, Crop Rotation and Water Supply Program when it began in 2005. In 2015, Metropolitan acquired approximately 12,049 irrigable acres from Verbena LLC, bringing Metropolitan's ownership in the Palo Verde Valley to approximately 20,995 acres of irrigated farmland. The lands have historically been leased to growers who produced high water-using crops, such as alfalfa, using flood irrigation.

With the expiration of all leases in 2016, Metropolitan is currently identifying long-term management objectives for the land, including a shift toward less water-intensive agriculture. Strategies for reducing water use may include transitioning to low water-using crops, adopting efficient irrigation technologies such as microspray, and adopting deficit irrigation practices. In addition, Metropolitan is developing technologies for monitoring crop water use via remote sensing imagery and on-the-ground sensors.

By managing the lands for lower consumptive water use, Metropolitan expects to reduce water use in PVID by 15–29 TAF per year (additional to savings from the fallowing program), while maintaining the valley's agricultural economy. Under the terms of the QSA, any water savings within the PVID service area are made available to Metropolitan. The additional water savings are expected to accrue in 2017, after new leases for the lands are put into place.

Southern Nevada Water Authority and Metropolitan Storage and Interstate Release Agreement

SNWA has undertaken extraordinary water conservation measures to maintain its consumptive use within Nevada's basic apportionment of 300 TAF. The success of the conservation program has resulted in unused basic apportionment for Nevada. As SNWA expressed interest in storing a portion of the water with Metropolitan, the agencies, along with the United States and the Colorado River Commission of Nevada, entered into a storage and interstate release agreement in October 2004. Under the agreement, additional Colorado River water supplies are made available to Metropolitan when there is space available in the CRA to receive the water. SNWA stored approximately 330,000 acre-feet with Metropolitan through 2015. SNWA is not expected to call upon Metropolitan to return water until after 2019.

Lower Colorado Water Supply Project

In March 2007, Metropolitan, the City of Needles, and the USBR executed a Lower Colorado Water Supply Project contract. Under the contract, Metropolitan receives, on an annual basis, Lower Colorado Water Supply Project water unused by Needles and other entities adjacent to the river that do not have rights or have insufficient rights to use Colorado River water. The water supply for the project comes from groundwater wells located along the All-American Canal. A portion of the payments made by Metropolitan to Needles are placed in a trust fund for potentially acquiring a new water supply for the Project should the groundwater pumped from the project's wells become too saline for use. Metropolitan received 6.1 TAF from this project in 2014, and an estimated 5.9 TAF in 2015 based on the amount of water pumped and used by other project water users.

Lake Mead Storage Program

In May 2006, Metropolitan and the USBR executed an agreement for a demonstration program that allowed Metropolitan to leave conserved water in Lake Mead that Metropolitan would otherwise have used in 2006 and 2007. USBR would normally make unused water available to other Colorado River water users, so the program included a provision that water left in Lake Mead must be conserved through extraordinary conservation measures and not simply be water that was not needed by Metropolitan in the year it was stored. This extraordinary conservation was accomplished through savings realized under the Palo Verde Land Management, Crop Rotation, and Water Supply Program. Through the two-year demonstration program, Metropolitan created 44.8 TAF of "Intentionally Created Surplus" (ICS) water. In December 2007, Metropolitan entered into agreements to set forth the rules under which ICS water is developed, stored in, and delivered from Lake Mead. The amount of water stored in Lake Mead, created through extraordinary conservation, that is available for delivery in a subsequent year is reduced by a one-time deduction of five percent, resulting in additional system water in storage in the lake, and an annual evaporation loss of three percent, beginning in the year following the year the water is stored. Metropolitan created ICS water in 2009, 2010, 2011, and 2012 and withdrew ICS water in 2008, 2013, and 2014. As of January 1, 2015, Metropolitan had a total of 61.8 TAF of Extraordinary Conservation ICS water in Lake Mead.

The December 2007 federal guidelines concerning the operation of the Colorado River system reservoirs provided the ability for agencies to create "System Efficiency ICS" through the development and funding of system efficiency projects that save water that would otherwise be lost from the Colorado River. To that end, in 2008 the Central Arizona Water Conservation District (CAWCD), SNWA, and Metropolitan contributed funds for the construction of the Drop 2 (Brock) Reservoir by the USBR. The purpose of the Drop 2 (Brock) Reservoir is to increase the capacity to regulate deliveries of Colorado River water at Imperial Dam, reducing the amount of excess flow downstream of the dam by approximately 70 TAF annually. In return for its $25 million net contribution toward construction, operation, and maintenance, 100 TAF of water that was stored in Lake Mead was assigned to Metropolitan as System Efficiency ICS. Through 2014, Metropolitan has diverted 35 TAF of this amount, with 65 TAF remaining in storage.

In 2009, Metropolitan entered into an agreement with the United States, SNWA, the Colorado River Commission of Nevada, and CAWCD to have USBR conduct a one-year pilot operation of the Yuma Desalting Plant at one-third capacity. The pilot project operated between May 2010 and March 2011 and provided data for future decision making regarding long-term operation of the Plant and developing a near-term water supply. Metropolitan's contribution toward plant operating costs secured 24.4 TAF of System Efficiency ICS which was stored in Lake Mead as of January 1, 2015.

Quagga Mussel Control Program

The presence and spawning of quagga mussels in the lower Colorado River from Lake Mead through Lake Havasu poses a threat to Metropolitan and other Colorado River water users due to the potential to continuously seed water conveyance systems with mussel larvae. Chlorination is the most frequently used means to control mussel larvae entering water systems.

Metropolitan developed the Quagga Mussel Control Program (QMCP) in 2007 to address the long term introduction of mussel larvae into the CRA from the lower Colorado River which is now heavily colonized from Lake Mead through Lake Havasu. The QMCP consists of surveillance activities and control measures. Surveillance activities are conducted annually alongside regularly scheduled 2-3 week-long CRA shutdowns. Control activities consist of continuous chlorination at the outlet of Copper Basin Reservoir (5 miles into the aqueduct), a mobile chlorinator for control of mussels on a quarterly basis at outlet towers, and physical removal of mussels from the trash racks at Whitsett Intake Pumping Plant in Lake Havasu. Since 2007, the CRA has scheduled 2 to 3 week-long shutdowns each year for maintenance and repairs which provide the opportunity for direct inspections for mussels and the additional benefit of desiccating quagga mussels. Recent shutdown inspections have demonstrated that the combined use of chlorine and regularly scheduled shutdowns effectively control mussel infestation in the CRA since only few and small mussels have been found during these inspections.

In addition, Metropolitan has appropriated $9.55 million to upgrade chlorination facilities in the aqueduct and at two additional locations in its system, the outlets of Lakes Mathews and Skinner. It is likely that additional upgrade costs will be incurred for these facilities. Chemical control (chlorination) at Copper Basin Reservoir, Lake Mathews, and the Lake Skinner Outlet costs approximately $3.0-3.2 million per year depending on the amount of Colorado River water conveyed through the aqueduct.

Achievements to Date

Metropolitan has developed a number of supply and conservation programs to increase the amount of supply available from the CRA. However, other users along the River have rights that will allow their water use to increase as their water demands increase. The Colorado River faces long-term challenges of water demands exceeding available supply with additional uncertainties due to climate change. Because Metropolitan holds the lowest priority rights in California during a normal Lake Mead storage condition, future supply available could decrease. Metropolitan's supply and conservation programs, as well as planned additional water management programs for 2035, are shown in Table 3-1.

Table 3-1
Colorado River Aqueduct
Program Capabilities
Year 2035
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
Basic Apportionment – Priority 4	550,000	550,000	550,000
IID/MWD Conservation Program	85,000	85,000	85,000
Priority 5 Apportionment (Surplus)	250,000	0	21,000
PVID Land Management, Crop Rotation, and Water Supply Program	130,000	130,000	130,000
Lower Colorado Water Supply Project	5,000	5,000	5,000
Lake Mead ICS Storage Program	400,000	400,000	400,000
Binational ICS	8,000	24,000	24,000
Forbearance for Present Perfected Rights	(2,000)	(2,000)	(2,000)
CVWD SWP/QSA Transfer Obligation	(35,000)	(35,000)	(35,000)
DWCV SWP Table A Obligation	(45,000)	(42,000)	(118,000)
DWCV SWP Table A Transfer Callback	23,000	22,000	61,000
DWCV Advance Delivery Account	22,000	20,000	57,000
SNWA Agreement Payback	0	0	(5,000)
Subtotal of Current Programs	***1,391,000***	***1,157,000***	***1,173,000***
Programs Under Development			
SNWA Interstate Banking Agreement	0	0	0
Additional Fallowing Programs	25,000	25,000	25,000
Subtotal of Proposed Programs	***25,000***	***25,000***	***25,000***
Additional Non-Metropolitan CRA Supplies			
SDCWA/IID Transfer	200,000	200,000	200,000
Coachella & All-American Canal Lining			
To SDCWA	82,000	82,000	82,000
To San Luis Rey Settlement Parties[1]	16,000	16,000	16,000
Subtotal of Non-Metropolitan Supplies	***298,000***	***298,000***	***298,000***
Maximum CRA Supply Capability[2]	**1,714,000**	**1,480,000**	**1,496,000**
Less CRA Capacity Constraint (amount above 1.20 MAF)	*(464,000)*	*(230,000)*	*(246,000)*
Maximum Expected CRA Deliveries[3]	**1,200,000**	**1,200,000**	**1,200,000**
Less Non-Metropolitan Supplies[4]	*(298,000)*	*(298,000)*	*(298,000)*
Maximum Metropolitan Supply Capability[5]	**902,000**	**902,000**	**902,000**

[1] Subject to satisfaction of conditions specified in agreement among Metropolitan, the United States, and the San Luis Rey Settlement Parties

[2] Total amount of supplies available without taking into consideration CRA capacity constraint.

[3] The Colorado River Aqueduct delivery capacity is 1.20 MAF annually.

[4] Exchange obligation for the SDCWA-IID transfer and exchange and the Coachella and All American Canal Lining projects.

[5] The amount of CRA water available to Metropolitan after meeting its exchange obligations.

3.2 State Water Project

Much of the SWP water supply passes through the San Francisco-San Joaquin Bay-Delta (Bay-Delta). The SWP consists of a series of pump stations, reservoirs, aqueducts, tunnels, and power plants operated by DWR. Figure 3-2 shows SWP facilities. This statewide water supply infrastructure provides water to 29 urban and agricultural agencies throughout California. More than two-thirds of California's residents obtain some of their drinking water from the Bay-Delta.

The original State Water Contract called for an ultimate delivery capacity of 4.2 MAF, with Metropolitan holding a contract for 1,911 TAF. For decades, the Bay-Delta has experienced water quality and supply reliability challenges and conflicts due to variable hydrology and environmental standards that limit pumping operations. SWP deliveries in the most recent critically dry years lagged these projections, and were 5 percent of contractual amounts in 2014 and 20 percent of contractual amounts in 2015. Consequently, Metropolitan's key concern is the continual deterioration of water supply reliability.

Another important concern for Metropolitan is sustained improvement in SWP water quality. Metropolitan must be able to meet the increasingly stringent drinking water regulations that are expected for disinfection by-products and pathogens in order to protect public health. Meeting these regulations will require improving the Bay-Delta water supply by cost effectively combining alternative source waters, source improvement, and treatment facilities. Additionally, Metropolitan requires water quality improvements of Bay-Delta water supplies to meet its 500 mg/L salinity blending objective in a cost-effective manner, while minimizing resource losses and helping to ensure the viability of regional recycling and groundwater management programs.

Background

The listing of several fish species as threatened or endangered under the federal or California Endangered Species Acts (respectively, the "Federal ESA" and the "California ESA" and, collectively, the "ESAs") has adversely impacted operations and limited the flexibility of the SWP. Currently, five species (the winter-run and spring-run Chinook salmon, Delta smelt, North American green sturgeon, and Central Valley steelhead) are listed under the ESAs. In addition, on June 25, 2009, the California Fish and Game Commission declared the longfin smelt a threatened species under the California ESA.

In 2004 and 2005, the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) issued biological opinions and incidental take statements that govern operations of the SWP and the CVP with respect to the Delta smelt, the winter-run and spring-run Chinook salmon, and the Central Valley steelhead. In July 2006, the USBR reinitiated consultation with the USFWS and NMFS with respect to the 2004 and 2005 biological opinions (with the addition of the North American green sturgeon, which was listed in April 2006) following the filing of legal challenges to those biological opinions and incidental take statements.

Figure 3-2
Current and Projected Facilities of the State Water Project

The Delta smelt, Sacramento River winter-run and spring-run salmon, and Central Valley steelhead are listed species under the Federal ESA. Because of the listing, the federal Central Valley Project (CVP) and SWP are prohibited from “taking” the fish in their operations and must consult with federal fisheries agencies to determine whether their operations will jeopardize the existence of the species, and if so, establish “reasonable and prudent alternatives” (RPAs) to normal project operations to minimize their impacts on the smelt and salmon.

In its revised Biological Opinion adopted on December 15, 2008, the USFWS provided criteria for operation of the CVP and SWP in a manner not likely to jeopardize the continued existence of the Delta smelt or adversely modify designated critical habitat. The NMFS made a similar finding with respect to project operation effects on the listed salmon and steelhead in its revised Biological Opinion issued on June 4, 2009. Earlier Biological Opinions were found invalid in litigation described in past annual audit-pending litigation reports. Consequently, both agencies issued an “incidental take statement” which allows the CVP and SWP to continue operation despite the fact that such operation would result in incidental take of some of the listed fish. Project operations must incorporate RPAs suggested by the agencies in the 2008 and 2009 Biological Opinions to ensure they are exempt from the otherwise applicable prohibition on “take” of Federal ESA-listed species.

In 2009, multiple lawsuits were filed by water contractors challenging the 2008 Delta smelt Biological Opinion and the USBR’s failure to analyze the environmental impacts of accepting and implementing the Biological Opinion’s RPAs under the National Environmental Policy Act (NEPA). The lawsuits were adjudicated before Judge Wanger in federal district court in Fresno, California. Following lengthy hearings, on December 14, 2010, the Court granted summary judgment to the water contractor plaintiffs, finding that the Delta smelt Biological Opinion was invalid and would have to be remanded to the USFWS to be redone. The Court issued a final amended judgment on May 18, 2011, remanding the matter to the USFWS. Appeals of the final amended judgment to the U.S. Court of Appeals for the Ninth Circuit were filed by the Federal Defendants and the Environmental-Interveners. The plaintiffs also filed cross-appeals. On March 13, 2014, the Ninth Circuit issued a 2-1 decision reversing the district court, and upholding the Delta smelt Biological Opinion *San Luis & Delta Mendota Water Authority v. Jewell*, 747 F.3d 581 (9th Cir. 2014). The two-judge majority ruled that the district court should not have considered extra-record testimony of experts retained by the parties, and that the Biological Opinion and RPA restrictions were supported by the best available science and were not arbitrary and capricious.[5] In October 2014, Metropolitan and other water contractors petitioned the U.S. Supreme Court for a writ of certiorari for the Court’s review of whether USFWS must consider economic impacts of the RPA restrictions on the general public and third parties. On January 12, 2015, the U.S. Supreme Court denied the petitions. *Stewart & Jasper Orchards v. Jewell*, U.S., No. 14-377, *cert. denied* 1/12/15, *State Water Contractors v. Jewell*, U.S., No. 14-402, *cert. denied* 1/12/15. The Court's orders let stand the March 2014 Ninth Circuit ruling upholding the Biological Opinion and RPAs.

In 2009, multiple lawsuits were also filed challenging the 2009 salmon Biological Opinion and also adjudicated before Judge Wanger in federal district court. On September 20, 2011, the Court issued a decision that invalidated the salmon Biological Opinion and remanded it to NMFS for preparation of a new Biological Opinion. Both the Environmental-Interveners and the Federal Defendants appealed the final judgment to the Ninth Circuit. In a decision issued on

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[5] The Ninth Circuit confirmed the District Court ruling that USBR must analyze the RPAs under NEPA. USBR has prepared a Final Environmental Impact Statement analyzing the impacts of implementing the RPAs in both Biological Opinions and expects to issue a Record of Decision in early 2016. It remains to be seen whether USBR will approve an alternative to the RPAs or how that may affect SWP supplies.

December 22, 2014, a three-judge panel of the Ninth Circuit unanimously reversed the district court decision by Judge Wanger. The ruling validates the Biological Opinion and the RPAs issued by NMFS in 2009, which include seasonal limits on export and river operations imposed to protect the salmonid species.

The impact on SWP deliveries attributable to the Delta smelt and salmonid species biological opinions combined is estimated to be 1.0 MAF in an average year, reducing SWP deliveries from approximately 3.3 MAF to approximately 2.3 MAF for the year under average hydrology.

In addition to the litigation under the Federal ESA, in March 2009, the State Water Contractors filed suit in Sacramento Superior Court challenging the California ESA 2081 permit that authorizes the incidental take of longfin smelt from SWP operations. The lawsuit alleges that the restrictions on water exports imposed under the 2081 California ESA permit are excessive and are not scientifically justified. This case was voluntarily dismissed without prejudice in February 2014 pursuant to a settlement agreement which provides for dismissal of the litigation and the establishment of a collaborative longfin smelt science study program.

DWR has altered the operations of the SWP to accommodate species of fish listed under the ESAs. These changes in project operations have adversely affected SWP deliveries. Between 2008 and 2014, restrictions on Bay-Delta pumping under the Biological Opinion have reduced deliveries of SWP water by 3 MAF to the state water contractors and by approximately 1.5 MAF to Metropolitan.

Operational constraints likely will continue until a long-term solution to the problems in the Bay-Delta is identified and implemented. The Delta Vision process, established by Governor Schwarzenegger, was aimed at identifying long-term solutions to the conflicts in the Bay-Delta, including natural resource, infrastructure, land use, and governance issues. In addition, State and federal resource agencies and various environmental and water user entities are currently engaged in the development of the Bay Delta Conservation Plan (BDCP)/California WaterFix, which is aimed at making physical and operational improvements to the SWP system in the Delta necessary to restore and protect ecosystem health, south-of-Delta SWP and CVP water supplies, and water quality.

Other issues, such as the recent decline of some fish populations in the Bay-Delta and surrounding regions and certain operational actions in the Bay-Delta, may significantly reduce Metropolitan's water supply from the Bay-Delta. Biological opinions or incidental take authorizations under the Federal ESA and California ESA might further adversely affect SWP and CVP operations. Additionally, new litigation, listings of additional species under the ESAs, or new regulatory requirements imposed by the SWRCB could further adversely affect SWP operations in the future by requiring additional export reductions, releases of additional water from storage, or other operational changes impacting water supply operations. Metropolitan cannot predict the ultimate outcome of any of the litigation or regulatory processes described above, but believes they could have an adverse impact on the operation of the SWP pumps, Metropolitan's SWP supplies, and Metropolitan's water reserves.

Changed Conditions

In July 2015, DWR released the 2015 State Water Project Delivery Capability Report. The 2015 Delivery Capability Report provides estimates of the current (2015) and future (2035) SWP delivery capability for each SWP contractor under a range of hydrologic conditions. These estimates incorporate regulatory requirements in accordance with USFWS and NMFS biological opinions. In addition, these estimates of future capability also reflect potential impacts of climate change and sea level rise.

Metropolitan used a number of modeling studies from the 2015 Delivery Capability Report for its SWP supplies forecasts during the 2015 UWMP planning horizon. Metropolitan used the Base Scenario as the current 2015 condition and transitioned to the delivery capability from the Early Long-Term in the next five years. For 2020 through 2029, Metropolitan uses the forecasts from the Existing Conveyance Low Outflow (ECLO) scenario. Metropolitan uses the Alternative 4a study associated with the recirculated draft environmental impact report (EIR)/supplemental draft environmental impact statement (EIS) on the California Water Fix for SWP deliveries for 2030 and beyond.

Implementation Approach

Metropolitan's implementation approach for the SWP depends on the full use of the current State Water Contract provisions, including its basic contractual amounts, Article 21 interruptible supplies, and Turnback Pool supply provisions. In addition, it requires successful negotiation and implementation of a number of agreements, including the Sacramento Valley Water Management (Phase 8 Settlement) Agreement, and the BDCP/California WaterFix. Each of these stakeholder processes or agreements involves substantial Metropolitan and member agency staff involvement to represent regional interests. Metropolitan is committed to working collaboratively with DWR, SWP contractors, and other stakeholders to ensure the success of these extended negotiations and programs.

SWP Reliability

This discussion provides details of the major actions Metropolitan is undertaking to improve SWP reliability. The BDCP/California WaterFix is being prepared through a collaboration of state, federal, and local water agencies, state and federal fish agencies, environmental organizations, and other interested parties. At the outset of the BDCP process, a planning agreement was developed and executed among the participating parties, and a Steering Committee was formed. The plan would identify a set of water flow and habitat restoration actions that would contribute to the recovery of endangered and sensitive species and their habitats in California's Bay-Delta. The goal of the BDCP was to provide for both species/habitat protection and improved reliability of water supplies.

The First Administrative Draft of the BDCP was released in March 2012. The Administrative Draft EIR/EIS analyzed 15 alternatives, including a broad combination of water delivery configurations, capacities, operations and habitat restoration targets, as well as a no action alternative. The alternatives are the result of public scoping sessions conducted in 2008 and 2009, the Sacramento-San Joaquin Delta Reform Act, ongoing public discussions, and input from responsible/trustee state agencies and NEPA cooperating agencies.

In July 2012, Governor Jerry Brown and U.S. Interior Secretary Ken Salazar outlined revisions to the proposed BDCP plan, along with a full range of alternative proposals. Elements of the preferred proposal include construction of two side-by-side tunnels and water intake facilities with a total capacity of 9,000 cfs - down from the earlier proposal of 15,000 cfs. Operation of the facilities was planned to be phased in over several years.

Throughout 2012 and 2013, additional public meetings were held to answer questions and gather public comments. In August 2013, an optimized proposal was released that balanced costs, engineering design, and ease of construction while significantly reducing local dislocation and disturbance in the Delta.

In December 2013, the State released the Draft BDCP and the Draft EIR/EIS. The documents detailed 22 specific actions, called Conservation Measures, which included new water delivery facilities in the north Delta, as well as measures to restore or protect up to 150,000 acres of habitat and measures to address other stressors to fish and wildlife in the Delta.

In December 2014, the State announced further refinements to the water delivery facilities to reduce impacts to Delta communities, minimize disturbances or dislocation of Greater Sandhill Cranes, and improve the long-term reliability and operation of the proposed infrastructure. During the 2013-2014 public comment period, commenters expressed concerns about the impacts of a large-scale habitat restoration effort on the Delta economy and community character. Other comments articulated concerns about the expected effectiveness of certain habitat restoration measures, the nature of climate change, and the related level of scientific uncertainty. Additionally, there were widespread concerns that the 50-year permit term sought under the BDCP was too long given the uncertainties about climate change and the effectiveness of habitat restoration, and commenters suggested that DWR should pursue permits of shorter duration. These comments prompted the State to reconsider the BDCP's ability to justify the continued pursuit of 50-year permits associated with a comprehensive conservation plan and resulted in the consideration of a sub-alternative to the original proposed project, as well as additional sub-alternatives that do not include a 50-year permit application or associated conservation plan.

In April 2015, State agencies announced a modified preferred alternative, Alternative 4A. Alternative 4A (California WaterFix) was developed as the new CEQA and NEPA Preferred Alternative, replacing Alternative 4 (the proposed BDCP). Alternative 4A includes the conveyance facilities proposed under Alternative 4 and those mitigation measures and environmental commitments needed to obtain necessary permits and authorizations for implementation under Section 7 of the Federal ESA and through the California Department of Fish and Wildlife's 2081(b) process.

California WaterFix and EcoRestore would be implemented under different Federal and State ESA regulatory permitting process (Section 7 versus Section 10(a) of the Federal ESA, and pursuant to section 2081 of the State ESA instead of the Natural Community Conservation Planning Act). This would fulfill the requirement of the 2009 Delta Reform Act to contribute toward meeting the coequal goals of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem.

The new water conveyance facilities would be constructed and operated under the California WaterFix, which proposes design changes to the water conveyance facilities. Refinements to the design reduce the overall environmental/construction impacts, and increase long term operational and cost benefits. Some of the engineering configuration improvements include moving the tunnel alignment away from local communities and environmentally sensitive areas. Reconfiguration of intake and pumping facilities lessen construction impacts in local communities and longer term operational impacts.

The main objective under the EcoRestore Program is the restoration of at least 30,000 acres of Delta habitat, with the near-term goal of making significant strides toward that objective by 2020. These restoration programs would include projects and actions that are in compliance with pre-existing regulatory requirements designed to improve the overall health of the Delta. Other priority restoration projects would also be identified by the Sacramento-San Joaquin Delta Conservancy and other agencies and local governments. Funding would be provided through multiple sources, including various local and federal partners, state bonds, and other state-mandated funds. State Water Project/Central Valley Project contractors would provide funds as part of existing regulatory obligations. The California WaterFix is being evaluated in the partially recirculated draft EIR/supplemental EIS released in July 2015. In that document, the cumulative impacts of the California WaterFix and EcoRestore Program are evaluated, along with other reasonably foreseeable future projects. The public comment period closed on October 30, 2015. DWR and USBR released a working draft of the ESA biological assessment on January 15, 2016 and the independent science peer review of the draft biological assessment began on March 25, 2016.

Lead agencies for the BDCP/California WaterFix EIR/EIS are DWR, USBR, the USFWS, and NMFS, in cooperation with the California DFW, the U.S. Environmental Protection Agency (USEPA), and the U.S. Army Corps of Engineers.

Monterey Amendment

The Monterey Amendment originated from disputes between the urban and agricultural SWP contractors over how contract supplies are to be allocated in times of shortage. In 1994, in settlement discussions in Monterey, the contractors and DWR reached an agreement to settle their disputes by amending certain provisions in the long-term water supply contracts. These changes, known as the Monterey Amendment, altered the water allocation procedures such that both shortages and surpluses would be shared in the same manner for all contractors, eliminating the prior "agriculture first" shortage provision. In turn, the agricultural contractors agreed to permanently transfer 130 TAF to urban contractors and permanently retire 45 TAF of their contracted supply. The amendment facilitated several important water supply management practices including groundwater banking, voluntary water marketing, and more flexible and efficient use of SWP facilities such as borrowing from Castaic Lake and Lake Perris and using carryover storage in San Luis Reservoir to enhance dry-year supplies. It also provided for the transfer of DWR land to the Kern County Water Agency for development of the Kern Water Bank. The Monterey Amendment was challenged in court, and the original EIR invalidated. Following a settlement, DWR completed a new EIR and concluded the CEQA review in May 2010.

However, the project has been challenged again in a new round of lawsuits. Central Delta Water Agency, South Delta Water Agency, California Water Impact Network, California Sportfishing Protection Alliance, and the Center For Biological Diversity filed a lawsuit against DWR in Sacramento County Superior Court challenging the validity of the EIR under CEQA and the validity of underlying agreements under a reverse validation action (the "*Central Delta I*" case). These same plaintiffs filed a reverse validation lawsuit against the Kern County Water Agency in Kern County Superior Court ("*Central Delta II*"). This lawsuit targets a transfer of land from Kern County Water Agency to the Kern Water Bank, which was completed as part of the original Monterey Agreement. The third lawsuit is an EIR challenge brought by Rosedale-Rio Bravo Water Storage District and Buena Vista Water Storage District against DWR in Kern County Superior Court ("*Rosedale*"). The *Central Delta II* and *Rosedale* cases were transferred to Sacramento Superior Court, and the three cases were consolidated for trial.

In January 2013, the Court ruled that the validation cause of action in *Central Delta I* was time-barred by the statute of limitations. On October 2, 2014, the court issued its final rulings in *Central Delta I* and *Rosedale*, holding that DWR must complete a limited scope remedial CEQA review addressing the potential impacts of the Kern Water Bank. However, the court's ruling also allows operation of the SWP to continue under the terms of the Monterey Agreement while the remedial CEQA review is prepared and leaves in place the underlying project approvals while DWR prepares the remedial CEQA review. The *Central Delta II* case was stayed pending resolution of the *Central Delta I* case. The plaintiffs have appealed the decision.

SWP Terminal Storage

Metropolitan has contractual rights to 65 TAF of flexible storage at Lake Perris (East Branch terminal reservoir) and 154 TAF of flexible storage at Castaic Lake (West Branch terminal reservoir). This storage provides Metropolitan with additional options for managing SWP deliveries to maximize yield from the project. Over multiple dry years, it can provide Metropolitan with 73 TAF of additional supply. In a single dry year like 1977, it can provide up to 219 TAF of additional supply to Southern California.

Yuba Dry Year Water Purchase Program

In December 2007, Metropolitan entered into an agreement with DWR providing for Metropolitan's participation in the Yuba Dry Year Water Purchase Program between Yuba County Water Agency and DWR. This program provides for transfers of water from the Yuba County Water Agency during dry years through 2025.

Desert Water Agency/Coachella Valley WD SWP Table A Transfer

Under the transfer agreement, Metropolitan transferred 100 TAF of its SWP Table A contractual amount to Desert Water Agency/CVWD (DWCV). Under the terms of the agreement, DWCV pays all SWP charges for this water, including capital costs associated with capacity in the California Aqueduct to transport this water to Perris Reservoir, as well as the associated variable costs. The amount of water actually delivered in any given year depends on that year's SWP allocation. Water is delivered through the existing exchange agreements between Metropolitan and DWCV, under which Metropolitan delivers Colorado River supplies to DWVC equal to the SWP supplies delivered to Metropolitan. While Metropolitan transferred 100 TAF of its Table A amount, it retained other rights, including interruptible water service; its full carryover amounts in San Luis Reservoir; its full use of flexible storage in Castaic and Perris Reservoirs; and any rate management credits associated with the 100 TAF. In addition, Metropolitan is able to recall the SWP transfer water in years in which Metropolitan determines it needs the water to meet its water management goals. The main benefit of the agreement is to reduce Metropolitan's SWP fixed costs in wetter years when there are more than sufficient supplies to meet Metropolitan's water management goals, while at the same time preserving its dry-year SWP supply. In a single critically dry-year like 1977, the call-back provision of the entitlement transfer can provide Metropolitan about 13 TAF of SWP supply. In multiple dry years like 1990-1992, it can provide Metropolitan about 19 TAF of SWP supply.

Desert Water Agency/Coachella Valley WD Advance Delivery Program

Under this program, Metropolitan delivers Colorado River water to the Desert Water Agency and CVWD in advance of the exchange for their SWP Contract Table A allocations. In addition to their Table A supplies, Desert Water Agency and CVWD, subject to Metropolitan's written consent, may take delivery of SWP supplies available under Article 21 and the Turn-back Pool Program. By delivering enough water in advance to cover Metropolitan's exchange obligations, Metropolitan is able to receive Desert Water Agency and CVWD's available SWP supplies in years in which Metropolitan's supplies are insufficient without having to deliver an equivalent amount of Colorado River water. This program allows Metropolitan to maximize delivery of SWP and Colorado River water in such years. These Table A deliveries are incorporated into the estimate of SWP Deliveries under Current Programs shown in Table 3-2.

Desert Water Agency/Coachella Valley WD Other SWP Deliveries

Since 2008, Metropolitan has provided Desert Water Agency and CVWD written consent to take delivery of non-SWP supplies separately acquired by each agency from the SWP facilities. These deliveries include water acquired from the Yuba Dry Year Water Purchase Program and the 2009 Drought Water Bank. Metropolitan has also consented to:

- 10 TAF of exchange deliveries to CVWD for non-SWP water acquired from the San Joaquin Valley from 2008 through 2010,
- 36 TAF of exchange deliveries to Desert Water Agency for non-SWP water acquired from the San Joaquin Valley from 2008 through 2015, and
- 16.5 TAF of exchange deliveries to CVWD from groundwater storage of Kern River flood flows or SWP water delivered from Kern County Water Agency provided by Rosedale Rio Bravo Water Storage District from 2012 through 2035.

Table 3-2 summarizes Metropolitan's SWP supply range for 2035. Appendix 3 provides a detailed discussion of the current SWP programs and programs that are under development.

Table 3-2
California Aqueduct
Program Capabilities
Year 2035
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
MWD Table A	362,000	257,000	976,000
DWCV Table A	37,000	26,000	99,000
San Luis Carryover [1]	80,000	240,000	240,000
Article 21 Supplies	0	0	8,000
Yuba River Accord Purchase	0	0	0
Subtotal of Current Programs	***479,000***	***523,000***	***1,323,000***
Programs Under Development			
Delta Improvements	87,000	178,000	248,000
Subtotal of Proposed Programs	***87,000***	***178,000***	***248,000***
Maximum Supply Capability	**566,000**	**701,000**	**1,571,000**

[1] Includes DWCV carryover.

SWP Water Quality

Metropolitan requires a safe drinking water supply from the Bay-Delta to meet current and future regulatory requirements for public health protection. Finding cost-effective ways to reduce total organic carbon (TOC), bromide concentrations, pathogenic microbes, and other unknown contaminants from the Bay-Delta water supply is one of Metropolitan's top priorities. Metropolitan also requires a SWP supply that is consistently low in salinity - Total Dissolved Solids (TDS) - so it can blend SWP water with higher-salinity Colorado River water to achieve salinity goals for its member agencies. In addition, Metropolitan needs consistently low-salinity SWP water to increase in-basin water recycling and groundwater management programs. These programs require that blended water supplied to the member agencies meets the TDS goals adopted by Metropolitan's Board, which specify a salinity objective of 500 mg/L for blended imported water.

Metropolitan is actively involved in DWR's Municipal Water Quality Investigations (MWQI) Program. The highly variable quality of State Water Project water influences the operation of

Metropolitan's system and its water treatment process. Increasingly restrictive State and Federal drinking water standards, concerns over emerging contaminants such as personal care products and pharmaceuticals, algal taste and odors, and Delta ecosystem fisheries issues are critical variables. DWR's MWQI Program strives to monitor, protect, and improve drinking water quality of Delta water deliveries to the urban State Water Contractors and other users of Delta water. The program focuses on issues related to drinking water quality through regular water quality monitoring, special field and laboratory studies, the use of forecasting tools such as computer models and data management systems, and reporting. While the program has developed extensive monitoring in the Delta including real-time monitoring, increased monitoring along the California Aqueduct is the next major step.

Levee modifications at Franks Tract and other source control actions may significantly reduce ocean salinity concentrations in Delta water, which would benefit Delta water users and export interests alike. Franks Tract is an island located in the central Delta that was actively farmed until levee breaches in 1936 and 1938. Since 1938, the tract has remained a flooded island, and its levees remain in disrepair. Tidal flows in the Delta entrap saline ocean water in the flooded tract, resulting in degraded water quality for both in-Delta and export users. Recent computer modeling analyses by Metropolitan, DWR, and the US Geological Survey indicate that reducing this salinity intrusion by partially closing existing levee breach openings and/or building radial gate flow control structures will significantly reduce TDS and bromide[7] concentrations in water from the Delta during the summer and fall months and in drought years. Based on Metropolitan's analysis, improvements to Franks Tract alone could reduce peak bromide concentrations in the summer and fall months by about 33 percent at Contra Costa Water District's (CCWD) Rock Slough intake, by 27 percent at CCWD's Old River intake, and by 24 percent at the SWP intake in the South Delta.

DWR and USBR proposed to implement the Franks Tract Project to improve water quality and fisheries conditions in the Bay-Delta. DWR and USBR are evaluating installing operable gates to control the flow of water at key locations (Three Mile Slough and/or West False River) to reduce sea water intrusion, and to positively influence movement of fish species of concern to areas that provide favorable habitat conditions. By protecting fish resources, this project also would improve operational reliability of the SWP and CVP because curtailments in water exports (pumping restrictions) are likely to be less frequent.

The state has adopted an "equivalent level of public health protection" (ELPH) program that targets water quality actions outside the Delta. The Bay-Delta Program is coordinating a feasibility study on water quality improvement in the California Aqueduct.

Metropolitan and the Friant Water Users Authority (FWUA) have entered into a partnership to investigate the potential of enhancing the quantity and affordability of the eastern San Joaquin Valley's water supply while improving Southern California's water quality. The FWUA and Metropolitan studied projects that benefited both regions. Using Proposition 13 funds, an existing canal belonging to the Arvin-Edison Water Storage District was enlarged, enabling greater volumes of water to be exchanged between their groundwater and the California Aqueduct.

SWP System Outage and Capacity Constraints

As its infrastructure ages, the SWP becomes increasingly vulnerable to natural disasters, particularly the Delta levee system and the California Aqueduct, which are both susceptible to floods and earthquakes. In June 2004, a levee in the Jones Tract of the Delta failed, resulting in

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[7] The importance of bromides is discussed in the Water Quality chapter.

total inundation of the island and disrupting SWP operations. Catastrophic loss of either the Delta levee system or the aqueduct would shut down the project, affecting the welfare of millions. While Metropolitan has made substantial investments in local resources and in-basin storage to insulate Southern California against loss of its imported water supplies, additional investment is needed in the at-risk infrastructure.

The Bay-Delta Levees Program coordinates Delta levee maintenance and improvement activities. Its goal is to protect water supplies needed for the environment, agriculture, and urban uses by reducing the threat of levee failure and seawater intrusion. Over the next two to three years, DWR and other agencies will carry out a Comprehensive Program Evaluation (CPE). It will incorporate the risk study that has been commissioned by DWR, including the currently-proposed expanded scope of that study. The CPE will: (a) supplement the DWR risk study to ensure that it considers all relevant levee risks, (b) include the development of a formal strategic plan that contains a description of any proposed future program changes, and (c) recommend priorities and estimate funding needs for the Levees Program. For example, the Army Corps of Engineers' (P.L. 84-99 ROD) target will be reevaluated as part of the CPE using information from the Risk Study.

The California Aqueduct remains susceptible to floods at several points as it travels from the Delta along the west side of the San Joaquin Valley. Key among these is where the aqueduct crosses the Arroyo Pasajero, an alluvial fan located near Coalinga, California. At that spot, the aqueduct effectively forms a barrier to Arroyo flood flows. Although flood control facilities were built to protect the aqueduct, the volumes of runoff and sediment deposition are much greater than originally estimated, so a significant flood risk remains. The aqueduct was severely damaged during March of 1995 when a flood overwhelmed control facilities and overtopped the aqueduct with 10 TAF of floodwater and an estimated 800,000 cubic yards of sediment. Impacts to downstream water users lasted through the summer of 1995. In December of 2004, DWR began construction of "Phase I" improvements to the aqueduct where it crosses the Arroyo. These improvements will increase the size of the detention basins west of the aqueduct to protect it against a 50-year storm event.

DWR is also investing in the replacement of aging SWP infrastructure critical to SWP operations. It is midway into its Turbine Rehabilitation Program at Oroville Reservoir's Hyatt-Thermalito complex. In 2004, DWR awarded a contract to replace four pumps at the Edmonston Pumping Plant. Moreover, improved maintenance procedures have decreased the amount of time pumps at Edmonston come off-line for maintenance to less than 10 percent of the time.

Because of the risk of a prolonged shutdown of the SWP caused by seismic or hydrologic events either within the Delta or along the California Aqueduct, Metropolitan has acted decisively to ensure that Southern California has adequate emergency storage. Diamond Valley Lake (DVL) and SWP terminal reservoir storage, combined with member-agency emergency storage, are jointly capable of providing the region with a six-month supply of water if combined with a temporary 25 percent reduction in demand. Metropolitan engineering studies indicate this would provide sufficient time to repair the SWP and resume delivery.

Metropolitan is investigating potential opportunities for carbon sequestration in subsided islands within the legal Delta to create a potential revenue source for Delta landowners and other interested parties. Farming the Delta peat soils generates a large amount of carbon dioxide (CO_2), and growing native vegetation (versus continued farming operations) not only decreases greenhouse gas emissions, but can actually sequester an even larger amount of CO_2 over time while rebuilding new peat soils. With rebuilding new peat soils to historic elevations, the risk of levee failure would decrease, and may eventually be eliminated.

Achievements to Date

SWP Reliability

Delta Vision

The Delta has suffered from multiple crises for years – ecosystem, water supply, levee stability, water quality, policy, program, and litigation. The ecosystem condition continues to deteriorate, with record-low reports of fish populations, Delta smelt, and other species on the brink of extinction, and the commercial salmon season shut down completely for two years in a row. Continued drought conditions and court-ordered restrictions on water exports have led to reductions in water deliveries to contractors. Deteriorating levees, land subsidence, earthquake risk, and climate change all contribute to growing concerns about mass Delta levee failure. Delta water quality also continues to be a critical issue, as both local agricultural and urban communities contribute contaminants to the system. Litigation related to Delta environmental concerns and the proposed California WaterFix/ EcoRestore/ BDCP will likely continue in the future.

Metropolitan's Long-Term Action Plan

Besides the short- and mid-term actions described earlier in Section 1.4, Metropolitan's adopted Delta action plan in June 2007 includes a long-term Delta Plan. The long-term action plan recognizes the need for a global, comprehensive approach to the fundamental issues and conflicts in the Delta to result in a truly sustainable Delta. A piecemeal approach cannot satisfy the many stakeholders that have an interest in the Delta and will fail; there must be a holistic approach that deals with all issues simultaneously. In dealing with the basic issues of the Delta, solutions must address the physical changes required, as well as the financing and governance. There are three basic elements that must be addressed: Delta ecosystem restoration, water supply conveyance, and flood control protection and storage development. In addition, the state needs to establish governance structures and financing approaches to implement and manage the three identified elements.

Governor's Delta Vision Process

Through this enduring Delta crisis, the Legislature and the Governor initiated, in 2006, a process to develop a new long-term vision for the Delta. SB 1574 (Kuehl/2006) required a cabinet committee to present recommendations for a Delta strategic vision. The governor created a Delta Vision Blue-Ribbon Task Force to advise the Cabinet Committee. The Task Force produced an October 2008 Strategic Plan, which the Cabinet Committee largely adopted and submitted, with its recommendations, to the Legislature on January 3, 2009. Metropolitan, as a stakeholder to the process, provided input to the Task Force.

The 2009 Delta Legislation

After delivery of the Delta Vision recommendations, the Legislature held informational hearings from Delta experts, Task Force members, and the Schwarzenegger Administration, as well as the public at large, and engaged in vigorous water policy discussions. Following the informational hearings, several legislators began developing detailed legislation which culminated in pre-print proposals being issued in early August of 2009 for public review and discussion over the summer recess. The Assembly Water, Parks and Wildlife Committee and the Senate Natural Resources and Water Committee then held joint informational hearings on the pre-print proposals and received extensive public comment. Thereafter, legislative leadership appointed a conference committee, which convened and held additional public hearings, with further legislator discussions on key issues. That work continued into the 7th Extraordinary Session, which was called by the governor specifically to address the pending Delta and water issues, and culminated in the signing of a historic package of bills. One of the keystones of that package was SB X7-1, which reformed Delta policy and governance. Specifically, SB X7-1:

- Establishes a new legal framework for Delta management, emphasizing the coequal goals of "providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem" as foundation for state decisions as to Delta management.
- Reconstitutes and redefines role of the Delta Protection Commission (DPC), to narrow membership to focus on local representation and to expand the DPC’s role in economic sustainability.
- Creates a new Sacramento-San Joaquin Delta Conservancy (Conservancy), to support efforts that advance environmental protection and the economic well-being of Delta residents.
- Creates the Delta Stewardship Council (Council) as an independent state agency to guide actions in the Delta which furthers the coequal goals of Delta restoration and water supply reliability.
- Repeals the CALFED Bay-Delta Authority Act and transfers existing staff, contracts, etc. to the Council.
- Creates the Delta Independent Science Board (Science Board) and Delta Science Program.
- Requires the State Water Resources Control Board (SWRCB), by August 12, 2010, to develop new flow criteria for the Delta ecosystem necessary to protect public trust resources.
- Requires the Department of Fish and Game (DFG), now the Department of Fish and Wildlife (DFW), by December 31, 2010, to develop and recommend to the SWRCB flow criteria and quantifiable biological objectives for aquatic and terrestrial species.
- Creates a Delta Watermaster as the enforcement officer for the SWRCB Division of Water Rights in the Delta.
- Requires the Council to develop, adopt, and commence implementation of the "Delta Plan" by January 1, 2012, with a report to the Legislature by March 31, 2012.
- Requires the DPC to develop a proposal to protect, enhance, and sustain the unique cultural, historical, recreational, agricultural, and economic values of the Delta as an evolving place.
- Requires the Delta Plan to further the coequal goals of Delta ecosystem restoration and a reliable water supply.
- Requires the Delta Plan to promote statewide water conservation, water use efficiency, and sustainable use of water, as well as improvements to water conveyance/storage and operation of both to achieve the coequal goals.
- Requires the Delta Plan to attempt to reduce risks to people, property, and state interests in the Delta by promoting effective emergency preparedness, appropriate land uses, and strategic levee investments.
- Announces a statewide policy to reduce reliance on the Delta in meeting California’s future water supply needs through a statewide strategy of investing in improved regional supplies,

conservation, and water use efficiency. Each region that depends on water from the Delta watershed shall improve its regional self-reliance for water through investment in water use efficiency, water recycling, advanced water technologies, local and regional water supply projects, and improved regional coordination of local and regional water supply efforts.

- Requires the Council to include the Bay Delta Conservation Plan (BDCP) in the Delta Plan and makes the BDCP eligible for state funding if:
    - The BDCP complies with Natural Community Conservation Planning Act (NCCPA) and is approved as a Habitat Conservation Plan under the Federal ESA.
    - The BDCP complies with the California Environmental Quality Act and includes a full range of alternatives, including a reasonable range of flow criteria, rates of diversion, and other operational criteria.
    - DWR consults with the Council and Science Board during development of the BDCP.
    - DFW approves the BDCP as a Natural Community Conservation Plan and determines that it meets the requirements for incorporation into the Delta Plan.

SWP Water Quality

The most significant achievement for SWP water quality has been continued definition and advancement of the Delta Improvement Package. Most notably, the Franks Tract studies identified cost-effective ways to achieve significant improvements in the quality of Delta export water.

Progress was also made on the Southern California-San Joaquin Regional Water Quality Exchange Project. In 2009, Metropolitan and Arvin Edison Water Storage District enlarged their South Canal to enable exchanging more water between their groundwater basins and the California Aqueduct. Their relatively pure water allows Metropolitan to improve source water, and increase quantities, during times when quality and quantity are relatively poor. This project also allows Metropolitan better access to water it has stored in the Arvin Edison Groundwater Storage Project.

SWP System Reliability

The completion and filling of DVL marked the most important achievement with respect to protecting Southern California against an SWP system outage. Water began pouring into the reservoir in November 1999, and the lake was filled by early 2003. The lake can hold up to 810 TAF which provides Southern California with a six-month emergency water supply, as well as carryover and regulatory storage.

The Inland Feeder Project

The Inland Feeder is a 44-mile-long conveyance system that connects the State Water Project to DVL and the CRA. The Inland Feeder provides greater flexibility in managing Metropolitan's major water supplies and allows greater amounts of State Water Project water to be accepted during wet seasons for storage in DVL. In addition, the Inland Feeder increases the conveyance capacity from the East Branch of the SWP by 1,000 cubic feet per second, allowing the East Branch to operate up to its full capacity. The project also improves the quality of the Southland's drinking water by allowing more uniform blending of better quality water from the SWP with Colorado River supplies, which have a higher mineral content. Construction of the Inland Feeder was completed in September 2009.

3.3 Central Valley/State Water Project Storage and Transfer Programs

Metropolitan endeavors to increase the reliability of supplies received from the California Aqueduct by developing flexible SWP storage and transfer programs. Over the years, Metropolitan has developed numerous voluntary SWP storage and transfer programs, to secure additional dry-year water supplies.

Background

Metropolitan has a long history of managing the wide fluctuations of SWP supplies from year to year by forming partnerships with Central Valley agricultural districts along the California Aqueduct, as well as with other Southern California SWP Contractors. These partnerships allow Metropolitan to store its SWP supplies during wetter years for return in future drier years. Some programs also allow Metropolitan to purchase water in drier years for delivery via the California Aqueduct to Metropolitan's service area.

Because yields from individual programs can vary widely depending on hydrologic conditions and CVP/SWP operations, the dry-year yields for the various programs reported in this section are expected values only. In any given year, actual yields could depart from the expected values. Despite that uncertainty, Metropolitan's models of these programs indicate that in the aggregate, they can meet the resource target under a wide range of hydrologic conditions and CVP/SWP operations.

In addition, the SWP storage and transfer programs have served to demonstrate the value of partnering, and increasingly, Central Valley agricultural interests see partnering with Metropolitan as a sensible business practice beneficial to their local district and regional economy.

Implementation Approach

Metropolitan is currently operating several SWP storage programs that serve to increase the reliability of supplies received from the California Aqueduct. Metropolitan is also pursuing a new storage program with Antelope Valley-East Kern Water Agency, which is currently under development. In addition, Metropolitan pursues SWP water transfers on an as needed basis. Table 3-3 lists the expected yields from these storage and transfer programs. Figure 3-3 shows the location of Metropolitan's statewide groundwater banking programs.

Storage and Transfer Programs

Semitropic Storage Program

Metropolitan has a groundwater storage program with Semitropic Water Storage District located in the southern part of the San Joaquin Valley. The maximum storage capacity of the program is 350 TAF. The specific amount of water Metropolitan can store in and subsequently expect to receive from the program depends upon hydrologic conditions, any regulatory requirements restricting Metropolitan's ability to export water for storage, and the demands placed on the Semitropic Program by other program participants. In 2014, Metropolitan amended the program to increase the return yield by an additional 13.2 TAF per year. The minimum annual yield available to Metropolitan from the program is currently 34.7 TAF, and the maximum annual yield is 236.2 TAF, depending on the available unused capacity and the SWP allocation. During wet years, Metropolitan has the discretion to use the program to store portions of its SWP water that are in excess of the amounts needed to meet Metropolitan's service area demand. In Semitropic, the water is delivered to district farmers who use the water in lieu of pumping groundwater. During dry years, the district returns Metropolitan's previously stored water to Metropolitan by direct groundwater pump-in return and the exchange of SWP supplies.

Arvin-Edison Storage Program

Metropolitan amended the groundwater storage program with Arvin-Edison Water Storage District in 2008 to include the South Canal Improvement Project. The project increases the reliability of Arvin-Edison returning higher water quality to the California Aqueduct. In addition, Metropolitan and Arvin-Edison often enter into annual operational agreements to optimize program operations in any given year. The program storage capacity is 350 TAF. The specific amount of water Metropolitan can expect to store in and subsequently receive from the program depends upon hydrologic conditions and any regulatory requirements restricting Metropolitan's ability to export water for storage. The storage program is estimated to deliver 75 TAF. During wet years, Metropolitan has the discretion to use the program to store portions of its SWP supplies which are in excess of the amounts needed to meet Metropolitan's service area demand. The water can be either directly recharged into the groundwater basin or delivered to district farmers who use the water in lieu of pumping groundwater. During dry years, the district returns Metropolitan's previously stored water to Metropolitan by direct groundwater pump-in return or by exchange of surface water supplies. In 2015, Metropolitan funded the installation of three new wells at a cost of $3 million that will restore the return reliability by 2.5 TAF per year. The funding will ultimately be recovered through credits against future program costs.

Table 3-3 summarizes Metropolitan's Central Valley/SWP transfer programs supply range for 2035. The supply capabilities shown reflect actual storage program conveyance constraints. In addition, SWP supplies are estimated using DWR's 2015 SWP Delivery Capability Report released in July 2015. Appendix 3 provides a detailed discussion of the current Central Valley and SWP storage and transfers programs and programs that are under development.

Table 3-3
Central Valley/State Water Project Storage and Transfer Programs
Supply Projection
Year 2035
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
San Bernardino Valley MWD Minimum Purchase	3,000	0	20,000
San Bernardino Valley MWD Option Purchase	0	0	16,000
San Gabriel Valley MWD Exchange and Purchase	2,000	2,000	2,000
Central Valley Storage and Transfers			
Semitropic Program	50,000	49,000	70,000
Arvin Edison Program	63,000	75,000	75,000
Mojave Storage Program	2,000	0	26,000
Kern Delta Program	47,000	50,000	50,000
Transfers and Exchanges	50,000	50,000	50,000
Subtotal of Current Programs	***217,000***	***226,000***	***309,000***
Programs Under Development			
Antelope Valley/East Kern Acquisition and Storage	7,000	20,000	20,000
Subtotal of Proposed Programs	***7,000***	***20,000***	***20,000***
Maximum Supply Capability	**224,000**	**246,000**	**329,000**

San Bernardino Valley MWD Storage Program

The San Bernardino Valley MWD Storage program allows for the purchase of a portion of San Bernardino Valley MWD's SWP supply. The program includes a minimum purchase provision of 20 TAF and the option of purchasing additional supplies when available. This program can deliver between 20 TAF and 70 TAF in dry years, depending on hydrologic conditions. The expected delivery for a single dry year similar to 1977 is 20 TAF should supplies be available. The agreement with San Bernardino Valley MWD also allows Metropolitan to store up to 50 TAF of transfer water for use in dry years. The agreement can be renewed until December 31, 2035.

San Gabriel Valley MWD Exchange Program

The San Gabriel Valley MWD program allows for the exchange of up to 5 TAF each year. For each acre-foot Metropolitan delivers to the City of Sierra Madre, a San Gabriel Valley MWD member agency, San Gabriel Valley MWD provides two acre-feet to Metropolitan in the Main San Gabriel Basin, up to 5 TAF. The program provides increased reliability to Metropolitan by allowing additional water to be delivered to Metropolitan's member agencies Three Valleys MWD and Upper San Gabriel Valley MWD.

Antelope Valley-East Kern Water Agency Exchange and Storage Program

The Antelope Valley-East Kern Water Agency (AVEK) exchange and storage program provides Metropolitan with additional supplies and increased reliability. Under the exchange program, for every two acre-feet Metropolitan receives, Metropolitan returns one acre-foot to AVEK to improve its reliability. The exchange program is expected to deliver 30 TAF over ten years, with 10 TAF available in dry years. Under the program, Metropolitan will also be able to store up to 30 TAF in the AVEK's groundwater basin, with a dry year return capability of 10 TAF.

Kern-Delta Water District Storage Program

This groundwater storage program has 250 TAF of storage capacity. The program is capable of providing up to 50 TAF of dry-year supply. In 2015, Metropolitan funded the cross river pipeline that, when completed, will help improve Metropolitan's return reliability by reducing losses during exchanges. Water for storage can be either directly recharged into the groundwater basin or delivered to district farmers who use the water in lieu of pumping groundwater. During dry years, the district returns Metropolitan's previously stored water to Metropolitan by direct groundwater pump-in return or by exchange of surface water supplies.

Mojave Storage Program

Metropolitan entered into a groundwater banking and exchange transfer agreement with Mojave Water Agency on October 29, 2003. This agreement was amended in 2011 to allow for the cumulative storage of up to 390 TAF. The agreement allows for Metropolitan to store water in an exchange account for later return. Through 2021, and when the State Water Project allocation is 60 percent or less, Metropolitan can annually withdraw the Mojave Water Agency's SWP contractual amounts in excess of a 10 percent reserve. When the SWP allocation is over 60 percent, the reserved amount for Mojave's local needs increases to 20 percent. Under a 100 percent allocation, the State Water Contract provides Mojave Water Agency 82.8 TAF of water.

Central Valley Transfer Programs

Metropolitan secures Central Valley water transfer supplies via spot markets and option contracts to meet its service area demands when necessary. Hydrologic and market conditions, and regulatory measures governing Delta pumping plant operations, will determine the amount of water transfer activity occurring in any year. Recent transfer market activity, described below, provides examples of how Metropolitan has secured water transfer supplies as a resource to fill anticipated supply shortfalls needed to meet Metropolitan's service area demands.

In 2003, Metropolitan secured options to purchase approximately 145 TAF of water from willing sellers in the Sacramento Valley during the irrigation season. These options protected against potential shortages of up to 650 TAF within Metropolitan's service area that might have arisen from a decrease in Colorado River supply or as a result of drier-than-expected hydrologic conditions. Using these options, Metropolitan purchased approximately 125 TAF of water for delivery to the California Aqueduct.

In 2005, Metropolitan, in partnership with seven other State Water Contractors, secured options to purchase approximately 130 TAF of water from willing sellers in the Sacramento Valley, of which Metropolitan's share was 113 TAF. Metropolitan also had the right to assume the options of the other State Water Contractors if they chose not to purchase the transfer water. Due to improved hydrologic conditions, Metropolitan and the other State Water Contractors did not exercise these options.

In 2008, Metropolitan, in partnership with seven other State Water Contractors, secured approximately 40 TAF of water from willing sellers in the Sacramento Valley, of which Metropolitan's share was approximately 27 TAF.

In 2009, Metropolitan, in partnership with 8 other buyers and 21 sellers, participated in a statewide Drought Water Bank, which secured approximately 74 TAF, of which Metropolitan's share was approximately 37 TAF.

In 2010, Metropolitan, in partnership with three other State Water Contractors, secured approximately 100 TAF of water from willing sellers in the Sacramento Valley, of which Metropolitan's share was approximately 88 TAF. Metropolitan also purchased approximately 18 TAF of water from Central Valley Project Contractors located in the San Joaquin Valley. In addition, Metropolitan entered into an unbalanced exchange agreement that resulted in Metropolitan receiving approximately 37 TAF.

In 2015, Metropolitan, in partnership with eight other State Water Contractors, secured approximately 20 TAF of water from willing sellers in the Sacramento Valley, of which Metropolitan's share was approximately 13 TAF.

In addition, Metropolitan has secured water transfer supplies under the Yuba Accord, which is a long-term transfer agreement. To date, Metropolitan has purchased approximately 165 TAF.

Finally, Metropolitan has secured water transfer supplies under the Multi-Year Water Pool Demonstration Program. In 2013 and 2015, Metropolitan secured 30 TAF and 1.3 TAF, respectively.

Metropolitan's recent water transfer activities demonstrate Metropolitan's ability to develop and negotiate water transfer agreements either working directly with the agricultural districts who are selling the water or through a statewide Drought Water Bank. Because of the complexity of cross-Delta transfers and the need to optimize the use of both CVP and SWP facilities, DWR and USBR are critical players in the water transfer process, especially when shortage conditions increase the general level of demand for transfers and amplify ecosystem and water quality issues associated with through-Delta conveyance of water. Therefore, Metropolitan views state and federal cooperation to facilitate voluntary, market-based exchanges and sales of water as a critical component of its overall water transfer strategy.

Achievements to Date

Metropolitan has made rapid progress to date developing SWP storage and transfer programs. Most notably, Metropolitan has utilized approximately 457 TAF to supplement its SWP supplies during the recent 2012-2015 unprecedented drought. Of this total, approximately 325 TAF are from SWP storage program extractions in Semitropic, Arvin, Kern Delta, and Mojave; 57 TAF are from the San Bernardino and San Gabriel Valley MWD programs; and 78 TAF of SWP transfer supplies were purchased from the State Water Contractors Buyers Group, Multi-Year Water Pool, and Yuba water purchase programs.

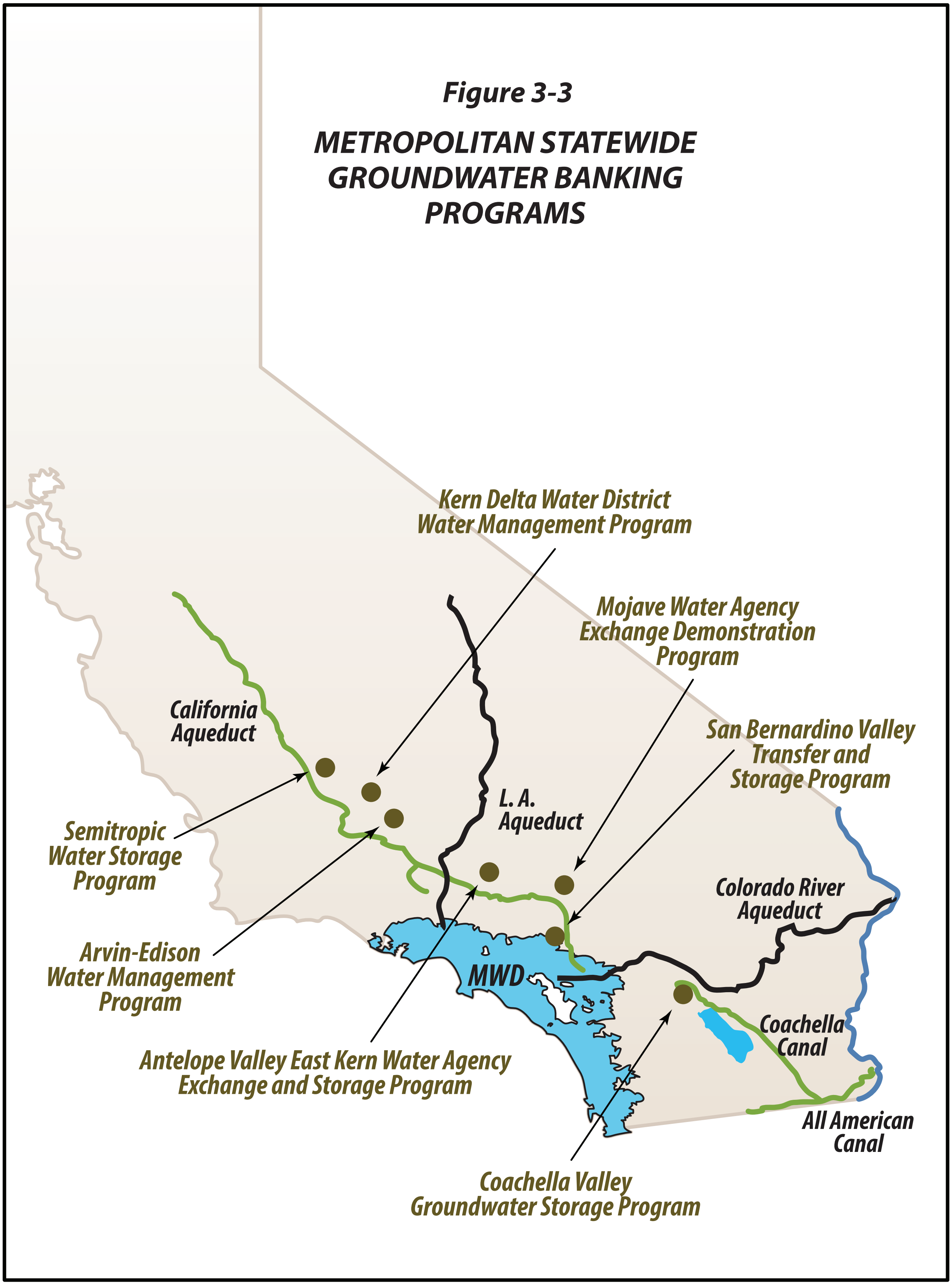

Figure 3-3

METROPOLITAN STATEWIDE GROUNDWATER BANKING PROGRAMS

3.4 Demand Management and Conservation

Demand management through conservation is a core element of Metropolitan's long-term water management strategy. Metropolitan continues to build on a nearly 25-year investment in conservation of more than $495 million, reflecting a long-term commitment to water conservation. Among other measures, this investment has resulted in the replacement of more than 3.4 million toilets with more water efficient models, distribution of more than 530,000 high-efficiency clothes washers (HECWs), and removal of approximately 170 million square feet of grass from both commercial and residential properties. Collectively, Metropolitan's conservation programs and other conservation in the region will reduce Southern California's reliance on imported water by more than 1.0 MAF per year by 2025.

In response to the continuing drought, Metropolitan's Board of Directors took unprecedented action in fiscal year 2014-15 to increase conservation and permanently reduce demand within Southern California. In December 2014, the Board authorized an additional $40 million for regional conservation incentives, raising the two year conservation budget to $100 million (fiscal years 2014-15 and 2015-16). In May 2015, the Board further increased the two-year conservation budget to an unprecedented $450 million, with $340 million committed to turf removal incentives for fiscal years 2014-15 and 2015-16. The Board also authorized $11 million for multimedia, multicultural, water awareness and conservation outreach campaigns that were implemented in 2014 and 2015.

Background

Metropolitan's conservation policies and programs are guided by the conservation savings target adopted in the IRP. These policies and programs directly relate to the demand management measures for wholesale water agencies in the Urban Water Management Planning Act and the urban water conservation Best Management Practices (BMPs) in the California Urban Water Conservation Council Memorandum of Understanding Regarding Water Conservation in California (Urban MOU). As a signatory to the Urban MOU, Metropolitan pledged to make a good faith attempt to implement the BMPs.

Conservation savings result from active, code-based, and price-effect conservation efforts. Active conservation consists of water-agency funded programs such as rebates and incentives for water efficient fixtures and equipment and turf removal. Code-based and price-based conservation consists of demand reductions attributable to conservation-oriented plumbing codes and usage reductions resulting from increases in the price of water. Metropolitan does not currently assign a savings value for public awareness campaigns and conservation education because any initial effect on demand reduction and the longevity of the effect are difficult to measure. It is generally accepted that these outreach programs prompt consumers to install water saving fixtures and change water-use behavior, thereby creating a residual benefit of increasing the effectiveness of complementary conservation programs.

Distinguishing between active, code-based, and price-effect conservation can be analytically complex when, for example, active programs for fixtures are concurrent with conservation-related plumbing codes. Metropolitan uses specially designed estimating models to quantify and project conservation savings. This plan combines active, code-based, and price-effect conservation savings using methods that avoid double counting.

Conservation savings are commonly estimated from a base-year water-use profile. Metropolitan uses 1980 as the base year because it marked the effective date of a new plumbing code in California requiring toilets in new construction to be rated at 3.5 gallons per flush or less. Between 1980 and 1990, the region saved an estimated 250 TAF per year as the result of this 1980 plumbing code and unrelated water rate increases. These savings are referred to as “pre-1990 savings.” Metropolitan’s resource planning target combines pre-1990 savings and estimates of more recently achieved savings.

Including regional pre-1990 conservation savings, Metropolitan continues to pursue a 2025 total conservation target of approximately 1.13 MAF per year. A large share of the target has already been achieved through existing Metropolitan and member agency programs, pre-1990 savings, price-effects, and continued savings that accrue from plumbing codes. The remainder is expected to be achieved through additional agency-sponsored active conservation programs, code changes, and price-effects.

Implementation Approach

Metropolitan’s approach for achieving the conservation target includes implementing a suite of demand management measures, including public education and outreach, a variety of conservation programs, metering, research and development, and asset management. These programs include cost-effective BMP-oriented active conservation programs and new, innovative programs that address regional water uses. Metropolitan also provides support to member agencies for local programs that assist with implementing retail BMPs and reducing per capita water use. The stewardship charge in Metropolitan’s rate structure provides the funding mechanism for active conservation programs and non-incentive strategies. Metropolitan continues to seek state and federal grant funding for conservation in coordination with its member agencies.

Metropolitan’s conservation programs are closely linked to the efforts of the California Urban Water Conservation Council (CUWCC), the organization created to administer the Urban MOU. As a signatory to the Urban MOU, Metropolitan has pledged to make a good faith effort to implement a prescribed set of urban water conservation BMPs. Metropolitan provides technical and financial support needed by member agencies in meeting the terms of the Urban MOU. Enclosed with this report, as Appendix 8, are copies of the BMP reports Metropolitan has filed with the CUWCC since Metropolitan’s 2010 urban water management plan.

In addition to implementing cost-effective BMPs, Metropolitan actively supports many CUWCC committee and research activities. For example, Metropolitan has historically assisted in CUWCC’s ongoing efforts to document and increase the effectiveness of BMP-related conservation efforts. Presently, Metropolitan is represented on the following CUWCC committees:

- Board
- Commercial, Industrial, and Institutional Committee
- Residential Committee
- Landscape Committee
- Research and Evaluation Committee
- Utility Operations Committee
- Education Committee
- BMP Reporting Committee

Metropolitan also participates in national water efficiency efforts. Metropolitan is a USEPA WaterSense partner, helping to promote water efficient products and practices in Southern California. Metropolitan is also a member of the Alliance for Water Efficiency, participating in the committees on research, WaterSense and water efficient products, and education and outreach.

The following sections describe Metropolitan's demand management measures and conservation programs.

Public Education and Outreach

Metropolitan provides comprehensive education and outreach programs throughout its service area. Metropolitan's wide-ranging and comprehensive education program recently received California's highest environmental honor: the Governor's Environmental and Economic Leadership Award.

Public Education Programs

Metropolitan's water education programs reach thousands of students every year with lessons on water quality, conservation, and stewardship. Free teacher workshops, classroom materials, field trips, and class instruction are provided to schools throughout the district. A comprehensive K-12 curriculum meets state standards for each grade level in the areas of science, math, language arts, and social studies. Table 3-4 shows Metropolitan's extensive commitment to conservation-related education programs.

Metropolitan also provides all-day instruction for grades 4-7 through the Diamond Valley Lake Education Program with several thousand students and teachers participating each year. Metropolitan also collaborated with the Western Science Center Outreach Program to provide activities for more than 5,000 students in grades 2-5, and oversaw the Diamond Valley Lake Visitor Center that educated over 10,000 people on Metropolitan's water systems and operations, programs, and water stewardship.

More than 20,000 people viewed student artwork from Metropolitan's "Water is Life" Student Art and Calendar program, which stresses the importance of conservation at home, school, and in the community. The 2015 Student Art Exhibit toured and was displayed at 27 member and retail agencies in 2015.

One of Metropolitan's signature events is the annual Solar Cup™ at Lake Skinner for high school students. This is a team-based educational program in which students develop and apply skills in math, engineering, and communications while learning about water resources and creating conservation-focused public service announcements. In 2015, 41 teams and more than 800 high school students built, equipped, and raced 16-foot solar powered boats in a successful three-day event that received extensive news coverage.

For college students, Metropolitan offers the Southern California World Water Forum College Grant Program with support from USBR and the Los Angeles County Sanitation Districts. The 2014–2017 program will provide 17 grants to colleges and universities for local and globally-focused projects that foster a better understanding and community awareness of water issues, while improving technology related to water supply and delivery, water conservation, and/or sanitation programs.

Metropolitan recently launched a new education resources website. This site highlights Metropolitan's water-based Science-Technology-Engineering-Arts-Math (STEAM) programs for pre-kindergarten through college students and hosts a downloadable curriculum, aligned to the state's education standards. This website, which has many mobile features, is a resource for students, parents, teachers, and community educators interested in learning and teaching about water's critical role in society.

Metropolitan's education related Twitter postings received more than 37,000 impressions, and Metropolitan's education Web page for kindergarten through college students drew over 40,000 visitors.

Outreach

In fiscal year 2013-14, Metropolitan implemented a variety of conservation and education outreach programs throughout our service area. Since late 2013, the primary focus of these programs has been on the drought and the need for additional conservation in order to maintain the region's water supply reserves. In March 2014, Metropolitan's Board of Directors authorized a $5.5 million regional outreach campaign for conservation and to raise water awareness. The multimedia campaign used television and radio advertisements and traffic report sponsorships, along with online, streaming radio and mobile ads, plus focused billboard and movie theater advertising. Many of the campaign elements were provided in-language to help engage the region's ethnically diverse population. Campaign tools, such as television and radio ads and graphics for bill inserts, billboards, and websites, were available to local agencies at no cost. As part of the campaign, Metropolitan conducted several interviews for television and radio and placed several "advertorial" news stories in the online editions of the *Los Angeles Times* and *Union Tribune-San Diego* newspapers. These elements promoted the ongoing need for conservation in Southern California, describing long-term investments in water storage and development of local water resources, and the availability of rebates and incentives for turf removal and purchase of water-saving devices and appliances.

In March 2015, Metropolitan's Board of Directors authorized $5.5 million for a second multi-lingual communications, outreach, and advertising campaign. The campaign tagline, "Let's All Take A Turn," emphasizes the seriousness of the drought and brings the message to residents that if we all do a little more to save water, it adds up to make a huge difference.

Metropolitan launched the research-based advertising campaign in the spring with digital and radio, in cooperation with the district's 26 member public agencies. For the first time, the entire campaign was produced in five languages: English, Spanish, Mandarin, Korean, and Vietnamese. The summer campaign called for online, social media, streaming radio, and mobile ads, along with billboards, television commercials, and special events -- such as the transformation of the iconic Randy's donut in Inglewood to the giant red Turn knob -- in order to effectively communicate the need for everyone to conserve water during the historic, ongoing drought.

Metropolitan also held press conferences on its own or in conjunction with others such as the Southern California Water Committee (SCWC) urging more conservation during the ongoing drought. These were augmented by op-ed pieces describing Southern California's response to the drought that were placed in newspapers such as the *Los Angeles Times* and *Orange County Register*.

Throughout the year, Metropolitan officials conducted dozens of interviews with news reporters to discuss a wide range of water-related topics such as the impact of the drought, water supply reliability, and conservation. As part of this public outreach, Metropolitan's General Manager blogged on Metropolitan's home web page, mwdh2o.com, about various water challenges facing the region.

In 2014, Metropolitan began a focused outreach effort for leading businesses and industries that are high volume water use customers within Metropolitan's service area. Metropolitan's executive management has met with executives in the beverage, bottling, refining, aerospace, tourism, and golf industries to discuss Southern California's water outlook, key policy issues, and opportunities to collaborate on water use efficiency projects that will reduce demand for potable water.

Metropolitan's bewaterwise.com® web site continues to play a key role in educating the public, attracting nearly 760,000 unique visitors from July 1, 2014 through June 30, 2015. The website includes a new page focused on the drought and enhanced information on Metropolitan's rebate and incentive programs. Metropolitan also provides a Spanish language version of the site to help educate and inform the region's Spanish-speaking population. In addition, the website features California Friendly® Landscape training classes where home gardeners and landscape professionals can learn the latest ways to reduce water use in landscapes. Classes cover the basics of irrigation systems, watering and fertilizing, landscape design, and plant identification.

Metropolitan is active on social media, regularly posting to Facebook and Twitter. The Facebook page, mwdh2o, has over 12,000 likes, and the Bewaterwise Twitter account, @bewaterwiseh2o, has over 3,000 followers. Metropolitan's Instagram page began in September 2015. To increase collaboration with environmental organizations, Metropolitan helped organize a regional Twitter campaign, #WaterYouDoing, to help spread water-saving messages.

Metropolitan provides a speakers bureau and regularly presents for business and community organizations. Metropolitan also provides direct outreach to federal, state, and local government leaders and their staff to inform them of key water issues and provide updates on Metropolitan's activities and programs.

Community Partnering Program

In fiscal year 2014-15, the Community Partnering Program sponsored and actively participated in nearly 60 water-related education and outreach programs for member agencies, community groups, educational institutions, public agencies, non-profit organizations, and professional associations. Projects included community festivals and events, conservation and garden projects, web-based information and social media, publications in multiple languages, educational materials dealing with watersheds, conservation, water recycling, and other initiatives.

California Friendly Landscape Education and Training Program

Metropolitan provides education and training on ways to conserve water in homes and landscapes. Offerings include in-person and online classes, surveys, and audits.

Landscape Classes

Metropolitan offers in-person and online courses in irrigation efficiency and water-wise garden design through its California Friendly Landscape Training Program. In FY 2014-15, Metropolitan conducted 197 classes for 6,590 students throughout Metropolitan's service area.

Landscape Irrigation Audits

Metropolitan provides irrigation surveys for large landscape customers. These surveys are performed by a certified Landscape Irrigation Auditor and provide the customer with specific recommendations on how to improve irrigation efficiency at the site. The survey report generated by the auditor also provides information on incentives to help the customer fund the needed improvements. In fiscal year 2014-15, 123 surveys covering 453 acres were conducted.

Irrigation Evaluations and Residential Surveys

Metropolitan provides funding to its member agencies that choose to implement irrigation evaluations and indoor surveys for residents. Irrigation evaluations provide customers with a recommended irrigation schedule and suggested improvements for irrigation systems. Indoor residential surveys provide customers with information on identifying leaks and making changes to water-using devices in the home.

Water Conservation Programs

Metropolitan's water conservation programs focus on two main areas: (1) residential water use, and (2) commercial, industrial, and institutional water use. Metropolitan directly implements regional programs, and provides financial support for local programs that are implemented by the member agencies. Metropolitan's Water Use Efficiency team provides program development, implementation, administration, monitoring, evaluation, and research.

Metropolitan's Conservation Credits Program (CCP) provides the basis for financial incentives and funding for the conservation programs and other demand management related activities. Established in 1988, this funding mechanism supports Metropolitan's commitment to conservation as a long-term water management strategy.

The basis of Metropolitan's financial support to member agency conservation efforts is estimated at $195 per acre-foot of water saved up to the device cost. In general, CCP-funded water conservation project proposals must:

- Have demonstrable water savings;
- Reduce water demands on Metropolitan's system; and
- Be technically sound and require Metropolitan's participation to make the project financially and economically feasible.

Table 3-5 summarizes CCP savings and investments. Additional funding for conservation programs has been made available through federal and state government agencies. Metropolitan has worked to obtain a share of this funding to enhance the region's water conservation investments. Table 3-6 describes past sources and uses of these funds.

Table 3-7 summarizes the types and numbers of efficient devices that have been installed through Metropolitan's conservation programs since they began in fiscal year 1990-91.

Regional Conservation Programs

As mentioned above, Metropolitan's conservation programs focus on two main sectors: (1) residential water use, and (2) commercial, industrial and institutional water use.

Residential Programs

Metropolitan's residential conservation activities consist of two major programs:

- SoCal Water$mart - Metropolitan provides a region-wide residential rebate program named SoCal Water$mart. Since its inception in 2008, rebate activity has increased dramatically as many residential customers became increasingly aware of the financial incentives available to them to help offset the purchase of water-efficient devices. To date, this program helped to replace over 3.3 million toilets, 530,000 washing machines, 37,000 urinals, 300,000 smart irrigation controllers, 2.3 million rotating nozzles, and hundreds of thousands of other devices and appliances.

- Metropolitan-Funded Residential Programs Administered by Member Agencies - Metropolitan's member and retail agencies also implement local residential water conservation programs within their respective service areas and receive Metropolitan incentives for qualified retrofits and other water-saving actions. Typical projects include high-efficiency toilet (HET) distributions, locally administered clothes washer rebate programs, turf removal programs, and residential water audits.

Residential Rebate Items

Metropolitan provides incentives on a variety of water efficient devices for the residential sector. The following is a brief description of current and past devices that contribute to projected conservation savings:

- Turf Removal (Residential) - About 50 percent of residential household water demand is used for outside irrigation where opportunities to conserve water are substantial. Southern California residents have turned the turf removal program into Metropolitan's most popular conservation measure. With an increased incentive rate ($2 per square foot of turf removed) during this current drought, approximately 45 million square feet of grass have been removed from residential properties since July 2014 through the regional rebate program, and more turf removal projects are anticipated. To encourage market transformation, Metropolitan has committed over $282 million for the regional turf removal program for both residential and commercial properties for fiscal years 14-15 and 15-16.
- High-Efficiency Clothes Washers - HECWs continue to be a major component of indoor water conservation. The water efficiency of clothes washers is represented by the "integrated water factor," which is a measure of the amount of water used to wash a standard load of laundry. Washers with a lower integrated water factor will save more water. Metropolitan has continued to move the water conservation rebate standards by requiring lower integrated water factors for eligible washers. The program eligibility requirement is currently set at an integrated water factor 3.7, which saves over 10,000 gallons per year per washer over a conventional top loading washer.
- High-Efficiency Toilets - Metropolitan has provided incentives for water efficient toilets since 1988. Metropolitan recently changed its rebate program to provide funding for toilets that flush at 1.1 gallons or less. Metropolitan uses the USEPA's WaterSense list of performance tested high-efficiency toilets and the Maximum Performance of Premium Toilet Models testing list to distinguish qualifying models.
- Rotating Nozzles for Sprinklers - Pop-up spray heads with multi-stream, multi-trajectory rotating nozzles provide outdoor water savings. Field tests and studies have demonstrated these nozzles apply water more evenly than traditional nozzles with fixed fan spray patterns, offering the potential for water savings. Low precipitation rates associated with these nozzles can reduce run-off, thereby offering a significant value-added benefit when irrigating sloping landscapes.
- Irrigation Controllers - Smart irrigation controllers and soil moisture sensors adjust irrigation schedules based on rain, temperature, sunlight, soil moisture, soil conditions, plant types, slope or some combination of indicators. Metropolitan uses the USEPA WaterSense list for eligible controllers.

Commercial, Industrial and Institutional Programs

Metropolitan's commercial industrial and institutional (CII) conservation consists of three major rebate and incentive programs:

- SoCal Water$mart Program - The majority of the commercial conservation activity comes from Metropolitan's regional SoCal Water$mart program, which also extends rebates to multi-family properties. The SoCal Water$mart program had its largest year in fiscal year 2014-15, providing about $51.0 million in CII rebates for about 328,000 product replacements.
- Water Savings Incentive Program - The Water Savings Incentive Program provides financial incentives for customized landscape irrigation and industrial process improvements. This program allows large-scale water users to create their own conservation projects and receive incentives for up to 10 years of water savings for measured water-use efficiency improvements.
- Metropolitan-Funded Commercial Programs Administered by Member Agencies - Member and retail agencies also implement local commercial water conservation programs using Metropolitan incentives. Projects target specific commercial sectors, with some programs also receiving assistance from state or federal grant programs. Metropolitan incentives are also used as the basis for meeting cost-share requirements for the grants.

Commercial Rebate Items

Metropolitan's CII programs provide rebates for water-saving plumbing fixtures, landscaping equipment, food-service equipment, cleaning equipment, HVAC (heating, ventilation, air conditioning) equipment, and medical equipment.

- Turf Removal (Commercial) - Similar to the residential sector, water demand for landscape irrigation on commercial, industrial, and institutional properties is significant. Opportunities to conserve water are substantial, particularly in areas with ornamental turf. With an increased incentive rate ($2 per square foot of turf removed) during this current drought, approximately 27 million square feet of grass have been removed from commercial, industrial, and institutional properties since July 2014 through the regional rebate program, and more turf removal projects are anticipated. To encourage market transformation, Metropolitan has committed over $282 million for the regional turf removal program for both residential and commercial properties for fiscal years 2014-15 and 2015-16.
- Commercial Devices - Following is a list of current and past devices that contribute to projected conservation savings:
    - Connectionless Food Steamers
    - Cooling Tower Conductivity Meters
    - Dry Vacuum Pumps
    - High-Efficiency Clothes Washers
    - High-Efficiency Toilets
    - High-Efficiency Urinals
    - Ice Machines
    - In-Stem Flow Regulators
    - Large Rotors - High Efficiency Nozzles
    - Multi Stream Rotating Nozzles
    - pH Cooling Tower Controllers
    - Plumbing Flow Control Valves
    - Pre-rinse Spray Heads
    - Steam Sterilizers
    - Ultra-Low-Flush Toilets
    - Ultra-Low-Flush Urinals
    - Water Brooms
    - Weather-Based Irrigation Controllers
    - X-ray Processors
    - Zero Water Urinals

Metering

Metropolitan's water distribution system is metered. Metropolitan has over 400 service connections that meter water deliveries to our member agencies. Meters at these service connections are checked every six months or sooner to verify that they are measuring correctly. More extensive maintenance is done on a yearly basis to ensure the meter systems continue to operate reliably.

Research and Development Programs

Metropolitan is committed to conservation research as a way to advance technology, improve program results, and help transform markets. Self-funded studies include water savings analysis of various rotating nozzle incentive programs, water savings from turf removal projects, and water savings analysis of smart/weather based irrigation controllers.

Metropolitan's Innovative Conservation Program (ICP) is a competitive grant program that evaluates water savings and reliability of new water saving devices, technologies, and strategies. With funding provided by USBR, SNWA, Central Arizona Project, and Metropolitan, approximately $500,000 of funding was available for research for the 2013 ICP. After evaluating 50 project proposals, thirteen were selected. The majority focused on landscape water use, but there were also commercial, agricultural, and residential water use studies as well. The next round of grants will be implemented in fiscal year 2016-17.

Metropolitan has partnered with the Alliance for Water Efficiency (AWE) for water conservation research. Recent projects include: a drought management study of Australia, a water neutral development ordinance; and a study on commercial kitchen efficiency, outdoor impacts of the drought, and reasons and rationale for landscape choices.

Measurement and Evaluation

Measurement and evaluation are important components of Metropolitan's conservation programs. These serve four primary functions:

- Providing a means to measure and evaluate the effectiveness of current and potential conservation programs
- Developing reliable estimates of various conservation programs and assessing the relative benefits and costs of these interventions
- Providing technical assistance and support to member agencies in the areas of research methods, statistics, and program evaluation
- Documenting the results and the effectiveness of Metropolitan-assisted conservation efforts

Metropolitan's staff has served as technical advisors for a number of state and national studies involving the quantification and valuation of water savings.

Recognition for Conservation Achievements

Conservation is an integral part of water supply planning at Metropolitan. Metropolitan works to improve the understanding of the costs and benefits of conservation so investment decisions are both efficient and effective at meeting program goals. As a cooperative member of California's water conservation community, Metropolitan has made significant contributions to the development and coordination of conservation activities throughout the state. These contributions have been recognized in the form of "Gold Star" certification from the Association of California Water Agencies and awards from the USBR and California Municipal Utilities Association. Metropolitan was recently awarded the AWWA's 2014 Public Communications Achievement Award for its water awareness and conservation outreach campaign.

Table 3-4
School Education Programs

Program or Activity	Date Initiated	Date Updated	Current Status	Grades	Description
Admiral Splash	1983	2006	Ongoing	Grades 4-5	A two-week program focusing on Southern California history, the water cycle, supply and the distribution system, water uses and conservation.
All About Water	1991	2008	Ongoing	K-2	Activities to teach young students about droughts, conservation, water quality and physical properties of water.
Geography of Water	1993	1998	Ongoing	Grades 4-8	A curriculum module on the relationship between population, precipitation, geography, economics, and water distribution.
Guzzler Gang	1993	2004	Ongoing	K-3	Water conservation book introduces students to characters who are known for “guzzling” water.
Water Ways	1995	2006	Ongoing	Grade 5	A supplement integrated into fifth-grade U.S. History curricula regarding water use, sources, ethics, and environment issues selected from three historical periods. This includes historical attitudes towards the stewardship of water.
Water Quality	2001	-	Ongoing	Grades 7-12	Hands-on activities to investigate water quality issues, with conservation as an element of the overall picture.
Water Works	2001	-	Ongoing	Grades 7-12	A school-to-career, job-specific program featuring activities and profiles on a variety of water-related careers, including conservation specialist.
Water Times	2005	-	Ongoing	Grade 6	An age-appropriate newspaper that provides interdisciplinary concepts, tools, and calculations related to water conservation, and that conveys an overall ethic of water stewardship.
Conservation Connection: Water and Energy Use in Southern California	2010	-	Ongoing	Grades 6-8	An activity-focused unit designed to engage students in finding solutions to conserve both water and energy at school and home. The curriculum also contains an online water and energy survey for students and their families.
Little Splash	2012		Ongoing	K-3	Collection of 21 activity and coloring pages including reading, writing, coloring, drawing, and working puzzles that teach concepts about water.

Table 3-5
Metropolitan's Conservation Credits Program

Fiscal Year	Annual Water Savings (AF)	Investment
2014 – 2015	179,000	$142 million
2013 – 2014	157,000	$16.9 million
2012 – 2013	161,000	$11.4 million
2011 - 2012	156,000	$12.9 million
2010 - 2011	153,000	$16.0 million
2009 - 2010	147,000	$36.7 million

Table 3-6
Grant Program Funding

Funding Source	Program/Project	Funding Amount ($1,000s)	Description	Status
CALFED				
	Residential HECW	$925	Increase rebate amount	Completed
	Protector del Agua	$100	Course development	Completed
Prop 13 Grants				
	HECW	$2,500	Increase rebate amount	Completed
	ET Controllers	$1,800	Initiate rebates	Completed
CPUC (w/CUWCC)				
2003	Pre-Rinse Spray Valves: Phase 1	$1,600[1]	12,000 direct installations[1]	Completed
2004	Pre-Rinse Spray Valves: Phase 2	$2,200[1]	17,000 direct installations[1]	Completed
USBR				
2003	CA-Friendly Landscapes	$182	New home landscapes	Completed
2003	Data Loggers	$50	Software error analysis	Deferred
2004	CA-Friendly Landscapes	$60	New home landscapes	Completed
2004	Synthetic Turf pilot	$220	Provide incentives	Completed
2004	World Forum	$50	College/university grants	Completed
2004	CII Region wide	$250	Additional dollars to rebate amounts and for administration	Completed
2005	Protector del Agua	$50	Develop web classes	Completed
2005	Landscape Market Analysis	$50	Analyze landscape conservation opportunities	Completed
2005	City Makeover	$50	Public landscapes	Completed
2006	Innovative Conservation Program	$300	Support research projects	Completed
2008	Innovative Conservation Program	$300	Support research projects	In Progress
2012	Sprinkler Nozzle Incentive Program	$1,501	Provide incentives	In Progress
2013	High Efficiency Clothes Washer Program	$500	Provide incentives	In Progress
2014	California Friendly Turf Replacement – Phase 2 Incentive Program	$300	Provide incentives	In Progress
Water for the West				
	Protector del Agua	$25	Develop web classes	Completed
Prop 50				
	Residential HECW	$1,660	Increase rebate amount	Completed
	CA-Friendly Landscapes	$423	Common area landscapes	Completed
	High Efficiency Toilets	$1,000	Increase rebate amount	Completed
	Protector del Agua	$78	Develop on-line classes	Completed
2008	Residential HECW	$2,000	Increase rebate amount	Completed

[1] This is the funding amount and number of installations that represent Metropolitan's share of the project.

Table 3-7
Conservation Achievements in Metropolitan's Service Area

	Qty	Units
CII Rebated Devices (FY 1990-91 to FY 2014-15)		
Audits/Surveys	13,432	ea
Connectionless Food Steamers	56	ea
Cooling Tower Conductivity Controllers	1,196	ea
Dry Vacuum Pump	33	ea
Toilets	196,939	ea
Urinals	37,162	ea
Ice Machines	56	ea
In-stem Flow Regulators	8,701	ea
High Efficiency Washers	36,427	ea
pH Conductivity Controllers	338	ea
Plumbing Flow Control Valves	13,770	ea
Pre-Rinse Spray Heads	17,177	ea
Laminar Flow Restrictors	13173	ea
Multi-Stream Rotating Nozzles	1,247,644	ea
Soil Moisture Sensors	21	ea
Steam Sterilizers	28	ea
Water Brooms	6,931	ea
Weather Based Irrigation Controllers	11,939	acres
Weather Based Irrigation Controllers	246,593	stations
X-Ray Processors	185	ea
High Efficiency Nozzles	78,105	ea
Synthetic Turf	7,455,647	sq. ft.
Turf Removal	27,194,789	sq. ft.
Residential Rebated Devices (FY 1990-91 to FY 2014-15)		
Aerators	158,817	ea
Audits/Surveys	122,810	ea
High Efficiency Clothes Washers	496,511	ea
Toilets	3,184,362	ea
Multi-Stream Rotating Nozzles	1,007,352	ea
Rain Barrels	18,657	ea
Soil Moisture Sensors	39	ea
Showerheads	1,735,436	ea
Turf Removal	38,387,543	sq. ft.
Weather Based Irrigation Controllers	2,226	acres
Weather Based Irrigation Controllers	10,641	stations

Asset Management Program

In fulfillment of California Water Code §10631(f)(2), provided below is a description of Metropolitan's distribution system asset management program.

Metropolitan's approach to asset management is contained within its Infrastructure Reliability Strategy. The goal of Metropolitan's Infrastructure Reliability Strategy is to ensure long-term reliable performance of the system in an efficient and cost-effective manner. Infrastructure reliability is addressed through two primary programs: the Maintenance Management Program and the Infrastructure Protection Plan. The activities performed under these programs allow for Metropolitan to extend the life span of its facilities and equipment and improve the overall reliability of the entire conveyance, treatment, and distribution system.

Maintenance Management Program

Metropolitan manages the maintenance on approximately 135,000 pieces of equipment located at its five treatment plants, sixteen hydro-electric power plants, five desert pumping plants, 242 miles of canals, and over five thousand structures on 819 miles of pipeline.

Computerized Maintenance Management System**:** A Computerized Maintenance Management System (CMMS) is used to track, plan, and schedule the required activities. The system currently has over 28,000 preventative maintenance cycles scheduled with approximately 96 percent of these performed at fixed intervals (Time Based). The remaining four percent are performed based on the condition or use of the equipment (Condition Based).

Routine Maintenance, Inspection, and Monitoring

Monitoring, inspection, and maintenance of equipment and facilities are a proactive effort to assess the overall condition of the assets. It encompasses identifying needed repairs and performing routine maintenance.

Time-Based Maintenance

Metropolitan currently uses time-based maintenance as the primary means of maintaining equipment reliability. Time-based maintenance for equipment is set at specific time intervals using manufacturer recommendations. These recommendations are used to develop Job Plans in the CMMS which detail the individual steps required for a particular maintenance operation.

Condition-Based Maintenance

Condition-based maintenance (CBM) relies on an understanding of how a piece of equipment degrades or fails to meet its intended function. It requires a greater depth of understanding of the manufacturer's recommended maintenance, industry standards, or practices. This knowledge is used in conjunction with field experience to develop a technique to gauge the equipment's condition. Through trending or analysis, a determination can then be made as to when the equipment may reach a point where corrective maintenance will be required including rehabilitation or replacement. A regular inspection cycle is set in the CMMS software to evaluate current equipment condition. High and low condition alarms are also set that trigger a corrective maintenance activity when equipment is starting to degrade or its use has reached a servicing checkpoint.

Predictive maintenance is a subcategory of CBM that uses diagnostic equipment or testing to determine the equipment condition. Predictive maintenance is also used to detect impending problems before the equipment malfunctions. In some cases, Metropolitan has automated the inspections such as through online vibration monitoring systems that trend the performance of critical and large equipment. A fundamental characteristic of this type of maintenance is that it provides the capability to anticipate potential problems while the equipment is still operating. This provides several key benefits when compared to time-based maintenance or allowing equipment to reach a point where corrective maintenance is required. These benefits include: improved availability or uptime, enhanced reliability, and reduced cost.

Corrective Maintenance

Corrective maintenance is performed on equipment that either has already failed or has had a problem detected during routine (time or condition based) maintenance. Corrective maintenance needs to be scheduled, requires replacing equipment components, or involves a shutdown of the impacted system. Corrective maintenance is also tracked, planned, and scheduled in the CMMS.

Major Scheduled Outages/Shutdowns

In addition to the general maintenance described above, Metropolitan may take major systems out of service, such as water treatment plants, large pipelines, conveyance systems, or other large facilities, typically for periods of seven to twenty-one days. This is done to perform major maintenance or repairs on several components or systems, upgrade or add new processes, or perform other important work.

Reports and Metrics

Metropolitan produces internal reports that track maintenance management activities including overall backlog and past due work orders (including any missed regulatory preventive maintenance). In addition, other CMMS reports are available that provide managers, planners/schedulers, and maintenance staff with the data needed to evaluate and track work.

Metropolitan utilizes best management practices and performance metrics from the Society of Maintenance & Reliability Professionals to ensure a reliable and cost effective maintenance management program.

Infrastructure Protection Plan

Activities under the Infrastructure Protection Plan ensure long-term infrastructure reliability by conducting special condition assessments and vulnerability assessments of Metropolitan’s facilities.

Special Condition Assessments

Special Condition Assessments are extensive inspections, investigations, and evaluations of Metropolitan facilities and equipment that go beyond routine maintenance and monitoring activities. The assessments are conducted to identify needed rehabilitation and replacement projects which can lead to long-term reliability programs. These assessments include: inspections of facilities during shutdowns when the facility may otherwise be non-accessible, investigations of systemic issues, and evaluations of Metropolitan's ability to maintain deliveries in the event of an unplanned facility outage or loss of water supply.

Special Condition Assessments may be initiated through requests from Operations, in response to a specific event or concern within Metropolitan’s system, or due to an issue identified within the water industry that could potentially affect Metropolitan. Through these activities, long-term infrastructure reliability programs are developed and executed to ensure that the reliability of Metropolitan's distribution system is unimpeded and the overall life-expectancy of its assets is maintained to the most cost-effective standard possible.

Vulnerability Assessments

Vulnerability Assessments involve simulating hazards such as vehicle impact, flooding, fire, equipment failure, third-party impacts, and earthquakes in order to identify their potential impacts to Metropolitan's ability to deliver water. Like the condition assessments, Vulnerability Assessments utilize operator experience and event reviews to identify potential vulnerabilities and impacts. The assessments evaluate both the reliability of individual facilities, as well as the reliability of Metropolitan's system as a whole, if it is exposed to a potential hazard. It is through these assessments that mitigation options are identified to improve reliability.

Potential mitigation includes facility and equipment upgrades, and procedural changes for designing, operating, or maintaining facilities. In addition, mitigation options may include recommendations for Metropolitan's emergency response planning to improve the capability to respond to an unplanned outage and restore service as quickly as possible. The types of hazards assessed include: seismic activity, hydraulic surge, vehicle impact, equipment malfunction, erosion or flooding, fire, corrosion, wind-blown projectiles, third party construction, and vandalism.

As a part of the Vulnerability Assessments, a specific set of reliability design criteria for water treatment plants have been developed to ensure optimal reliability, starting in the design phase. These reliability design criteria establish design practices that ensure that reliability is designed into new facilities, and that the staff uses this criterion when reviewing each capital project.

3.5 Recycling, Groundwater Recovery, and Desalination

Metropolitan continues to support local resources development through its Local Resources Program. The Local Resources Program provides financial incentives for local agencies to develop supplies including water recycling, groundwater recovery, and seawater desalination.

Metropolitan's involvement in local resources development started in 1982 as the Local Projects Program to provide financial incentives to its member agencies to develop recycled water projects. In 1991, Metropolitan established the Groundwater Recovery Program to provide financial assistance for the development of groundwater recovery projects. In 1995, these two programs evolved into the Local Resources Program (LRP).

Water recycling projects involve further treatment of secondary treated wastewater that is currently discharged to the ocean, streams, or lands and use it for non-potable uses such as landscape and agricultural irrigation, commercial and industrial purposes, and for indirect potable uses such as groundwater recharge, seawater intrusion barriers, and surface water augmentation. Currently, more than half of the water recycling in California occurs in Metropolitan's service area.

Groundwater recovery projects involve treatment of high salinity or contaminated groundwater for potable uses. Groundwater recovery projects use a variety of treatment technologies to remove undesirable constituents such as nitrates, volatile organic compounds (VOCs), perchlorate, color, and salt. Desalination of brackish groundwater and other local supplies enhances the continued supply reliability of the region by maximizing local groundwater resources.

Metropolitan's service area is also leading the development of seawater desalination in California. The 56 TAF Carlsbad Project in San Diego County started operations in December 2015 and represents the largest seawater desalination project in the country. Several other local water agencies are also considering seawater desalination projects. These projects have the potential to help meet Metropolitan's current goals for new local supplies.

Background

Recycling

This section provides a description of the wastewater sources that potentially could be recycled. This section also discusses the existing and potential uses of recycled water, as well as the technical and economic issues associated with those uses. In general, Metropolitan supports:

- Increasing water recycling in California and the Colorado River Basin
- Advocating funding assistance by parties that benefit both directly and indirectly from the use of recycled water
- Expanding recycled water uses
- Reviewing recycled water regulations to ensure streamlined administration, and public health and environmental protection
- Planning efforts and voluntary cooperative partnerships at the local and statewide levels
- Conducting research and studies to address public acceptance, new technologies, and health effects assessments
- Increasing cooperation between agencies to serve recycled water in other agency service areas

Wastewater Disposal in the Service Area

As part of regional planning that encourages use of recycled water, a database has been developed that includes the name of each wastewater treatment facility, operating agency, location and elevation of the facility, extent of wastewater treatment, capacity and anticipated production, method of effluent disposal, and influent and effluent water qualities. Shown in Table 3-8 are the existing and projected total effluent capacities of the wastewater treatment plants from a database of 89 plants identified within Metropolitan's service area.

Wastewater treatment capacity provides an indication of the amount of wastewater being generated and disposed in Metropolitan's service area. Most wastewater plants in the service area provide secondary treatment, a level of treatment that complies with the Clean Water Act. Inland wastewater plants generally provide treatment to tertiary levels so the effluent may be disposed of in a stream or other water body or for beneficial reuse. A small percentage of tertiary treated effluent undergoes reverse osmosis or electrodialysis reversal processes, producing high-quality recycled water for groundwater recharge, industrial uses, or, in some instances, municipal uses.

Within Metropolitan's service area, many local agencies collect and treat municipal wastewater. Some of the largest agencies include:

- Los Angeles County Sanitation Districts
- Orange County Sanitation District
- City of Los Angeles Bureau of Sanitation
- San Diego Metropolitan Wastewater Department
- Eastern Municipal Water District
- Inland Empire Utilities Agency

Table 3-8
Existing and Projected Total Effluent Capacity
Wastewater Treatment Plants within Metropolitan's Service Area

Treatment Level	Existing Capacity (MGD)	2040 Capacity (MGD)
Primary	1,770	3,139
Secondary	1,169	2,708
Tertiary	434	1,464
Advanced	104	229

This data was compiled as part of the Southern California Comprehensive Water Reclamation and Reuse Study.

Many small special-purpose wastewater agencies, dual-purpose (water and wastewater) special districts, and municipal wastewater agencies also provide wastewater treatment and disposal services within Metropolitan's service area.

Wastewater is collected in a sewer collection system. From there, it flows to a wastewater treatment plant. Once treated, wastewater is disposed of through one of three mechanisms:

Ocean Outfalls

Treated wastewater is either disposed of directly through an ocean outfall or conveyed to the ocean outfall via a land outfall.

Reuse

Currently, about 414 TAF per year of recycled water is used for landscape irrigation, industrial processes, and groundwater recharge applications in the region. A few inland treatment plants (in Riverside and San Bernardino counties) irrigate feed and fodder crops with recycled water. While this use is considered beneficial, it is not necessarily the highest and best use for recycled water. Higher value uses of recycled water include landscape or agricultural irrigation, commercial and industrial applications, groundwater recharge, seawater intrusion barrier, and other uses such as street sweeping and dust control, etc.

Stream Discharge

The majority of inland plants discharge treated effluent into local streams and rivers. That water is then used downstream for beneficial uses, eventually flowing to the ocean. Some of the affected rivers (or ephemeral streams) include:

- Los Angeles River
- Santa Ana River
- Calleguas Creek
- Rio Hondo & San Gabriel Rivers
- Santa Margarita River

Uses of Recycled Water

Water recycling is a reliable water supply, and it helps local agencies comply with environmental regulations. Uses of recycled water can generally be categorized as below.

Industrial

Industrial users represent a large potential market for recycled water, particularly in heavily industrialized areas, such as the cities of Vernon, Commerce, Industry, and the Wilmington area of Los Angeles. Additionally, refineries in West Basin MWD’s service area and the city of Torrance use recycled water. Typical industrial uses include cooling tower makeup water, boiler feed water, paper manufacturing, carpet dying, and process water. Industrial users are high-demand, continuous-flow customers, which allows greater operational flexibility by allowing plants to base load operations rather than contend with seasonal and diurnal flow variations. Because of these operational benefits, industrial users reduce the need for storage and other peak demand facilities and management.

Irrigation

Recycled water is used to irrigate golf courses, parks, schoolyards, cemeteries, greenbelts, roadway medians, and agricultural purposes throughout Southern California. Using recycled water for irrigation reduces the need for imported water during the critical summer months and in drought situations when water supplies are scarce. Unlike industrial uses, irrigation demands have large seasonal variations in reuse.

Indirect Potable

Indirect Potable Reuse (IPR) refers to the use of recycled water for groundwater recharge, and surface water reservoir augmentation purposes. These types of uses require additional treatment levels beyond irrigation uses and use of an environmental buffer.

1. *Groundwater Recharge* – Metropolitan's service area overlies numerous groundwater basins, most of which rely on artificial recharge to sustain groundwater production, and some of which are threatened by seawater intrusion. Water agencies along the Los Angeles and Orange Counties coastline inject water into the underlying groundwater basins to create a barrier against this seawater intrusion and protect groundwater quality. The use of recycled water for seawater intrusion barrier projects is increasing and is replacing imported water used for this purpose. Increasing the proportion of recycled water can free imported water for direct consumption. Table 3-9 presents a summary of this recycled water use.
2. *Surface Water Augmentation* – Surface Water Augmentation includes use of advanced treated recycled water to augment a surface water reservoir. The reservoir serves as an environmental buffer (similar to groundwater in the case of groundwater recharge) prior to when recycled water is treated for potable uses. Blended water from the reservoir is then treated at a conventional water treatment plant for potable purposes. There is currently no reservoir augmentation with recycled water in Metropolitan's service area. The Division of Drinking Water (DDW) of the State Water Resources Water Control Board (SWRCB) is required under SB 918 to establish surface water augmentation regulations by December 31, 2016. The City of San Diego is currently operating a demonstration project to evaluate the feasibility and expected permitting requirements of a full-scale reservoir augmentation project.

Table 3-9
2015 Recycled Water Use for
Groundwater Replenishment and Seawater Barrier Injection
(TAF per year)

Groundwater Basin	Recycled Water Use
Central Basin	45
Chino Basin	11
Orange County Basin	88
West Coast Basin	12
Other Basins	2
Total	**158**

Direct Potable Reuse

Direct Potable Reuse (DPR) refers to the use of advanced treated municipal recycled water as a direct supply to or immediately after a conventional water treatment plant. DPR differs from IPR by having no environmental buffer. DPR eliminates the need and cost to store water in an environmental buffer (groundwater or surface water reservoir) for several months and instead requires additional treatment or testing to ensure public health requirements are achieved. Currently, there are no permitted DPR projects in California. DDW is required under SB 918 to review recommendations of an expert panel to evaluate and report on the feasibility of DPR to the legislature by December 31, 2016.

Technical and Economic Issues of Recycled Water

Recycled water use is growing rapidly in Metropolitan's service area. Further expansion depends on progress in research, regulatory change, public acceptance, water quality issues, cost, operational issues, and conflicting institutional objectives. Each of these challenges, as well as opportunities for recycled water use, lessons learned, and recommendations to enhance the development of recycled water, are discussed below.

Challenges

Lengthy and Variable Permitting Process

The SWRCB established the Recycled Water Policy (Policy). This Policy requires the SWRCB and the nine Regional Water Quality Control Boards (Regional Boards) to encourage the use of recycled water, consistent with state and federal water quality laws. The Policy provides additional directions to the Regional Boards on appropriate criteria to be used in regulating recycled water projects. The DDW and the nine Regional Boards are responsible for setting the rules and permitting for recycled water projects. The timeline and roadmap for getting a permit are challenging and inconsistently implemented in different regions of the state. Limited history and technical information (e.g., on direct potable reuse) to inform regulations and limited staffing at DDW and other agencies have challenged the ability to propose, revise, and adopt new regulations in a timely manner. Agencies planning and designing DPR and IPR projects face delays because of regulatory uncertainty. In addition, many project proponents hoping for grant or loan funding have identified lengthy CEQA review as a challenge.

Indirect potable reuse projects face regulatory constraints such as treatment, blend water, retention time, and Basin Plan Objectives, which are the designated uses assigned by the SWRCB and which may limit how much recycled water can feasibly be recharged into the groundwater basins. For example, the Basin Plan Objective for TDS of a particular basin may be lower than the quality of the tertiary water effluent available, resulting in the need for more blend water or advanced levels of treatment. These treatment requirements impact the economic feasibility of a project.

Public Perception/Conflicting Messaging

Conflicting messaging confuses the public about the safety of recycled water. There is not a clear understanding by the public of the difference between non-potable reuse, indirect potable reuse, and direct potable reuse uses. The public is most familiar with non-potable reuse as they see recycled water in use at parks, golf courses, schools, and other large landscapes. However, public perception and acceptance of drinking recycled water (IPR and DPR) is a much bigger challenge. Signage for non-potable reuse projects at parks, schools, and golf courses that read, "Using recycled water; do not drink" can adversely affect the public's acceptance of DPR and IPR. Although public acceptance of recycled drinking water has improved, effective education and public outreach is still needed. There is a need for new messaging to reduce the confusion.

Cost

Cost, including up-front capital and ongoing operation and maintenance, remains a barrier to recycled water development. Most low-cost projects have been built. The price tag for expanding the recycled water distribution systems remains a barrier to full implementation of non-potable reuse projects – these projects require pipelines connecting the treatment plants and the individual users. Some agencies may also be considering indirect potable reuse and direct potable reuse projects to reduce the need to have extensive recycled water distribution systems because of the cost. Some non-potable reuse and indirect potable reuse projects and all direct potable reuse projects require advanced treatment facilities, which are comparatively expensive. Advanced treatment may also require additional brine concentrate disposal facilities (e.g., a brine line) and extensive infrastructure for injection wells/spreading facilities, or for delivery of the product water to a spreading ground, surface reservoir, or water treatment plant for potable uses. End users play a very important role for recycled water advancement. Site conversion costs (borne by the customer) and additional conveyance infrastructure for new customers can also be a barrier to reaching full non-potable reuse project capacity. Some agencies may be challenged with cash flow issues or cannot secure the funding needed to implement projects.

In addition, with the increasing prospect of statewide regulations for indirect potable reuse and direct potable reuse, some agencies pursuing indirect potable reuse are hesitant to extend their existing distribution system for non-potable reuse projects for fear of stranded facilities. Similarly, some agencies pursuing direct potable reuse may delay their planned indirect potable reuse projects to prevent stranded distribution facilities[7].

Source Control and Effluent Water Quality Needs

Source water quality and flow control is essential to help safeguard the water recycling treatment process and the end use of the water by placing controls on the type, timing, and amount of wastewater that comes into the plant. A good source control program limits treatment plant disruptions and ensures treatment processes are capable of handling spikes in volume, industrial influent, and high salinity influent. When it comes to the treatment process, recycled water policy requires that the effluent meets certain water quality standards. Salt and nutrient management plans protect groundwater beneficial uses and prevent excess degradation, which may limit expanded indirect potable reuse applications if the agency does not have funds for advanced treatment to remove salts to meet the Basin Plan Objectives. In some cases, existing source control plans may need to be updated to deal with constituents of emerging concern and with more stringent needs of the users.

Water use efficiency helps conserve water, but also incidentally reduces wastewater volume resulting in an increase in the concentration of wastewater. As a result, additional treatment is needed, which increases operation and maintenance costs of the system. Source water quality is especially important for implementing indirect potable reuse and direct potable reuse projects to protect potable water systems.

Operational Issues

While each agency is different, it is important to recognize the possible operational issues that may occur with the use of recycled water, including:

- Reduction in wastewater flows due to ongoing conservation and drought

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[7] Indirect potable reuse projects usually require injection wells or a distribution system to a surface reservoir or recharge basin, and may also require improvements to a surface reservoir, recharge basin, or treatment facility.

- Lack of seasonal storage to address diurnal and seasonal demands; construction of storage facilities may be needed for flow equalization
- Brine disposal needs
- Environmental flow or stream discharge requirements may limit the ability to deliver recycled water during high demand periods
- Regulatory issues such as blend requirements and water quality objectives may impact the effectiveness of indirect potable reuse
- Lack of regional GIS data to optimize recycled water deliveries
- Need for multiple barriers to ensure recycled water quality and for monitoring techniques that provide feedback in real-time to respond to plant disruptions, especially with DPR projects
- Need for additional operator training and certification

Conflicting Institutional Objectives

Institutional coordination among drinking water, wastewater, and groundwater management agencies may be challenging, and the agencies may face barriers due to the difficulty in aligning varying institutional objectives. The main objective of a wastewater agency is to collect, treat, and safely dispose of wastewater based on a set of established standards. This may conflict with the objectives of a groundwater agency that is legally tasked to protect the quality of groundwater. At the same time, water agencies developing recycled water projects are usually seeking a consistent, higher quality treated wastewater for a successful recycling program – though the wastewater agency may not be treating the wastewater to such higher quality for its normal disposal, and the groundwater agency may still be concerned about the quality of the return flows of this recycled water to the groundwater basin.

Opportunities

Progress Towards New Regulatory Process

The State of California has made some progress in developing permit standards that provide opportunities to expand recycled water use.

Non-potable reuse: The SWRCB developed a general permit for non-potable uses of recycled water in June 2014 that provides an opportunity for new projects to come online sooner with more standardized monitoring requirements. Further, revisions are being considered to attract additional users and further streamline recycled water projects.

Indirect and direct potable reuse: The SWRCB is facing a December 2016 deadline under SB 918 to develop regulations for surface water augmentation and to investigate and report to the legislature the feasibility of DPR.

Metropolitan is also working with the WateReuse Association and other agencies on legislative and regulatory issues to streamline permitting processes and to provide needed funding and support for increased use of the recycled water.

New Funding Opportunities

On January 17, 2014, as part of the governor's emergency drought declaration, the SWRCB, under the Clean Water State Revolving Fund, offered up to $800 million in low-interest loans for water recycling projects that offset or augment state water supplies and can be completed within three years. Projects must apply for the funding through the SWRCB by December 2, 2015. As of May 27, 2015, over 30 projects had applied requesting more than $1.6 billion in funding.

Proposition 1 (Assembly Bill 1471, Rendon) authorized $7.545 billion in general obligation bonds for water projects with $725 million for water recycling and desalination projects. Another $625 million will be administered through SWRCB's Water Recycling Funding Program for water recycling and $100 million through DWR for desalination.

In 2014, Metropolitan increased the financial incentives under its Local Resources Program (LRP) for agencies to develop recycled water. Metropolitan also established the On-site Retrofit Pilot Program to provide rebates to customers that convert their irrigation and industrial system from potable water to recycled water. In addition, Metropolitan established the Reimbursable Services Program to provide technical and construction assistance to its member agencies for local project development. Under this program, Metropolitan advances funds and is reimbursed by the agency.

Improving Public Perception

The drought has heightened water awareness in the region and has provided momentum for water conservation and reuse. The public is more willing to accept alternative supplies such as recycled water. Public outreach and education have also helped improve the public's perception of recycled water. Public sharing of information, open door stakeholder meetings, and focus groups have been very effective at distributing information and addressing public concerns. Case studies and demonstration projects are used to educate and improve public perception on recycled water.

Ample opportunities exist for cooperation among agencies to address the issue of conflicting and confusing messaging by branding or the use of alternative terminologies. A regional workgroup could explore and encourage outreach partnerships among agencies.

New Technologies, Research, and Information Sharing

New technologies, research, and information sharing greatly enhance the development of recycled water. Programs such as Metropolitan's Foundational Actions Funding Program focus on technical studies and pilot projects that reduce barriers to future local production. Projects under this program include optimizing new treatment techniques for recycled water, exploring new monitoring methodologies, and testing innovative brine concentration technology. In addition to the technical portions of this program, the FAF Program supports collaboration between agencies and regional sharing of information.

Research is especially critical in advancing new water supply options, such as DPR. WateReuse, in partnership with other agencies (including Metropolitan), is leading the California Direct Potable Reuse Initiative[8] to advance DPR as a water supply option in California and to address regulatory, utility, and community concerns. WateReuse's report *Direct Potable Reuse: A Path Forward*[9] provides an overview of DPR and identifies research needs.

Regional studies can also examine the needs of multi-jurisdictional areas and foster communication among agencies to promote the use of recycled water. For example, sharing regional information such as GIS data can identify areas of recycled water surpluses and needs.

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[8] https://www.watereuse.org/foundation/research/direct potable reuse-Initiative

[9] https://www.watereuse.org/product/direct-potable-reuse-path-forward

In addition, a clearinghouse could be developed to collect and disseminate information on research and technology developments and studies.

Partnerships

Drinking water, wastewater, and groundwater management agencies share some common objectives, including access to source water, cost minimization, and protection of the environment. Many agencies are successfully cooperating and developing recycled water projects. These partnerships can allow sanitation districts to reduce the cost of disposing treated wastewater in the ocean, reduce impacts to the marine environment, and provide a source of reclaimed water to water agencies for recycling. At the same time, groundwater basin management agencies could be the recipients of final recycled water, helping maintain or increase groundwater levels.

Lessons Learned

There have been many success stories on recycled water development. Focusing on public outreach and education has improved public perception. Partnerships and joint efforts among water and wastewater agencies proved to be an effective way to remove barriers and make progress. Numerous studies and research funded by federal, state, and local agencies are benefitting local and regional effort.

Public Outreach is Important

Public outreach and education have helped improve the public's perception of recycled water. When the public is informed and takes part in the decision making process, they will likely be more accepting of a project.

Water shortages raise awareness for alternate ways to conserve. As a result, the public is more willing to accept alternative supplies such as recycled water, support the more expensive projects, and tolerate rate increases. Some residential property owners are interested in using recycled water for watering plants to help with the drought. For example, residents have access to recycled water from "residential recycled water fill stations" in the Irvine Ranch Water District. Developing similar programs throughout Southern California would help increase recycled water use and conservation of potable supplies.

Additional Funding is Needed

LRP incentives and onsite retrofit program funding have increased use of recycled water in the region by almost 200 percent. However, incentives alone may not be enough to spur project development - capital funding is also necessary because the LRP only provides funding after a project begins operation. As an example, even though Metropolitan recently increased its LRP incentive rates, there are only a few applications for new projects because agencies lack capital funding to construct the project in the first place. Although available construction funding for recycled water projects has increased under the recently passed Proposition 1, projects generally still require a 50 percent local match. One source of funding is typically not enough to fund a recycled water project.

Funding is also needed for studies, pilot projects, and research. Metropolitan's Foundational Actions Funding Program provided funding for studies and pilot projects to help advance the development of local supplies.

Partnerships Can Be Successful

History shows us that partnerships among agencies help advance use of recycled water and provide tangible benefits to each participating agency. A good example of partnerships working well is the agreement between Orange County Water District (OCWD) and the Orange County Sanitation District. This partnership began in the 1970s, when OCWD built the Water Factory 21 to produce recycled water to mitigate seawater intrusion in the Orange County Groundwater Basin. Twenty years later, the two agencies decided to jointly build the Groundwater Replenishment System (GWRS) recycled water project. The GWRS is the largest planned indirect potable reuse facility in the world with a current capacity of 100,000 AFY and future expansion to 130,000 AFY.

Other examples of cooperation between agencies to further recycled water use include partnerships between the city of Los Angeles and West Basin Municipal Water District (West Basin Water Recycling Program), the City of Los Angeles and the City of Burbank (North Hollywood Water Recycling Project), City of Long Beach and the Water Replenishment District (Alamitos Barrier Water Recycling Project), and the Sanitation Districts of Los Angeles County and Central Basin Municipal Water District (Century and Rio Hondo Water Recycling Project).

Water Industry Organizations and Regional Collaboration Help Advance Recycled Water

Recent advancements to recycled water development are due, in large part, to cooperation and collaboration among water and sanitation districts, as well as other water industry organizations. Historically, the WateReuse Association was one of the main advocates for recycled water development in the state. Their activities initially focused on permitting issues, public outreach/education, conferences for information sharing, and research related to recycled water. As recycled water became a core resource for water and wastewater agencies, they started to ramp up their activities to help advance recycled water and utilized partnerships with academia along with other trade organizations such as the Association of California Water Agencies, California Urban Water Agencies, WateReuse Association, and California Association of Sanitation Agencies. Professional organizations such as American Water Works Association (AWWA) are another vehicle to promote recycled water through research, technical seminars, and operator training and certification. These organizations have proven to be effective in promoting regional collaboration on research and leveraging resources.

Recommendations

Explore Opportunities to Improve Permitting Process

- Streamline and simplify water recycling regulations with uniform administration consistent with operations, public health, and the environment
- Support legislation and regulation that expands the types of recycled water uses consistent with the protection of public health and help achieve the state's recycled water goal (an additional 1 million acre-feet by 2020)
- Convene a forum to discuss projects, permitting, and treatment technologies

Improve Public Education and Awareness of Water Recycling

- Pursue unified, consistent messaging
- Consider expanding residential fill stations to further advance public acceptance of recycled water

Explore Various Investment Strategies, Such as Incentives, Ownership, and Partnerships

- Promote collaboration among stakeholders and agencies to facilitate implementation of recycled water projects in California
- Promote development of new financing to increase water recycling, advance research in science and technology, assess health effects, develop additional regional planning, and study innovative technologies
- Explore a business case for further development of recycled water partnerships or ownership
- Consider additional end user programs to replace potable water systems with recycled water
- Collaborate on pursuing grant funding

Consider Joint Technical Studies and Projects

- Explore a collaborative regional effort to develop a regional GIS data set
- Explore integration approaches
- Investigate programs for the development of new technologies, such as comprehensive real-time monitoring devices and techniques that improve water quality and ensure public health, and maintain public confidence
- Study opportunities to protect or improve the quality of wastewater source supplies
- Explore development of a regional study to help identify opportunities for seasonal storage

Groundwater Recovery

All Southern California groundwater basins experience varying degrees of water quality challenges as a result of urban and agricultural uses. The accumulation of high-salinity water and degradation from volatile organics are two common constraints to the economic use of groundwater for urban applications. In some cases, the threat of increased salt buildup can also complicate conjunctive use of groundwater basins and imported supplies.

Use of degraded groundwater normally requires high levels of treatment. Membrane processes used to recover the majority of severely degraded water have a high capital cost and incur a high operational cost for power. Once treated, however, recovered groundwater may be integrated into potable water systems. Metropolitan initiated its Groundwater Recovery Program (GRP) in 1991 to encourage local agencies to treat and use degraded groundwater for municipal purposes. The GRP was open to all technologies that recovered and used degraded groundwater. It was retired in 1998 and folded into Metropolitan's LRP.

Seawater Desalination

The constant availability of ocean water regardless of weather or climate is one of the key benefits of seawater desalination. Thus, Metropolitan and its member agencies have been considering seawater desalination as a potential new supply source since the 1960s. Up until the 1990s, seawater desalination was considered too expensive compared to other resource alternatives, especially imported water. However, advances in membrane technology, energy recovery, and process design in the 1990s lowered desalination costs compared to other new supply alternatives. By the early 2000s, several member agencies began pursuing local projects to diversify their resource portfolios. In 2001, Metropolitan created an incentive program, the

Seawater Desalination Program, to support these projects. Soon after, the Board approved Metropolitan's role as a regional facilitator for seawater desalination with the purpose of assisting the member agencies with state and regional development issues. In 2014, Metropolitan merged seawater desalination projects into the LRP to promote development of additional local supplies in the region.

Changed Conditions

The status of locally planned projects changes from year to year. Metropolitan periodically surveys its member agencies for planned projects to coordinate local supply projections and plans. Recent changes in long-term strategies, regulations, and funding priorities could provide new opportunities to develop these resources.

Recycled Water

Several recent state policies and adopted codes help recycled water development as described below.

SWRCB adopted the State Recycled Water Policy (Policy) in February 2009 after several years of negotiation and amended it in 2013 to include the monitoring and analytical requirements for constituents of emerging concern (CEC). The Policy supports the SWRCB Strategic Plan to promote sustainable local water supplies and establishes a mandate to increase the use of recycled water in California by 1 MAF per year over 2002 levels (approximately 525,000 AF) by 2020 and by an additional 3 MAF per year by 2030. The Policy is organized into recycled water goals, roles of agencies, salt and nutrient management plans, landscape irrigation, groundwater recharge, anti-degradation, emerging constituents, and recycled water incentives.

SWRCB's General Permit for Recycled Water Use was adopted June 4, 2014, in response to the Governor's draught declaration and to facilitate the use of recycled water to offset potable water demands. Coverage is available to most treated municipal wastewater for non-potable uses, but specifically excludes groundwater replenishment. Monitoring for CECs is not required for non-potable uses. Application of recycled water for irrigation sites is limited to agronomic rates.

On November 18, 2009, the Building Standards Commission unanimously voted to approve the California Dual Plumbing Code that establishes statewide standards for installing both potable and recycled water plumbing systems in new commercial, retail, and office buildings, theaters, auditoriums, condominiums, schools, hotels, apartments, barracks, dormitories, jails, prisons, and reformatories. The code was adopted January 15, 2010, with an effective date of January 1, 2011.

Assembly Bill 2071 (Levine 2014) directs SWRCB by December 31, 2016, in consultation with other agencies, to determine if the voluntary use of disinfected treated recycled water for watering animals would pose a significant risk to the public and animal health. The SWRCB shall approve the use or establish uniform statewide recycling criteria to address identified risks. Use of recycled water would be prohibited for dairy animals that are producing items for human consumption.

Assembly Bill 2282 (Gatto 2014) directs the California Building Standards Commission to adopt in the 2016 Intervening Code Adoption Cycle mandatory building standards for the installation of recycled water systems for newly constructed commercial and residential buildings in areas where there is access to a water recycling facility.

Groundwater Recovery Brine Disposal

The management of existing regional brine lines and the development of new brine line systems will be a critical factor in the continued growth in brackish groundwater desalination. The brine line will also be applicable for disposing brine from advanced treatment of wastewater for recycled water use. All processes that recover degraded groundwater also produce concentrated waste flows for which disposal can be problematic. Most importantly, membrane processes such as reverse osmosis – the predominant desalting technology used in Southern California – produce significant volumes of brine that can account for about 15 percent of the treated water. In Southern California, brines generated from brackish water desalination are typically disposed through dedicated brine lines to ocean outfalls or sanitary sewers.

The region currently has one fully operating brine line, the Santa Ana Regional Interceptor (SARI line). The SARI line collects brine from desalters in San Bernardino, Riverside, and Orange Counties. A key benefit of the SARI line is that it has allowed inland water agencies to recover impaired groundwater resources which would otherwise be unusable.

A lower portion of a second brine line, Calleguas Regional Salinity Management Pipeline, is in operation while the upper reach is still under construction. The Calleguas Regional Salinity Management Pipeline delivers brine from recycled water plants and groundwater desalination facilities in Ventura County to the ocean.

A third regional line is in the planning phase in San Diego County. The Southern California Salinity Coalition, a coalition of water and wastewater agencies, has advocated for state and federal financial assistance to build these regional brine lines.

Seawater Desalination

In the past five years, State agencies have implemented new regulations which could negatively impact the future development of seawater desalination. This includes the SWRCB's Ocean Plan amendments and Once-Through Cooling regulations, as well as the establishment of Marine Life Protected Areas (MLPAs) in Southern California. At the same time, the impacts of the current drought and the potential for multi-decadal dry-periods due to climate change have increased interest in seawater desalination as a potential long-term response to water shortages.

Ocean Plan Regulations

In May 2015, after five years of development, the SWRCB updated California's Ocean Plan with regulations affecting new seawater desalination projects. The regulations include stringent requirements for intakes, outfalls, brine discharges, and marine life mitigation. Regional Water Quality Control Boards will be responsible for implementing the regulations and will have broad powers over project design elements. The new regulations may increase project costs and could limit the ability to develop regional-scale projects.

Once-Through Cooling Regulations

Prior to the revised Ocean Plan regulations, the SWRCB in 2010 adopted regulations requiring coastal power plants to phase out the use of once-through-cooling (the use of seawater to cool generators in a single-pass system) by 2030. As once-through-cooling is phased out, many of the environmental and operational benefits of co-locating seawater desalination projects with power plants will be diminished. However, coastal power plants remain attractive sites for development due to the presence of coastal-dependent industrial zoned land, power infrastructure, and the potential to repurpose existing infrastructure.

Marine Life Protected Areas

In 2011, the California DFW adopted a system of 50 MLPAs covering approximately 15 percent of Southern California's coastline[11]. MLPAs are defined zones along the coast where certain commercial and recreational activities are restricted. Most construction and operational activities associated with seawater desalination are prohibited in MLPAs with the exception of certain types of subsurface intakes. MLPAs are located along the Channel Islands, as well as along the mainland coast. The MLPAs network includes areas near planned seawater desalination projects. Depending on how MLPAs enforcement regulations are interpreted, they could be a limiting factor for some planned seawater desalination projects.

Implementation Approach

Local Resources Program

The Local Resources Program (LRP) is the primary tool for Metropolitan to incentivize local resources development. The success of the LRP is due to its adaptability to changed conditions. Periodically, Metropolitan and its member agencies review and update the LRP in response to water supply conditions.

Metropolitan continues to explore ways to help increase recycled water use. In order for a site to receive recycled water, the potable water systems must be retrofitted for recycled water use. On-site conversion costs (borne by customers) are generally high. In July 2014, Metropolitan established the On-site Retrofit Pilot Program to provide financial incentives to customers for the conversion of their potable industrial and irrigation systems to recycled water.

Furthermore, in October 2014, Metropolitan made significant improvements to the LRP that included increasing the incentive amount and providing three incentive payment structures. Metropolitan offers three LRP incentive payment structure options to choose from: sliding scale incentives up to $340/AF over 25 years, sliding scale incentives up to $475/AF over 15 years, or fixed incentives up to $305/AF over 25 years. In addition, onsite retrofit costs for recycled water uses are eligible for LRP incentives. Under the enhanced program, LRP projects include other local water resources development including seawater desalination. To expedite development of ready-to-proceed projects, Metropolitan would also provide reimbursable services, such as engineering design, to member agencies.

Regional Recycling Program

On November 10, 2015, Metropolitan's Board authorized Metropolitan to enter into an agreement with the County Sanitation District No. 2 of Los Angeles County (Sanitation District) to implement a demonstration-scale recycled water treatment plant and to establish the framework of terms and conditions for development of a regional recycled water supply program. Under this proposed agreement, Metropolitan has the opportunity to work collaboratively with the Sanitation District to develop a potential regional recycled water supply program that would purify and reuse water for the recharge of groundwater basins. Metropolitan and the Sanitation District would jointly develop this program to purify secondary effluent from the Sanitation District's Joint Water Pollution Control Plant (JWPCP) using advanced treatment technologies to produce water that is near-distilled in quality and that

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[11] http://www.wildlife.ca.gov/Conservation/Marine/MPAs/Network/Southern-California

would be equal to or better than the quality of water currently used to replenish groundwater basins in the Southern California region. The secondary effluent from the JWPCP is currently discharged to the Pacific Ocean. The purified water would be delivered to Metropolitan's member agencies to meet their groundwater recharge and storage requirements. A collaboration between the two districts could advance the reuse of water at a scale, timing, and strategic location to serve the direct needs of multiple member agencies for recharge of groundwater basins in Southern California, and to augment regional supplies for Metropolitan's service area.

The demonstration project would serve as a proof of concept and would provide critical information needed for implementation of a potential regional recycled water supply program. The demonstration project would consist of three components: (1) a one million gallon per day (MGD) demonstration-scale treatment plant, which would verify source water quality criteria and confirm the advanced treatment process needed to purify water for groundwater recharge; (2) feasibility studies of the delivery system to determine the distribution facilities, routing, capacity, phasing, and timing needed to recharge various groundwater basins within Metropolitan's service area, and (3) a financing plan to assess the economic viability of a full-scale regional program. The proposed agreement also establishes the framework for the development of a full-scale regional recycled water supply program that would enable a potential reuse of up to 150 MGD of treated effluent from the Sanitation District's JWPCP.

Seawater Desalination Program

Metropolitan's Seawater Desalination Program (SDP) was created in 2001 through a competitive Request for Proposals (RFP) to encourage the development of potential projects by local agencies. Like the LRP, it offers sliding-scale incentives to member and local agencies, providing up to $250 per AF for produced supplies. In response to the RFP in 2001, Metropolitan entered into SDP agreements with three member agencies. The Carlsbad Project was originally part of the SDP program, but has proceeded without an SDP agreement or incentives. A fifth potential project in the initial RFP was not pursued.[12] In 2014, Metropolitan expanded regional funding opportunities for seawater desalination by merging it into the LRP incentive program described above. Table 3-10 provides a summary of the status of the SDP projects. Local agencies are also considering a number of projects independent of the SDP with the potential to produce up to 360 TAF per year if developed. Table 3-11 provides a summary of these local agency projects.

Metropolitan also provides regional facilitation for seawater desalination by providing technical assistance, supporting member agency projects during permit hearings and other proceedings, coordinating responses to proposed legislation and regulations, and working with the member agencies to resolve related issues. To further these goals, Metropolitan help found and now participates in CalDesal, a consortium of water utility and private companies promoting desalination as an element of California's future supply portfolio.

Achievements to Date

Metropolitan has continued to develop and refine its programs to encourage the involvement of its member agencies in water recycling, groundwater recovery, and desalination. Developing and managing these programs requires considerable coordination and refinement. Changing conditions over the last five years have reduced the costs of these options and allow Metropolitan to rely on these sources for future water supply.

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[12] The LADWP opted to not pursue its potential seawater desalination project in the mid-2000s.

Metropolitan is committed to providing financial assistance to the development of water recycling projects throughout its service area. Since 1982, Metropolitan has executed LRP contracts for 75 recycled water projects, 59 of which produced about 184 TAF in 2015. Local projects not receiving funding from Metropolitan provide an additional 272 TAF of recycled water to the region.

Since 1991, Metropolitan has executed GRP and LRP contracts for 24 recovered groundwater projects, 22 of which produced about 57 TAF in 2015. In addition to the projects under Metropolitan's programs, about 50 TAF of degraded groundwater is recovered by agencies in Metropolitan's service area without Metropolitan's financial assistance.

Table 3-12 provides a summary of recycled water use and groundwater recovery in 2015. To date, Metropolitan has invested $372 million in recycling programs and $132 million for groundwater recovery. Table 3-13 provides a summary of the groundwater and recycled water production and incentive payments under Metropolitan's programs to date.

Member agency seawater desalination projects under Metropolitan's SDP are still in the planning stages, though significant pilot testing and related studies have been completed by the local agencies in support of the projects. The 56 TAF Carlsbad project was completed and is now operational without Metropolitan's financial assistance.

Table 3-10
Seawater Desalination Program Project Status

Project	Member Agency Service Area	Capacity Range AF per Year	Status	SDP Agreement
Long Beach Seawater Desalination Project	Long Beach Water Department	10,000	Long-term intake testing	Yes
Doheny Desalination Project	Municipal Water District of Orange County/ South Coast Water District	5,000 – 16,000	Pre-EIR Studies	Yes
Carlsbad Seawater Desalination Project	San Diego County Water Authority	56,000	Operational	No
West Basin Seawater Desalination Project	West Basin Municipal Water District	20,000 – 60,000	Pre-EIR Studies	Yes
Total: Seawater Desalination Projects		**91,000 – 142,000**		

Table 3-11
Other Potential Seawater Desalination Projects in Metropolitan's Service Area

Project	Member Agency Service Area	AF per Year	Status
Huntington Beach Seawater Desalination Project	Municipal Water District of Orange County / Orange County Water District	56,000	Permitting
Camp Pendleton Seawater Desalination Project	San Diego County Water Authority	56,000 to 168,000	Planning
Ventura County	Calleguas Municipal Water District	20,000 to 80,000	Feasibility Study
Rosarito Beach	San Diego County Water Authority, Otay Water District	56,000 to 112,000[1]	Feasibility study
Total: Other Potential Projects		**160,000 – 360,000**	

[1] Metropolitan's service area would receive a share of the total supply produced by the project.

Table 3-12
2015 Recycled Water Use and Groundwater Recovery
(TAF)

Type of Project	With Metropolitan Funding	Without Metropolitan Funding	Total
Recycled Water[1]	184	230[1]	414
Groundwater Recovery	60	55	115
Total	**244**	**285**	**529**

[1] Including 60 TAF of Santa Ana River baseflow.

Table 3-13
Local Resources Program

	Recovered Groundwater	Recycled Water	Total
Projects			
In Operation	24	75	99
Ultimate Yield (TAF)	112	310	422
Deliveries (TAF)			
FY 2014-2015	60	184	244
Since Inception	791	2,237	3,028
Payments ($ millions)			
FY 2014-2015	$8	$30	$38
Since Inception	$132	$372	$504

3.6 Surface Storage and Groundwater Management Programs: Within the Region

Since the 1950s, local water management in Metropolitan's service area has included the surface water storage and conjunctive use of groundwater. Conjunctive use of water refers to the use and storage of imported surface water supplies in groundwater basins and reservoirs during periods of abundance. This stored water is available for use during periods of low surface water supplies as a way of augmenting seasonal and multiyear shortages.

Background

Metropolitan established general long-term storage guidelines in its WSDM Plan. The WSDM Plan provides for flexibility during dry years, allowing Metropolitan to use storage for managing water quality, hydrology, SWP, and CRA issues. Dry-year surface storage yields have been characterized in several ways, including delivery capabilities over two- and three-year dry periods. The approach used in Metropolitan's resource planning assumes that dry-year surface storage can be used as needed and as available within the WSDM planning framework. In addition to surface reservoirs in the region, storage capacity in the region's groundwater basins allows for conjunctive use programs. In 2000, the Association of Ground Water Agencies (AGWA) published Groundwater and Surface Water in Southern California: A Guide to Conjunctive Use that estimated the potential for dry-year or long-term conjunctive use in Metropolitan's service area at approximately 4.0 MAF. In 2007, Metropolitan published the Groundwater Assessment Study that estimated 3.2 MAF of space in groundwater basins available for storage within Metropolitan's service area. Metropolitan's 1996 IRP calls for the development of conjunctive use programs with member agencies and groundwater basin managers to store surplus imported supplies in wet years to provide dry-year supplies.

To prepare for supply disruptions, Metropolitan and its member agencies have adopted goals for water storage within the region. Metropolitan has identified in-region storage that should be set aside for use in emergencies, such as a disruption to imported supplies due to a major seismic event at the San Andreas Fault.

Implementation Approach

Surface Storage

Since the beginning of the Metropolitan's planning process, two significant changes have occurred to regional surface storage. These two changes are the construction of DVL and Metropolitan receiving operational control of 218,940 AF in Castaic Lake and Lake Perris.

Diamond Valley Lake

Construction of Southern California's newest and largest reservoir nearly doubled the area's surface water storage capacity. Transport of imported water to the lake began in November 1999, and the lake reached capacity in early 2003. DVL holds up to 810 TAF, some of which is for dry-year or seasonal storage, and the remainder for emergency storage.

SWP Terminal Reservoirs

Under the 1994 Monterey Agreement and Amendment, Metropolitan received operational control of 218,940 AF in the reservoirs at the southern terminals of the California Aqueduct. Control of this storage capacity in Castaic Lake and Lake Perris gives Metropolitan greater flexibility in handling supply shortages. In 2005, seismic concerns arose regarding Perris Dam. In response, DWR reduced the storage amount at Lake Perris by half until those concerns can be studied and addressed; however, Metropolitan's operational storage remained the same. Since then, Metropolitan has continued to withdraw and replace water from the reservoir operating from the lower level. In November 2011, DWR issued a Final EIR for the repair of the dam at Lake Perris. Construction work began on August 2014 and is anticipated to continue through 2017.

Groundwater Storage

Many local groundwater storage programs have been implemented over the years to maximize the use of local water supplies. These programs have included the diversion of water flows into percolation ponds for recharging groundwater basins and the recovery of degraded groundwater.

- For many years, flood control agencies within Metropolitan's service area have captured and spread stormwater for groundwater replenishment. Local runoff and reclaimed water have been conserved via spreading grounds, injection wells, reservoirs, and unlined river channels. In addition, flood control agencies have operated seawater barrier projects in Los Angeles and Orange Counties to prevent seawater intrusion into the coastal groundwater basins.
- Water quality problems have raised serious concerns about the ability to sustain average annual production levels in some groundwater basins. The federal Superfund program, although slow to implement clean-up projects, has helped maintain or increase the usable groundwater. These increased levels have been augmented by groundwater water recovery projects discussed in Section 3.5.

Conjunctive use of the aquifers offers an even more important source of dry year supplies. Unused capacity in Southern California groundwater basins can be used to optimize imported water supplies, and the development of groundwater storage projects allows effective management and regulation of the region’s major imported supplies from the Colorado River and SWP. Over the years, Metropolitan has implemented conjunctive water use through various programs. Typically, this storage takes place in one of two ways:

- Direct deliveries to storage – Metropolitan delivers recharge water directly to water storage facilities, including spreading sites and injection wells.
- In-lieu deliveries to storage – Metropolitan delivers additional water directly to a member agency’s distribution system. The member agency then uses this water rather than pumping the groundwater it otherwise would have taken out of storage. The deferred local production results in water being left in local storage (surface or groundwater) for future use.

Metropolitan has developed a number of local programs to work with its member agencies to increase storage in groundwater basins. Metropolitan has encouraged storage through its cyclic and conjunctive use storage programs. These programs allow Metropolitan to deliver water into a groundwater basin in advance of agency demands. Cyclic storage agreements allow pre-delivery of imported water for recharge into groundwater basins in excess of an agency’s planned and budgeted deliveries making best use of available capacity in conveyance pipelines, use of storm channels for delivery to spreading basins, and spreading basins. This water is then purchased at a later time when the agency has a need for groundwater replenishment deliveries. Conjunctive use agreements provide for storage of imported water that can be called for use by Metropolitan during dry, drought, or emergency conditions. During a dry period, Metropolitan has the option to call water stored in the groundwater basins pursuant to its contractual conjunctive use agreements. At the time of the call, the member agency pays Metropolitan the prevailing rate for that water. Metropolitan has drawn on dry-year supply from cyclic storage accounts and nine contractual conjunctive use storage programs to address shortages from the SWP and the CRA.

Achievements to Date

In 2000, Metropolitan entered an agreement with DWR to administer $45 million of Proposition 13 state bond funds for Metropolitan's Southern California Water Supply Reliability Projects Program. Metropolitan paired the $45 million of state funds with $35 million of Metropolitan capital funds to develop nine groundwater storage programs in partnership with member and retail agencies and groundwater basin managers. These nine contractual storage programs provide for storage of up to 212 TAF and dry-year yield of up to 70 TAF. These programs are summarized in Table 3-14.

In 2007, Metropolitan prepared the Groundwater Assessment Study Report in collaboration with its member agencies and with groundwater basin managers. The report finds that while there is substantial storage space in service area groundwater basins that could be used for conjunctive use, there are significant challenges that must be overcome in order to implement additional storage programs. Use of additional storage opportunity requires:

- Capture, delivery, and recharge of additional local and imported surface supplies;
- Improved capability to store available surplus surface supplies with adequate conveyance and recharge capacity; and
- Resolution of constraints including: remediation of contamination, institutional and legal issues, funding for significant investment in capital infrastructure, and incongruity between aquifer capability with overlying demand for water supplies.

To follow up on the findings of the Groundwater Assessment Study Report, Metropolitan initiated a series of seven groundwater workshops beginning in July 2008 among Metropolitan, member agencies, groundwater basin managers, and stakeholders to discuss challenges for increasing conjunctive use and to develop recommendations for addressing the challenges. The workgroup's recommendations were submitted as a Board Report to Metropolitan's Board of Directors and provided as input to Metropolitan's current planning process. The recommendations are as follows:

1. Enhance groundwater recharge with increased stormwater, recycled water, and imported water recharge.
2. Streamline requirements, remove policy constraints, clarify procedures, increase coordination and sharing of information to accomplish recharge goals.
3. Develop flexible regional policies and programs that can be tailored to meet specific local needs of each groundwater basin.
4. Increase integration of local groundwater and regional water supplies with a proposal for a comprehensive modeling study to initiate review of innovative opportunities.
5. Use appropriate price signals to encourage conjunctive use and investments for storage.
6. Increase coordination among Metropolitan, member agencies, basin managers, groundwater producers, and stakeholders inclusive of collaboration for legislative, regulatory, and educational efforts in support of specific initiatives and funding needed for sound groundwater management.

As part of Metropolitan's 2015 IRP Update, two workshops focusing on sustainable local groundwater were held with member agencies and groundwater basin managers. Since 2013, Metropolitan has also been working with the SCWC Stormwater Task Force to evaluate the feasibility of further supporting groundwater production with increases in stormwater capture for groundwater recharge. In 2015, the SCWC's 4th Annual Stormwater Workshop was held to invite input to Metropolitan's IRP process.

Table 3-14
Contractual Conjunctive Groundwater Projects

Project and Project Proponents	Storage Capacity (TAF)	Dry-Year Yield (TAF/Year)	Storage Account Balance as of 12/31/2015 (TAF)
LOS ANGELES COUNTY			
Long Beach Conjunctive Use Project Long Beach	13.0	4.3	0
Foothill Area GW Storage Project Foothill MWD	9.0	3.0	0
Long Beach CUP: Expansion in Lakewood Long Beach	3.6	1.2	0
City of Compton Conjunctive Use Program City of Compton	2.3	0.8	0
Upper Claremont Heights Conjunctive Use Three Valleys MWD	3.0	1.0	0.3
ORANGE COUNTY			
Orange County GW Conjunctive Use Program OCWD, MWDOC	66.0	22.0	5.7
SAN BERNARDINO COUNTY			
Chino Basin Programs IEUA, TVMWD, Chino Basin Watermaster	100.0	33.0	0
Live Oak Basin Conjunctive Use Project Three Valleys MWD	3.0	1.0	0.7
RIVERSIDE COUNTY			
Elsinore Groundwater Storage Program Western MWD, Elsinore Valley MWD	12.0	4.0	0.1
Total	**211.9**	**70.3**	**6.8**

3.7 Water Use Reduction

In November 2009, Governor Arnold Schwarzenegger signed the Water Conservation Act of 2009 (SB X7-7) into law as part of the historic comprehensive water package designed to address the State's growing water challenges. The Act represented the culmination of efforts by water industry leaders (including Metropolitan), the environmental community, and the Legislature to enact legislation that would answer the governor's call for the state to reduce per capita water use 20 percent by the year 2020 (referred to as "20x2020") as part of a larger effort to ensure reliable water supplies for future generations and restore the Bay-Delta.

The 20x2020 legislation requires urban retail water suppliers to develop urban water use targets to help meet the 20 percent reduction in water use by 2020, with interim targets for 2015. The legislation provides flexibility in how targets are established and achieved. Per capita reductions can be accomplished through any combination of increased water conservation, improved water use efficiency, and increased use of recycled water to offset potable demand. Potable demand offsets can occur through direct reuse of recycled water, such as for irrigation, or indirect potable reuse through groundwater recharge and reservoir augmentation. Retail water suppliers receive partial credit for past efforts in conservation and recycled water; therefore, not all agencies need to reduce demand by 20 percent in order to comply with the law.

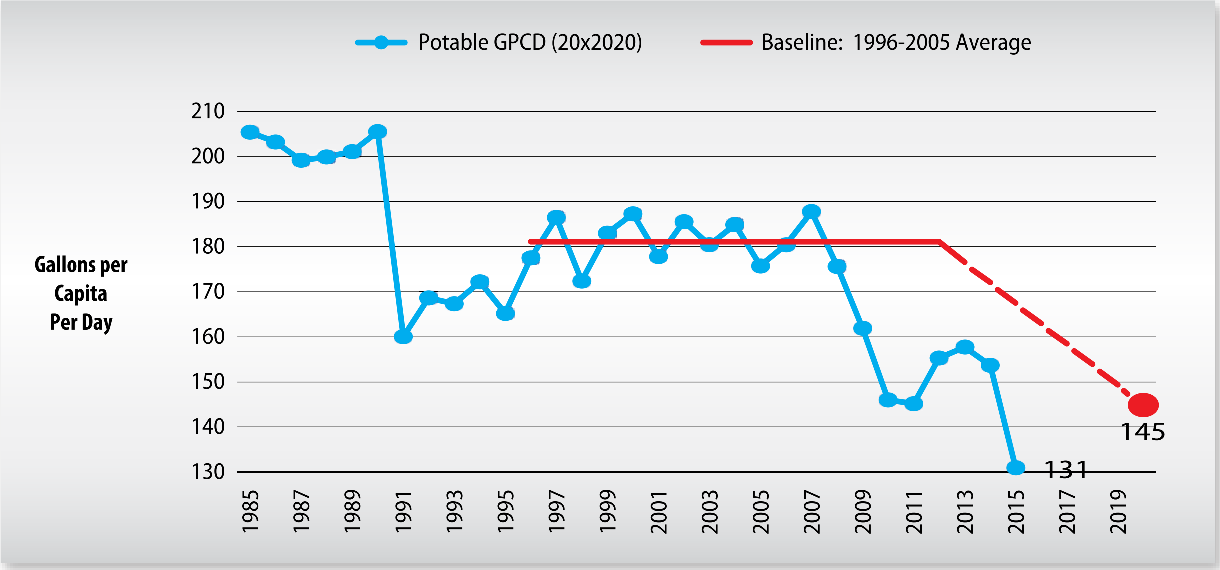
Achievement as of 2015

As a wholesale water agency, Metropolitan is not required to establish or report an urban water use reduction target. However, Metropolitan's CCP and LRP are designed to assist member agencies and retail water suppliers in the service area to comply with SB X7-7. These programs are described in Sections 3.4 and 3.5. Therefore, Metropolitan monitors the progress of its service area.

Based on an analysis of population, demand, and the methodologies for setting targets described in the legislation, Metropolitan's baseline is 181 GPCD, and the 2020 reduction target is 145 GPCD, as illustrated in Figure 3-4. From 2011-2014, there was a slight increase in per capita water use explained in part by continued economic recovery and drier weather as compared to previous years. With mandatory restrictions from the state and water supply allocation from Metropolitan, the 2015 GPCD is 131, a 28 percent reduction from the baseline.

Over the next five years, Metropolitan will periodically assess water supply conditions and trends in per capita demand within its service area and evaluate potential programs to ensure attainment of the goal. Metropolitan also continues to provide support for retail agency efforts through technical assistance, legislation, code and standards updates, and potential financial incentives where needed for market transformation to increase water use efficiency.

Figure 3-4 Potable Per Capita Water Use: 20% Reduction by 2020 Metropolitan's Service Area (Calendar Year)



3.8 Energy Management Initiative

To further Metropolitan's mission to provide its service area with adequate and reliable supplies of high-quality water to meet present and future needs in an environmentally and economically responsible way, Metropolitan has adopted an energy management initiative. The energy management policies guide the agency in energy-efficient design and operation of its facilities, cost-effective power acquisition strategies, and the implementation of cost-effective renewable energy technologies. To highlight a few recent accomplishments, Metropolitan completed the Energy Management & Reliability Study in December 2009 to identify the issues and potential future actions for Metropolitan to consider in achieving energy reliability and cost control. Metropolitan is a registered member in The Climate Registry and has prepared annual greenhouse gas emissions inventories since 2005, and also reports emissions data to the California Air Resources Board under mandatory reporting regulations.

In May 2009, Metropolitan completed a 10-acre field of solar panels at the Robert A. Skinner Water Treatment Plant in the Temecula Valley of southwestern Riverside County. The 1 megawatt solar installation is designed to generate approximately 2.4 million kilowatt-hours (kWh) of clean, renewable energy a year, equal to the power used by about 250 homes annually. Metropolitan received more than $5 million in rebates during the first five years of the facility's operation.

In August 2010, Metropolitan's Board adopted Energy Management Policies, to provide staff with the necessary guidance to move forward with cost-effective and environmentally responsible programs, projects, and initiatives. Identified projects are considered by Metropolitan's Board of Directors for authorization on a case-by-case basis. These policies recognize the upward pressure on costs caused by the reduction of Metropolitan's Hoover power allocation in 2017, by evolving power markets, by increased direct and indirect regulatory pressure to reduce greenhouse gas (GHG) emissions, and by the risk of reduced Colorado River hydropower supplies with climate change. The specific policies are as follows:

- Water/Energy Nexus: Identify collaborative programs and initiatives between the water and energy industries, constructing sustainable partnerships to reduce costs and provide enhanced reliability.
- Regulatory: Track federal and state greenhouse gas regulations and develop strategies to hedge against price and regulatory risks towards Metropolitan.
- Legislation: Pursue legislation to protect or enhance reliability of energy supply and mitigate energy cost risk.
- Contracts: Maintain maximum flexibility on existing and future contracts with Hoover and other energy contracts to hedge against cost and regulatory risks.
- Projects/Partnerships: Pursue cost-effective renewable energy projects and partnerships to hedge against energy price increases and regulatory risks, while reducing Metropolitan's carbon footprint.
- Revenue Stream: Pursue revenue stream renewable energy facilities on operational lands to assist in cost containment.
- Economic & Environmental Stewardship: Based on projected economic and regulatory conditions, develop cost-effective programs, projects, and initiatives to control operational costs.
- Energy Management Updates: Continue to consider/implement actions or projects consistent with Energy Management Policies and report progress to the Board.

On December 20, 2011, the President signed the Hoover Power Allocation Act. The Act stipulated that Metropolitan and the other Hoover power contractors would receive 95 percent of their current Hoover allocation when the new contract becomes effective in 2017. The new contract will have a term of 50 years, from 2017 to 2067.

Metropolitan also started construction work in 2015 for a 3-megawatt solar installation at the Weymouth plant. This planned solar installation would meet up to 20 percent of the Weymouth plant's expected daily power consumption. A 1-megawatt solar project planned for Metropolitan's Jensen facility is now in design.

Moving forward with these energy management initiatives will enhance Metropolitan's ability to provide long-term power reliability, to protect against energy market price volatility, and to hedge against overall cost risks for operation of Metropolitan's distribution system and the CRA.

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Water Quality

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Metropolitan's planning efforts have recognized the importance of the quality of its water supplies. To the extent possible, Metropolitan responds to water quality concerns by protecting the quality of the source water and developing water management programs that maintain and enhance water quality. Contaminants that cannot be sufficiently controlled through protection of source waters must be handled through changed water treatment protocols or blending. These practices can increase costs and/or reduce operating flexibility. This section discusses source water quality and issues of concern affecting water management strategies and water supply reliability.

Background

Metropolitan's planning efforts for groundwater storage, recycled water, and other water management strategies require meeting specific water quality targets for imported water. Metropolitan has two major sources of water: the Colorado River and the State Water Project (SWP). Groundwater inflows are also received into the SWP through groundwater banking programs in the Central Valley. Each source has specific quality issues, which are summarized in this section. To date, Metropolitan has not identified any water quality risks that cannot be mitigated. As described in this section, the only potential effect of water quality on the level of water supplies based on current knowledge might be increases in the salinity of water resources. Under California's current drought conditions, decreased flows have altered Delta flow patterns and, while the effects of the drought have not been fully studied, there have been some observable changes in water quality such as increased salinity due to increased seawater intrusion. However, even under drought conditions, SWP salinity is significantly lower than Colorado River water salinity, and Metropolitan relies on blending imported water sources to mitigate for the higher salinity Colorado River water. During recent periods of drought, Metropolitan's SWP allocation has been reduced, including to a historical low of zero percent in January 2014, which affected blending operations. Metropolitan increased its reliance on Colorado River water in 2014 and 2015, and subsequently, salinity in treatment plant deliveries increased overall from the higher Colorado River salinity levels. Metropolitan anticipates no significant reductions in water supply availability from imported sources due to water quality concerns, such as salinity, over the next five years.

Colorado River

High salinity levels remain a significant issue associated with Colorado River supplies. In addition, Metropolitan has been engaged in efforts to protect its Colorado River supplies from threats of uranium, perchlorate, and chromium-6, which are discussed later in this section. Metropolitan has also been active in efforts to protect these supplies from potential increases in nutrient loading due to agriculture and urbanization, as well as tracking the occurrence of constituents of emerging concern, such as N-nitrosodimethylamine (NDMA) and pharmaceuticals and personal care products (PPCPs). Metropolitan fully expects its source water protection efforts to be successful, so the only foreseeable water quality constraint to the use of Colorado River water will be the need to blend (mix) it with SWP supplies to meet Metropolitan's Board-adopted salinity standards.

State Water Project

The key water quality issues for the SWP are disinfection byproduct precursors, in particular, total organic carbon and bromide. Metropolitan is working to protect the water quality of this source, but it has needed to upgrade its water treatment plants to deal adequately with disinfection byproducts. Disinfection byproducts result from total organic carbon and bromide in the source water reacting with disinfectants at the water treatment plant, and they may place some near-term restrictions on Metropolitan's ability to use SWP water. Metropolitan is overcoming these treatment restrictions through the use of ozone disinfection at its treatment plants. Ozone facilities have been completed at four of Metropolitan's treatment plants, and construction is underway for ozone facilities at the Weymouth water treatment plant. Arsenic is also of concern in some groundwater storage programs. Groundwater inflows into the California Aqueduct are managed to comply with regulations and protect downstream water quality while meeting supply targets. Additionally, nutrient levels are significantly higher in the SWP system than within the Colorado River, leading to the potential for algal related concerns that can affect water management strategies. Metropolitan is engaged in efforts to protect the quality of SWP water from potential increases in nutrient loading from wastewater treatment plants.

Local Agency Supplies and Groundwater Storage

Drinking water standards for contaminants, such as arsenic, chromium-6, and other emerging constituents, may add costs to the use of groundwater storage and may affect the availability of local agency groundwater sources. These contaminants are not expected to affect the availability of Metropolitan supplies, but they may affect the availability of local agency supplies. This could affect the level of demands on Metropolitan supplies if local agencies abandon supplies in lieu of treatment options. Metropolitan has not analyzed the effect that many of these water quality issues could have on local agency supply availability.

In summary, the major regional water quality concerns include the following:

- Salinity
- Perchlorate
- Total organic carbon and bromide (disinfection byproduct precursors)
- Nutrients (as they relate to algal productivity)
- Arsenic
- Uranium
- Chromium-6
- Constituents of Emerging Concern (e.g., NDMA and PPCPs)

Metropolitan has taken several actions and adopted programs to address these contaminants and to ensure a safe and reliable water supply. These actions, organized by contaminant, are discussed below, along with other water quality programs that Metropolitan has been engaged in to protect its water supplies.

Issues of Potential Concern

Salinity

The State Water Resources Control Board's Division of Drinking Water (DDW), formerly the California Department of Public Health, established a secondary drinking water standard for salinity, commonly expressed as total dissolved solids (TDS), with a recommended maximum contaminant level (MCL) of 500 milligrams per liter (mg/L) and upper limit MCL of 1,000 mg/L. Imported water from the Colorado River has high salinity levels, so it must be blended (mixed) with lower-salinity water from the SWP to meet salinity management goals. Higher salinity levels in Colorado River water would increase the proportion of SWP supplies required to meet Metropolitan's Board-adopted imported water salinity objectives. High levels of salinity can impact various water uses such as limiting groundwater and recycled water uses, reducing the lifespan of household appliances, and reducing crop yields. These salinity impacts affect various sectors including residential, agricultural, commercial, industrial, utility, groundwater, and recycled water. Metropolitan adopted an imported water salinity goal because higher salinity could increase costs and reduce operating flexibility. For example,

1. If diminished water quality causes a need for membrane treatment to remove TDS, the process typically results in losses of up to 15 percent of the water processed. These losses would result in both an increased requirement for additional water supplies and environmental constraints related to brine disposal. In addition, the process is costly. However, only a portion of the imported water would need to be processed, so the possible loss in supplies is small.
2. High TDS in water supplies leads to high TDS in wastewater, which lowers the usefulness and increases the cost of recycled water.
3. Water quality degradation of imported water supply could limit the use of local groundwater basins for storage because of standards controlling the quality of water recharged to the basins.

In addition to the link between water supply and water quality, Metropolitan has identified economic benefits from reducing the TDS concentrations of water supplies. Estimates show that a reduction in salinity concentrations of 100 mg/L in both the Colorado River and SWP supplies will yield economic benefits of $95 million per year (1999 dollars) within Metropolitan's service area.[12] This economic benefit provides an additional incentive to reduce salinity concentrations within the region's water supplies.

The Salinity Management Policy

Considering all of these factors, Metropolitan's Board approved a Salinity Management Policy on April 13, 1999. The policy set a goal of achieving salinity concentrations in delivered water of less than 500 mg/L TDS when practical, understanding that hydrologic conditions will make this infeasible at times. It also identified the need for both local and imported water sources to be managed comprehensively to maintain the ability to use recycled water and groundwater. To achieve these targets, lower TDS SWP water supplies are blended with Colorado River supplies. Using this approach, the salinity target could be met an estimated seven out of ten years. In the other three years, hydrologic conditions would result in a reduced volume of SWP supplies and increased salinity. Since 1999, Metropolitan has met the salinity objective, but due to drought conditions, the target goal was exceeded between 2008 and 2011 and again

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[12] Metropolitan Water District of Southern California and U.S. Bureau of Reclamation, Salinity Management Study: Final Report (June 1999)

between 2013 and 2015. Metropolitan has alerted its local agencies that high salinity levels are inevitable under these drought conditions despite its best efforts. Metropolitan has also urged its member agencies to structure the operation of their local projects and groundwater supplies so they are prepared to mitigate the effect of higher salinity levels in imported waters. In addition, Metropolitan seeks to obtain better quality water in the spring/summer months (April through September) to maximize the use of recycled water in agriculture.

The adoption of the Salinity Management Policy resulted from the completion of a Salinity Management Study in 1999. Metropolitan worked collaboratively with multiple stakeholders to complete the salinity study which assessed regional salinity problems and developed management strategies. Metropolitan is currently working with the USBR and Southern California Salinity Coalition to update the study. The current study objectives include updating the economic impact model to complete a revised salinity economic damage assessment of Metropolitan's service area; developing regional salinity indicators to increase awareness and facilitate salinity management in groundwater basins; and assessing Metropolitan's long-term capability of delivering low-salinity water supplies and determining whether new salinity operational goals should be established.

Within Metropolitan's service area, local water sources account for approximately half of the salt loading, and imported water accounts for the remainder. All of these sources must be managed appropriately to sustain water quality and supply reliability goals. The following sections discuss the salinity issues relevant to each of Metropolitan's major supply sources and other resources.

Colorado River

Water imported via the CRA has the highest level of salinity of all of Metropolitan's sources of supply, averaging around 630 mg/L since 1976. Concern over salinity levels in the Colorado River has existed for many years.

To deal with the concern, the International Boundary and Water Commission approved Minute No. 242, Permanent and Definitive Solution to the International Problem of the Salinity of the Colorado River, in 1973, and the President approved the Colorado River Basin Salinity Control Act in 1974. High TDS in the Colorado River as it entered Mexico and the concerns of the seven Basin states regarding the quality of Colorado River water in the United States drove these initial actions. To foster interstate cooperation on this issue, the seven basin states formed the Colorado River Basin Salinity Control Forum (Forum).

The salts in the Colorado River system are indigenous and pervasive, mostly resulting from saline sediments in the Basin that were deposited in prehistoric marine environments. They are easily eroded, dissolved, and transported into the river system. The Colorado River Basin Salinity Control Program is designed to prevent a portion of this abundant salt supply from moving into the river system. The program targets the interception and control of non-point sources, such as surface runoff, as well as wastewater and saline hot springs. Examples of salinity control measures include improved irrigation practices, rangeland management, and the operation of a deep well brine injection project.

The Forum proposed, the states adopted, and the USEPA approved water quality standards in 1975, including numeric criteria and a plan for controlling salinity increases. The standards require that the plan ensure that the flow-weighted average annual salinity remain at or below the 1972 levels, while the Basin states continue to develop their 1922 Colorado River Compact-apportioned water supply. The Forum selected three stations on the main stream of the lower Colorado River as appropriate points to measure the river's salinity. These stations and numeric criteria are: (1) below Hoover Dam, 723 mg/L; (2) below Parker Dam, 747 mg/L; and (3) at Imperial Dam, 879 mg/L.

Per the Forum, concentrations of salts in the Colorado River cause approximately $382 million in quantified damages (2014 dollars) in the lower Basin each year.[13] The salinity control program has proven to be very successful and cost-effective. Salinity control projects remove over a million tons of salts from Colorado River water, resulting in reduced salinity concentrations of over 100 mg/L as a long-term average.

During the high water flows of 1983-1986, salinity levels in the CRA dropped to a historic low of 525 mg/L. However, during the 1987-1992 drought, higher salinity levels of 600 to 650 mg/L returned. TDS in Lake Havasu was measured at 626 mg/L in June 2015 and is projected to continue increasing as water development occurs throughout the Colorado River basin, particularly as the Upper Colorado River Basin States continue to develop their apportioned water reducing dilution in the Colorado River. Also, under drought conditions, Lake Powell has received higher salinity water, and as the system normalizes, salinity is expected to increase in the lower Colorado River as water from Lake Powell is released downstream.

State Water Project

Water supplies from the SWP have significantly lower TDS concentrations than the Colorado River, averaging approximately 250 mg/L in water supplied through the East Branch and 325 mg/L on the West Branch over the long-term, with short term variability as a result of hydrologic conditions.[14] Because of this lower salinity, Metropolitan blends SWP water with high salinity CRA water to reduce the salinity concentrations of delivered water. However, both the supply and the TDS concentrations of SWP water can vary significantly in response to hydrologic conditions in the Sacramento-San Joaquin watersheds.

As indicated above, the TDS concentrations of SWP water can vary widely over short periods of time. These variations reflect seasonal and tidal flow patterns, and they pose an additional problem for use of blending as a management tool to lower the higher TDS from the Colorado River supply. For example, during the 1977 drought, the salinity of SWP water reaching Metropolitan increased to 430 mg/L, and supplies became limited. During this same event, salinity at the SWP's Banks pumping plant exceeded 700 mg/L. Under future similar circumstances, Metropolitan's 500 mg/L TDS objective could only be achieved by reducing imported water from the CRA. Thus, it may not always be possible to maintain both the salinity objective and water supply reliability unless salinity concentrations of source supplies can be reduced.

A federal court ruling and a resulting biological opinion issued through consultation with U.S. Fish and Wildlife Service addressing the effects of the water supply pumping operations on sensitive fish species in the Delta has limited SWP exports at specified times of the year since December 2007. These restrictions have increased reliance on higher salinity Colorado River water, impacting the ability at times to meet Metropolitan's goal of 500 mg/L TDS at its blend plants. Drought conditions leading to lower SWP water supply allocations in recent years also affect Metropolitan's ability to meet its salinity goal. The target goal was exceeded between 2008 and 2011 when water supply allocations were reduced to 35-50 percent. Similarly, the target goal has been exceeded between 2013 and 2015 under current drought conditions with

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[13] Colorado River Basin Salinity Control Program–Briefing Document (May 1, 2015)

[14] The higher salinity in the West Branch deliveries is due to salt loadings from local streams, operational conditions, and evaporation at Pyramid and Castaic Lakes.

restricted annual water supply allocations reduced to 5-35 percent and briefly reduced to a historical zero percent allocation in January 2014.

TDS objectives in Article 19 of the SWP Water Service Contract specify a ten-year average of 220 mg/L and a maximum monthly average of 440 mg/L. These objectives have not been met, and Metropolitan is working with DWR and other agencies on programs aimed at reducing salinity in Delta supplies. These programs aim to reduce salinity on the San Joaquin River through modifying agricultural drainage and developing comprehensive basin plans. In addition, operable gates and channel barriers have been placed in strategic locations in the Delta to impede transport of seawater derived salt. For the first time since 1977, in response to California's drought emergency, DWR installed a temporary rock barrier across False River in May 2015 to help limit salt intrusion from the San Francisco Bay into the central Delta. DWR is also leading the development of the California WaterFix, which involves water delivery upgrades that could reduce SWP salinity levels by diverting a greater percentage of lower salinity Sacramento River flows to the South Delta export pumps.

Recycled Water

Wastewater flows always experience significantly higher salinity concentrations than the potable water supply. Typically, each cycle of urban water use adds 250 to 400 mg/L of TDS to the wastewater. Salinity increases tend to be higher where specific commercial or industrial processes add brines to the discharge stream or where brackish groundwater infiltrates into the sewer system.

Where wastewater flows have high salinity concentrations, the use of recycled water may be limited or require more expensive treatment (e.g., reverse osmosis). Landscape irrigation and industrial reuse become problematic at TDS concentrations over 1,000 mg/L. Some crops such as strawberries and avocados are particularly sensitive to high TDS concentrations, and the use of high-salinity recycled water may reduce yields of these crops. In addition, Basin Plan Objectives may lead to restrictions on the use of recycled water on lands overlying those groundwater basins.

These issues are exacerbated during times of drought, when the salinity of imported water supplies may increase salinity in wastewater flows and recycled water. Basin management plans and recycled water customers may restrict the use of recycled water at a time when its use would be most valuable. Therefore, to maintain the cost-effectiveness of recycled water, the salinity level of the region's potable water sources and wastewater flows must be controlled.

In May 2009, the SWRCB adopted a Recycled Water Policy[15] to help streamline the permitting process and to help establish uniform statewide criteria for recycled water projects. The policy was amended in January 2013 to include monitoring requirements for constituents of emerging concern. This policy promotes the development of watershed- or basin-wide salt management plans (to be adopted by the respective Regional Boards) to meet water quality objectives and protect beneficial uses, rather than imposing project-by-project restrictions. The Recycled Water Policy identifies several criteria to guide recycled water irrigation or groundwater recharge project proponents in developing a salt (and nutrient) management plan (SNMP).

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[15] http://www.swrcb.ca.gov/water_issues/programs/water_recycling_policy/docs/recycledwaterpolicy_approved.pdf

Groundwater Basins

Increased TDS in groundwater basins occurs either when basins near the ocean are over drafted, leading to seawater intrusion, or when agricultural and urban return flows add salts to the basins. Much of the water used for agricultural or urban irrigation infiltrates into the aquifer, so where irrigation water is high in TDS or where the water transports salts from overlying soil, the infiltrating water will increase the salinity of the aquifer. In addition, wastewater discharges in inland regions may lead to salt buildup from fertilizer and dairy waste. In the 1950s and 1960s, high-TDS Colorado River water was used to recharge severely overdrafted aquifers and prevent saltwater intrusion, resulting in significant salt loadings to the region's groundwater basins.

In the past, these high salt concentrations have caused some basins within Metropolitan's service area to be unsuitable for municipal uses if left untreated. The Arlington Basin in Riverside and the Mission Basin in San Diego required demineralization before they could be returned to municipal service. The capacity of the larger groundwater basins makes them better able to dilute the impact of increasing salinity. While most groundwater basins within the region still produce water of acceptable quality, this resource must be managed carefully to minimize further degradation. Even with today's more heightened concern regarding salinity, approximately 600,000 tons of salts per year accumulate within the region, leading to ever-increasing salinity concentrations in many groundwater basins.[16] Drought conditions have further impacted salinity levels in recycled water, reflective of increased salinity levels in source water. Increased recycled water salinity levels make it difficult for dischargers to comply with water quality objectives for groundwater basins.

To protect the quality of groundwater basins, Regional Boards often place restrictions on the salinity concentrations of water used for basin recharge or for irrigation of lands overlying the aquifers. Those situations may restrict water reuse and aquifer recharge, or they may require expensive mitigation measures. SNMPs offer an opportunity for stakeholders to work with Regional Boards to address salt and nutrient issues regionally. The SNMP development process is locally-driven and focuses on addressing all sources of salts and nutrients, instead of only regulating individual recycled water projects which may not address all sources impacting groundwater. The SNMP objectives include: optimizing recycled water use, protecting groundwater supply and beneficial uses, protecting agricultural beneficial uses, and protecting human health. SNMPs were to be completed by May 2014 with a possible two year extension. After completion, SNMPs may be adopted in a Basin Plan Amendment.

Several SNMPs were completed by the completion deadline, while other plans were granted an extension for completion in 2016. The Santa Ana Region Basin Plan updated its TDS and Nitrogen Management Plan with a subsequent SNMP amendment in 2014. This SNMP highlights efforts to implement extensive groundwater recharge projects using recycled water in the Chino Basin and expansion of the GWRS in Orange County. The Central Basin and West Coast Basin SNMP was approved as an amendment to the Los Angeles Region Basin Plan in February 2015. This SNMP highlights existing and planned implementation measures to ensure future compliance with water quality objectives including increased recharge at seawater intrusion barriers, increased groundwater pump and treat by the Goldsworthy and Brewer Desalters, and increased recycled water use for irrigation. Multiple SNMPs have been completed in the San Diego Region, and basin plan amendments are being considered. SNMPs are also being developed for the Main San Gabriel Basin, Raymond Basin, San Fernando Valley Basin, and Calleguas Creek and Oxnard Plains.

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[16] Metropolitan Water District of Southern California and U.S. Bureau of Reclamation, Salinity Management Study: Final Report (June 1999)

Perchlorate

Perchlorate compounds are used as a main component in solid rocket propellant, and are also found in some types of munitions and fireworks. Perchlorate compounds quickly dissolve and become highly mobile in groundwater. Unlike many other groundwater contaminants, perchlorate neither readily interacts with the soil matrix nor degrades in the environment. Conventional drinking water treatment (as utilized at Metropolitan's water treatment plants) is not effective for perchlorate removal.

The primary human health concern related to perchlorate is its effect on the thyroid. Perchlorate can interfere with the thyroid's ability to produce hormones required for normal growth and development. Pregnant women who are iodine deficient and their fetuses, infants and small children with low dietary iodide intake, and individuals with hypothyroidism may be more sensitive to the effects of perchlorate.

DDW established a primary drinking water standard for perchlorate in 2007 with an MCL of 6 micrograms per liter (μg/L). In February 2015, the California Office of Environmental Health Hazard Assessment (OEHHA) lowered the public health goal (PHG) for perchlorate from 6 μg/L to 1 μg/L. In response to the new PHG, DDW will review the perchlorate MCL. There is currently no federal drinking water standard for perchlorate, but the USEPA is in the process of developing a national primary drinking water regulation.

Perchlorate was first detected in Colorado River water in June 1997 and was traced back to Las Vegas Wash. The source of contamination was found to be emanating from a chemical manufacturing facility in Henderson, Nevada. Tronox, Inc. was responsible for the ongoing perchlorate remediation of the site, although contamination resulted from years of manufacturing operations from site predecessors. Another large perchlorate groundwater plume is also present in the Henderson area from a second industrial site. Remediation activities are ongoing for cleanup of that plume by American Pacific Corporation (AMPAC).

Following the detection of perchlorate in the Colorado River, Metropolitan, along with USEPA and agencies in Nevada including the Nevada Division of Environmental Protection (NDEP), organized the forces necessary to successfully treat and decrease the sources of perchlorate loading. Under NDEP oversight, remediation efforts began in 1998, and treatment operations became fully operational in 2004. These efforts have reduced perchlorate loading into Las Vegas Wash from over 1,000 lbs/day (prior to treatment) to 50-90 lbs/day since early 2007. This has resulted in over 90 percent reduction of the perchlorate loading entering the Colorado River system. In January 2009, Tronox filed for Chapter 11 bankruptcy protection citing significant environmental liabilities taken from the previous site owner. A settlement was reached in February 2011 which resulted in the formation of the Nevada Environmental Response Trust (NERT). NERT received $81 million for cleanup efforts while pursuing additional funding sources.

In April 2014, Tronox reached a $5.15 billion settlement with its predecessors which awarded approximately $1.1 billion, directed to NERT, to clean up perchlorate and other contaminants at the former Tronox site in Henderson. The settlement, which represents one of the largest environmental recoveries in history, went into effect in January 2015 and helps to ensure adequate funds are available for site cleanup and protection of the downstream Colorado River. NERT is currently conducting remedial investigations for long-term soil and groundwater cleanup, while NDEP is initiating a regional investigation of downstream perchlorate-contaminated areas to further reduce loading into Las Vegas Wash. The remedial plan has an established goal to reduce perchlorate loading into Las Vegas Wash to less than 10 lbs/day, which would result in levels well below 1 μg/L in the Colorado River. This would help ensure compliance with any potential reduction of California's perchlorate MCL of 6 µg/L, in light of the new 1 µg/L public health goal.

As a result of the aggressive clean-up efforts, perchlorate levels in Colorado River water at Lake Havasu have decreased significantly in recent years from a peak of 9 µg/L in May 1998. Levels have remained less than 6 µg/L since October 2002, and have been typically less than 2 µg/L since June 2006. Metropolitan routinely monitors perchlorate at over 30 locations within its system, and levels currently remain below 2 µg/L. Metropolitan has not detected perchlorate in the SWP since monitoring began in 1997.

Perchlorate has also been found in groundwater basins within Metropolitan's service area, largely from local sources. The vast majority of locations where perchlorate has been detected in the groundwater are associated with the manufacturing or testing of solid rocket fuels for the Department of Defense and the National Aeronautics and Space Administration (NASA), or with the manufacture, storage, handling, or disposal of perchlorate (such as Aerojet in Azusa in the Main San Gabriel Basin and the Jet Propulsion Laboratory/NASA in the Raymond Basin). Past agricultural practices using fertilizers laden with naturally occurring perchlorate have also been implicated in some areas. Per SWRCB's water quality database, reported monitoring results from 2011 to 2014 indicate that 10 Metropolitan member agencies have detected perchlorate in their service areas at levels greater than 4 µg/L in 36 sources, while 7 member agencies have detected levels greater than 6 µg/L.

Metropolitan has investigated technologies to mitigate perchlorate contamination. Perchlorate cannot be removed using conventional water treatment. Nanofiltration and reverse osmosis do work effectively, but at a very high cost. AMPAC and NERT utilize a biological fluidized bed reactor (FBR) process train for the cleanup of their Henderson sites. A number of sites in Southern California have successfully installed ion exchange systems to treat perchlorate impacted groundwater. In November 2009, a study of biological treatment for perchlorate removal in the City of Pasadena's groundwater was completed with funding provided through a Congressional mandate from USEPA to Metropolitan. The City of Pasadena decided to continue using ion exchange treatment for perchlorate removal and expanded treatment to two well sites.

Treatment options are available to recover groundwater supplies contaminated with perchlorate. However, it is very difficult to predict whether treatment will be pursued to recover all lost production because local agencies will make decisions based largely on cost considerations, ability to identify potentially responsible parties for cleanup, and the availability of alternative supplies.

Total Organic Carbon and Bromide

Disinfection byproducts (DBPs) form when source water containing high levels of total organic carbon (TOC) and bromide is treated with disinfectants such as chlorine or ozone. Studies have shown a link between certain cancers and DBP exposure. In addition, some studies have shown an association between reproductive and developmental effects and chlorinated water. While many DBPs have been identified and some are regulated under the Safe Drinking Water Act, there are others that are not yet known. Even for those that are known, the potential adverse health effects may not be fully characterized.

Water agencies began complying with new regulations to protect against the risk of DBP exposure in January 2002. This rule, known as the Stage 1 Disinfectants and Disinfection Byproducts (D/DBP) Rule, required water systems to comply with new MCLs and a treatment technique to improve control of DBPs. USEPA then promulgated the Stage 2 D/DBP Rule in

January 2006 requiring systems to comply at terminus locations in the distribution system to be more representative of maximum residence time and to protect the public. Metropolitan has been in compliance with the Stage 2 D/DBP Rule since it became effective.

Existing levels of TOC and bromide in Delta water supplies present challenges for water utilities to maintain safe drinking water supplies and comply with regulations. Levels of these constituents in SWP water increase several-fold due to agricultural drainage and seawater intrusion as water moves through the Delta.

Source water quality improvements must be combined with cost-effective water treatment technologies to ensure safe drinking water at a reasonable cost. Metropolitan has five treatment plants: two that receive SWP water exclusively, and three that receive a blend of SWP and Colorado River water. In 2003 and 2005, Metropolitan completed upgrades to its SWP-exclusive water treatment plants, Mills and Jensen, respectively, to utilize ozone as its primary disinfectant. This ozonation process minimizes the production of certain regulated disinfection byproducts that would otherwise form in the chlorine treatment of SWP water. The non-ozone plants utilizing blended water have met federal guidelines for these byproducts through managing the blend of SWP and Colorado River water. To maintain the byproducts at a level consistent with federal law, Metropolitan limits the percentage of water from the SWP for plants utilizing chlorine as the primary disinfectant. In 2010 and 2015, Metropolitan completed ozone upgrades at Skinner and Diemer water treatment plants, respectively. Construction of ozonation facilities is underway at Weymouth water treatment plant and is expected to be completed in 2017. The estimated ozone retrofit cost for all five treatment plants is over $1.1 billion.

Nutrients

Elevated levels of nutrients (phosphorus and nitrogen compounds) can stimulate nuisance algal and aquatic weed growth that affects water system operations and consumer acceptability, including the production of noxious taste and odor compounds and algal toxins. In addition to taste and odor and toxin concerns, increases in algal and aquatic weed biomass can impede flow in conveyances, shorten filter run times, increase solids production at drinking water treatment plants, and add to organic carbon loading. Further, nutrients can provide an increasing food source that may lead to the proliferation of quagga and zebra mussels, and other invasive biological species. Studies have shown phosphorus to be the limiting nutrient in both SWP and Colorado River supplies. Therefore, any increase in phosphorus loading has the potential to stimulate algal growth, leading to the concerns identified above.

SWP supplies have significantly higher nutrient levels than Colorado River supplies. Wastewater discharges, agricultural drainage, and nutrient-rich soils in the Delta are primary sources of nutrient loading to the SWP. Metropolitan and other drinking water agencies receiving Delta water have been engaged in efforts to minimize the effects of nutrient loading from Delta wastewater plants. The Sacramento Regional County Sanitation District (SRCSD), the primary discharger to the Sacramento River, is in the process of constructing wastewater treatment plant upgrades to comply with its 2010 discharge permit requirements for ammonia and nitrate removal. Excessive levels of ammonia are suspected to be altering the Delta's food web which, in turn, has implications for SWP supply reliability. SRCSD expects to complete its EchoWater Project by 2023 and has stated that the project will serve multiple benefits including improving water quality in the Sacramento River, protecting the fragile Delta ecosystem, and expanding recycled water use opportunities. The improvements include a biological nutrient removal process for ammonia and nitrate removal. The project also includes tertiary treatment processes for filtration and enhanced disinfection. In 2014, the City of Stockton Wastewater

Treatment Plant, a discharger to the San Joaquin River, was issued a draft permit with a more stringent nitrate discharge limit consistent with the final discharge limits issued in SRCSD's permit. The City of Stockton may have to implement similar plant upgrades as SRCSD to comply with discharge permit requirements.

Metropolitan reservoirs receiving SWP water have experienced several taste and odor episodes in recent years. For example, between 2010 and 2014, Metropolitan reservoirs experienced 11 taste and odor events requiring treatment. A taste and odor event can cause a reservoir to be bypassed and potentially have a short-term effect on the availability of that supply. Metropolitan has a comprehensive program to monitor and manage algae in its source water reservoirs. This program was developed to provide an early warning of algae related problems and taste and odor events to best manage water quality in the system.

The issue of cyanotoxins has become a growing concern as a result of increasing occurrences both nationally and internationally. For example, in August 2014, an algae bloom producing Mycrocystin in Lake Erie significantly affected water supply for Toledo, Ohio, prompting the city to issue urgent notices to residents to not drink or boil the drinking water. This event stimulated state and federal legislation to develop health advisories and strategic plans for algal toxins. In June 2015, USEPA issued health advisories for two cyanobacterial toxins: Microcystins and Cylindrospermopsin. The health advisories serve as recommended precautionary levels and are not enforceable federal water quality standards. Cyanotoxins are included on the current Contaminant Candidate List (CCL3), which identifies contaminants considered for regulation under the Safe Drinking Water Act. USEPA is currently developing improved analytical methods for cyanotoxins to support nationwide monitoring for Microcystins, Anatoxin-a, and Cylindrospermopsin through the Unregulated Contaminant Monitoring Rule 4 program, which would be published in late 2016 and require monitoring to begin in January 2018. Metropolitan would comply with Unregulated Contaminant Monitoring Rule monitoring and reporting requirements.

Although phosphorus levels are much lower in the Colorado River than in the SWP, this nutrient is still of concern. Despite relatively low concentrations (Colorado River has been considered an oligotrophic, or low-productivity, system), any additions of phosphorus to Colorado River water can result in increased algal growth. In addition, low nutrient Colorado River water is relied upon by Metropolitan to blend down the high nutrient SWP water in Metropolitan's blend reservoirs. With population growth expected to continue in the Las Vegas area in the future, ensuring high levels of treatment at wastewater treatment plants to maintain existing phosphorus levels will be critical in minimizing the operational, financial, and public health impacts associated with excessive algal growth and protecting downstream drinking water uses. Metropolitan and other affected drinking water agencies collaborate with wastewater dischargers in the Las Vegas area to protect the phosphorus-limited Colorado River. Since 2001, wastewater dischargers have undertaken considerable efforts to improve treated effluent water quality by removing phosphorus on a year-round basis. In 2005, dischargers also began optimizing their treatment processes to remove greater amounts of phosphorus, maintaining levels well below current permit requirements.

Although current nutrient loading is of concern for Metropolitan and is anticipated to have cost implications, with its comprehensive monitoring program and response actions to manage algal related issues, there should be no impact on availability of water supplies. Metropolitan's source water protection program will continue to focus on preventing future increases in nutrient loading as a result of urban and agricultural sources.

Arsenic

Arsenic is a naturally occurring element found in rocks, soil, water, and air. It is used in wood preservatives, alloying agents, certain agricultural applications, semi-conductors, paints, dyes, and soaps. Arsenic can get into water from the natural erosion of rocks, dissolution of ores and minerals, runoff from agricultural fields, and discharges from industrial processes. Long-term exposure to elevated levels of arsenic in drinking water has been linked to certain cancers, skin pigmentation changes, and hyperkeratosis (skin thickening).

In April 2004, OEHHA set a public health goal for arsenic of 0.004 μg/L, based on lung and urinary bladder cancer risk. The MCL for arsenic in domestic water supplies was lowered to 10 μg/L, with an effective date of January 2006 in the federal regulations, and an effective date of November 2008 in the California regulations. Monitoring results submitted to California Department of Public Health (now DDW) since 2010 showed that arsenic is ubiquitous in drinking water sources, reflecting its natural occurrence. They also showed that many sources have arsenic detections above the 10 μg/L MCL. Southern California drinking water sources that contain concentrations of arsenic over 10 μg/L include San Bernardino (25 sources), Los Angeles (27 sources), Riverside (12 sources), San Diego (2 sources), Orange (2 sources), and Ventura (2 sources).[17]

The arsenic drinking water standard impacts both groundwater and surface water supplies. Historically, Metropolitan's water supplies have had low levels of this contaminant and did not require treatment changes or capital investment to comply with the standard. However, some of Metropolitan's water supplies from groundwater storage programs are at levels near the MCL. These groundwater storage projects are called upon to supplement flow only during low SWP allocation years. Under drought conditions, Metropolitan has further relied on groundwater storage programs and continues to participate in the California Aqueduct Pump-in Facilitation Group to ensure that water quality in the SWP is not adversely affected when considering water supply decisions. Metropolitan has had to restrict flow from one program to limit arsenic increases in the SWP. Implementation of an arsenic treatment facility, which is operated by a groundwater banking partner, has increased groundwater supply costs. Moreover, Metropolitan has invested in solids handling facilities at its treatment plants and implemented operational changes to manage arsenic in the treatment process residual solids.

The state detection level for purposes of reporting (DLR) of arsenic is 2 μg/L. Between 2009 and 2014, arsenic levels in Metropolitan's water treatment plant effluents ranged from non-detect (< 2 μg/L) to 3.9 μg/L. For Metropolitan's source waters, levels in Colorado River water have ranged from not detected to 3.5 μg/L, while levels in SWP water have ranged from non-detect to 4.4 μg/L. Increasing coagulant doses at water treatment plants can reduce arsenic levels for delivered water.

Some member agencies may face greater problems with arsenic compliance due to naturally occurring arsenic in groundwater. Per the Water Replenishment District's 2013-2014 Regional Groundwater Monitoring Report, arsenic concentrations greater than the 10 μg/L MCL are detected in about a third of the Central Basin wells.[18] Water supplies imported by the Los Angeles Department of Water and Power may also contain arsenic above the MCL. The cost of arsenic removal from these supplies could vary significantly.

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[17] DDW data reported from web site: http://geotracker.waterboards.ca.gov. Numbers reported may change as the website is frequently updated. Also, the website includes additional source data reported by other entities.

[18] *Regional Groundwater Monitoring Report Water Year 2013-2014, Los Angeles County, California*, prepared by Water Replenishment District, February 2015.

Uranium

The U.S. Department of Energy (DOE) has completed about 50 percent of a project to move a 16-million-ton pile of uranium mill tailings near Moab, Utah which lies approximately 750 feet from the Colorado River. Due to the proximity of the pile to the Colorado River, there is a potential for the tailings to enter the river as a result of a catastrophic flood event or other natural disaster. In addition, contaminated groundwater from the site is slowly seeping into the river. The DOE is responsible for remediating the site, which includes removal and offsite disposal of the tailings and onsite groundwater remediation.

Previous investigations have shown uranium concentrations contained within the pile at levels significantly above the California MCL of 20 picocuries per liter (pCi/L). Metropolitan has been monitoring for uranium in the CRA and at its treatment plants since 1986. Monitoring at Lake Powell began in 1998. Uranium levels measured at Metropolitan's intake have ranged from 1 to 6 pCi/L, well below the California MCL. Conventional drinking water treatment, as employed at Metropolitan's water treatment plants, can remove low levels of uranium; however, these processes would not be protective if a catastrophic event washed large volumes of tailings into the Colorado River. Public perception of drinking water safety is also of particular concern as to uranium.

Remedial actions at the site since 1999 have focused on removing contaminated water from the pile and groundwater. To date, over 4,400 pounds of uranium in contaminated groundwater have been removed. In July 2005, DOE issued its Final Environmental Impact Statement with the preferred alternative of permanent offsite disposal by rail to a disposal cell at Crescent Junction, Utah, located approximately 30 miles northwest of the Moab site.

Rail shipment and disposal of the uranium mill tailings pile from the Moab site began in April 2009 using American Recovery and Reinvestment Act 2009 funding which helped to accelerate initial cleanup efforts. Through August 2015, DOE has shipped over 7.7 million tons of mill tailings to the Crescent Junction disposal cell. DOE estimates completing movement of the tailings pile by 2025, depending on annual appropriations. Metropolitan continues to track progress of the remediation efforts and work with Congressional representatives to support increased annual appropriations and expedite cleanup.

Another uranium-related issue began receiving attention in 2008 due to a renewed worldwide interest in nuclear energy and a resulting increase in uranium mining claims filed throughout the western United States. Of particular interest were thousands of mining claims filed near Grand Canyon National Park and the Colorado River. Metropolitan sent letters to the Secretary of the Interior to highlight source water protection and consumer confidence concerns related to uranium exploration and mining activities near the Colorado River, and advocate for close federal oversight over these activities. In 2009, Secretary of the Interior Ken Salazar announced a two-year hold on new mining claims on 1 million acres adjacent to the Grand Canyon to allow necessary scientific studies and environmental analyses to be conducted. In January 2012, Secretary Salazar formally signed a 20-year moratorium on new uranium and other hard rock mining claims. The moratorium has been challenged by a number of industry groups and was most recently upheld by a U.S. District Court in September 2014. Meanwhile, local conservation groups continue to defend the moratorium and are seeking additional protection of lands with mines that have been inactive for long periods of time, but may resume operations. Although of no direct impact to Metropolitan due to its upstream location and resulting dilution, in August 2015, an accidental release of wastewater from an abandoned mine in southwest Colorado demonstrated the potential threat that mining activities can have on public health and the environment.

Chromium-6

Chromium is a naturally occurring element found in rocks, soil, plants, and animals. Chromium III is typically the form found in soils and is an essential nutrient that helps the body use sugar, protein, and fat. Chromium-6 is used in electroplating, stainless steel production, leather tanning, textile manufacturing, dyes and pigments, wood preservation, and as an anti-corrosion agent. Chromium occurs naturally in deep aquifers and can also enter drinking water through discharges of dye and paint pigments, wood preservatives, chrome plating liquid wastes, and leaching from hazardous waste sites. In drinking water, chromium-6 is very stable and soluble, whereas chromium III is not very soluble. Chromium-6 is the more toxic species and is known to cause lung cancer in humans when inhaled, but the health effects in humans from ingestion are still in question. There is evidence that when chromium-6 enters the stomach, gastric acids may reduce it to chromium III. However, recent studies conducted by the National Toxicology Program have shown that chromium-6 can cause cancer in animals when administered orally.

Effective July 1, 2014, California's Office of Administrative Law approved a primary drinking water standard of 10 μg/L for chromium-6. USEPA regulates chromium-6 as part of the total chromium drinking water standard of 100 μg/L and is currently evaluating whether a new federal drinking water standard for chromium-6 is warranted based on new health effects information.

Metropolitan utilizes an analytical method with a minimum reporting level of 0.03 μg/L, which is less than the State DLR of 1 μg/L. In the past 5 years, the results from all of Metropolitan's source and treated waters are less than the State DLR. The following summarizes chromium-6 levels found in Metropolitan's system:

In the past 5 years, results of source and treated water monitoring for chromium-6 indicate the following:

- Levels in Colorado River water are mostly not detected (<0.03 μg/L), but when detected, levels range from 0.03 to 0.08 μg/L. SWP levels range from 0.03 to 0.8 μg/L. Treated water levels range from 0.03 to 0.7 μg/L.
- There is a slight increase in chromium-6 in the treated water from the oxidation (chlorination and ozonation) of natural background chromium (total) to chromium-6.
- Colorado River monitoring results upstream and downstream of the site of a Pacific Gas and Electric (PG&E) gas compressor station located along the Colorado River near Topock, Arizona (discussed below) have ranged from not detected (<0.03 μg/L) to 0.06 μg/L.
- Chromium-6 in Metropolitan's groundwater pump-in storage programs in the Central Valley has ranged from not detected (< 1 μg/L) to 8.9 μg/L in 2014, with the average for the different programs ranging from < 1 μg/L to 3 μg/L.

PG&E used chromium-6 as an anti-corrosion agent in its cooling towers at the Topock site from 1951 to 1985. Wastewater from the cooling towers was discharged from 1951 to 1968 into a dry wash next to the station. Monitoring wells show the plume concentration has peaked as high as 16,000 μg/L in groundwater. Since 2004, PG&E has operated an interim groundwater extraction and treatment system that is protecting the Colorado River. Quarterly monitoring of the river has shown levels of chromium-6 less than 1 μg/L, which are considered background levels. The California Department of Toxic Substances Control (DTSC) and the U. S. Department of the Interior are the lead state and federal agencies overseeing the cleanup efforts. Metropolitan participates through various stakeholder workgroups and partnerships that include state and federal regulators, Indian tribes, and other stakeholders (e.g., Colorado River Board) involved in the corrective action process. In January 2011, a final treatment remedy was selected, and an Environmental Impact Report was certified. In November 2015, PG&E completed the final remedy design based on the selected remedy which involves the installation of an in-situ bioremediation treatment system. In April 2015, DTSC required the preparation of a Subsequent Environmental Impact Report (EIR) to address new design details. The Subsequent EIR will be completed in Spring 2017. Construction is expected to be completed in early 2022, followed by operation of the treatment system for an estimated 30 years.

The federal- and state-approved technologies for removing total chromium from drinking water include coagulation/filtration, ion exchange, reverse osmosis, and lime softening. For several years, the cities of Glendale, Burbank, and Los Angeles have been voluntarily limiting chromium-6 levels in their drinking water to 5 μg/L, which is significantly lower than the state MCL of 10 μg/L that went into effect on July 1, 2014.

Constituents of Emerging Concern

N-Nitrosodimethylamine

N-Nitrosodimethylamine (NDMA) is part of a family of organic chemicals called nitrosamines. NDMA is a chloramine disinfection by-product, and it is the most abundantly detected nitrosamine in drinking water systems. Metropolitan utilizes chloramines as a secondary disinfectant at its treatment plants. Wastewater treatment plant discharges can contribute organic matter into source waters, which react with chloramines to form NDMA at drinking water treatment plants. Certain coagulation aid polymers used in water treatment, e.g., polydiallyldimethylammonium chloride (polyDADMAC), can also contribute to NDMA formation. Some NDMA control measures are being used to avoid adverse impacts on Southern California drinking water supplies. Metropolitan is involved in several projects to understand the impact of different treatment processes on NDMA and its precursors at drinking water treatment plants and in distribution systems. Certain pre-oxidation processes, such as chlorine and ozone, have been shown to destroy NDMA precursors. Additional studies are being conducted to better understand how polyDADMAC contributes to NDMA formation and to identify measures to reduce polymer-derived NDMA formation.

USEPA considers NDMA to be a probable human carcinogen. USEPA placed NDMA in the Unregulated Contaminant Monitoring Rule 2 (UCMR2) and on the Contaminant Candidate List 3 (CCL3). Although there is no federal regulation for nitrosamines in drinking water, DDW set a notification level of 0.01 μg/L each for NDMA and two other nitrosamines. Occurrences of NDMA in treated water supplies at concentrations greater than 0.01 μg/L are recommended to be included in a utility's annual Consumer Confidence Report. In December 2006, OEHHA set a public health goal for NDMA of 0.003 μg/L. Since 1999, Metropolitan has conducted voluntary monitoring of the five treatment plant effluents and representative distribution system locations semi-annually. In 2014, NDMA was the only detected nitrosamine in Metropolitan's treated water systems, and it was in a range of non-detect (<0.002 μg/L) to 0.005 μg/L. NDMA or a broader class of nitrosamines may likely be the next class of disinfection by-products to be regulated by USEPA.

Pharmaceuticals and Personal Care Products

Pharmaceuticals and personal care products (PPCPs) are a growing concern to the water industry. Numerous studies have reported the occurrence of these emerging contaminants in treated wastewater, surface water, and sometimes, in finished drinking water in the United States and around the world. The use of ozone in treatment processes may have a beneficial effect on PPCP removal in drinking water. The sources of PPCPs in the aquatic environment include (but may not be limited to) treated wastewater and industrial discharge, agricultural run-off, and leaching of municipal landfills. Currently, there is no evidence of human health risks from long-term exposure to the low concentrations (low ng/L; parts per trillion) of PPCPs found in some drinking water. Furthermore, there are no regulatory requirements for PPCPs in drinking water. USEPA included 13 PPCPs on the CCL3; however, currently there are no standardized analytical methods for these compounds. USEPA's strategy for addressing PPCPs involves strengthening analytical methods, conducting source studies, improving public understanding of PPCPs in water, building partnerships and promoting stewardship opportunities, and taking regulatory action when appropriate.

In 2007, Metropolitan implemented a short-term monitoring program to determine the occurrence of PPCPs and other organic wastewater contaminants in Metropolitan's treatment plant effluents and selected source water locations within the Colorado River and SWP watersheds. Currently, PPCP monitoring is conducted on an annual basis for Metropolitan's source waters and treatment plants. Some PPCPs have been detected at very low ng/L levels, which is consistent with reports from other utilities. However, analytical methods are still being refined, and more work is required to fully understand occurrence issues. Metropolitan has been actively involved in studies related to PPCPs, including analytical methods improvements, and characterization of drinking water sources in California.

Other Water Quality Programs

In addition to monitoring for and controlling specific identified chemicals in the water supply, Metropolitan has undertaken a number of programs to protect the quality of its water supplies. These programs are summarized below.

Source Water Protection

Source water protection is the first step in a multi-barrier approach to provide safe and reliable drinking water. In accordance with California's Surface Water Treatment Rule, Title 22 of the California Code of Regulations, DDW requires large utilities delivering surface water to complete a Watershed Sanitary Survey every five years to identify possible sources of drinking water contamination, evaluate source and treated water quality, and recommend watershed management activities that will protect and improve source water quality. The most recent sanitary surveys for Metropolitan's water sources are the Colorado River Watershed Sanitary Survey – 2010 Update and the State Water Project Watershed Sanitary Survey – 2011 Update.[20] The next Sanitary Surveys for the watersheds of the Colorado River and the SWP will report on watershed and water quality issues through 2015.

Metropolitan has an active source water protection program and continues to advocate on numerous issues to protect and enhance SWP and Colorado River water quality. As part of its source water protection program, Metropolitan monitors and forecasts source water quality, including closely monitoring the biology and limnology of lakes and aqueducts. Monitoring is conducted to comply with regulatory requirements, respond to water quality events, assess temporal variability, advise operations, and investigate emerging constituents and invasive species.

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[20] Metropolitan Water District of Southern California, *Colorado River Watershed Sanitary Survey, 2010 Update*. For the State Water Project, the sanitary survey report was prepared on behalf of the State Water Project Contractors Authority, in 2011, and was titled *California State Water Project Watershed Sanitary Survey, 2011 Update*.

Colorado River Water Quality Partnerships

Metropolitan collaborates with external partners to asses and manage watershed threats to Colorado River water quality. Metropolitan is a member of the Clean Colorado River Sustainability Coalition, which was formed in 1997 and focuses on protecting and enhancing the Colorado River through monitoring and analysis of water quality to assure and sustain high quality water for all users of the Colorado River. In 2011, Metropolitan formed the Lower Colorado River Water Quality Partnership with SNWA and Central Arizona Project to identify and implement collaborative solutions to address water quality issues facing the Colorado River. Metropolitan also participates in the Lake Mead Water Quality Forum which was formed in 2012, and its Lake Mead Ecosystem Monitoring Workgroup subcommittee. The Lake Mead Water Quality Forum's goals are to support the protection of human health and the environment and to preserve and improve the water quality of the Las Vegas Wash, Las Vegas Bay, and Lake Mead (and as a result, the Colorado River). In addition, as discussed earlier, Metropolitan is a member of the Colorado River Basin Salinity Control Forum which facilitates coordination between Basin states and federal agencies on salinity matters and the implementation of the Colorado River Basin Salinity Control Program.

SWP Water Quality Programs

Metropolitan supports DWR policies and programs aimed at maintaining or improving the quality of SWP water delivered to Metropolitan. In particular, Metropolitan supported the DWR policy to govern the quality of non-project water conveyed by the California Aqueduct. In addition, Metropolitan has supported the expansion of DWR's Municipal Water Quality Investigations Program beyond its Bay-Delta core water quality monitoring and studies to include enhanced water quality monitoring and forecasting of the Delta and SWP. These programs are designed to provide early warning of water quality changes that will affect treatment plant operations both in the short-term (hours to weeks) and up to seasonally. The forecasting model is currently suitable for use in a planning mode. It is expected that with experience and model refinement, it will be suitable to use as a tool in operational decision making.

Metropolitan has implemented selective withdrawals from the Arvin-Edison storage program and exchanges with the Kern Water Bank to improve water quality. Although these programs were initially designed to provide dry-year supply reliability, they can also be used to store SWP water at periods of better water quality so the stored water may be withdrawn at times of lower water quality, thus diluting SWP water deliveries. Although elevated arsenic levels have been a concern in one groundwater banking program, there are also short-term water quality benefits that can be realized through storage programs, such as groundwater pump-ins into the California Aqueduct with lower TOC levels (as well as lower bromide and TDS, in some programs).

Regulatory and Legislative Actions

Metropolitan conducts technical reviews of regulatory and legislative actions that may have an effect on the quality of Metropolitan's source waters. These may include changes in federal and state water quality standards; California Environmental Quality Act (CEQA) documents for projects or programs within Metropolitan's source watersheds; National Pollutant Discharge Elimination System permits for wastewater discharges into the Delta or Colorado River systems; and regulations or statewide policies and permits affecting source water quality or reservoir management issues. In addition, Metropolitan advocates and provides funding requests for key source water protection priorities, including the Moab uranium tailings cleanup and Colorado River salinity control.

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Coordination and Public Outreach

5

Collaborative Regional Planning

Southern California has a remarkable, unparalleled tradition of meeting its water challenges as a single cohesive region. Metropolitan serves as both importer of water and regional water planner, and for the past generation, Metropolitan's Integrated Water Resources Plan (IRP) and the related Urban Water Management Plan (UWMP) have served as the reliability road map for the region. Metropolitan's 2015 IRP Update and 2015 UWMP were prepared concurrently through a collaborative process that included extensive coordination with Southern California's wholesale and retail water agencies, as well as municipal service providers and public planning agencies. The process also included outreach to engage the general public, businesses, environmental organizations, diverse communities, and other stakeholders with an interest in the future of Southern California's water supplies.

This chapter describes how Metropolitan's process to develop the 2015 UWMP complies with the provisions for coordination and public outreach in the Urban Water Management Planning Act (CA Water Code §10610, et seq.).

Development of "Water Tomorrow," a Regional Plan

In early 2015, Metropolitan initiated a process to concurrently update its 2010 IRP and prepare the 2015 UWMP. Metropolitan branded this IRP update as "Water Tomorrow," which underlines the purpose of the plan and its importance to the region. The 2015 IRP Update seeks to integrate into a single plan the many local water actions that take place throughout Metropolitan's service area. This information was then used to prepare the UWMP.

For Metropolitan, the process to update the IRP and prepare the UWMP began with considerable homework. Local supply surveys, estimates of retail demands, and data within local urban water management plans were among the many key building blocks. Regional planning agencies provided updated demographics and population projections. In addition, planning processes for the Colorado River supply and the SWP (the region's primary imported water supplies) provided estimates of water supply availability given a range of possible future circumstances. The data were analyzed through Metropolitan's own planning model.

Data and documents are important, but it is the collaboration – with Metropolitan's 26 member agencies, its 38-member Board of Directors, numerous important stakeholders, and the general public – that truly enriched this process and shaped the final plans. Broad policy discussions and reviews were held at the board level. Member agency workshops dug into considerable technical detail. Public meetings, even social media, provided important feedback on how best to plan for a reliable water future.

The end result was the integration of many strategies, and many possible future water scenarios, into an adaptable regional plan – an IRP – and the related UWMP. The comprehensive process behind the 2015 IRP Update and preparation of the 2015 UWMP continues the tradition of Southern California working together to have reliable supplies of water for tomorrow.

Coordination with Other Appropriate Agencies

Metropolitan coordinated the preparation of this UWMP with its 26 member agencies, wastewater management agencies, municipal service providers, groundwater management agencies, and regional planning agencies. The extensive regional coordination is consistent with the requirements of California Water Code Sections 10620(d)(2), 10641, and 10642.

Board of Directors Oversight

Metropolitan's Board of Directors provided oversight throughout the concurrent process for the 2015 IRP Update and the preparation of the 2015 UWMP. The process began with a presentation to Metropolitan's Water Planning and Stewardship Committee in February 2015. To provide focused involvement of the Metropolitan Board, the board created an Integrated Resources Planning Committee (IRP Committee), which is made up of 17 Metropolitan board directors. Beginning in March 2015, the IRP Committee met on a regular basis to provide guidance and receive information from Metropolitan staff. The IRP Committee held 10 meetings between March 2015 and January 2016, as summarized in Table 5-1.

Table 5-1
Summary of Metropolitan Board of Directors Committee Meetings

Date	Committee	Topic
February 9, 2015	WP&S Committee	Overview of the upcoming IRP process
March 24, 2015	IRP Committee	Overview of the upcoming 2015 IRP Update and UWMP process, including a historical overview of previous IRPs, and description of proposed topics and timeline
April 28, 2015	IRP Committee	Detailed review of current IRP targets and initial look at changed conditions
May 26, 2015	IRP Committee	Expert presenters on Conservation Rates and Conservation Potential; Member Agency Technical Process Update
June 23, 2015	IRP Committee	Expert presenters on Groundwater and Stormwater; Member Agency Technical Process Update
July 28, 2015	IRP Committee	Expert presenters on Climate Change and Uncertainty; Member Agency Technical Process Update
August 18, 2015	IRP Committee	Initial Results and Water Balances, IRP/UWMP Outreach, Delta Assumptions
September 29, 2015	IRP Committee	Draft Results; IRP/UWMP Outreach
October 27, 2015	IRP Committee	IRP/UWMP Outreach, Technical Recommendations, Draft IRP Issue Paper Addendum
December 7, 2015	IRP Committee	Draft 2015 IRP Update, Overview of Phase 1 Policy Inventory and Phase 2 Policy Process
January 12, 2016	IRP Committee	Final 2015 IRP Update

Collaboration with Member Agencies and Other Organizations

For guidance, discussion, and information-sharing on technical topics, Metropolitan staff collaborated with Metropolitan's member agencies through an IRP Member Agency Technical Workgroup. The Technical Workgroup met 11 times between April and October 2015. Each meeting focused on specific subjects. Through the workgroup, member agency staff provided Metropolitan staff with data and information essential for updating the 2015 IRP Update forecasts, feedback on draft analyses, and policy topics for the policy discussions following the adoption of the 2015 IRP Update. Additionally, member agency staff and external experts provided input and direction on the development of the 2015 IRP Update Issue Paper Addendum and collaborated with Metropolitan staff during the writing process.

Metropolitan distributed data sets of demographics, total demands after conservation, local supplies, and demands on Metropolitan at the regional and member agency levels using a 25-year planning horizon. The data were provided to the member agencies in five-year increments under single-dry, multi-dry, and average-year conditions as required in California Water Code §10631(j). When requested, Metropolitan staff met individually with the member agencies to review the data sets and discuss any agency-specific questions or issues. Regional issues and analysis methodologies were discussed during the technical workgroup meetings. Demand and supply estimates were included in the draft copy of the 2015 UWMP distributed to the member agencies in December, 2015.

IRP/UWMP briefings were also periodically presented during regular Member Agency Managers meetings held at Metropolitan. Metropolitan's update process also coordinated dialogue with the monthly water use efficiency meeting held with conservation coordinators from Metropolitan's member agencies and their retail sub-agencies. These meetings served as a forum for input on Metropolitan's conservation model methodology. Metropolitan staff also met with the member agency Conservation Program Advisory Committee for technical discussion and comments on Metropolitan's Conservation Savings Model. Additional meetings included the Local Resources Program (LRP) Coordinator's meeting and webinar where member agencies and retailers provided input to the recycled water discussion. The Technical Workgroup and other member agency planning meetings are summarized in Table 5-2.

Public Outreach during IRP/UWMP Preparation

Public involvement was an important element of the process to update the IRP and prepare the 2015 UWMP. Public outreach efforts complement the technical processes with the IRP committee and the member agencies. Most importantly, the efforts that were implemented during 2015 establish a means for the public to provide input to the policy discussions that are occurring following the adoption of the 2015 IRP Update.

Metropolitan's three key objectives for the public involvement element of the 2015 IRP Update and preparation of the UWMP are as follows:

- Ensure that the 2015 IRP Update/UWMP process is understandable and accessible to anyone who has an interest in Southern California's water supplies
- Provide opportunities for learning, dialogue, and input
- Create a pathway to encourage continued engagement in future policy discussions

To achieve the first objective, Metropolitan branded the 2015 IRP Update as "Water Tomorrow," which underlines the purpose of the plan and its importance to the region. Metropolitan then created a new website, MWDWaterTomorrow.com, which provides extensive information on the current update process, as well as the history of Metropolitan's IRP over the past two decades. For the 2015 IRP Update, the site includes a calendar of past and future meetings, technical analysis and presentations, brief descriptions of Southern California's water resources, a comment section, and ways to participate. Metropolitan shares news and updates about Water Tomorrow through traditional and social media, Metropolitan's "Your Water" e-newsletter, and a variety of social media platforms. Metropolitan also provides speakers for community and business organizations throughout its service area.

While the first objective addresses public awareness, the second objective seeks to ensure that public involvement advances the region's understanding of water issues, challenges and perspectives and benefits Metropolitan's planning process. Metropolitan worked with the Southern California Water Committee to present the 2015 IRP Update process and technical issues at two workshops held at Metropolitan. Approximately 150 people participated in the first workshop in June to discuss a "Drought Proof Strategy." The second workshop was held in August where approximately 125 attendees discussed the future of outdoor water conservation. In September, Metropolitan met with the Southern California Water Dialogue whose diverse membership includes environmental organizations, private industry, and public agencies. The Southern California Association of Governments presented an overview of demographic projections, and Metropolitan staff provided an introduction to the technical analysis for the 2015 IRP Update. The IRP Committee Chair facilitated discussion on the 2015 IRP Update among the approximately 75 participants.

Following the three focused workshops held with the Southern California Water Committee and the Southern California Water Dialogue, Metropolitan convened the Water Tomorrow public workshop on October 22, 2015. More than 450 people participated in the all-day workshop, which was offered both in person and online to encourage broad participation throughout Metropolitan's service area. Staff recapped the technical analysis and key findings. Professional facilitators guided participant discussion in key resource areas: conservation, local resources, groundwater, and imported supplies. The key discussion points, ideas, and outcomes were reported to the IRP Committee to help inform future board policy discussions.

The third outreach objective looks to the future. One of Metropolitan's overarching communication goals is to develop the general public's knowledge of water resource issues and the range of solutions available to Southern California. An informed public is better able to contribute to the discussions and understand the implications and opportunities afforded by decisions. Metropolitan is building on the progress in the first phase of the 2015 IRP Update to encourage continued involvement in future discussions for the IRP and other water issues. These discussions will focus on solutions to challenges, and topics will range from policy and regulations to technology and behavior change.

As social media has become part of mainstream communications, Metropolitan tried a supplemental means of public engagement. Metropolitan worked with Northern Rift, a firm that has created a software platform to engage the public in raising and collaborating on ideas, to offer an online Water Tomorrow Innovation Game. Participants proposed ideas to solve Southern California's water challenges and then collaborated on the ideas to help grow them or discuss their limitations. The top ideas selected by the community of participants and those selected by a panel of water resource and policy experts were recognized at a reception hosted by Metropolitan. The Board of Directors may consider the ideas in future discussions on implementation of the 2015 IRP Update.

UWMP Public Notice and Adoption

Metropolitan provided notice of the availability of the draft 2015 UWMP and the public hearing to consider adoption, in accordance with California Water Code Sections 10621(b) and 10642, and Government Code Section 6066. The public review draft of the plan was posted prominently on Metropolitan's website, mwdh2o.com, on February 1, 2016, more than 60 days in advance of the public hearing on April 11, 2016. The notice of availability of the document was sent to the member agencies, as well as cities and counties in the Metropolitan service area. In addition, a public notice advertising the public hearing was published in six Southern California newspapers on February 1 and 8, 2016. A copy of the notification letter sent to the member agencies, cities and counties in Metropolitan's service area is included in this chapter, as well as the notice published in the newspapers. Table 5-3 provides a list of participating member agencies and other appropriate agencies that Metropolitan coordinated with in its regional planning, as well as the cities and counties that were notified about the preparation of its 2015 UWMP.

Metropolitan held the public hearing for the draft 2015 UWMP on April 11, 2016, at the Board's Water Planning and Stewardship Committee meeting. On May 10, 2016, Metropolitan's Board determined that the 2015 UWMP is consistent with the Act and an accurate representation of the water resources plan for the Metropolitan service area. As stated in Resolution 9209, the Board adopted the 2015 UWMP and authorized its submittal to the State of California. A copy of Resolution 9209 is included in this section.

Submission and Availability of Final 2015 UWMP

In fulfillment of California Water Code §10645, Metropolitan's Final 2015 UWMP was posted on the mwdh2o.com website on May 10, 2016, following its adoption by the Metropolitan board.

In fulfillment of California Water Code §§ 10635(b) and 10644(a)(1), Metropolitan also mailed copies of the Final 2015 UWMP (in electronic pdf format) to the California State Library and all cities and counties within Metropolitan's service area within 30 days of Board adoption.

In fulfillment of California Water Code § 10621(d) and § 10644(a)(1) and (2), Metropolitan's Final 2015 UWMP was electronically submitted to the State of California through DWR's WUE data website https://wuedata.water.ca.gov/secure/ in June 2016.

Table 5-2
2015 Technical Process Member Agency Participation

Date	Group	Topic
April 8, 2015	Member Agency Technical Workgroup	Introduction to 2015 IRP Update/UWMP process
April 16, 2015	Water Use Efficiency Meeting	Introduction to 2015 IRP Update/UWMP process, Conservation
April 22, 2015	Member Agency Technical Workgroup	Uncertainty planning in the IRP
April 29, 2015	Conservation Program Advisory Committee	Conservation model
May 18, 2015	Member Agency Technical Workgroup	Imported Supplies (Colorado River Aqueduct, State Water Project, Central Valley Transfers and Storage)
May 20, 2015	Water Use Efficiency Meeting	Conservation
May 27, 2015	Member Agency Technical Workgroup	Groundwater (Part 1 of 2)
June 11, 2015	Member Agency Technical Workgroup	Groundwater (Part 2 of 2)
June 16, 2015	LRP Coordinators Meeting	Recycled Water Issue Paper
June 18, 2015	Water Use Efficiency Meeting	Long-term impacts of current water use restrictions, Issue Paper chapter on Conservation
June 24, 2015	Member Agency Technical Workgroup	Local Resources (Part 1 of 2)
July 8, 2015	Member Agency Technical Workgroup	Local Resources (Part 2 of 2)
July 16, 2015	Water-Use Efficiency Meeting	Conservation savings forecast, Draft 2015 IRP Update Issue Paper Addendum
July 22, 2015	Member Agency Technical Workgroup	Retail Demands and Conservation
August 3, 2015	Member Agency Technical Workgroup	Draft IRP Technical Results (Part 1 of 2)
August 21, 2015	Member Agency Managers Meeting	Draft IRP Technical Results briefing
September 15, 2015	Member Agency Technical Workgroup	Draft IRP Technical Results (Part 2 of 2)
September 25, 2015	Member Agency Managers Meeting	IRP/UWMP Technical Process Overview
October 5, 2015	Member Agency Technical Workgroup	Final Technical Results
October 16, 2015	Member Agency Managers Meeting	Final Technical Results
November 16, 2015	Member Agency and Sanitation Districts Coordination Meeting	Overview of draft 2015 UWMP and Water Service Reliability

Table 5-3
Water Supplier Information Exchange

6 Counties			
Los Angeles	Orange	Riverside	San Bernardino
San Diego	Ventura		
136 Cities			
Agoura Hills	Fillmore	Long Beach	Rosemead
Aliso Viejo	Fontana	Los Alamitos	San Clemente
Arcadia	Fountain Valley	Lynwood	San Dimas
Artesia	Fullerton	Malibu	San Fernando
Azusa	Garden Grove	Manhattan Beach	San Gabriel
Bell Gardens	Gardena	Maywood	San Jacinto
Bellflower	Glendale	Menifee	San Marcos
Bradbury	Glendora	Mission Viejo	San Marino
Buena Park	Hawaiian Gardens	Monrovia	Santa Ana
Burbank	Hermosa Beach	Monterey Park	Santa Fe Springs
Calabasas	Hidden Hills	Moorpark	Santa Monica
Camarillo	Huntington Beach	Murrieta	Seal Beach
Carson	Imperial Beach	National City	Sierra Madre
Chino	Industry	Newport Beach	Signal Hill
Chino Hills	Inglewood	Norco	Simi Valley
Chula Vista	Irvine	Norwalk	Solana Beach
Claremont	Irwindale	Ontario	South El Monte
Compton	La Canada Flintridge	Oxnard	South Gate
Corona	La Habra	Palos Verdes Estates	South Pasadena
Covina	La Habra Heights	Paramount	Stanton
Cudahy	La Mesa	Pasadena	Temecula
Culver City	La Mesa	Perris	Temple City
Cypress	La Mirada	Pico Rivera	Thousand Oaks
Dana Point	La Palma	Placentia	Torrance
Del Mar	La Puente	Pomona	Upland
Diamond Bar	La Verne	Port Hueneme	Ventura
Downey	Laguna Beach	Poway	Villa Park
Duarte	Laguna Hills	Rancho Cucamonga	Vista
Eastvale	Laguna Niguel	Rancho Palos Verdes	Walnut
El Cajon	Laguna Woods	Rancho Santa Margarita	West Hollywood
El Monte	Lake Elsinore	Redondo Beach	Westlake Village
El Segundo	Lake Forest	Riverside	Westminster
Encinitas	Lakewood	Rolling Hills	Whittier
Escondido	Lawndale	Rolling Hills Estates	Wildomar

Table 5-3
Water Supplier Information Exchange (continued)

26 Member Agencies			
Anaheim	Foothill MWD	Municipal Water District of Orange County	Three Valleys MWD
Beverly Hills	Fullerton	Pasadena	Torrance
Burbank	Glendale	San Diego County Water Authority	Upper San Gabriel Valley MWD
Calleguas MWD	Inland Empire Utilities Agency	San Fernando	West Basin MWD
Central Basin MWD	Las Virgenes MWD	San Marino	Western MWD
Compton	Long Beach	Santa Ana	
Eastern MWD	Los Angeles	Santa Monica	
9 Groundwater Basin Management Organizations			
Santa Margarita River Watermaster	Ventura County Watershed Protection District	Water Replenishment District	Upper Los Angeles River Area Watermaster
San Bernardino County Flood Control District	Chino Basin Watermaster	Main San Gabriel Basin Watermaster/	Orange County Water District
Raymond Basin Management Board			
Other Agencies / Planning Organizations			
Sanitation Districts of Los Angeles County	City of Los Angeles Bureau of Sanitation	Southern California Association of Governments	Western Riverside Council of Governments
Orange County Sanitation District	City of San Diego Metropolitan Wastewater Department	City of San Diego Recycled Water Section Public Utilities Department	San Diego Association of Governments

(Notification per California Water Code §10621(b) and §10642)

Letter Notifying Cities and Counties

February 1, 2016

[Sent via US Mail to Member Agencies, City Managers and County Administrators]

Notice of Public Hearing on The Metropolitan Water District of Southern California's Draft 2015 Urban Water Management Plan

The Metropolitan Water District of Southern California (Metropolitan) cordially invites you to participate and provide comments at a public hearing on the draft 2015 Urban Water Management Plan (UWMP). The UWMP presents Metropolitan's long-term plan for ensuring water supply reliability and water quality for the region. The draft UWMP complies with California state law requiring urban water suppliers to prepare and update urban water management plans every five years. The hearing will be held as part of the meeting of the Water Planning and Stewardship Committee whose board members are helping to shape a public dialogue on the future of water management and conservation in the region. The meeting is at:

The Metropolitan Water District of Southern California
700 North Alameda Street, Los Angeles, CA 90012
Water Planning and Stewardship Committee Meeting – Room 2-456
Monday, April 11, 2016 at 10:00 AM

The draft UWMP is posted on Metropolitan's web site, mwdh2o.com for your review. Public input is encouraged and will be considered during finalization of the 2015 UWMP. Written comments are due by **April 11, 2016**. Please send comments to:

The Metropolitan Water District of Southern California
PO Box 54153
Los Angeles, CA 90054-0153
Attn: Edgar Fandialan

If you would like more information or have any questions, please contact Edgar Fandialan at (213) 217-6764 or via email at efandialan@mwdh2o.com.

Very Truly Yours,

Devendra Upadhyay
Manager, Water Resource Management

(Newspaper publication per California Water Code §10642 and Government Code §6066)

PUBLIC HEARING SCHEDULED ON DRAFT URBAN WATER MANAGEMENT PLAN

The Metropolitan Water District of Southern California (Metropolitan) will hold a public hearing on **Monday, April 11, 2016** to receive comments on its draft 2015 Urban Water Management Plan (UWMP).

The hearing will be held as part of the meeting of the Water Planning and Stewardship Committee whose board members are helping to shape a public dialogue on the future of water management and conservation in the region. The meeting is at:

The Metropolitan Water District of Southern California
700 North Alameda Street, Los Angeles, CA 90012
Water Planning and Stewardship Committee Meeting – Room 2-456
Monday, April 11, 2016 at 10:00 AM

The UWMP presents Metropolitan's long-term plan for ensuring water supply reliability and water quality for the region. The draft UWMP complies with California state law requiring urban water suppliers to prepare and update urban water management plans every five years.

The draft plan is available on Metropolitan's web site, mwdh2o.com. Public input is encouraged and will be considered during finalization of the 2015 UWMP. Metropolitan will accept written comments on the draft plan. All written comments must be received by **April 11, 2016**, by sending them to:

The Metropolitan Water District of Southern California
P.O. Box 54153
Los Angeles, CA 90054-0153
Attn: Edgar Fandialan

For more information on the draft UWMP, please contact Edgar Fandialan of Metropolitan's Water Resource Management Group at (213) 217-6764.

Resolution 9209

RESOLUTION
OF THE BOARD OF DIRECTORS
OF THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
ADOPTING THE 2015 URBAN WATER MANAGEMENT PLAN

WHEREAS, the California Urban Water Management Planning Act requires urban water suppliers providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually to prepare and adopt, in accordance with prescribed requirements, an urban water management plan every five years; and

WHEREAS, the California Urban Water Management Planning Act specifies the requirements and procedures for adopting such Urban Water Management Plans; and

WHEREAS, the Board of Directors of The Metropolitan Water District of Southern California has duly reviewed, discussed, and considered such Urban Water Management Plan and has determined the 2015 Urban Water Management Plan to be consistent with the California Urban Water Management Planning Act and to be an accurate representation of the water resources plan for The Metropolitan Water District of Southern California.

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of The Metropolitan Water District of Southern California that, on May 10, 2016, this District hereby adopts this 2015 Urban Water Management Plan for submittal to the State of California.

I HEREBY CERTIFY that the foregoing is a full, true and correct copy of a resolution adopted by the Board of Directors of The Metropolitan Water District of Southern California, at its meeting held on May 10, 2016.

Secretary of the Board of Directors
of The Metropolitan Water District
of Southern California

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Appendix 1

DEMAND FORECAST

Appendix 1
DEMAND FORECAST

Forecast Overview

Retail water demand forecasting is essential for planning total water requirements in Metropolitan's service area. Retail water demand can be met with conservation, local supplies, or imported supplies. As a wholesale imported water supplier, Metropolitan's long-term plans focus on the future demands for Metropolitan's supplies. In order to project the need for resources and system capacity, Metropolitan begins with a long-term projection of retail water demands.

Total retail demands include:

- Retail Municipal and Industrial (M&I) — Retail M&I demands represent urban water use within the region including residential, commercial, industrial, and institutional water uses. To forecast retail M&I demands, Metropolitan uses econometric models that have been adapted for conditions in Southern California. The econometric models are statistical models that can capture and explain the impacts of long-term socioeconomic trends on retail M&I demands. The econometric models incorporate projections of demographic and economic variables from regional transportation planning agencies to produce forecasts of water demand.
- Retail Agricultural Demand — Retail agricultural demands consist of water use for irrigating crops. Metropolitan's member agencies provide projections of agricultural water use based on many factors, including farm acreage, crop types, historical water use, and land use conversion. Metropolitan relies on member agencies' projections of agricultural demands.
- Seawater Barrier Demand — Seawater barrier demands represent the amount of water needed to hold back seawater intrusion into the coastal groundwater basins. Groundwater management agencies determine the barrier requirements based on groundwater levels, injection wells, and regulatory permits.
- Replenishment Demand — Replenishment demands represent the amount of water member agencies plan to use to replenish their groundwater basins in order to maintain sustainable basin health and production.

Retail M&I Demand Forecast

In forecasting retail M&I water demand, Metropolitan adopted a new econometric model (the Metropolitan Water District – Econometric Demand Model or MWD-EDM) developed by The Brattle Group (January 2015). MWD-EDM utilizes multiple regression, which is generally favored by academics and practitioners for long-term water demand analysis. It uses demand relationships based on actual observed behavior to consider the effect of anticipated changes in demand factors on long-term demand.

MWD-EDM is comprised of three separate regression models described below. Each model is developed using historical water consumption and socio-demographic and economic data specific to the sector:

- Single-Family Residential (SFR) Model - SFR water demand is modeled as a function of price, weather, retailer level housing, socio-demographic characteristics, and member agency level fixed effects. The model used water consumption data from 153 retailers with 3,000 accounts or more in Metropolitan's service area. The dataset, ranging from 1994 to 2011, consisted of 1,225 observations and represented 80 percent of all SFR accounts from all 26 Metropolitan member agencies.
- Multi-family Residential (MFR) Model - MFR demand is modeled as a function of price, retailer level housing, socio-demographic characteristics, and member agency level fixed effects. Water consumption data was collected from 53 water retailers consisting of 469 observations and representing 23 out of 26 Metropolitan member agencies.
- Commercial, Industrial, and Institutional (CII) Model - CII demand is modeled as a function of price, weather, employment, the share of employment in the manufacturing sector, and member agency level fixed effects. Water consumption data was collected from 75 water retailers consisting of 709 observations and representing 25 out of 26 Metropolitan member agencies.

The SFR and MFR models forecast average monthly household consumption before conservation, while the CII model forecasts average monthly consumption per employee. Table A.1-1 shows the dependent and the covariates uses in the econometric models for each sector.

Table A.1-1
MWD-EDM Variables

Sector	Dependent Variable	Independent Variable (Covariate)
SFR	Water-Use Per Household	Total Average Cost Total Average Cost x Median Lot Size Annual precipitation Average Max Temperature Median Income Average Household Size Median Lot Size
MFR	Water-Use Per Household	Median Tier Price Median Income Median Lot Size Average Household Size
CII	Water-Use Per Employee	Median Tier Price Cooling Degree Days Average Max Temperature Share of Employment In Manufacturing Median Tier Price x Share of Manufacturing

Total retail M&I demand is the product of projected household/employee and the average monthly consumption.

Price Elasticity

Price elasticity of demand is a measure used in economics to show the responsiveness of the quantity of water demanded to a change in its price. The assumed price increase reduces the water use. This reduction can be assessed in MWD-EDM and is considered a conservation savings due to price or "price-effect." Consumers can respond to price increases by installing water-conserving fixtures and appliances such as high-efficiency toilets. However, many of the fixture-based conservation savings options are already factored into Metropolitan's Conservation Savings Model. As more water efficient fixtures are installed, the impact of changing water using behavior through price or rates is reduced. Consider consumers who respond to rate increases by taking shorter showers. Their behavior adjustment will save less water if they use a water-efficient low-flow showerhead compared to a regular showerhead. This effect is known as demand hardening. In order to avoid double-counting conservation savings and account for demand hardening, the impact of price elasticity is reduced. In MWD-EDM, price elasticity is reduced to 33 percent by 2020 and is kept constant beyond 2020. Price-effect savings are reduced (and demands increased) as a result of this adjustment. The elasticity is reduced in proportion to increases in conservation savings from the conservation model. Reducing price elasticity to 1/3 of its originally estimated levels is based on professional judgment, assuming that much of the easily obtained water use efficiencies will be achieved by 2020, but allowing for new conservation technologies.

Fixed Effects

MWD-EDM forecasts retail M&I demand for each of the 26 member agencies. To account for the differences observed between each agency, MWD-EDM uses the fixed effects or the constant term that represents the member agency specific intercepts that account for all time-invariant unobserved factors common to an agency.

Demographics

Demographics are recognized by the water industry as drivers of water demand. Metropolitan's retail demand modelling is driven by key demographics such as projected population, households, employment, and median household income.

Metropolitan uses demographic growth projections produced by two regional transportation planning agencies: the Southern California Association of Governments (SCAG) and the San Diego Association of Governments (SANDAG). Together they represent more than 200 cities in Southern California and produce long-term transportation plans for sustainable communities. Among other responsibilities, SCAG and SANDAG also prepare projections of population, households, income, and employment for their regions. Both planning agencies update their regional growth forecasts approximately every four years, at different times. SCAG is the regional planning agency for six counties: Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura. SANDAG is the regional planning agency for San Diego County. Significantly, SCAG's and SANDAG's official growth projections are backed by environmental reports. These regional growth forecasts provide the core assumptions underlying Metropolitan's retail demand forecasting model.

In April 2012, SCAG released the *2012-2035 Regional Transportation Plan/Sustainable Communities Strategy* growth forecast (RTP-12). The RTP-12 incorporated updated data and assumptions that reflected the 2007-2009 economic recession, the 2010 Census count, and 2011 employment data from the California Employment Development Department for the Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura Counties. Metropolitan uses the forecast for every county except Imperial, which is outside of Metropolitan's service area.

In October 2013, SANDAG released the *Series 13: 2050 Regional Growth Forecast* (Series 13). Series 13 is a comprehensive projection of the regional demographic, economic, and housing trends expected over the next four decades for the San Diego region. Metropolitan uses the forecast for the San Diego County Water Authority's service area in the retail demand forecast.

Effects of the Great Recession on SCAG's and SANDAG's Forecasts

The Great Recession of 2007-09 severely impacted the region's economic growth. Economic growth is a major factor in population growth through migration. Job availability attracts people to the region. Conversely, a scarcity of employment leads to out-migration as people leave in search of work. Between 2007 and 2010, the region lost approximately 750,000 jobs. The state and the region experienced disproportionately high job losses compared with the nation. Because patterns of migration are influenced by job availability, Southern California saw net outbound domestic migration. Other major factors that affect population growth are fertility and mortality. The acute economic uncertainties also affected people's decision to start a family. Consequently, delayed family formation and reduced birth rate contributed to slower population growth than was anticipated before the recession. However, mortality rates were projected to be lower as the proportion of older people (age 65+) significantly increases. As a result, the net growth in population in the post-recession era is projected to be lower than previously projected in the 2010 IRP Update.

Trends in Southern California

Population

According to SCAG and SANDAG estimates, the population in Metropolitan's service area will reach 19.4 million in 2020, 20.0 million in 2025, and 21.8 million by 2040. While Los Angeles County leads in total population, the inland areas of Riverside and San Bernardino counties are projected to grow at the fastest rates over the next ten years. Generally speaking, however, annual growth rates will slow for all counties between 2010 and 2040. In part, this is due to changing patterns of migration. It also reflects the effects of the recession of the late 2000s and the ongoing restructuring of the Southern California economy.

Employment

Within Metropolitan's service area, employment growth is likely to occur unevenly across the six counties. Over the 25-year period between 2015 and 2040, the greatest employment increases are expected to occur in Riverside, Los Angeles, and San Diego Counties with estimated increases of 383, 379, and 237 thousand jobs respectively. Relative to existing employment, Riverside and San Bernardino counties are expected to have the highest rates of employment growth.

Figure A.1-2 and Table A.1-3 summarize the projected growth of commercial, industrial, and institutional employment in Metropolitan's service area. Total urban employment is expected to increase from 8.2 million in 2015 to about 9.6 million in 2040. This increase of about 17 percent is greater than the projected population increase of 16 percent, suggesting a slightly increased share of the population will be employed over time.

Figure A.1-1 Actual and Projected Population

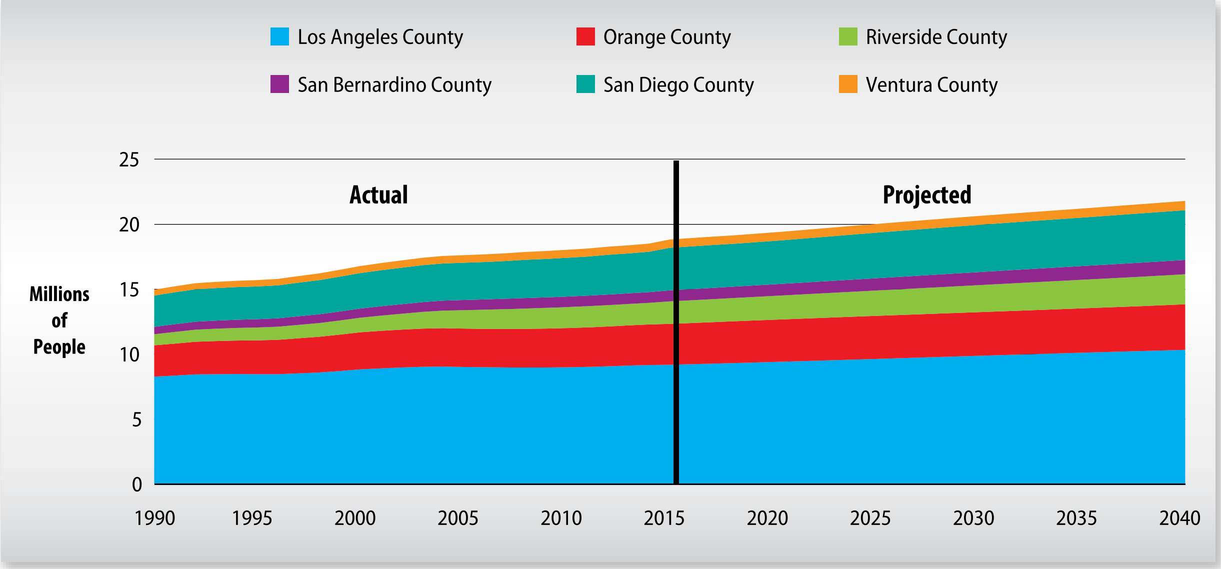
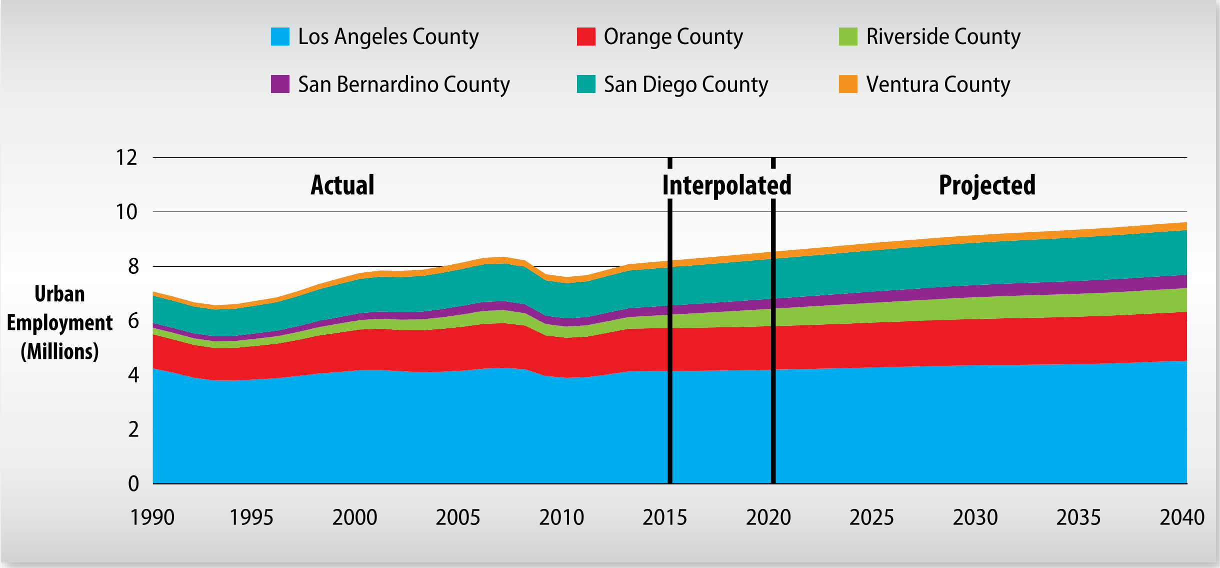


Figure A.1-2 Actual and Projected Urban Employment



Residential Consumers

Southern California's regional planning agencies have forecast residential housing growth in all parts of the Metropolitan service area. These forecasts are shown in Figure A.1-3 and Table A.1-4. The total occupied housing stock is expected to increase more than 20 percent between 2015 and 2040, growing from 6.1 to around 7.3 million housing units. Much of this growth will likely occur in hotter inland areas of Southern California. Within the service territory, the household occupancy size (household population divided by total occupied dwelling units) is projected to decline slightly from about 3.0 persons per unit currently to 2.9 persons per unit by 2040.

Permits for new residential housing construction are another indicator of the future growth in water demand. Figure A.1-4 shows the pattern of historical growth in residential housing permits between 1970 and 2040. The effect of economic cycles can clearly be seen over time with the precipitous fall in housing construction during the 2007 to 2010 recession being most notable. There is a recent slight increase of construction from 2011 to 2014.

Figure A.1-3 Actual and Projected Households

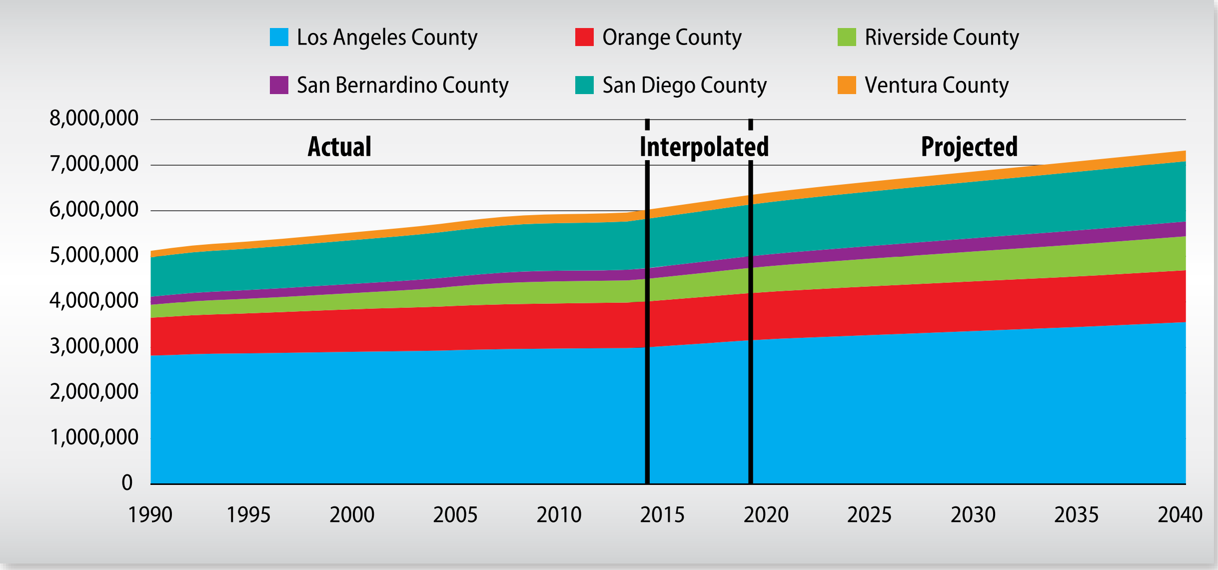
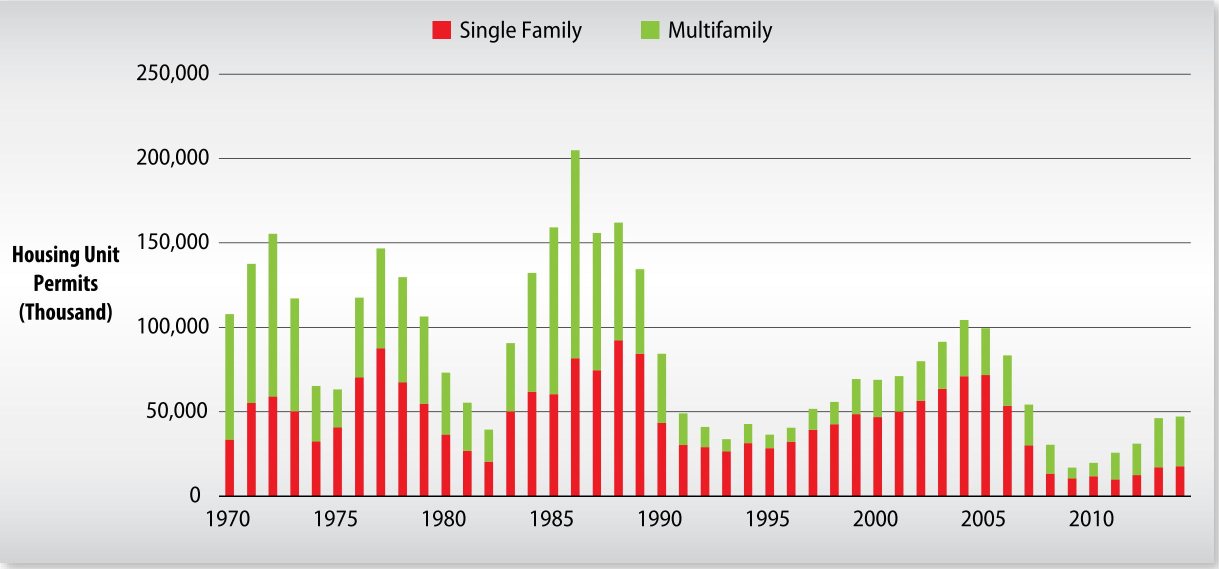


Figure A.1-4 Residential Housing Permits in Six-County Region



Water Demands

As shown in Figure A.1-5 and Table A.1-5, actual retail water demands in 2015 was 3.1 million acre-feet (MAF), which is approximately the same as in 1980. This is due to a number of factors including an aggressive outreach campaign due the severe drought since 2012, advancement in conservation, and mandatory water use restriction.

Of the estimated 3.1 MAF of total retail water use in 2015, agricultural water use was only about 99 TAF. This is due to severe drought, water rate increases, and water use restrictions. By 2040, under average conditions, retail agricultural demand is expected to be about 160 TAF.

Retail Demand

It is estimated that total M&I water use will grow from an annual average of 3.0 MAF in 2015 to 3.8 MAF in 2040. All water demand projections assume normal weather conditions. Future changes in estimated water demand assume continued water savings due to conservation measures such as water savings resulting from plumbing codes, price effects, and the continuing implementation of utility-funded conservation BMPs. Retail demand was greatly reduced in 2015 due to extraordinary response to statewide calls for a 25 percent reduction in water use in light of historic drought conditions. Regional water use is projected to increase slightly until 2020 as demands rebound towards more normal levels. Between 2020 and 2040, regional water use will grow slowly as driven by population and economic growth while water use efficiency increases.

By County

M&I water demand is not expected to grow uniformly across counties. Consistent with the general pattern of future demographic distributions, the largest absolute increases in urban water demands are expected to occur in Los Angeles and Riverside Counties, with respective estimated increases of about 231 TAF and 202 TAF between 2015 and 2040.

By Sector

Water use can also be broken down by sector. Between 2015 and 2040, single-family residential water use is expected to increase by 18.5 percent (Table A.1-8), while multifamily water use is estimated to increase by 32.9 percent (Table A.1-9). Table A.1-10 shows estimated nonresidential water use increasing by 19.0 percent between 2015 and 2040.

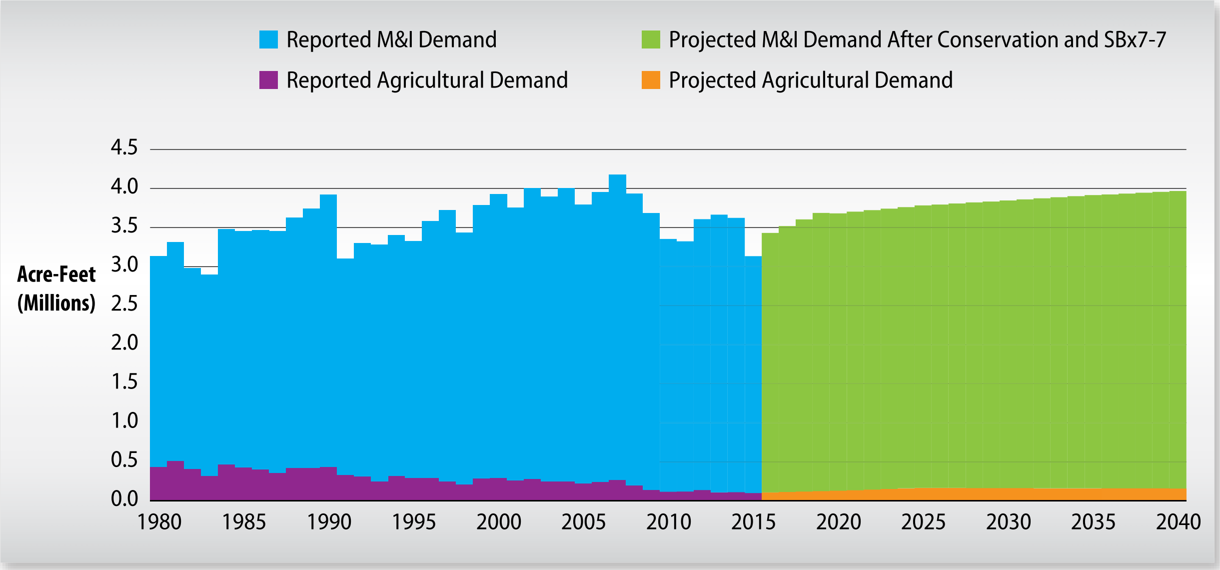
Residential Water Use

While single-family homes are estimated to account for about 60 percent of the total occupied housing stock in 2015, they are responsible for about 77 percent of total residential water demands (Tables A.1-8 and A.1-9). This is consistent with the fact that single-family households are known to use more water than multifamily households (e.g., those residing in duplexes, triplexes, apartment buildings and condo developments) on a per housing-unit basis. This is because single-family households tend to have more persons living in the household; they are likely to have more water-using appliances and fixtures; and they tend to have more landscaping.

Nonresidential Water Use

Nonresidential water use represented approximately 25 percent of the total M&I demands in Metropolitan's service area in 2015 (Table A.1-10). This includes water that is used by businesses, services, government, institutions (such as hospitals and schools), and industrial (or manufacturing) establishments. Within the commercial/institutional category, the top water users include schools, hospitals, hotels, amusement parks, colleges, laundries, and restaurants. In Southern California, major industrial users include electronics, aircraft, petroleum refining, beverages, food processing, and other industries that use water as a major component of the manufacturing process.

Figure A.1-5 Actual and Projected Retail Water Demand



Conservation Savings

Table A.1-12 shows estimated conservation savings resulting from active conservation programs ("Active"), ongoing conservation from natural replacement of plumbing fixtures ("Code-Based"), and conservation induced by projected increases in the real price of water ("Price"). Code-Based savings account for the largest share of total conservation. However, aggressive utility-funded conservation programs have made a significant contribution in this area. For example, Metropolitan-assisted programs were responsible for an estimated 179 TAF in savings during FY 2014-15 and nearly 800 TAF in cumulative conservation savings since FY 1990/91.

Projected M&I Demand by Sector

Table A.1-13 provides a summary of municipal and industrial demands, broken down by sector, along with each sector's share of total retail demand. In 2015, residential use accounted for about 70 percent of total projected M&I demand, while non-residential use constituted nearly 21 percent of projected M&I demand. These shares are expected to remain the same until 2040. System losses and unmetered use are expected to remain relatively constant over this period at about 9 percent.

Table A.1-2 Population Growth in Metropolitan's Service Area (July)

(Acre-feet)

County	Actual				Estimated	Projected				
	1995	2000	2005	2010	2015	2020	2025	2030	2035	2040
Los Angeles County	8,461,000	8,833,000	9,025,000	9,004,000	9,267,000	9,397,000	9,636,000	9,875,000	10,122,000	10,332,000
Orange County	2,605,000	2,854,000	2,954,000	3,012,000	3,153,000	3,246,000	3,316,000	3,376,000	3,382,000	3,507,000
Riverside County	989,000	1,120,000	1,409,000	1,618,000	1,679,000	1,825,000	1,951,000	2,074,000	2,201,000	2,309,000
San Bernardino County	638,000	706,000	783,000	810,000	839,000	889,000	947,000	1,001,000	1,059,000	1,103,000
San Diego County	2,519,000	2,730,000	2,863,000	2,987,000	3,169,000	3,341,000	3,496,000	3,631,000	3,746,000	3,825,000
Ventura County	490,000	541,000	583,000	616,000	633,000	657,000	671,000	682,000	696,000	715,000
Metropolitan's Service Area	**15,702,000**	**16,784,000**	**17,617,000**	**18,047,000**	**18,740,000**	**19,355,000**	**20,017,000**	**20,639,000**	**21,206,000**	**21,791,000**

Source: US Census, CA Department of Finance, SCAG RTP-12, and SANDAG Series 13

Note: Totals may not foot due to rounding differences

Table A.1-3 Urban Employment Growth in Metropolitan's Service Area (July)

(Acre-feet)

County	Actual				Estimated	Projected				
	1995	2000	2005	2010	2015	2020	2025	2030	2035	2040
Los Angeles County	3,841,000	4,180,000	4,163,000	3,900,000	4,151,000	4,191,000	4,288,000	4,364,000	4,400,000	4,530,000
Orange County	1,236,000	1,498,000	1,618,000	1,476,000	1,582,000	1,603,000	1,652,000	1,709,000	1,747,000	1,797,000
Riverside County	262,000	346,000	451,000	407,000	488,000	647,000	732,000	803,000	845,000	871,000
San Bernardino County	201,000	255,000	322,000	307,000	339,000	367,000	413,000	453,000	477,000	492,000
San Diego County	1,021,000	1,258,000	1,358,000	1,292,000	1,409,000	1,470,000	1,519,000	1,558,000	1,604,000	1,646,000
Ventura County	172,000	218,000	235,000	226,000	242,000	260,000	270,000	279,000	282,000	292,000
Metropolitan's Service Area	**6,733,000**	**7,755,000**	**8,147,000**	**7,608,000**	**8,211,000**	**8,538,000**	**8,874,000**	**9,166,000**	**9,355,000**	**9,628,000**

Source: US Census, CA Department of Finance, SCAG RTP-12, and SANDAG Series 13

Note: Totals may not foot due to rounding differences

Table A.1-4 Occupied Housing Growth in Metropolitan's Service Area

(Acre-feet)

	Actual				Estimated			Projected		
County	1995	2000	2005	2010	2015	2020	2025	2030	2035	2040
Los Angeles County	2,876,000	2,909,000	2,944,000	2,980,000	3,038,000	3,189,000	3,277,000	3,366,000	3,455,000	3,557,000
Orange County	881,000	937,000	974,000	992,000	1,013,000	1,042,000	1,073,000	1,092,000	1,111,000	1,139,000
Riverside County	323,000	357,000	432,000	483,000	506,000	563,000	609,000	656,000	703,000	744,000
San Bernardino County	192,000	204,000	220,000	232,000	240,000	262,000	278,000	294,000	310,000	325,000
San Diego County	913,000	963,000	1,016,000	1,045,000	1,093,000	1,145,000	1,200,000	1,241,000	1,289,000	1,322,000
Ventura County	156,000	170,000	185,000	195,000	200,000	211,000	217,000	222,000	227,000	235,000
Metropolitan's Service Area	**5,341,000**	**5,540,000**	**5,771,000**	**5,927,000**	**6,090,000**	**6,412,000**	**6,654,000**	**6,871,000**	**7,095,000**	**7,322,000**

Source: US Census, CA Department of Finance, SCAG RTP-12, SANDAG Series 13 2050 Regional Growth Forecast (April 2015)

Note: Totals may not foot due to rounding differences

Table A.1-5 Total Retail Demand in Metropolitan's Service Area with Conservation and SB X7-7

(Acre-feet)

	Actual							Projected		
County	1995	2000	2005	2010	2015	2020	2025	2030	2035	2040
Los Angeles County	1,558,000	1,739,000	1,643,000	1,423,000	1,309,000	1,503,000	1,499,000	1,507,000	1,525,000	1,539,000
Orange County	577,000	660,000	629,000	546,000	539,000	604,000	613,000	617,000	613,000	619,000
Riverside County	404,000	492,000	495,000	467,000	420,000	551,000	593,000	622,000	650,000	666,000
San Bernardino County	184,000	251,000	264,000	249,000	216,000	279,000	296,000	307,000	319,000	327,000
San Diego County	502,000	661,000	614,000	533,000	520,000	597,000	628,000	639,000	652,000	658,000
Ventura County	108,000	132,000	158,000	136,000	131,000	149,000	153,000	154,000	155,000	157,000
Metropolitan's Service Area	**3,333,000**	**3,935,000**	**3,803,000**	**3,354,000**	**3,135,000**	**3,683,000**	**3,782,000**	**3,846,000**	**3,914,000**	**3,966,000**

*2015 based on best available data.

Table A.1-6 Total Retail M&I Demand in Metropolitan's Service Area with Conservation and SB X7-7

(Acre-feet)

	Actual					Projected				
County	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
Los Angeles County	1,550,000	1,738,000	1,643,000	1,422,000	1,308,000	1,502,000	1,499,000	1,506,000	1,524,000	1,539,000
Orange County	559,000	643,000	619,000	544,000	533,000	599,000	608,000	614,000	611,000	617,000
Riverside County	245,000	357,000	413,000	409,000	379,000	486,000	507,000	537,000	565,000	581,000
San Bernardino County	152,000	221,000	236,000	227,000	190,000	273,000	289,000	302,000	314,000	322,000
San Diego County	438,000	556,000	523,000	506,000	509,000	559,000	580,000	592,000	606,000	613,000
Ventura County	94,000	125,000	145,000	128,000	116,000	132,000	132,000	133,000	133,000	134,000
Metropolitan's Service Area	**3,038,000**	**3,640,000**	**3,579,000**	**3,236,000**	**3,035,000**	**3,551,000**	**3,615,000**	**3,684,000**	**3,753,000**	**3,806,000**

2015 based on best available data.

Table A.1-7 Total Retail Agricultural Demand in Metropolitan's Service Area

(Acre-feet)

	Actual					Projected				
County	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
Los Angeles County	7,500	500	400	1,000	1,000	300	400	400	400	400
Orange County	17,700	17,300	9,800	1,800	5,700	4,700	4,700	3,400	2,000	2,000
Riverside County	158,700	134,100	81,700	58,100	41,100	65,600	85,500	85,100	84,900	84,500
San Bernardino County	32,200	29,800	27,500	21,600	26,000	5,300	7,000	5,000	5,000	5,000
San Diego County	64,400	105,600	91,300	27,100	10,800	37,800	48,300	47,200	46,100	45,000
Ventura County	14,300	7,500	12,600	8,400	14,700	16,100	21,400	22,000	22,600	22,600
Metropolitan's Service Area	**294,800**	**294,800**	**223,300**	**118,000**	**99,300**	**129,800**	**167,300**	**163,100**	**161,000**	**159,500**

2015 based on best available data.

Table A.1-8 Single Family Retail Demand in Metropolitan's Service Area[1]

(Acre-feet)

		Projected				
County	2015	2020	2025	2030	2035	2040
Los Angeles County	770,000	854,000	833,000	836,000	850,000	849,000
Orange County	293,000	324,000	327,000	327,000	326,000	328,000
Riverside County	306,000	371,000	371,000	390,000	412,000	421,000
San Bernardino County	144,000	169,000	174,000	180,000	187,000	192,000
San Diego County	316,000	364,000	375,000	380,000	385,000	385,000
Ventura County	93,000	104,000	101,000	102,000	102,000	103,000
Metropolitan's Service Area	1,922,000	2,186,000	2,181,000	2,215,000	2,262,000	2,278,000

[1] Projections do not include savings estimates to meet SB X7-7.

Table A.1-9 Multi-family Retail Demand in Metropolitan's Service Area[1]

(Acre-feet)

		Projected				
County	2015	2020	2025	2030	2035	2040
Los Angeles County	301,000	330,000	349,000	355,000	362,000	376,000
Orange County	87,000	94,000	96,000	99,000	98,000	102,000
Riverside County	42,000	48,000	63,000	67,000	70,000	77,000
San Bernardino County	32,000	37,000	39,000	42,000	44,000	46,000
San Diego County	103,000	115,000	125,000	133,000	143,000	151,000
Ventura County	13,000	13,000	14,000	15,000	15,000	16,000
Metropolitan's Service Area	578,000	637,000	686,000	711,000	732,000	768,000

[1] Projections do not include savings estimates to meet SB X7-7.

Table A.1-10 Commercial, Industrial and Institutional Retail Demand in Metropolitan's Service Area[1]

(Acre-feet)

		Projected				
County	2015	2020	2025	2030	2035	2040
Los Angeles County	325,000	355,000	353,000	351,000	349,000	350,000
Orange County	165,000	183,000	186,000	189,000	189,000	189,000
Riverside County	65,000	96,000	104,000	110,000	113,000	113,000
San Bernardino County	57,000	69,000	76,000	81,000	84,000	85,000
San Diego County	99,000	111,000	112,000	110,000	110,000	110,000
Ventura County	33,000	39,000	39,000	39,000	38,000	38,000
Metropolitan's Service Area	744,000	853,000	870,000	880,000	883,000	885,000

[1] Projections do not include savings estimates to meet SB X7-7.

Table A.1-11 Unmetered Use in Metropolitan's Service Area[1]

(Acre-feet)

County	2015	2020	2025	2030	2035	2040
				Projected		
Los Angeles County	149,000	154,000	156,000	159,000	162,000	165,000
Orange County	69,000	70,000	72,000	73,000	74,000	76,000
Riverside County	34,000	39,000	42,000	46,000	49,000	52,000
San Bernardino County	39,000	42,000	45,000	48,000	51,000	53,000
San Diego County	14,000	15,000	16,000	16,000	17,000	18,000
Ventura County	15,000	16,000	16,000	17,000	17,000	17,000
Metropolitan's Service Area	320,000	336,000	347,000	359,000	370,000	381,000

[1] Projections do not include savings estimates to meet SB X7-7.

Table A.1-12 Conservation Savings in Metropolitan's Service Area – 1980 Base Year[1]

(Acre-feet)

	Estimated					Projected				
County	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
Los Angeles	81,000	166,000	235,000	296,000	364,000	406,000	436,000	465,000	484,000	513,000
Orange County	25,000	55,000	81,000	104,000	123,000	130,000	138,000	147,000	156,000	167,000
Riverside	10,000	22,000	37,000	52,000	67,000	76,000	88,000	100,000	113,000	126,000
San Bernardino	5,000	10,000	16,000	22,000	27,000	32,000	37,000	42,000	46,000	52,000
San Diego	25,000	56,000	78,000	96,000	114,000	138,000	152,000	167,000	182,000	197,000
Ventura	4,000	9,000	13,000	16,000	20,000	28,000	30,000	32,000	35,000	37,000
Active, Code, Price	150,000	318,000	460,000	586,000	715,000	810,000	881,000	953,000	1,016,000	1,092,000
Pre-1990 Conservation	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000
Total Conservation	400,000	568,000	710,000	836,000	965,000	1,060,000	1,131,000	1,203,000	1,266,000	1,342,000

[1] Estimated conservation savings with active savings installed as of 2015.
Savings projections do not include savings derived from SB X7-7.

Table A.1-13 Projected Municipal and Industrial Demands by Sector

(Acre-feet)

	Historical[1]					Projected[2]				
Sector	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
Single-Family	1,792,000	2,169,000	2,150,000	1,925,000	1,922,000	2,186,000	2,181,000	2,215,000	2,262,000	2,278,000
Multi-Family	522,000	632,000	626,000	561,000	578,000	637,000	686,000	711,000	732,000	768,000
Non-Residential	699,000	847,000	839,000	751,000	744,000	853,000	870,000	880,000	883,000	885,000
System Losses/Unmetered	275,000	333,000	330,000	296,000	320,000	336,000	347,000	359,000	370,000	381,000
Metropolitan Total	3,288,000	3,981,000	3,945,000	3,533,000	3,564,000	4,012,000	4,084,000	4,165,000	4,247,000	4,312,000

[1] Estimates of historical water use are prorated using percentages from projected demands and actual water use.

[2] Projected demands are weather normalized and do not include savings estimates to meet SB X7-7

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Appendix 2

EXISTING REGIONAL WATER SUPPLIES

Appendix 2
EXISTING REGIONAL WATER SUPPLIES

Water used in Metropolitan's service area comes from both local and imported sources. Local sources include groundwater, surface water, and recycled water. Sources of imported water include the Colorado River, the State Water Project (SWP), and the Owens Valley/Mono Basin. On average over the last 10 years (from 2006 to 2015), local sources met about 45 percent of the water needs, while imported sources supplied the remaining 55 percent.

The City of Los Angeles imports water from the Owens Valley/Mono Basin east of the Sierra Nevada through the Los Angeles Aqueduct (LAA). This water currently meets about 4 percent of the region's water needs based on a ten-year average from 2006 to 2015, but is dedicated for use by the City of Los Angeles. Metropolitan provides imported water supplies to meet the remaining 51 percent of the region's water needs based on the same ten-year period. These imported supplies are received from Metropolitan's Colorado River Aqueduct (CRA) and the SWP's California Aqueduct. Table A.2-1 and Figure A.2-1 show the historical sources of local and imported supplies within Metropolitan's service area.

Table A.2-2 shows the quantities of Metropolitan water used by member agencies during the last ten years. Metropolitan's largest water customers are the San Diego County Water Authority (27 percent), City of Los Angeles (17 percent), and Municipal Water District of Orange County (13 percent).

The following sections describe the current supply sources in more detail. The main body of the Urban Water Management Plan contains descriptions of planned future supplies.

Local Water Supplies

Local sources of water available to the region include surface water, groundwater, and recycled water. Some of the major river systems in Southern California have been developed into systems of dams, flood control channels, and percolation ponds for supplying local water and recharging groundwater basins. For example, the San Gabriel and Santa Ana Rivers capture over 85 percent of the runoff in their watersheds. The Los Angeles River system, however, is not as efficient in capturing runoff. In its upper reaches, which make up 25 percent of the watershed, most runoff is captured with recharge facilities. In its lower reaches, which comprise the remaining 75 percent of the watershed, the river and its tributaries are lined with concrete, so there are no recharge facilities. The Santa Clara River in Ventura County is outside of Metropolitan's service area, but it replenishes groundwater basins used by water agencies within Metropolitan's service area. Other rivers in Metropolitan's service area, such as the Santa Margarita and San Luis Rey, are essentially natural replenishment systems.

Table A. 2-1

Sources of Water Supply to the Metropolitan Service Area

(Acre-Feet)[1]

Calendar Year	Local Supplies	L.A. Aqueduct	Colorado River Aqueduct[2]	State Water Project[3]	Total
1976	1,363,000	430,000	778,000	638,000	3,209,000
1977	1,370,000	275,000	1,277,000	209,000	3,131,000
1978	1,253,000	472,000	710,000	576,000	3,011,000
1979	1,419,000	493,000	784,000	532,000	3,227,000
1980	1,452,000	515,000	791,000	560,000	3,317,000
1981	1,500,000	465,000	791,000	827,000	3,583,000
1982	1,392,000	483,000	686,000	737,000	3,298,000
1983	1,385,000	519,000	850,000	410,000	3,163,000
1984	1,621,000	516,000	1,150,000	498,000	3,785,000
1985	1,535,000	496,000	1,018,000	728,000	3,776,000
1986	1,510,000	521,000	1,001,000	756,000	3,789,000
1987	1,465,000	428,000	1,175,000	763,000	3,831,000
1988	1,521,000	369,000	1,199,000	957,000	4,047,000
1989	1,542,000	288,000	1,189,000	1,215,000	4,234,000
1990	1,470,000	106,000	1,183,000	1,458,000	4,217,000
1991	1,426,000	186,000	1,252,000	625,000	3,490,000
1992	1,512,000	177,000	1,153,000	744,000	3,586,000
1993	1,408,000	289,000	1,144,000	663,000	3,505,000
1994	1,527,000	133,000	1,263,000	845,000	3,768,000
1995	1,590,000	464,000	933,000	451,000	3,438,000
1996	1,715,000	425,000	1,089,000	663,000	3,892,000
1997	1,759,000	436,000	1,125,000	724,000	4,044,000
1998	1,726,000	467,000	941,000	521,000	3,655,000
1999	1,887,000	309,000	1,072,000	792,000	4,060,000
2000	1,768,000	255,000	1,217,000	1,473,000	4,714,000
2001	1,708,000	267,000	1,245,000	1,119,000	4,340,000
2002	1,706,000	179,000	1,198,000	1,415,000	4,498,000
2003	1,659,000	252,000	676,000	1,561,000	4,148,000
2004	1,627,000	203,000	741,000	1,802,000	4,373,000
2005	1,590,000	369,000	707,000	1,525,000	4,190,000
2006	1,710,000	379,000	514,000	1,695,000	4,297,000
2007	1,852,000	129,000	696,000	1,648,000	4,326,000
2008	1,842,000	147,000	896,000	1,037,000	3,922,000
2009	1,857,000	137,000	1,044,000	908,000	3,946,000
2010	1,729,000	251,000	837,000	1,129,000	3,946,000
2011	1,664,000	370,000	445,000	1,379,000	3,859,000
2012	1,867,000	167,000	455,000	1,252,000	3,741,000
2013	1,866,000	65,000	984,000	974,000	3,889,000
2014	1,885,000	62,000	1,168,000	607,000	3,723,000
2015 [4]	1,676,000	27,000	1,180,000	550,000	3,442,000

1. Not including system losses.
2. Colorado River Aqueduct deliveries to service area: gross Havasu diversions less return flows, deliveries to USBR, Mexico, and storage.
3. State Water Project deliveries to service area: includes Table A, Art. 21, Art. 14(b), Art. 12(d), 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, SBVMWD Purchases.
4. Based on best available data and estimates as of October 2015.

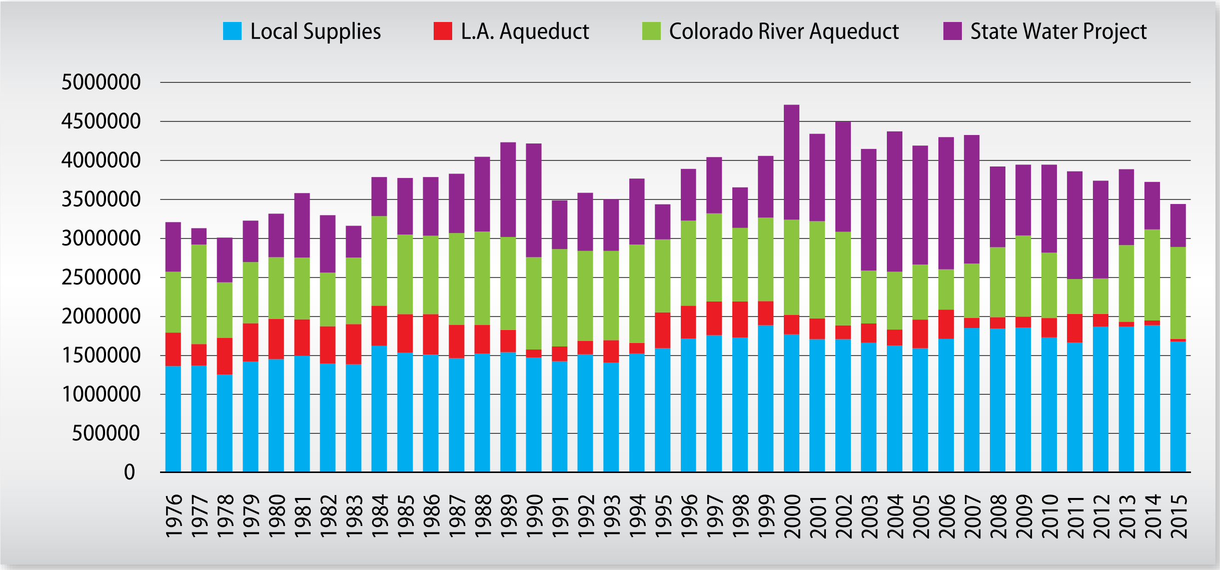
Table A.2-2 Historical Metropolitan Water Deliveries to Member Agencies

(Acre-feet)

Member Agency	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015[1]
City of Anaheim	33,000	25,000	21,000	16,000	21,000	22,000	29,000	20,000	20,000	18,000	13,000
City of Beverly Hills	12,000	12,000	12,000	12,000	11,000	10,000	10,000	11,000	11,000	12,000	10,000
City of Burbank	15,000	16,000	13,000	15,000	12,000	10,000	18,000	15,000	15,000	16,000	8,000
Calleguas Municipal Water District	120,000	126,000	131,000	121,000	101,000	87,000	97,000	106,000	112,000	110,000	85,000
Central Basin Municipal Water District	67,000	114,000	85,000	55,000	53,000	63,000	67,000	38,000	36,000	30,000	58,000
City of Compton	4,000	4,000	3,000	2,000	2,000	2,000	2,000	2,000	1,000	0	0
Eastern Municipal Water District	113,000	126,000	127,000	110,000	99,000	89,000	90,000	93,000	101,000	103,000	74,000
Foothill Municipal Water District	12,000	12,000	12,000	10,000	10,000	9,000	8,000	8,000	9,000	10,000	7,000
City of Fullerton	18,000	20,000	11,000	8,000	11,000	10,000	10,000	10,000	9,000	9,000	6,000
City of Glendale	22,000	22,000	23,000	21,000	19,000	16,000	18,000	18,000	19,000	19,000	14,000
Inland Empire Utilities Agency	93,000	112,000	75,000	58,000	36,000	45,000	76,000	57,000	64,000	68,000	38,000
Las Virgenes Municipal Water District	21,000	23,000	26,000	27,000	21,000	20,000	20,000	21,000	24,000	24,000	18,000
City of Long Beach	51,000	43,000	36,000	35,000	33,000	26,000	43,000	30,000	35,000	37,000	34,000
City of Los Angeles	184,000	185,000	441,000	430,000	352,000	206,000	120,000	328,000	439,000	384,000	389,000
Municipal Water District of Orange County	303,000	319,000	270,000	234,000	211,000	218,000	264,000	240,000	216,000	263,000	197,000
City of Pasadena	21,000	24,000	25,000	24,000	20,000	20,000	18,000	18,000	21,000	21,000	15,000
San Diego County Water Authority	547,000	598,000	698,000	566,000	540,000	447,000	408,000	455,000	492,000	518,000	466,000
City of San Fernando	1,000	0	1,000	0	0	0	0	0	0	0	0
City of San Marino	1,000	2,000	1,000	1,000	1,000	1,000	0	1,000	1,000	1,000	1,000
City of Santa Ana	22,000	22,000	12,000	8,000	7,000	10,000	16,000	12,000	15,000	11,000	6,000
City of Santa Monica	13,000	13,000	13,000	12,000	12,000	10,000	6,000	7,000	6,000	5,000	3,000
Three Valleys Municipal Water District	69,000	68,000	74,000	68,000	58,000	62,000	66,000	64,000	69,000	67,000	44,000
City of Torrance	21,000	21,000	20,000	19,000	18,000	17,000	17,000	17,000	17,000	17,000	14,000
Upper San Gabriel Valley Municipal Water District	45,000	48,000	23,000	13,000	6,000	46,000	35,000	16,000	30,000	27,000	47,000
West Basin Municipal Water District	145,000	144,000	142,000	130,000	120,000	120,000	112,000	117,000	121,000	118,000	107,000
Western Municipal Water District of Riverside County	91,000	103,000	120,000	99,000	86,000	76,000	75,000	82,000	74,000	76,000	55,000
Total of All Agencies	2,044,000	2,202,000	2,415,000	2,094,000	1,860,000	1,642,000	1,625,000	1,786,000	1,957,000	1,964,000	1,709,000

1. Based on best available data and estimates as of September 2015.

Figure A.2-1 Sources of Supply to Metropolitan's Service Area



Local supplies fluctuate in response to variations in rainfall. During prolonged periods of below-normal rainfall, local water supplies decrease. Conversely, prolonged periods of above-normal rainfall increase local supplies. Sources of groundwater basin replenishment include local precipitation, runoff from the coastal ranges, and artificial recharge with imported water supplies. In addition to runoff, recycled water provides an increasingly important source of replenishment water for the region.

Major Groundwater Basins

Groundwater sources account for about 90 percent of the local water supplies, which are found in many basins throughout the Southern California region and provide an annual average total production of about 1.35 MAF per year. Figure A.2-2 shows the location of the groundwater basins within Metropolitan's service area. Groundwater yield comes from natural recharge from the percolation of rainfall and stream runoff and active recharge from spreading and injection of captured stormwater, recycled water, and imported water. In certain major drainage areas, runoff is retained in flood control reservoirs and released into spreading basins for percolation into the ground. In Los Angeles County, many groundwater recharge facilities located along the upper reaches of the Los Angeles River and San Gabriel River systems provide recharge to San Fernando, Raymond, Main San Gabriel, Central, and West Coast groundwater basins. The Orange County Water District operates a system of diversion structures and recharge basins along the Santa Ana River that captures much of the storm runoff, as well as water from reclamation facilities in Riverside and San Bernardino counties. Storm runoff is also diverted to recharge basins in the Chino Basin. This water, which would otherwise flow into the Pacific Ocean, is allowed to percolate into the underlying aquifers so it may be pumped for local use when needed. Recycled water use for groundwater recharge has increased steadily. The Water Replenishment District of Southern California (WRD) has spread recycled water at the Montebello Forebay to recharge Central and West Coast basins for many years and is working to expand this practice. The Inland

Empire Utilities Agency (IEUA) provides recycled water for recharge of the Chino Basin. Orange County Water District has implemented the Groundwater Replenishment System (GWRS) to recharge over 100 TAF per year of highly-treated recycled water to the Orange County Basin. Highly treated recycled water is also used at seawater barriers in the West Coast, Central, and Orange County basins and has largely replaced use of imported water for this purpose.

Almost all major groundwater basins in Southern California are either adjudicated or managed by special districts or agencies. Over 90 percent of the groundwater used in Metropolitan's service area is produced from adjudicated or managed groundwater basins. Adjudicated basins in the region include: Raymond Basin, Upper Los Angeles River Area basins (which include San Fernando, Sylmar, Verdugo, and Eagle Rock Basins), Main San Gabriel Basin, Central Basin, West Coast Basin, Six Basins, Chino Basin, and Cucamonga Basin. The Orange County Groundwater Basin is managed by Orange County Water District; portions of the Ventura County Basins are managed by the Fox Canyon Groundwater Management Agency; and the West San Jacinto Basins and Hemet-San Jacinto Basins are managed by Eastern Municipal Water District. In general, these basins have management plans that include protection from seawater intrusion in the coastal region, water quality deterioration, and excessive lowering of water levels. Groundwater basin managers address treatment of contamination, manage recharge and storage programs, and monitor extraction, water levels, and water quality.

Major River Systems and Reservoirs

Local surface water resources consist of runoff captured in storage reservoirs and diversions from streams. Reservoirs hold the runoff for later direct use, and diversions from streams are delivered directly to local water systems. As Table A.2-3 shows, local water agencies currently own and operate 34 reservoirs. These reservoirs provide a storage capacity of approximately 897 TAF. The historic average yield of these local surface supplies, which come from reservoir releases and stream diversions, is about 90 TAF per year. The annual yield varies widely between wet and dry years, and most reservoirs that capture local surface runoff are operated with minimal carry-over storage. San Diego County has the greatest storage capacity for these types of reservoirs, with approximately 84 percent of the total local agency storage capacity in Metropolitan's service area.

In addition to the storage that is owned and operated by local agencies, Metropolitan operates DVL, Lake Skinner, and Lake Mathews. DVL stores water imported during years of ample supply. Of DVL's 810 TAF capacity, up to half is dedicated to emergency storage; the remainder is available to augment supplies during dry years and for seasonal storage. In contrast, Lake Skinner and Lake Mathews are largely used for system operations rather than dry year storage. Table A.2-4 lists Metropolitan-owned reservoirs with significant storage capacity.

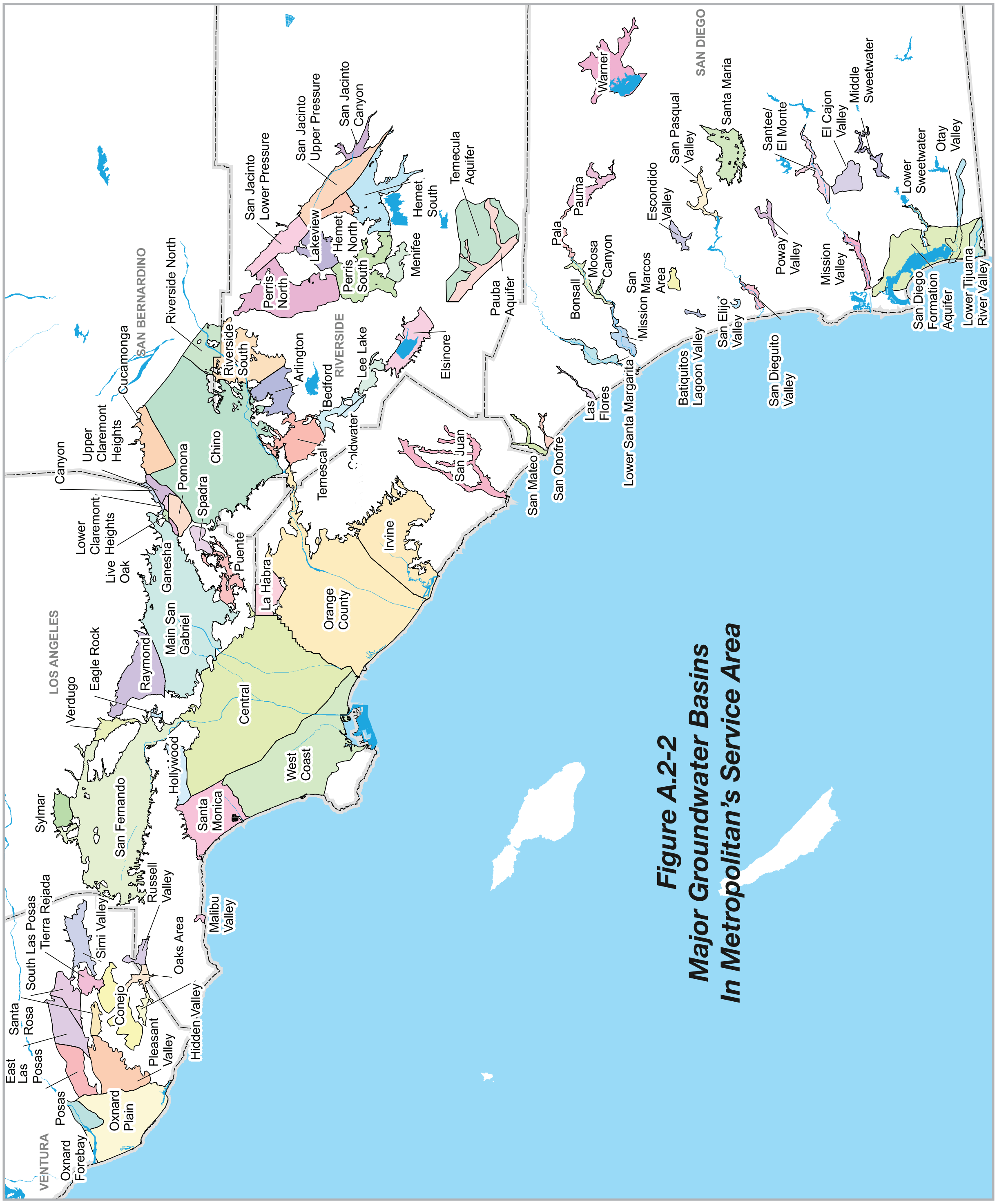


Figure A.2-2
Major Groundwater Basins
In Metropolitan's Service Area

Table A.2-3
Local Storage Reservoirs in Metropolitan's Service Area
(Thousands Acre-feet)

Member Agency/Sub-agency	Reservoir	Storage Capacity
Eastern MWD		
Rancho California WD	Vail Lake	51.0
Lake Hemet MWD	Lake Hemet	14.0
Las Virgenes MWD	Westlake Reservoir	10.0
City of Los Angeles	Los Angeles	10.2
	Encino	9.8
	Stone Canyon	10.8
	Hollywood	4.2
MWD of Orange County		
Irvine Ranch WD & Serrano ID	Santiago	25.0
San Diego County Water Authority		
Carlsbad MWD	Maerkle	0.6
Escondido, City of	Dixon	2.6
	Wohlford	6.5
Fallbrook PUD	Red Mountain	1.3
Helix WD	Cuyamaca	8.2
	Jennings	9.8
Poway, City of	Poway	3.3
Rainbow MWD	Beck	0.6
	Morro Hill	0.5
Ramona MWD	Ramona	12.0
San Diego County Water Authority	Olivenhain – CWA	24.8
San Diego, City of	Barrett	37.9
	El Capitan	112.8
	Hodges	30.3
	Lower Otay	49.5
	Miramar	7.2
	Morena	50.2
	Murray	4.8
	San Vicente	249.4
	Sutherland	29.7
San Dieguito WD	San Dieguito	0.9
Sweetwater Authority	Loveland	25.4
	Sweetwater	28.1
Valley Center MWD	Turner	1.6
Vista Irrigation District	Henshaw	51.8
Western MWD of Riverside		
Temescal Water Company	Railroad Canyon	12.0
Total		**896.8**

Table A.2-4
Regional Storage Reservoirs in Metropolitan's Service Area

(Thousands Acre-feet)

Reservoir	Capacity
Diamond Valley Lake	810
Lake Skinner[1]	44
Lake Mathews[1]	182

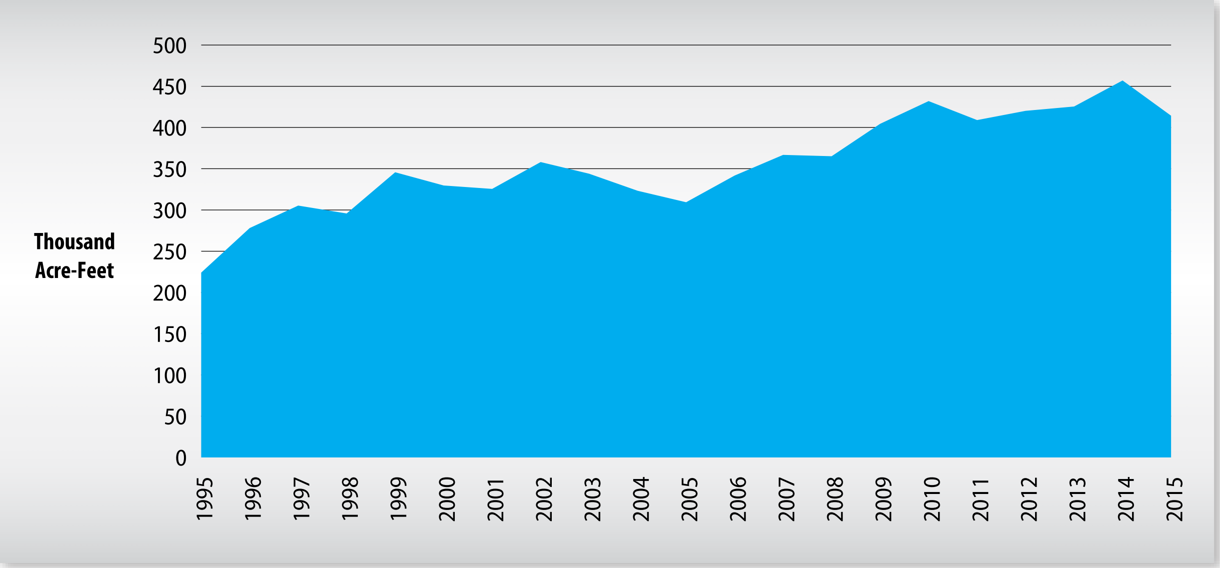
[1] These are used for operations and not primarily for dry year storage.

Lastly, Castaic and Perris are the terminal reservoirs to the West Branch and East Branch of the California Aqueduct operated by DWR. Through the Monterey Amendment to its SWP water service contract, Metropolitan has access to 219 TAF of flexible storage capacity in these SWP terminal reservoirs.

Water Recycling and Groundwater Recovery

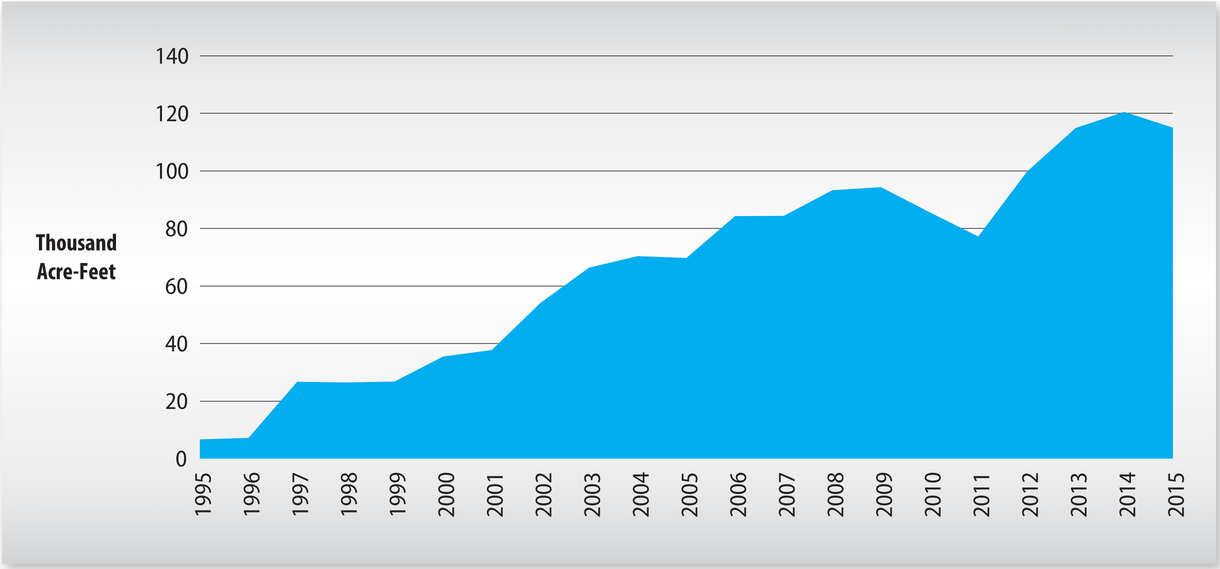
Water recycling projects involve treating wastewater to a level that is acceptable and safe for many non-potable applications. This resource is providing an increasing level of local water. In 1982, Metropolitan began helping to fund its member agencies' recycled water projects. Since that time, Metropolitan has invested approximately $372 million. In fiscal year 2014-15, water recycling projects in which Metropolitan has invested produced over 184 TAF. Local agency projects that did not receive financial assistance from Metropolitan produced an additional 170 TAF, and approximately 60 TAF of Santa Ana River base flow were used to recharge the Orange County basin. This brings the regional total to 414 TAF of recycled water use. Figure A.2-3 demonstrates the increase in this regional supply for direct use.

Figure A.2-3 Recycled Water



In addition, local agencies have implemented several projects to recover contaminated or degraded groundwater for potable uses. The groundwater recovery projects use a variety of treatment technologies to remove nitrates, volatile organic compounds, perchlorate, color, and salt. In 1991, Metropolitan began helping fund its member agencies' groundwater recovery projects. Since that time, Metropolitan has invested approximately $132 million. In FY 2014-15, these groundwater recovery projects produced 60 TAF. Other member agency projects that did not receive funding from Metropolitan produced another 55 TAF, for a regional total of 115 TAF. Figure A.2-4 shows this increase in supply.

Figure A.2-4 Groundwater Recovery



Imported Water

Most member agencies and retail water suppliers depend on imported water for a portion of their water supply. For example, Los Angeles and San Diego (the largest and second largest cities in the state) have historically obtained up to 85 percent of their water from imported sources. These imported water requirements are similar to those of other metropolitan areas within the state, such as San Francisco and other cities around the San Francisco Bay.

Figure A.2-5 shows the conveyance facilities for the state's imported water supplies. Descriptions of each of the imported sources of water available to Metropolitan's service area follow. Justification for projected water supplies from these sources is provided in Appendix 3.

Colorado River

A number of water agencies within California have rights to divert water from the Colorado River. Through the Seven Party Agreement (1931), seven agencies recommended apportionments of California's share of Colorado River water within the state. Table A.2-5 shows the historic apportionment of each agency, and the priority accorded that apportionment.

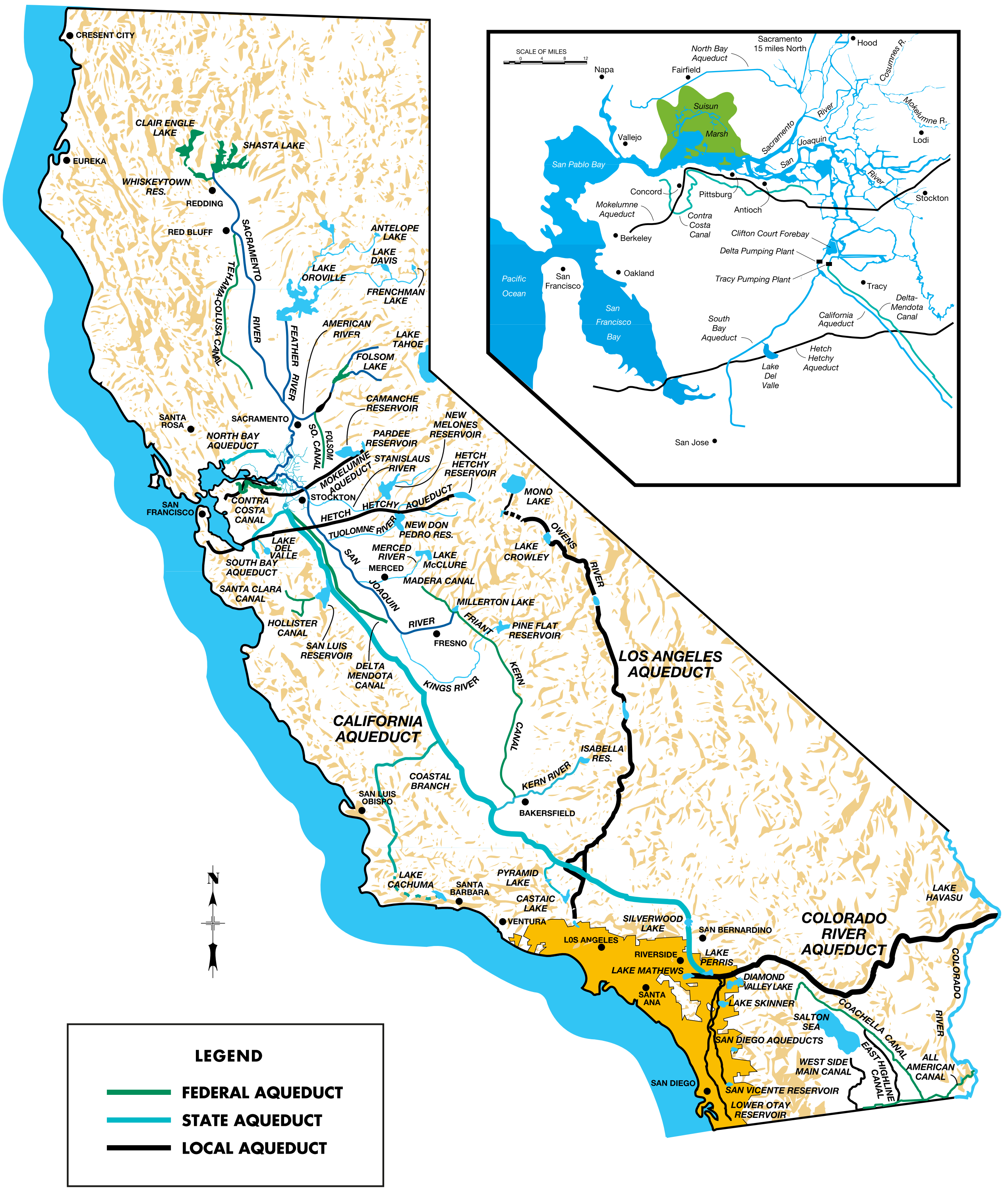
Table A.2-5
Priorities in Seven-Party Agreement and Water Delivery Contracts

Priority	Description	TAF Annually
1	Palo Verde Irrigation District – gross area of 104,500 acres of land in the Palo Verde Valley	3,850
2	Yuma Project (Reservation Division) – not exceeding a gross area of 25,000 acres in California	
3(a)	Imperial Irrigation District and land in Imperial and Coachella Valleys[1] to be served by All American Canal	
3(b)	Palo Verde Irrigation District—16,000 acres of land on the Lower Palo Verde Mesa	
4	Metropolitan Water District of Southern California for use on the coastal plain of Southern California	550
Subtotal		4,400
5(a)	Metropolitan Water District of Southern California for use on the coastal plain of Southern California	550
5(b)	Metropolitan Water District of Southern California for use on the coastal plain of Southern California[2]	112
6(a)	Imperial Irrigation District and land in Imperial and Coachella Valleys[1] to be served by the All American Canal	300
6(b)	Palo Verde Irrigation District—16,000 acres of land on the Lower Palo Verde Mesa	
7	Agricultural Use in the Colorado River Basin in California	
	Total Prioritized Apportionment	**5,362**

[1] The Coachella Valley Water District now serves Coachella Valley.

[2] In 1946, the City of San Diego, the San Diego County Water Authority, Metropolitan, and the Secretary of the Interior entered into a contract that merged and added the City of San Diego's rights to store and deliver Colorado River water to the rights of Metropolitan. The conditions of that agreement have long since been satisfied.

Figure A.2-5
MAJOR WATER CONVEYANCE FACILITIES IN CALIFORNIA



The water is delivered to Metropolitan's service area by way of the Colorado River Aqueduct (CRA), which has a capacity of nearly 1,800 cfs. The CRA conveys water 242 miles from its Lake Havasu intake to its terminal reservoir, Lake Mathews, near the City of Riverside. Conveyance losses along the CRA of 10 TAF per year reduce the amount of Colorado River water received in the coastal plain.

Since the date of the original contract, several events have occurred that changed the dependable supply that Metropolitan expects from the CRA. The most significant event was the 1964 U.S. Supreme Court decree in *Arizona v. California* that reduced Metropolitan's dependable supply of Colorado River water to 550 TAF per year. The reduction in dependable supply occurred with the commencement of Colorado River water deliveries to the Central Arizona Project. In 1987, Metropolitan entered into a contract with the U.S. Bureau of Reclamation (USBR) for an additional 180 TAF per year of surplus water when surplus water is available. In addition, Metropolitan has obtained a minimum of approximately 85 TAF per year of Colorado River water since 1996 through a conservation program with the Imperial Irrigation District.

In 1979, the Present Perfected Rights (PPRs) of certain Indian reservations, cities, and individuals along the Colorado River were quantified. These PPRs predate the Seven-Party Agreement, but the rights holders were not included in the Seven Party Agreement prioritizing California's use and storage of Colorado River water.

In 1999, under the auspices of the Colorado River Board of California, a draft plan, "California's Colorado River Water Use Plan", was developed. The Colorado River Board of California protects California's rights and interests in the resources provided by the Colorado River and represents California in discussions and negotiations regarding the Colorado River and its management. The overall purpose of California's Colorado River Water Use Plan is to provide Colorado River water users with a framework by which programs, projects, and other activities may be coordinated and cooperatively implemented. This framework specified how California would make the transition from relying on surplus water supplies from the Colorado River to living within its normal (basic) water supply apportionment.

To implement these plans, a number of agreements have been executed. In October 2003, representatives from Metropolitan, IID, and Coachella Valley Water District (CVWD) executed the Quantification Settlement Agreement (QSA) and several other related agreements. Parties involved include the San Diego County Water Authority (SDCWA), the California Department of Water Resources (DWR), the California Department of Fish and Wildlife, the U.S. Department of the Interior, and the San Luis Rey Indian Water Rights Settlement Parties. The QSA quantifies the use of water under the third priority of the Seven Party Agreement and allows for implementation of agricultural conservation, land management, and other programs identified in Metropolitan's 1996 IRP. Quantification of the third priority provides the needed numeric baseline from which conservation and transfer programs may be measured. The QSA has helped California reduce its reliance on Colorado River water above its normal apportionment.

The quantification of the agricultural priorities under the QSA provided for the water saved under the Palo Verde Land Management and Crop Rotation Program to be made available to Metropolitan. This program provides up to 133 TAF of water to be available to Metropolitan in certain years and will supply a minimum of 33 TAF per year.

In October 2004, SNWA and Metropolitan entered into a storage and interstate release agreement. Under this program, SNWA can request that Metropolitan store unused Nevada apportionment. The amount of water which Metropolitan diverted through 2014 under this agreement was over 272 TAF. In subsequent years, SNWA may request return of approximately

205 TAF stored before 2015 and 125 TAF of the water stored in 2015. It is expected that SNWA will not request return of water stored prior to 2015 until after 2019. Water stored in 2015 allowed Metropolitan to augment its water supply from the Colorado River in 2015.

In December 2007, the Secretary of the Interior approved the adoption of specific interim guidelines for reductions in Colorado River water deliveries during declared shortages and coordinated operations of Lake Powell and Lake Mead. These guidelines provide water release criteria from Lake Powell and water storage and water release criteria from Lake Mead during shortage, normal, and surplus conditions in the Lower Basin; provide a mechanism for the storage and delivery of conserved system and non-system water in Lake Mead; and modify and extend interim surplus guidelines through 2026. The Record of Decision and accompanying agreement among the Colorado River Basin States protect reservoir levels by reducing deliveries during drought periods, encourage agencies to develop conservation programs, and allow the states to develop and store new water supplies. The Colorado River Basin Project Act of 1968 insulates California from shortages in all but the most extreme hydrologic conditions.

In May 2006, Metropolitan and the USBR executed an agreement for a demonstration program that allowed Metropolitan to leave conserved water in Lake Mead that Metropolitan would otherwise have used in 2006 and 2007. The water left in Lake Mead must have been made available through extraordinary conservation measures, which was accomplished in 2006 and 2007 through savings realized under the Palo Verde Land Management, Crop Rotation, and Water Supply Program. This demonstration program was an activity eligible for creation of Extraordinary Conservation Intentionally Created Surplus (ICS) under the provisions of the December 2007 federal guidelines for the operation of Lake Powell and Lake Mead. Metropolitan continued to store water in Lake Mead through extraordinary conservation measures as provided in the December 2007 federal guidelines in 2009, 2010, 2011, and 2012. Metropolitan took delivery of a portion of its extraordinary conservation ICS in 2013 and 2014. As of January 1, 2015, Metropolitan had approximately 61.8 TAF of extraordinary conservation ICS water in Lake Mead.

The December 2007 federal guidelines provided Colorado River contractors the ability to create System Efficiency ICS through development and funding of system efficiency projects. To that end, in 2008 the Central Arizona Water Conservation District, SNWA, and Metropolitan contributed funds for the construction of the Drop 2 (Brock) Reservoir by the USBR. The purpose of the Drop 2 reservoir is to increase the capacity to regulate deliveries of Colorado River water at Imperial Dam, reducing the amount of water released downstream by approximately 70 TAF annually. In return for funding one-sixth of the project cost, 100 TAF of water stored in Lake Mead was assigned to Metropolitan as System Efficiency ICS in 2008. Including the Drop 2 reservoir, Metropolitan created System Efficiency ICS storage of over 124 TAF from 2008-2011. Of this total, approximately 24 TAF of System Efficiency ICS was achieved through financially contributing to a one-year pilot operation of the Yuma Desalting Plant. As of January 1, 2015, Metropolitan had approximately 89 TAF of System Efficiency ICS water in Lake Mead.

Metropolitan is undertaking ongoing efforts to maintain and improve the flexibility and quality of its water supply from the Colorado River. Section 3.1 of this report describes current programs and plans related to flexibility, and Chapter 4 describes water quality programs.

State Water Project

The State Water Project, which is owned by the state and operated by DWR, is the second source of Metropolitan's imported water supplies. The SWP comprises 32 storage facilities (reservoirs and lakes), 662 miles of aqueduct, and 25 power and pumping plants.

The SWP conveys water from Northern California to the north and south of the San Francisco Bay Area and areas south of the Bay Delta region. Water from the SWP originates at Lake Oroville, which is located on the Feather River in Northern California. That water, along with all additional unused water from the watershed, flows into the Sacramento/San Joaquin Delta. Water from the Delta is then either pumped to water users in the San Francisco Bay area or transported through the California Aqueduct to water users in Central and Southern California.

DWR contracted to deliver water in stages to 32 SWP contractors, with an ultimate delivery of 4,172 TAF per year. Currently, DWR is delivering water to 29 of these SWP contractors. Metropolitan is the largest, with a contractual amount of 1,911 TAF per year, or approximately 46 percent of the total contracted amount. Metropolitan receives deliveries of SWP supplies via the California Aqueduct at Castaic Lake in Los Angeles County, Devil Canyon Afterbay in San Bernardino County, and Box Springs Turnout and Lake Perris in Riverside County. The first delivery of SWP water to Metropolitan occurred in 1972.

The initial facilities of the SWP, completed in the early 1970s, were designed to meet the original needs of the SWP contractors. It was intended that additional SWP facilities would be built over time to meet projected increases in contractors' delivery needs. Each contractor's SWP contract provided for a buildup in contractual amount over time, with most contractors reaching their maximum annual contractual amount by the year 1990. Since the completion of the initial SWP facilities in the early 1970s, major improvements to the system have included: four new pumps added to the Banks Pumping Plant at the Delta, the completion of the Coastal Branch, and the East Branch enlargement. Even with these improvements, however, there are still significant capacity constraints within the SWP that limit the delivery capability of the full contracted amount. During the same time, the contractors' needs for water from the SWP have increased. As a result, the contractors' demands for SWP water currently exceed the dependable yield.[1] Metropolitan has developed groundwater storage programs with Semitropic Water Storage District, Arvin-Edison Water Storage District, and Kern Delta Water District to supplement the available water supply.

The amount of contractual supplies DWR approves for delivery varies annually with contractor demands and projected water supplies from tributary sources to the Delta, based on snowpack in the Sierra Nevada, reservoir storage, operational constraints, and demands of other water users. Deliveries to Metropolitan reached a high of 1,802 TAF in calendar year 2004. Metropolitan experienced shortages in SWP supplies in fiscal years 1991 and 1992, with reduced deliveries of 391 TAF and 710 TAF, respectively.[2] SWP deliveries were limited during the recent drought – a record low 5 percent of contractual amount in 2014 and 20 percent of contractual amount in 2015.

In recent years, the listing of several fish species in the Sacramento/San Joaquin River Delta (Delta) under both state and federal Endangered Species Acts has constrained SWP operations and created more uncertainty in SWP supply reliability. These listed species include Delta smelt, winter-run Chinook salmon, spring-run Chinook salmon, and splittail. In July 2015, DWR released the SWP Delivery Capability Report. The report shows that future SWP deliveries will be impacted by two significant factors. The first is significant restrictions on SWP and Central Valley Project (CVP) Delta pumping required by the biological opinions issued by the U.S. Fish and

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[1] The dependable yield of the existing SWP facilities is considered to be the delivery capability during a critically dry seven-year period.

[2] These numbers are Metropolitan's allocated contractual amount. Total water deliveries to Metropolitan's service area are shown in Table A.2-1.

Wildlife Service (December 2008) and National Marine Fisheries Service (June 2009). The second is climate change, which is altering the hydrologic conditions in the State.

Metropolitan is undertaking ongoing efforts to maintain and improve the reliability and quality of its water supply from the State Water Project. Sections 3.2 and 3.3 in the 2015 UWMP describe current programs and plans for reliability, and Chapter 4 addresses water quality issues.

Los Angeles Aqueduct

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

Prior to the 1990-1991 drought, the City of Los Angeles had imported an average of 440 TAF of water annually from the combined Owens Valley/Mono Basin system, of which about 90 TAF came from the Mono Basin. In 1986, the aqueduct delivered a record 520 TAF of water.

In the late 1980s, a series of court injunctions limited the amount of water that Los Angeles could receive from its aqueduct system. In 1990, these limitations, along with a persistent drought, limited the delivery from the aqueduct to only 106 TAF. The Mono Lake Water Rights Decision (Decision) in September of 1994 ended the litigation in the Mono Basin, while negotiations continued with Inyo County on the fate of the Owens Valley water supply. In the Decision, the state ruled that Mono Lake should rise 17 feet over the next 25 years. During this time, Los Angeles would only be permitted to divert a fraction of its historical amounts. After the lake had risen, the City of Los Angeles would still be allowed only significantly reduced diversions. However, the high precipitation during the 1990s allowed increased diversions of water to the LAA to occur at a much earlier time frame than had been foreseen at the time of the Decision.

More recently, the LAA diversions of water from the Owens Valley came under additional pressure. A long history of diversions of water from the Owens River had led to the drying up of Owens Lake by the end of the 1920s. This dry lakebed became a major source of windblown dust, resulting in EPA pressure to develop a State Implementation Plan to bring the region into compliance with federal air quality standards. In 1998, the Los Angeles Department of Water and Power entered into a Memorandum of Agreement with the Great Basin Air Pollution Control District that specified actions needed to control the problem. These actions included shallow flooding and managed vegetation at various lakebed locations. An estimated 54 TAF per year will be required to maintain the dust control measures, further restricting the water available for diversion through the LAA. More recently, the city has been required to restore portions of the Owens River, which could further restrict the water that can be provided from this source. During the last 5 years (2011 to 2015), LAA supplies ranged from 370 TAF in the wet 2011 year to a low of 27 TAF in 2015.

Historic Total Regional Water Supplies

The previous sections have presented the various sources of Metropolitan and the region's water supply. The amount of water supplied by each local and imported source from 1976 through 2015 appears in Table A.2-1. The imported supplies represent the amount of water imported into Metropolitan's service area, not the amount delivered to member agencies, which is shown in Table A.2-2. The difference between Metropolitan's imports and deliveries is water placed into or withdrawn from storage.

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Appendix 3

JUSTIFICATIONS FOR SUPPLY PROJECTIONS

Appendix 3
JUSTIFICATIONS FOR SUPPLY PROJECTIONS

Water Code §10631 requires that urban agencies identify and quantify existing and planned sources of water and include a detailed description of all water supply projects and water supply programs that may be undertaken to meet the total projected water use. In addition, legislation authored by Senator Sheila Kuehl (Senate Bill 221 – now Water Code §10613, *et seq.*) and Senator Jim Costa (Senate Bill 610 – now Water Code §66473.7) requires water retailers to demonstrate that their water supplies are sufficient for certain proposed subdivisions and large development projects subject to the California Environmental Quality Act (CEQA). Although Metropolitan and other wholesalers do not have verification responsibilities under this legislation, information provided by Metropolitan may be useful to retailers in complying with these responsibilities. This Appendix provides the basis for the water availability contained in this report, by major source of supply. Such bases and proofs are required for supply verification under the legislation. Links to the copy of the guidebook for implementation of the legislation can be found at http://www.water.ca.gov/pubs/use/sb_610_sb_221_guidebook/guidebook.pdf.

Throughout this Appendix, references are made to Metropolitan's operating budget and its long-term capital investment plan. The most recent operating budget (for fiscal years 2014-15 and 2015-16) was adopted at the April 8, 2014 Board Meeting. A copy of the budget summary and the Capital Investment Plan for fiscal years 2014-15 and 2015-16 can be found at http://www.mwdh2o.com/PDF_Who_We_Are/1.4.7_Biennial_budget.pdf.

Another document of interest related to Metropolitan's water supply planning is its annual report to the state Legislature in compliance with Senate Bill 60 of 1999 (Hayden).[3] Senate Bill 60 requires that Metropolitan report on its progress in increasing its emphasis on cost-effective conservation, recycling, and groundwater recharge.

A.3.1 Colorado River Aqueduct Deliveries

A. Colorado River Supplies

Metropolitan obtains water from the Colorado River under a number of categories specified in its supplemental water storage and delivery contract with the Secretary of the Interior: its basic apportionment that is classified as Priority 4 water, unused and surplus water that is classified as Priority 5 and Priority 6(a) water, and water resulting from a number of conservation programs that is classified as Priority 3(a) water. Pursuant to a U.S. Supreme Court decree, and regulations and operating guidelines of the USBR, Metropolitan may receive as unused apportionment, water supplies unused by agricultural districts, supplies unused by the states of Arizona and Nevada, and as Intentionally Created Surplus, supplies stored from previous years'

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[3] Metropolitan Water District of Southern California, *Annual Progress Report to the California State Legislature: Achievements in Conservation, Recycling and Groundwater Recharge* (February 2016), which can be found at http://www.mwdh2o.com/PDF_About_Your_Water/2.1.1_Regional_Progress_ReportSB60.pdf. The legislation requiring this information can be found at http://www.leginfo.ca.gov/pub/99-00/bill/sen/sb_0051-0100/sb_60_bill_19990916_chaptered.pdf. Similar reports have been filed with the Legislature since 2000.

extraordinary conservation and efficiency improvements to the operations of the Colorado River system. Subject to the terms of agreements, this stored water may be withdrawn as needed during years in which insufficient supplies are available. Appendix 2 describes the history of water supplies and the expected availability from this source, and Section 3.1 of the 2015 UWMP describes the agreements for water supplies.

Rationale for Expected Supply

Historical Record

Water supply under Metropolitan's Priority 4 apportionment of Colorado River water has been delivered since 1939. By existing contract, it is expected to be available in perpetuity because of California's senior water rights to use of Colorado River water.

The historical record for available Colorado River water indicates that Metropolitan's fourth priority supply has been available in every year and can reasonably be expected to be available over the next 20 years.

Written Contracts or Other Proof

Metropolitan's entitlement to Colorado River water is based on a series of interstate compacts, federal laws, agreements, court decrees, and guidelines collectively known as "The Law of the River,"[4] which govern the distribution and management of Colorado River water. The following documents specifically determine Metropolitan's dependable supplies:

1931 Seven Party Agreement.[5] The 1931 Agreement recommended California's Colorado River use priorities and has no termination date. California's basic annual apportionment is 4.4 MAF. Palo Verde Irrigation District (PVID), Yuma Project (Reservation Division), Imperial Irrigation District (IID), Coachella Valley Water District (CVWD), and Metropolitan are the entities that hold the priorities. As shown in Table A.2-5, these priorities are included in the contracts that the Department of the Interior executed with the California agencies in the 1930s for water from Lake Mead. Metropolitan holds Priority 4 to California's basic apportionment of Colorado River water and utilizes this water – 550 TAF per year – every year. In addition, Metropolitan has access to additional Colorado River water – up to 662 and 38 TAF per year, respectively – through its Priority 5 and Priority 6(a) in the California apportionment. Appendix 2 describes the current status of water available under these priorities.

Metropolitan's Basic Contracts.[6] Metropolitan's 1930, 1931, and 1946 basic contracts with the Secretary of the Interior permit the delivery of 1.212 MAF per year when sufficient water is available. Metropolitan's 1987 surplus flow contract with USBR permits the delivery of water to fill the remainder of the Colorado River Aqueduct when water is available.

Consolidated Court Decree.[7] The 1964 U.S. Supreme Court Decree confirmed the Arizona, California, and Nevada basic apportionments of 2.8 MAF per year, 4.4 MAF per year, and 300 TAF per year, respectively. The 1964 Decree also permits the Secretary of the Interior to make water available that is unused by one of the states for use in the other two states. In addition, it permits the Secretary of the Interior to make surplus water available. A number of

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[4] A description of many of these documents can be found at http://www.usbr.gov/lc/region/pao/lawofrvr.html.

[5] This agreement among the seven California agencies was dated August 18, 1931, and was codified in federal regulations promulgated by the Secretary of the Interior on September 28, 1931.

[6] Including contract number Ilr-645 dated April 9, 1930, supplemented September 28, 1931.

[7] The Consolidated Decree entered by the U.S. Supreme Court on March 27, 2006, in *Arizona v. California, et al.*, can be found at http://www.usbr.gov/lc/region/pao/pdfiles/scconsolidateddecree2006.pdf.

decrees were subsequently entered by the U.S. Supreme Court in the case *Arizona v. California, et al.,* culminating in the Consolidated Decree entered on March 27, 2006.

2003 Quantification Settlement Agreement (QSA) and several other related agreements were executed in October 2003.[8] The QSA quantifies the use of water under the third priority of the Seven Party Agreement, and further allocates 38 TAF of the sixth priority to Metropolitan. The QSA provides the numeric baseline needed to measure conservation and transfer programs, and it allows for implementation of agricultural conservation, land fallowing, and other programs identified in the 1996 IRP. Although this agreement does not directly impact Metropolitan's entitlements, Metropolitan agreed to forbear consumptive use when necessary so that the Secretary of the Interior can satisfy the uses of holders of miscellaneous and Indian present perfected rights in excess of 14.5 TAF.

2005 Settlement Agreement with Quechan Indian Tribe. In 2005, Metropolitan entered into a settlement agreement with the Quechan Indian Tribe and other parties. The Tribe uses Colorado River water on the Fort Yuma Indian Reservation. Under the settlement agreement, the Tribe, in addition to the amounts of water decreed for the benefit of the Reservation in 1964, is entitled to: (a) an additional 20 TAF of diversions from the Colorado River or (b) the amount necessary to supply the consumptive use required for irrigation of a specified number of acres, and for the satisfaction of related uses, whichever is less. Of the additional water, 13 TAF became available to the Quechan Indian in 2006. An additional 7 TAF becomes available to the Tribe in 2035. Metropolitan and the Tribe agreed that if the Tribe chooses to limit proposed development and utilization of their irrigable lands, which would require the diversion of any of the additional water in a year, and instead allows the water which would otherwise be used to be diverted by Metropolitan, Metropolitan provides an incentive payment to the Tribe to avoid or reduce a loss of supply.

Colorado River Interim Guidelines for Lower Basin Shortage and the Coordinated Operations for Lake Powell and Lake Mead. In December 2007, the Secretary of the Interior approved a Record of Decision establishing specific interim guidelines for reductions in Colorado River water deliveries in the Lower Basin during declared shortages and coordinated operations of Lake Powell and Lake Mead. These guidelines provide water release criteria from Lake Powell and water storage and water release criteria from Lake Mead during shortage, normal, and surplus conditions in the Lower Basin, and provide a mechanism for Metropolitan to store and take delivery of conserved system and non-system water in Lake Mead.

Financing

Metropolitan's operating budget (referenced at the beginning of this appendix) includes the cost of delivering Colorado River water and the payment to the Quechan Indian Tribe, which is paid from water sales revenue.

Federal, State, and Local Permits/Approvals

Metropolitan's fourth priority Colorado River water is currently available, and this priority assures delivery of the basic apportionment.

B. IID - Metropolitan Conservation Program

Source of Supply

The IID-Metropolitan Conservation Program provides an annual supply that is delivered to Metropolitan's service area via its Colorado River Aqueduct (CRA). In 1988, Metropolitan

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[8] These agreements can be found at http://www.iid.com/water/library/qsa-water-transfer.

executed a Conservation Agreement to fund water efficiency improvements within IID's service area in return for the right to divert the water conserved by those improvements. The program consists of structural and non-structural measures, including the concrete lining of existing canals, the construction of local reservoirs and spill-interceptor canals, installation of non-leak gates, and automation of the distribution system. Other implemented projects include the delivery of water to farmers on a 12-hour basis rather than a 24-hour basis and improvements in on-farm water management through drip irrigation systems.

Expected Supply Capability

The IID-Metropolitan Conservation Program activity began in 1990, has been fully operational since 1998, and makes available 105 TAF of conserved water annually from 2016 onward. The initial program agreement provided CVWD the option to call up to about 45 TAF per year if needed to meet its demands. Execution of the QSA has reduced CVWD's option to a maximum of 20 TAF. This water is available to Metropolitan if not required by CVWD, but the minimum supply to MWD has been increased to 85 TAF from 2016 onward through a second amendment to the agreement, and the clarification on the number of 12-hour deliveries that would be included in the program through a letter agreement.

Rationale for Expected Supply

Historical Record

The IID-Metropolitan Conservation Program has been fully operational since 1998. Existing agreements have extended the initial term to at least 2041 or 270 days after the termination of the QSA, whichever is later, and they guarantee Metropolitan a minimum of 85 TAF per year from 2016 onward.

With operations beginning in 1990, the program has conserved as much as 109.46 TAF per year to date. By an amendment to the program agreement beginning in 2007, and a 2014 letter agreement, the annual conserved water yield will be 105 TAF. The historical record indicates that Metropolitan's expected minimum supply of 85 TAF per year would be available over the next 26 years at least.

Written Contracts or Other Proof

Metropolitan's annual supply from the IID-Metropolitan Conservation Program is based on three agreements and amendments to the agreements.

1988 IID-Metropolitan Conservation and Use of Conserved Water Agreement. This Agreement was executed in December 1988 by IID and Metropolitan for a 35-year term following completion of program implementation (1998–2033).

1989 Approval Agreement. This Agreement secured the approval of PVID and CVWD to not divert an amount of water equal to the amount conserved except under limited circumstances. The Agreement was executed in December 1989.

1989 Supplemental Approval Agreement. This Agreement was executed in December 1989 between Metropolitan and CVWD to coordinate Colorado River diversions and the use of the conserved water provided by the Program.

2003 Amendments to 1988 Agreement and 1989 Approval Agreement. These amendments revise Metropolitan's potential obligation to reduce its use of the conserved water yield in favor of its use by CVWD down to 20 TAF annually. Any of this water not used by CVWD would be available to Metropolitan.

2007 Amendments to 1988 Agreement and 1989 Approval Agreement. These amendments specify that beginning in 2007, the annual conserved water yield has and will be 105 TAF with continued operation of 24 tailwater pumpback systems, of which up to 20 TAF would be made available to CVWD upon its request.

2014 Letter Agreement Related to the 1988 Agreement. This letter agreement specifies that beginning in 2016, the annual conserved water yield has and will be 105 TAF, of which up to 20 TAF would be made available to CVWD upon its request. This amendment also removes tailwater recovery systems from the conservation actions and quantifies the yield and number of 12-hour deliveries that are included in the program.

Financing

The water efficiency improvements under this Program have already been funded, constructed, and put into operation. Metropolitan's five-year financial forecast in the budget includes the cost of operating, maintaining, and delivering the conserved water under the IID-Metropolitan Conservation Program.

Federal, State, and Local Permits/Approvals

A comprehensive environmental review process supported implementation.

EIR for Program. The IID Board certified the final EIR for the Program in December 1986.[9]

EIR for Supplemental Program. The IID Board certified the final EIR for the Completion Program in June 1994.[10]

Program EIR for Quantification Settlement Agreement. Metropolitan's Board certified the final Program EIR for the QSA in June 2002.[11]

Addendums to the QSA Final Program EIR. Metropolitan's Board adopted the Addendum to the QSA Final Program EIR in December 2002 and a second addendum in September 2003. Metropolitan's Board also adopted the Findings of Fact and Statement of Overriding Considerations, and Mitigation and Monitoring and Reporting Program at that time.

C. Palo Verde Irrigation District Land Management, Crop Rotation and Water Supply Program

Source of Supply

At its May 11, 2004 meeting, Metropolitan's Board authorized a 35-year land management, crop rotation, and water supply program with the PVID. Under the program, participating landowners in PVID are being paid to reduce their water use by not irrigating a portion of their land. A maximum of 29 percent of lands within PVID can be fallowed in any given year. Under the terms of the QSA, water savings within the PVID service area are made available to Metropolitan. PVID has the first priority for Colorado River water under the water delivery contracts with the USBR. Implementation of the program began in January 2005. The agreement also specifies that the participating landowners will fallow land in an amount equal to 25% of the landowner's total maximum fallowing commitment during each year.

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[9] Imperial Irrigation District, *Final EIR, Proposed Water Conservation Program and Initial Water Transfer, Imperial Irrigation District,* October, 1986. SCH Number: 1986012903.

[10] Imperial Irrigation District, *Final EIR for Modified East Lowline and Trifolium Interceptors, and Completion Projects*, May 1994. SCH Number: 1992071061.

[11] Coachella Valley Water District, Imperial Irrigation District, Metropolitan, San Diego County Water Authority, *Final Program EIR, Implementation of the Colorado River Quantification Settlement Agreement*, June 2002, SCH Number 2000061034.

Expected Supply Capability

It is estimated that the PVID/Metropolitan Program would provide up to 133 TAF per year of additional Colorado River water. This water would be available in any year as needed and in accordance with the provisions described in the agreements with Palo Verde Valley landowners and PVID.

Rationale for Expected Supply

Historical Record

Metropolitan and PVID tested the concept of developing a water supply for Metropolitan by entering into an agreement in 1992.[12] Agreements were signed with landowners and lessees in the Palo Verde Valley to forego irrigation for a two-year period from August 1992 to July 1994. Water unused by PVID, in the amount of 186 TAF, was stored in Lake Mead for Metropolitan. Both PVID and Metropolitan signed approved Principles of Agreement in 2001. PVID issued the Final EIR for the Proposed Palo Verde Irrigation District Land Management, Crop Rotation and Water Supply Program in September 2002.[13]

Implementation of the program began in January 2005. In March 2009, Metropolitan and PVID entered into a one-year supplemental fallowing program within PVID that provided for the fallowing of additional acreage, with savings of 24.1 TAF in 2009 and 32.3 TAF in 2010.

Calendar Year	**Volume of Water Saved** (TAF)
2005	108.7
2006	105.0
2007	72.3
2008	94.3
2009	120.2
2010	116.3
2011	122.2
2012	73.7
2013	32.8
2014	43.0
2015	85.0 (estimated)

Written Contracts or Other Proof

Contracts for this program are listed below.

August 2004 Forbearance and Fallowing Program Agreement. This agreement establishes the PVID/Metropolitan Program, which provides for a solicitation of and provisional approval of landowner participation offers, specifies the process for incorporating offers into agreements with landowners, and states the terms and conditions for fallowing, including payments made by Metropolitan.

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[12] Presented to Metropolitan's Board at its regular meeting on January 14, 1992.

[13] SCH Number 2001101149.

Landowner Agreements for Fallowing in PVID. These agreements specify an escrow process to consummate the transaction, an easement deed to encumber land for fallowing, a tenant agreement to subordinate a tenant's lease to the agreement and easement, and an encumbrance agreement to subordinate any encumbrance (e.g., a mortgage) to the easement. These agreements also state the landowner's fallowing obligation, payments to be made by Metropolitan, and land management measures to be implemented.

Financing

Metropolitan's annual O&M budget (referenced above) includes the cost of the PVID/Metropolitan Program.

Federal, State and Local Permits

EIR for Program. A Notice of Preparation for the PVID/Metropolitan Program was published on October 29, 2001. PVID issued the Final EIR for the Proposed Palo Verde Irrigation District Land Management, Crop Rotation, and Water Supply Program in September 2002 (see reference above).

D. Management of Metropolitan-Owned Land in Palo Verde

Source of Supply

In 2016, Metropolitan will negotiate new leases on its 20,995 irrigable acres in the Palo Verde valley. Starting in 2017, additional water savings beyond what is achieved by the Land Management, Crop Rotation, and Water Supply Program will be generated on Metropolitan-owned farmland in PVID through a shift to less water-intensive crops, the adoption of more efficient irrigation technologies, and/or precision irrigation practices. Any conserved water created in PVID will flow to Metropolitan's fourth priority Colorado River allocation.

Expected Supply Capability

Metropolitan's lands in PVID already generate 24 – 94 TAF of water savings through the existing PVID Land Management, Crop Rotation and Water Supply Program, depending on the call. Changes in land management through cropping and irrigation practices are expected to generate an additional 15 and 29 TAF annually from 2017 onward. Savings will be small at first but are expected to increase over the first several years as new crops are planted and irrigation systems are upgraded. Because all Metropolitan-owned lands are enrolled in the PVID Land Management, Crop Rotation and Water Supply Program, the savings from agricultural practices will depend on the fallowing call for each year, with a high call resulting in lower savings due to lower baseline usage.

Rationale for Expected Supply

The exact water savings will depend on the details of the land management proposals developed by Metropolitan's lessees. However, Metropolitan's goal is to reduce the current consumptive water use on the lands by at least 1.5 AF per acre per year. This reduction is consistent with a switch from flood-irrigated alfalfa to deficit-irrigated alfalfa or to drip-irrigated vegetables, two possible cropping strategies that have been proposed.

Metropolitan owns 20,995 irrigable acres in the valley, but depending on the fallowing call, which varies from 7 to 35% of eligible acreage, only 13,647–19,525 acres are in production in any given year. If a 1.5 AF per acre reduction were realized on all of the irrigated acres in production in a given year, the resulting savings would be 20–29 TAF per year, depending on the call. Savings in the first few years are likely to be as low as 15 TAF while crops and irrigation systems are transitioned.

Financing

Metropolitan's annual O&M budget includes the cost of the PVID land management program.

Federal, State and Local Permits

This program is not subject to any permits or environmental impact reviews under federal, state, or local laws.

E. All-American and Coachella Canal Lining Projects

Source of Supply

Water is being conserved by the replacement of earthen portions of the Coachella Canal and the All-American Canal with concrete-lined canals. The concrete lining reduces the amount of water lost to seepage from the canals.

Expected Supply Capability

Pursuant to the October 10, 2003 Allocation Agreement, Metropolitan is entitled to delivery of 16 TAF annually until the San Luis Rey Settlement Parties[14] satisfy the conditions described in Section 104 of the San Luis Rey Indian Water Rights Settlement Act (Public Law 100-675 Title 1 as amended). Once the statutory conditions have been met, Metropolitan will provide by exchange water to the United States for use by the Settlement Parties, and San Diego County Water Authority will convey the water for use by the Settlement Parties.

Rationale for Expected Supply

The All-American and Coachella canal lining projects were implemented pursuant to the authorization contained in Title II of Public Law 100-675. The allocation of the water resulting from these projects is provided under the Allocation Agreement. The Allocation Agreement is a QSA-related agreement. The USBR, on behalf of the Secretary of the Interior, has issued interim determinations for the Coachella Canal Lining Project (January 31, 2008) and the All-American Canal Lining Project (December 4, 2009) that result in the annual delivery to Metropolitan of 4.5 TAF and 11.5 TAF, respectively. Delivery of this water for Metropolitan's use continues until conditions described in Section 104 of Public Law 100-675 and the Allocation Agreement are satisfied.

Program Facilities

The Coachella Canal is owned by the United States and is operated by CVWD. The All-American Canal is owned by the United States and is operated by IID. The water is conveyed through existing CRA facilities from Lake Havasu to Metropolitan.

Historical Record

The Coachella Canal Lining Project began conserving water in 2006 and reached its full conservation yield in calendar year 2009. The All-American Canal Lining Project began conserving water in 2008 and reached its full conservation yield in calendar year 2010. Actual annual deliveries to Metropolitan are as follows:

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[14] The San Luis Rey Settlement Parties are the La Jolla, Pala, Pauma, Rincon and San Pasqual Bands of Mission Indians, the San Luis Rey Indian Water Authority, and the City of Escondido and Vista Irrigation District.

Calendar Year	Volume Delivered to Metropolitan (AF)
2006	172
2007	4,500
2008	6,013
2009	15,648
2010	16,000
2011	16,000
2012	16,000
2013	16,000
2014	16,000
2015	16,000 (estimated)

Written Contracts or Other Proof

2003 Allocation Agreement. This agreement among the United States, Metropolitan, CVWD, IID, San Diego County Water Authority, and the San Luis Rey Settlement Parties provides for the determination by the Secretary of the Interior of the conserved water yield from the All-American Canal Lining Project and the Coachella Canal Lining Project, the allocation of water as a result of the Projects among IID, SDCWA, Metropolitan, and the Settlement Parties, and the delivery of the allocated amounts to the respective users by the Secretary of the Interior.

Financing

Under the Allocation Agreement, water resulting from the All-American and Coachella Canal lining projects is made available to Metropolitan until the conditions specified in Sections 7.2.1, 7.2.2, and 7.2.4 of the Allocation Agreement have been satisfied. Metropolitan sets aside funding for the portion of the conserved water it receives in trust for the San Luis Rey Indian Water Authority as part of its annual O&M budget.[15]

Federal, State, and Local Permits/Approvals

A comprehensive environmental review process supported implementation.

Program EIR for Quantification Settlement Agreement. Metropolitan's Board certified the final Program EIR for the QSA in June 2002.[16]

Addendums to the QSA Final Program EIR. Metropolitan's Board adopted the Addendum to the QSA Final Program EIR in December 2002 and a second addendum in September 2003. Metropolitan's Board also adopted the Findings of Fact and Statement of Overriding Considerations, and Mitigation and Monitoring and Reporting Program at that time.

EIR/EIS for the All-American Canal Lining Project. USBR approved the Record of Decision for the All American Canal Lining Project on July 29, 1994. IID certified the All-American Canal Lining Project Final EIS/EIR and approved the project on August 16, 1994. USBR released a Supplemental Information Report on the All American Canal Lining Project, dated January 12, 2006.

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[15] Payments from Metropolitan for Supplemental Water and Related Power Delivered Prior to Satisfaction of Section 104.

[16] Coachella Valley Water District, Imperial Irrigation District, Metropolitan, San Diego County Water Authority, Final Program EIR, Implementation of the Colorado River Quantification Settlement Agreement, June 2002, SCH Number 2000061034.

EIR/EIS for the Coachella Canal Lining Project. USBR approved the Record of Decision for the Coachella Canal Lining Project on March 27, 2002. CVWD certified the Coachella Canal Lining Project Final EIS/EIR and approved the project on May 15, 2001.

Metropolitan certified that it had reviewed and considered the information contained in those two documents and adopted the Lead Agencies' findings on December 13, 1994, for the All-American Canal Lining Project and on September 11, 2001, for the Coachella Canal Lining Project.

Addendum to EIS/EIR for the Coachella Canal Lining Project. An addendum to the Coachella Canal Lining Project Final EIS/EIR was published on February 27, 2004. CVWD certified the Addendum and approved the project on March 2, 2004.

F. Metropolitan-CVWD Delivery and Exchange Agreement for 35,000 Acre-Feet

Source of Supply

Metropolitan delivers to CVWD up to 35 TAF from Metropolitan's available State Water Project (SWP) Table A supply without condition on the actual Department of Water Resources (DWR) allocation for that year. As CVWD does not have a connection to the SWP, the water is delivered to CVWD by an exchange with Colorado River water. Metropolitan takes delivery of the Table A supply in conjunction with forgoing diversion of an equal volume of its Colorado River supply, effectively leaving this water in the River for diversion by CVWD at Imperial Dam. Exchange deliveries may also be made at the CRA Whitewater service connection or through the Metropolitan-CVWD-Desert Water Agency Advance Delivery Agreement. This program represents a net debit to Metropolitan's supplies.

Expected Capability

Up to 35 TAF of Metropolitan's SWP Table A supply will be delivered annually to CVWD by exchange.

Rationale for the Expected Supply

This program is undertaken pursuant to the Delivery and Exchange Agreement between Metropolitan and Coachella for 35,000 AF dated October 10, 2003, and is a QSA-related agreement.

Program Facilities

Metropolitan takes delivery of the Table A supply from the East Branch of the California Aqueduct at Devil Canyon Afterbay. At Metropolitan's request, the USBR releases a portion of Metropolitan's available Colorado River supply from Lake Mead for diversion by CVWD at Imperial Dam and conveyance through the All-American Canal System.

Historical Record

Since the 2003 execution of the QSA and the Delivery and Exchange Agreement, the following volumes of exchange water were delivered to CVWD at Imperial Dam:

Calendar Year	**Volume of Exchange Water** (AF)
2003	0
2004	0
2005	0
2006	34,958
2007	0
2008	0
2009	0
2010	10,000
2011	0
2012	0
2013	0
2014	0
2015	313

Written Contracts or Other Proof

2003 Delivery and Exchange Agreement. This agreement between Metropolitan and CVWD provides for the delivery of up to 35,000 AF of Metropolitan SWP Table A supply by exchange with Colorado River water.

Federal, State, and Local Permits/Approvals

Program EIR for Quantification Settlement Agreement. Metropolitan's Board certified the final Program EIR for the QSA in June 2002.[17]

Addendums to the QSA Final Program EIR. Metropolitan's Board adopted the Addendum to the QSA Final Program EIR in December 2002 and a second addendum in September 2003. Metropolitan's Board also adopted the Findings of Fact and Statement of Overriding Considerations, and Mitigation and Monitoring and Reporting Program at that time.

September 2002 Final Program EIR for Coachella Valley Water Management Plan and State Water Project Entitlement Transfer. The final Program EIR for the Coachella Valley Water Management Plan and SWP Entitlement Transfer was certified by the CVWD on October 8, 2002.

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[17] Coachella Valley Water District, Imperial Irrigation District, Metropolitan, San Diego County Water Authority, Final Program EIR, Implementation of the Colorado River Quantification Settlement Agreement, June 2002, SCH Number 2000061034.

G. SNWA and Metropolitan Storage and Interstate Release Agreement

Source of Supply

The source of supply is SNWA's unused Nevada apportionment of Colorado River water made available to Metropolitan for diversion and storage. In later years, Metropolitan would return water through reduced diversions of Colorado River water made at the request of SNWA.

Expected Capability

As of January 1, 2015, over 272 TAF had been diverted by Metropolitan since 2004. In 2015, Metropolitan diverted 150 TAF to SNWA.

Returns to SNWA are limited to no more than 30 TAF annually unless Metropolitan agrees to a larger amount. SNWA has agreed to forgo requesting return through 2019 of water stored prior to 2015 unless Metropolitan agrees to the return. In 2020 and 2021, SNWA may request return of an amount equal to the shortage allocated by the Secretary of the Interior to Nevada. If the Secretary of the Interior apportions less than 280 TAF of basic apportionment for use in Nevada, SNWA may request the return of up to 50 TAF, 1 acre-foot for each acre-foot less than the 280 TAF of basic apportionment apportioned for use in Nevada.

Of the amount proposed to be stored in 2015, 125 TAF would be available for return to SNWA.

If less than 75 TAF has been returned, then during each year prior to 2027 for which Lake Mead begins the year at or below elevation 1,045 feet, Metropolitan will create 50 TAF of Intentionally Created Surplus (ICS) in Lake Mead, until the combined sum of ICS and the amount of water stored for SNWA returned equals 75 TAF. Prior to 2027, Metropolitan would be able to request delivery of this ICS during a year in which Lake Mead begins the year at or above elevation 1,080 feet.

Rationale for the Expected Supply

Program Facilities

Water is diverted through the CRA by Metropolitan. To return the water to SNWA, Metropolitan would reduce its CRA diversions, and the Secretary of the Interior would make water available to SNWA at Lake Mead.

Historical Record

The annual volumes of water diverted into the CRA, and the volume of water stored for SNWA by Metropolitan are as follows:

Calendar Year	Volume of Water Diverted (AF)	Volume of Water Stored for SNWA (AF)
2004	10,000	10,000
2005	10,000	10,000
2006	5,000	5,000
2007	0	0
2008	45,000	45,000
2009	0	0
2010	0	0
2011	0	0
2012	62,839	41,892
2013	75,000	50,000
2014	65,000	43,333
2015	150,000	125,000

No water has been returned to SNWA.

Written Contracts or Other Proof

2004 Storage and Interstate Release Agreement. This agreement among Metropolitan, the Colorado River Commission of Nevada, SNWA, and the United States provides for the Secretary of the Interior to make available to Metropolitan for diversion and storage unused Nevada apportionment. In subsequent years, the agreement provides for Metropolitan to make water available to SNWA by forgoing diversion of a portion of its available Colorado River supply.

Operational Agreement. As amended on August 11, 2009, on October 24, 2012, and on October 19, 2015, the Operational Agreement specifies the conditions under which Metropolitan would divert and store unused Nevada apportionment through 2026 and the return of water to SNWA.

H. Lower Colorado Water Supply Project

Source of Supply

Groundwater is pumped by the Lower Colorado Water Supply Project near the All-American Canal and is discharged to the Canal. IID reduces its net diversions of Colorado River water by an amount equal to the amount of Project water discharged into the Canal, permitting entities along the Colorado River that do not have rights or have insufficient rights to divert Colorado River water to obtain a supply of water. In 2007, Metropolitan entered into a contract with the USBR and the City of Needles to utilize the unused Project capacity.

Expected Capability

Metropolitan estimates that it received 5.9 TAF of Lower Colorado Water Supply Project water in 2015.

Rationale for the Expected Supply

Program Facilities

Two Lower Colorado Water Supply Project wells pump water into the All-American Canal. The groundwater level in one of the wells has declined to the point that it cannot operate at capacity with existing equipment. Replacement equipment to restore pumping capacity has been installed. Two new Project wells are expected to become operational in 2016 to augment pumping capacity.

Historical Record

Metropolitan has received the following amounts of Lower Colorado Water Supply Project water:

Calendar Year	**Volume of Water** (AF)
2007	5,011
2008	6,300
2009	2,349
2010	3,872
2011	3,611
2012	3,253
2013	4,208
2014	6,109
2015	5,965 (estimated)

Written Contracts or Other Proof

2007 Lower Colorado Water Supply Project Contract among the United States, the City of Needles, and Metropolitan. This contract as amended in 2010 provides for the United States to deliver Colorado River water to Metropolitan, the availability of which results from the pumping of Lower Colorado Water Supply Project groundwater and the exchange of such water.

Financing

Metropolitan's O&M budget includes the cost associated with receipt of Lower Colorado Water Supply Project water.

I. Lake Mead Storage Program, Drop 2 (Brock) Reservoir Funding, Yuma Desalting Plant Pilot Project, and Binational Intentionally Created Surplus

Source of Supply

Water has been and will be stored in Lake Mead as Intentionally Created Surplus (ICS) through extraordinary conservation measures, such as water saved through the Palo Verde Irrigation District Land Management, Crop Rotation, and Water Supply Program.

Water has been and will be stored in Lake Mead as ICS through system efficiency measures, such as Metropolitan's funding contributions toward construction of the Drop 2 (Brock) Reservoir near the All-American Canal and pilot operation of the Yuma Desalting Plant.

Water will be stored in Lake Mead as Binational ICS through implementation of pilot conservation projects in Mexico.

Expected Capability

Metropolitan may create as much as 400 TAF of Extraordinary Conservation ICS water in a single year less the amount that may be created by IID, which could be as much as 25 TAF.

Upon creation, 5 percent of the Extraordinary Conservation ICS is deducted, resulting in additional system water in storage in Lake Mead and leaving 95 percent of the water available for release to Metropolitan. Each year thereafter, the remaining balance at the end of the year is reduced by three percent to account for evaporation losses.

The amount of Extraordinary Conservation ICS accumulated in Lake Mead for Metropolitan is limited to 1.5 MAF less the amount accumulated by IID which could be as much as 50 TAF.

Metropolitan may take delivery of as much as 400 TAF of Extraordinary Conservation ICS from Lake Mead in a year less the amount delivered to IID, which could be as much as 50 TAF.

Rather than storing Extraordinary Conservation ICS water in Lake Mead, IID may, with the written consent of Metropolitan, have up to 25 TAF of this water delivered to Metropolitan for storage in any one calendar year. Upon request by IID, Metropolitan would return 90 percent of the stored water to IID with the remaining 10 percent left for Metropolitan's use. Also, Metropolitan may make temporary use of IID's Extraordinary Conservation ICS accumulated in Lake Mead.

As of January 1, 2015, Metropolitan has 89 TAF of System Efficiency ICS stored in Lake Mead. There are no evaporation losses charged to stored System Efficiency ICS. Metropolitan may take delivery of as much as 24 TAF of this System Efficiency ICS resulting from pilot operation of the Yuma Desalting Plant and 25 TAF of this System Efficiency ICS resulting from construction of the Drop 2 (Brock) Reservoir beginning in 2015 annually. The USBR may reduce this delivery if it determines a reduction is necessary to avoid a shortage.

Metropolitan will receive 23.75 TAF of Binational ICS in Lake Mead by December 31, 2017.

Rationale for the Expected Supply

Program Facilities

This program makes use of Lake Mead and the CRA.

Historical Record

From 2006 to 2010, Metropolitan created approximately 201.5 TAF of Extraordinary Conservation ICS. From 2008 to 2011, Metropolitan created approximately 124.4 TAF of System Efficiency ICS.

In 2008, the USBR assigned to Metropolitan 100 TAF of water stored in Lake Mead as System Efficiency ICS due to Metropolitan's contributions to the Drop 2 Reservoir project.

In 2010 and 2011, the USBR assigned to Metropolitan 16.75 TAF and 7.647 TAF of water stored in Lake Mead as System Efficiency ICS, respectively, due to Metropolitan's contributions to the Yuma Desalting Plant pilot project.

From 2011 to 2012, Metropolitan created approximately 348.7 TAF of Extraordinary Conservation ICS, and zero System Efficiency ICS.

As of January 1, 2015, Metropolitan's Extraordinary Conservation and System Efficiency ICS volumes in Lake Mead were approximately 61.8 TAF and 89.4 TAF, respectively.

Written Contracts or Other Proof

2007 Lower Colorado River Basin Intentionally Created Surplus Forbearance Agreement among the Arizona Department of Water Resources, PVID, IID, the City of Needles, CVWD, Metropolitan, SNWA, and the Colorado River Commission of Nevada. This agreement sets forth the rules under which ICS water is developed, stored in, and delivered from Lake Mead.

2007 California Agreement for the Creation and Delivery of Extraordinary Conservation Intentionally Created Surplus among Metropolitan, PVID, IID, CVWD, and the City of Needles. This agreement determines the conditions under which California contractors receiving Colorado River water may store and deliver water from Lake Mead.

2007 Agreement among the United States, the Colorado River Commission of Nevada, and the SNWA for the Funding and Construction of the Lower Colorado River Drop 2 Storage Reservoir Project. This agreement provides for: the United States to design and construct the Drop 2 Storage Reservoir Project; SNWA to fund the capital cost of the Project; the United States to credit SNWA's ICS account with 600 TAF of System Efficiency ICS; and allows Metropolitan to become a party to the agreement, requiring that Metropolitan provide funding for a portion of the capital cost.

2007 Delivery Agreement between the United States and Metropolitan. This agreement provides the procedures for creating the ICS water and guarantees delivery of the water to Metropolitan.

2008 Metropolitan Notice of Election to Participate as a Party to the Drop 2 Funding Agreement. This notice requires Metropolitan to provide funding for a portion of the capital cost of the Drop 2 Storage Reservoir Project, and the United States to credit Metropolitan's ICS account with 100 TAF of System Efficiency ICS, reducing the amount of System Efficiency ICS in SNWA's account by an equal amount.

2009 Agreement among the United States, Metropolitan, the Colorado River Commission of Nevada, SNWA, and the Central Arizona Water Conservation District for a Pilot Project for Operation of the Yuma Desalting Plant. This agreement provides for the allocation of the costs for the preparation and pilot operation of the Yuma Desalting Plant.

2010 Yuma Desalting Plant Pilot Project Delivery Agreement between the United States and Metropolitan. This agreement secures delivery of the ICS water created and specifies the manner in which this water will be accounted.

2012 Agreement among the United States, Metropolitan, the Colorado River Commission of Nevada, SNWA, and the Central Arizona Water Conservation District for a Pilot Program for the Conversion of Intentionally Created Mexican Allocation to Intentionally Created Surplus. This agreement provides for the allocation of the costs among the agencies for the implementation of pilot conservation projects within Mexico and the allocation of 95 TAF of conserved water among the non-federal agencies as Binational ICS in Lake Mead.

2012 Interim Operating Agreement for Implementation of Minute No. 319 of the International Boundary and Water Commission. This agreement among the United States, the Upper Basin states, and Lower Basin states' agencies, including Metropolitan, sets forth the rules under which Intentionally Created Mexican Allocation is to be converted to Binational ICS for storage in and delivery from Lake Mead.

2012 Lower Colorado River Basin Forbearance Agreement for Binational Intentionally Created Surplus. This agreement among the state of Arizona, the Colorado River Commission of Nevada and SNWA, and California Colorado River water contractors, including Metropolitan, ensures that the Binational ICS made available to a contractor that invests in a project in Mexico would not be claimed by another contractor in another state.

2012 Binational ICS Delivery Agreement. This agreement between Metropolitan and the United States secures delivery of the Binational ICS water made available by exchange and specifies the manner in which this water would be accounted.

2013 Agreement between Metropolitan and IID Regarding Binational Intentionally Created Surplus. This agreement allows IID to provide a payment to Metropolitan of up to 50 percent of the financial contribution to be made to the United States by Metropolitan for the implementation of pilot conservation projects within Mexico. As a result of IID's payment, Metropolitan will receive 23.75 TAF and IID will receive 23.75 TAF of Binational ICS by December 31, 2017.

J. Programs Under Development

Expansion of the Palo Verde Irrigation District (PVID) Land Management Program: Additional fallowing agreements may be developed in subsequent years as needed.

Arizona Storage and Interstate Release Agreement: A storage and interstate release program with the Central Arizona Project has been under consideration. In lieu of Arizona storing Colorado River water in groundwater basins, water would be stored with Metropolitan for later return.

Bard Water District Seasonal Fallowing Pilot Program: In January 2016, Metropolitan's Board of Directors authorized the General Manager to enter into a pilot seasonal fallowing program with Bard Water District (Bard). Farmers in Bard have expressed interest in participating in a two-year pilot program to conduct seasonal fallowing on their lands. A number of farmers in Bard grow one or more vegetable crops in the fall and winter followed by a field crop in the spring and summer. This rotation of crops provides an opportunity to fallow land for a four-month period from April to July. Based on the interest expressed by farmers in Bard, staff for Metropolitan and Bard have developed proposed terms for a two-year pilot program that could provide Metropolitan with an estimated 4.6 TAF in both 2016 and 2017. Metropolitan and Bard would enter into a pilot program agreement which would specify that a maximum of 2,000 acres within Bard would be fallowed per season and that Bard would not deliver any water to the fallowed acres from April 1 to July 31, 2016 and 2017. Metropolitan would enter into an agreement with each individual farmer through which the farmer would agree to fallow at least 10 contiguous acres for the four month period. Implementation of a pilot program would provide information that could lead to the development of a longer term land management and fallowing program with Bard.

A.3.2 California Aqueduct Deliveries

A. State Water Project Deliveries

Source of Supply

The State Water Project (SWP) provides imported water to the Metropolitan service area and has provided from 25 to 50 percent of Metropolitan's supplies. In accordance with its contract with the Department of Water Resources (DWR), Metropolitan has a Table A allocation of 1,911,500 AF per year under contract from the SWP. Actual deliveries have never reached this amount because they depend on the availability of supplies as determined by DWR. The availability of SWP supplies for delivery through the California Aqueduct over the next 18 years is estimated according to the historical record of hydrologic conditions, existing system capabilities as may be influenced by environmental permits, requests of the SWC and SWP contract provisions for allocating Table A, Article 21 and other SWP deliveries including San Luis carryover to each contractor. As shown in this 2015 UWMP, the estimates of SWP deliveries to Metropolitan are based on DWR's July 2015 SWP Delivery Capability Report.

As part of its contract with DWR, Metropolitan pays both the fixed costs of financing SWP facilities construction and the variable costs of operations, maintenance, power, and replacement costs for water delivered each year. SWP water is delivered to Metropolitan through the East Branch at Devil Canyon Power Plant afterbay, along the Santa Ana Valley Pipeline, and at Lake Perris. Metropolitan takes delivery from the West Branch at Castaic Lake.

Expected Supply Capability

The Edmund G. Brown California Aqueduct is capable of transporting Metropolitan's full contract amount of 1,911,500 AF per year. However, the quantity of water available for export through the California Aqueduct can vary significantly year to year. The amount of precipitation and runoff in the Sacramento and San Joaquin watersheds, system reservoir storage, regulatory requirements, and contractor demands for SWP supplies impact the quantity of water available to Metropolitan.

Rationale for Expected Supply

Metropolitan and 28 other public entities have contracts with the State of California for SWP water. These contracts require the state, through DWR, to use reasonable efforts to develop and maintain the SWP supply. The state has made significant investment in infrastructure. It has constructed 28 dams and reservoirs, 26 pumping and generation plants, and about 660 miles of aqueducts. More than 25 million California residents benefit from water from the SWP. DWR estimates that with current facilities and regulatory requirements, the project will deliver approximately 2.3 MAF under average hydrology considering impacts attributable to the combined Delta smelt and salmonid species biological opinions.

On a yearly basis, DWR estimates the amount of supplies that are available for that year. Metropolitan uses a forecasting method for SWP deliveries based on historical patterns of precipitation, runoff, and actual deliveries of water.

Further, under the water supply contract, DWR is required to use reasonable efforts to maintain and increase the reliability of service to Metropolitan. As discussed in a subsequent section, DWR is participating in the Bay-Delta process to achieve these requirements.

Historical Record

The historical record shows significant accomplishments by DWR in providing its contractors with SWP water supplies. Through 2013, the SWP has delivered over 90 MAF to its contractors. The maximum annual water supply was delivered in 2005, and totaled 3.75 MAF. In 2006 and 2011 the project delivered 3.7 MAF. DWR has continued to invest in SWP facilities to deliver water to its contractors.

Written Contracts or Other Proof

1960 Contract between the State of California and The Metropolitan Water District of Southern California for a Water Supply. This contract, initially executed in 1960 and amended numerous times since, is the basis for SWP deliveries to Metropolitan. It requires DWR to make reasonable efforts to secure water supplies for Metropolitan and its other contractors. The contract expires in 2035. At that time, Metropolitan has the option to renew the contract under the same basic conditions.

Financing

Metropolitan's payments for its State Water contract obligation are approved each year by its Board of Directors and currently constitute approximately a third of the annual budget.

Federal, State and Local Permit/Approvals

Operation of the SWP. The DWR is responsible for acquiring, maintaining, and complying with numerous federal and state permits for operation of the SWP. Metropolitan has been active in monitoring the issues affecting its contract with DWR.

EIR for the East Branch Enlargement. In April 1984, DWR prepared and finalized an EIR for the Enlargement of the East Branch of the Governor Edmund G. Brown California Aqueduct.

EIR for the Harvey O. Banks Pumping Plant. In January 1986, DWR prepared and finalized an EIR for the additional pumping units at Harvey O. Banks Delta Pumping Plant.

EIR for the Mission Hills Extension. In 1990, DWR prepared and finalized an EIR for the SWP Coastal Branch, Phase II and Mission Hills Extension.

East Branch Extension Project Phase 1. In 1998, DWR completed an EIR to extend the East Branch of the California Aqueduct to provide service to San Gorgonio Pass Water Agency. Phase 1 was completed in 2002.

U.S. Fish and Wildlife Service Biological Opinion. In December 2008, U.S. Fish and Wildlife issued a Biological Opinion for Delta smelt.

National Marine Fisheries Service Biological Opinion. In June 2009, the National Marine Fisheries Service issued a Biological Opinion for salmon.

B. Desert Water Agency/Coachella Valley Water District/Metropolitan Water Exchange and Advance Delivery Programs

Source of Supply

The Desert Water Agency (DWA) and CVWD, both in Riverside County, have rights to SWP deliveries, but do not have any physical connections to the SWP facilities. Both agencies are adjacent to the CRA. For DWA and CVWD to obtain water equal to their SWP allocations, Metropolitan has agreed to exchange an equal quantity of its Colorado River water for DWA and CVWD's SWP water. DWA has a SWP Table A contract right of 55.75 TAF per year, and CVWD has a SWP Table A contract right of 138.35 TAF per year, for a total of 194.1 TAF per year.

Expected Supply Capability

Under the existing agreements, Metropolitan provides water from its CRA to DWA and CVWD in exchange for SWP deliveries. Metropolitan can deliver additional water to its DWA/CVWD service connections, permitting these agencies to store water. When supplies are needed, Metropolitan can then receive its full Colorado River supply, as well as the SWP allocation from the two agencies, while the two agencies can rely on the stored water for meeting their water supply needs. The amount of DWA and CVWD SWP Table A water available to Metropolitan depends on total SWP deliveries and varies from year to year.

In addition to their Table A supplies, DWA and CVWD, subject to Metropolitan's written consent, may take delivery of SWP supplies available under Article 21, the Turn-back Pool Program, and non-SWP water supplies they may acquire and convey through the SWP facilities. These other supplies are delivered to DWA and CVWD by exchange with Metropolitan in the same manner as Table A deliveries. DWA and CVWD are participants in the Yuba Dry Year Water Purchase Program. Additionally, DWA participated in the 2009 Drought Water Bank and the 2015-2016 Multi-Year Water Pool Demonstration Program. CVWD has also purchased non-project supplies from partners in the San Joaquin Valley on an annual basis since 2008. Metropolitan has also consented to:

- 10 TAF of exchange deliveries to CVWD for non-SWP water acquired from the San Joaquin Valley from 2008 through 2010, and
- 36 TAF of exchange deliveries to DWA for non-SWP water acquired from the San Joaquin Valley from 2008 through 2015.

Rationale for Expected Supply

The DWR estimates the amount of supplies that are available each year. Metropolitan uses a forecasting method for SWP deliveries based on historical patterns of precipitation, runoff and actual deliveries of water.

Historical Record

DWA and CVWD Exchange Program is currently in operation. The Advance Delivery Agreement has been in place since 1984. Since 1973, Metropolitan has been taking delivery of these agencies' SWP Table A water and has provided equivalent water to those agencies from Metropolitan's CRA supplies. Metropolitan has also been delivering water in advance of the amount needed under the exchange agreements. With water having been delivered in advance, Metropolitan can reduce deliveries to DWA and CVWD as needed. Indeed, from the end of August 2012 through October 2015, Metropolitan drafted approximately 164 TAF, leaving 207 TAF in the Advance Delivery account.

Written Contracts or Other Proof

1967 and 1983 Water Exchange Contract and Agreements. The DWA and CVWD Program is currently in operation. The DWA and CVWD water exchange contract has been in place since 1967, was amended in 1972, and was modified with execution of additional agreements in 1983.

1984 Advance Delivery Agreement. The Advance Delivery Agreement allows Metropolitan to supply DWA and CVWD with Colorado River water in advance of the time these agencies are entitled to receive water under the exchange agreements. In future years, Metropolitan can recover this water by reducing its deliveries under the exchange agreements.

The 2003 Exchange Agreement. DWA, CVWD, and Metropolitan executed the 2003 Exchange Agreement under which Metropolitan transferred 88,100 AF and 11,900 AF of its SWP Table A water to DWA and CVWD, respectively, reducing Metropolitan's Table A volume from 2,011,500 AF to 1,911,500 AF. The 2003 Exchange Agreement became operational in calendar year 2005 with the execution of letter agreements among DWA, CVWD, and Metropolitan governing its implementation. The exhibits to the November 9, 2004, and November 19, 2007, letter agreements also modify certain provisions of the Water Exchange Contract and Agreements and the Advance Delivery Agreement.

November 2012 Letter Agreement. CVWD and Metropolitan executed the letter agreement to deliver non-SWP water in exchange for Colorado River water under which CVWD arranged for the delivery of up to 16.5 TAF per year of water to Metropolitan provided by Rosedale-Rio Bravo Water Storage District to CVWD. Metropolitan delivers to CVWD an equal amount of Colorado River water.

Financing

The funds for deliveries under this Program are included in Metropolitan's O&M budget and Long-Range Finance Plan (referenced above).

Federal, State, and Local Permits/Approvals

DWR is responsible for acquiring, maintaining, and complying with numerous Federal and State permits for operation of the SWP.

July 26, 1983, CVWD Negative Declaration, Whitewater River Spreading Area expansion Phase 1.

February 1983, DWA Final EIR for the proposed extension of time for utilizing Colorado River water to recharge the upper Coachella Valley groundwater basins to the year 2035, Volume I and II, April 1983, Volume III.

September 2002, Final Program EIR for Coachella Valley Water Management Plan and SWP Entitlement Transfer was certified by CVWD on October 8, 2002.

C. Semitropic Water Banking and Exchange Program

Source of Supply

The agreement between Semitropic Water Storage District (Semitropic) and Metropolitan was executed in February 1994. Semitropic obtains water from the SWP through its contracts with the Kern County Water Agency. SWP supplies irrigate an area of 161,200 acres within Semitropic's service area. When this surface water is not available, these growers withdraw water from the underlying aquifer. The agreement between Semitropic and Metropolitan allows Metropolitan to make use of 350 TAF of storage in Semitropic's groundwater basin. In years of plentiful supply, Metropolitan can deliver available SWP supplies to Semitropic through the California Aqueduct. During dry years, Metropolitan can withdraw this stored water. Five other banking partners participate in this Program and use 650 TAF of storage in Semitropic's groundwater basin.

Expected Supply Capability

The Semitropic-Metropolitan Program provides Metropolitan with the capacity to store up to 350 TAF of water under the current agreement. During dry years, Metropolitan can recover its stored water through a combination of direct pumping of the groundwater and delivery of Semitropic's SWP Table A water in the California Aqueduct. In 2014, Metropolitan amended the program to increase the return yield by an additional 13.2 TAF per year. The minimum annual yield available to Metropolitan from the program is currently 44.7 TAF, and the maximum annual yield is 236.2 TAF depending on the available unused capacity and the SWP allocation. The average annual supply capability for a single dry year similar to 1977 is 125 TAF or for multiple dry years similar to the period 1990-1992 is 107 TAF.

Rationale for Expected Supply

Historical Record

The Semitropic-Metropolitan Water Banking and Exchange Program has been operational since 1994. With existing agreements, it will continue to operate over the term of 41 years (1994-2035). By the end of 2015, the program had 137 TAF in its storage account.

Written Contracts or Other Proof

1992 Turn-in/out Construction, Operation and Maintenance Agreement. This Agreement was executed in 1992 by DWR and Semitropic to allow construction, operation, and maintenance of the Semitropic California Aqueduct Turn in/out.

1993 Temporary Semitropic-Metropolitan Water Banking Agreement. This Agreement was executed in February 1993 by Semitropic and Metropolitan to allow the storage of available Metropolitan supplies in advance of execution of the long-term agreement.

1994 Semitropic/Metropolitan Water Banking and Exchange Agreement. This Agreement was executed in December 1994 by Semitropic and Metropolitan to implement the program for a 41-year term (1994-2035).

1995 Point of Delivery Agreement. This agreement, with DWR, Kern County Water Agency, and Metropolitan, allows Metropolitan to divert water from the California Aqueduct into Semitropic's service area.

1995 Introduction of Local Water into the California Aqueduct. This agreement, with DWR, Kern County Water Agency, and Semitropic, allows Metropolitan to receive water from the program into the California Aqueduct.

2014 Amendment to Increase Program Yield. The amendment increased Metropolitan's minimum return yield by 13,200 acre-feet per year.

Financing

Metropolitan's O&M budget (referenced above) includes payments for the Semitropic Program.

Federal, State, and Local Permits/Approvals

Final EIR. Semitropic acting as the lead agency under CEQA and Metropolitan acting as a responsible agency jointly completed the EIR for the Program. The EIR was certified by Semitropic in July 1994 and adopted by Metropolitan in August 1994.

Regulatory Approvals. All regulatory approvals are in place, and the program is operational.

D. Arvin-Edison Water Management Program

Source of Supply

The Arvin-Edison Water Storage District (Arvin-Edison) manages the delivery of local groundwater and water imported into its service area from the Central Valley Project's (CVP) Millerton Reservoir via the Friant-Kern Canal. The surface water service area consists of 132,000 acres of predominantly agricultural land, and to a minor degree, municipal and industrial uses. It is situated in Kern County. Arvin-Edison operates its supplies conjunctively, storing water in the underlying aquifer when imported supplies are available and withdrawing that water when the availability of imported supplies is reduced. In 1997, Metropolitan entered into an agreement with the Arvin-Edison Water Storage District. The agreement allows Metropolitan to store available water in Arvin-Edison's groundwater basin, either through direct spreading operations, or through deliveries to growers in Arvin-Edison's service area. Similar to Arvin-Edison's own usage, this previously stored water could be withdrawn when the availability of imported supplies to Metropolitan is reduced.

Expected Supply Capability

The Arvin-Edison/Metropolitan Program provides Metropolitan with the capacity to store up to 350 TAF of water under the current agreement. During dry years, Metropolitan can recover its stored water either through direct pumping of the groundwater or through exchange. Based on the terms and conditions of the program agreement, the return of water to Metropolitan ranges from a minimum of 40 TAF per year (peak 4-month summer period) up to 110 TAF (over a 12-month period). The average annual supply capability for this program is 75 TAF for either a single dry year similar to 1977 or for each year of a multiple dry year period similar to the period 1990-1992.

Rationale for Expected Supply

Historical Record

The Arvin-Edison/Metropolitan Water Management Program has been operational since 1997. With existing agreements, it will continue to operate over the term of 38 years (1997-2035). By the end of 2015, the program had 124 TAF in its storage account.

Written Contracts or Other Proof

1997 Arvin-Edison/Metropolitan Water Management Agreement. This Agreement was executed in December 1997 by Arvin-Edison and Metropolitan to implement the program for a 30-year term (1997-2027).

1998 Turn-in/out Construction and Maintenance Agreement. This Agreement was executed in 1998 by DWR, Kern County Water Agency, Arvin-Edison, and Metropolitan to allow construction, operation and maintenance of the Arvin-Edison California Aqueduct Turn in/out.

1998-2002 Water Delivery and Return Agreements. These agreements, with DWR, Kern County Water Agency, Arvin-Edison, and Metropolitan, allow Metropolitan to divert water from, and introduce water to, the California Aqueduct.

2004 Point of Delivery Agreement. This agreement, with DWR, Kern County Water Agency, and Metropolitan, allows Metropolitan to divert water from the California Aqueduct into Arvin-Edison's service area.

2004 Introduction of Water into the California Aqueduct. This agreement, with DWR, Kern County Water Agency, and Arvin-Edison, allows Metropolitan to receive water from the program into the California Aqueduct.

2007 First Amended and Restated Agreement Between Arvin-Edison Water Storage District and The Metropolitan Water District of Southern California for a Water Management Program. This amendment increased the maximum storage level to 350 TAF, extended the agreement term to 2035, and provided for the construction of the South Canal Improvement Project. The project increases the reliability of Arvin-Edison returning higher water quality to the California Aqueduct.

Financing

Metropolitan's O&M budget (referenced above) includes payments for the Arvin-Edison Program.

Federal, State, and Local Permits/Approvals

Environmental Status: A Negative Declaration was completed in 1996.

An Addendum to the 1996 Negative Declaration was completed in 2003.

A Negative Declaration for the Arvin-Edison South Canal Improvement Project was completed in 2007.

Regulatory Approvals: All regulatory approvals are in place, and the program is operational.

E. San Bernardino Valley Municipal Water District Program

Source of Supply

The San Bernardino Valley Municipal Water District Program allows Metropolitan to purchase a dependable annual supply, as well as an additional supply for dry year needs. Under this program, Metropolitan purchases water provided to San Bernardino Valley Municipal Water District (Valley District) from its annual State Water Project (SWP) water allocation. Valley District delivers the purchased supplies to Metropolitan's service area through the coordinated use of facilities and interconnections within the water conveyance system of the two districts.

The purchased SWP supply is provided to Metropolitan as direct deliveries of annual SWP water through the California Aqueduct to Metropolitan's service area, as well as through deliveries of recaptured SWP water previously stored in the San Bernardino groundwater basin to Metropolitan's service area. Under this program, Metropolitan purchases a minimum of 20 TAF per year of SWP allocation every year. In addition, Metropolitan has the option to purchase Valley District's additional SWP allocation, if available, and the first right-of-refusal to purchase additional SWP supplies available beyond the minimum and option amounts. In the event that Metropolitan's operational needs do not require all, or a portion of the minimum purchased water, that unused amount may be carried forward up to a total of 50 TAF for later delivery. Finally, the program establishes a critical dry year supply account for Metropolitan that could provide additional amounts of dry year supplies. During any year designated by DWR as a critically dry year, Valley District could deliver from this account up to 50 TAF of recaptured SWP water previously stored in the San Bernardino groundwater basin.

To facilitate the transfer, the program also provides the coordinated use of existing facilities, including the Valley District's Foothill Pipeline and the Inland Feeder, to improve the conveyance capabilities of the delivery of SWP water to the service areas of both districts. The intertie between the Foothill Pipeline and the Inland Feeder has been constructed and was operational as of December 2002. This intertie allows Metropolitan to move SWP water from the East Branch of the California Aqueduct through the Foothill Pipeline and Inland Feeder, into DVL and the CRA. As a result of this intertie, Metropolitan has an alternative conveyance capacity of 260 cfs into Metropolitan's system should an outage occur on the upper section of the Inland Feeder.

Expected Supply Capability

The average annual supply capability for a single dry year similar to 1977 is 70 TAF. For multiple dry years similar to the period 1990-1992, the expected supply capability is 37 TAF.

Rationale for Expected Supply

Historical Record

The San Bernardino Valley Municipal Water District Program began operations in 2001 and is expected to be renewed continually in the future. Since its inception in 2001, this program has delivered 103 TAF to Metropolitan. There was no water remaining in the carryover account in 2009. Deliveries in 2013, 2014, and 2015 have been suspended by mutual agreement.

Written Contracts or Other Proof

Metropolitan's annual and dry-year supplies from the San Bernardino Valley Municipal Water District Program are based on Metropolitan Board actions and agreements.

2000 Board Approval of Coordinated Operating Agreement. In June 2000, Metropolitan's Board authorized entering into a Coordinated Operating Agreement between Metropolitan and Valley District to develop projects that could provide benefits to both districts through the coordinated use of facilities and SWP supplies.

2000 Coordinated Operating Agreement. The Coordinated Operating Agreement between Metropolitan and Valley District was executed in July 2000.

2001 Board Approval of the Coordinated Use Agreement. In April 2001, Metropolitan's Board authorized entering into the Coordinated Use Agreement for Conveyance Facilities and SWP Water Supplies between Metropolitan and Valley District for the purchase of dependable annual and dry year supplies by Metropolitan.

2001 Coordinated Use Agreement. The Coordinated Use Agreement for Conveyance Facilities and SWP Water Supplies between Metropolitan and Valley District for the purchase of dependable annual and dry year supplies by Metropolitan was executed May 2001. The Agreement is effective as of July 1, 2001, for an "evergreen" term (10-years with automatic annual extensions unless otherwise notified).

Financing

Metropolitan's O&M budget (referenced above) includes the funds to purchase Program water.

Federal, State, and Local Permits/Approvals

The Program became effective as of July 1, 2001. An environmental review process and regulatory approval supported implementation.

Final EIR. Final Regional Water Facilities Master Plan EIR dated February 1, 2001, was certified by Valley District, as lead agency, and by Metropolitan, as responsible agency. Notices of determinations were filed by Valley District and Metropolitan on May 29, 2001, and April 18, 2001, respectively.

State Water Contractors' Review. In May 2001, the SWC reviewed and issued a letter supporting the program.

DWR Review. DWR agreed to the program in December 2001.

F. San Gabriel Valley Municipal Water District Program

Source of Supply

The San Gabriel Valley Municipal Water District Program allows Metropolitan to exchange supplies to provide additional water for normal and dry year needs. Under this program, Metropolitan delivers supplies to the City of Sierra Madre, a San Gabriel Valley MWD member agency. In exchange for Metropolitan delivering one acre-foot, San Gabriel Valley MWD returns two acre-feet to Metropolitan in the Main San Gabriel Basin, up to 5 TAF. For any exchange amount less than 5 TAF, Metropolitan purchases the balance of the 5 TAF. The program provides increased reliability to Metropolitan by allowing additional water to be delivered to Metropolitan's member agencies Three Valleys MWD and Upper San Gabriel Valley MWD that rely upon the Main San Gabriel Basin for their supplies.

Expected Supply Capability

The average annual supply capability for a single dry year similar to 1977 is a net 2 TAF. For multiple dry years similar to the period 1990-1992, the expected supply capability is 2 TAF.

Rationale for Expected Supply

Historical Record

The San Gabriel Valley Municipal Water District Program began operations in 2013 and is expected to be renewed continually in the future. Since its inception in 2013, the program has completed the exchange of 10 TAF, with a net increase to Metropolitan's supply by an additional 7.3 TAF.

Written Contracts or Other Proof

Metropolitan's dependable annual and dry-year supplies from the San Gabriel Valley Municipal Water District Program are based on Metropolitan Board action and agreement.

2013 San Gabriel Valley MWD Exchange and Purchase Agreement. The agreement between Metropolitan and San Gabriel Valley MWD was executed in September 2013.

2013 Board Approval of the San Gabriel Valley MWD Exchange and Purchase Agreement. In August 2013, Metropolitan's Board authorized entering into the agreement with San Gabriel Valley MWD.

Financing

Metropolitan's O&M budget (referenced above) includes the funds to purchase water.

Federal, State, and Local Permits/Approvals

The Program became effective as of September 2013. An environmental review process supported implementation.

CEQA Compliance. The proposed action involved an exchange and purchase agreement associated with the leasing, licensing, and operating of existing public water conveyance facilities with negligible or no expansion of use and no possibility of significantly impacting the physical environment.

G. Antelope Valley East Kern Water Agency Exchange and Storage Program

Source of Supply

The Antelope Valley East Kern Water Agency (AVEK) Program allows Metropolitan to both exchange and store SWP supplies to provide additional water for normal and dry year needs.

Under this program, AVEK provides Metropolitan its unused SWP supplies. For every two acre-feet provided by AVEK, Metropolitan will return one acre-foot. The exchange program is expected to deliver 30 TAF over ten years, with 10 TAF available in dry years. Metropolitan will also have a storage capability in the groundwater basin, with a capacity of 30 TAF, and a dry year return capability of 10 TAF.

Expected Supply Capability

The average annual supply capability for a single dry year similar to 1977 is 10 TAF for each program. For multiple dry years similar to the period 1990-1992, the expected supply capability is 3 TAF for each program.

Rationale for Expected Supply

Historical Record

The AVEK Program is projected to provide benefits starting as early as 2016.

Written Contracts or Other Proof

Metropolitan's dependable annual and dry-year supplies from the AVEK Exchange and Storage Program are based on Metropolitan Board action and proposed agreement.

2015 Board Approval of the AVEK Exchange and Storage Agreement. In November 2015, Metropolitan's Board authorized entering into the agreement with AVEK.

Financing

Metropolitan's Board authorized up $16.6 million for the program with additional funds, if needed, from Metropolitan's O&M budget (referenced above).

Federal, State, and Local Permits/Approvals

The Program will become effective once the agreement is executed in 2016. An environmental review process supported implementation.

CEQA Compliance. The proposed action involved an exchange and purchase agreement associated with the leasing, licensing, and operating of existing public water conveyance facilities with negligible or no expansion of use and no possibility of significantly impacting the physical environment.

H. Bay-Delta Improvements

Source of Supply

Improving the water supply reliability of the State Water Project (SWP) is a primary focus of Metropolitan's long-term planning efforts. Metropolitan's strategy is to reduce its dependence on SWP supplies during dry years, when risks to the Bay-Delta ecosystem are greatest, and to maximize its deliveries of available SWP water during wetter years to store in surface reservoirs and groundwater basins for later use during droughts and emergencies.

State and federal resource agencies and various environmental and water user entities are currently engaged in the development of the Bay Delta Conservation Plan (BDCP)/California WaterFix, which is aimed at making physical and operational improvements to the SWP system in the Delta necessary to restore and protect ecosystem health, south-of-Delta SWP and CVP water supplies, and water quality. The goal for the 2015 IRP Update for SWP supplies is to manage flow and export regulations in the near term and ultimately to achieve a long-term Bay-Delta solution. This goal involves continued engagement in collaborative science-based approaches to manage regulations in the near-term and continued participation in the long-term California WaterFix and the California EcoRestore efforts. This approach targets an average of 984 TAF of SWP supplies in the near-term and an increase of 248 TAF to 1.2 MAF of supplies on average starting in 2030 when the long-term Bay-Delta solution is assumed to be in place. A more detailed description of SWP supplies is included in Section 3.2 of the 2015 UWMP, Section 3.2 and Technical Appendix 10 of the 2015 IRP Update.

The SWP conveys water from the western slope of the Sierra Nevada to water users both north and south of the Bay-Delta. Specifically, SWP water is delivered to Metropolitan's service area through a system of reservoirs, the Bay-Delta, pumping plants, and the California Aqueduct. Owned and operated by the California Department of Water Resources (DWR), the SWP provides municipal and agricultural water to 29 State Water Contractors. Annual deliveries for the SWP average about 2.5 MAF. Municipal uses account for about 60 percent of annual deliveries, with the remaining 40 percent going to agriculture.

SWP supplies are estimated using the 2015 SWP Delivery Capability Report distributed by DWR in July 2015. The 2015 Delivery Capability Report presents the current DWR estimate of the amount of water deliveries for current (2015) conditions and conditions 20 years in the future. These estimates incorporate restrictions on SWP and CVP operations in accordance with the biological opinions of the U.S. Fish and Wildlife Service and National Marine Fisheries Service issued on December 15, 2008, and June 4, 2009, respectively. Under the 2015 Delivery Capability Report with existing conveyance and low outflow requirements scenario, the delivery estimates for the SWP for 2020 conditions as percentage of Table A amounts are 12 percent, equivalent to 257 TAF for Metropolitan, under a single dry-year (1977) condition and 51 percent, equivalent to 976 TAF for Metropolitan, under long-term average conditions.

In dry, below-normal conditions, Metropolitan has increased the supplies received from the California Aqueduct by developing flexible Central Valley/SWP storage and transfer programs. Over the last two years under the pumping restrictions of the SWP, Metropolitan has worked collaboratively with the other contractors to develop numerous voluntary Central Valley/SWP storage and transfer programs. The goal of these storage/transfer programs is to develop additional dry-year supplies that can be conveyed through the available Banks pumping capacity to maximize deliveries through the California Aqueduct during dry hydrologic conditions and regulatory restrictions.

The Bay Delta Conservation Plan

The BDCP was prepared through a collaboration of state, federal, and local water agencies, state and federal fish agencies, environmental organizations, and other interested parties. At the outset of the BDCP process, a planning agreement was developed and executed among the participating parties, and a Steering Committee was formed. The BDCP identified a set of conservation measures including water conveyance improvements and restoration actions to contribute to the recovery of endangered and sensitive species and their habitats in California's Sacramento-San Joaquin Delta. The BDCP was formulated to contribute to the state's co-equal goals of water supply reliability and ecosystem restoration.

Lead agencies for the EIR/EIS were the DWR, the USBR, the United States Fish and Wildlife Service, and National Oceanic and Atmospheric Administration's National Marine Fisheries Service, in cooperation with the California DFW, the USEPA, and the United States Army Corps of Engineers. Metropolitan served on the steering committee. DWR and USBR are the lead agencies for the California WaterFix.

In order to select the most appropriate elements of the final conservation plan, the BDCP considered a range of options for accomplishing these goals using information developed as part of an environmental review process. Potential habitat restoration and water supply conveyance options included in the BDCP were assessed through an Environmental Impact Report (EIR)/Environmental Impact Statement (EIS). The BDCP planning process and the supporting EIR/EIS process are being funded by state and federal water contractors. The First Administrative Draft BDCP was released in March 2012, a Second Administrative Draft BDCP and EIR/EIS was released in March 2012, and the Public Draft BDCP and EIR/EIS was released December 2013. Each of the above draft documents was released to the public. The official public comment draft was released in December 2013.

A new permitting approach and associated new alternatives to the BDCP were announced in April 2015. The California WaterFix and California EcoRestore would be implemented under a different Endangered Species Act permitting process. This would fulfill the requirement of the 2009 Delta Reform Act to contribute toward meeting the coequal goals of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem.

The new water conveyance facilities included in Alternative 4 (the BDCP) would be constructed and operated under the California WaterFix. Proposed changes to the design of the water conveyance facilities reduce the overall environmental/construction impacts to the environment, minimize disruptions to local communities, and increase long term operational and cost benefits. Some of the improvements would include moving the tunnel alignment away from local communities and environmentally sensitive areas. The elimination of pumping plants, reduction of permanent power lines and power use, and the reconfiguration of intake and pumping facilities sediment basins and reconfiguration/relocation of the construction staging sites in the North Delta will lessen construction and longer term operational impacts. If implemented, these would result in reduced environmental and construction impacts and increase improved long-term operational and cost benefits.

The main objective under the EcoRestore Program is to pursue at least 30,000 acres of Delta habitats over the next five years. These restoration programs would include projects and actions that are in compliance with pre-existing regulatory requirements designed to improve the overall health of the Delta. Other priority restoration projects would also be identified by the Delta Conservancy and other local governments. Funding would be provided through multiple sources including state bonds and other state-mandated funds, SWP/CVP contractors funds as part of existing regulatory obligations, and from various local and federal partners.

As part of the new alternatives and the state's proposed project, the regulatory approach to obtaining state and federal endangered species compliance is shifting from the BDCP Habitat Conservation Plan/Natural Community Conservation Plan strategy to an approach that contemplates a Biological Opinion pursuant to Federal ESA Section 7 and a State 2081 Permit. This approach, as well as the proposed revision to the new water facilities and ecosystem restoration actions, are evaluated in the partially Recirculated Draft EIR/EIS released in July 2015. The deadline for comments was October 2015.

The State Water Resources Control Board (SWRCB) is continuing its phased review and update of the 2006 Water Quality Control Plan (WQCP) for the Bay-Delta. The first phase focuses on the southern Delta salinity objectives for the protection of agriculture, San Joaquin River flow objectives for the protection of fish and wildlife, and a program of implementation for achieving those objectives. The second phase considers the comprehensive review of the other elements of the Bay-Delta WQCP, including but not limited to Sacramento River and Delta outflow objectives. Metropolitan has been collaborating with water users and other stakeholders to develop sound science and technical analyses in support of the WQCP review process, including sharing results in technical forums and publishing findings in peer-reviewed scientific journals. Metropolitan has been meeting with Board members and staff to share findings as new science and analyses are developed and to encourage close coordination between BDCP and WQCP updates.

Rationale for Expected Supply

Implementation Status

Expected supplies are projected in accordance with the approved implementation plan for CALFED's Bay-Delta Program and with the work plans for the Sacramento Valley Water Management Agreement.

Written Contracts or Other Proof

Metropolitan's projected dependable annual and dry-year supplies from planned Bay-Delta improvements are based on Metropolitan Board actions and agreements.

CALFED's Bay-Delta Program.

Bay-Delta Accord approved in December 1994.

Proposition 204 funds approved by voters in November 1996.

Metropolitan policy direction regarding CALFED's Bay-Delta Program adopted in July 1999. This policy direction established water supply goals.

Proposition 13 funds approved by voters in March 2000.

CALFED Framework announced in June 2000.

Final implementation plans for the first phase of CALFED's Bay-Delta Program approved in August 2000, in conjunction with the approval of the Program and conclusion of the environmental review process.

Proposition 50 funds approved by voters in November 2002.

Proposition 1, approved by the voters in 2014, authorized $7.545 billion in general obligation bonds for state water supply infrastructure projects, including surface and groundwater storage, ecosystem and watershed protection and restoration, and drinking water protection.

Annual Federal appropriations.

Metropolitan's Bay-Delta Policies/Agreements.

Execution of Planning Agreement for BDCP (Planning Agreement) approved in October 2006.

Execution of BDCP Cost-Sharing Agreement approved in November 2006.

Delta Action Plan Framework approved in June 2007.

Delta Conveyance Criteria approved in September 2007.

Delta Governance Principles approved in August 2008.

Execution of Initial Funding Agreement approved in December 2008.

Delta Vision Implementation policies approved in January 2009.

Delta-Related Legislation approved in April 2009.

Execution of Amendments to Planning Agreement approved in December 2009.

Execution of Planning Agreement Amendment (additional funds) approved in July 2010.

Execution of Amendment to Memorandum of Agreement approved in August 2011.

Sacramento Valley Water Management Agreement.

Work plans detailing projects that could provide benefits by the 2002 and 2003 water years were developed in October 2001.

Statement of settlement policy principles recommended in December 2001 by negotiators for approval.

Statement of settlement policy principles approved by Metropolitan's Board in January 2002.

A Sacramento Valley Water Management Agreement was signed and approved by settlement parties in December 2002.

Financing

Funding for BDCP would come from federal, state, and local water supplier sources.

The California WaterFix would be paid for by public water agencies that rely on the supplies.

California EcoRestore is a program separate from California WaterFix. The state would pursue at least 30,000 acres of Delta habitat restoration over the next 5 years, pursuant to pre-existing regulatory requirements such as the 2008 and 2009 Biological Opinions and various enhancements to improve the overall health of the Delta ecosystem. Proposition 1 funds and other state public dollars will be directed exclusively for public benefits unassociated with any regulatory compliance responsibilities.

Federal, State, and Local Permits/Approvals

CALFED's Bay-Delta Program.

Programmatic EIR/EIS finalized in July 2000.

Record of Decision issued in August 2000 for the final Programmatic EIR/EIS regarding the CALFED Bay-Delta Program.

Sacramento Valley Water Management Agreement.

Settlement parties approved Sacramento Valley Management Agreement in December 2002.

I. Kern Delta Water Management Program

Source of Supply

In December 1999, Metropolitan advertised a request for proposals for participation in "The California Aqueduct Dry-year Transfer Program." As a result of this request for proposals, four programs, including one from the Kern Delta Water District (Kern Delta), were selected for further consideration. In 2001, Metropolitan entered into Principles of Agreement with Kern Delta for the development of a dry-year supply program. Kern Delta serves 125,000 acres of actively farmed highly productive farmland located in the San Joaquin Valley portion of southern Kern County. Kern Delta has under contract 180 TAF per year of good quality, highly reliable pre-1914 Kern River water and 25.5 TAF per year of SWP Table A contract right (under contract with Kern County Water Agency).

The dry-year supply program between Kern Delta and Metropolitan involves the storage of water with Kern Delta. In years of plentiful supply, the agreement allows Metropolitan to store water in Kern Delta's groundwater basin, either through direct spreading operations or through deliveries to growers in Kern Delta's service area. Metropolitan has the ability to store up to 250 TAF of water. Agreement provisions may allow for storage beyond this amount. When needed, Metropolitan can recover its stored water either through direct pumping of the groundwater or exchange at a rate of 50 TAF per year. The program duration will be from 2002 to 2027 with provisions that allow the water to be withdrawn until 2033.

Expected Supply Capability

The Kern Delta/Metropolitan Program provides Metropolitan with the capacity to store up to 250 TAF of water at any one time. When needed, Metropolitan can recover its stored water either through direct pumping of the groundwater or exchange at a rate of 50 TAF per year.

Rationale for Expected Supply

Implementation Status

Expected supplies are projected in accordance with accepted detailed groundwater modeling that has been accomplished for the program. In addition, the Kern Delta/Metropolitan Water Management Program was operational and accepting water for storage by fall of 2003. By the end of 2015, the program had 119 TAF in its storage account.

Written Contracts or Other Proof

2001 Kern Delta/Metropolitan Principles of Agreement. Principles of agreement were entered into between Kern Delta and Metropolitan in June 2001, covering program costs, operational aspects, and risks/responsibilities.

2002 Kern Delta and Metropolitan Boards of Directors Approval. These actions approved execution of the long-term agreement, which delineates program operations, costs, and risks/responsibilities

Financing

Metropolitan's O&M budget (referenced above) includes payments for the Kern Delta/ Metropolitan Program.

Federal, State, and Local Permits/Approvals

Kern Delta, acting as lead agency under CEQA, has prepared a full EIR. As part of this EIR, Kern Delta published a Notice of Preparation and held meetings with the general public, interested agencies, and resource agencies. In November 2002, the Final EIR was certified by Kern Delta and adopted by Metropolitan.

J. Central Valley / State Water Project Storage and Water Transfers

Source of Supply

Up to 27 MAF of water (80 percent of California's developed water) is delivered for agricultural use every year. Over half of this water is used in the Central Valley; and much of it is delivered by, or adjacent to, SWP and Central Valley Project (CVP) conveyance facilities. This allows for the voluntary transfer of water to many urban areas, including Metropolitan, via the California Aqueduct.

In recent years, a portion of this agricultural water supply has been secured by Metropolitan through mutually beneficial transfer agreements:

The Governor's Water Bank (Bank) in 1991, 1992, 1994, and 2009 secured 75 to 820 TAF per year of water supply. Further, the DWR's Dry Year Water Purchase Program (Purchase Program) in 2001, 2002, and 2003 secured a total of 162 TAF. DWR established and administered the Bank and the Purchase Program by facilitating purchasing water from willing sellers and transferring the water to those with critical needs using the SWP facilities. Sellers, such as farmers and water districts, made water available for the Bank and Purchase Program by fallowing crops, shifting crops, releasing surplus reservoir storage, and by substituting groundwater for surface supplies.

In 2003, Metropolitan secured options to purchase approximately 145 TAF of water from willing sellers in the Sacramento Valley during the irrigation season. Using these options, Metropolitan purchased approximately 125 TAF of water for delivery to the California Aqueduct.

In 2005, Metropolitan, in partnership with three other SWC, secured options to purchase approximately 130 TAF of water from willing sellers in the Sacramento Valley during the irrigation season, of which Metropolitan's share was 113 TAF. Metropolitan also had the right to assume the other SWC options if they chose not to exercise their options. Due to improved hydrologic conditions, Metropolitan and the other SWC did not exercise these options.

In December 2007, Metropolitan entered into a long-term agreement with DWR providing for Metropolitan's participation in the Yuba Dry Year Water Purchase Program between Yuba County Water Agency and DWR that was approved by the SWRCB as part of the Yuba River Accord. This program provides for transfers of water from the Yuba County Water Agency during dry years through the year 2025, and Metropolitan has purchased approximately 165 TAF to date.

In 2008, Metropolitan, in partnership with eight other SWC, purchased approximately 40 TAF of water from willing sellers in the Sacramento Valley during the irrigation season, of which Metropolitan's share was approximately 27 TAF.

In 2009, Metropolitan participated in the Governor's Water Bank, which purchased approximately 74 TAF, of which Metropolitan's share was approximately 36.9 TAF.

In 2010, Metropolitan in partnership with three other SWC, secured approximately 100 TAF of water from willing sellers in the Sacramento Valley, of which Metropolitan's share was approximately 88 TAF.

In 2010, Metropolitan purchased approximately 18 TAF of water from CVP Contractors located in the San Joaquin Valley. In addition, Metropolitan entered into an unbalanced exchange agreement that resulted in Metropolitan receiving approximately 37 TAF.

In 2015, Metropolitan, in partnership with eight other SWC, secured approximately 20 TAF of water from willing sellers in the Sacramento Valley, of which Metropolitan's share was approximately 12 TAF.

In addition, Metropolitan has secured water transfer supplies under the Multi-Year Water Pool Demonstration Program. In 2013 and 2015, Metropolitan secured 30 TAF and 1.3 TAF, respectively. Unlike the other transfer programs discussed herein, which were derived from agricultural sellers, a portion of these transfer supplies came from urban sellers.

Expected Supply Capability

Metropolitan's recent water transfer activities demonstrate Metropolitan's ability to develop and negotiate water transfer agreements working either directly with the agricultural districts that are selling the water or with DWR acting as an intermediary via a Drought Water Bank. As discussed in the SWP section of this 2015 UWMP, significant restrictions on SWP and Central Valley Project (CVP) Delta pumping required by the biological opinions issued by the U.S. Fish and Wildlife Service (December 2008) and National Marine Fisheries Service (June 2009) will reduce anticipated SWP deliveries and therefore increase Metropolitan's need for Central Valley water transfer supplies. Unfortunately, these biological opinions result in SWP deliveries being shifted to the summer months thereby restricting the ability to pump water transfer supplies through the Delta pumping plants. On average, in dry years when Delta pumping capacity is available, Metropolitan expects to be able to purchase 125 TAF for delivery via the California Aqueduct.

Rationale for Expected Supply

Historical Record

Metropolitan has made rapid progress in developing SWP transfer programs. This progress may be attributed to several factors, including Metropolitan dedicating additional staff to identify, develop, and implement SWP transfer programs; increased willingness of Central Valley agricultural interests to enter into transfer programs with Metropolitan; and Metropolitan staff's ability to work with DWR and USBR staff to facilitate SWP storage and transfer programs. The availability of dry year supplies has been demonstrated by the annual water purchase programs described above. In addition, Metropolitan participates in longer-term programs to secure water like the Yuba Accord and the Multi-Year Water Pool Demonstration Program.

The historical record for purchases from the Bank, Purchase Program, Metropolitan-initiated Central Valley programs, Yuba Accord, and Multi-Year Demonstration Program, as well as the number of sellers and buyers participating in these Programs, are strong indicators that there are significant amounts of water that can be purchased through spot market or long-term water transfers during dry years. This historical record is summarized in Table A.3-1 below.

Approximately 20 percent of these north of the Delta water transfers are dedicated to improving Delta water quality to comply with regulations governing Delta pumping.

Written Contracts or Other Proof

With near record-low precipitation in California in recent years, Governor Edmund G. Brown Jr. issued several executive orders to expedite processing of water transfers within the state:

Executive Order B-21-13 (May 20, 2013): The Department of Water Resources and the State Water Resources Control Board are to "take immediate action to address the dry conditions and water delivery limitations by doing the following: … (1) Expedite processing of one-year water transfers for 2013 and assist water transfer proponents and suppliers as necessary, provided that the transfers will not harm other legal users of water and will not unreasonably affect fish, wildlife, or other in-stream beneficial uses; (2) The SWRCB shall expedite review and processing of water transfer petitions in accordance with the applicable provisions of the Water Code; (3) The DWR shall expedite and facilitate water transfer proposals in accordance with applicable provisions of the Water Code..."

January 1, 2014 Drought Proclamation: "The Department of Water Resources and the State Water Resources Control Board will expedite the processing of water transfers, as called for in Executive Order B-21-13. Voluntary water transfers from one water right holder to another enables water to flow where it is needed most."

April 25, 2014 Drought Proclamation: "The Department of Water Resources and the State Water Resources Control Board will immediately and expeditiously process requests to move water to areas of need, including requests involving voluntary water transfers, forbearance agreements, water exchanges, or other means. If necessary, the Department will request that the Water Board consider changes to water right permits to enable such voluntary movements of water."

Executive Order B-29-15 (April 1, 2015): "The Department shall immediately consider voluntary crop idling water transfer and water exchange proposals of one year or less in duration that are initiated by local public agencies and approved in 2015 by the Department subject to the criteria set forth in Water Code section 1810." [This executive order incorporated by reference the previous drought proclamations.]

Table A.3-1
Historical Record of MWD Central Valley Water Transfers

Program	Purchases (AF per year)		Participants	
	Total	**Metropolitan**	**Sellers**	**Buyers**
1991 Governor's Water Bank	820,000	215,000	351	13
1992 Governor's Water Bank	193,246	10,000	18	16
1994 Governor's Water Bank	220,000	100	6	15
2001 Dry-Year Purchase Program	138,806	80,000	9	8
2003 MWD Water Transfer Program	146,230[1]	126,230	11	1
2005 SWC Water Transfer Program	127,275[2]	0	3	4
2008 SWC Water Transfer Program	39,152	26,621	4	8
2009 Governor's Water Bank	47,505	36,900	10	9
2010 SWC Water Transfer Program	98,959	88,159	11	4
2013 Multi-Year Water Pool Demo	92,232	30,000	4	9
2015 Multi-Year Water Pool Demo	3,000	1,374	1	14
2015 SWC Water Transfer Program	19,686	12,358	5	9

[1] Quantities denote options Metropolitan secured, of which 20,000 AF were not exercised due to improved hydrologic conditions.

[2] Quantities denote options Metropolitan secured, but not exercised due to improved hydrologic conditions.

Agreements Between Sellers and Buyers. Since 1991, Metropolitan has entered into Central Valley water transfer agreements in eleven years with sellers, or DWR acting in an intermediary capacity for the Drought Water Banks. The essential terms and conditions for negotiating purchases, including maximum offering price, quantity of water needed, and the timing of delivery, were established in these agreements.

1999 Board Directive. Metropolitan's Board has authorized water transfers in accordance with the Water Surplus and Drought Management Plan (WSDM Plan) adopted in April 1999. The WSDM Plan is a comprehensive policy guideline for managing Metropolitan's water supply during periodic surplus and shortage conditions. During shortage conditions, the plan specifies the type, priority, and timing of drought actions, including the purchase of transfers on the spot market that could be taken in order to prevent or mitigate negative impacts on retail demands.

Financing

Funds for Central Valley water transfers are included in Metropolitan's O&M budget (referenced above).

Federal, State, and Local Permits/Approvals

Environmental documentation for the Drought Water Banks. In November 1993, DWR prepared and finalized a programmatic EIR for the operation of the drought water banks during future drought events. In 2009, an emergency CEQA exemption was issued to support the Drought Water Bank.

Individual CEQA and NEPA documents for Metropolitan's 2003, 2005, and 2008 Central Valley water transfer programs. Individual sellers prepared CEQA documentation to support their transfers. In addition, the USBR prepared NEPA documentation for those transfers requiring federal approval.

K. Yuba Accord Dry Year Purchase Program

Source of Supply

As part of a comprehensive settlement of a State Water Resources Control Board (SWRCB) proceeding in which the Yuba County Water Agency (YCWA) is required to increase Yuba River fishery flows, referred to as the "Yuba River Accord" (Accord), YCWA reached agreement with DWR and USBR to sell a portion of the water it would be required to release, plus additional water made available by reoperation of YCWA's storage reservoirs and groundwater substitution. DWR entered into a purchase agreement with YCWA under which one-half of the water available for purchase would be available to SWP contractors that elected to participate in the purchase program.

Under this 25-year program, the price for water is set by the agreement between DWR and the YCWA. There are four categories of water sold, and the price for each type of water depends on hydrology.

Expected Supply Capability

Metropolitan's share of the water made available under the Yuba Accord Dry Year Purchase Program is approximately 25 percent. Should other participating contractors decline to purchase their respective shares, that water is allocated to the remaining interested participating contractors. Metropolitan's likely share of assured YCWA transfer water would be at least 13,750 AF in dry years and up to 35,000 AF or more in other years. These volumes are as provided by YCWA north-of-the-Delta and are subject to conveyance losses through the Delta to the Banks Pumping Plant (approximately 20 percent).

Rationale for Expected Supply

Historical Record

Actual volumes purchased by Metropolitan during the eight years of this program were as follows:

Year	Purchased Volume (AF)
2008	26,430
2009	42,915
2010	67,068
2011	0
2012	0
2013	14,548
2014	10,962
2015	8,192

Written Contracts or Other Proof

DWR-YCWA Purchase Agreement. This December 4, 2007, agreement provides the annual determination of the amount of water to be made available by YCWA and purchased by DWR. The agreement also specifies the costs of various categories of water to be made available under a variety of hydrologic conditions.

DWR-Metropolitan Participation Agreement. This December 21, 2007, agreement provides Metropolitan's election to purchase water made available by YCWA to DWR and the scheduling delivery of the purchased water. The agreement provides for mechanisms for Metropolitan payments to DWR that are due to YCWA under the DWR-YCWA Purchase Agreement.

Amended DWR-Metropolitan Participation Agreement. This December 5, 2014, amendment established prices for surface water transfer supplies between 2016 and 2020 and clarifies YCWA's rights to sell to third parties.

Financing

Funds for purchases of water from the Yuba Accord Dry Year Purchase Program are included in Metropolitan's O&M budget (referenced above).

Federal, State, and Local Permits/Approvals

SWRCB Order WR 2008-0014. Approval of YCWA's petition to modify revised Water Right Decision 1644 related to Water Right Permits 15026, 15027, and 15030 (Applications 5632, 15204, and 15574), and petition for long-term transfer of up to 200,000 AF of water per year from YCWA to the DWR and the USBR under Permit 15026 (Application 5632) - Lower Yuba River in Yuba County.

A.3.3 In-Basin Storage and Supplies

A. Surface Storage

Source of Supply

Surface storage is a critical element of Southern California's water resources strategy. Because California experiences dramatic swings in weather and hydrology, surface storage is important to regulate those swings and mitigate possible supply shortages. Surface storage provides a means of storing water during normal and wet years for later use during dry years, when imported supplies are limited. Since the early twentieth century, DWR and Metropolitan have constructed surface water reservoirs to meet emergency, drought/seasonal, and regulatory water needs for Southern California. These reservoirs include Pyramid Lake, Castaic Lake, Elderberry Forebay, Silverwood Lake, Lake Perris, Lake Skinner, Lake Mathews, Live Oak Reservoir, Garvey Reservoir, Palos Verdes Reservoir, Orange County Reservoir, and Metropolitan's DVL. Some reservoirs such as Live Oak Reservoir, Garvey Reservoir, Palos Verdes Reservoir, and Orange County Reservoir, which have a total combined capacity of about 3,500 AF, are used solely for regulating purposes. The remaining surface reservoirs are primarily used to meet emergency, drought, and seasonal requirements. The total gross storage capacity for these larger remaining reservoirs is 1,768,100 AF. However, not all of the gross storage capacity is available to Metropolitan; dead storage and storage allocated to others reduce the amount of storage that is available to Metropolitan to 1,669,100 AF.

Expected Supply Capability

Surface storage reservoirs are an important tool that allows Metropolitan to meet the water needs of its service area. As discussed in the EIR for the Eastside Reservoir (DVL) Project dated October 1991 and Metropolitan's IRP, the allocation of available surface storage can be divided into two primary components: emergency and drought/seasonal. As specified by Metropolitan's Board of Directors in the Final EIR for DVL, "Metropolitan shall maintain sufficient water reserves within its service area to supplement local production during an emergency or severe water shortage." With DVL in operation, Metropolitan can now re-operate the surface reservoirs and meet the Board's stated objectives.

Updated Emergency Storage Requirements: Metropolitan's criteria for determining emergency storage requirements, which were approved by Metropolitan's Board, were established in the Final EIR for DVL and further discussed in the IRP. Emergency Storage requirements are based on the potential for a major earthquake to damage the CRA, LAA, and both branches of the California Aqueduct that could force the aqueducts out of service for six months. During this period, a mandatory reduction in water use of 25 percent from normal-year demand levels would be instituted, water stored in surface reservoirs and groundwater basins under Metropolitan's interruptible program would be made available, and full local groundwater production would be sustained.

The storage reserved in system reservoirs for emergency purposes is shown in Table A.3-2.

Updated Storage Requirements for Dry-Year Supply and Seasonal Needs: Storage capacity in system reservoirs, including DVL, is also earmarked for dry-year supply and system regulation purposes. Dry-year supply storage within Metropolitan's service area is required to meet the additional water demands that occur during single-year and extended droughts. As specified in the Final EIR for DVL and further discussed in the IRP, this storage requirement is defined as the difference between average-year demand and above average demand during dry years. In addition to dry-year storage, seasonal storage is required to meet seasonal peak demands, which are defined as the difference between average winter demands and average summer demands. The dry-year supply and seasonal storage also provides sufficient reserves to permit approximately five percent downtime for rehabilitation, repair, and maintenance of raw water transmission facilities.

Table A.3-2
Surface Storage Utilization
(acre-feet per year)

Forecast Year	2020	2025	2030	2035	2040
MWD Dry-Year/Seasonal Surface Storage					
DVL, Mathews, Skinner	720,000	720,000	720,000	720,000	720,000
Flexible Storage in Castaic & Perris	219,000	219,000	219,000	219,000	219,000
Subtotal of Dry-Year/Seasonal Storage	***939,000***	***939,000***	***939,000***	***939,000***	***939,000***
MWD Emergency Storage					
DVL, Mathews, Skinner	312,000	312,000	312,000	312,000	312,000
Emergency Storage in DWR Reservoirs	334,000	334,000	334,000	334,000	334,000
Subtotal of Emergency Storage	***646,000***	***646,000***	***646,000***	***646,000***	***646,000***
Total MWD Surface Storage	**1,585,000**	**1,585,000**	**1,585,000**	**1,585,000**	**1,585,000**

Historical Record

Metropolitan has a contract with the DWR that allows use of its terminal reservoirs, such as Castaic Lake on the West Branch and Lake Perris on the East Branch of the California Aqueduct (see Section A.3.3.B for a discussion of Metropolitan's contractual rights to storage in these DWR reservoirs). In addition, Metropolitan owns and operates surface reservoirs such as Lake Skinner, Lake Mathews, and DVL to enhance water supply reliability for its member agencies.

Written Contracts or Other Proof of Usage

The surface reservoirs used by Metropolitan are available either by contract (in the case of the DWR terminal reservoirs) or by construction of its own facilities. The following historical record is provided:

November 1960 Contract between the State of California Department of Water Resources and the Metropolitan Water District of Southern California for a Water Supply. This Contract and its numerous amendments describe Metropolitan's legal access to and obligations for the operation of the SWP for the benefit of its Contractors. Metropolitan has an entitlement to 1,911,500 AF of water each year subject to availability. The terms of this Contract describe Metropolitan's rights to and obligations for the terminal surface reservoirs for water supply purposes.

November 1974 Memorandum of Understanding and Agreement on Operation of Lake Skinner. This MOU and the January 2005 Amendment, signed by Metropolitan and other affected parties, govern Metropolitan's operations of Lake Skinner in Riverside County. The DWR Division of Safety and Dams also reviews monitoring data on the safety of the dam annually.

November 1994 Memorandum of Understanding on Operation of Domenigoni Valley Reservoir (now known as Diamond Valley Lake). This MOU, signed by Metropolitan and other affected parties, governs Metropolitan's operations of DVL in Riverside County. The DWR Division of Safety and Dams also reviews monitoring data on the safety of the dam annually.

Elderberry Forebay Contract for Conditions for Use. Conditions for use of storage are described in the contract between the DWR, State of California, and the Department of Water and Power, City of Los Angeles, for Cooperative Development, West Branch, California Aqueduct; Amendment No. 1, July 3, 1969; and Amendment No. 4, June 27, 1985.

June 2002 Division of Safety of Dams Certificate of Approval. The DWR, Division of Safety of Dams issued the Certificate of Approval for operation of DVL in early 2000, with three conditions. These conditions were: (1) Satisfactory operation of the butterfly valves and emergency gate in the inlet/outlet tower, (2) completion of the Tank Saddle Cutoff remediation, and (3) completion of the Signal Spillway. Metropolitan completed these conditions in 2001, and DVL is currently operational in accordance with the Certificate of Approval.

October 1991 Final EIR for the Eastside Reservoir Project (DVL). The EIR established criteria for integrating the operations of Metropolitan's reservoirs and DWR's southern reservoirs for emergency purposes. These criteria also provided that Metropolitan reservoirs could be expected to withdraw all drought storage water within a two-year period.

B. Flexible Storage Use of Castaic Lake and Lake Perris

Source of Storage

Metropolitan's flexible storage accounts in Castaic Lake and Lake Perris, which are SWP reservoirs, is 153,940 AF and 65,000 AF, respectively. These accounts provide Metropolitan with dry-year supply that is independent of the Table A allocation. Metropolitan can withdraw water from these reservoirs in addition to its allocated supply in any year on an as-needed basis. Withdrawn water must be replaced from supplies available to Metropolitan within five years of each withdrawal. This "flexible storage" is available in Castaic Lake to Metropolitan, Ventura County Flood Control and Water Conservation District, and to the Castaic Lake Water Agency. It is available in Lake Perris to Metropolitan only.

Expected Supply Capability

The dry year supply available to Metropolitan from the flexible storage use of Castaic Lake and Lake Perris totals 218,940 AF, made up of 153,940 AF in Castaic Lake and 65,000 AF in Lake Perris. Table A.3-3 shows the use of this available supply in accordance with Metropolitan's operating criteria.

In 2005, seismic concerns arose regarding the Lake Perris Dam. In response, DWR plans to reduce the storage amount at Lake Perris by half until those concerns can be studied and addressed. In the long-term, the reduction in storage may potentially impact the amount of flexible storage available to Metropolitan from Lake Perris, and also impact the total amount of emergency storage available. However, since 2005, Metropolitan has continued to withdraw and replace water from the reservoir, which is operating at a lower level. In November 2011, DWR issued a Final EIR for the repair of the Dam. Construction began in August 2014 and is anticipated to continue through 2017.

Table A.3-3
Estimated Water Supplies Available for Metropolitan's Use Under the Flexible Storage Use of Castaic Lake and Lake Perris *

(TAF per year)

Year	Multiple Dry-Years (1990-1992)	Single Dry Year (1997)
2020	73	219
2025	73	219
2030	73	219
2035	73	219
2040	73	219

* Source: Metropolitan's operating criteria.

Rationale for Expected Supply

Implementation Status

Express provisions related to flexible storage have been incorporated in Metropolitan's SWP contract since 1995. The operating options have been available for use since that time and will continue to be in effect indefinitely as a part of the SWP contracts.

Historical Record

Metropolitan has exercised the flexible storage provision on numerous occasions through and including calendar year 2014. Its use is based on existing contract provisions.

DWR Bulletin 132-94. The use of Castaic Lake and Lake Perris is determined in accordance with the proportionate use factors from Bulletin 132-94, Table B, upon which capital cost repayment obligations are based. Based on its capital repayment obligations, Metropolitan's proportionate use of Castaic Lake is 96.2 percent and of Lake Perris is 100 percent. Per its SWP contract, Metropolitan has express rights to use certain portions of the SWP southern reservoirs independently of DWR to supply water in amounts in addition to approved SWP deliveries.

Metropolitan's SWP Contract. Metropolitan's SWP contract was amended in 1995 to include Article 54, "Usage of Lakes Castaic and Perris." This article provides flexible storage to contractors participating in repayment of the capital costs of Castaic Lake and Lake Perris. Each contractor shall be permitted to withdraw up to a Maximum Allocation from Castaic Lake and Lake Perris. These contractors may withdraw a collective Maximum Allocation up to 160 TAF in Castaic Lake and 65 TAF in Lake Perris, which shall be apportioned among them pursuant to the respective proportionate use factors, as shown in Table A.3-4 below.

Financing

The cost associated with the withdrawal and replacement of water in the flexible storage is included in Metropolitan's annual payments under the State Water Contract.

Federal, State, and Local Permits/Approvals

The flexible storage provision became effective in 1995. DWR has the approval authority to affect changes in the operations and usage of existing SWP facilities, including Castaic Lake and Lake Perris.

Table A.3-4
Flexible Storage Allocations

Participating Contractor	Proportionate Use Factor	Maximum Flexible Storage Allocation (AF)
Castaic Lake		
Metropolitan	.96212388	153,940
Ventura County Flood Control and Water Conservation District	.00860328	1,376
Castaic Lake Water Agency	.02927284	4,684
Total Castaic Lake	1.00000000	160,000
Lake Perris[1]	1.00000000	65,000
Metropolitan		

[1] The 2003 Exchange Agreement among Metropolitan, CVWD, and DWA, among other things, transferred to CVWD and DWA a portion of Metropolitan's capacity in the California Aqueduct and the East Branch including Lake Perris. However, Metropolitan's rights to the full 65,000 AF of Lake Perris flexible storage account was retained by Metropolitan.

C. *Metropolitan Surface Reservoirs*

Source of Supply

Storage capacity in Metropolitan reservoirs, including Lake Skinner, Lake Mathews, Live Oak Reservoir, Garvey Reservoir, Palos Verdes Reservoir, Orange County Reservoir, and DVL, is earmarked to meet emergency, dry-year/seasonal, and system regulation needs, as these have been defined above.

Expected Supply Capability

The total available storage capacity for all Metropolitan-controlled surface reservoirs (Metropolitan-owned and DWR terminal reservoirs) is 1,585,300 AF. As discussed earlier, approximately 650 TAF has been set aside to meet the emergency storage requirements of the service area. After accounting for emergency storage, the surface storage available in Metropolitan-owned reservoirs to meet dry-year/seasonal requirements is presented in Table A.3-5.

Rationale for Expected Supply

Program Facilities

Major facilities for Lake Mathews include an earthen dam to impound water and a recently completed new outlet tower. Major facilities for Lake Skinner include an earthen dam to impound water, an outlet tower, an inlet from the San Diego Canal to deliver water into the reservoir, a water treatment filtration facility, and recreational facilities consisting of a marina, parks, swimming areas, golf course, and hiking trails. Major facilities at DVL include three earthen dams to impound water, an inlet/outlet tower, a secondary inlet from the Inland Feeder, a large pumping station to deliver water into the reservoir, and power generating facilities. Recreational facilities consisting of a marina, parks, swimming areas, golf course, hiking trails, equestrian trails, and lodging are planned.

Historical Record

The DVL has been operational for more than 15 years. Lake Mathews and Lake Skinner have been in service for over 30 years.

November 1974 Memorandum of Understanding and Agreement on Operation of Lake Skinner. This MOU and the January 2005 Amendment, signed by Metropolitan and other affected parties, govern Metropolitan's operations of Lake Skinner in Riverside County. The DWR Division of Safety and Dams also reviews monitoring data on the safety of the dam annually.

October 1991 Final EIR for the Eastside Reservoir Project (DVL). The EIR established criteria for integrating the operations of Metropolitan's reservoirs and DWR's southern reservoirs for emergency purposes. These criteria also provided that Metropolitan reservoirs could be expected to withdraw all drought storage water within a two-year period.

November 1994 Memorandum of Understanding on Operation of Domenigoni Valley Reservoir (now known as Diamond Valley Lake). This MOU, signed by Metropolitan and other affected parties, governs Metropolitan's operations of DVL in Riverside County. The DWR Division of Safety and Dams also reviews monitoring data on the safety of the dam annually.

June 2002 Division of Safety of Dams Certificate of Approval. The DWR, Division of Safety of Dams issued the Certificate of Approval for operation of DVL in early 2000, with three conditions. These conditions were: (1) satisfactory operation of the butterfly valves and emergency gate in the inlet/outlet tower, (2) completion of the Tank Saddle Cutoff remediation, and (3) completion of the Signal Spillway. Metropolitan completed these conditions in 2001, and DVL is currently operational in accordance with the Certificate of Approval.

Table A.3-5
Estimated Supplies Available from Metropolitan's Surface Storage
Program Capabilities
(acre-feet per year)

Forecast Year	Multiple Dry Years (1990-92)	Single Dry Year (1977)
2020	189,000	566,000
2025	211,000	634,000
2030	234,000	702,000
2035	262,000	788,000
2040	271,000	814,000

Source: Metropolitan analysis

Financing

The capital cost of DVL, Lake Mathews, and Lake Skinner was financed by a combination of revenue bonds and operating revenues. Annual operating costs, including maintenance and pumping, are included in Metropolitan's annual O&M budget (referenced above).

Federal, State, and Local Permits/Approvals

All necessary permits have been obtained. A permit to generate and sell power has been acquired from the Federal Energy Regulatory Commission. No further regulatory permits are required.

D. Groundwater Conjunctive Use Programs

Source of Supply

Metropolitan's IRP established the strategy to store imported water that is most available during wet years in surface reservoirs or groundwater aquifers for later use during droughts and emergencies. In this way, Metropolitan can reduce its reliance on direct deliveries from the SWP and the Colorado River during dry years when competing demands by other users and risks to the watershed ecosystems are greatest.

Groundwater basins in Metropolitan's service area have potential to store more than 4.0 MAF of additional water supplies following depletions that have occurred since 2008 due to continuing extreme dry weather. In 2000, the Association of Ground Water Agencies (AGWA) published "Groundwater and Surface Water in Southern California: A Guide to Conjunctive Use," which estimated a substantial potential for developing dry-year or long term conjunctive use within Metropolitan's service area. In 2007, Metropolitan published the Groundwater Assessment Study which estimated 3.2 MAF of space in groundwater basins available for storage. Based on these studies and recent updates, Metropolitan has implemented a conjunctive use program for imported water storage in groundwater basins within the service area. Additionally, the 2015 Update of the Integrated Water Resources Plan (2015 IRP Update) identified policies and strategies for ensuring sustainable groundwater production in light of a potential for extended multiple-year dry conditions.

Rationale for Expected Supply

Implementation Status:

The status of implementation for the groundwater conjunctive use programs has been described in the body of this report.

Historical Record

The Main San Gabriel Cyclic Storage Agreements. The cyclic agreements allow supplemental imported water to be delivered to the basin in advance of requirement to support groundwater production. This added flexibility allows scheduling to balance imported water supply availability and delivery capacity with available local conveyance and spreading capacity.

The Cyclic Storage Agreement with Upper San Gabriel Valley MWD allows pre-delivery and storage of up to 100 TAF of imported water. The agreement was originally signed in 1975 for a term of five years and has been extended in five year increments through November 2018. The Cyclic Storage Agreement with Three Valleys MWD allows for pre-delivery and storage of up to 40 TAF. This agreement was originally signed in 1991 for a term of five years and has been extended in five year increments. This agreement is currently extended until November 2018. Both agreements are expected to be renewed repeatedly in the future.

Written Contracts or Other Proof

Metropolitan's dry-year supply from the groundwater conjunctive use programs is based on Metropolitan's Board actions and agreements.

Proposition 13 Groundwater Conjunctive Use Programs.

AGWA published "Groundwater and Surface Water in Southern California: A Guide to Conjunctive Use" in 2000 identifying the potential storage capacity for groundwater basins.

Metropolitan Water District published the Groundwater Assessment Study Report in 2007 in collaboration with its member agencies and groundwater basin managers documenting existing use and development of groundwater resources in Metropolitan's service area and estimating additional groundwater basin storage potential.

Principles for groundwater storage adopted by the Metropolitan Board in January 2000.

Resolution for Proposition 13 Funds adopted by the Metropolitan Board in October 2000.

Agreement executed with the DWR for Interim Water Supply Construction Grant Commitment Safe Drinking Water, Clean Water, Watershed Protection and Flood Protection (Proposition 13, Chapter 9, Article 4) providing for Metropolitan to administer $45 million in state Proposition 13 grant funds for groundwater reliability programs; October 2000

Agreement executed for Long Beach Conjunctive Use Project, July 2002

Agreement executed for Live Oak Conjunctive Use Project, October 2002

Agreement executed for Foothill Area Groundwater Storage Project, February 2003

Agreement executed for Chino Basin Programs, June 2003

Agreement executed for Orange County Groundwater Storage Program, June 2003

Agreement executed for Compton Conjunctive Use Program, February 2005

Agreement executed for Long Beach Conjunctive Use Project — Expansion in Lakewood, July 2005

Agreement executed for Upper Claremont Basin Groundwater Storage Program, September 2005

Agreement executed for Elsinore Basin Conjunctive Use Program, May 2008

All of these programs have an initial 25-year term, with provision for renewal or extension after that period.

Financing

Financing has been supplied from multiple sources as discussed below:

Financing from Proposition 13 and Additional Groundwater Storage Programs.

Proposition 13 funds ($45 million) were allocated to Metropolitan by the state in May 2000 for the development of local groundwater storage projects.

Metropolitan has executed groundwater storage funding agreements for nine storage programs, expended $45 million of the Proposition 13 funds, and appropriated over $35 million of Metropolitan capital funds for the storage programs in the Orange County and Chino groundwater basins. All nine storage programs have completed facilities and are on-line. Metropolitan has called for production of stored water beginning in 2007.

Table A.3-6 provides details on groundwater storage programs.

Federal, State, and Local Permits/Approvals

Long Beach Conjunctive-use Storage Project. Environmental documentation for the Long Beach Conjunctive-use Storage Project was certified by the City of Long Beach in August 2001.

Live Oak Basin Conjunctive-use Storage Project. Environmental documentation for the Live Oak Basin Conjunctive-use Storage Project was certified by Three Valleys MWD in January 2002.

Foothill Area Groundwater Storage Project. Environmental documentation for the Foothill Area Groundwater Storage Project was certified by Foothill Municipal Water District in January 2003.

Chino Basin Programs Groundwater Storage Project. Environmental documentation for the Chino Basin Programs Groundwater Storage Project was certified by Inland Empire Utility Agency in December 2002.

Long Beach Conjunctive Use Storage Project — Expansion in Lakewood. Environmental documentation for the project was certified by the City of Lakewood in May 2005.

City of Compton Conjunctive Use Program. Environmental documentation for the project was certified by the City of Compton in December 2004.

Orange County Groundwater Conjunctive Use Program. Environmental documentation for the project was certified by Orange County Water District in March 1999 and in July 2002.

Upper Claremont Basin Groundwater Storage Program. Environmental documentation for the project was certified by Three Valleys MWD in July 2005.

Elsinore Basin Conjunctive Use Program. Environmental documentation for the project was certified by Elsinore Valley MWD in February 2004.

E. Program under Development

Regional Recycled Water Supply Program: Metropolitan is exploring the potential development of a regional recycled water program in partnership with the Sanitation Districts of Los Angeles County. This program would purify and reuse water for the recharge of groundwater basins and augment water supplies within the Southern California region.

F. IRP Development Targets

Colorado River: The 2015 IRP Update calls for developing sufficient base supply programs to ensure that a minimum of 900 TAF of diversions are available when needed and to ensure access to 1.2 MAF of supplies in dry years through flexible programs and storage. This will require an approach that maintains existing base supply availability, minimizes reductions in base supplies from risks and challenges, and augments base supply amounts to increase resilience to any reductions that may occur.

State Water Project: The 2015 IRP Update goal for SWP supplies is to adaptively manage flow and export regulations in the near term and to achieve a long-term Delta solution that addresses ecosystem and water reliability challenges. The goal for SWP supplies in the 2015 IRP Update is an average of 984 TAF of SWP supplies in the near-term and 1.2 MAF on average starting in 2030 when a long-term Delta solution is estimated to be in place. The increase in supply due to Delta improvements is reflected in Table A.3-7 as a program under development for the California Aqueduct.

Conservation and Local Supplies: The 2015 IRP Update identifies that approximately 200 TAF of new local supply and water conservation is needed, in conjunction with stabilizing, protecting, and restoring the region's imported supplies. The approach for water conservation is targeting water-use reductions through aggressive implementation of the state's Model Water Efficient Landscape Ordinance standards. The water conservation approach, if successful, will result in approximately 180 TAF of new water conservation savings. The approach for local supplies is to develop the remaining 20 TAF of additional need through recycling, groundwater recovery, and seawater desalination. These 2015 IRP Update development targets are reflected in Table A.3-7 as programs under development for In-Region Storage and Programs.

Table A.3-6
Metropolitan's In-Region Groundwater Storage Programs

Program	Metropolitan Agreement Partners	Program Term	Max Storage AF	Dry-Year Yield AF/Yr
Long Beach Conjunctive Use Storage Project (Central Basin)	Long Beach	June 2002-2027	13,000	4,300
Foothill Area Groundwater Storage Program (Monkhill/ Raymond Basin)	Foothill MWD	February 2003-2028	9,000	3,000
Orange County Groundwater Conjunctive Use Program	MWDOC OCWD	June 2003-2028	66,000+	22,000
Chino Basin Conjunctive Use Programs	IEUA TVMWD Watermaster	June 2003-2028	100,000	33,000
Live Oak Basin Conjunctive Use Project (Six Basins)	TVMWD City of La Verne	October 2002-2027	3,000	1,000
City of Compton Conjunctive Use Project (Central Basin)	Compton	February 2005-2030	2,289	763
Long Beach Conjunctive Use Program Expansion in Lakewood (Central Basin)	Long Beach	July 2005-2030	3,600	1,200
Upper Claremont Basin Groundwater Storage Program (Six Basins)	TVMWD	Sept. 2005- 2030	3,000	1,000
Elsinore Basin Conjunctive Use Storage Program	Western MWD Elsinore Valley MWD	May 2008- 2033	12,000	4,000
TOTAL			**211,889**	**70,263**

Table A.3-7
Colorado River Aqueduct
Program Capabilities
Year 2020
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
Basic Apportionment – Priority 4	550,000	550,000	550,000
IID/MWD Conservation Program	85,000	85,000	85,000
Priority 5 Apportionment (Surplus)	0	0	17,000
PVID Land Management, Crop Rotation, and Water Supply Program	130,000	130,000	130,000
Lower Colorado Water Supply Project	8,000	8,000	8,000
Lake Mead ICS Storage Program	400,000	400,000	400,000
Binational ICS	8,000	24,000	24,000
Forbearance for Present Perfected Rights	(2,000)	(2,000)	(2,000)
CVWD SWP/QSA Transfer Obligation	(35,000)	(35,000)	(35,000)
DWCV SWP Table A Obligation	(37,000)	(26,000)	(99,000)
DWCV SWP Table A Transfer Callback	19,000	13,000	51,000
DWCV Advance Delivery Account	18,000	13,000	48,000
SNWA Agreement Payback	0	0	0
Subtotal of Current Programs	***1,144,000***	***1,160,000***	***1,177,000***
Programs Under Development			
SNWA Interstate Banking Agreement	75,000	150,000	0
Additional Fallowing Programs	5,000	5,000	5,000
Subtotal of Proposed Programs	***80,000***	***155,000***	***5,000***
Additional Non-Metropolitan CRA Supplies			
SDCWA/IID Transfer	161,000	193,000	193,000
Coachella & All-American Canal Lining			
To SDCWA	82,000	82,000	82,000
To San Luis Rey Settlement Parties[1]	16,000	16,000	16,000
Subtotal of Non-Metropolitan Supplies	***259,000***	***291,000***	***291,000***
Maximum CRA Supply Capability[2]	**1,483,000**	**1,606,000**	**1,473,000**
Less CRA Capacity Constraint (amount above 1.20 MAF)	*(233,000)*	*(356,000)*	*(223,000)*
Maximum Expected CRA Deliveries[3]	**1,200,000**	**1,200,000**	**1,200,000**
Less Non-Metropolitan Supplies[4]	*(259,000)*	*(291,000)*	*(291,000)*
Maximum Metropolitan Supply Capability[5]	**941,000**	**909,000**	**909,000**

[1] Subject to satisfaction of conditions specified in agreement among Metropolitan, the United States, and the San Luis Rey Settlement Parties.

[2] Total amount of supplies available without taking into consideration CRA capacity constraint.

[3] The CRA delivery capacity is 1.20 MAF annually.

[4] Exchange obligation for the SDCWA-IID transfer and exchange and the Coachella and All-American Canal Lining projects.

[5] The amount of CRA water available to Metropolitan after meeting its exchange obligations.

Table A.3-7
Colorado River Aqueduct
Program Capabilities
Year 2025

(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
Basic Apportionment – Priority 4	550,000	550,000	550,000
IID/MWD Conservation Program	85,000	85,000	85,000
Priority 5 Apportionment (Surplus)	250,000	0	31,000
PVID Land Management, Crop Rotation, and Water Supply Program	130,000	130,000	130,000
Lower Colorado Water Supply Project	7,000	7,000	7,000
Lake Mead ICS Storage Program	400,000	400,000	400,000
Binational ICS	8,000	24,000	24,000
Forbearance for Present Perfected Rights	(2,000)	(2,000)	(2,000)
CVWD SWP/QSA Transfer Obligation	(35,000)	(35,000)	(35,000)
DWCV SWP Table A Obligation	(37,000)	(26,000)	(99,000)
DWCV SWP Table A Transfer Callback	19,000	13,000	51,000
DWCV Advance Delivery Account	18,000	13,000	48,000
SNWA Agreement Payback	0	0	0
Subtotal of Current Programs	***1,393,000***	***1,159,000***	***1,190,000***
Programs Under Development			
SNWA Interstate Banking Agreement	50,000	100,000	0
Additional Fallowing Programs	25,000	25,000	25,000
Subtotal of Proposed Programs	***75,000***	***125,000***	***25,000***
Additional Non-Metropolitan CRA Supplies			
SDCWA/IID Transfer	200,000	200,000	200,000
Coachella & All-American Canal Lining			
To SDCWA	82,000	82,000	82,000
To San Luis Rey Settlement Parties[1]	16,000	16,000	16,000
Subtotal of Non-Metropolitan Supplies	***298,000***	***298,000***	***298,000***
Maximum CRA Supply Capability[2]	**1,766,000**	**1,582,000**	**1,513,000**
Less CRA Capacity Constraint (amount above 1.20 MAF)	*(516,000)*	*(332,000)*	*(263,000)*
Maximum Expected CRA Deliveries[3]	**1,200,000**	**1,200,000**	**1,200,000**
Less Non-Metropolitan Supplies[4]	*(298,000)*	*(298,000)*	*(298,000)*
Maximum Metropolitan Supply Capability[5]	**902,000**	**902,000**	**902,000**

[1] Subject to satisfaction of conditions specified in agreement among Metropolitan, the United States, and the San Luis Rey Settlement Parties.

[2] Total amount of supplies available without taking into consideration CRA capacity constraint.

[3] The CRA delivery capacity is 1.20 MAF annually.

[4] Exchange obligation for the SDCWA-IID transfer and exchange and the Coachella and All-American Canal Lining projects.

[5] The amount of CRA water available to Metropolitan after meeting its exchange obligations.

Table A.3-7
Colorado River Aqueduct
Program Capabilities
Year 2030

(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
Basic Apportionment – Priority 4	550,000	550,000	550,000
IID/MWD Conservation Program	85,000	85,000	85,000
Priority 5 Apportionment (Surplus)	250,000	0	28,000
PVID Land Management, Crop Rotation, and Water Supply Program	130,000	130,000	130,000
Lower Colorado Water Supply Project	6,000	6,000	6,000
Lake Mead ICS Storage Program	400,000	400,000	400,000
Binational ICS	8,000	24,000	24,000
Forbearance for Present Perfected Rights	(2,000)	(2,000)	(2,000)
CVWD SWP/QSA Transfer Obligation	(35,000)	(35,000)	(35,000)
DWCV SWP Table A Obligation	(45,000)	(42,000)	(118,000)
DWCV SWP Table A Transfer Callback	23,000	22,000	61,000
DWCV Advance Delivery Account	22,000	20,000	57,000
SNWA Agreement Payback	0	0	0
Subtotal of Current Programs	***1,392,000***	***1,158,000***	***1,186,000***
Programs Under Development			
SNWA Interstate Banking Agreement	25,000	50,000	0
Additional Fallowing Programs	25,000	25,000	25,000
Subtotal of Proposed Programs	***50,000***	***75,000***	***25,000***
Additional Non-Metropolitan CRA Supplies			
SDCWA/IID Transfer	200,000	200,000	200,000
Coachella & All-American Canal Lining			
To SDCWA	82,000	82,000	82,000
To San Luis Rey Settlement Parties[1]	16,000	16,000	16,000
Subtotal of Non-Metropolitan Supplies	***298,000***	***298,000***	***298,000***
Maximum CRA Supply Capability[2]	**1,740,000**	**1,531,000**	**1,509,000**
Less CRA Capacity Constraint (amount above 1.20 MAF)	*(490,000)*	*(281,000)*	*(259,000)*
Maximum Expected CRA Deliveries[3]	**1,200,000**	**1,200,000**	**1,200,000**
Less Non-Metropolitan Supplies[4]	*(298,000)*	*(298,000)*	*(298,000)*
Maximum Metropolitan Supply Capability[5]	**902,000**	**902,000**	**902,000**

[1] Subject to satisfaction of conditions specified in agreement among Metropolitan, the United States, and the San Luis Rey Settlement Parties.

[2] Total amount of supplies available without taking into consideration CRA capacity constraint.

[3] The CRA delivery capacity is 1.20 MAF annually.

[4] Exchange obligation for the SDCWA-IID transfer and exchange and the Coachella and All-American Canal Lining projects.

[5] The amount of CRA water available to Metropolitan after meeting its exchange obligations.

Table A.3-7
Colorado River Aqueduct
Program Capabilities
Year 2035

(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
Basic Apportionment – Priority 4	550,000	550,000	550,000
IID/MWD Conservation Program	85,000	85,000	85,000
Priority 5 Apportionment (Surplus)	250,000	0	21,000
PVID Land Management, Crop Rotation, and Water Supply Program	130,000	130,000	130,000
Lower Colorado Water Supply Project	5,000	5,000	5,000
Lake Mead ICS Storage Program	400,000	400,000	400,000
Binational ICS	8,000	24,000	24,000
Forbearance for Present Perfected Rights	(2,000)	(2,000)	(2,000)
CVWD SWP/QSA Transfer Obligation	(35,000)	(35,000)	(35,000)
DWCV SWP Table A Obligation	(45,000)	(42,000)	(118,000)
DWCV SWP Table A Transfer Callback	23,000	22,000	61,000
DWCV Advance Delivery Account	22,000	20,000	57,000
SNWA Agreement Payback	0	0	(5,000)
Subtotal of Current Programs	***1,391,000***	***1,157,000***	***1,173,000***
Programs Under Development			
SNWA Interstate Banking Agreement	0	0	0
Additional Fallowing Programs	25,000	25,000	25,000
Subtotal of Proposed Programs	***25,000***	***25,000***	***25,000***
Additional Non-Metropolitan CRA Supplies			
SDCWA/IID Transfer	200,000	200,000	200,000
Coachella & All-American Canal Lining			
To SDCWA	82,000	82,000	82,000
To San Luis Rey Settlement Parties[1]	16,000	16,000	16,000
Subtotal of Non-Metropolitan Supplies	***298,000***	***298,000***	***298,000***
Maximum CRA Supply Capability[2]	**1,714,000**	**1,480,000**	**1,496,000**
Less CRA Capacity Constraint (amount above 1.20 MAF)	*(464,000)*	*(230,000)*	*(246,000)*
Maximum Expected CRA Deliveries[3]	**1,200,000**	**1,200,000**	**1,200,000**
Less Non-Metropolitan Supplies[4]	*(298,000)*	*(298,000)*	*(298,000)*
Maximum Metropolitan Supply Capability[5]	**902,000**	**902,000**	**902,000**

[1] Subject to satisfaction of conditions specified in agreement among Metropolitan, the United States, and the San Luis Rey Settlement Parties.

[2] Total amount of supplies available without taking into consideration CRA capacity constraint.

[3] The CRA delivery capacity is 1.20 MAF annually.

[4] Exchange obligation for the SDCWA-IID transfer and exchange and the Coachella and All-American Canal Lining projects.

[5] The amount of CRA water available to Metropolitan after meeting its exchange obligations.

Table A.3-7
Colorado River Aqueduct
Program Capabilities
Year 2040

(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
Basic Apportionment – Priority 4	550,000	550,000	550,000
IID/MWD Conservation Program	85,000	85,000	85,000
Priority 5 Apportionment (Surplus)	167,000	0	16,000
PVID Land Management, Crop Rotation, and Water Supply Program	130,000	130,000	130,000
Lower Colorado Water Supply Project	4,000	4,000	4,000
Lake Mead ICS Storage Program	400,000	400,000	400,000
Binational ICS	8,000	24,000	24,000
Forbearance for Present Perfected Rights	(2,000)	(2,000)	(2,000)
CVWD SWP/QSA Transfer Obligation	(35,000)	(35,000)	(35,000)
DWCV SWP Table A Obligation	(45,000)	(42,000)	(118,000)
DWCV SWP Table A Transfer Callback	23,000	22,000	61,000
DWCV Advance Delivery Account	22,000	20,000	57,000
SNWA Agreement Payback	0	0	(10,000)
Subtotal of Current Programs	***1,307,000***	***1,156,000***	***1,162,000***
Programs Under Development			
SNWA Interstate Banking Agreement	0	0	0
Additional Fallowing Programs	25,000	25,000	25,000
Subtotal of Proposed Programs	***25,000***	***25,000***	***25,000***
Additional Non-Metropolitan CRA Supplies			
SDCWA/IID Transfer	200,000	200,000	200,000
Coachella & All-American Canal Lining			
To SDCWA	82,000	82,000	82,000
To San Luis Rey Settlement Parties[1]	16,000	16,000	16,000
Subtotal of Non-Metropolitan Supplies	***298,000***	***298,000***	***298,000***
Maximum CRA Supply Capability[2]	**1,630,000**	**1,479,000**	**1,485,000**
Less CRA Capacity Constraint (amount above 1.20 MAF)	*(380,000)*	*(229,000)*	*(235,000)*
Maximum Expected CRA Deliveries[3]	**1,200,000**	**1,200,000**	**1,200,000**
Less Non-Metropolitan Supplies[4]	*(298,000)*	*(298,000)*	*(298,000)*
Maximum Metropolitan Supply Capability[5]	**902,000**	**902,000**	**902,000**

[1] Subject to satisfaction of conditions specified in agreement among Metropolitan, the United States, and the San Luis Rey Settlement Parties.

[2] Total amount of supplies available without taking into consideration CRA capacity constraint.

[3] The CRA delivery capacity is 1.20 MAF annually.

[4] Exchange obligation for the SDCWA-IID transfer and exchange and the Coachella and All-American Canal Lining projects.

[5] The amount of CRA water available to Metropolitan after meeting its exchange obligations.

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Table A.3-7
California Aqueduct
Program Capabilities
Year 2020

(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
MWD Table A	362,000	257,000	976,000
DWCV Table A	37,000	26,000	99,000
San Luis Carryover [1]	57,000	172,000	172,000
Article 21 Supplies	0	0	8,000
San Bernardino Valley MWD Minimum Purchase	0	0	20,000
San Bernardino Valley MWD Option Purchase	0	0	11,000
San Gabriel Valley MWD Exchange and Purchase	2,000	2,000	2,000
Yuba River Accord Purchase	12,000	14,000	8,000
Central Valley Storage and Transfers			
Semitropic Program	48,000	45,000	65,000
Arvin Edison Program	49,000	75,000	75,000
Mojave Program	0	0	19,000
Kern Delta Program	47,000	50,000	50,000
Transfers and Exchanges	50,000	50,000	50,000
Subtotal of Current Programs	***664,000***	***691,000***	***1,555,000***
Programs Under Development			
Delta Improvements	0	0	0
Antelope Valley/East Kern Acquisition and Storage	7,000	20,000	20,000
Subtotal of Proposed Programs	***7,000***	***20,000***	***20,000***
Maximum Supply Capability	**671,000**	**711,000**	**1,575,000**

[1] Includes DWCV carryover.

Table A.3-7
California Aqueduct
Program Capabilities
Year 2025

(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
MWD Table A	362,000	257,000	976,000
DWCV Table A	37,000	26,000	99,000
San Luis Carryover [1]	64,000	193,000	193,000
Article 21 Supplies	0	0	8,000
San Bernardino Valley MWD Minimum Purchase	0	0	20,000
San Bernardino Valley MWD Option Purchase	0	0	11,000
San Gabriel Valley MWD Exchange and Purchase	2,000	2,000	2,000
Yuba River Accord Purchase	12,000	14,000	8,000
Central Valley Storage and Transfers			
Semitropic Program	48,000	45,000	65,000
Arvin Edison Program	60,000	75,000	75,000
Mojave Storage Program	0	0	19,000
Kern Delta Program	47,000	50,000	50,000
Transfers and Exchanges	50,000	50,000	50,000
Subtotal of Current Programs	***682,000***	***712,000***	***1,576,000***
Programs Under Development			
Delta Improvements	0	0	0
Antelope Valley/East Kern Acquisition and Storage	7,000	20,000	20,000
Subtotal of Proposed Programs	***7,000***	***20,000***	***20,000***
Maximum Supply Capability	**689,000**	**732,000**	**1,596,000**

[1] Includes DWCV carryover.

Table A.3-7
California Aqueduct
Program Capabilities
Year 2030

(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
MWD Table A	362,000	257,000	976,000
DWCV Table A	37,000	26,000	99,000
San Luis Carryover [1]	71,000	214,000	214,000
Article 21 Supplies	0	0	8,000
San Bernardino Valley MWD Minimum Purchase	3,000	0	20,000
San Bernardino Valley MWD Option Purchase	0	0	16,000
San Gabriel Valley MWD Exchange and Purchase	2,000	2,000	2,000
Yuba River Accord Purchase	0	0	0
Central Valley Storage and Transfers			
Semitropic Program	50,000	49,000	70,000
Arvin Edison Program	63,000	75,000	75,000
Mojave Storage Program	2,000	0	26,000
Kern Delta Program	47,000	50,000	50,000
Transfers and Exchanges	50,000	50,000	50,000
Subtotal of Current Programs	***687,000***	***723,000***	***1,606,000***
Programs Under Development			
Delta Improvements	87,000	178,000	248,000
Antelope Valley/East Kern Acquisition and Storage	7,000	20,000	20,000
Subtotal of Proposed Programs	***94,000***	***198,000***	***268,000***
Maximum Supply Capability	**781,000**	**921,000**	**1,874,000**

[1] Includes DWCV carryover.

Table A.3-7
California Aqueduct
Program Capabilities
Year 2035

(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
MWD Table A	362,000	257,000	976,000
DWCV Table A	37,000	26,000	99,000
San Luis Carryover [1]	80,000	240,000	240,000
Article 21 Supplies	0	0	8,000
San Bernardino Valley MWD Minimum Purchase	3,000	0	20,000
San Bernardino Valley MWD Option Purchase	0	0	16,000
San Gabriel Valley MWD Exchange and Purchase	2,000	2,000	2,000
Yuba River Accord Purchase	0	0	0
Central Valley Storage and Transfers			
Semitropic Program	50,000	49,000	70,000
Arvin Edison Program	63,000	75,000	75,000
Mojave Storage Program	2,000	0	26,000
Kern Delta Program	47,000	50,000	50,000
Transfers and Exchanges	50,000	50,000	50,000
Subtotal of Current Programs	***696,000***	***749,000***	***1,632,000***
Programs Under Development			
Delta Improvements	87,000	178,000	248,000
Antelope Valley/East Kern Acquisition and Storage	7,000	20,000	20,000
Subtotal of Proposed Programs	***94,000***	***198,000***	***268,000***
Maximum Supply Capability	**790,000**	**947,000**	**1,900,000**

[1] Includes DWCV carryover.

Table A.3-7
California Aqueduct
Program Capabilities
Year 2040

(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
MWD Table A	362,000	257,000	976,000
DWCV Table A	37,000	26,000	99,000
San Luis Carryover [1]	80,000	240,000	240,000
Article 21 Supplies	0	0	8,000
San Bernardino Valley MWD Minimum Purchase	3,000	0	20,000
San Bernardino Valley MWD Option Purchase	0	0	16,000
San Gabriel Valley MWD Exchange and Purchase	2,000	2,000	2,000
Yuba River Accord Purchase	0	0	0
Central Valley Storage and Transfers			
Semitropic Program	50,000	49,000	70,000
Arvin Edison Program	63,000	75,000	75,000
Mojave Storage Program	2,000	0	26,000
Kern Delta Program	47,000	50,000	50,000
Transfers and Exchanges	50,000	50,000	50,000
Subtotal of Current Programs	***696,000***	***749,000***	***1,632,000***
Programs Under Development			
Delta Improvements	87,000	178,000	248,000
Antelope Valley/East Kern Acquisition and Storage	7,000	20,000	20,000
Subtotal of Proposed Programs	***94,000***	***198,000***	***268,000***
Maximum Supply Capability	**790,000**	**947,000**	**1,900,000**

[1] Includes DWCV carryover.

Table A.3-7
In-Region Storage and Programs
Program Capabilities
Year 2020
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
Metropolitan Surface Storage (DVL, Mathews, Skinner)	145,000	434,000	434,000
Flexible Storage in Castaic & Perris	44,000	132,000	132,000
Groundwater Storage			
Conjunctive Use	30,000	68,000	68,000
Cyclic Storage	20,000	59,000	59,000
Subtotal of Current Programs	***239,000***	***693,000***	***693,000***
Programs Under Development			
IRP Development Targets			
Conservation	33,000	40,000	40,000
Local Resources	3,000	3,000	3,000
Subtotal of Proposed Programs	***36,000***	***43,000***	***43,000***
Maximum Supply Capability	**275,000**	**736,000**	**736,000**

Table A.3-7
In-Region Storage and Programs
Program Capabilities
Year 2025
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
Metropolitan Surface Storage (DVL, Mathews, Skinner)	162,000	486,000	486,000
Flexible Storage in Castaic & Perris	49,000	148,000	148,000
Groundwater Storage			
Conjunctive Use	37,000	68,000	68,000
Cyclic Storage	24,000	72,000	72,000
Subtotal of Current Programs	***272,000***	***774,000***	***774,000***
Programs Under Development			
IRP Development Targets			
Conservation	66,000	72,000	72,000
Local Resources	7,000	8,000	8,000
Subtotal of Proposed Programs	***73,000***	***80,000***	***80,000***
Maximum Supply Capability	**345,000**	**854,000**	**854,000**

Table A.3-7
In-Region Storage and Programs
Program Capabilities
Year 2030
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
Metropolitan Surface Storage			
(DVL, Mathews, Skinner)	179,000	538,000	538,000
Flexible Storage in Castaic & Perris	55,000	164,000	164,000
Groundwater Storage			
Conjunctive Use	42,000	68,000	68,000
Cyclic Storage	27,000	82,000	82,000
Subtotal of Current Programs	***303,000***	***852,000***	***852,000***
Programs Under Development			
IRP Development Targets			
Conservation	99,000	106,000	106,000
Local Resources	11,000	12,000	12,000
Subtotal of Proposed Programs	***110,000***	***118,000***	***118,000***
Maximum Supply Capability	**413,000**	**970,000**	**970,000**

Table A.3-7
In-Region Storage and Programs
Program Capabilities
Year 2035
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
Metropolitan Surface Storage			
(DVL, Mathews, Skinner)	201,000	604,000	604,000
Flexible Storage in Castaic & Perris	61,000	184,000	184,000
Groundwater Storage			
Conjunctive Use	51,000	68,000	68,000
Cyclic Storage	33,000	100,000	100,000
Subtotal of Current Programs	***346,000***	***956,000***	***956,000***
Programs Under Development			
IRP Development Targets			
Conservation	136,000	144,000	144,000
Local Resources	15,000	16,000	16,000
Subtotal of Proposed Programs	***151,000***	***160,000***	***160,000***
Maximum Supply Capability	**497,000**	**1,116,000**	**1,116,000**

Table A.3-7
In-Region Storage and Programs
Program Capabilities
Year 2040

(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
Metropolitan Surface Storage (DVL, Mathews, Skinner)	208,000	624,000	624,000
Flexible Storage in Castaic & Perris	63,000	190,000	190,000
Groundwater Storage			
Conjunctive Use	56,000	68,000	68,000
Cyclic Storage	37,000	110,000	110,000
Subtotal of Current Programs	***364,000***	***992,000***	***992,000***
Programs Under Development			
IRP Development Targets			
Conservation	173,000	180,000	180,000
Local Resources	19,000	20,000	20,000
Subtotal of Proposed Programs	***192,000***	***200,000***	***200,000***
Maximum Supply Capability	**556,000**	**1,192,000**	**1,192,000**

Appendix 4

WATER SUPPLY ALLOCATION PLAN

December 2014

Water Supply Allocation Plan

December 2014 Revision

Metropolitan Water District of
Southern California

Inside cover: Photo courtesy of Cora Edmonds/ArtXchange for the Healing Planet

Water Supply Allocation Plan

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List of Acronyms

AF – Acre-feet
CUP – Groundwater Conjunctive Use Program
CWD – County Water District
DWP – Drought Management Plan
IAWP – Interim Agricultural Water Program Reductions and Rates
IICP – Incremental Interruption and Conservation Plan
IRP – Integrated Resources Plan
GPCD – Gallons per Capita per Day
M&I – Municipal and Industrial
MWD – Municipal Water District
RUWMP – Regional Urban Water Management Plan
SWP – State Water Project
WSAP – Water Supply Allocation Plan
WSDM – Water Surplus and Drought Management

Definitions

Extraordinary Supplies- Deliberate actions taken by member agencies to augment the total regional water supply only when Metropolitan is allocating supplies through the WSAP.

Groundwater Recovery- The extraction and treatment of groundwater making it usable for a variety of applications by removing high levels of chemicals and/or salts.

In-lieu deliveries- Metropolitan-supplied water bought to replace water that would otherwise be pumped from the groundwater basins.

Seawater Barrier- The injection of fresh water into wells along the coast to protect coastal groundwater basins from seawater intrusion. The injected fresh water acts like a wall, blocking seawater that would otherwise seep into groundwater basins as a result of pumping.

Section 1: Introduction

Calendar Year 2007 introduced a number of water supply challenges for the Metropolitan Water District of Southern California (Metropolitan) and its service area. Critically dry conditions affected all of Metropolitan's main supply sources. In addition, a ruling in the Federal Courts in August 2007 provided protective measures for the Delta Smelt in the Sacramento-San Joaquin River Delta which brought uncertainty about future pumping operations from the State Water Project. This uncertainty, along with the impacts of dry conditions, raised the possibility that Metropolitan would not have access to the supplies necessary to meet total firm demands[1] and would have to allocate shortages in supplies to the member agencies.[2]

In preparing for this possibility, Metropolitan staff worked jointly with the member agency managers and staff to develop a Water Supply Allocation Plan (WSAP). The WSAP includes the specific formulas for calculating member agency supply allocations and the key implementation elements needed for administering an allocation should a shortage be declared. The WSAP became the foundation for the urban water shortage contingency analysis required under Water Code Section 10632 and was incorporated into Metropolitan's 2010 Regional Urban Water Management Plan (RUWMP).

Section 2: Development Process

Member Agency Input

Between July 2007 and February 2008, Metropolitan staff worked cooperatively with the member agencies through a series of member agency manager meetings and workgroups to develop a formula and implementation plan to allocate supplies in case of shortage. These workgroups provided an arena for in-depth discussion of the objectives, mechanics, and policy aspects of the different parts of the WSAP. Metropolitan staff also met individually with fifteen member agencies for detailed discussions of the elements of the recommended proposal. Metropolitan introduced the elements of the proposal to many nonmember retail agencies in its service area by providing presentations and feedback to a number of member agency caucuses, working groups, and governing boards. The discussions, suggestions, and comments expressed by the member agencies during this process contributed significantly to the development of this WSAP.

Board of Directors Input

Throughout the development process Metropolitan's Board of Directors was provided with regular progress reports on the status of this WSAP, with oral reports in September, October, and December 2007, an Information Board of Directors Letter with a draft of the WSAP in November 2007, and a Board of Directors Report with staff recommendations in January 2008. Based on Water Planning and Stewardship Committee discussion of the staff recommendations and further review of the report by

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[1] Firm demands are also referred to as uninterruptable demands; likewise non-firm demands are also called interruptible demands.

[2] See Appendix A: Metropolitan Member Agencies.

the member agencies, refinements were incorporated into the WSAP for final consideration and action in February 2008. The WSAP was adopted at the February 12, 2008 Board of Directors meeting.[3]

The 12-Month Review Process

When the Board adopted the WSAP in February 2008, the decision specified a formal revisit of the WSAP commencing in February 2010. The scheduled revisit was meant to ensure the opportunity for Metropolitan staff and the member agencies to re-evaluate the WSAP and recommend appropriate changes to the Board of Directors.

In April 2009, the Board voted to implement the WSAP for the first time. The WSAP was implemented at a Level 2 allocation level, and was in effect for the period of July 1, 2009, through June 30, 2010. Since implementation of the 2009/10 WSAP began in July 2009, a number of practical issues relating to the WSAP were identified by staff and the member agencies for further consideration during the 12-Month Review Process. Metropolitan staff engaged with the member agencies in a formal review of the WSAP from January through May 2010. During the review process the member agency managers participated in a series of six workshops. The focus of these workshops was to facilitate in-depth discussion on WSAP-related issues and lessons learned since the WSAP was implemented in July 2009. The proposed adjustments to the WSAP developed during the review process were adopted at the August 17, 2010 Board of Directors meeting[4].

The Three-Year Review Process

The Board action to adopt of the WSAP in February 2008 also directed staff to review the WSAP formula three years after the February 2008 adoption. February 2011 marked the three-year anniversary since the adoption of the WSAP. Similar to the 12-Month Review Process, the purpose of the Three-Year Review Process was to provide an opportunity for Metropolitan staff and the member agencies to re-evaluate the plan and recommend appropriate changes for board consideration.

Metropolitan staff met with the member agencies in a formal review of the WSAP from February through August 2011. Staff and member agency managers participated in a series of eleven workshops. Proposed adjustments to the WSAP developed during the process were adopted at the September 13, 2011 Board of Directors meeting.[5]

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[3] A complete listing of member agency meetings and Board of Directors reporting activities is contained in Appendix B: Water Supply Allocation Plan Process Timeline.

[4] A complete listing of member agency meetings and Board of Directors reporting activities is contained in Appendix C: 12-Month Review Process and Results.

[5] A complete listing of member agency meetings and Board of Directors reporting activities is contained in Appendix D: Three-Year Review Process and Results.

2014 Review Process

In 2014, California was challenged with a third year of severe drought.[6] Metropolitan managed its operations through significant use of regional storage reserves. It was anticipated that end of year total dry storage reserves would approach levels similar to those when the WSAP was last implemented in 2009.

Following discussion at the June 2014 Water Planning and Stewardship Committee, Metropolitan staff convened a member agency working group to revisit the WSAP. The purpose of the working group was to collaborate with member agencies to identify potential revisions to the WSAP in preparation for mandatory supply allocations in 2015. There were eight working group meetings and three discussions at the monthly Member Agency Managers' Meetings.

The process focused on three areas of the WSAP: the Base Period, the Allocation Formula, and the Allocation enforcement mechanism. Proposed adjustments to the WSAP developed during the process were adopted at the December 9, 2014 Board of Directors meeting. [7]

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[6] The Governor of California proclaimed a State of Emergency due to drought conditions on January 17, 2014 and, on April 24, 2014 issued an Executive Order proclaiming a continued State of Emergency noting drought conditions have persisted for the last three years and authorizing adoption and implementation of emergency regulations.

[7] A complete listing of member agency meetings and Board of Directors reporting activities is contained in Appendix E: 2014 Review Process and Results.

Section 3: Review of Historical Shortage Plans[8]

The WSAP incorporates key features and principles from the following historical shortage allocation plans but will supersede them as the primary and overarching decision tool for water shortage allocation.

Interruptible Water Service Program

As part of the new rate structure implemented in 1981, Metropolitan's Board of Directors adopted the Interruptible Water Service Program (Interruptible Program) which was designed to address short-term shortages of imported supplies. Under the Interruptible Program, Metropolitan delivered water for particular types of use to its member agencies at a discounted rate. In return for this discounted rate, Metropolitan reserved the right to interrupt delivery of this Interruptible Program water so that available supplies could be used to meet municipal and industrial demands.

Incremental Interruption and Conservation Plan

The ability to interrupt specific deliveries was an important element of Metropolitan's strategy for addressing shortage conditions when it adopted the Incremental Interruption and Conservation Plan (IICP) in December 1990. Reductions in IICP deliveries were used in concert with specific objectives for conservation savings to meet needs during shortages. The IICP reduced Interruptible Service deliveries in stages and provided a pricing incentive program to insure that reasonable conservation measures were implemented.

1995 Drought Management Plan

The 1995 Drought Management Plan (DMP) was a water management and allocation strategy designed to match supply and demand in the event that available imported water supplies were less than projected demands. Adopted by the Metropolitan Board of Directors in November 1994, the 1995 DMP was a short-term plan designed to provide for the 1995 calendar year only. The primary objective of the 1995 DMP was to identify methods to avoid implementation of mandatory reductions. The 1995 DMP included various phases and a step-by-step strategy for evaluating supply and demand conditions and utilizing Metropolitan's available options, with the final phase being implementation of the revised IICP.

1999 Water Surplus and Drought Management Plan

Metropolitan staff began work on the Water Surplus and Drought Management (WSDM) Plan in March 1997 as part of the Integrated Water Resources Plan (IRP), which was adopted by Metropolitan's Board of Directors in January 1996. The IRP established regional water resource targets, identifying the need for developing resource management policy to guide annual operations. The WSDM Plan defined Metropolitan's resource management policy by establishing priorities for the use of regional resources to achieve the region's reliability goal identified in the IRP. In April 1999, Metropolitan's Board of Directors adopted the WSDM Plan.

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[8] A summary of the key elements in the following allocation plan is found in Appendix F: Summary of Historical Shortage Plans.

The WSDM Plan also included a set of principles and considerations for staff to address when developing specific allocation methods. The WSDM Plan stated the following guiding principle to be followed in developing any future allocation scheme:

> *"Metropolitan will encourage storage of water during periods of surplus and work jointly with its member agencies to minimize the impacts of water shortages on the region's retail consumers and economy during periods of shortage."*[9]

This principle reflects a central desire for allocation methods that are both equitable and minimize regional hardship to retail water consumers. The specific considerations postulated by the WSDM Plan to accomplish this principle include the following:[10]

- The impact on retail customers and the economy
- Allowance for population and growth
- Change and/or loss of local supply
- Reclamation/Recycling
- Conservation
- Investment in local resources
- Participation in Metropolitan's interruptible programs
- Investment in Metropolitan's facilities.

Section 4: Water Supply Allocation Formula

Based on the guiding principle and considerations described in the WSDM Plan, Metropolitan staff and the member agencies developed a specific formula for allocating water supplies in times of shortage. The formula seeks to balance the impacts of a shortage at the retail level while maintaining equity on the wholesale level, and takes into account growth, local investments, changes in supply conditions and the demand hardening[11] aspects of non-potable recycled water use and the implementation of conservation savings programs. The formula, described below, is calculated in three steps: base period calculations, allocation year calculations, and supply allocation calculations.[12] The first two steps involve standard computations, while the third section contains specific methodology developed for this WSAP.

Base Period Calculations

The first step in calculating a water supply allocation is to estimate water supply and demand using a historical base period with established water supply and delivery data. The base period for each of the different categories of demand and supply is calculated using data from the fiscal years (July through June) ending 2013 and 2014.[13]

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[9] WSDM Plan, p. 1. Emphasis added.

[10] WSDM Plan, p. 2.

[11] Demand hardening is the effect that occurs when all low-cost methods of decreasing overall water demand have been applied (e.g., low-flow toilets, water recycling) and the remaining options to further decrease demand become increasingly expensive and difficult to implement.

[12] Detailed operational elements of these objectives and a numerical example are discussed in Appendix G: Water Supply Allocation Formula Example.

[13] Exceptions to this methodology are noted in the descriptions of base period calculations.

Base Period Local Supplies: Local supplies for the base period are calculated using a two-year average of groundwater production, groundwater recovery, Los Angeles Aqueduct supply, surface water production, and other imported supplies. Non-potable recycling production is not included in this calculation due to its demand hardening effect.

Base Period Wholesale Demands: Demands on Metropolitan for the base period are calculated using a two-year average of firm purchases and in-lieu deliveries to long-term groundwater replenishment, conjunctive use, cyclic, and supplemental storage programs.

Base Period Retail Demands: Total retail-level municipal and industrial (M&I) demands for the base period are calculated by adding the Base Period Wholesale Demands and the Base Period Local Supplies. This estimates an average total demand for water from each agency.

Base Period Mandatory Conservation Credit: Metropolitan allows a consultation process that enables member agencies to describe mandatory water use restrictions and/or rationing restrictions that were in place within their service areas during the Base Period. Restrictions may vary among agencies but include restricted water uses, fines, and water budget or penalty based rate structures that are enacted by the governing body of the member agency or retail agency. Following the consultation process, Metropolitan staff will recommend adjustments based on evidence of reduced GPCD. To qualify for an adjustment, GPCD reductions would have to be observed that are beyond those expected from the agency's ongoing conservation efforts and trends.

Allocation Year Calculations

The next step in calculating the water supply allocation is estimating water needs in the allocation year. This is done by adjusting the base period estimates of retail demand for population or economic growth and changes in local supplies.

Allocation Year Retail Demands: Total retail M&I demands for the allocation year are calculated by adjusting the Base Period Retail Demands for baseline inflation and growth.

Baseline Inflation Adjustment: Baseline inflation occurs when non-potable recycling or conservation is developed after the Base Period. The development of these supplies reduces actual demands for water in the Allocation Year. Because non-potable-recycling and conservation are excluded from the WSAP formula, the actual need for water in the Allocation year is overestimated. The Baseline Inflation Adjustment removes increases in non-potable recycling and conservation annually from the Base Period forward to better reflect the true need for water in the Allocation Year.

Growth Adjustment: The growth adjustment is calculated using the estimated actual annual rate of population growth at the county level, as generated by the California Department of Finance, whenever possible. For years without complete data, the growth rate is calculated using an average of the three most recent years available. Growth will be allocated based on historical per capita water use during the Base Period, with a cap equal to Metropolitan's IRP Target for Water Use Efficiency. For allocation years up to and including 2014, the cap will be 163 GPCD, and for allocation years 2015-2020 the cap will reduce linearly from 163 to 145 GPCD. On an appeals basis, member agencies may request that their adjustment be calculated using member agency level population growth. A weighted combination of actual population and actual employment growth rates may also be requested.

Allocation Year Local Supplies: Allocation Year Local Supplies include groundwater production, groundwater recovery, Los Angeles Aqueduct supply, surface water production, seawater desalination, and other imported supplies. Estimates of Allocation Year Local Supplies are provided by the member agencies upon implementation of a WSAP. If estimates are not provided, Metropolitan will use the sum of the Base Period Local Supplies and Base Period In-Lieu Deliveries as a default. Agencies may provide updated estimates at any time during the Allocation Year to more accurately reflect their demand for Metropolitan supplies.

Extraordinary Supplies: Under the WSAP formula, local supply production in the Allocation Year can either be designated as a "planned" supply, or as an "extraordinary" supply.[14] This is an important designation for a member agency because the two types of supplies are accounted for differently in the WSAP formula. Local supplies classified at Extraordinary Supply are only partially included (scaled depending on the WSAP Level) as local supplies. This has the effect of providing significantly more benefit to the member agency in terms of total water supply that is available to the retail customer.[15]

Allocation Year Wholesale Demands: Demands on Metropolitan for the allocation year are calculated by subtracting the Allocation Year Local Supplies from the Allocation Year Retail Demands.

Water Supply Allocation Calculations

The final step is calculating the water supply allocation for each member agency based on the allocation year water needs identified in Step 2. The following table displays the elements that form the basis for calculating the supply allocation. Each element and its application in the allocation formula are discussed below.

Table 1: Shortage Allocation Index

(a) Regional Shortage Level	(b) Wholesale Minimum Percentage	(c) Maximum Retail Impact Adjustment Percentage
1	92.5%	2.5%
2	85.0%	5.0%
3	77.5%	7.5%
4	70.0%	10.0%

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[14] Appendix H: Board Policy Principles on Determining the Status of Extraordinary Supply lists the key Board principles used in determining if a supply qualifies as an Extraordinary Supply.

[15] See Appendix G: Water Supply Allocation Formula Example for specific allocation formulae.

5	62.5%	12.5%
6	55.0%	15.0%
7	47.5%	17.5%
8	40.0%	20.0%
9	32.5%	22.5%
10	25.0%	25.0%

Regional Shortage Level: The WSAP formula allocates shortages of Metropolitan supplies over ten levels.

Wholesale Minimum Allocation: The Wholesale Minimum Allocation ensures a minimum level of Metropolitan supplied wholesale water service to each member agency.

Maximum Retail Impact Adjustment: The purpose of this adjustment is to ensure that agencies with a high level of dependence on Metropolitan do not experience disparate shortages at the retail level compared to other agencies when faced with a reduction in wholesale water supplies. The Maximum Retail Impact Percentage is prorated on a linear scale based on each member agency's dependence on Metropolitan at the retail level. This percentage is then multiplied by the agency's Allocation Year Wholesale Demand to determine an additional allocation.

Conservation Demand Hardening Credit: The Conservation Demand Hardening Credit addresses the increased difficulty in achieving additional water savings at the retail level that comes as a result of successful implementation of water conserving devices and conservation savings programs. To estimate conservation savings, each member agency will establish a historical baseline Gallons Per Person Per Day (GPCD) calculated in a manner consistent with California Senate Bill SBx7-7.[16] Reductions from the baseline GPCD to the Allocation Year are used to calculate the equivalent conservation savings in acre-feet. The Conservation Demand Hardening Credit is based on an initial 10 percent of the GPCD-based Conservation savings plus an additional 5 percent for each level of Regional Shortage set by the Board during implementation of the WSAP. The credit will also be adjusted for:

- The overall percentage reduction in retail water demand
- The member agency's dependence on Metropolitan

The credit is calculated using the following formula:

Conservation Demand Harding Credit = Conservation Savings x (10% + Regional Shortage Level Percentage) x (1 +((Baseline GPCD – Allocation Year GPCD)/Baseline GCPD)) x Dependence on MWD Percentage

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[16] California Department of Water Resources, February 2011, "Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use. Available at: http://www.water.ca.gov/wateruseefficiency/sb7/docs/MethodologiesCalculatingBaseline_Final_03_01_2011.pdf

This provides a base demand hardening credit equal to 10 percent of conservation savings and increases the credit as deeper shortages occur, which is when conservation demand hardening has a bigger impact on the retail consumer. The credit also increases based on the percentage of an agency's demand that was reduced through conservation. This accounts for increased hardening that occurs as increasing amounts of conservation are implemented. Lastly, the credit is scaled to the member agency's dependence on Metropolitan to ensure that credits are being applied to the proportion of water demand that is being affected by reductions in Metropolitan supply.

Minimum Per-Capita Water Use Credit: This adjustment creates a minimum per capita water use threshold. Member agencies' retail-level water use is compared to two different thresholds. The proposed minimum thresholds are based upon compliance guidelines established under Senate Bill X7-7.

- 100 GPCD total water use
- 55 GPCD residential water use

Agencies that fall below either threshold under the WSAP will receive additional allocation from Metropolitan to bring them up to the minimum GPCD water use level. If an agency qualifies under both thresholds, the one resulting in the maximum allocation adjustment will be given.[17] To qualify for this credit, member agencies must provide documentation of the total agency level population and the percent of retail level demands that are residential; no appeal is necessary.

Total WSAP Allocation: The allocation to an agency for its M&I retail demand is the sum of the Wholesale Minimum Allocation, the Retail Impact Adjustment, the Conservation Demand Hardening Credit, and the Minimum Per-Capita Water Use Credit.[18]

Total Metropolitan Supply Allocations: In addition to the WSAP Allocation described above, agencies may also receive separate allocations of supplies for and seawater barrier and groundwater replenishment demands. Allocations of supplies to meet seawater barrier demands are to be determined by the Board of Directors independently but in conjunction with the WSAP. Separating the seawater barrier allocation from the WSAP allocation allows the Board to consider actual barrier requirements in the Allocation Year and address the demand hardening issues associated with cutting seawater barrier deliveries. According to the principles outlined for allocating seawater barrier demands, allocations should be no deeper than the WSAP Wholesale Minimum Percentage implemented at that time.

The WSAP also provides a limited allocation for drought-impacted groundwater basins based on the following framework:[19]

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[17] See Appendix J: Per Capita Water Use Minimum Example for specific minimum per-capita water use credit formulae and example.

[18] See Appendix G: Water Supply Allocation Formula Example for specific allocation formulae.

[19] See Appendix L: Groundwater Replenishment Allocation for more information.

1. Metropolitan staff will hold a consultation with the requesting member agency and the appropriate groundwater basin manager to document whether the basin is in one of the following conditions:
    a. Groundwater basin overdraft conditions that will result in water levels being outside normal operating ranges during the WSAP allocation period; or
    b. Violations of groundwater basin water quality and/or regulatory parameters that would occur without imported deliveries
2. An allocation is provided based on the verified need for groundwater replenishment. The allocation would start with a member agency's ten-year average purchases of imported groundwater replenishment supplies (excluding years in which deliveries were curtailed). The amount would then be reduced by the declared WSAP Regional Shortage Level.

Section 5: WSAP Implementation

The WSAP will take effect if a regional shortage is declared by the Board of Directors. The following implementation elements are necessary for administering the WSAP during a time of shortage. These elements cover the processes needed to declare a regional shortage level as well as provide information pertaining to the allocation surcharge.

Allocation Period

The allocation period covers twelve consecutive months, from July of a given year through the following June. This period was selected to minimize the impacts of varying State Water Project (SWP) allocations and to provide member agencies with sufficient time to implement their outreach strategies and rate modifications.

Setting the Regional Shortage Level

Metropolitan staff is responsible for recommending a Regional Shortage Level for the Board of Directors' consideration. The recommendation shall be based on water supply availability, and the implementation of Metropolitan's water management actions as outlined in the WSDM Plan. Metropolitan staff will keep the Board of Directors apprised to the status of water supply conditions and management actions through monthly reports to the Water Planning and Stewardship Committee. To further facilitate staff in the development of a recommended regional shortage level, member agency requests for local supply adjustments shall be submitted by April 1st.

Metropolitan's Board of Directors, through the Water Planning and Stewardship Committee, is responsible for approving the final Regional Shortage Level at its April meeting. By the April meeting, the majority of the winter snowfall accumulation period will have passed and will allow staff to make an allocation based on more stable water supply estimates. Barring unforeseen large-scale circumstances, the Regional Shortage Level will be set for the entire allocation period, which will provide the member agencies an established water supply level for their planning.

Exit Strategy

While the Board ultimately has discretion to implement or lift and allocation at any point of time during the year; the WSAP includes a two-part exit strategy that is meant to streamline the WSAP implementation decision making process.

- If the Board decides to implement the WSAP, then any current WSAP allocation would remain in place until the end of the Allocation Year.
- If the Board decides not to implement the WSAP, then any current WSAP allocation would be terminated concurrent with the Board decision.

Allocation Appeals Process

An appeals process is necessary for the administration of any changes or corrections to an agency's allocation. Metropolitan's General Manager will designate, subsequent to a declaration of an allocation by the Board of Directors, an Appeals Liaison as the official point of contact for all information and inquiries regarding appeals. All member agency General Managers will be notified in writing of the name and contact information of the Appeals Liaison. Only appeals that are made through the Appeals Liaison and in accordance with the provisions outlined in Appendix N: Allocation Appeals Process will be evaluated. Basis for appeals claims can include but are not limited to:

- Adjusting erroneous historical data used in base period calculations
- Adjusting for population growth rates
- Determining if a local supply qualifies as Extraordinary Supply

Additional details and a checklist for the appeals process are available in Appendix N: Allocation Appeals Process and Appendix O: Appeals Submittal Checklist.

Allocation Surcharge

Member agency allocations are supported by an Allocation Surcharge. The Allocation Surcharge is charged to water use above the Member Agency allocation and is charged in addition to Metropolitan's standard rates for water service. Allocation Surcharges will only be assessed to the extent that an agency's total annual usage exceeds its total annual allocation. Any revenues collected through the Allocation Surcharge will be applied towards Metropolitan's Water Management Fund, which is used to in part to fund expenditures in dry-year conservation. No billing or assessment of allocation surcharges rates will take place until the end of the twelve-month allocation period.

> **Allocation Surcharge:** The application of the Allocation Surcharge structure is a two tier structure that provides a lower level of Allocation Surcharge for minor overuse of allocations and a higher level of Allocation Surcharge for major overuse of allocations. The structure and applicable Allocation Surcharges are listed in Table 2.

Table 2: Allocation Surcharge

Water Use	Base Water Rate[20]	Allocation Surcharge[21]	Total Rate
100% of Allocation	Tier 1	0	Tier 1
Between 100% and 115%	Tier 1	$1,480	Tier 1 + ($1,480)
Greater than 115%	Tier 1	$2,960	Tier 1 + ($2,960)

Qualifying Income-Based Rate Allocation Surcharge Adjustment:[22] Any Allocation Surcharges incurred by a member agency under the WSAP will be adjusted to reflect the extent to which retail customers within a member agency's service area are served under a "lifeline" or similar qualified discounted rate program based on income or ability to pay ("Income-Based Rate").

Any member agency who is assessed Allocation Surcharges under the WSAP may submit an acre-foot equivalent of water used by retail customers served under a qualifying Income-Based Rate.[23] This amount of water use would be multiplied by the percentage of retail-level reduction in allocation year demand necessary for that member agency to avoid exceeding its WSAP allocation. The monetary amounts resulting from these acre feet are subtracted from the total monetary amounts incurred by an agency for exceeding its allocation. In the case that the monetary amounts associated with the Income-Based Rate are greater than the total Allocation Surcharges an agency incurs, no Allocation Surcharges will be incurred. The end result of this adjustment is that the member agency will not be subject to Allocation Surcharges for the use of water by their retail customers served under a qualifying Income-Based Rate.

Growth Rate Allocation Surcharge Adjustment": In recognition of member agency differences in geography and climate, a Growth Rate Allocation Surcharge Adjustment will be given to any agency that exceeds its WSAP Allocation. The Allocation Surcharge reduction will be based on the difference in acre-feet between the Growth Adjustment applied at Metropolitan's IRP planning goal rate, and the greater of the following:

- The IRP planning goal rate adjusted for the member agency's ETo, or
- The member agency's certified and documented 20x2020 targeted GPCD

If both of these alternatives result in a lower growth adjustment than the IRP planning goal, no Allocation Surcharge reduction will be made.

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[20] The base water rate shall be the applicable water rate for the water being purchased. In most cases, it will be the Tier 1 rate (plus Treatment Surcharge for treated water deliveries). However, it is possible that the water being purchased would be in the amount that would put an agency beyond its Tier 1 limit. In that case, the base water rate will be the Tier 2 rate (plus Treatment Surcharge for treated water deliveries).

[21] Allocation Surcharge is applied to water use in excess of an agency's WSAP allocation.

[22] See Appendix K: Qualifying Income-Based Rate Allocation Surcharge Adjustment Example for specific penalty adjustment formulae and example.

[23] Appropriate documentation and certification will be required.

Tracking and Reporting

Subsequent to a declared regional shortage by the Board of Directors, Metropolitan staff will produce monthly reports of each member agency's water use compared to its allocations based on monthly delivery patterns to be submitted by the member agency. In order to produce these reports, member agencies are requested to submit their local supply use on a monthly basis and certify end of allocation year local supply use. These reports and comparisons are to be used for the purposes of tracking and communicating potential underage/overage of an agency's annual allocations.

Key Dates for Water Supply Allocation Implementation

The timeline for implementation of an allocation is shown in Table 3. A brief description of this timeline follows:

January to March: Water Surplus and Drought Management reporting occurs at Metropolitan's Water Planning and Stewardship Committee meetings. These reports will provide updated information on storage reserve levels and projected supply and demand conditions.

April: Member agencies report their projected local supplies for the coming allocation year. This information is incorporated in staff analysis of storage reserves and projected supply and demand conditions in order to provide an allocation recommendation to the Board. Metropolitan's Board will consider whether an allocation is needed. A declaration of an allocation will include the level of allocation to be in effect for the allocation year. Likewise, member agencies will report their projected demands and local supplies needed to meet seawater barrier and groundwater replenishment requirements for the allocation year. Metropolitan's Board will consider whether allocations for seawater barrier demands and groundwater replenishment demands are needed independently from the WSAP allocation decision.**July 1st**: If the Board declared an allocation in April, then it will be effective starting July 1st. The allocation level will be held through June 30th, barring unforeseen circumstances. Member agencies will now be requested to submit their local supply use on a monthly basis and certify end of allocation year local supply use. Local production data must be reported to Metropolitan by the end of the month following the month of use (use in July must be reported by the end of August). This information will be combined with Metropolitan sales information in order to track retail water use throughout Metropolitan's service area. Each month Metropolitan will report on member agency water sales compared to their allocation amounts.

June 30th: The allocation year is complete.

July: Member agency local supplies must be certified for the month of June, the last month of the previous allocation year.

August: Metropolitan will calculate each member agency's total potable water use based on local supply certifications and actual sales data for the allocation year of July through June. Allocation surcharges will be assessed for usage above a given member agency's final adjusted allocation (reflecting the actual local supply and imported water use that occurred in the allocation year).

Table 3: Board Adopted Allocation Timeline

Year	Month	Year 1 Board Decision	Year 1 Allocation Year	Year 2 Board Decision	Year 2 Allocation Year
Year 1	January				
	February				
	March				
	April	Declaration *			
	May				
	June				
	July		**Effective Period** Continuous Tracking of Member Agency Local Supply and Imported Water Use		
	August				
	September				
	October				
	November				
	December				
Year 2	January				
	February				
	March				
	April			Declaration *	
	May				
	June				
	July				**Effective Period** Continuous Tracking of Member Agency Local Supply and Imported Water Use
	August		Assess		
	September				
	October				
	November				
	December				
Year 3	January				
	February				
	March				
	April				
	May				
	June				

*Member agency projections of local supplies are due on April 1st to assist Metropolitan staff in determining the need for an allocation in the coming allocation year.

Appendix A: Metropolitan Member Agencies

Table 4: Member Agencies		
City of Anaheim	City of Glendale	City of San Marino
City of Beverly Hills	Inland Empire Utilities Agency	City of Santa Ana
City of Burbank	Las Virgenes MWD	City of Santa Monica
Calleguas MWD	City of Long Beach	Three Valleys MWD
Central Basin MWD	City of Los Angeles	City of Torrance
City of Compton	MWD of Orange County	Upper San Gabriel MWD
Eastern MWD	City of Pasadena	West Basin MWD
Foothill MWD	San Diego CWA	Western MWD
City of Fullerton	City of San Fernando	

Source: http://mwdh2o.com/WhoWeAre/Member-Agencies/

Appendix B: Water Supply Allocation Plan Process Timeline

July 2007

- City of Long Beach Water Department staff briefing
- Member Agency Managers/Member Agency Workgroup meeting
- Northern Managers Group meeting
  - Foothill MWD, City of Pasadena, City of Long Beach, Calleguas MWD, City of Los Angeles, West Basin MWD, City of Burbank, Three Valleys MWD, City of Glendale, Upper San Gabriel MWD

August 2007

- Central Basin MWD staff briefing
- Eastern MWD staff briefing
- San Diego CWA staff briefing
- Member Agency Managers/Member Agency Workgroup meeting
- Western MWD staff briefing
- City of Beverly Hills staff briefing

September 2007

- Member Agency Subgroup meetings
  - MWD of Orange County, San Diego CWA, West Basin MWD, Central Basin MWD
- MWD of Orange County staff briefing
- Member Agency Workgroup meeting
- Member Agency Workgroup meeting
- MWD Board of Directors Oral Report

October 2007

- Inland Empire Utilities Agency staff briefing
- Central Basin MWD Caucus Meeting (included sub-agencies)
- Three Valleys MWD staff briefing
- MWD of Orange County staff briefing
- West Basin MWD staff briefing
- MWD Board of Directors Oral Report

November 2007

- West Basin MWD Caucus Meeting (included sub-agencies)
- West Basin Water Users Association presentation
- Walnut Valley MWD staff briefing (sub-agency of Three Valleys MWD)
- Foothill MWD Managers Meeting (included sub-agencies)
- Central Basin MWD staff briefing
- City of Claremont City Council (sub-agency of Three Valleys MWD)
- MWD Board of Directors Information Letter with Draft Proposal

December 2007

- Northern Managers Group Meeting
- California Department of Public Health staff briefing
- City of Long Beach Water Department staff briefing
- Santa Ana River Watershed Project Authority presentation
- Foothill MWD Managers Meeting (included sub-agencies)
- MWD Board of Directors Oral Report

January 2008

- Northern Managers Group Meeting
- Water Replenishment District Board of Directors presentation
- Three Valleys MWD staff briefing
- Member Agency Conservation Coordinator’s Group presentation
- Member Agency Managers/Member Agency Workgroup meeting
- City of Chino Hills presentation (sub-agency of IEUA)
- Member Agency Workgroup meeting
- Hemet/San Jacinto Exchange Club presentation
- MWD Board of Directors Report with Staff Recommended Water Supply Allocation Plan

February 2008

- MWD of Orange County and Irvine Ranch WD staff briefing
- MWD Board of Directors Action Item
- San Gabriel Valley Water Association Meeting
- Orange County Water Policy Meeting
- SCAG Water Policy Task Force Meeting

Appendix C: 12-Month Review Process and Results

January 2010

- WSAP 12-Month Review Process workshop #1
  - Focused discussion of WSAP issues identified by Metropolitan staff and by member agencies since the July 2009 implementation began.

February 2010

- WSAP 12-Month Review Process workshop #2
  - Continuation of focused discussion
- WSAP 12-Month Review Process workshop #3
  - Continuation of focused discussion

March 2010

- WSAP 12-Month Review Process workshop #4
  - Continuation of focused discussion
- MWD Board of Directors information item
  - Review of potential modifications to the WSAP definition of Extraordinary Supply

April 2010

- WSAP 12-Month Review Process workshop #5
  - Recap of identified issues and discussion of Metropolitan staff proposals for adjustments to the WSAP
- Member Agency Managers Meeting
  - Update on the 12-Month Review Process
- WSAP 12-Month Review Process workshop #6
  - Discussion of WSAP issues related to groundwater replenishment
- Member Agency Managers conference call
  - Clarification of WSAP definition for Extraordinary Supply

May 2010

- Member Agency Managers Meeting
  - Discussion of proposed Extraordinary Supply policy principles and WSAP Local Supply certification process.
- Member Agency Managers conference call
  - Discussion of proposed Extraordinary Supply policy principles

June 2010

- MWD Board of Directors action item

July 2010

- MWD Board of Directors information item
  - Review of proposed adjustments to the WSAP developed in the 12-Month Review Process

August 2010

- MWD Board of Directors action item

Resulting Changes

- Removed references to Gains and Losses of Local Supply
    - Removed references in the WSAP to “gains and losses of local supplies” in order to better facilitate the accounting of historical base year and allocation year local supplies. This change did not affect the WSAP formula or allocations.
- Removed references to the Regional Shortage Percentage
    - Removed references to the “Regional Shortage Percentage” in the WSAP to reduce unintended confusion between calculation factors and shortage amounts. This change did not affect the WSAP formula or allocations.
- Included the Retail Impact Adjustment in all shortage levels
    - Included the Retail Impact Adjustment for Regional Shortage Levels 1 and 2. This change results in additional allocations to Metropolitan-dependent agencies under Level 1 and Level 2 regional shortages.
- Revised the accounting of Extraordinary Supplies
    - Revised the methodology for accounting of Extraordinary Supply in the WSAP formula by:
        - Removing the Base Period Local Supply threshold provision,
        - Removing the sliding-scale sharing mechanism from the formula, and
        - Including the full amount of the Extraordinary Supply in the calculation of the Retail Impact Adjustment.
- Included a Minimum Per Capita Water Use Threshold
    - Developed a minimum water use credit based on two GPCD water use thresholds. Member agencies would receive additional Metropolitan allocation for an acre-foot equivalent of GPCD below the minimum threshold. Member agency water use, on a gallon per capita per day (GPCD) basis, is compared to the following minimum thresholds established under Senate Bill X7-7 (Water Conservation Act of 2009)
        - 100 GPCD total use or
        - 55 GPCD residential indoor use
- Excluded Seawater Barrier from the WSAP Formula
    - Excluded seawater barrier supplies from the WSAP Base Period and Allocation Year local supply calculations. This allows the Board to determine allocations for seawater barrier demands separately from the WSAP.

Appendix D: Three-Year Review Process and Results

February 2011

- WSAP 3-Year Review Process workshop #1
    - Review of the existing WSAP policy formula; review of the process timeline; and focused discussion of WSAP issues identified by Metropolitan staff and by member agencies since the WSAP's adoption in February 2008

March 2011

- WSAP 3-Year Review Process workshop #2
    - Discussion of issues related to local supplies and baseline inflation due to adjustments for recycling in the WSAP formula
- WSAP 3-Year Review Process workshop #3
    - Continuation of prior workshop

April 2011

- WSAP 3-Year Review Process workshop #4
    - Discussion of issues and alternatives related to base period selection and baseline inflation in the WSAP formula
- WSAP 3-Year Review Process workshop #5
    - Discussion of recommendations to address baseline inflation in the WSAP formula

May 2011

- WSAP 3-Year Review Process workshop #6
    - Discussion of issues and alternatives for the growth adjustment methodology in the WSAP formula
- WSAP 3-Year Review Process workshop #7
    - Continuation of prior workshop

June 2011

- WSAP 3-Year Review Process workshop #8
    - Continuation of prior workshop, discussion of WSAP implementation exit strategy
- WSAP 3-Year Review Process workshop #9
    - Continuation of exit strategy discussion, discussion of baseline inflation due to conservation and related conservation demand hardening issues

July 2011

- WSAP 3-Year Review Process workshop #9
    - Continued discussion of baseline inflation and conservation issues, and discussion of sharing allocations between agencies with common local resources

August 2011

- WSAP 3-Year Review Process workshop #10
    - Discussion of WSAP Allocation Year timing vs. Tier 1-Tier 2 rate cycle timing, discussion of approaches for encouraging completion of WSAP local supply certifications
- Review WSAP at Member Agency Managers Meeting
    - Discussion of proposed WSAP adjustments to address baseline inflation issues, revise the growth adjustment methodology, and establish a WSAP exit strategy

September 2011

- MWD Board of Directors action item

Resulting Changes

- Baseline Inflation Adjustment
  - Removed non-potable recycling and conservation from the WSAP baseline
    - Increases in recycling and conservation will be subtracted annually from the Base Period forward
    - The annual population growth rate will be applied after deducting the annual increases in recycling and conservation
    - If an agency ends up in allocation penalty, a penalty reduction will be applied in an amount equal to the Code-Based and rate Structure conservation savings that were removed from the WSAP baseline
- Changed the Growth Adjustment methodology
  - Growth will be allocated at historical per capita rate capped at the 2010 Integrated Water Resource Plan (IRP) Target for Water Use Efficiency
    - For years up to and including 2014, the cap will be 163 GPCD
    - For years 2015-2020, the cap will reduce linearly from 163 to 145 GPCD
  - If an agency exceeds its allocation, a penalty reduction will be applied based on either:
    - The differential Evapotranspiration (ETo) of its service area compared to the MWD average, or
    - Certified and documented 20 x 2020 targeted GPCD
- Exit Strategy
  - Clarified the course of action for an existing WSAP allocation when Metropolitan's Board makes a declaration decision for the following WSAP year
    - If there is an allocation for the next year, then the current allocation stays in place
    - If there is no allocation for the next year, then the current allocation is lifted concurrent with the April decision

Appendix E: 2014 Review Process and Results

July 2014

- WSAP Workgroup Meeting #1
    - First meeting of the 2014 WSAP Review process; review of the existing WSAP policy and formula; review of the process timeline; began discussion of issues related to base period selection
- WSAP Workgroup Meeting #2
    - Discussion of base period selection

August 2014

- WSAP Workgroup Meeting #3
    - Continuation of prior workshop discussion; comparison of base period alternatives

September 2014

- WSAP Workgroup Meeting #4
    - Discussion of a base period proposal; discussion of replenishment issues in the WSAP; discussion of 2015 water supply scenarios
- Review WSAP at Member Agency Managers Meeting
    - Review of WSAP workgroup process; discussion on issues related to base period, demand hardening, and local resources development
- WSAP Workgroup Meeting #5
    - Review of base period recommendation; discussion of issues regarding agencies in mandatory conservation during a base period; discussion on replenishment in the WSAP

October 2014

- WSAP Workgroup Meeting #6
    - Continuation of prior workshop discussion; discussion of alternative methods for conservation demand hardening credit; discussion of new and existing local supplies
- Review WSAP at Member Agency Managers Meeting
    - Review of WSAP workgroup process; discussion of issues related to base period and demand hardening

November 2014

- WSAP Workgroup Meeting #7
    - Review and discussion of issues and potential methods for base period selection and adjustment, replenishment allocation, and conservation demand hardening credit; review of estimated effects of potential WSAP changes at the regional level
- WSAP Workgroup Meeting #8
    - Review of proposed recommendations for the WSAP based on workgroup discussion
- Review WSAP at Member Agency Managers Meeting
    - Review of proposed recommendations for the WSAP based on workgroup discussion

Resulting Changes

- Base Period Update to FY2013 and FY2014
    - Changed the WSAP Base Period from calendar years 2004-2006 to fiscal years ending July 2013 and 2014
    - Mandatory Conservation Adjustment
        - Agencies with mandatory conservation in effect during the base period (FY 2013 and/or FY 2014) may qualify for a demand hardening adjustment, adjustment is subject to a consultation process that includes consideration historical demand and GPCD information

- Modify Conservation Demand Hardening Credit
    - Replaced device calculation-based estimates of conservation savings with a GPCD-based method
        - Conservation savings are calculated by comparing GPCD from a historical baseline to the Allocation Year; the difference is converted to acre-feet using the Allocation Year population.
            - Baseline GCPD is 10-year average ending between 2004 and 2010, with gross water, using gross water use minus non-potable recycled water production and documented historical population
    - Replaced formula for calculating the credit for each Regional Shortage Level
    - Conservation Demand hardening credit will be based on an initial 10 percent of GPCD-based conservation savings plus an additional 5 percent for each level of Regional Shortage; the credit will also be adjusted for the overall percentage reduction in retail water demand and the member agency’s dependence on Metropolitan.
- Allocation Surcharge
    - Replaced the WSAP Penalty Rate with an Allocation Surcharge based on the estimated cost of Turf Replacement conservation programs

Appendix F: Summary of Historical Shortage Plans

These five elements incorporated into the WSAP have, in four out of five instances, been used in previous shortage plans. Both the IICP and the 1995 DMP used a historical base period calculation, adjusted for growth, made local supply adjustments, and used conservation hardening credits in their formulations. The retail impact adjustment is the only feature of the WSAP that has not been used historically.

Table 5: Historical Shortage Plan Overview

Plan Element	1991 IICP	1995 DMP	WSAP
Historical Base Period	√	√	√
Growth Adjustment	√	√	√
Local Supply Adjustment	√	√	√
Conservation Hardening Credit	√	√	√
Retail Impact Adjustment			√

Appendix G: Water Supply Allocation Formula Example

The following example gives a step-by-step description of how the formula would be used to calculate an allocation of Metropolitan supplies for a hypothetical member agency. All numbers are hypothetical for the purpose of the example and do not reflect any specific member agency.

Step 1: Calculate Base Period Retail Demand

Base Period Local Supplies: Calculated using a two-year average of groundwater (gw), groundwater recovery (gwr), Los Angeles Aqueduct supply (laa), surface water (sw), seawater desalination (sd), and other non-Metropolitan imported supplies (os). For the purpose of this example, assume that the two year average is 59,000 af.

$$[(gw1+gwr1+laa1+sw1+sd1+os1) + (gw2+gwr2+laa2+sw2+sd2+os2)] \div 2 = 59{,}000 \text{ af}$$

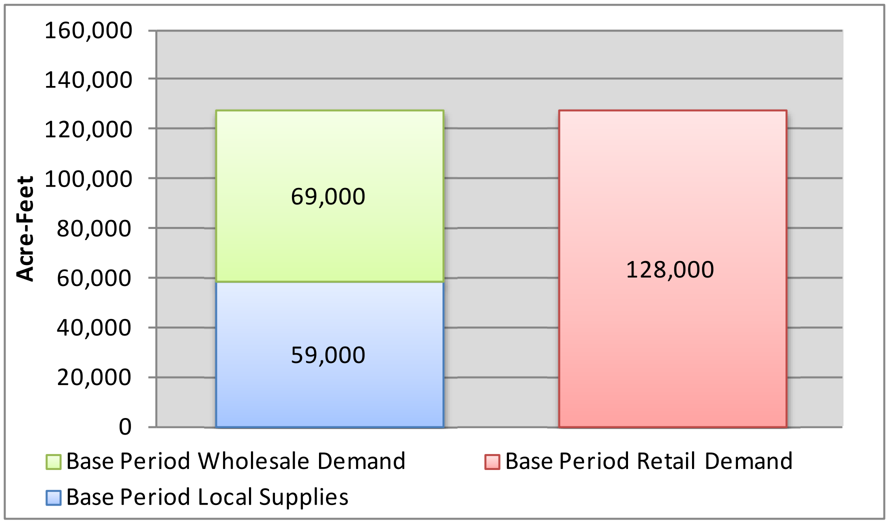
Base Period Wholesale Demands: Calculated using the same two-year time period as the Base Period Local Supplies. The Base Period Wholesale Demands include firm purchases (fp) and in-lieu deliveries to long-term groundwater replenishment (il), conjunctive use (cup), cyclic (cyc), and supplemental storage programs (ss). For the purpose of this example, assume that the two year average is 69,000 af.

$$[(fp^1++il^1+cup^1+cyc^1+ss^1) + (fp^2+il^2+cup^2+cyc^2+ss^2)] \div 2 = 69{,}000 \text{ af}$$

Base Period Retail Demands: Calculated as the sum of the Base Period Local Supplies and Base Period Wholesale Demand.

$$59{,}000 + 69{,}000 = 128{,}000 \text{ af}$$

Figure 1: Base Period Retail Demand Calculation



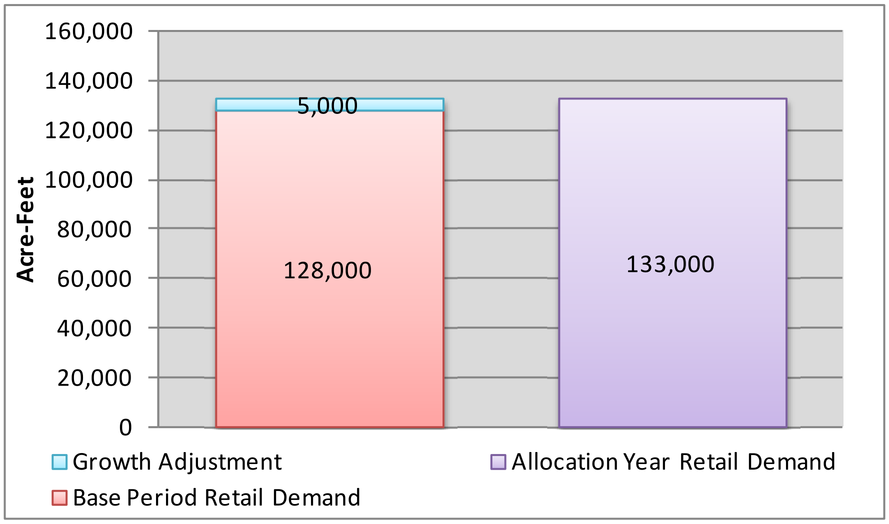
Calculate Adjustment for Base Period Mandatory Rationing (if applicable): The hypothetical agency used in this example is assumed not to qualify for the Base Period Mandatory Rationing Adjustment. A detailed discussion of the adjustment methodology can be found in Appendix I: Base Period Rationing Adjustment Example.

Step 2: Calculate Allocation Year Retail Demand

Allocation Year Retail Demand: Calculated by adjusting the Base Period Retail Demand for any baseline inflation and growth that occurred since the Base Period.

128,000 af + 5,000 af (net adjustment to retail demand) = 133,000 af

Figure 2: Allocation Year Retail Demand Calculation



Step 3: Calculate Allocation Year Wholesale Demand

Allocation Year Local Supplies: Estimates of Allocation Year Local Supplies are provided by the member agencies upon implementation of a WSAP. If estimates are not provided, Metropolitan will use the sum of the Base Period Local Supplies and Base Period In-Lieu Deliveries as a default. Agencies may provide updated estimates at any time during the Allocation Year to more accurately reflect their demand for Metropolitan supplies. For this example assume that the Allocation Year Local Supplies total 65,000 acre-feet.

Allocation Year Local Supplies = 65,000 af

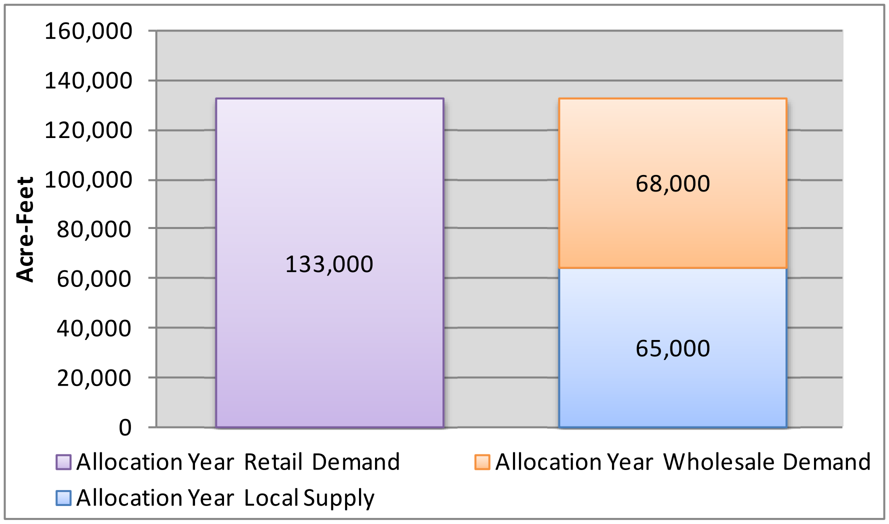
For this example assume also that this agency has an additional 5,000 acre-feet of supplies that meet the determinations for Extraordinary Supply. These supplies are withheld from the allocation formula except for in calculating the Retail Impact Adjustment Allocation.

Extraordinary Local Supplies = 5,000 af

Allocation Year Wholesale Demands: Calculated by subtracting the Allocation Year Local Supplies (65,000 af) from the Allocation Year Retail Demands (133,000 af).

133,000 af - 65,000 af = 68,000 af

Figure 3: Allocation Year Wholesale Demand Calculation



Step 4: Calculate the Wholesale Minimum Allocation

Wholesale Minimum Percentage: Calculate from Table 1 for Regional Shortage Level 4.

Table 1: Shortage Allocation Index		
(a) Regional Shortage Level	(b) Wholesale Minimum Percentage	(c) Maximum Retail Impact Adjustment Percentage
4	70.0%	10.0%

Wholesale Minimum Allocation: Calculated by multiplying the agency's Allocation Year Wholesale Demand (68,000 af) by the Wholesale Minimum Percentage (70%) from the Table 1 for Regional Shortage Level 4.

68,000 af * 70% = 47,600 af

Step 5: Calculate the Retail Impact Adjustment Allocation

Maximum Retail Impact Adjustment Percentage: Calculate from Table 1 for Regional Shortage Level 4.

Retail Impact Adjustment Allocation: Calculated first by determining the agency's dependence on Metropolitan by dividing the Allocation Year Wholesale Demand (68,000 af) minus the Extraordinary Supply (5,000 af) by the Allocation Year Retail Demand (133,000 af) and multiplying by 100.

[(68,000 af - 5,000 af)/ 133,000 af] * 100 = 47%

Next, this percentage dependence on Metropolitan (47%) is multiplied by the Maximum Retail Impact Percentage for Shortage Level 4 (10%).

47% * 10% = 4.7%

This percentage is now multiplied by the Allocation Year Wholesale Demand (68,000 af) for the Retail Impact Adjustment Allocation.

68,000 af * 4.7% = 3,221 af

Step 7: Calculate the Conservation Demand Hardening Adjustment

Calculate Baseline GPCD: To estimate conservation savings, each member agency will establish a historical baseline GPCD calculated in a manner consistent with California Senate Bill SBx7-7, using a 10 or 15-year average ending between 2004 and 2010, using gross water use minus non-potable recycle water production and documented historical population. For this example assume that the Baseline GPCD is 154 GPCD

Baseline GPCD = 154 GPCD

Calculate Allocation Year GPCD: Next, calculate the allocation year GPCD by converting the Allocation Year Retail Demand to GPCD and dividing by the Allocation Year Population from the WSAP. For this example the Allocation Year Retail Demand is 133,000 AF (see Step 2 above) and assume the Allocation Year Population is 905,000 persons. The resulting GPCD is 131 GPCD.

Allocation Year GPCD = 133,000 af/year * 325,851 gallons/af ÷ 365 days/year ÷ 905,000 persons = 131 GPCD

Calculate Reduction in GPCD: Subtract Allocation Year GPCD from Baseline GPCD to determine the GPCD Reduction.

GPCD Reduction = 154 GPCD – 131 GPCD = 23 GPCD

Calculate Conservation Savings: Convert the GPCD Reduction to the equivalent annual conservation savings in acre-feet, using the Allocation Year Population.

$$\text{Conservation Savings} = \frac{((\text{GPCD Reduction}) \text{ x } 365 \text{ days/yr x Population})}{325{,}851 \text{ gallons/af}}$$

Conservation Savings = 23 x 365 x 905,000 ÷ 325,851 = 23,316 af

Multiply by Regional Shortage Level Percentage: Multiply the Conservation Savings by 10 percent plus an additional 5 percent for each level of Regional Shortage (see Step 4 above). This example assumes a Regional Shortage Level of 4. This scales the hardening credit by the level of regional shortage, thereby increasing the credit as deeper shortages occur when demand hardening has a larger impact on the retail consumer.

23,316 af x (10% + (4 x 5%) = 6,995 af

Multiply by Conservation Savings Percentage: Next, multiply by the percentage of an agency's demand that was reduced through conservation. This scales the hardening by the total percentage reduction to recognize that increased hardening occurs as increasing amounts of conservation are implemented.

Conservation Savings Percentage = 1 + ((Baseline GPCD – Allocation Year GPCD)/Baseline GPCD)

Conservation Savings Percentage = 1+ ((154 GPCD – 131 GPCD)/154 GPCD) = 115%

6,995 af x 115% = 8,044 af

Multiply by Dependence on MWD: Next, multiply by the agency's percentage dependence on MWD as shown in Step 5 above. This scales the credit to the member agency's dependence on MWD to ensure that credits are being applied to the proportion of water demand that is being affected by reductions in MWD's supply. For this example, dependence on MWD is 47%.

8.044 af x 47% = 3,781 af

Summary: The Conservation Demand Hardening Adjustment calculation is summarized by the following formula:

Conservation Demand Hardening Adjustment = Conservation Savings x (10% + Regional Shortage Level %) x (1+Conservation%) x Dependence on MWD %

Conservation Demand Hardening Adjustment = 23,316 af x (10% + (4 x 5%)) x (115%) x (47%) = 3,781 af

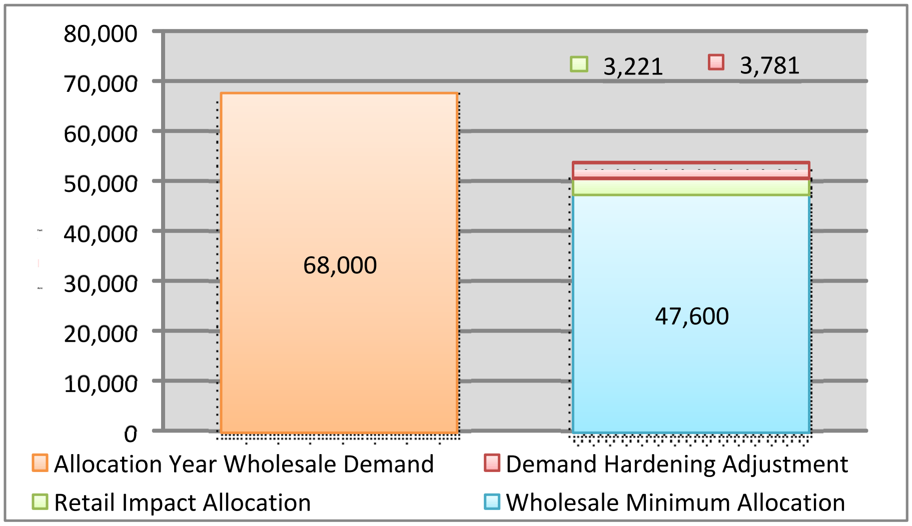
Step 8: Calculate the Low Per-Capita Adjustment Allocation: The hypothetical agency used in this example is assumed not to qualify for the Low Per-Capita Adjustment. A detailed discussion and example of the Low Per-Capita Adjustment calculation can be found in Appendix J: Per Capita Water Use Minimum Example.

Step 9: Calculate the total WSAP Allocation

WSAP Allocation: Calculated by adding the Wholesale Minimum Allocation (47,600 af), the Maximum Retail Impact Adjustment (3,221 af), the Demand Hardening Adjustment (3,781 af), and the Low Per-Capita Adjustment (0 af).

47,600 af + 3,221 af + 3,781 af + 0 af = 54,602 af

Figure 4: WSAP Allocation Regional Shortage Level 4



Step 10: Calculate total retail level reliability

Retail level reliability: Calculated by adding the WSAP Allocation (54,602 af), the Allocation Year Local Supply (65,000 af) and the Extraordinary Local Supply (5,000 af) and dividing by the Allocation Year Retail Demand (133,000 af).

(54,602 af + 65,000 af + 5,000 af) ÷ 133,000 af = 93.7%

Total Metropolitan Supply Allocations: In addition to the WSAP Allocation described above, agencies may also receive separate allocations of supplies for groundwater replenishment and seawater barrier demands. More information on the groundwater replenishment allocation is located in Appendix L: Groundwater Replenishment Allocation.

Appendix H: Board Policy Principles on Determining the Status of Extraordinary Supply

At the June 8, 2010 Water Planning and Stewardship Committee meeting Metropolitan's Board of Directors adopted the following policy principles to guide staff in determining the Extraordinary Supply status of future member agency supply programs.

No Negative Impacts to Other Member Agencies

A potential Extraordinary Supply for a member agency should not decrease the amount of Metropolitan water supply that would be available to the other member agencies in a WSAP. Programs that utilize Metropolitan supplies as a primary or in-lieu source or as a means of payback or future replenishment may have the effect of decreasing supplies, available to other agencies, if designated as Extraordinary Supply.

Provides Supply in Addition to Existing Regional Supplies

A potential Extraordinary Supply should provide a water supply that increases the overall water supplies that are available to the region in a WSAP. A program that is designed to move existing regional supplies from year to year would not qualify.

Specifically Designed Program or Supply Action

A potential Extraordinary Supply must be intentionally created and operated to provide additional supply yield. Normal variations in existing and planned local supply programs would not qualify.

Intended for Consumptive Use in a WSAP

A potential Extraordinary Supply should be designed with the primary intention to deliver water supply to a member agency only at a time when Metropolitan is allocating supplies. Programs designed to deliver water on a regular basis would not qualify. Exceptions for reasonable use of a supply program for emergency or other extenuating local circumstances should be considered.

Fully Documented Resource Management Actions

A potential Extraordinary Supply should have a full description as to the source, transmission, distribution, storage, and delivery of the water supply.

These principles are intended to identify deliberate actions taken by member agencies to augment supplies only when Metropolitan is allocating supplies through the WSAP. Production from existing local supplies, programs that are operated on an ongoing basis, and incidental increases in water supply would not qualify as Extraordinary Supply. The intent of the Extraordinary Supply designation is to recognize programs and actions that are additive to the total regional water supply as the region continues to confront the water supply challenges from drought and regulatory conditions. To that end, any supply actions taken after the initial implementation of the WSAP in July 2009 that utilize Metropolitan supplies either as a primary source, or to refill or replenish an incurred obligation or deficit at a future date would not qualify as Extraordinary Supply.

Appendix I: Base Period Mandatory Rationing Adjustment

Agencies that were under mandatory water use restrictions during the Base Period may have water use that is lower due to the mandatory actions already taken. Without adjusting for this, those agencies could be required to enforce even higher levels of restrictions under an allocation than those agencies that had not started mandatory restrictions.

To qualify for a Base Period Mandatory Rationing Adjustment, the member agency must provide Metropolitan staff with the following information:

- Time period when the mandatory conservation was in effect; it must be in effect during the Base Period
- A statement, with documentation, of how drought restrictions comply with the following Mandatory Conservation qualifications:
    - Governing Body-authorized or enacted
    - Includes mandatory demand reduction actions, restrictions or usage limitations including penalty-backed water budgets
    - Enforced by assessing penalties, fines, or rates based upon violating restrictions or exceeding usage limitations
- If the agency in question is a retail subagency, then the retailer's base period water demands during the Base Period in order to determine proportion to the member agency's total demand
- Historical data to construct GPCD base and trend for the consultation

Calculating the Base Period Rationing Adjustment involves following steps:

- Use the Baseline GPCD 10 or 15-year period selected by member agency for the Conservation Demand Hardening Adjustment calculation.
- Interpolate from the GPCD value of the midpoint of the Baseline GPCD period to the average GPCD of the two years preceding the agency's mandatory conservation
- Extrapolate to the WSAP Base Period (FY2013 and FY2014)
- Calculate the difference between estimated and observed GPCD for FY2013 and FY2014
- Convert to Acre-Feet and add to the member agency's Base Period Retail Demands

Appendix J: Per-Capita Water Use Minimum Example

This adjustment creates a minimum per capita water use threshold. Member agencies' retail-level water use under the WSAP is compared to two different thresholds. The minimum water use levels are based on compliance guidelines for total and residential water use established under Senate Bill X7-7.

Total Retail Level Use: 100 GPCD
Residential Retail Level Use: 55 GPCD

Agencies that fall below either threshold under the WSAP would receive additional allocation from Metropolitan to bring them up to the minimum GPCD water use level. To qualify for this credit, member agencies must provide documentation of the total agency level population and the percent of retail level demands that are residential; no appeal is necessary.

The following example gives a step-by-step description of how the Low Per-Capita Water Use Adjustment would be calculated for a hypothetical member agency. All numbers are hypothetical for the purpose of the example and do not reflect any specific member agency. This example was calculated using the following assumptions:

Allocation Year Retail Demand: 50,000 acre-feet
Allocation Year Local Supplies: 25,000 acre-feet;
Allocation Year Wholesale Demand: 25,000 acre-feet
Base Period Conservation: 5,000 acre-feet
Agency Population: 375,000
Percent of Retail Demands that are Residential: 60%

Step 1: Calculate Total Retail-Level Allocation Year Supplies

Table 6 shows the Allocation Year Local Supply, WSAP Allocation, and the total Allocation Year Supplies for the example agency at each Regional Shortage Level. The WSAP Allocation was calculated using the methodology detailed in Appendix G: Water Supply Allocation Formula Example and the assumptions listed above.

Table 6: Total Retail Level Allocation Year Supplies			
Regional Shortage Level	**Allocation Year Local Supply**	**WSAP Allocation**	**Total Allocation Year Supply**
1	25,000	23,594	48,594
2	25,000	22,188	47,188
3	25,000	20,781	45,781
4	25,000	19,375	44,375
5	25,000	17,969	42,969
6	25,000	16,563	41,563
7	25,000	15,156	40,156
8	25,000	13,750	38,750
9	25,000	12,344	37,344
10	25,000	10,938	35,938

Step 2: Calculate the Equivalent Total and Residential GPCD

The next step is to calculate the equivalent water use in gallons per capita per day (GPCD) for the Total Allocation Year Supply. The following equation shows the GPCD calculation under Regional Shortage Level 10.

35,938 af * 325,851 gallons ÷ 375,000 people ÷ 365 days = 85.6 GPCD

The residential per-capita water use is calculated in the same manner. Based on the assumption that 60% of the agency demands are residential, the following equation shows the residential GPCD calculation under Regional Shortage Level 10.

35,938 af * 60% * 325,851 gallons ÷ 375,000 people ÷ 365 days = 51.3 GPCD

Step 3: Compare the Total and Residential GPCD to the Minimum Water Use Thresholds

The next step is to compare the total GPCD water use to the 100 GPCD total water use threshold. In a Regional Shortage Level 10, the WSAP results in an allocation that is 14.4 GPCD below the minimum threshold.

100 GPCD – 85.6 GPCD = 14.4 GPCD

Likewise the residential GPCD water use is compared to the 55 GPCD residential water use threshold.

55 GPCD – 51.3 GPCD = 3.7 GPCD

Step 4: Determine the Allocation Adjustment in Acre-Feet

The final step is to calculate the acre-foot equivalent of the GPCD that fell below the minimum threshold. In a Regional Shortage Level 10, the adjustment provides 6,068 acre-feet of additional allocation to the agency; the results for Shortage Levels 1-10 are shown in Table 7.

14.4 GPCD ÷ 325,851 gallons * 375,000 people * 365 days = 6,068 acre-feet

Table 7: Total Per-Capita Water Use Adjustment

Regional Shortage Level	Allocation Year Supply	Equivalent GPCD	GPCD Below Threshold	Allocation Adjustment
1	48,594	115.7	0	0
2	47,188	112.3	0	0
3	45,781	109.0	0	0
4	44,375	105.6	0	0
5	42,969	102.3	0	0
6	41,563	98.9	1.1	443
7	40,156	95.6	4.4	1,849
8	38,750	92.3	7.7	3,255
9	37,344	88.9	11.1	4,662
10	35,938	85.6	14.4	6,068

Again, this step is repeated for the residential water use. In a Regional Shortage Level 10, the adjustment provides 1,540 acre-feet of additional allocation to the agency; the residential water use results for Regional Shortage Levels 1-10 are shown in Table 8.

3.7 GPCD ÷ 325,851 gallons * 375,000 people * 365 days = 1,540 acre-feet

Table 8: Residential Per-Capita Water Use Adjustment

Regional Shortage Level	Allocation Year Supply	Equivalent GPCD	GPCD Below Threshold	Allocation Adjustment
1	29,156	69.4	0	0
2	28,313	67.4	0	0
3	27,469	65.4	0	0
4	26,625	63.4	0	0
5	25,781	61.4	0	0
6	24,938	59.4	0	0
7	24,094	57.4	0	0
8	23,250	55.4	0	0
9	22,406	53.3	1.7	697
10	21,563	51.3	3.7	1,540

Agencies that fall below either threshold under the WSAP would receive additional allocation from Metropolitan to bring them up to the minimum GPCD water use level. If an agency qualifies under both thresholds, the one resulting in the maximum allocation adjustment would be given. Under this example the agency would receive 6,068 acre-feet of additional allocation in a Regional Shortage Level 10.

Appendix K: Qualifying Income-Based Rate Allocation Surcharge Adjustment Example

The following example provides a step by step description of how the qualifying income-based rate allocation surcharge adjustment is calculated. To qualify for this adjustment, member agencies must provide documentation showing the amount of retail demands that are covered by a qualifying income-based rate; no appeal is necessary.

The following list summarizes the allocation year demands, local supplies, and allocation as calculated in Appendix G: Water Supply Allocation Formula Example for a hypothetical agency under a Level 4 Regional Shortage. For detailed instructions on how to calculate these figures, reference Appendix G: Water Supply Allocation Formula Example.

Allocation Year Retail Demand: 133,000 acre-feet
Allocation Year Local Supplies: 68,000 acre-feet;
Level 4 WSAP Allocation: 52,735 acre-feet

Step 1: Allocation Surcharge Calculation

(a) **Water Use above Allocation:** The first step in calculating the income-based rate Allocation Surcharge adjustment is to calculate the agency's total Allocation Surcharge under the WSAP. If the agency did not incur any Allocation Surcharge from the allocation year, the income-based rate allocation surcharge adjustment would not apply. For the purpose of this example, the agency used 61,000 acre-feet of MWD supplies in the allocation year. This represents 8,265 acre-feet of use above the water supply allocation.

WSAP Allocation	52,735 af
Actual MWD Water Use	61,000 af
Use Above WSAP Allocation	8,265 af

(b) **Total Allocation Surcharge:** In this example the agency used 115.7% of its water supply allocation. 7,910 of the 8,265 acre-feet of use above the allocation would be assessed the Allocation Surcharge at an amount of $1,480 per acre-foot and 354 of the 8,265 acre-feet of use above the allocation would be assessed the Allocation Surcharge at an amount of $2,960.

Between 100% and 115% of Allocation	7,910 af	$1,480/af	$11,706,800
Greater than 115% of Allocation	354 af	$2,960/af	$1,047,840
Total	8,265 af		$12,754,640

Step 2: Effective Income-Based Rate Cutback

(a) **Calculate Retail Cutback:** The second step in calculating the income-based rate allocation surcharge adjustment is to calculate the amount of supply cutback that would have been expected from qualifying income-based rate customers under the WSAP. Using the water supply allocation that was calculated above, the total retail level impact on the agency can be determined. In this example the agency receives a retail level cutback of 15,265 acre-feet, or 11.5% of their retail level demand.

WSAP Allocation + Allocation Year Local Supplies	117,735 af
Allocation Year Retail Demand	133,000 af
Effective Cutback	**15,265 af (11.5%)**

(b) **Income-based Rate Customer Retail Cutback:** To calculate the effective income-based rate cutback, the amount of demand covered by a qualifying income-based rate is multiplied by the effective retail level cutback. For this example assume that the agency has 10,000 acre-feet of qualifying demands.

Qualifying Income-Based Rate Demand	10,000 af
Effective Cutback Percentage	11.5%
Effective Income-Based Rate Cutback	**1,148 af**

(c) **Income-based Rate Cutback Allocation Surcharge:** Once the effective cutback has been calculated, the amount of Allocation Surcharge that is associated with qualifying income-based rate customers can be determined.

Between 100% and 115% of Allocation	794 af	$1,480/af	$1,175,120
Greater than 115% of Allocation	354 af	$2,960/af	$1,047,840
Total	**1,148 af**		**$2,222,960**

(d) **Adjusted Allocation Surcharge Calculation:** Finally, the Allocation Surcharge attributable to qualifying income-based rate customers is subtracted from the total Allocation Surcharge that was calculated above to determine the qualifying income-based rate adjusted allocation surcharge. In the case that the monetary amounts associated with the Income-Based Rate are greater than the total amounts an agency incurs, no Allocation Surcharge will be incurred.

Total Allocation Surcharge	$12,754,640
Qualifying Income-Based Rate Allocation Surcharge	$2,222,960
Qualifying Income-Based Rate Adjusted Allocation	**$10,531,680**

Appendix L: Groundwater Replenishment Allocation

Groundwater basins help provide vital local supplies that can buffer the region from short-term drought impacts. Longer droughts can result in reductions to the many sources of water that replenish groundwater basins, resulting in lower basin levels and potential impacts to the overlying consumptive demands. Limited imported deliveries under these conditions may help avoid impacts to the basins that may be drawn out of their normal operating range or subject to water quality or regulatory impacts. To this end, Metropolitan provides a limited allocation for drought impacted groundwater basins based on the following framework:

a) Staff hold a consultation with qualifying member agencies who have taken groundwater replenishment deliveries since 2010 and the appropriate groundwater basin managers to document whether their basins are in one of the following conditions:
   i. Groundwater basin overdraft conditions that will result in water levels being outside normal operating ranges during the WSAP allocation period; or
   ii. Violations of groundwater basin water quality and/or regulatory parameters that would occur without imported deliveries.

b) Provide an allocation based on the verified need for groundwater replenishment. The allocation would start with a member agency's ten-year average purchases of imported groundwater replenishment supplies (excluding years in which deliveries were curtailed). The amount would then be reduced by the declared WSAP Regional Shortage Level (5 percent for each Regional Shortage Level).

c) Any allocation provided under this provision for drought impacted groundwater basins is intended to help support and maintain groundwater production for consumptive use. As such, a member agency receiving an allocation under this provision will be expected to maintain groundwater production levels equivalent to the average pumping in the Base Period. Any adjustments to a member agency's M&I allocation due to lower groundwater production would be reduced by deliveries made under this provision.

d) Agencies for which this allocation does not provide sufficient supplies for the needs of the groundwater basin may use the WSAP Appeals Process to request additional supply (subject to Board approval). The appeal should include a Groundwater Management Plan that documents the need for additional supplies according to the following tenets:
   i. Maintenance of groundwater production levels;
   ii. Maintenance of, or reducing the further decline of, groundwater levels;
   iii. Maintenance of key water quality factors/indicators;
   iv. Avoidance of permanent impacts to groundwater infrastructure or geologic features; and
   v. Consideration of severe and/or inequitable financial impacts.

Final amounts and allocations will be determined following the consultations with groundwater basin managers and member agencies.

Appendix M: Water Rates, Charges, and Definitions

Table 9: Water Rates and Charges
Dollars per acre-foot (except where noted)

Rate	Effective 1/1/2014	Effective 1/1/2015	Effective 1/1/2016
Tier 1 Supply Rate	$148	$158	$156
Tier 2 Supply Rate	$290	$290	$290
System Access Rate	$243	$257	$259
Water Stewardship Rate	$41	$41	$41
System Power Rate	161	$126	$138
Tier 1	$593	$582	$594
Tier 2	$735	$714	$728
Treatment Surcharge	$297	$341	$348
Full Service Treated Volumetric Cost			
Tier 1	$890	$923	$942
Tier 2	$1,032	$1,055	$1,076
Readiness-to-Serve Charge (millions of dollars)	$166	$158	$153
Capacity Charge (dollars per cubic foot second)	$8,600	$11,100	$10,900

Definitions:

(1) **Tier 1 Supply Rate -** recovers the cost of maintaining a reliable amount of supply.

(2) **Tier 2 Supply Rate** - set at Metropolitan's cost of developing additional supply to encourage efficient use of local resources**.**

(3) **System Access Rate** – recovers a portion of the costs associated with the delivery of supplies.

(4) **System Power Rate** – recovers Metropolitan's power costs for pumping supplies to Southern California.

(5) **Water Stewardship Rate** – recovers the cost of Metropolitan's financial commitment to conservation, water recycling, groundwater clean-up and other local resource management programs.

(6) **Treatment Surcharge** – recovers the costs of treating imported water.

(7) **Readiness-to-Serve Charge -** a fixed charge that recovers the cost of the portion of system capacity that is on standby to provide emergency service and operational flexibility.

(8) **Capacity Charge** – the capacity charge recovers the cost of providing peak capacity within the distribution system.

Source: http://www.mwdh2o.com/WhoWeAre/Management/Financial-Information

Appendix N: Allocation Appeals Process

Step 1: Appeals Submittal

All appeals shall be submitted to the Appeals Liaison in the form of a written letter signed by the member agency General Manager. Each appeal must be submitted as a separate request, submittals with more than one appeal will not be considered. The appeal request is to include:

- A designated member agency staff person to serve as point of contact.
- The type of appeal (erroneous baseline data, loss of local supply, etc.).
- The quantity (in acre-feet) of the appeal.
- A justification for the appeal which includes supporting documentation.

A minimum of 60 days are required to coordinate the appeals process with Metropolitan's Board process.

Step 2: Notification of Response and Start of Appeals Process

The Appeals Liaison will phone the designated member agency staff contact within 3 business days of receiving the appeal to provide an initial receipt notification, and schedule an appeals conference. Subsequent to the phone call, the Liaison will send an e-mail to the Agency General Manager and designated staff contact documenting the conversation. An official notification letter confirming both receipt of the appeal submittal, and the date of the appeals conference, will be mailed within 2 business days following the phone contact

Step 3: Appeals Conference

All practical efforts will be made to hold an appeals conference between Metropolitan staff and member agency staff at Metropolitan's Union Station Headquarters within 15 business days of receiving the appeal submittal. The appeals conference will serve as a forum to review the submittal materials and ensure that there is consensus understanding as to the spirit of the appeal. Metropolitan staff will provide an initial determination of the size of the appeal (small or large) and review the corresponding steps and timeline for completing the appeals process.

Steps 4-7 of the appeals process differ depending upon the size of the appeal

Small Appeals

Small appeals are defined as those that would change an agency's allocation by less than 10 percent, or are less than 5,000 acre-feet in quantity. Small appeals are evaluated and approved or denied by Metropolitan staff.

Step 4: Preliminary Decision

Metropolitan staff will provide a preliminary notice of decision to the member agency within 10 business days of the appeals conference. The preliminary decision timeline may be extended to accommodate requests for additional information, data, and documentation. The Appeals Liaison will mail a written letter to the member agency staff contact and General Manager, stating the preliminary decision and the rationale for approving or denying the appeal.

Step 5: Clarification Conference

Following the preliminary decision the Appeals Liaison will schedule a clarification conference. The member agency may choose to decline the clarification conference if they are satisfied with the preliminary decision. Declining the clarification conference serves as acceptance of the preliminary decision, and the decision becomes final upon approval by Metropolitan's executive staff.

Step 6: Final Decision

Metropolitan staff will provide a final notice of decision to the member agency within 10 business days of the clarification conference, pending review by Metropolitan's executive staff. The Appeals Liaison will mail a written letter to the member agency staff contact and General Manager, stating the final decision and the rationale for the decision. A copy of the letter will also be provided to Metropolitan executive staff.

Step 6a: Board Resolution of Small Appeal Claims

Member agencies may request to forward appeals that are denied by Metropolitan staff to the Board of Directors through the Water Planning and Stewardship Committee for final resolution. The request for Board resolution shall be submitted to the Appeals Liaison in the form of a written letter signed by the member agency General Manager. This request will be administered according to Steps 6 and 7 of the large appeals process.

Step 7: Board Notification

Metropolitan staff will provide a report to the Board of Directors, through the Water Planning and Stewardship Committee, on all submitted appeals including the basis for determination of the outcome of the appeal.

Large Appeals

Large appeals are defined as those that would change an agency's allocation by more than 10 percent, and are larger than 5,000 acre-feet. Large appeals are evaluated and approved or denied by the Board of Directors.

Step 4: Preliminary Recommendation

Metropolitan staff will provide a preliminary notice of recommendation to the member agency within 10 business days of the appeals conference. The preliminary decision timeline may be extended to accommodate requests for additional information, data, and documentation. The Appeals Liaison will mail a written letter to the member agency staff contact and General Manager, stating the preliminary recommendation and the rationale for the recommendation. A copy of the draft recommendation will also be provided to Metropolitan executive staff.

Step 5: Clarification Conference

Following the preliminary recommendation the Appeals Liaison will schedule a clarification conference. The member agency may choose to decline the clarification conference if the satisfied with preliminary recommendation. Declining the clarification conference signifies acceptance of the preliminary recommendation, and the recommendation becomes final upon approval by Metropolitan's executive staff.

Step 6: Final recommendation

Metropolitan staff will provide a final notice of recommendation to the member agency within 10 business days of the clarification conference, pending review by Metropolitan executive staff. The Appeals Liaison will mail a written letter to the member agency staff contact and General Manager, stating the final recommendation and the rationale for the recommendation. A copy of the final recommendation will also be provided for Metropolitan executive review.

Step 7: Board Action

Metropolitan staff shall refer the appeal to the Board of Directors through the Water Planning and Stewardship Committee for approval.

Appendix O: Appeals Submittal Checklist

Appeal Submittal

- ☐ Written letter (E-mail or other electronic formats will not be accepted)
- ☐ Signed by the Agency General Manager

Mailed to the appointed Metropolitan Appeals Liaison

Contact Information

- ☐ Designated staff contact
  - Name
  - Address
  - Phone Number
  - E-mail Address
- ☐ General Manager
  - Name
  - Address
  - Phone Number
  - E-mail Address

Type of Appeal

- ☐ State the type of appeal
  - Erroneous historical data used in base period calculations
    - Metropolitan Deliveries
    - Local Production
    - Growth adjustment
    - Conservation savings
  - Exclusion of physically isolated areas
  - Extraordinary supply designation
  - Groundwater Replenishment Allocation
  - Base Period Mandatory Rationing Adjustment
  - Other

Quantity of Appeal

- ☐ State the quantity in acre-feet of the appeal

Justification and Supporting Documentation

- ☐ State the rationale for the appeal
- ☐ Provide verifiable documentation to support the stated rationale
  - Examples of verifiable documentation Include, but are not limited to:
    - Billing Statements
    - Invoices for conservation device installations
    - Basin Groundwater/Watermaster Reports
    - California Department of Finance economic or population data
    - California Department of Public Health reports

Appendix 5

LOCAL PROJECTS

(From 2015 IRP local supply project survey April and July 2015)

Table A.5-1
Recycled Water Projects

Existing Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
City of Anaheim		
Anaheim Water Recycling Demonstration Project	110	2012
OCWD Groundwater Replenishment System - Anaheim Canyon Power Plant	200	2011
OCWD Groundwater Replenishment System - Anaheim Regional Transportation Intermodal Center	10	2014
City of Burbank		
Burbank Recycled Water System Expansion Phase 2 Project	960	2009
Burbank Reclaimed Water System Expansion Project	850	1995
BWP Power Plant	1,500	1985
Calleguas Municipal Water District		
Oxnard Advanced Water Purification Facility Ph. 1	2,310	2011
Camrosa Water District Recycling System	1,230	2005
Camrosa Water District Recycling System	450	1990
Lake Sherwood Reclaimed Water System	400	1997
VCWWD No. 1 WWTP Recycled Water Distribution System	2,200	2003
VCWWD No. 8 Recycled Water Distribution System	1,100	2001
Central Basin Municipal Water District		
Century/Rio Hondo Reclamation Program	10,500	1992
Montebello Forebay	50,000	1990
Cerritos Reclaimed Water Project	4,000	1993
Eastern Municipal Water District		
Eastern Reach 1, Phase II Water Reclamation Project	1,700	2000
Eastern Regional Reclaimed Water System Reach 3 Reach 7	4,830	2013
Eastern Recycled Water Expansion Project	5,000	2013
Recycled Water Pipeline Reach 16 Project	820	2006
Rancho California Reclamation Expansion Project	6,000	1993
Rancho California Reclamation	4,950	1993
Eastern Regional Reclaimed Water System (Non-LRP)	21,200	1989
Eastern Regional Reclaimed Water System (Non-LRP)	22,400	1975
Foothill Municipal Water District		
La Canada-Flintridge Country Club	90	1962
City of Glendale		
Glendale Water Reclamation Expansion Project	500	1992
Glendale Verdugo-Scholl Canyon Brand Park Reclaimed Water Project	2,225	1995
Glendale Grayson Power Plant Project	460	1986
Glendale Water Reclamation Expansion Project	100	2013

Inland Empire Utilities Agency		
IEUA Regional Recycling Water Distribution System	3,500	1998
IEUA Regional Recycling Water Distribution System	13,500	1998
IEUA Regional Recycled Water Distribution System (Non-LRP)	7,550	2007
IEUA Regional Recycled Water Distribution System (Non-LRP)	15,000	1997
IEUA Regional Recycled Water Distribution System (Non-LRP) (IPR)	13,850	2005
Las Virgenes Municipal Water District		
Calabasas Reclaimed Water System	4,000	1997
Las Virgenes Valley Reclaimed Water System	500	1997
City of Long Beach		
Alamitos Barrier Recycled Water Expansion Project	3,475	2013
Alamitos Barrier Reclaimed Water Project	3,025	2005
Long Beach Reclaimed Water Master Plan, Phase I System Expansion	2,750	1986
Long Beach Reclamation Project (Non-LRP Floor)	2,100	2004
THUMS	1,429	1981
City of Los Angeles		
Hansen Area Water Recycling Project, Phase 1	2,115	2008
Hansen Dam Golf Course Water Recycling Project	500	2015
Harbor Water Recycling Project	50	2005
Harbor Water Recycling Project	4,950	2005
Sepulveda Basin Water Recycling Project Phase IV	550	2009
Los Angeles Taylor Yard Park Water Recycling Project	150	2009
Van Nuys Area Water Recycling Project	150	2009
Griffith Park	900	1997
MCA/Universal	300	1997
Municipal Water District of Orange County		
El Toro Recycled Water System Expansion	1,175	2015
Green Acres Reclamation Project - Coastal	320	1991
San Clemente Water Reclamation Project	500	1990
Trabuco Canyon Reclamation Expansion Project	800	1992
Green Acres Reclamation Project - Orange County	2,160	1991
Capistrano Valley Non Domestic Water System Expansion	2,360	2006
(SMWD Chiquita) Development Of Non-Domestic Water System Expansion in Ladera Ranch & Talega Valley.	2,772	2005
Michelson – Los Alisos WRP Upgrades	8,500	2007
Moulton Niguel Water Reclamation Project/Moulton Niguel Phase 4 Reclamation System Expansion	9,276	2006
OCWD Groundwater Replenishment System Seawater Barrier Project	35,000	2008
OCWD Groundwater Replenishment System Spreading Project	35,000	2008
South Coast WD South Laguna Reclamation Project	1,450	2004
IRWD Michelson Reclamation Project	8,200	1997
OCWD Groundwater Replenishment System Spreading Project, Phase II	30,000	2015

Trabuco Canyon Reclamation Expansion Project (Non-LRP Floor)	280	1992
SMWD purchase from IRWD	321	2001
Trabuco Canyon Reclamation Expansion Project (Non-LRP)	350	1992
MNWD Moulton Niguel Water Reclamation Project (Non-LRP Floor)	470	2006
El Toro WD Recycling	500	1997
San Clemente Water Reclamation Project (Non-LRP)	500	1997
SJC Capistrano Valley Non-Domestic Water System Expansion (Non-LRP)	565	1999
IRWD Los Alisos Water Reclamation Plant	1,500	1997
OCWD Groundwater Replenishment System Spreading Project	2,500	2008
OCWD Groundwater Replenishment System Seawater Barrier Project (Non-LRP Floor/old Water Factory 21)	5,000	1975
City of Santa Ana		
Green Acres Reclamation Project - Santa Ana	320	1991
City of Santa Monica		
Dry Weather Runoff Reclamation Facility (SMURRF)	280	2005
San Diego County Water Authority		
Oceanside Water Reclamation Project	200	1992
Santa Maria Water Reclamation Project	400	1999
San Elijo Water Reclamation System	640	2000
Escondido Regional Reclaimed Water Project	650	2004
Padre Dam Reclaimed Water System, Phase 1	850	1998
San Elijo Water Reclamation System	960	2000
Fallbrook Public Utility District Water Reclamation Project	1,200	1990
Olivenhain Recycled Project – Southeast Quadrant (4S Ranch WRF)	1,788	2003
Encina Basin Water Reclamation Program - Phase I and II	5,000	2005
Otay Water Reclamation Project, Phase I/Otay Recycled Water System	7,500	2005
North City Water Reclamation Project	11,000	1998
Camp Pendleton	680	1997
Camp Pendleton	1,020	1997
Fairbanks Ranch	308	1997
North City Water Reclamation Project - City of Poway	750	2009
Olivenhain Northwest Quadrant Recycled Water Project (Meadowlark WRF) (Vallecitos)	1,000	2009
Olivenhain Recycled Project (SE Quad) - RG San Diego	1,000	2009
Olivenhain Southeast Quadrant Recycled Water Project (Non-LRP) (Santa Fe Valley WRF)	100	2005
Padre Dam MWD Recycled Water System (Non-LRP Floor)	65	1998
San Vincente Water Recycling Project (Non-LRP)	235	2003
San Vincente Water Recycling Project (Non-LRP)	350	1996
Rancho Santa Fe Water Pollution Control Facility	500	1997
Rincon del Diablo MWD Recycled Water Program (Non-LRP)	3,426	2006
San Diego Wild Animal Park	168	1997
South Bay Water Reclamation Project	1,520	2006

Valley Center - Lower Moosa Canyon	493	1974
Valley Center MWD - Woods Valley Ranch	84	2005
Whispering Palms	179	1997
Whispering Palms	269	1997
Three Valleys Municipal Water District		
City of Industry Regional Recycled Water Project - Suburban (7%)	228	2012
City of Industry Regional Recycled Water Project - Rowland	1,536	2012
City of Industry Regional Recycled Water Project - Walnut Valley	2,531	2008
Pomona Reclamation Project	9,320	1975
Pomona Reclamation Project - Cal-Poly Pomona	1,500	1997
Rowland Reclamation Project	2,000	1997
Fairway, Grand Crossing, Industry & Lycoming Wells into Reclamation System	1,184	1997
Walnut Valley Reclamation Project	2,550	1985
City of Torrance		
Edward C. Little Water Recycling Facility (ELWRF) Treatment Facility, Phase I-IV	7,800	1995
Upper San Gabriel Valley Municipal Water District		
Direct Reuse Project Phase IIA	2,258	2006
City of Industry Regional Recycled Water Project - Suburban (93%)	3,032	2011
Direct Reuse, Phase I	1,000	2003
Direct Reuse, Phase IIA Expansion/Rosemead Extension Project	720	2012
Direct Reuse, Phase IIB - Industry (Package 2)	360	2012
Direct Reuse, Phase IIB - Industry (Package 3)	310	2012
Direct Reuse, Phase IIB - Industry (Package 4)	210	2012
Los Angeles County Sanitation District Projects	4,375	1985
Norman's Nursery	100	1997
West Basin Municipal Water District		
West Basin Water Recycling Phase V Expansion Project	8,000	2013
Edward C. Little Water Recycling Facility (ELWRF) Treatment Facility, Phase I-IV	10,500	1995
Edward C. Little Water Recycling Facility (ELWRF) Treatment Facility, Phase I-IV	25,556	1995
Western Municipal Water District of Riverside County		
Elsinore Valley (Wildomar) Recycled Water System - Phase I Project	300	2013
City of Corona Reclaimed Water Distribution System	16,800	1968
Elsinore Valley/Horse Thief Reclamation	560	1997
Elsinore Valley/ Railroad Canyon Reclamation	1,050	1997
March Air Reserve Base Reclamation Project	896	1997
Rancho California Reclamation	4,950	1997

Under Construction Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
City of Glendale		
Glendale Public Works Yard	80	2016
City of Los Angeles		
South Griffith Park Recycled Water Project	370	2017
Harbor Industrial Recycled Water Project	9,300	2015
North Atwater, Chevy Chase Park, Los Feliz Water Recycling Project	50	2015
Municipal Water District of Orange County		
San Clemente Water Reclamation Project Expansion	1,000	2017
San Diego County Water Authority		
Olivenhain Northwest Quadrant Recycled Water Project, Phase B	300	2016
Valley Center MWD - Wood Valley Water Recycling Facility Phase II Expansion	196	2020
Escondido Regional Reclaimed Water Project (Easterly Ag Distribution & MFRO with Mains and Brine)/Primary	1,258	2019
Western Municipal Water District of Riverside County		
March Air Reserve Base Reclamation Project Expansion	448	2012

Full Design & Appropriated Funds Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
City of Los Angeles		
Terminal Island Expansion Project	7,880	2018
San Diego County Water Authority		
Encina Basin Water Reclamation Program - Phase III	3,314	2016
City of San Diego PURE Water - Phase 1 North City	33,630	2022
Escondido Regional Reclaimed Water Project (HARRF Upgrades)/Primary	2,492	2019
Upper San Gabriel Valley Municipal Water District		
Direct Reuse, Future Extensions of the Recycled Water Program	130	2016
Direct Reuse, Phase I - Rose Hills Expansion	600	2016
Indirect Reuse Replenishment Project (IRRP)	10,000	2018
Western Municipal Water District of Riverside County		
Elsinore Valley/Tuscany, Phase IA	1,225	2017

Advanced Planning (EIR/EIS Certified) Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
Calleguas Municipal Water District		
VCWWD No. 8 Recycled Water Distribution System	1,250	2020
Central Basin Municipal Water District		
West San Gabriel Recycled Water Expansion Project	500	2018
East Los Angeles Recycled Water Expansion Project	1,000	2021

Foothill Municipal Water District		
Recycled Water Scalping Plant	300	2018
Inland Empire Utilities Agency		
IEUA Regional Recycled Water Distribution System/IEUA Regional Recycled Water Distribution System (Non-LRP)	20,000	2020
City of Long Beach		
Long Beach Reclamation Project Expansion, Phase II Boeing/Douglas Park	450	2020
City of Los Angeles		
Downtown Water Recycling Project	2,350	2020
Sepulveda Basin Water Recycling Project Phase IV Expansion	250	2017
Municipal Water District of Orange County		
SMWD Chiquita Development of Non-Domestic Water System Expansion I	3,360	2018
SMWD Chiquita Development of Non-Domestic Water System Expansion II	5,600	2018
City of Pasadena		
Pasadena Non-Potable Water Project	3,056	2019
San Diego County Water Authority		
Escondido Regional Potable Reuse Project	5,000	2025
Live Oak WRF	42	2020
North District Recycled Water System	1,200	2020
Western Municipal Water District of Riverside County		
Elsinore Valley/Summerly	1,380	2020

Feasibility Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
City of Anaheim		
OCWD Groundwater Replenishment System - Anaheim Resort and Platinum Triangle	1,100	2017
Calleguas Municipal Water District		
Oxnard Advanced Water Purification Facility Ph. 2	5,000	2020
Eastern Municipal Water District		
EMWD Indirect Potable Reuse (IPR)	15,000	2020
Rancho Indirect Potable Reuse	9,070	2020
Las Virgenes Municipal Water District		
Woodland Hills Golf Course Extension	324	2018
City of Los Angeles		
San Pedro Waterfront Water Recycling Project	100	2022
Water Recycling Small Pipeline Extension Projects	1,000	2020
Woodland Hills Water Recycling Project	290	2019
Tillman Groundwater Replenishment System	30,000	2022
Los Angeles Greenbelt Project Extension	250	2018
LA Zoo Water Recycling Project	85	2020
LAX Cooling Towers	240	2021
Elysian Park Tank & Pumping Station Water Recycling Project	400	2022
Garber Street Tank Water Recycling Project	500	2018

Municipal Water District of Orange County		
South Coast WD J.B. Latham AWT Joint project	7,841	2020
San Diego County Water Authority		
Oceanside IPR Project	2,500	2020
Olivenhain Joint RW Transmission Project with SFID and OMWD	1,200	2020
Otay WD - North District Recycled Water System	4,400	2025
Padre Dam Phase 1 East County, 2.2 mgd Potable Reuse	2,464	2019
Padre Dam Phase 1 East County, T22 Expansion from 2 to 6 mgd	1,008	2019
Padre Dam Phase 2 East County,11.6 mgd Potable Reuse	12,992	2022
Santa Maria Water Reclamation Project	3,000	2020
Santa Fe ID Eastern Service Area Recycled Water Project	689	2025
Santa Fe ID Western Service Area Recycled Water System Expansion Project	111	2020
Upper San Gabriel Valley Municipal Water District		
Miller Coors Direct Reuse and Groundwater Recharge Project	1,000	2020
West Basin Municipal Water District		
Carson Regional Water Recycling Facility (CRWRF) Phase III Expansion Project - BP Expansion	2,100	2018
Western Municipal Water District of Riverside County		
Rancho California Reclamation Expansion/demineralization Western AG	13,800	2018

Conceptual Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
City of Burbank		
Direct potable reuse of recycled water	4,000	2025
Foothill Municipal Water District		
Verdugo Basin Project	560	2020
City of Los Angeles		
Natural Advanced Treatment Concept	19,000	2025
Encino Reservoir Recycled Water Storage Concept	1,550	2025
LA Westside Title 22	5,500	2030
Harbor Area Water Recycling Expansion and Storage	12,220	2022
Municipal Water District of Orange County		
IRWD Michelson Reclamation Project Expansion, Phase II	2,300	2025
OCWD Groundwater Replenishment System Spreading Project, Phase III	30,000	2025
LBCWD Laguna Canyon Recycling Project	200	2025
El Toro WD Recycling/El Toro Recycled Water System Expansion II	225	2025
San Diego County Water Authority		
City of San Diego PURE Water - Phase 2 Central Area	42,598	2035
City of San Diego PURE Water - Phase 3 South Bay	16,815	2035
Lake Turner Non-Potable Distribution System	440	2025
Lakeside Riverview Well Field Groundwater Recovery	500	2020

Olivenhain Wanket Reservoir RW Conversion	200	2020
Santa Fe ID Advanced Water Purification Project	1,100	2030
Valley Center MWD - Welk WRF	84	2025
Valley Center MWD - Lilac Ranch WRF	140	2020
Lower Moosa Canyon WRF - AWT Upgrade	280	2020
Valley Center MWD - Woods Valley Ranch WRF Phase 3 Expansion	179	2020
City of Torrance		
Joint Water Pollution Control Plant (JWPCP)	5,000	2020
Upper San Gabriel Valley Municipal Water District		
Direct Reuse, Phase II - Satellite Treatment Plant	500	2020
Western Municipal Water District of Riverside County		
City of Riverside Recycled Water Program	2,270	2025
City of Riverside Recycled Water Program Expansion	19,130	2025
City of Riverside Recycled Water Program Expansion	20,000	2025

Table A.5-2
Groundwater Recovery Projects

Existing Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
City of Beverly Hills		
Beverly Hills Desalter Project	3,120	2003
City of Burbank		
Burbank Operable Unit/Lockheed Valley Plant	11,000	1996
Calleguas Municipal Water District		
Round Mountain Water Treatment Plant	1,000	2013
Tapo Canyon Water Treatment Plant	1,445	2010
Central Basin Municipal Water District		
Water Quality Protection Project	5,807	2004
Eastern Municipal Water District		
Menifee Basin Desalter Project	4,032	2002
Perris Desalter	4,500	2006
Foothill Municipal Water District		
Glenwood Nitrate Water Reclamation Project	150	2003
City of Glendale		
San Fernando Wells Basin - Glendale Operable Units	8,469	2001
Verdugo Basin Wells A & B	2,750	1997
Inland Empire Utilities Agency		
Chino Basin Desalination Program, Phase I / Inland Empire	17,500	2000
Municipal Water District of Orange County		
Capistrano Beach Desalter Project	1,560	2007
Tustin Desalter Project (17th St.)	3,840	1996
San Juan Basin Desalter Project	5,760	2004
IRWD Wells 21 & 22	6,400	2013
Irvine Desalter Project	6,700	2007
Colored Water Treatment Facility Project	11,300	2001
IRWD DATS Project	8,300	2001
Tustin Main Street Nitrate	2,000	1997
Well 28	4,300	1997
San Diego County Water Authority		
Lower Sweetwater River Basin Groundwater Demineralization Project, Phase I	3,600	2000
Oceanside Desalter Project/Oceanside (Mission Basin) Desalter Expansion Project	7,800	2003
San Vicente & El Capitan Seepage Recovery	500	2015

Three Valleys Municipal Water District		
Cal-Poly Pomona Water Treatment Plant	250	2013
Pomona Well #37 – Harrison Well Groundwater Treatment Project	1,000	2006
City of Pomona VOC Plant	4,678	1997
Pomona Well #37 – Harrison Well Groundwater Treatment Project (Non-LRP)	1,200	2011
City of Torrance		
Madrona Desalination Facility (Goldsworthy Desalter)	2,880	2002
Western Municipal Water District of Riverside County		
Temescal Basin Desalting Facility Project	10,000	2001
Chino Basin Desalination Program, Phase I / Western	17,500	2000
Temescal Basin Desalting Facility Project (Non-LRP)	5,600	2001
Under Construction Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
Eastern Municipal Water District		
Moreno Valley Groundwater Development Program	2,000	2018
City of Glendale		
Verdugo Basin Rockhaven Well	500	2016
San Diego County Water Authority		
Lower Sweetwater Desalter, Phase II	5,200	2017
Full Design & Appropriated Funds Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
Eastern Municipal Water District		
Brackish Wells 94, 95, and 96	2,250	2018
Perris Desalter II	4,000	2020
San Diego County Water Authority		
Rancho del Rey Well Desalination	400	2025
City of Torrance		
Madrona Desalter (Goldsworthy) Expansion	2,400	2017
Advanced Planning (EIR/EIS Certified) Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
Calleguas Municipal Water District		
North Pleasant Valley Desalter	7,300	2020
City of Los Angeles		
Tujunga Well Treatment	24,000	2020
Municipal Water District of Orange County		
SJC San Juan Desalter Project Expansion	2,000	2020
Tustin Legacy Well # 1	2,200	2020

Feasibility Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
City of Beverly Hills		
Groundwater Development	2,000	2023
Calleguas Municipal Water District		
Moorpark/South Las Posas Desalter Phase 1	5,000	2020
West Simi Desalter (District 8)	2,800	2025
Eastern Municipal Water District		
Perris Groundwater Development (Well and Pipeline)	1,000	2018
Municipal Water District of Orange County		
IRWD Wells 51, 52 & 53 Potable (Non-exempt)	2,400	2020
City of San Marino		
San Marino GWR Project	2,500	2018
San Diego County Water Authority		
Middle Sweetwater River Basin Groundwater Well System (Otay WD)	1,500	2025
Mission Valley Brackish Groundwater Recovery Project (City of San Diego)	1,680	2025
Oceanside Mission Basin Desalter Expansion/Seawater Recovery and Treatment	5,600	2025
Otay Mesa Lot 7 Well Desalination (Otay WD)	400	2025
San Diego Formation / Diamond BID Pilot Production Well	1,600	2025
San Paqual Brackish Groundwater Recovery Project (City of San Diego)	1,619	2020
Sweetwater Authority/Otay WD San Diego Formation Recovery	3,900	2025

Conceptual Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
City of Beverly Hills		
Shallow Groundwater Development	500	2020
Calleguas Municipal Water District		
Camrosa Santa Rosa Basin Desalter	1,000	2022
Municipal Water District of Orange County		
LBCWD Groundwater Facility	2,025	2025
Mesa Colored Water Treatment Facility Project, Phase II	5,650	2018
South Coast WD Capistrano Beach Desalter Expansion	1,200	2025
San Diego County Water Authority		
San Dieguito River Basin Brackish GW Recovery and Treatment	1,500	2025
Western Municipal Water District of Riverside County		
Arlington Basin Groundwater Desalter Project Expansion	2,000	2020
Arlington Basin Groundwater Desalter Project Expansion Advanced Brine Treatment	1,900	2020
Arlington Basin Groundwater Desalter Project Expansion Biological Denitrification	4,100	2020

Table A.5-3
Seawater Desalination Projects

Existing Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
San Diego County Water Authority		
Carlsbad Seawater Desalination Project	56,000	2015

Advanced Planning (EIR/EIS Certified) Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
Municipal Water District of Orange County		
Huntington Beach Seawater Desalination Project	56,000	2017

Feasibility Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
San Diego County Water Authority		
Rosarito Beach Seawater Desalination Feasibility Study (Otay WD)	28,000	2025
West Basin Municipal Water District		
West Basin Seawater Desalination Project	22,400	2022

Conceptual Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
Municipal Water District of Orange County		
South Orange (Dana Point) Coastal Ocean Desalination Project	16,800	2020
San Diego County Water Authority		
Camp Pendleton Seawater Desalination Project	56,000	2035

Appendix 6

CONSERVATION ESTIMATES AND WATER SAVINGS FROM CODES, STANDARDS, AND ORDINANCES

Appendix 6

CONSERVATION ESTIMATES AND WATER SAVINGS FROM CODES, STANDARDS, AND ORDINANCES

Background

Unlike traditional water supplies, which can be directly measured, conservation reduces water demand in ways that are quantified indirectly. Demand is reduced through changes in consumer behavior and savings from water-efficient fixtures. There are numerous approaches for estimating and projecting conservation savings, and many of them are utility-specific to meet the unique needs of different water agencies. Metropolitan estimates savings from the extensive existing conservation programs that it funds, as well as savings produced by plumbing codes. Metropolitan also incorporates the savings due to the impacts of price on consumers in its demand forecasts. These conservation savings estimates are incorporated into Metropolitan's long-term planning such as the Integrated Water Resources Plan (IRP) and included in its Urban Water Management Plan (UWMP).

Conservation savings are commonly estimated from a base-year water-use profile. Beginning with the 1996 IRP, Metropolitan identified 1980 as the base year for estimating conservation because it marked the effective date of a new plumbing code in California requiring toilets in new construction to be rated at 3.5 gallons per flush or less. Between 1980 and 1990, the Metropolitan service area saved an estimated 250 TAF per year as the result of this 1980 plumbing code and unrelated water rate increases. Within Metropolitan's planning framework, these savings are referred to as "pre-1990 savings." Metropolitan's conservation accounting combines pre-1990 savings and estimates of more recently achieved savings from the following sources of conservation:

- Active Conservation – Water saved directly as a result of conservation programs by water agencies, including implementation of Best Management Practices by the California Urban Water Conservation Council (CUWCC). Active conservation is unlikely to occur without agency action.
- Code-Based Conservation – Water saved as a result of changes in water efficiency requirements for plumbing fixtures in plumbing codes. Sometimes referred to as "passive conservation," this form of conservation would occur as a matter for course without any additional action from water agencies.
- Price-Effect Conservation – Water saved by retail customers attributable to the effect of changes in the real (inflation-adjusted) price of water. Because water has a positive price elasticity of demand, increases in water price will decrease the quantity demanded.

Metropolitan's Conservation Estimate

In September 19, 2014, Governor Brown signed SB 1420 (Wolk, D-Davis), which added Section 10631(e)(4) to the Water Code. This Section provides that "water use projections may display and account for the water savings estimated to result from adopted codes, standards, ordinances, or transportation and land use plans" if that information is available and applicable to an urban water supplier.

Metropolitan's conservation estimate involves a comprehensive representation of Metropolitan's active conservation activities, which utilizes a combination of: (1) fixture/program savings rates based on CUWCC reports and other sources, and (2) a measurement of code-based plumbing code conservation from a 1990 base year. In addition, the price-effect savings is also calculated using Metropolitan's MWD-EDM, a statistical model used for forecasting retail water demands. Potential savings from public outreach and education programs are not included in Metropolitan's conservation estimate.

Distinguishing between active, code-based, and price-effect conservation can be complex when, for example, active programs for fixtures are concurrent with conservation-related plumbing codes. Metropolitan's conservation estimate combines active, code-based, and price-effect conservation savings using methods that avoid double counting. Currently, there are 74 devices and programs accounted for in estimating active conservation. These devices are aggregated into residential, landscape, commercial, industrial, and institutional sectors. There are eight fixtures tied to Code-based conservation estimate. Metropolitan's conservation estimate is developed in cooperation with its 26 member agencies and is categorized into:

- Single-family residential (SFR),
- Multi-family residential (MFR), and
- Commercial, industrial, and institutional (CII).

Active Conservation

The estimated savings from active conservation take into account programs administered by Metropolitan and its member agencies since 1990. The savings are calculated by combining counts of active program activity – numbers of devices and/or program implementations – with device-related savings factors. The factors include:

- Savings per device/implementation
- Device life expressed in years
- Decay rate expressed as percent decay per year

Device savings estimates are determined by key assumptions described above. Devices may be represented more than once due to different implementation methods or savings factors. Assumptions are periodically reviewed to ensure they represent the best savings estimates available. Device savings are limited by decay rates, or device life, but not both at the same time. For example, a residential high-efficiency toilet (HET) saves about 38 gallons per day over a lifetime of 20 years with no assumed decay rate.

Code-Based Conservation

Code-Based conservation accounts for water saved as a result of changes in water efficiency requirements for plumbing fixtures in plumbing codes. Plumbing code conservation is the impact of plumbing codes and other ordinances on water demand. Metropolitan's Code-Based conservation estimate represents plumbing code conservation with demographically-driven stock models. The stock models are device- or fixture- specific and are based on the same demographic data used in Metropolitan's retail demand projection. Each stock model tracks the stocks and flows of conserving and non-conserving water devices, allowing it to estimate the impacts of plumbing codes on device saturation and overall savings.

The Metropolitan's Code-Based conservation estimate accounts for the following:

- New Construction: Water fixtures installed due to new construction are assumed to be in compliance with the plumbing codes in effect when the new construction occurs. For instance, a house built in 1997 would meet the efficiency standards set by California's 1992 plumbing code. Therefore, new construction is assumed to result in measurable savings from 1990, which is the baseline for conservation savings calculations. Estimates and projections of the number of fixtures added through new housing units and offices are based on growth in housing units or employment.
- Natural Replacement: Natural replacement accounts for the savings that accrue when fixtures are replaced with more efficient models due to remodeling, failure, or other reasons. Metropolitan's savings estimate represents this effect with a "natural replacement rate" that is expressed as a percentage of existing fixtures that are replaced in a given year. Natural replacement rates vary by device and are linked to the expected life of the device. Devices with short lifespans will be replaced more frequently and thus have higher natural replacement rates. A simple percentage is used to account for this natural turn-over in non-conserving fixtures because it is difficult to back-calculate the age of the fixtures in pre-1990 construction.
- Fixtures Up for Renewal: As water-conserving fixtures reach their useful lives and become defective or inefficient, they may be replaced with water conserving fixtures due to plumbing codes. The water savings from the device is then considered "renewed" savings, which is tracked in Metropolitan's savings estimate. For example, a fixture that was installed through an active conservation program provides water savings that otherwise would not have been realized without plumbing codes. However, subsequent adoption of efficient plumbing codes means that when the fixture reaches the end of its life, it will be replaced by the same or more water-efficient model.

Stock Models

The number of efficient fixtures for each stock model is the sum of fixtures from active programs, new construction, natural replacement, and fixtures up for renewal. Table A.6-1 below shows the fixtures and devices that are assigned stock models based on existing plumbing codes.

Table A.6-1
Stock Models

Residential	CII
Toilets	Toilets
Showerheads	Urinals
Faucet Aerators	Pre-Rinse Spray Heads
Washing Machines	Washing Machines

The Stock Models generate separate annual estimates of devices and fixtures for tracking active conservation savings, while also accounting for the impacts of active programs on the overall device saturation rate. As a result, increased levels of active conservation lead to lower levels of plumbing code conservation. This helps avoid double counting in Metropolitan's conservation savings estimate.

Plumbing Code Assumptions

Plumbing code savings are determined by the device-specific assumptions used in the stock models, presented in Table A.6-2. The stock models are driven by projections of housing and employment consistent with the demand projections. Initial device counts and growth in the number of devices are determined by the demographics combined with the following assumptions:

- Devices per Household or Per Employee: This factor represents the average number of devices per household or per employee and is multiplied by the demographic projections to develop estimates of total number of devices or "stock." Devices per household and employee can vary by agency and change over time.
- Plumbing Code Compliance Rate: The plumbing code compliance rate is expressed as a percent and serves two purposes: (1) it indicates the presence of a plumbing code in a specific year, and (2) it determines the overall compliance rate with the plumbing code. This allows plumbing code effects to be phased in over several years.
- Natural Replacement Rate: This represents the rate at which existing non-conserving devices are converted to conserving devices due to remodeling or device failure. It has a strong impact on the saturation rate of devices that existed prior to plumbing codes, such as pre-1992 toilets.
- Device Life: The stock models also account for device life for water-efficient devices installed after 1990. This allows the stock model to track devices installed through active conservation as they reach the end of their life and are replaced due to plumbing codes. The stock models use the same device life specified in the savings assumptions.

Table A.6-2
Plumbing Code Assumptions

Stock Model	Device per Household/ Employee	Compliance Rate	Natural Replacement Rate	Plumbing Code Year
Res. Toilets	2	99%	2%	1992/2014
Res. Shower Heads	1.8	95%	10%	1992
Res. Aerators	3.5	90%	33%	1992
Res. Washing Machine	0.74	100%	6.7%	2007
CII Toilets	0.27*	100%	2%	1992/2014
CII Urinals	0.06	100%	4%	1992
CII Pre-Rinse Spray Heads	0.0055*	95%	16.7%	2006
CII Washing Machine	0.0073*	100%	5%	2007

* Varies over time and by agency (based on CUWCC BMPs savings factors)

These assumptions are derived from CUWCC conservation reports, American Water Works Association Research Foundation's 1999 end use study, Metropolitan's Orange County Saturation Study, and other sources. In the residential sector, devices per household combine single family and multifamily trends.

Model Water Efficient Landscape Ordinance

The California Water Commission adopted an updated Model Water Efficient Landscape Ordinance (MWELO) on July 15, 2015. The MWELO promotes efficient landscapes in new developments and retrofitted landscapes. The MWELO increases water efficiency standards for new and retrofitted landscapes through more efficient irrigation systems, greywater usage, onsite storm water capture, and by limiting the portion of landscapes that can be covered in turf. Local agencies had until December 1, 2015 to adopt the MWELO or to adopt a Local Ordinance which must be at least as effective in conserving water as MWELO. Local agencies working together to develop a Regional Ordinance had until February 1, 2016 to adopt, but they are still subject to the December 2015 reporting requirements. Local agencies were required to report on the implementation and enforcement of local ordinances by December 31, 2015.

Metropolitan's modeling of code-based conservation includes a calculation of savings that would result from 50 percent of new households having efficient outdoor water use consistent with MWELO. The 50 percent compliance rate for new households is a conservative estimate based on an assessment of the efficacy of the current MWELO ordinance.

Metropolitan's 2015 IRP Update includes a regional target for additional conservation development. This target is based on estimates calculated from the potential savings that could result from increasing MWELO compliance from 50 percent to 100 percent of new households, and on the potential savings that could result from one percent per year of all existing households reducing outdoor water use in a manner consistent with MWELO. Because MWELO does not apply to existing households, it is anticipated that achieving the equivalent MWELO efficient water savings will require a combination of approaches that can target reductions in outdoor water use.

Price Savings Assumptions

Price-effect savings are calculated by comparing MWD-EDM demand projections with price increases to demand projections with constant 1990 water rates. The difference is the price-effect savings measured from a 1990 base. Price-effect savings increase as prices rise over time; they also increase as the household and employment base grow. A price increase applied to 1,000 households will generate more water savings than the same price increase applied to 500 households.

Un-metered Water Use Savings

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

The total passive savings are shown in Table A.6-3 below.

Table A.6-3
Passive Savings[1]
(Acre-feet)

	2010	2015	2020	2025	2030	2035	2040
Total	701,000	765,000	846,000	931,000	1,016,000	1,097,000	1,180,000

[1] Passive savings are accounted for in water use projections in Section 2.

Appendix 7

DISTRIBUTION SYSTEM WATER LOSSES

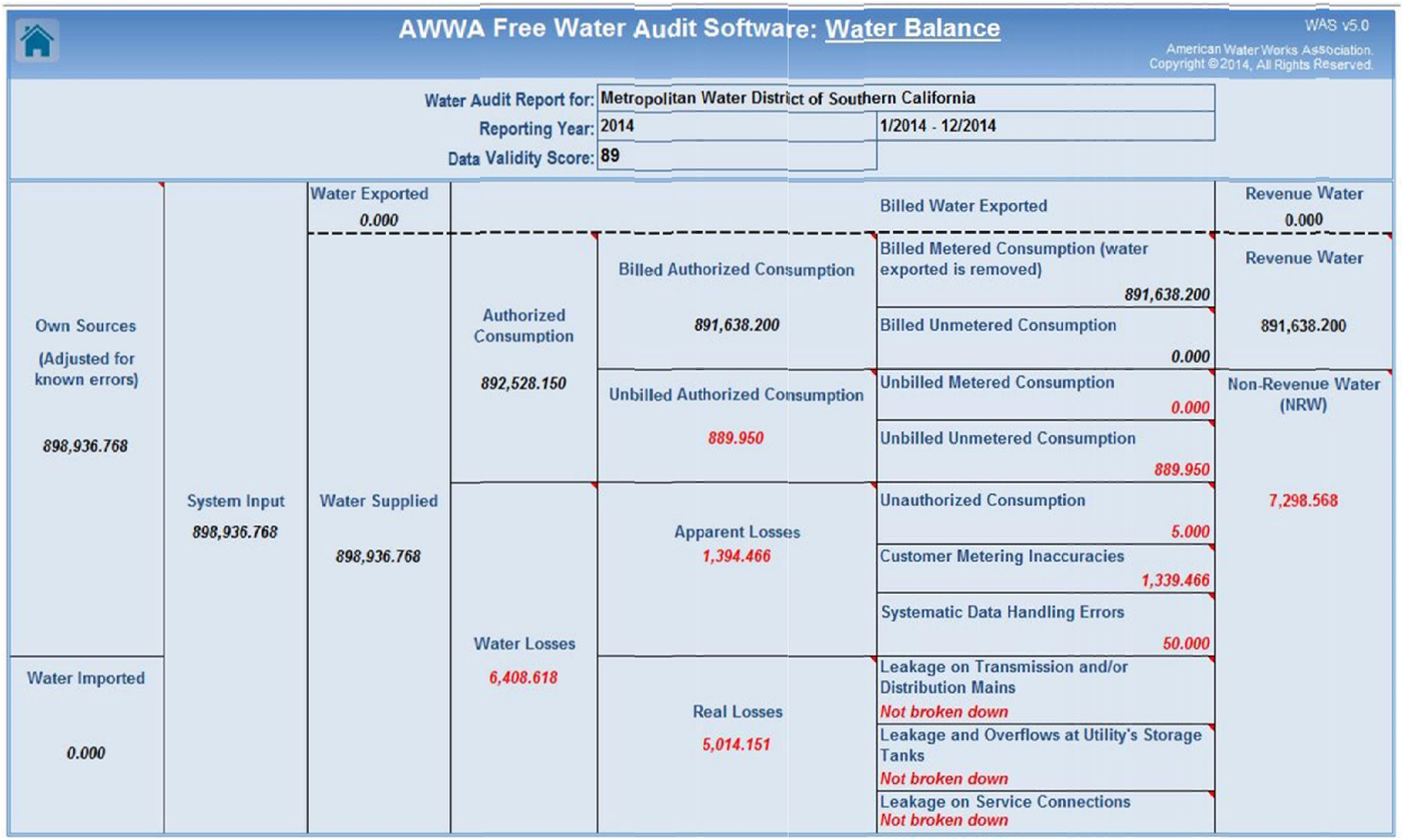
Appendix 7
DISTRIBUTION SYSTEM WATER LOSSES

Metropolitan followed the American Water Works Association (AWWA) Water Audit methodology to track all sources of water and uses of water within its system. The AWWA Audit methodology quantifies real and apparent water system losses in an agency's distribution system. Section 10631(e)(3)(A) of the California Water Code requires that the 2015 Urban Water Management Plan quantify distribution system water losses for the most recent 12-month period available.

For the distribution system water losses assessment, Metropolitan is including its water balance audit for calendar years 2014 and 2013, as presented in tables A.7-1 and A.7-2, respectively. In addition, this appendix also includes a memorandum entitled "Metropolitan Water District – Water Balance Validation & Component Analysis Feasibility Study" dated January 16, 2013. This memorandum discusses the water balance assessment for year 2012. The 2014 and 2013 assessments were updated using the methods and worksheets developed in the 2012 assessment, and results were submitted as part of Metropolitan's CUWCC filings included in Appendix 8.

In addition to the distribution system losses described in the AWWA tables, Metropolitan estimates that 37 TAF was lost from reservoir evaporation occurring in Lake Mathews, Lake Skinner, and Diamond Valley Lake during calendar year 2014.

Table A.7-1
Metropolitan's Distribution System Water Loss (AF)
Calendar Year 2014



AWWA Free Water Audit Software: Water Balance

WAS v5.0

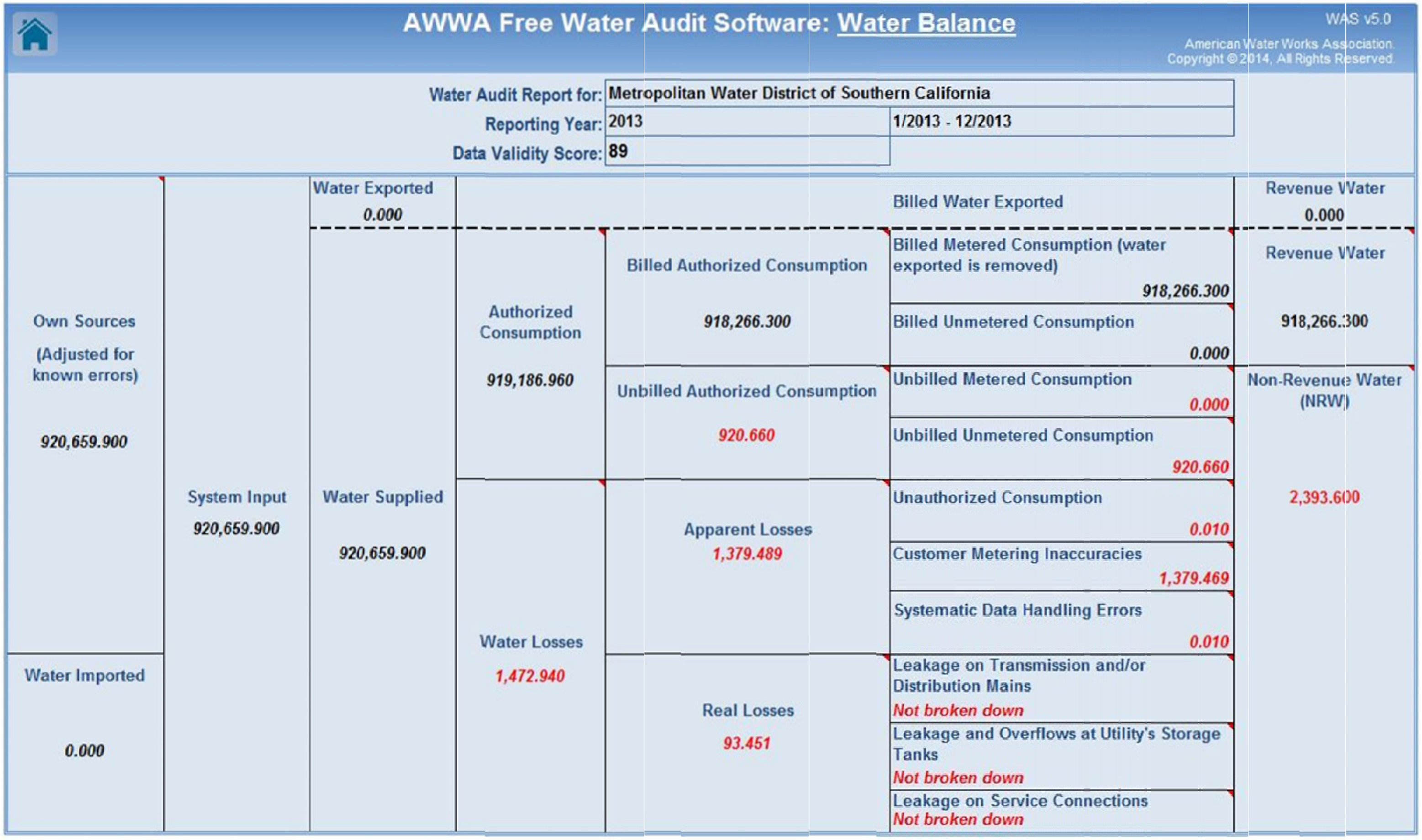
Water Audit Report for: Metropolitan Water District of Southern California

Reporting Year: 2014 | 1/2014 - 12/2014

Data Validity Score: 89

Own Sources (Adjusted for known errors) 898,936.768	System Input 898,936.768	Water Exported 0.000			Billed Water Exported	Revenue Water 0.000
		Water Supplied 898,936.768	Authorized Consumption 892,528.150	Billed Authorized Consumption 891,638.200	Billed Metered Consumption (water exported is removed) 891,638.200	Revenue Water 891,638.200
					Billed Unmetered Consumption 0.000	
				Unbilled Authorized Consumption 889.950	Unbilled Metered Consumption 0.000	Non-Revenue Water (NRW) 7,298.568
					Unbilled Unmetered Consumption 889.950	
			Water Losses 6,408.618	Apparent Losses 1,394.466	Unauthorized Consumption 5.000	
					Customer Metering Inaccuracies 1,339.466	
					Systematic Data Handling Errors 50.000	
Water Imported 0.000				Real Losses 5,014.151	Leakage on Transmission and/or Distribution Mains *Not broken down*	
					Leakage and Overflows at Utility's Storage Tanks *Not broken down*	
					Leakage on Service Connections *Not broken down*	

Table A.7-2
Metropolitan's Distribution System Water Loss (AF)
Calendar Year 2013



AWWA Free Water Audit Software: Water Balance

WAS v5.0

American Water Works Association.
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Water Audit Report for: Metropolitan Water District of Southern California
Reporting Year: 2013 1/2013 - 12/2013
Data Validity Score: 89

Own Sources (Adjusted for known errors) 920,659.900	System Input 920,659.900	Water Exported 0.000			Billed Water Exported	Revenue Water 0.000
		Water Supplied 920,659.900	Authorized Consumption 919,186.960	Billed Authorized Consumption 918,266.300	Billed Metered Consumption (water exported is removed) 918,266.300	Revenue Water 918,266.300
					Billed Unmetered Consumption 0.000	
				Unbilled Authorized Consumption 920.660	Unbilled Metered Consumption 0.000	Non-Revenue Water (NRW) 2,393.600
					Unbilled Unmetered Consumption 920.660	
			Water Losses 1,472.940	Apparent Losses 1,379.489	Unauthorized Consumption 0.010	
					Customer Metering Inaccuracies 1,379.469	
					Systematic Data Handling Errors 0.010	
Water Imported 0.000				Real Losses 93.451	Leakage on Transmission and/or Distribution Mains Not broken down	
					Leakage and Overflows at Utility's Storage Tanks Not broken down	
					Leakage on Service Connections Not broken down	

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Water Systems Optimization, Inc.
290 Division – Suite 311
San Francisco, CA 94103
(415) 538 8641

TO: **Mark Graham, Keith Nobriga, Timothy Schaadt**
FROM: **WSO**
DATE: **January 16, 2013**
RE: **Metropolitan Water District – Water Balance Validation & Component Analysis Feasibility Study**

I. Introduction

Water loss assessment is the focus of the Best Management Practice (BMP) 1.2 in the California Urban Water Conservation Council (CUWCC)'s Memorandum of Understanding (MOU). As a signee of this MOU, the Metropolitan Water District (MWD) is required to submit standard water balances annually and complete a component analysis of real losses every four years. Beyond compliance with the CUWCC BMP 1.2 requirements, regularly assessing water loss provides an opportunity for MWD to realize efficiency improvements and water savings.

Water Systems Optimization (WSO) was hired to validate MWD's water balance and investigate the feasibility of a component analysis of real losses for a transmission system. The standards used in the water balance and component analysis assumptions are geared toward distribution systems with significantly smaller pipe sizes and lower pressures; it is important to evaluate whether this methodology can provide useful insight for a transmission system.

II. Treated Water Balance Findings

The following outlines the findings from the water loss assessment and highlights important assumptions applied to present a realistic water balance for MWD.

For the treated water system, WSO compiled a basic water balance for the calendar year of 2012. First, the inputs into the treated water system were totaled from MWD's master meter data. Next WSO inventoried all of the treated water service connections. Reviewed and confirmed by MWD staff, WSO tabulated the total volume of water deliveries – or authorized consumption – for the potable water system. Non-revenue water is the difference between these two volumes (Total Water Supplied minus Billed Metered Consumption).

Table 1 presents the non-revenue water determination for the treated water system.

Table 1: Non-Revenue Water Determination for Treated Water System

TOTAL WATER SUPPLIED (A)	891,434.20	AF
BILLED CONSUMPTION (B)	886,370.10	AF
NON-REVENUE WATER (A-B)	5,064.10	AF
NON-REVENUE WATER *as a % of supply*	0.57%	

The non-revenue water determination shows that MWD successfully delivered and generated revenue for nearly all of the treated water it produced in CY 2012.

To satisfy the AWWA Water Balance requirements, non-revenue water must be broken down into its three components: 1) Unbilled Consumption, 2) Apparent Losses consisting of meter under-registration and water theft and 3) Real Losses - physical water losses from infrastructure failures.

The assumptions outlined in Table 2 were applied to address these volume of non-revenue water for MWD. It is important to note that many of the AWWA Free Water Audit Software's suggested default values were changed to account for the unique nature of MWD's transmission-only system.

Table 2: Assumptions Used in Treated Water Balance

Non-Revenue Water	**Value Used for MWD**	**Notes on Assumption**
Unbilled Unmetered Consumption	0.1% of Water Supplied	*This is the volume of water used for operational purposes throughout the year (neither billed nor metered). Though the default value for distribution systems is 1.25% of Water Supplied, a much lower value is applied here.*
Meter Under-Registration	0.25% Meter Under-Registration	*This is the assumed inaccuracy of customer meters. Though Venturi meters are quoted at +/-0.75% accuracy, a lower under-registration is applied to accommodate for the low total of non-revenue water.*
Unauthorized Use (Theft)	Zero	*MWD staff reported that water theft in the system is negligible if it exists at all.*

With these assumptions, a complete water balance – including the real loss volume estimation - was produced. Table 3 presents the finalized water balance for the MWD treated water system (additionally, the free AWWA Water Audit Software which outlines the same volumes is included in Appendix A).

Table 3: Water Balance for MWD Treated Water CY 2012

WATER BALANCE COMPONENT	CY 2012 VOLUME
	(AF)
WATER SUPPLIED	**891,434.20**
Billed Metered Authorized Consumption	886,370.10
Billed Un-metered Authorized Consumption	NA
BILLED AUTHORIZED CONSUMPTION	**886,370.10**
Un-billed Metered Authorized Consumption	NA
Un-billed Un-metered Authorized Consumption	891.43
UN-BILLED AUTHORIZED CONSUMPTION	**891.43**
AUTHORIZED CONSUMPTION	**887,261.53**
WATER LOSSES	**4,172.67**
Unauthorized Consumption	NA
Meter Error	2,215.93
APPARENT LOSSES	**2,215.93**
REAL LOSSES	**1,956.74**

It is expected for a system exclusively composed of transmission lines to experience low losses: a large diameter pipe network with low service connection density has few points of infrastructural vulnerability.

Non-Revenue Water by Zone

To take a closer look at the treated water system, WSO divided MWD's treated water system into five zones. Examining separate water balances for each of these zones allowed for a more detailed picture of water loss throughout the system. Table 4 describes the parameters for each zone's boundaries.

It is important to note that a number of these zones are overlapping. The combination of Zone A and Zone D capture the total treated water system. Zones, B, C, and E are all within the bigger Zone A.

Table 4: Zone Boundary Designations

ZONE	BOUNDARY DETAILS
A	The total treated water zone, excluding the portion off of Skinner Lake
B	Exclusively the Allan McColloch Pipeline ("AMP")
C	Exclusively the West Valley Feeder #2 and the Calabasas Feeder
D	Treated water off of Skinner Lake
E	"Los Angeles Central Zone" refers to the the zone where different sources of treated water overlap, boundaries defined as: *Inputs into the Los Angeles Central Zone:* • PVF-0 serves as one of the northern boundaries • MF-1 serves as one of eastern boundaries • 2LF-4W serves as one of the eastern boundaries • MFBP-0 serves as one of the eastern boundaries • WC-0 serves as one of the eastern boundaries • LF-2W serves as one of the eastern boundaries • SC-OS serves as one of the eastern boundaries • SF-V serves as the western boundary *Outputs from the Los Angeles Central Zone (distinct from customers):* • LF-2E serves as an outlet on the eastern boundary • 2LF-3E serves as an outlet on the eastern boundary • 2LF/WOCS serves as an outlet on the eastern boundary • SC-ON serves as an outlet on the eastern boundary

For each zone, WSO determined the non-revenue water volume for the calendar year of 2012. First, the inputs into each zone - metered by one or many of the MWD's master meters – were totaled. Next WSO inventoried all of the service connections by zone. Reviewed and confirmed by MWD staff, WSO tabulated the total volume of water deliveries – or authorized consumption – for each zone. Non-revenue water is the difference between these two volumes (Total Water Supplied minus Billed Metered Consumption).

Table 5 presents the non-revenue determinations for MWD's treated system by zone alongside the number of service connections and mileage for each zone.

Table 5: Non-Revenue Water Determinations by Zone

ZONE		**A**	**B**	**C**	**D**	**E**
Mileage	(miles)	485.29	22.96	17.95	42.08	152.09
Service Connections		284	28	4	12	117
TOTAL WATER SUPPLIED:	(AF)		99,722.30	124,294.60	153,329.70	231,175.50
BILLED CONSUMPTION	(AF)		100,590.60	123,618.20	152,790.60	232,513.80
NON-REVENUE WATER:	(AF)	4,525.00	(868.30)	676.40	539.10	(1,338.30)
NON-REVENUE WATER *as a % of supply*		0.61%	-0.87%	0.54%	0.35%	-0.58%

Examining the non-revenue water determinations by zone confirms that MWD experiences very low water loss levels across its treated water system. The calculations in Zones B and E show that more consumption was billed than entered the particular zone. This implausible scenario likely suggests the impact of meter inaccuracy in the master meter, the customer meters, or both. It is important to note that when non-revenue water is so low, any metering inaccuracy will have significant impacts in the water balance.

III. Recommendations for Improved Water Loss Assessment

For future water balances, it is recommended to replace any assumptions applied here with documentation of use specific to MWD's practices. Going forward it will be useful to keep track or actively estimate the following volumes:

- Unbilled Unmetered Authorized Consumption: all operational uses for flushing, maintenance, etc.
- Unauthorized Consumption: documentation of any water theft

It is also recommended to calculate non-revenue water for the whole treated water system – and by zone – on a frequent basis. After inventorying the appropriate inputs and outputs, the designation of zones will serve to highlight smaller areas of attention if the non-revenue water determinations vary. Ongoing attention to the trends of non-revenue water throughout the year will allow for further investigation if it increases and presents a larger problem.

Lastly, it is recommended to continue the current maintenance and testing schedule of all input meters and wholesale customer meters.

IV. Component Analysis Feasibility and Results

Transmission mains have long been a challenging component to address effectively in water network audits and modelling of real losses. The lack of reliable methods for assessing this component of real water loss has forced the use of educated guesses and assumptions (Laven and Lambert, 2012).

It is important to note that The Bursts and Background Estimates (BABE) Concept was developed for component analysis of Real Losses on distribution systems (Lambert, 1994; Lambert and Morrison, 1995). It classifies leakage events into three different categories – undetectable background leakage, unreported bursts and reported bursts – each with different characteristics in terms of typical frequencies, flow rates and run-times. Because of this methodology's focus on distribution systems, it becomes challenging to use it to produce a reliable real loss component analysis for a transmission system. The results need to be interpreted in the context of the limitations of conducting a real loss component analysis for a transmission system. A Real Loss component analysis separates the leak and break volumes of real loss into the following categories (see Figure 1).

- **Reported leaks**: those leaks that are called in during the normal course of the day. Reported leaks may be called in by the public, meter readers or by other utility personnel.
- **Unreported leaks**: are those leaks that are not called in and have to be located by proactive leak detection methods.
- **Background Leakage:** the collective weeps and seeps in pipe joints and connections. They have flow rates that are typically too small (1gpm or less) to be detected by conventional acoustic leak detection equipment. They run continuously until they gradually worsen to the point when they can be detected. The only ways of reducing background leakage is through pressure management or infrastructure replacement.

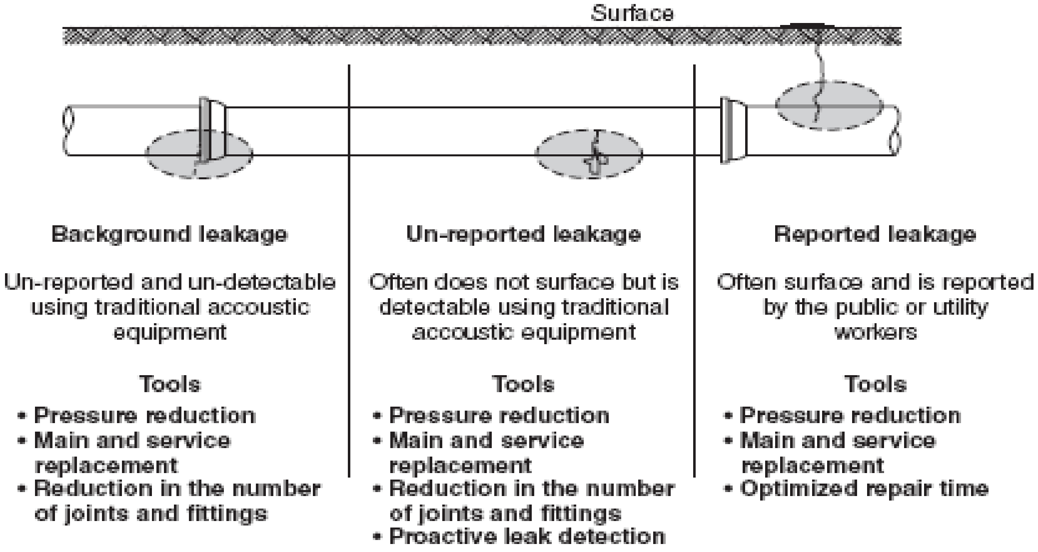
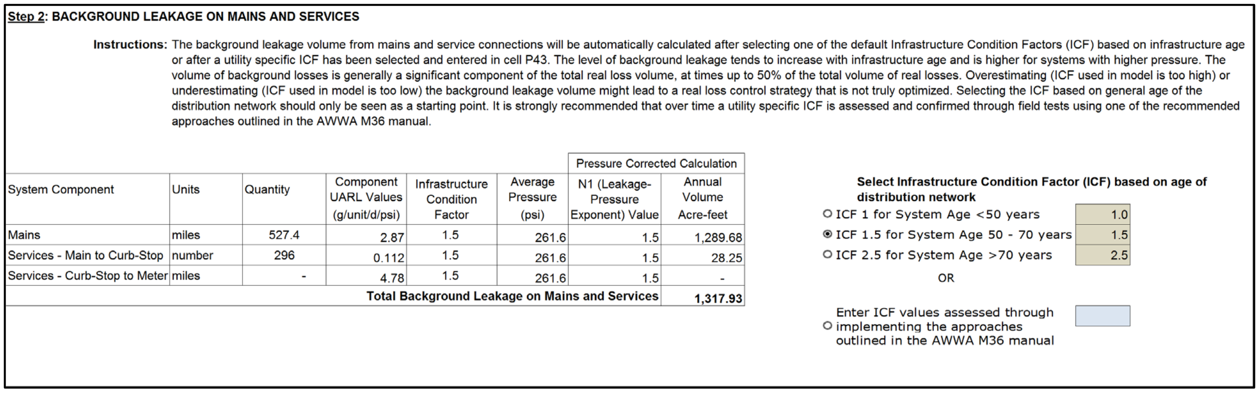


Figure 1: Components of Real Losses and Tools for Intervention

IV. a – Background Leakage

The total volume of estimated background leakage on MWD's treated water transmission system was calculated using an Infrastructure Condition Factor (ICF) of 1.5, which assumes that background leakage is 1.5 times higher than the technical minimum. This assumption was informed by the transmission's high operating pressure and the generally very good condition of the infrastructure. Under this assumption, the total volume of background losses for MWD's treated water transmission system was calculated to be 1,318 AF. This background losses volume accounts for about 67% of the total volume of real losses calculated for CY 2012 (see Figure 2 for the calculation details). Given the high average pressure in the transmission system and the nature of the transmission system infrastructure it appears reasonable that two thirds of the total real loss volume is caused by background leakage, which comprises of weeps and seeps in pipe joints and connections.



Step 2: BACKGROUND LEAKAGE ON MAINS AND SERVICES

Instructions: The background leakage volume from mains and service connections will be automatically calculated after selecting one of the default Infrastructure Condition Factors (ICF) based on infrastructure age or after a utility specific ICF has been selected and entered in cell P43. The level of background leakage tends to increase with infrastructure age and is higher for systems with higher pressure. The volume of background losses is generally a significant component of the total real loss volume, at times up to 50% of the total volume of real losses. Overestimating (ICF used in model is too high) or underestimating (ICF used in model is too low) the background leakage volume might lead to a real loss control strategy that is not truly optimized. Selecting the ICF based on general age of the distribution network should only be seen as a starting point. It is strongly recommended that over time a utility specific ICF is assessed and confirmed through field tests using one of the recommended approaches outlined in the AWWA M36 manual.

						Pressure Corrected Calculation	
System Component	Units	Quantity	Component UARL Values (g/unit/d/psi)	Infrastructure Condition Factor	Average Pressure (psi)	N1 (Leakage-Pressure Exponent) Value	Annual Volume Acre-feet
Mains	miles	527.4	2.87	1.5	261.6	1.5	1,289.68
Services - Main to Curb-Stop	number	296	0.112	1.5	261.6	1.5	28.25
Services - Curb-Stop to Meter	miles	-	4.78	1.5	261.6	1.5	-
						Total Background Leakage on Mains and Services	1,317.93

Select Infrastructure Condition Factor (ICF) based on age of distribution network

○ ICF 1 for System Age <50 years	1.0
● ICF 1.5 for System Age 50 - 70 years	1.5
○ ICF 2.5 for System Age >70 years	2.5

OR

○ Enter ICF values assessed through implementing the approaches outlined in the AWWA M36 manual

Figure 2: Calculation of Background Leakage for MWD Treated Water Transmission System

IV. b – Reported Leakage/Failures

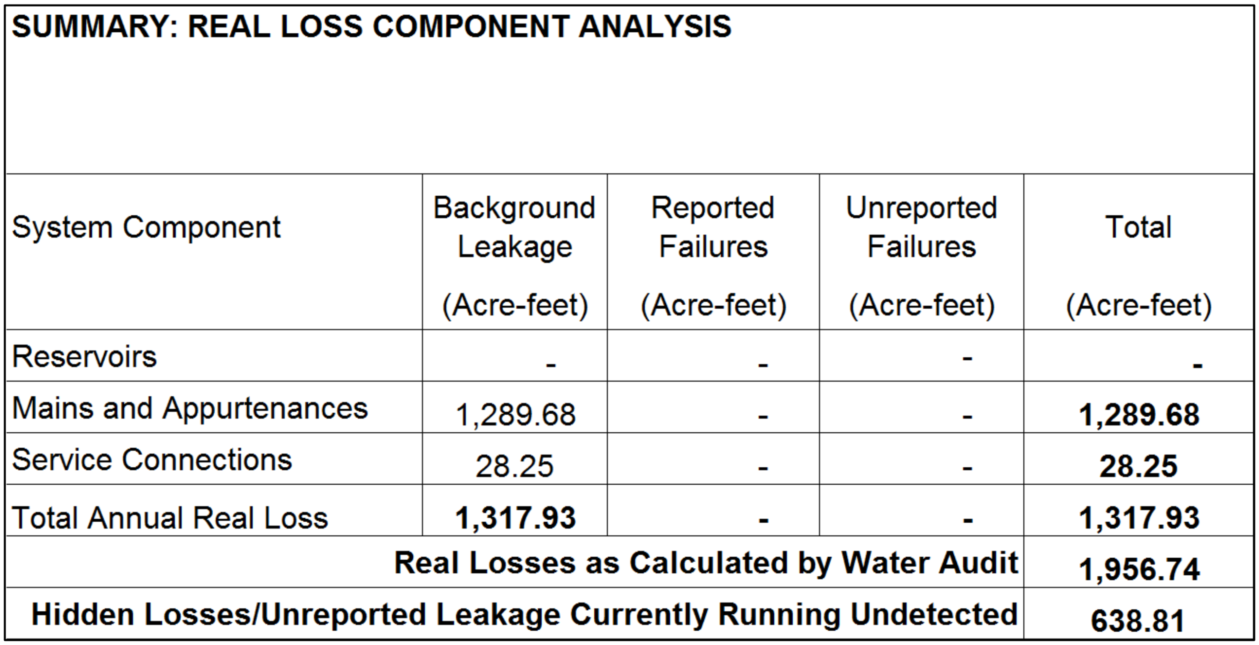
There were no reported leaks/failures during CY 2012. Therefore the total volume from reported leakage for 2012 is zero.

IV. c – Un-Reported Leakage/Failures

There were no un-reported leaks/failures during CY2012 identified through proactive leak detection efforts. Therefore the total volume from un-reported leakage for 2012 is zero.

IV. d – Real Loss Component Analysis Summary

Figure 3 provides a summary of the real loss component analysis for MWD's treated water transmission system. As mentioned in the introduction to this section the results need to be interpreted in the context of the limitations of conducting a real loss component analysis for a transmission system. The results would indicate that about two thirds of the total real loss volume are due to background leakage, which can only be reduced through pressure reduction or infrastructure replacement. The component analysis model indicates that about 639AF are due to unreported leaks that are currently running undetected and could possibly be detected by utilizing in-line leak detection technologies. However, given the cost for in-line leak detection services there does not appear to be an economic incentive for MWD to change their current leakage control strategy.



SUMMARY: REAL LOSS COMPONENT ANALYSIS

System Component	Background Leakage (Acre-feet)	Reported Failures (Acre-feet)	Unreported Failures (Acre-feet)	Total (Acre-feet)
Reservoirs	-	-	-	**-**
Mains and Appurtenances	1,289.68	-	-	**1,289.68**
Service Connections	28.25	-	-	**28.25**
Total Annual Real Loss	**1,317.93**	**-**	**-**	**1,317.93**
Real Losses as Calculated by Water Audit				**1,956.74**
Hidden Losses/Unreported Leakage Currently Running Undetected				**638.81**

Figure 3: Real Loss Component Analysis Results

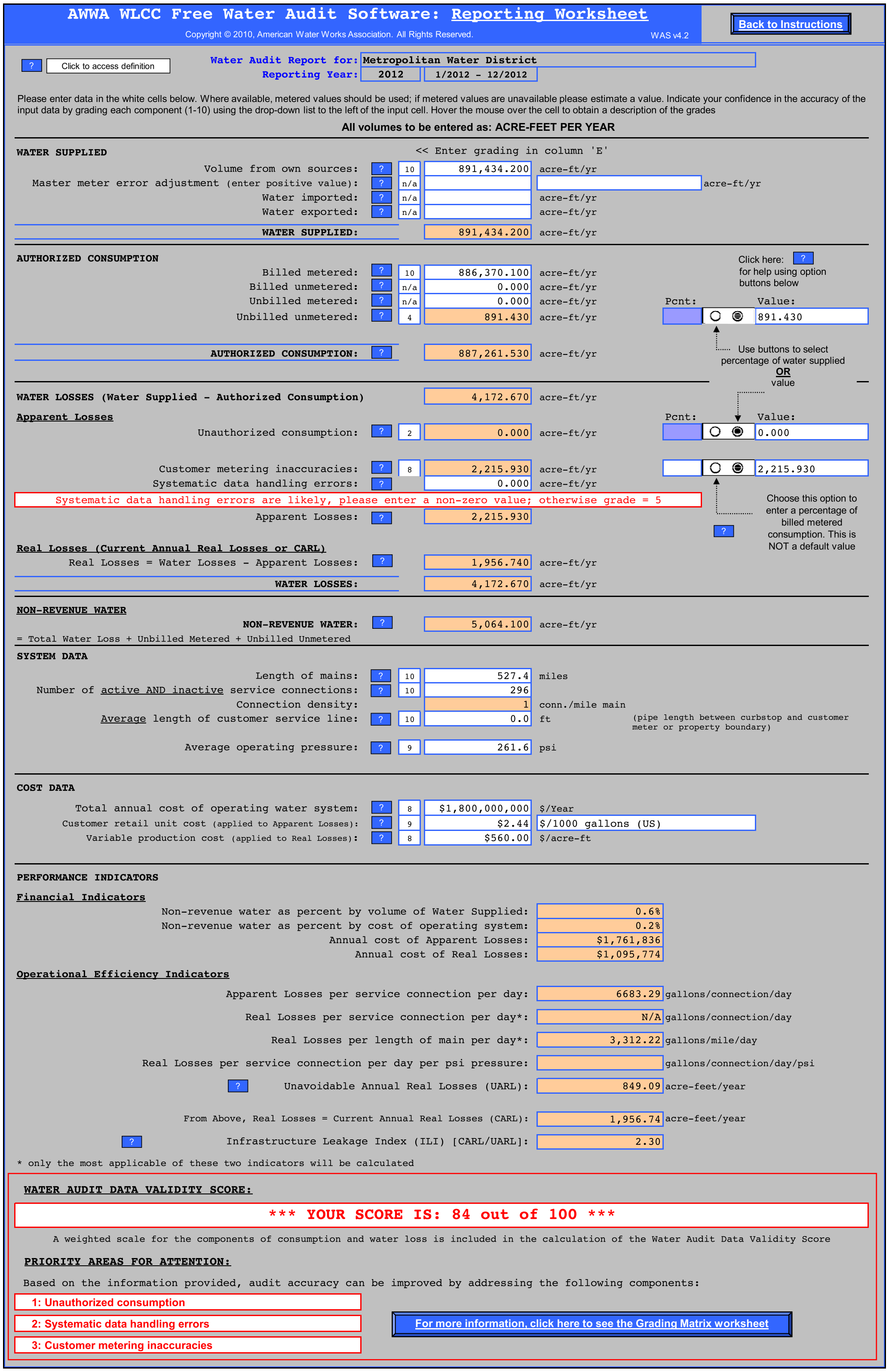
References

Laven, K. and A.O. Lambert. 2012. What Do We Know About Real Losses on Transmission Mains? Presented at IWA Water Loss Conference, Manila, Philippines, February 22 – 26, 2012.

Lambert (1994). Accounting for Losses: The Bursts and Background Concept. Journal of the Institution of Water and Environmental Management, 1994, Volume 8 (2), pp 205-214.

Lambert, A.O and J.A.E Morrison (1996). Recent Developments in Application of 'Bursts and Background Estimates' Concepts of Leakage Management. J.CIWEM, 1996, 10, April, 100-104

APPENDIX A: AWWA Free Water Audit Software



AWWA WLCC Free Water Audit Software: Reporting Worksheet

WAS v4.2

Water Audit Report for: Metropolitan Water District
Reporting Year: 2012 1/2012 - 12/2012

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: ACRE-FEET PER YEAR

WATER SUPPLIED << Enter grading in column 'E'

Volume from own sources:	10	891,434.200	acre-ft/yr
Master meter error adjustment (enter positive value):	n/a		acre-ft/yr
Water imported:	n/a		acre-ft/yr
Water exported:	n/a		acre-ft/yr
WATER SUPPLIED:		891,434.200	acre-ft/yr

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

				Pcnt:		Value:
Billed metered:	10	886,370.100	acre-ft/yr			
Billed unmetered:	n/a	0.000	acre-ft/yr			
Unbilled metered:	n/a	0.000	acre-ft/yr			
Unbilled unmetered:	4	891.430	acre-ft/yr		○ ●	891.430
AUTHORIZED CONSUMPTION:		887,261.530	acre-ft/yr			

Use buttons to select percentage of water supplied **OR** value

WATER LOSSES (Water Supplied - Authorized Consumption) 4,172.670 acre-ft/yr

Apparent Losses

				Pcnt:		Value:
Unauthorized consumption:	2	0.000	acre-ft/yr		○ ●	0.000
Customer metering inaccuracies:	8	2,215.930	acre-ft/yr		○ ●	2,215.930
Systematic data handling errors:		0.000	acre-ft/yr			

Systematic data handling errors are likely, please enter a non-zero value; otherwise grade = 5

Apparent Losses: 2,215.930

Choose this option to enter a percentage of billed metered consumption. This is NOT a default value

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: 1,956.740 acre-ft/yr

WATER LOSSES: 4,172.670 acre-ft/yr

NON-REVENUE WATER

NON-REVENUE WATER: 5,064.100 acre-ft/yr

= Total Water Loss + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:	10	527.4	miles
Number of active AND inactive service connections:	10	296	
Connection density:		1	conn./mile main
Average length of customer service line:	10	0.0	ft (pipe length between curbstop and customer meter or property boundary)
Average operating pressure:	9	261.6	psi

COST DATA

Total annual cost of operating water system:	8	$1,800,000,000	$/Year
Customer retail unit cost (applied to Apparent Losses):	9	$2.44	$/1000 gallons (US)
Variable production cost (applied to Real Losses):	8	$560.00	$/acre-ft

PERFORMANCE INDICATORS

Financial Indicators

Non-revenue water as percent by volume of Water Supplied:	0.6%
Non-revenue water as percent by cost of operating system:	0.2%
Annual cost of Apparent Losses:	$1,761,836
Annual cost of Real Losses:	$1,095,774

Operational Efficiency Indicators

Apparent Losses per service connection per day:	6683.29	gallons/connection/day
Real Losses per service connection per day*:	N/A	gallons/connection/day
Real Losses per length of main per day*:	3,312.22	gallons/mile/day
Real Losses per service connection per day per psi pressure:		gallons/connection/day/psi
Unavoidable Annual Real Losses (UARL):	849.09	acre-feet/year
From Above, Real Losses = Current Annual Real Losses (CARL):	1,956.74	acre-feet/year
Infrastructure Leakage Index (ILI) [CARL/UARL]:	2.30	

* only the most applicable of these two indicators will be calculated

WATER AUDIT DATA VALIDITY SCORE:

***** YOUR SCORE IS: 84 out of 100 *****

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Unauthorized consumption
2: Systematic data handling errors
3: Customer metering inaccuracies

Appendix 8

RECENT CUWCC FILINGS

Enter District ID No.	**161**	**Data File Name**	BASE Year	2009WBMP1.1	2010 WBMP1.1	2009 BMP 1.2	2010 BMP 1.2	2009 BMP 1.3	2010 BMP 1.3

CUWCC BMP COVERAGE REPORT FOR WHOLESALE AGENCIES

Foundation Best Management Practices for Urban Water Efficiency

Agency: Metropolitan Water District of SC
District Name: Metropolitan Water District of SC
CUWCC Unit #: 161

Primary Contact Alice Webb-Cole
Email: awebb@mwdh2o.com

Base Year:
Calendar or FiscalYear Reporting
Report Date: 27-May-11

Foundational BMPs

BMP 1.1.3 Wholesale Agency Assistance Programs

Date of 2009 Data Download July 5, 2011
Date of 2010 Data Download July 5, 2011

a) Financial investments and building partnerships Value of resources provided to retailers for: **2009**	**2009 Monetary Amount for Financial Incentives**	**2009 Monetary Amount for Equivalent Resources**
BMP 3 Residential	$ 22,503,457	no data
BMP 4 CII	$ 9,367,212	no data
BMP 5 Landscape	$ 12,695,902	no data
Total Value of Resources	$ 44,566,571	$ -
	On Track	

a) Financial investments and building partnerships Value of resources provided to retailers for: **2010**	**2010 Monetary Amount for Financial Incentives**	**2010 Monetary Amount for Equivalent Resources**
BMP 3 Residential	$ 20,631,899	no data
BMP 4 CII	$ 8,303,652	no data
BMP 5 Landscape	$ 7,776,340	no data
Total Value of Resources	$ 36,711,891	$ -
	On Track	

"On Track" if Retailer accepted offer and Wholesaler provided resources. "Not on Track" if Retailer accepted offer and Wholesaler did not provde resources.

Agency: Metropolitan Water District of SC **District Name:** Metropolitan Water District of SC **CUWCC Unit #:** 161

	2009 Technical Support Description	2010 Technical Support Description	
b) Technical Support	Posted results from Innovative Conservation Program on bewaterwise.com Host monthly meetings with member and retail water agenices that include research and new technology. 10.5 FTE working on developing and administering conservation programs. On Track	In December 2009, Metropolitan completed an online survey of Residential customers that determined approximate saturation of 1.6 gpf (or lesser) toilets. Posted results from Innovative Conservation Program on bewaterwise.com. Hosted monthly meetings with member and retail agencies that inlcude research and new technology when appropriate.10.5 FTEs working on developing and administering conservation programs. On Track	" On Track" if Retailer accepted and Wholesaler provided and described Technical Support

2009

c) Retail Angency	Programs Managed for Retailers
26 members&300 retailer	Regional Incentive Programs (RES and CII)
	On Track

2010

c) Retail Angency	Programs Managed for Retailers
26 member&300 retailers	Regional Incentive Programs
	On Track

" On Track" if Retailer accepted and Wholesaler provided and lists programs managed for retailers

d) Water Shortage Allocation	2009		2010	
Has Water shortage plan or policy been adopted?	2/12/2008 On Track	Adoption Date File Name	2/12/2008	"OnTrack" if plan /policy adopted and document provided. "Not on Track" if no water shortage plan or policy adopted or document not provided.
e) Non signatory Reporting of BMP implementation by non-signatory agencies	MWDSC Allocation Plan.pdf		MWDSC Allocation Plan.pdf	Report if possible

f) Encourage CUWCC Membership List Efforts to recruit retailers	List Efforts to recruit retailers		
	Metropolitan pays half dues for all agencies within Metropolitan's service area; On Track	Quarterly meetings hosted by MWDSC covering CUWCC topics, Annexations into MWDSC service area are required to be signatories to the CUWCC On Track	"On Track" if efforts listed or dues paid.

Agency: Metropolitan Water District of SC **District Name:** Metropolitan Water District of SC **CUWCC Unit #:** 161

Date of 2009 Data Submittal: #N/A
Date of 2010 Data Submittal: July 5, 2011

BMP 1.2 Water Loss Control

	2009	
Complete a prescreening Audit	No	On Track if Yes
Metered Sales AF	2,045,104	Metered sales to retail agencies
Verifiable Other Uses AF	9,582	
Total Supply AF	211,998	Into wholesale system
(Metered Sales + System uses)/ Total Supply >0.89	9.69	On Track if =>.89, Not on Track if No
If ratio is less than 0.9, complete a full scale Audit in 2009?	Off	On Track if Yes
Verify Data with Records on File?	Yes	On Track if Yes
Operate a system Leak Detection Program?	Yes	On Track if Yes
	On Track	

Comments

Metropolitan's system is monitored by 10+ patrols including staff collecting water quality samples, If evidence of leaking is detected near any of our facilite pilots flying the CRA and SWP pipeline staff during the normal course of operations.

If evidence of leaking is detected near any of our facilite

For wholesalers AWWA methodology applies to supplies to wholesalers, sales to retail agencies or sub wholesalers, and pipelines operated by wholesalers. End use retail customers are not considered in this

	2010	
Compile Standard Water Audit using AWWA Software?	No	On Track if Yes, Not on Track if No
AWWA file provided to CUWCC?	No	On Track if Yes, Not on Track if No
AWWA Water Audit Validity Score?	no data	Info only until 2012
Completed Training in AWWA Audit Method?	no	Info only until 2012
Completed Training in Component Analysis Process?	No	Info only until 2012
Complete Component Analysis?	no	Info only until 2012
Repaired all leaks and breaks to the extent cost effective?	Yes	On Track if Yes, Not on Track if No
Locate and repair unreported leaks to the extent cost effective.	Yes	On Track if Yes, Not on Track if No
Maintain a record-keeping system for the repair of reported leaks, including time of report, leak location, type of leaking pipe segment or fitting, and leak running time from report to repair.		Info only until 2012
Provided 7 types of Water Loss Control Info		info only until 2012

Leaks Repaire	Value Real Losses	Value Apparent	Miles Surveyed	Press Reduction	Cost Interventions	Water Lost from Leaks AF
no data	$ -	$ -	0	No	$ -	no data

Agency: Metropolitan Water District of SC

District Name: Metropolitan Water District of SC

CUWCC Unit #: 161

Not On Track

1.3 METERING WITH COMMODITY RATES FOR ALL NEW CONNECTIONS AND RETROFIT OF EXISTING CONNECTIONS

Date of 2009 Data Submittal: July 5, 2011
Date of 2010 Data Submittal: July 5, 2011

	2009	2010	
Exemption requested?	No	No	
At least as Effective As Requested?	No	No	
Does Agency have Unmetered Deliveries to Retail Agencies or Other Wholesalers?	No	No	
Metered Accounts billed by volume of use	Yes	Yes	Volumetric billing required for all connections on same schedule as metering
Completed a written plan, policy or program to test, repair and replace meters	No	No	On Track if Yes, Not on Track if No
	Not On Track	Not On Track	

Enter District ID No.	161

Agency Row #	50	50	55	161
Data File Name	2009 BMP2.1	2010 BMP2.1	2009 BMP2.2	2010 BMP2.2

CUWCC BMP COVERAGE REPORT FOR WHOLESALE AGENCIES

Foundation Best Management Practices for Urban Water Efficiency

Agency: Metropolitan Water District of SC
WHOLESALE Water Supplier

District Name: Metropolitan Water District of SC

CUWCC Unit #: 161

Coverage Report Date: May 19, 2011

Primary Contact Alice Webb-Cole

Email: awebb@mwdh2o.com

BMP 2. EDUCATION PROGRAMS

BMP 2.1 Public Outreach Actions Implemented and Reported to CUWCC

date 2009 datafile downloaded: July 5, 2011
date 2010 datafile downloaded: July 5, 2011

	2009	2010
1) Contacts with the public (minimum = 4 times per year)	22,000	88,000
2) Water supplier contacts with media (minimum = 4 times per year, i.e., at least quarterly).	10	9
3) An actively maintained website that is updated regularly (minimum = 4 times per year, i.e., at least quarterly).	Yes	Yes
4) Description of materials used to meet minimum requirement.	Newsletter articles on conservation Newsletter articles on conservation Website Newspaper contacts Television contacts News releases Radio contacts	Newsletter articles on conservation Newsletter articles on conservation Website Newspaper contacts News releases Television contacts Radio contacts
5) Annual budget for public outreach program.	$ 5,450,000	$ 4,405,796
6) Description of all other outreach programs	Conservation messaging including Television, Radio, and Online.	Conservation messaging including Television, Radio, and Online.
	On Track	On Track

All 6 action types implemented and reported to CUWCC to be 'On Track')

Agency: Metropolitan Water District of SC **District Name:** Metropolitan Water District of SC **CUWCC Unit #:** 161

WHOLESALE Water Supplier

Coverage Report Date: May 19, 2011

2.2 School Education Programs Implemented and Reported to CUWCC

date 2009 datafile downloaded: July 5, 2011

date 2010 datafile downloaded: May 26, 2011

	2009	2010	
Does this wholesale agency implement School Education Programs for Sub Wholesalers or Retail unility's benefit?	Yes	Yes	
Names of Sub Wholesale and Retail Agencies benefiting from Program?	Metropolitan provides public outreach to its 26 member agencies throughout parts of Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura	Metropolitan provides public outreach to its 26 member agencies throughout parts of Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura counties.	
1) Curriculum materials developed and/or provided by wholesale agency	All of our developed curriculum units include formal linkages. In addition, all supplements, activities and programs address CA. standards and frameworks.	All of our developed curriculum units include formal framework linkages. In addition, all supplements, activities and programs address CA. standards and frameworks.	All 5 actions types implemented and reported to CUWCC to be 'On Track'
2) Materials meet state education framework requirements and are grade-level appropriate?	Yes	Yes	
3) Materials Distributed to K-6?	Yes	Yes	
Describe K-6 Materials	Little Splash: K-3 Activity/Coloring Book, All About Water (K-3), Admiral Splash (gr. 4), Water Ways (gr. 5) and Water Times (gr. 6)	Channing Bete Co., Inc.- "Let's Learn about Using Water Wisely", "Let's Learn about Water", "My Book About Water", "Water Conservation" and Activity Materials Created In-house related to own brand marketing program	Describe materials to meet minimum requirements
Materials distributed to 7-12 students?	Yes	No	Info Only
4) Annual budget for school education program.	$ 476,000	$ 7,500	
5) Description of all other water supplier education programs	An array of supplemental materials and activities that can be ordered from Metropolitan's Education Website.	"Team Green Kids Club" -The club offers the opportunity for young stewards to exchange ideas and information on how to work together to recycle, conserve and preserve the natural resources of our community.	
	On Track	On Track	

CUWCC BMP Wholesale Coverage Report 2011

Foundational Best Managemant Practices for Urban Water Efficiency

BMP 1.1 Wholesale Agency Assistance Programs

ON TRACK

161 Metropolitan Water District of SC

Name: Mark Graham Email: mgraham@mwdh2o.com

a) Financial Investments and Building Partnerships

BMP Section	Monetary Amount for Financial Incentives	Monetary Amount for Equivalent Resources	
BMP 3 Residential	10541446	0	
BMP 4 CII	5001703	0	
BMP 5 Landscape	543269	0	

b) Technical Support

c) Retail Agency

d) Water Shortage Allocation

Adoption Date: 2/12/2008

File Name:

e) Non signatory Reporting of BMP implementation by non-signatory Agencies

f) Encourage CUWCC Membership List Efforts to Recuit Retailers

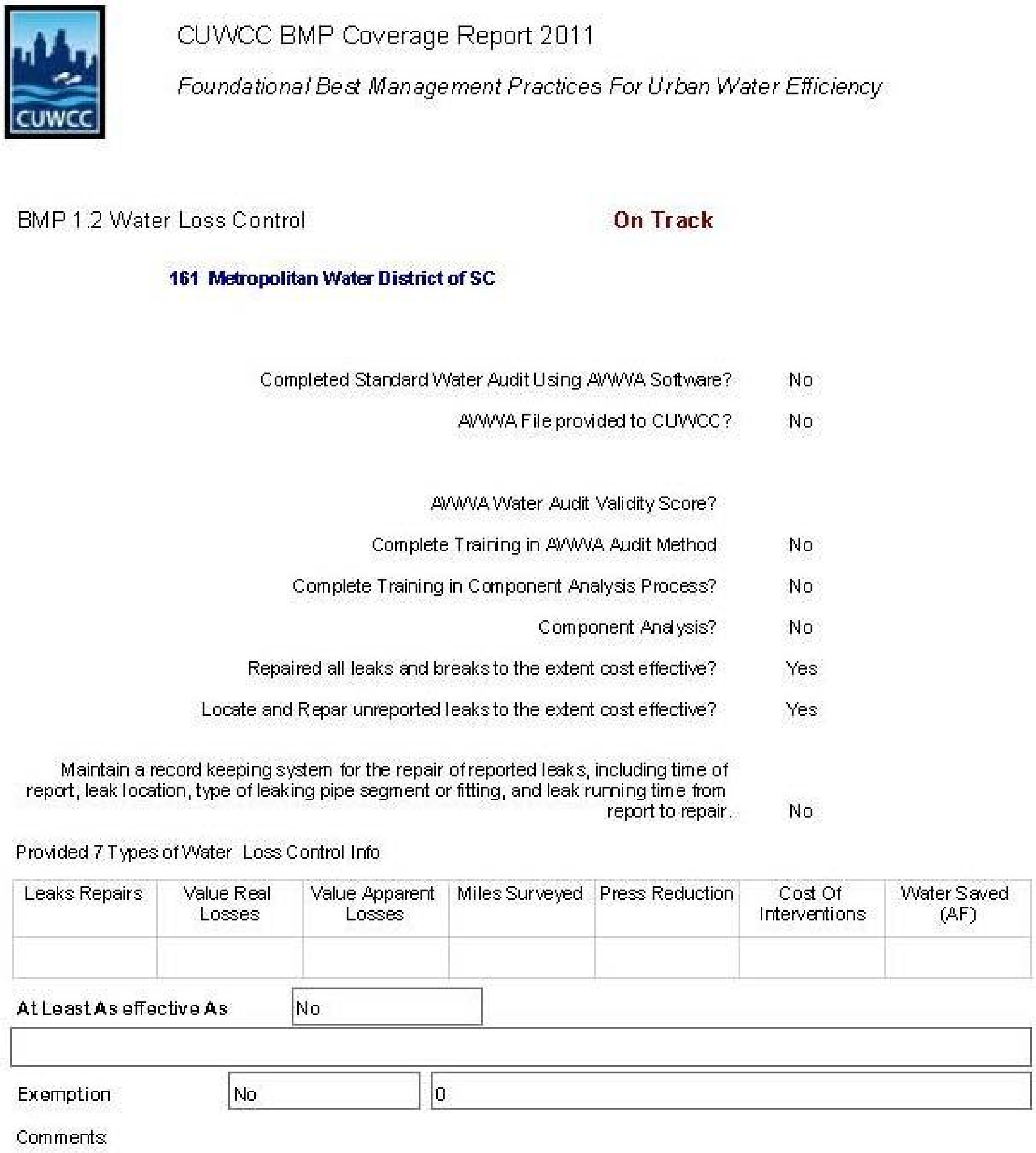
Conduct quarterly state wide meetings with California water agencies on conservation issues affecting the state.

197187.14

At Least As effective As No

Exemption No 0

Comments:



CUWCC BMP Coverage Report 2011

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.2 Water Loss Control **On Track**

161 Metropolitan Water District of SC

Completed Standard Water Audit Using AWWA Software?	No
AWWA File provided to CUWCC?	No
AWWA Water Audit Validity Score?	
Complete Training in AWWA Audit Method	No
Complete Training in Component Analysis Process?	No
Component Analysis?	No
Repaired all leaks and breaks to the extent cost effective?	Yes
Locate and Repar unreported leaks to the extent cost effective?	Yes
Maintain a record keeping system for the repair of reported leaks, including time of report, leak location, type of leaking pipe segment or fitting, and leak running time from report to repair.	No

Provided 7 Types of Water Loss Control Info

Leaks Repairs	Value Real Losses	Value Apparent Losses	Miles Surveyed	Press Reduction	Cost Of Interventions	Water Saved (AF)

At Least As effective As No

Exemption No 0

Comments:

CUWCC BMP Coverage Report 2011

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.3 Metering With Commodity

ON TRACK

161 Metropolitan Water District of SC

Numbered Unmetered Accounts	No
Metered Accounts billed by volume of use	Yes
Number of CII Accounts with Mixed Use Meters	0
Conducted a feasibility study to assess merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters?	No
Feasibility Study provided to CUWCC?	No

Date: 12:00:00 AM

Uploaded file name:

Completed a written plan, policy or program to test, repair and replace meters	No

At Least As effective As No

Exemption No 0

Comments:

Metropolitan as a wholesale agency only provides water to other water agencies.

BMP 2.1 Public Outreach

ON TRACK

161 **Metropolitan Water District of SC** **Wholesale Only**

Does your agency perform Public Outreach programs? Yes

The list of retail agencies your agency assists with public outreach

Metropolitan provides public outreach to its 26 member agencies throughout parts of Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura counties.

The name of agency, contact name and email address if not CUWCC Group 1 members

Did at least one contact take place during each quater of the reporting year? Yes

Public Outreach Program List	Number
Website	394909
Landscape water conservation media campaigns	17660022
Flyers and/or brochures (total copies), bill stuffers, messages printed on bill, information packets	290754
Newsletter articles on conservation	89904
Total	**18435589**

Did at least one contact take place during each quater of the reporting year? Yes

Number Media Contacts	Number
Newspaper contacts	17
Written editorials	8
News releases	6
Radio contacts	3
Television contacts	2
Articles or stories resulting from outreach	4
Total	**40**

Did at least one website update take place during each quater of the reporting year? Yes

Public Information Program Annual Budget

Annual Budget Category	Annual Budget Amount
Advertising	1200000
CPP	150000

BMP 2.1 Public Outreach

ON TRACK

Annual Budget Category	**Annual Budget Amount**
CFLT	105000
Total Amount:	**1455000**

Public Outreah Additional Programs
Advertising Campaign/Google Search Media Buy
Speakers Bureau
Community Partnering Program
California Friendly Landscape Training Program

Description of all other Public Outreach programs

Comments:

At Least As effective As No

Exemption No 0

CUWCC BMP Coverage Report 2011

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.2 School Education Programs **ON TRACK**

161 Metropolitan Water District of SC **Wholesale Only**

Does your agency implement School Education programs? Yes

The list of retail agencies your agency assists with public outreach

Metropolitan provides public outreach to its 26 member agencies throughout parts of Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura counties.

Materials meet state education framework requirements? Yes

All of our developed curriculum units include formal linkages. In addition, all supplements, activities and programs address CA standards and frameworks.

Materials distributed to K-6? Yes

Little Splash: K-3 Activity/Coloring Book, All About Water (K-3), Admiral Splash (gr. 4), Water Ways (gr. 5) and Water Times (gr. 6)

Materials distributed to 7-12 students? Yes (Info Only)

Water Quality: The Qualities and Science of Water and Water Works: School to Career Curriculum

Annual budget for school education program: 480000.00

Description of all other water supplier education programs

All of our developed curriculum units include formal linkages. In addition, all supplements, activities and programs address CA standards and frameworks. Little Splash: K-3 Activity/Coloring Book, All About Water (K-3), Admiral Splash (gr. 4), Water Ways (gr. 5) and Water Times (gr. 6) An array of supplemental materials and activities that can be ordered from Metropolitan's Education Website. N/A Student Art Contest for 2011
Calendar. 36 artists selected from 143 submitted by 24 agencies. Solar Cup 2011; a seven-month program, worked with 40 high school teams, 1100 students toward May event at Metropolitan's Lake Skinner.

Comments:

At Least As effective As No

Exemption No 0

CUWCC BMP Wholesale Coverage Report 2012

Foundational Best Managemant Practices for Urban Water Efficiency

BMP 1.1 Wholesale Agency Assistance Programs

ON TRACK

161 Metropolitan Water District of SC

Name: Mark Graham

Email: mgraham@mwdh2o.com

a) Financial Investments and Building Partnerships

BMP Section	Monetary Amount for Financial Incentives	Monetary Amount for Equivalent Resources	
BMP 4 CII	4395825		
BMP 5 Landscape	881228		
BMP 3 Residential	7585882		

b) Technical Support

c) Retail Agency

d) Water Shortage Allocation

Adoption Date: 2/12/2008

File Name:

e) Non signatory Reporting of BMP implementation by non-signatory Agencies

f) Encourage CUWCC Membership List Efforts to Recuit Retailers

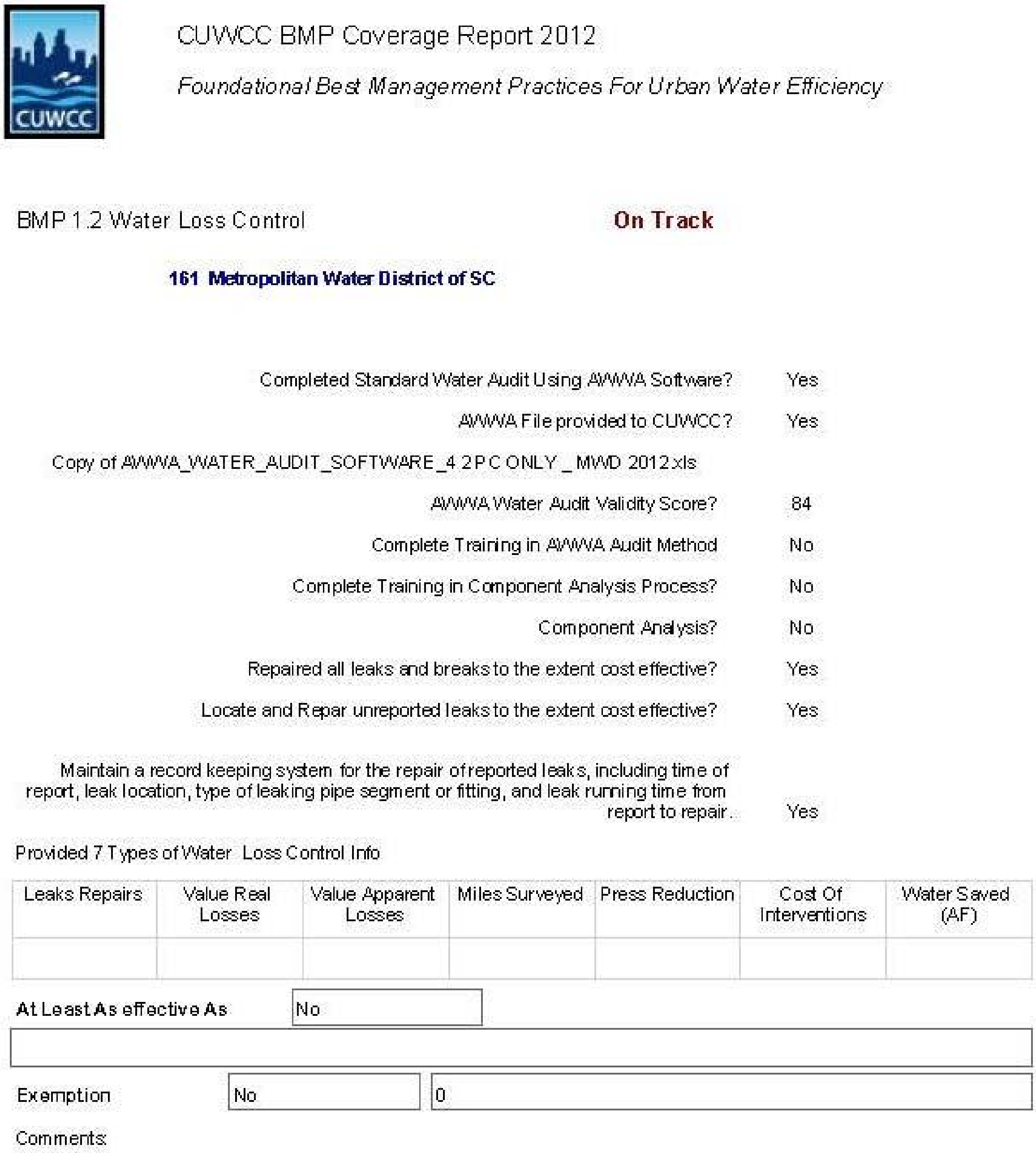
Conduct quarterly state wide meetings with California water agencies on conservation issues affecting the state.

216930.20

At Least As effective As No

Exemption No 0

Comments:



CUWCC BMP Coverage Report 2012

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.2 Water Loss Control **On Track**

161 Metropolitan Water District of SC

Completed Standard Water Audit Using AWWA Software?	Yes
AWWA File provided to CUWCC?	Yes
Copy of AWWA_WATER_AUDIT_SOFTWARE_4 2PC ONLY _ MWD 2012.xls	
AWWA Water Audit Validity Score?	84
Complete Training in AWWA Audit Method	No
Complete Training in Component Analysis Process?	No
Component Analysis?	No
Repaired all leaks and breaks to the extent cost effective?	Yes
Locate and Repar unreported leaks to the extent cost effective?	Yes
Maintain a record keeping system for the repair of reported leaks, including time of report, leak location, type of leaking pipe segment or fitting, and leak running time from report to repair.	Yes

Provided 7 Types of Water Loss Control Info

Leaks Repairs	Value Real Losses	Value Apparent Losses	Miles Surveyed	Press Reduction	Cost Of Interventions	Water Saved (AF)

At Least As effective As No

Exemption No 0

Comments:

CUWCC BMP Coverage Report 2012

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.3 Metering With Commodity

ON TRACK

161 Metropolitan Water District of SC

Numbered Unmetered Accounts	No
Metered Accounts billed by volume of use	Yes
Number of CII Accounts with Mixed Use Meters	0
Conducted a feasibility study to assess merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters?	No
Feasibility Study provided to CUWCC?	No

Date: 12:00:00 AM

Uploaded file name:

Completed a written plan, policy or program to test, repair and replace meters	No

At Least As effective As No

Exemption No 0

Comments:

Metropolitan as a wholesale agency only provides water to other water agencies.

CUWCC BMP Coverage Report 2012

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.1 Public Outreach **ON TRACK**

161 Metropolitan Water District of SC **Wholesale Only**

Does your agency perform Public Outreach programs? Yes

The list of retail agencies your agency assists with public outreach

Metropolitan provides public outreach to its 26 member agencies throughout parts of Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura counties.

The name of agency, contact name and email address if not CUWCC Group 1 members

Did at least one contact take place during each quater of the reporting year? Yes

Public Outreach Program List	Number
Newsletter articles on conservation	142052
Flyers and/or brochures (total copies), bill stuffers, messages printed on bill, information packets	319027
Landscape water conservation media campaigns	31030433
Website	403631
Total	**31895143**

Did at least one contact take place during each quater of the reporting year? Yes

Number Media Contacts	Number
Newspaper contacts	6
News releases	1
Television contacts	3
Articles or stories resulting from outreach	5
Total	**15**

Did at least one website update take place during each quater of the reporting year? Yes

Public Information Program Annual Budget

Annual Budget Category	Annual Budget Amount
Advertising	1200000
CPP	150000
Total Amount:	**1350000**

Public Outreah Additional Programs
Advertising Campaign/Google Search Media Buy

CUWCC BMP Coverage Report 2012

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.1 Public Outreach

ON TRACK

Public Outreah Additional Programs
Speakers Bureau
Community Partnering Program
Online Training

Description of all other Public Outreach programs

Comments:

At Least As effective As	No	
Exemption	No	0

CUWCC BMP Coverage Report 2012

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.2 School Education Programs ON TRACK

161 Metropolitan Water District of SC **Wholesale Only**

Does your agency implement School Education programs? No

The list of retail agencies your agency assists with public outreach

Materials meet state education framework requirements? Yes

All of our developed curriculum units include formal linkages. In addition, all supplements, activities and programs address CA standards and frameworks.

Materials distributed to K-6? Yes

Little Splash: K-3 Activity/Coloring Book, All About Water (K-3), Admiral Splash (gr. 4), Water Ways (gr. 5) and Water Times (gr. 6)

Materials distributed to 7-12 students? Yes (Info Only)

Water Quality: The Qualities and Science of Water and Water Works: School to Career Curriculum

Annual budget for school education program: 480000.00

Description of all other water supplier education programs

All of our developed curriculum units include formal linkages. In addition, all supplements, activities and programs address CA standards and frameworks. Little Splash: K-3 Activity/Coloring Book, All About Water (K-3), Admiral Splash (gr. 4), Water Ways (gr. 5) and Water Times (gr. 6) An array of supplemental materials and activities that can be ordered from Metropolitan's Education Website. Student Art Contest for 2012 Calendar. 36 artists selected from 120 submitted by 19 agencies. Solar Cup 2012, a seven-month program, worked with 39 high school teams and approxmiately 1200 students towards May event at Metropolitan's Lake Skinner.

Comments:

At Least As effective As No

Exemption No 0

CUWCC BMP Wholesale Coverage Report 2013

Foundational Best Managemant Practices for Urban Water Efficiency

BMP 1.1 Wholesale Agency Assistance Programs

ON TRACK

161 Metropolitan Water District of SC

Name: Mark Graham Email: mgraham@mwdh2o.com

a) Financial Investments and Building Partnerships

BMP Section	Monetary Amount for Financial Incentives	Monetary Amount for Equivalent Resources	
BMP 3 Residential	13347068		
BMP 4 CII	1376957		
BMP 5 Landscape	4696061		

b) Technical Support

c) Retail Agency

d) Water Shortage Allocation

Adoption Date: 2/12/2008

File Name: http://edmsidm.mwdh2o.com/idmweb/cache/MWD%20EDMS/003724356-1.pdf

e) Non signatory Reporting of BMP implementation by non-signatory Agencies

f) Encourage CUWCC Membership List Efforts to Recuit Retailers

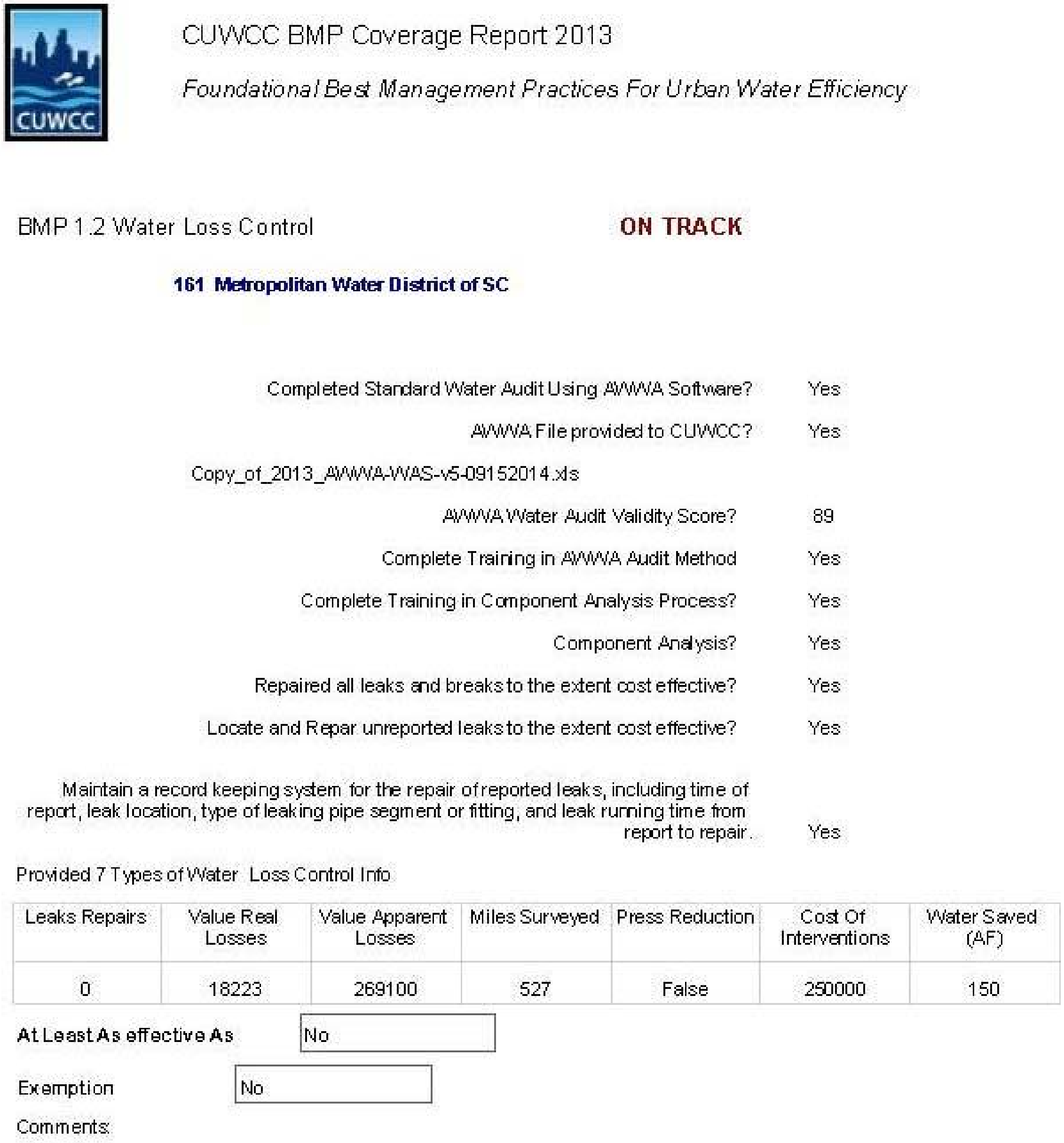
Metropolitan serves on the Board, chairs the R&E Committee, serves on various committees and relays that information to its member agencies at its monthly conservation coordinators meetings. Metropolitan encourages membership and hosts CUWCC speakers

0.00

At Least As effective As No

Exemption No

Comments:



CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.2 Water Loss Control **ON TRACK**

161 Metropolitan Water District of SC

Completed Standard Water Audit Using AWWA Software?	Yes
AWWA File provided to CUWCC?	Yes
Copy_of_2013_AWWA-WAS-v5-09152014.xls	
AWWA Water Audit Validity Score?	89
Complete Training in AWWA Audit Method	Yes
Complete Training in Component Analysis Process?	Yes
Component Analysis?	Yes
Repaired all leaks and breaks to the extent cost effective?	Yes
Locate and Repar unreported leaks to the extent cost effective?	Yes
Maintain a record keeping system for the repair of reported leaks, including time of report, leak location, type of leaking pipe segment or fitting, and leak running time from report to repair.	Yes

Provided 7 Types of Water Loss Control Info

Leaks Repairs	Value Real Losses	Value Apparent Losses	Miles Surveyed	Press Reduction	Cost Of Interventions	Water Saved (AF)
0	18223	269100	527	False	250000	150

At Least As effective As No

Exemption No

Comments:

CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.3 Metering With Commodity

ON TRACK

161 Metropolitan Water District of SC

Numbered Unmetered Accounts	No
Metered Accounts billed by volume of use	Yes
Number of CII Accounts with Mixed Use Meters	
Conducted a feasibility study to assess merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters?	No
Feasibility Study provided to CUWCC?	No
Date:	
Uploaded file name:	
Completed a written plan, policy or program to test, repair and replace meters	Yes

At Least As effective As No

Exemption No

Comments:

BMP 2.1 Public Outreach

ON TRACK

161 **Metropolitan Water District of SC** **Wholesale**

Does your agency perform Public Outreach programs? Yes

The list of retail agencies your agency assists with public outreach

City of Anaheim, PUD,City of Beverly Hills,City of Burbank, PSD,City of Compton, Water Dept.,City of Fullerton,City of Glendale, Water and Power,City of Pasadena,City of San Fernando,City of Santa Ana,City of Santa Monica,City of Torrance, Water Division,Las Virgenes Municipal Water District,Long Beach Water Department,Los Angeles Dept. of Water and Power,Western MWD of Riverside County - Retail

Metropolitan provides public outreach to its 26 member agencies throughout parts of Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura counties.

Agency Name	ID number
City of Anaheim, PUD	45
City of Beverly Hills	6972
City of Burbank, PSD	48
City of Compton, Water Dept.	52
City of Fullerton	59
City of Glendale, Water and Power	61
City of Pasadena	72
City of San Fernando	83
City of Santa Ana	258
City of Santa Monica	89
City of Torrance, Water Division	93
Las Virgenes Municipal Water District	147
Long Beach Water Department	66
Los Angeles Dept. of Water and Power	152
Western MWD of Riverside County - Retail	1006

The name of agency, contact name and email address if not CUWCC Group 1 members

Did at least one contact take place during each quater of the reporting year? Yes

Public Outreach Program List	**Number**
Newsletter articles on conservation	10417
Flyers and/or brochures (total copies), bill stuffers, messages printed on bill, information packets	174253
General water conservation information	16546797
Website	186770
Total	**16918237**

Did at least one contact take place during each quater of the reporting year? Yes

BMP 2.1 Public Outreach

ON TRACK

Number Media Contacts	**Number**
Newspaper contacts	520
News releases	17
Television contacts	105
Articles or stories resulting from outreach	120
Total	**762**

Did at least one website update take place during each quater of the reporting year? Yes

Public Information Program Annual Budget

Annual Budget Category	**Annual Budget Amount**
Advertising	1986300
CPP	100000
Total Amount:	**2086300**

Public Outreah Additional Programs
Mulit-lingual Advertising Campaign/Google Search Media Buy
Website, Social Media, Online Outreach
Community Partnering Program
Speaking Events and Speakers Bureau

Description of all other Public Outreach programs

Comments:

At Least As effective As No

Exemption No 0

BMP 2.2 School Education Programs

ON TRACK

161 Metropolitan Water District of SC **Wholesale**

Does your agency implement School Education programs? Yes

The list of retail agencies your agency assists with public outreach

City of Anaheim, PUD,City of Beverly Hills,City of Burbank, PSD,City of Compton, Water Dept.,City of Fullerton,City of Glendale, Water and Power,City of Pasadena,City of San Fernando,City of Santa Ana,City of Santa Monica,City of Torrance, Water Division,Las Virgenes Municipal Water District,Long Beach Water Department,Los Angeles Dept. of Water and Power,Western MWD of Riverside County - Retail

Agencies Name	ID number
City of Anaheim, PUD	45
City of Beverly Hills	6972
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City of Glendale, Water and Power	61
City of Pasadena	72
City of San Fernando	83
City of Santa Ana	258
City of Santa Monica	89
City of Torrance, Water Division	93
Las Virgenes Municipal Water District	147
Long Beach Water Department	66
Los Angeles Dept. of Water and Power	152
Western MWD of Riverside County - Retail	1006

Materials meet state education framework requirements? Yes

All of our developed curriculum units include formal linkages. In addition, all supplements, activities and programs address CA standards and frameworks including Common Core and Next Generation Science Standards.

Materials distributed to K-6? Yes

Little Splash: K-3 Activity/Coloring Book, All About Water (K-3), Admiral Splash (gr. 4), Water Ways (gr. 5) and Water Times (gr. 6)

Materials distributed to 7-12 students? Yes (Info Only)

Water Quality: The Qualities and Science of Water, Conservation Connection and Water Works: School to Career Curriculum

Annual budget for school education program: 490000.00

Description of all other water supplier education programs

CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.2 School Education Programs

ON TRACK

An array of supplemental materials and activities that can be ordered from Metropolitan's Education Website: www.mwdh2o.com/education

Comments:

At Least As effective As No

Exemption No 0

CUWCC BMP Wholesale Coverage Report 2014

Foundational Best Managemant Practices for Urban Water Efficiency

BMP 1.1 Wholesale Agency Assistance Programs

ON TRACK

161 **Metropolitan Water District of SC**

Name: Mark Graham Email: mgraham@mwdh2o.com

a) Financial Investments and Building Partnerships

BMP Section	Monetary Amount for Financial Incentives	Monetary Amount for Equivalent Resources	
BMP 3 Residential	16843175		
BMP 4 CII	1241465		
BMP 5 Landscape	21564361		

b) Technical Support

c) Retail Agency

d) Water Shortage Allocation

Adoption Date: 2/12/2008

File Name: http://edmsidm.mwdh2o.com/idmweb/cache/MWD%20EDMS/003724356-1.pdf

e) Non signatory Reporting of BMP implementation by non-signatory Agencies

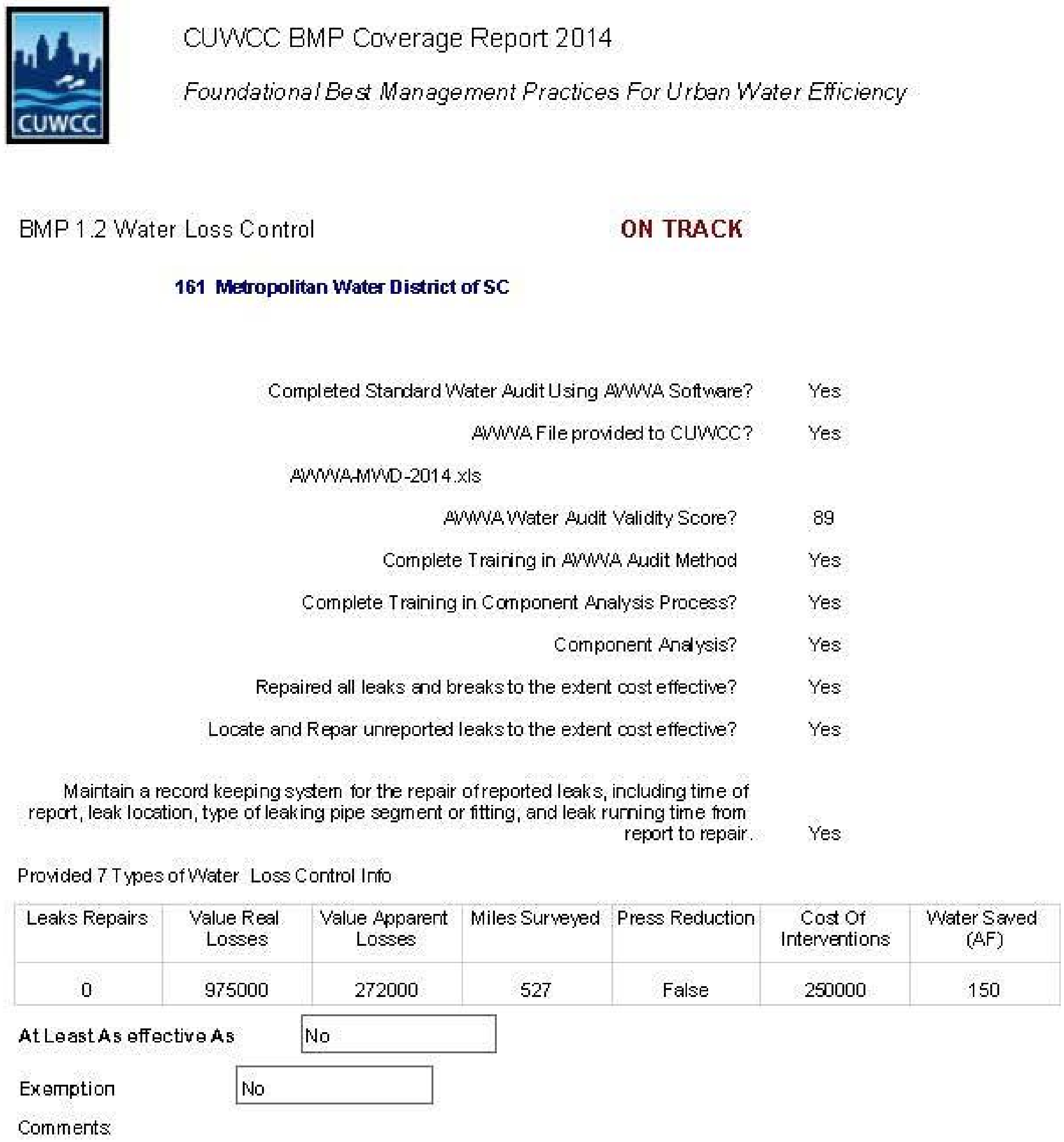
f) Encourage CUWCC Membership List Efforts to Recuit Retailers

Metropolitan serves on the Board, chairs the R&E Committee, serves on various committees and relays that information to its member agencies at its monthly conservation coordinators meetings. Metropolitan encourages membership and hosts CUWCC speakers

At Least As effective As No

Exemption No

Comments:



CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.2 Water Loss Control **ON TRACK**

161 Metropolitan Water District of SC

Completed Standard Water Audit Using AWWA Software?	Yes
AWWA File provided to CUWCC?	Yes
AWWA-MWD-2014.xls	
AWWA Water Audit Validity Score?	89
Complete Training in AWWA Audit Method	Yes
Complete Training in Component Analysis Process?	Yes
Component Analysis?	Yes
Repaired all leaks and breaks to the extent cost effective?	Yes
Locate and Repar unreported leaks to the extent cost effective?	Yes
Maintain a record keeping system for the repair of reported leaks, including time of report, leak location, type of leaking pipe segment or fitting, and leak running time from report to repair.	Yes

Provided 7 Types of Water Loss Control Info

Leaks Repairs	Value Real Losses	Value Apparent Losses	Miles Surveyed	Press Reduction	Cost Of Interventions	Water Saved (AF)
0	975000	272000	527	False	250000	150

At Least As effective As No

Exemption No

Comments

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.3 Metering With Commodity

ON TRACK

161 Metropolitan Water District of SC

Numbered Unmetered Accounts	No
Metered Accounts billed by volume of use	Yes
Number of CII Accounts with Mixed Use Meters	
Conducted a feasibility study to assess merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters?	No
Feasibility Study provided to CUWCC?	No
Date:	
Uploaded file name:	
Completed a written plan, policy or program to test, repair and replace meters	Yes
At Least As effective As	No
Exemption	No
Comments:	

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.1 Public Outreach

ON TRACK

161 **Metropolitan Water District of SC** **Wholesale**

Does your agency perform Public Outreach programs? Yes

The list of retail agencies your agency assists with public outreach

City of Anaheim, PUD,City of Beverly Hills,City of Burbank, PSD,City of Compton, Water Dept.,City of Fullerton,City of Glendale, Water and Power,City of Pasadena,City of San Fernando,City of Santa Ana,City of Santa Monica,City of Torrance, Water Division,Las Virgenes Municipal Water District,Long Beach Water Department,Los Angeles Dept. of Water and Power,Western MWD of Riverside County - Retail

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City of Anaheim, PUD	45
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City of Compton, Water Dept.	52
City of Fullerton	59
City of Glendale, Water and Power	61
City of Pasadena	72
City of San Fernando	83
City of Santa Ana	258
City of Santa Monica	89
City of Torrance, Water Division	93
Las Virgenes Municipal Water District	147
Long Beach Water Department	66
Los Angeles Dept. of Water and Power	152
Western MWD of Riverside County - Retail	1006

The name of agency, contact name and email address if not CUWCC Group 1 members

Did at least one contact take place during each quater of the reporting year? Yes

Public Outreach Program List	**Number**
Newsletter articles on conservation	12061
Flyers and/or brochures (total copies), bill stuffers, messages printed on bill, information packets	364276
General water conservation information	12773042
Website	522006
Total	**13671385**

Did at least one contact take place during each quater of the reporting year? Yes

BMP 2.1 Public Outreach

ON TRACK

Number Media Contacts	**Number**
Newspaper contacts	520
News releases	40
Television contacts	104
Articles or stories resulting from outreach	120
Total	**784**

Did at least one website update take place during each quater of the reporting year?	Yes

Public Information Program Annual Budget

Annual Budget Category	**Annual Budget Amount**
Advertising	2214600
CPP	100000
Total Amount:	**2314600**

Public Outreah Additional Programs
Advertising Campaign/Google Search Media Buy
Speakers Bureau
Community Partnering Program
Website

Description of all other Public Outreach programs

Comments:

At Least As effective As No

Exemption No 0

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.2 School Education Programs

ON TRACK

161 Metropolitan Water District of SC **Wholesale**

Does your agency implement School Education programs? Yes

The list of retail agencies your agency assists with public outreach

City of Anaheim, PUD,City of Beverly Hills,City of Burbank, PSD,City of Compton, Water Dept.,City of Fullerton,City of Pasadena,City of San Fernando,City of Santa Ana,City of Santa Monica,City of Torrance, Water Division,Las Virgenes Municipal Water District,Long Beach Water Department,Los Angeles Dept. of Water and Power,Western MWD of Riverside County - Retail

Agencies Name	ID number
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City of Compton, Water Dept.	52
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City of Santa Ana	258
City of Santa Monica	89
City of Torrance, Water Division	93
Las Virgenes Municipal Water District	147
Long Beach Water Department	66
Los Angeles Dept. of Water and Power	152
Western MWD of Riverside County - Retail	1006

Materials meet state education framework requirements? Yes

All of our developed curriculum units include formal linkages. In addition, all supplements, activities and programs address CA standards and frameworks including Common Core and Next Generation Science Standards.

Materials distributed to K-6? Yes

Little Splash: K-3 Activity/Coloring Book, All About Water (K-3), Admiral Splash (gr. 4), Water Ways (gr. 5) and Water Times (gr. 6)

Materials distributed to 7-12 students? Yes (Info Only)

Water Quality: The Qualities and Science of Water, Conservation Connection and Water Works: School to Career Curriculum

Annual budget for school education program: 450000.00

Description of all other water supplier education programs

An array of supplemental materials and activities that can be ordered from Metropolitan's Education Website: www.mwdh2o.com/education

BMP 2.2 School Education Programs

ON TRACK

Comments:

At Least As effective As	No	
Exemption	No	0

Appendix 9

METROPOLITAN'S ENERGY INTENSITY CALCULATIONS, INCLUDING CONVEYANCE AND DISTRIBUTION GENERATION

Appendix 9

METROPOLITAN'S ENERGY INTENSITY CALCULATIONS, INCLUDING CONVEYANCE AND DISTRIBUTION GENERATION

Introduction

The Metropolitan Water District of Southern California is a wholesale water agency that distributes water to its 26 Member Agencies. These agencies receive treated and untreated water through Metropolitan's 830 miles of interconnected pipelines. There are over 400 service connections to the 26 Member Agencies located throughout Metropolitan's 5200 square mile service area.

Water-Related Energy Use in California

Water supply by its nature is energy intensive, and it is widely reported that California's "Water Sector" uses 19 percent of the state's electricity and 32 percent of the state's natural gas not used for power generation. However, these facts are often misinterpreted by attributing the entire water-related energy use to urban water agencies such Metropolitan and the Department of Water Resources.

The original source for these figures is the California Energy Commission's 2005 "California's Water – Energy Relationship" report (CEC-700-2005-011-SF, Nov. 2005), which analyzed water-related energy use data for 2001. Based on the information in the report, approximately 3 percent of the electrical use is associated with urban water agency conveyance, treatment, and distribution. Of the remaining 16 percent, 0.8 percent is attributed to wastewater treatment, 4.2 percent is associated with agricultural use, and 11 percent is due to urban end uses – including the heating and cooling of water by customers. For non-power plant natural gas, over 99 percent of use is attributed to urban end uses, while 0.14 percent is used for urban water supply. Table A.9-1 presents the water related energy use in California and is adapted from the 2005 CEC report.

The 3 percent of electricity associated with urban water supply represents the "embedded energy" in water, whereas the 11 percent of electricity and 31 percent of natural gas attributed to end uses represent a direct use of energy by consumers.

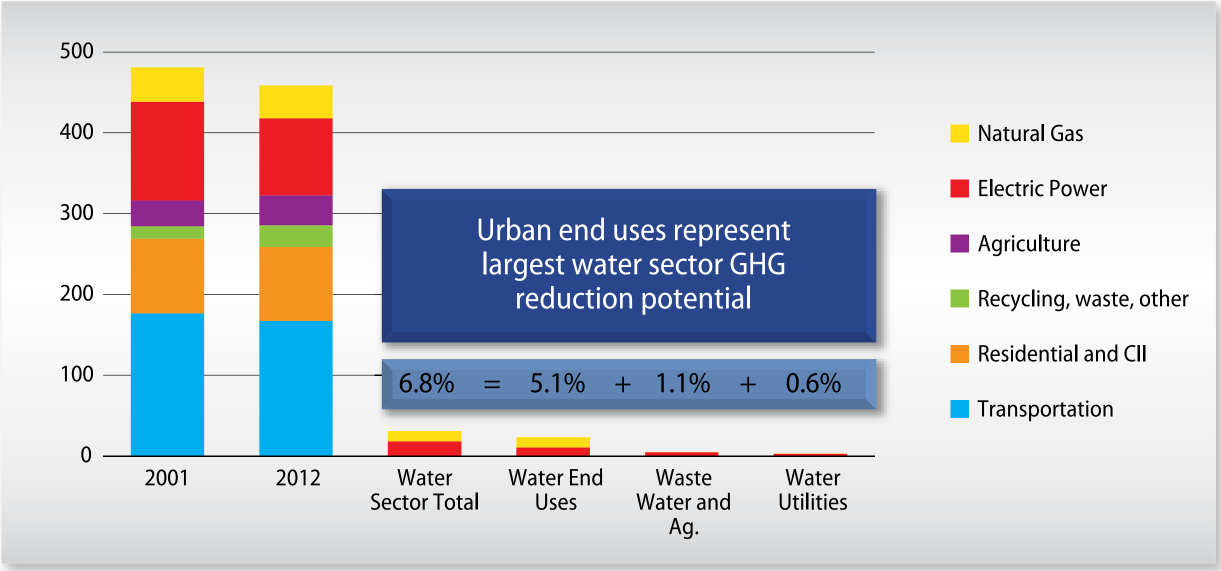
This distinction is essential for state policy issues currently under consideration related to energy use and GHG emissions in the water sector. When the results from the CEC study are compared to California's overall GHG emissions from all sectors, it becomes clear that the greatest potential for reducing water-related GHG emissions lies with consumer end uses. Figure A-9.1 shows that while the water sector contributes about 6.8 percent of the State's measured GHG emissions, water utilities contribute just 0.6% of the total. By comparison, water end uses – again, including the heating and cooling of water – account for 5.1 percent.

Table A.9-1
Water Related Energy Use in California

	Electricity (Gigawatt-hour)	Natural Gas (Million Therms)
Urban Water Supply	**7,554**	**19**
Waste Water Treatment	2,012	27
Urban End Users	27,887	4,220
Agricultural Total	10,560	18
Total Water Sector Use	**48,013**	**4,284**
Total California Use	**250,494**	**13,571**
Urban Water Supply	**3.0%**	**0.1%**
Waste Water Treatment	0.8%	0.2%
Urban End Users	11.1%	31.1%
Agricultural Total	4.2%	0.1%
Total Water Sector Use	**19.2%**	**31.6%**

Energy has always been a key factor in the development of California's water supply infrastructure. Most water projects in the state are designed to minimize energy use and maximize energy recovery. In response to California's GHG emission goals, Metropolitan and many other water utilities are proactively taking steps to reduce water-related energy use. This includes increasing energy recovery in conveyance and distribution systems, developing renewable energy projects, performing energy studies, auditing facility energy usage, and other related actions. Additionally, the conservation programs administered by Metropolitan and the member agencies save embedded energy, as well as the energy associated with consumer end uses.

Figure A.9-1 Greenhouse Gas Emissions in California Metric Tonnes of CO_2 Equivalent



Note: Based on the Air Resources Board GHG inventory from 2000 to 2012 data; http://www.arb.ca.gov/cc/inventory/data/tables/ghg_inventory_scopingplan_00-12_2014-03-24.pdf; Percentages for the water sector are based on CEC's 2005 Energy Intensity Report: CEC-700-2005-011-SF, Nov. 2005

Voluntary Energy Use Reporting

SB 1036 (Pavley 2014) added Section 10631.2 to the Water Code, which states that water agencies may voluntarily provide information on estimated energy usage in their Urban Water Management Plans. This Appendix explains how Metropolitan will provide that information. Due to the mixing of water supplies before and after treatment, and the large number of service connections, Metropolitan will provide system-wide Energy Intensity values. In addition, it should be noted that as water supply, water quality, and operational conditions change, including Member Agencies' demands, the annual values for energy use and energy intensity will vary from year to year.

Metropolitan's Energy Intensity for the water it provides to its Member Agencies is broken down into the following functions:

- Source
- Conveyance
- Treatment
- Distribution
- Storage

Source

The water Metropolitan receives comes from two sources; (1) the California Department of Water Resources' (DWR) State Water Project (SWP), and (2) the Colorado River. The water flows naturally into these sources and does not require energy for extraction or diversion. Therefore, there is no energy used to extract or divert water from these sources.

Conveyance

To estimate the amount of energy used to convey water supplies to Metropolitan's water treatment plants and distribution system, the energy requirements from the two conveyance systems supplying Metropolitan's water have been combined, along with the volume of water delivered, into a single weighted energy intensity value for conveyance. As the blend of water from the SWP and the Colorado River changes each year due to availability, water quality, and demands, the total energy consumption and energy intensity for the conveyance function vary year to year.

State Water Project

Metropolitan is a contractor for water from DWR's SWP. The SWP uses a combination of natural and man-made systems to move water from Lake Oroville on the Feather River in northern California, through the Sacramento/San Joaquin River Delta (Delta), and into the California Aqueduct for delivery to central and southern California. DWR conveys water through the California Aqueduct using a series of pumps and hydro generators. Metropolitan receives water from DWR through the West Branch of the California Aqueduct at Castaic Lake and from the East Branch of the California Aqueduct at several locations in San Bernardino and Riverside Counties.

The California Aqueduct's net Energy Intensity for the water received from the West Branch is 2,580 kWh/AF and for the East branch it is 3,236 kWh/AF. These values are the nominal pumping requirements of the SWP pumps (Banks, Dos Amigos, Buena Vista, Wheeler Ridge, Wind Gap, Edmonston, Oso, and Pear Blossom) less the nominal generation values from the West and East Branch recovery generating plants (Warne, Castaic, Alamo, Mojave, and Devil Canyon). These values do not incorporate any pumping or generating at the San Luis Gianelli Plant.

The SWP also produces power at its Hyatt/Thermalito complex (HTC) near Lake Oroville and the Feather River in northern California. DWR releases water from Lake Oroville that flows through the HTC hydro generators and produces power for the SWP. Given water operations in the Delta and interactions between the Central Valley Project and the SWP, there is not a direct link from HTC power generation and SWP deliveries; however, the contractors for State Project water, including Metropolitan, pay for the HTC based on their share of the SWP's Variable Operation, Maintenance, Power and Replacement (OMP&R) Component of the Transportation Charge. To determine the benefit Metropolitan receives from the HTC generation in calculating the Energy Intensity of SWP conveyance, this same OMP&R share (percentage) has been used with the total generation from the HTC. From 2004 through 2013, Metropolitan's share of the HTC costs has ranged from 60.2% to 74.3%. A multi-year average percentage has been used to reduce the year-to-year volatility of this factor.

The SWP contract has specific provisions on how and when to account for various water deliveries and the associated costs. This will result in differences between the SWP billing values and the amount of water delivered to Metropolitan from the SWP.

Colorado River

Metropolitan conveys water from the Colorado River through its Colorado River Aqueduct (CRA). The water is pumped through five pumping plants to reach Metropolitan's service area. The nominal Energy Intensity of water conveyed through the CRA is 2000 kWh/AF.

There are no recovery generating plants along the CRA, however, the water that Metropolitan pumps from the Colorado River has been released from Lake Mead through the Hoover Dam generators. Metropolitan receives 28.5% of the energy produced at Hoover. This energy is used exclusively to power the CRA pumps. The production rate (kWh/AF) is dependent on several factors, including the elevation of Lake Mead. The USBR updates this value monthly. Metropolitan has used its share of the energy produced at Hoover from its water releases in the calculation of the CRA conveyance energy requirement. This calculation utilizes the volume of water delivered into Metropolitan's service territory.

2013 Conveyance Total:	Energy used	3,627,553,292 kWh
	Water Delivered	1,945,801 AF
	Energy Intensity	1,864 kWh/AF

2014 Conveyance Total:	Energy used	3,448,714,628 kWh
	Water Delivered	1,768,121 AF
	Energy Intensity	1,951 kWh/AF

Treatment

Metropolitan has five treatment plants to provide potable water to its Member Agencies. The estimated amount of energy used to treat water supplies has been calculated by dividing the annual amount of energy consumed at the plant sites by the amount of water treated.

2013 Treatment Total:	Energy used	46,914,223 kWh
	Water Treated	1,072,870 AF
	Energy Intensity	44 kWh/AF

2014 Treatment Total:	Energy used	46,695,775 kWh
	Water Treated	1,016,046 AF
	Energy Intensity	46 kWh/AF

Distribution

Due to the high elevation at which Metropolitan receives water from the SWP and CRA, very little pumping (and electricity use) is needed to distribute treated and untreated water to its Member Agencies. Instead, gravity, not electricity, is primarily used to deliver water supplies through Metropolitan's distribution system.

In addition, Metropolitan has 16 recovery hydroelectric generating plants in its distribution system that produce greater amounts of power than is consumed from distribution pumping. These generators are on distribution pipelines located throughout Metropolitan's service area. The generators produce electricity from the water flowing through the pipelines. Without the hydrogenerators, the energy in the water would be reduced at facilities called pressure control structures and the potential for greenhouse gas free electricity lost. The energy used in the pumping plants and produced by the generators has been netted, with the result divided by the water delivered to the Member Agencies to calculate the distribution Energy Intensity.

2013 Distribution Total:	Energy used	-239,069,895 kWh (net generation)
	Water Delivered	1,959,867
	Energy Intensity	-122 kWh/AF
2014 Distribution Total:	Energy used	-118,895,649 kWh (net generation)
	Water Delivered	2,015,911 AF
	Energy Intensity	-59 kWh/AF

Storage

Metropolitan does not use any energy for its internal storage programs. Water is delivered by gravity flow. External water storage and recovery is managed by other parties and is often transacted through exchange arrangements. Any water delivered to Metropolitan from storage programs would be accounted for in the conveyance deliveries. Therefore, there is no energy used for placing water into storage.

Metropolitan's Annual Energy and Energy Intensity

Energy and Energy Intensity values are provided for each of the non-zero functions listed above: Conveyance; Treatment; and Distribution. As noted previously, these values vary from year to year due to operational changes and differences in source use due to changes in water supply availability and other factors. An estimated overall Energy Intensity is provided for untreated water deliveries and treated water deliveries.

2013

Estimated Delivered Untreated Water Energy Intensity:	1,742 kWh/AF
Estimated Delivered Treated Water Energy Intensity:	1,786 kWh/AF

2014

Estimated Delivered Untreated Water Energy Intensity:	1,892 kWh/AF
Estimated Delivered Treated Water Energy Intensity:	1,938 kWh/AF

Water Energy Tables

Provided in Tables A.9-2 and A.9-3 are the Water Energy Tables for CY 2013 and 2014 using the Water Supply Process Approach in Table O-1A from the 2015 UWMP Guidebook Appendix O.

Table A.9-2 (Table O-1A for Year 2013): Water Supply Process Approach

Reporting Date: **CY 2013**	**Urban Water Wholesale Supplies** **Includes SWP Embedded Energy and Non-Consequential Generation**							
	Water Management Process						Non-Consequential	
	Extract	**Storage**	**Conveyance[1]**	**Treatment**	**Distribution**	**Total**	**Hydro**	**Net**
Volume (AF)	-	-	1,945,801	1,072,870	1,959,867	-	[2]	[2]
Energy (kWh)	-	-	3,627,553,292	46,914,223	-239,069,895	-	[2]	[2]
Energy Intensity	-	-	**1,864**	**44**	**-122**	-	-	-
Treated Energy Intensity (kWh/AF)						**1,786**	-	-
Untreated Energy Intensity (kWh/AF)						**1,742**	-	-

Non Hydropower Self Generated Energy

Metropolitan generated 2,239,621 kWh at its Skinner treatment plant solar facility in CY2013.

Data Quality Narative

[1] Includes SWP deliveries of 973,943 AF at 2,780,057,816 kWhs

[2] Conveyance accounts for hydropower genergation from Hyatt Thermalito Complex at 976,000,000 kWhs, and Hoover Dam generation at 119,770,224 kWhs

Narative

See above section on Voluntary Energy Reporting.

Table A.9-3 (Table O-1A for Year 2014): Water Supply Process Approach

Reporting Date: **CY 2014**	**Urban Water Wholesaler:** **MWD Operational Control (Includes SWP Embedded Energy and Non-Consequential Generation)**							
	Water Management Process						Non-Consequential	
	Extract	**Storage**	**Conveyance[3]**	**Treatment**	**Distribution**	**Total**	**Hydro**	**Net**
Volume (AF)	-	-	1,768,121	1,016,046	2,015,911	-	[4]	[4]
Energy (kWh)	-	-	3,448,714,628	46,695,775	-118,895,649	-	[4]	[4]
Energy Intensity	-	-	**1,951**	**46**	**-59**	-	-	-
Treated Energy Intensity (kWh/AF)						**1,938**	-	-
Untreated Energy Intensity (kWh/AF)						**1,892**	-	-

Non Hydropower Self Generated Energy

Metropolitan generated 2,330,246 kWh at its Skinner treatment plant solar facility in CY2014.

Data Quality Narative

[3] Includes SWP deliveries of 607,344 AF at 1,683,268,784 kWhs

[4] Conveyance accounts for hydropower genergation from Hyatt Thermalito Complex at 423,752,000 kWhs, and Hoover Dam generation at 132,339,396 kWhs

Narative

See above section on Voluntary Energy Reporting.

Appendix 10

DWR's STANDARDIZED TABLES

Appendix 10
DWR's STANDARDIZED TABLES

In fulfillment of CA Water Code § 10621(d) and § 10644(a)(1) and (2), Metropolitan's Final 2015 UWMP was electronically submitted to the State of California through DWR's the WUE data website https://wuedata.water.ca.gov/secure/ in June 2016. This appendix contains the mandatory DWR tables that were uploaded to the WUE data website.

Table 2-2: Plan Identification

<table>
<tr><th>Select Only One</th><th colspan="2">Type of Plan</th><th>Name of RUWMP or Regional Alliance
<i>if applicable</i>
<i>drop down list</i></th></tr>
<tr><td>☑</td><td colspan="3">Individual UWMP</td></tr>
<tr><td></td><td>☐</td><td>Water Supplier is also a member of a RUWMP</td><td></td></tr>
<tr><td></td><td>☐</td><td>Water Supplier is also a member of a Regional Alliance</td><td></td></tr>
<tr><td>☐</td><td colspan="2">Regional Urban Water Management Plan (RUWMP)</td><td></td></tr>
<tr><td colspan="4">NOTES:</td></tr>
</table>

Table 2-3: Agency Identification	
Type of Agency (select one or both)	
☑	Agency is a wholesaler
☐	Agency is a retailer
Fiscal or Calendar Year (select one)	
☑	UWMP Tables Are in Calendar Years
☐	UWMP Tables Are in Fiscal Years
If Using Fiscal Years Provide Month and Date that the Fiscal Year Begins (mm/dd)	
Units of Measure Used in UWMP (select from Drop down)	
Unit	AF
NOTES:	

Table 2-4 Wholesale: Water Supplier Information Exchange (select one)	
☑	Supplier has informed more than 10 other water suppliers of water supplies available in accordance with CWC 10631. Completion of the table below is optional. If not completed include a list of the water suppliers that were informed.
2015 UWMP Section 5 Table 5-3	**Provide page number for location of the list.**
☐	Supplier has informed 10 or fewer other water suppliers of water supplies available in accordance with CWC 10631. **Complete the table below.**
Water Supplier Name *(Add additional rows as needed)*	
NOTES: See 2015 UWMP Sections 2 and 5 for discussion on Metropolitan's planning coordination, outreach, and notification (list provided in Table 5-3).	

Table 3-1 Wholesale: Population - Current and Projected						
Population Served	2015	2020	2025	2030	2035	2040*(opt)*
	18,740,000	19,355,000	20,017,000	20,639,000	21,206,000	21,791,000

NOTES: See 2015 UWMP Appendix 1 Table A.1-2.

Table 4-1 Wholesale: Demands for Potable and Raw Water - Actual			
Use Type *(Add additional rows as needed)*	2015 Actual		
Drop down list *May select each use multiple times* *These are the only use types that will be recognized by the WUE data online submittal tool*	Additional Description *(as needed)*	Level of Treatment When Delivered *Drop down list*	Volume
Sales to other agencies		Drinking Water	815,431
Sales to other agencies		Raw Water	944,248
Losses			44,049
		TOTAL	1,803,728

NOTES: Sales to other agecies include Metropolitan deliveries to member and non-member agencies and deliveries from conjunctive use programs. Some of these deliveries are not revenue producing nor sales.
Losses include evaporation losses from storage reservoirs, distribution system losses (2014 estimate), and water within Metropolitan's distribution system and regulating reservoirs. Water losses are both drinking and raw water.

Table 4-2 Wholesale: Demands for Potable and Raw Water - Projected

Use Type *(Add additional rows as needed)*	Additional Description *(as needed)*	Projected Water Use *Report To the Extent that Records are Available*				
Drop down list *May select each use multiple times* *These are the only Use Types that will be recognized by the WUEdata online submittal tool.*		2020	2025	2030	2035	2040 *(opt)*
Other		1,586,000	1,636,000	1,677,000	1,726,000	1,765,000
Transfers to other agencies		274,000	282,000	282,000	282,000	282,000
	TOTAL	1,860,000	1,918,000	1,959,000	2,008,000	2,047,000

NOTES: See 2015 UWMP detailed discussion in Section 2, Metropolitan's Regional Water Demands Table 2-3 for Average Year, and Supply Capability and Projected Demands Table 2-6 for Average Year (average of 1922-2012 hydrologies).

Table 4-3 Wholesale: Total Water Demands

	2015	2020	2025	2030	2035	2040*(opt)*
Potable and Raw Water *From Tables 4-1 and 4-2*	1,803,728	1,860,000	1,918,000	1,959,000	2,008,000	2,047,000
Recycled Water Demand* *From Table 6-4*	0	0	0	0	0	0
TOTAL WATER DEMAND	1,803,728	1,860,000	1,918,000	1,959,000	2,008,000	2,047,000

**Recycled water demand fields will be blank until Table 6-4 is complete.*

NOTES:

Table 4-4 Wholesale: 12 Month Water Loss Audit Reporting

Reporting Period Start Date (mm/yyyy)	Volume of Water Loss*
01/2014	6,409 AF

** Taken from the field "Water Losses" (a combination of apparent losses and real losses) from the AWWA worksheet.*

NOTES: See 2015 UWMP discussions in Section 2.6 and Appendix 7, and summary of 2014 distribution system losses in Table A.7-1.

Table 6-1 Wholesale: Groundwater Volume Pumped

☑	Supplier does not pump groundwater. The supplier will not complete the table below.					
Groundwater Type *Drop Down List* *May use each category multiple times*	Location or Basin Name	2011	2012	2013	2014	2015
	TOTAL	0	0	0	0	0

NOTES:

Table 6-3 Wholesale: Wastewater Treatment and Discharge Within Service Area in 2015

☑	Wholesale supplier neither distributes nor provides supplemental treatment to recycled water. The supplier will not complete the table below.									
Wastewater Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Wastewater Discharge ID Number *(optional)*	Method of Disposal *Drop down list*	Does This Plant Treat Wastewater Generated Outside the Service Area?	Treatment Level *Drop down list*	2015 volumes			
							Wastewater Treated	Discharged Treated Wastewater	Recycled Within Service Area	Recycled Outside of Service Area
Add additional rows as needed										
						Total	0	0	0	0

NOTES:

Table 6-4 Wholesale: Current and Projected Retailers Provided Recycled Water Within Service Area

☑	Recycled water is not directly treated or distributed by the supplier. The supplier will not complete the table below.						
Name of Receiving Supplier or Direct Use by Wholesaler	Level of Treatment *Drop down list*	2015	2020	2025	2030	2035	2040 *(opt)*
Add additional rows as needed							
	Total	0	0	0	0	0	0

NOTES:

Table 6-5 Wholesale: 2010 UWMP Recycled Water Use Projection Compared to 2015 Actual		
☑	Recycled water was not used or distributed by the supplier in 2010, nor projected for use or distribution in 2015. The wholesale supplier will not complete the table below.	
Name of Receiving Supplier or Direct Use by Wholesaler	2010 Projection for 2015	2015 actual use
Add additional rows as needed		
Total	0	0
NOTES: The 2010 RUWMP Table 2-8 included projection for recycled water use in 2015 of 404 TAF under average hydrology. In 2015, the actual recycled water use (regional total within Metropolitan service area) is estimated at 414 TAF, as discussed in this 2015 UWMP Section 3.5 on Table 3-12, page 3-62, and Appendix 2, page A.2-8. Regional total represents the projected production of existing and underconstruction projects by Metropolitan member agencies. Additional recycled production may materialize from the local resources target under Metropolitan's IRP (see 2015 IRP Update Section 2.1).		

Table 6-7 Wholesale: Expected Future Water Supply Projects or Programs						
☐	No expected future water supply projects or programs that provide a quantifiable increase to the agency's water supply. Supplier will not complete the table below.					
☑	Some or all of the supplier's future water supply projects or programs are not compatible with this table and are described in a narrative format.					
2015 UWMP Section 3 and Appendix 3	Provide page location of narrative in the UWMP					
Name of Future Projects or Programs	Joint Project with other agencies?		Description *(if needed)*	Planned Implementation Year	Planned for Use in Year Type *Drop Down list*	Expected Increase in Water Supply to Agency
	Drop Down Menu	*If Yes, Agency Name*				
Add additional rows as needed						
NOTES: See 2015 UWMP Section 3 description of resources and program development for the CRA, SWP, Central Valley/SWP storage and transfers programs, conservation, LRP (groundwater recovery, recycling, desalination), and groundwater. Also see Appendix 3 detailed discussion on all supply programs and justifications for supply projections.						

Table 6-8 Wholesale: Water Supplies — Actual

Water Supply	Additional Detail on Water Supply	2015		
Drop down list *May use each category multiple times.These are the only water supply categories that will be recognized by the WUEdata online submittal tool*		Actual Volume	Water Quality *Drop Down List*	Total Right or Safe Yield *(optional)*
Add additional rows as needed				
Purchased or Imported Water		1,318,925	Raw Water	
Supply from Storage		317,289	Raw Water	
Transfers		17,514	Raw Water	
Exchanges		150,000	Raw Water	
	Total	1,803,728		0
NOTES:				

Table 6-9 Wholesale: Water Supplies — Projected

Water Supply	Additional Detail on Water Supply	**Projected Water Supply** *Report To the Extent Practicable*									
		2020		2025		2030		2035		2040 *(opt)*	
Drop down list *May use each category multiple times. These are the only water supply categories that will be recognized by the WUEdata online submittal tool*		Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*
Add additional rows as needed											
Other		3,511,000		3,650,000		4,044,000		4,216,000		4,292,000	
	Total	3,511,000	0	3,650,000	0	4,044,000	0	4,216,000	0	4,292,000	0
NOTES: See 2015 UWMP detailed discussion in Section 2 and Supply Capability and Projected Demands Table 2-6 for Average Year (average of 1922-2012 hydrologies).											

Table 7-1 Wholesale: Basis of Water Year Data

Year Type	**Base Year** *If not using a calendar year, type in the last year of the fiscal or water year, for example, water year 1999-2000, use 2000*	**Available Supplies if Year Type Repeats**	
		☑ Quantification of available supplies is not compatible with this table and is provided elsewhere in the UWMP. Location: 2015 UWMP Section 2 Tables 2-4, 2-5, 2-6, and Appendix 3.	
		☐ Quantification of available supplies is provided in this table as either volume only, percent only, or both.	
		Volume Available	**% of Average Supply**
Average Year	1922-2012		100%
Single-Dry Year	1977		
Multiple-Dry Years 1st Year	1990		
Multiple-Dry Years 2nd Year	1991		
Multiple-Dry Years 3rd Year	1992		
Multiple-Dry Years 4th Year *Optional*			
Multiple-Dry Years 5th Year *Optional*			
Multiple-Dry Years 6th Year *Optional*			

Agency may use multiple versions of Table 7-1 if different water sources have different base years and the supplier chooses to report the base years for each water source separately. If an agency uses multiple versions of Table 7-1, in the "Note" section of each table, state that multiple versions of Table 7-1 are being used and identify the particular water source that is being reported in each table.

NOTES: See 2015 UWMP Section 2.3 discussion of sources of supply and water supply reliability assessment under average year, single-dry year, and multiple-dry year hydrologies (summarized in Tables 2-4, 2-5, and 2-6). Also see Appendix 3 for a detailed discussion on all supply programs and justifications for supply projections.

Table 7-2 Wholesale: Normal Year Supply and Demand Comparison

	2020	2025	2030	2035	2040 *(Opt)*
Supply totals *(autofill from Table 6-9)*	3,511,000	3,650,000	4,044,000	4,216,000	4,292,000
Demand totals *(autofill fm Table 4-3)*	1,860,000	1,918,000	1,959,000	2,008,000	2,047,000
Difference	1,651,000	1,732,000	2,085,000	2,208,000	2,245,000

NOTES: See 2015 UWMP detailed discussion in Section 2 and Supply Capabilities in Table 2-6 for Average Year hydrology.

Table 7-3 Wholesale: Single Dry Year Supply and Demand Comparison

	2020	2025	2030	2035	2040 (Opt)
Supply totals	2,647,000	2,786,000	3,091,000	3,263,000	3,339,000
Demand totals	2,005,000	2,066,000	2,108,000	2,160,000	2,201,000
Difference	642,000	720,000	983,000	1,103,000	1,138,000

NOTES: See 2015 UWMP detailed discussion in Section 2 and Supply Capabilities in Table 2-4 for Single Dry-Year condition (repeat of 1977 hydrology).

Table 7-4 Wholesale: Multiple Dry Years Supply and Demand Comparison

		2020	2025	2030	2035	2040 (Opt)
First year	Supply totals	2,146,000	2,234,000	2,394,000	2,487,000	2,546,000
	Demand totals	2,001,000	2,118,000	2,171,000	2,216,000	2,258,000
	Difference	145,000	116,000	223,000	271,000	288,000
Second year	Supply totals	2,146,000	2,234,000	2,394,000	2,487,000	2,546,000
	Demand totals	2,001,000	2,118,000	2,171,000	2,216,000	2,258,000
	Difference	145,000	116,000	223,000	271,000	288,000
Third year	Supply totals	2,146,000	2,234,000	2,394,000	2,487,000	2,546,000
	Demand totals	2,001,000	2,118,000	2,171,000	2,216,000	2,258,000
	Difference	145,000	116,000	223,000	271,000	288,000
Fourth year *(optional)*	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
Fifth year *(optional)*	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
Sixth year *(optional)*	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0

NOTES: See 2015 UWMP detailed discussion in Section 2 and Supply Capabilities in Table 2-5 for Multiple Dry-Year condition (repeat of 1990-1992 hydrology).

Table 8-1 Wholesale Stages of Water Shortage Contingency Plan		
Stage	Complete Both	
	Supply Reduction[1]	Water Supply Condition *(Narrative description)*
Add additional rows as needed		
Baseline Water Use Efficiency	Long-term conservation	Ongoing conservation, outreach, and recycling programs to achieve permanent reductions in water use and build storage reserves.
Condition 1: Water Supply Watch	Variable	Local agency voluntary dry-year conservation measures and use of regional storage reserves.
Condition 2: Water Supply Alert	Variable	Regional call for cities, counties, member agencies and retail water agencies to implement extraordinary conservation through drought ordinances and other measures to mitigate use of storage reserves.
Condition 3: Water Supply Allocation	5% - 50%	Implement Metropolitan's Water Supply Allocation Plan.

[1] *One stage in the Water Shortage Contingency Plan must address a water shortage of 50%.*

NOTES: See 2015 UWMP Section 2.4 discussion on Water Shortage Contingency Analysis, Water Surplus and Drought Management Plan, Water Supply Allocation Plan, and Water Supply Condition Framework (specifically Table 2-7).
As part of Catastrophic Supply Interruption Planning in Section 2.5, Metropolitan's Emergency Storage Requirements discuss planning based on a 100% reduction in imported supplies for a period of 6 months, which is greater than the 50% shortage required by the Act. In addition, the WSAP (included in Appendix 4) includes a Level 10 Regional Shortage Level that addresses regional shortage percentage of 50%.

Table 8-4 Wholesale: Minimum Supply Next Three Years

	2016	2017	2018
Available Water Supply	1,935,371	1,636,530	1,798,633

NOTES: See 2015 UWMP Section 1 discussion of Metropolitan's Short-term Supply Outlook and Supply Capability summarized in Table 1-7.

Table 10-1 Wholesale: Notification to Cities and Counties (select one)

☑	Supplier has notified more than 10 cities or counties in accordance with CWC 10621 (b) and 10642. **Completion of the table below is not required. Provide a separate list of the cities and counties that were notified.**	
2015 UWMP Section 5 Table 5-3	Provide the page or location of this list in the UWMP.	
☐	Supplier has notified 10 or fewer cities or counties. **Complete the table below.**	
City Name	60 Day Notice	Notice of Public Hearing
Add additional rows as needed		
	☐	☐
	☐	☐
	☐	☐
County Name *Drop Down List*	60 Day Notice	Notice of Public Hearing
Add additional rows as needed		
	☐	☐
	☐	☐
NOTES: See 2015 UWMP Section 5 discussion on Metropolitan's notification to cities and counties (list provided in Table 5-3).		