


Los Angeles Department of Water & Power

URBAN WATER
MANAGEMENT PLAN

2015

RESOLUTION NO. 016 285

WHEREAS, the California Urban Water Management Planning Act requires California water suppliers to prepare and adopt an Urban Water Management Plan every five years that describes their historical and future efforts in the area of water resource planning and supply; and

WHEREAS, the Los Angeles Department of Water and Power (LADWP) has prepared an update to the City of Los Angeles' Urban Water Management Plan (UWMP) pursuant to applicable provisions of Sections 10610 through 10656 of the California Water Code; and

WHEREAS, the UWMP is required as a condition of application eligibility for various water system grant and loan funding opportunities administered by the State of California; and

WHEREAS, LADWP selects Method 3 of the four methods developed by the California Department of Water Resources for calculating the 2020 water use target and 2015 interim target in the UWMP as required in the California Water Conservation Act of 2009, Senate Bill X7-7; and

WHEREAS, LADWP's current water rates include funding for the local supply programs described in the UWMP; and

WHEREAS, the UWMP has incorporated the Mayors Sustainable City pLAn goals to achieve up to 25 percent reduction in gallons per capita per day (gpcd) by 2035, 50 percent reduction of imported purchase water by 2025, and expand all local sources of water so that they account for at least 50 percent of the total supply by 2035; and

WHEREAS, the UWMP identifies current and planned supplies to meet all demands over the 25 year planning period under average, single-dry, and multi-dry year hydrology; and

WHEREAS, the UWMP identifies phases or actions to respond with up to 50 percent reduction in water supply as described in the City's Emergency Water Conservation Plan; and

WHEREAS, the development of the UWMP involved public meeting notices, public involvement, and incorporated oral and written public comments prior to final adoption; and

WHEREAS, the final UWMP must be adopted by the LADWP's Board of Water and Power Commissioners and submitted to the California Department of Water Resources by July 1, 2016.

NOW, THEREFORE, BE IT RESOLVED, that the City of Los Angeles Department of Water and Power's 2015 Urban Water Management Plan is hereby adopted; and

BE IT FURTHER RESOLVED that the President or Vice President, or the General Manager, or such person as the General Manager shall designate in writing, and the Secretary, Assistant Secretary, or the Acting Secretary of the Board are hereby authorized and directed to execute said plan on behalf of LADWP.

I HEREBY CERTIFY that the foregoing is a full, true, and correct copy of a Resolution adopted by the Board of Water and Power Commissioners of the City of Los Angeles at its meeting held JUN 07 2016

Barbara E. Moschos

Secretary

APPROVED AS TO FORM AND LEGALITY
MICHAEL N. FEUER, CITY ATTORNEY

APR 27 2016

BY

DAVID EDWARDS
DEPUTY CITY ATTORNEY

Urban Water Management Plan

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Note: The 2015 Urban Water Management Plan for the Los Angeles Department of Water and Power (LADWP) is available to the public at the Los Angeles City Public Library, County of Los Angeles Public Library, West Hollywood Library, Culver City Library, California State Library, and the LADWP website at www.ladwp.com/uwmp

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Glossary of Abbreviations and Terms

Agencies

AVEK	Antelope Valley-East Kern Water Agency
AWWA	American Water Works Association
BOE	City of Los Angeles Department of Public Works, Bureau of Engineering
LASAN	City of Los Angeles Department of Public Works, Bureau of Sanitation
Caltrans	California Department of Transportation
CBWRP	Central Basin Water Rights Panel
CDFG	California Department of Fish and Game
CDPH	California Department of Public Health
CITY	City of Los Angeles
CRB	Colorado River Board of California
CUWCC	California Urban Water Conservation Council
CVWD	Coachella Valley Water District
DDW	State Water Resources Control Board Division of Drinking Water
DOE	U.S. Department of Energy
DOF	California Department of Finance
DTSC	California Department of Toxic Substance Control
DWA	Desert Water Agency
DWR	California Department of Water Resources
GBUAPCD	Great Basin Unified Air Pollution Control District
GSAs	Groundwater Sustainability Agencies
IAPMO	International Association of Plumbing and Mechanical Officials
IID	Imperial Irrigation District
KERN-DELTA	Kern Delta Water District
LACDPH	Los Angeles County Department of Public Health
LACDPW	Los Angeles County Department of Public Works
LACFCD	Los Angeles County Flood Control District
LADBS	Los Angeles Department of Building and Safety
LADWP	Los Angeles Department of Water and Power
LARWQCB	Los Angeles Regional Water Quality Control Board
LBWD	Long Beach Water Department
MWD	Metropolitan Water District of Southern California

NWRI	National Water Research Institute
OVC	Owens Valley Committee
PG&E	Pacific Gas and Electric
PVID	Palo Verde Irrigation District
RWAG	Recycled Water Advisory Group
RWQCB	Regional Water Quality Control Board
SCAG	Southern California Association of Governments
SDCWA	San Diego County Water Authority
SLC	California State Lands Commission
SRCSD	Sacramento Regional County Sanitation District
SWRCB	State Water Resources Control Board
SWSD	Semitropic Water Storage District
UCLA	University of California, Los Angeles
USBR	United States Bureau of Reclamation
USEPA	United States Environmental Protection Agency
WBMWD	West Basin Municipal Water District
WRD	Water Replenishment District

Facilities and Locations

AVGB	Antelope Valley Groundwater Basin
AWPF	Advanced Water Purification Facility
AWTF	Advanced Water Treatment Facility
BAY-DELTA	San Francisco Bay and Sacramento-San Joaquin River Delta
BOU	Burbank Operable Unit
BWRP	Burbank Water Reclamation Plant
CRA	Colorado River Aqueduct
DCTWRP	Donald C. Tillman Water Reclamation Plant
ECLWRF	Edward C. Little Water Recycling Facility
EOC	Emergency Operations Center
HWRP	Hyperion Water Reclamation Plant
JWPCP	Joint Water Pollution Control Plant
LAA	Los Angeles Aqueducts (First and Second)
LAAFP	Los Angeles Aqueduct Filtration Plant
LAGWRP	Los Angeles/Glendale Water Reclamation Plant
LAWA	Los Angeles World Airports
LVMWD	Las Virgenes Municipal Water District
NHOU	North Hollywood Operable Unit
NTPS	Neenach Temporary Pumping Station
RWMP	Recycled Water Master Plan
SFB	San Fernando Basin
SWP	State Water Project
TIWRP	Terminal Island Water Reclamation Plant
TWRP	Tapia Water Reclamation Plant

ULARA	Upper Los Angeles River Area

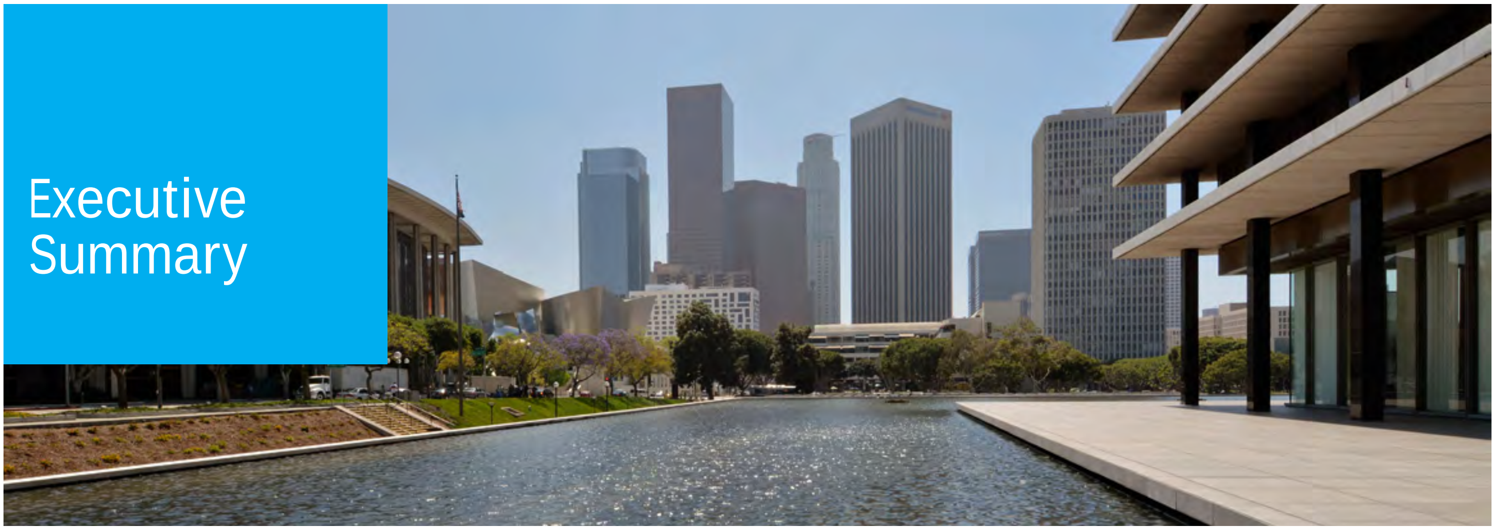
Measurements and Miscellaneous

AOP	Advanced Oxidation Process
ARRP	American Recovery and Reinvestment Act
AB	Assembly Bill
ACT	Urban Water Management Planning Act
AF	Acre-Feet
AFY	Acre-Feet Per Year
BDCP	Bay Delta Conservation Plan
BMP	Best Management Practices
BOARD	Board of Water and Power Commissioners
BOD	Biochemical Oxygen Demand
CAP	Central Arizona Project
CBO	Community-Based Organizations
CEQA	California Environmental Quality Act
CFS	Cubic Feet Per Second
CII	Commercial/Industrial/Institutional
CMIP	Coupled Model Intercomparison Project
COC	Cycles of Concentration
COCs	Chemicals of Concern
CRSS	Colorado River Simulation System
CVP	Central Valley Project
CWC	California Water Code
DBP	Disinfection Byproduct
DPR	Direct Potable Reuse
ED5	Mayor's Executive Directive 5
EIR	Environmental Impact Report
EO	Executive Order
ERP	Emergency Response Plan
ESA	California Endangered Species Act
ETAF	Evapotranspiration Adjustment Factor
ETo	Evapotranspiration Rate
ETWU	Estimated Total Water Use
EWMP	Enhanced Watershed Management Program
FLAA	First Los Angeles Aqueduct
Forum	Colorado River Basin Salinity Control Forum
FTC	Flow To City
FY	Fiscal Year (July to June)
FYE	Fiscal Year Ending
GAC	Granular Activated Carbon
GCM	Global Climate Models
GDAP	Groundwater Development and Augmentation Plan

GHG	Greenhouse Gases
GLAC	Greater Los Angeles County
GPCD	Gallons Per Capita Per Day
GPD	Gallons Per Day
GPF	Gallons Per Flush
GPM	Gallons Per Minute
GSIS	Groundwater System Improvement Study
GSPs	Groundwater Sustainability Plans
GWAM	Groundwater Augmentation Model
GWR	Groundwater Replenishment
HCSM	Hydrogeologic Conceptual Site Model
HEIP	High Energy Improvement Program
HET	High Efficiency Toilets
HSPF	Hydrologic Simulation Program-Fortran
IAP	Independent Advisory Panel
IPCC	Intergovernmental Panel on Climate Change
IPR	Indirect Potable Reuse
IRP	Integrated Resources Plan
IRWMP	Integrated Regional Water Management Plan
KWh/AF	Kilowatt-Hour per Acre-Foot
LAASM	Los Angeles Aqueduct Simulation Model
LID	Low Impact Development
LORP	Lower Owens River Project
LRP	Local Resources Program
LSPC	Load Simulation Program
M&I	Municipal and Industrial
MAF	Million Acre-Feet
MAWA	Maximum Applied Water Allowance
MCL	Maximum Contaminant Level
MF/RO	Microfiltration/Reverse Osmosis
MGD	Million Gallons Per Day
MOU	Memorandum of Understanding
MS4	Municipal Separate Storm Sewer System
MWIP	Manhattan Wellfield Improvement Project
MWELO	Model Water Efficient Landscape Ordinance
NDMA	N-nitrosodimethlamine
NdN	Nitrification/Denitrification
NPDES	National Pollutant Discharge Elimination System
NPR	Non-Potable Water Reuse
PCE	Perchloroethylene
pLAn	LA's Sustainable City Plan
PPB	Parts Per Billion
PPCPs	Pharmaceuticals and Personal Care Products
PPM	Parts Per Million

QSA	Quantification Settlement Agreement
RFP	Request for Proposal
RI	Remedial Investigation
RCP	Representative Concentration Pathway
RO	Reverse Osmosis
RTP	Southern California Association of Governments Regional Transportation Plan
RWMP	Recycled Water Master Plan
RWL	Receiving Water Limitations
RY	Runoff Year (April to March)
S2DBPR	Stage 2 Disinfection Byproducts Rule
SB	Senate Bills
SEF	Stream Ecosystem Flow
SGMA	Sustainable Groundwater Management Act
SIP	State Implementation Plan
SLAA	Second Los Angeles Aqueduct
SCMP	Stormwater Capture Master Plan
SGM	Sustainable Groundwater Management
SGFs	Sewer Generation Factors
SWAT	Irrigation Association Smart Water Application Technologies
SWE	Snow Water Equivalent
TAF	Thousand Acre-Feet
TAP	Technical Assistance Program
TCE	Trichloroethylene
TDMLs	Total Maximum Daily Loads
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TSS	Total Suspended Solids
TwB2	Tillage with Best Available Control Measure Backup
ULF	Ultra-Low Flush
UV	Ultra-Violet
UWMP	Urban Water Management Plan
VIC	Variable Infiltration Capacity
VOCs	Volatile Organic Compounds
WAS	Los Angeles Basin Water Augmentation Study
WBICs	Weather-Based Irrigation Controllers
WCPS	Water Conservation Potential Study
WCRP	World Climate Research Program
WMP	Watershed Management Program
WSDMP	Water Supply Drought Management Plan
WQBELs	Water Quality Based Effluent Limits
WQCMPUR	Water Quality Compliance Master Plan for Urban Runoff
WRR	Water Recycling Requirements
WSA	Water Supply Assessment
WSAP	Metropolitan Water District's Water Supply Allocation Plan

WSDM	Water Surplus and Drought Management Plan
WSS	Water Sense Specification
WY	Water Year (October to September)
20x2020	Reduce Per Capita Water Use by 20 Percent by 2020; Senate Bill x7-7



Executive Summary

ES-1 Overview and Purpose of Plan

In 1902, the City of Los Angeles (City) created a municipal water system by acquiring title to all properties of a private water company. In 1925, the Los Angeles Department of Water and Power (LADWP) was established by a new city charter. The availability of water has been essential to the economic development of the City, growing from a town with a population of approximately 146,000 in 1902 to the nation's second largest city with nearly 4 million people. As the largest municipal utility in the nation, LADWP delivers safe and reliable water service to over 675,000 active service connections.

Overview of Water Issues and Challenges

Faced with increasing demands for additional water supplies and drought conditions, LADWP and other water agencies in Southern California are addressing the challenge of providing a reliable water supply to a growing population. LADWP has a long history of working to ensure that its customers have reliable water. Since the completion of the prior Urban Water Management Plan (UWMP), the water supply situation has changed dramatically. Front and center is a multi-year drought that has precipitated several sustainability initiatives at the state level and within the City. These actions include calls to decrease water use by up to 25% per capita over the next 20 years, reduce dependence on imported water supplies, and accelerate the development of local supplies. Plans outlined herein are not only designed to ensure future water reliability for Los Angeles, but also comply with these sustainability policies and initiatives.

LADWP Responses

LADWP plans to address current and future drought conditions and the relevant State and City initiatives with the following responses:

- Achieving significant advances in water conservation, stormwater capture, and water recycling to increase supply reliability, reduce imported water purchases, and increase locally produced water.
- Remediating the contamination of the San Fernando Groundwater Basin.
- Ensuring continued reliability of the water supplies from the Metropolitan Water District of Southern California (MWD) through active representation on the MWD Board.
- Maintaining operational integrity of the Los Angeles Aqueduct and the City's water distribution systems.
- Meeting or exceeding all federal and state standards for drinking water quality.

Purpose of Plan

The California Urban Water Management Planning Act (Act-effective January 1, 1984) requires that every urban water supplier prepare and adopt an UWMP every five years. The main objective of producing these plans is to confirm that cities are performing the advance planning necessary to provide reliable water service in the future. Specifically, the UWMP forecasts future water demands and water supplies under average and dry year conditions; identifies future water supply projects such as recycled water; provides a summary of water conservation Best Management Practices (BMPs); and provides a single and multi-dry year management strategy.

The LADWP's 2015 UWMP presents the basic policy principles that guide LADWP's decision-making process to secure a sustainable water supply for Los Angeles. The UWMP serves two purposes:

- It is a master plan for water supply and resources management consistent with the City's goals and policy objectives; and
- It provides full compliance with the requirements of the ACT.

Specific Policy Responses to a Multi-Year Drought

A number of important changes have occurred since LADWP prepared its 2010 UWMP:

- The year 2012 marked the start of the current multi-year drought, resulting in Governor Brown proclaiming a drought state of emergency in 2014;
- In July 2014, the State Water Resources Control Board (SWRCB) implemented its Emergency Water Conservation Regulation (Emergency Regulation) as directed by Governor Brown to take actions to reduce water use by 20 percent Statewide;
- In October 2014, Mayor Eric Garcetti issued Executive Directive No. 5 (ED5) Emergency Drought Response which set goals to reduce per capita water use, reduce purchases of imported potable water by 50%, and create an integrated water strategy to increase local supplies and improve water security considering climate change and seismic vulnerability;
- In March 2015, the Emergency Regulation was expanded requiring urban water supplies to implement their water shortage contingency plans to a level equivalent to a 20 percent water use reduction;
- In April 2015, Sustainable City pLAn was released establishing short-term and long-term targets for the City over the next 20 years in 14 categories to strengthen and promote sustainability of the environment, economy, and equity in Los Angeles. A multi-faceted approach to developing a locally sustainable water supply was developed through pLAn calling for short-term, mid-term, and long-term goals reducing reliance on imported water, reducing per capita water use through conservation, and increasing local water supply availability;
- In May 2015, as the drought worsened, Emergency Regulation was further amended to mandate conservation targets for urban water suppliers to achieve a mandatory 25 percent water use reduction statewide from June 2015 through February 2016;
- In February 2016, the requirements of the May 2015 Emergency Regulation was extended to October 2016 with adjustments to account for climate affecting different parts of the state, growth experienced by urban areas, and significant investments that have been made to create new, local, drought-resilient sources of potable water supply.

Changes to the UWMP Act Since 2010

New requirements have been added to UWMP Act since completion of the 2010 UWMP, including:

- Extension of the submittal from December 31, 2015 to July 1, 2016;
- A requirement for a narrative description of water demand measures implemented over the past five years and future measures planned to meet 20 percent demand reduction targets by 2020;
- Implementation of a standard methodology for calculating system water loss;
- Mandatory electronic filing of UWMPs;
- Voluntary reporting of passive conservation savings, energy intensity, and climate change; and
- Requirement to analyze and define water features that are artificially supplied with water.

ES-2 Existing Water Supplies

Primary sources of water for the LADWP service area are the Los Angeles Aqueducts (LAA), local groundwater, State Water Project (supplied by MWD), and Colorado River Aqueduct (supplied by MWD). Exhibit ES-A indicates the general location of these supplies. An additional water source, recycled water, is becoming a larger part of the overall supply portfolio. Water supplies from the LAA, State Water Project, and Colorado River Aqueduct are classified as imported because they are obtained from outside LADWP's service area.

Many of LADWP's traditional water sources are being negatively impacted by climate extremes, environmental regulations, and groundwater basin contamination. These issues, and the appropriate responses, are explicitly addressed in this UWMP, including plans to reduce dependence on purchased imported water from MWD. However, it is important to note that it is in LADWP's best interest to protect all of its existing water supplies. Pressure on one supply resource, such as the recent minimal snowfall in the Eastern Sierra Nevada Mountains affecting the LAA supply, means that other supplies must make up the difference, for example groundwater and/or purchased water from MWD.

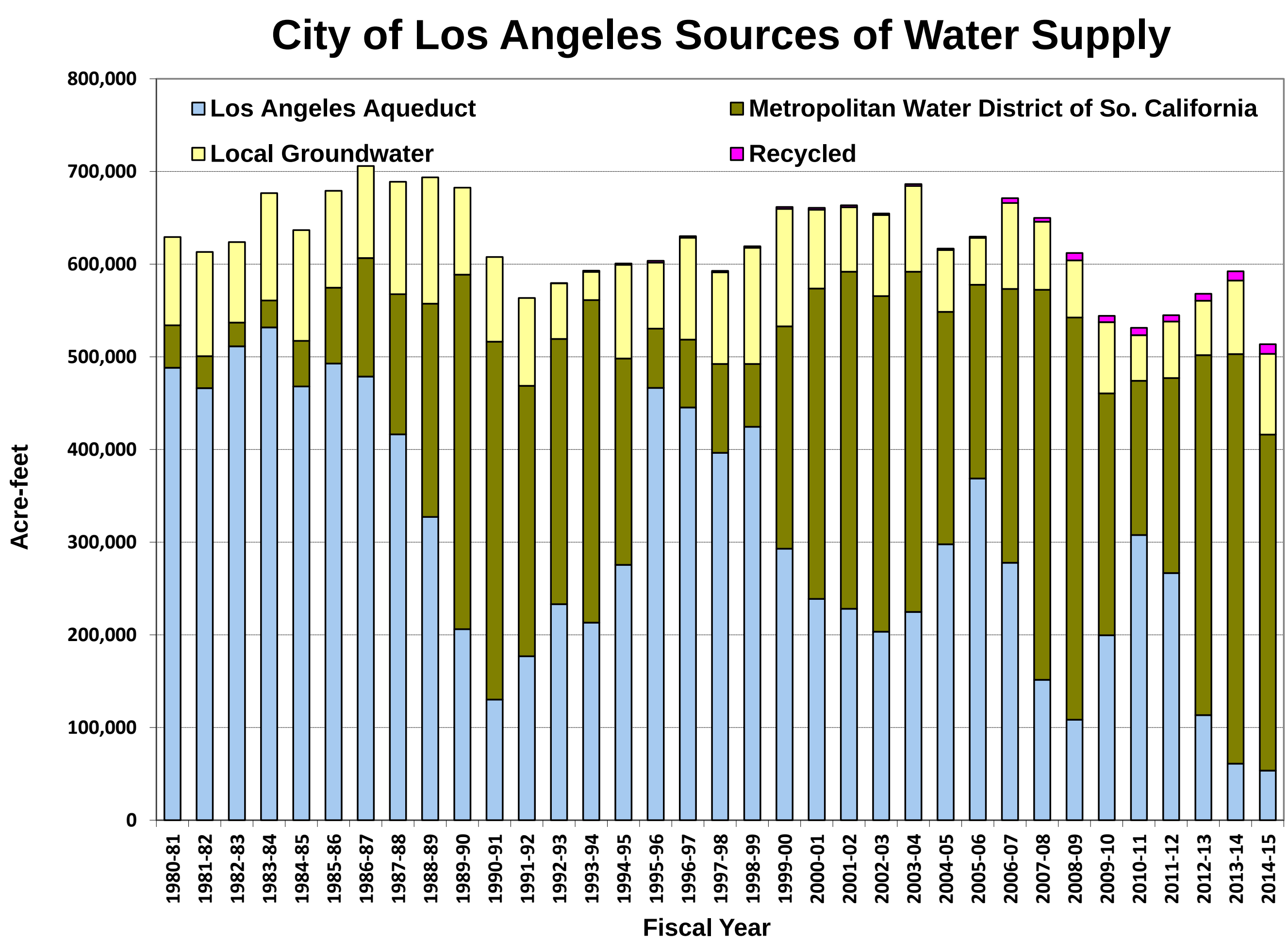
Exhibit ES-A
Main Sources of LADWP's Water Supply

Exhibit ES-B summarizes the historical water supplies from 1980 to 2015. Over the last ten years, demands have undergone a drastic reduction from a peak of 670,970 Acre Feet per Year (AFY) in Fiscal Year (FY) 2006/07. This is because several periods of drought have precipitated increased conservation. Most recently, the multi-year drought beginning in 2012 caused diminished supplies from the LAA, leading to heavy reliance on purchased MWD water. This drove conservation efforts that resulted in a 22 percent reduction in demand in 2014/15, as compared to 2006/07. Reliance on MWD reached a peak in FY 13/14 as a result of limitations on the LAA supply.

Recycled Water

As early as 1960, the City recognized the potential for water recycling and began investing in infrastructure that produces water of tertiary quality, a much higher treatment standard than normal wastewater treatment. In 1979, LADWP began delivering recycled water to the Department of Recreation and Parks for irrigation of various areas in Griffith Park. Today LADWP serves approximately 48 locations in the City with recycled water for irrigation, industrial, and environmental uses. There are approximately 200 customer service accounts. Total recycled water produced for FY 2014/15 was 36,738 AFY. All recycled water used within the

Exhibit ES-B
LADWP Historical Water Supply from FY 1980/81 to 2014/15



City undergoes, at a minimum, tertiary treatment and disinfection. This water is designed to meet the needs of the application, and meets or exceeds local and state requirements designed to ensure public safety.

Los Angeles Aqueduct

Since its construction in the early 1900's, the LAA has provided the vast majority of water for the City. Annual LAA deliveries are dependent on snowfall in the Eastern Sierra Nevada Mountains. Years with abundant snowpack result in larger water deliveries from the LAA, and typically reduced purchases of supplemental water from MWD. Conversely, low LAA deliveries in dry years increase the amount of water LADWP must purchase from MWD. The impact to LAA water supplies due to varying hydrology in the Eastern Sierra Nevada is exacerbated by requirements to release water for environmental enhancement projects in the Mono Basin and Owens Valley.

The cyclical nature of this hydrology in the Eastern Sierra Nevada Mountains is demonstrated by LAA deliveries over the last fifteen years. This period was characterized by a series of wet years, followed by a series of dry years that have extended into the current drought period. The current drought that began in 2012 has impacted the entire State of California. LAA deliveries reached a record low of 53,500 AF during FY 2014/15. From FY 2010/11 through 2014/15, LAA deliveries supplied an average of 29 percent of the City's water needs, which is substantially lower than long-term average. In the last decade, the City has been required to reallocate approximately 182,000 AFY of LAA water supply to environmental mitigation and enhancement projects leaving approximately 43 percent of the supply available for export to the City. Complying with environmental requirements, coupled with the drought, has led to increased dependence on imported water from MWD. This increased dependence has reinforced the need for LADWP to accelerate development of local supplies.

Local Groundwater

A key water supply for the City is local groundwater, the primary resource being the San Fernando Groundwater Basin. Groundwater basins are tremendous water reliability assets. They store water in wet years through natural replenishment, and can provide water utilities the opportunity to store additional water using purified recycled water, or by proactively increasing stormwater capture. The ability to store water is the key to water reliability in the Southwest, and stored groundwater can be used during dry years when others supplies are less available.

Over the last five years groundwater has provided approximately 12 percent of the total water supply for Los Angeles, and since 1970 has provided up to 23 percent of supply during extended dry periods. Unfortunately, groundwater contamination has impacted LADWP's ability to fully utilize its entitlements, especially over the last 10 years. Furthermore, expanding urbanization, increasing impervious hardscape, and channelization of stormwater runoff have reduced natural replenishment. Aging well fields and distribution infrastructure have also inhibited the full utilization of the City's groundwater resources.

In response to these issues, LADWP has renewed its focus on protecting and rehabilitating its local groundwater basins, including expanding the remediation efforts for the San Fernando Basin (SFB). LADWP continues to invest in stormwater recharge projects by enhancing and enlarging existing stormwater capture facilities. LADWP is also investing in advanced treatment systems to produce purified recycled water for groundwater replenishment, often referred to as indirect potable reuse. These investments will augment the City's groundwater and help ensure that basin water levels remain sustainable for the foreseeable future.

MWD Supply

As a wholesaler, MWD sells water to 26 member agencies in Southern California. LADWP is exclusively a retailer, selling water to individual residents and businesses. LADWP typically purchases MWD water to make up the deficit between demand and the availability of other City supplies. As a percentage of the City's total water supply, purchases from MWD have historically varied from 4 percent in FY 1983/84 to 75 percent in FY 2013/14, with a 5-year average of 57 percent from FY 2010/11 to 2014/15. The City relies heavily on MWD in dry years. This reliance has increased in recent years as the LAA supply has been impacted by extended drought and increased demand for water to protect the environment in the Mono Basin and Owens Valley. However, by 2025 the Sustainable City pLAn calls for a reduction in dependence on purchased imported water by 50 percent from FY 2013/14 levels. Although LADWP plans to reduce this reliance on MWD, it has made significant investments to ensure that this important supplemental supply is available when the City's LAA supply is reduced during droughts.

ES-3 Water Demand Drivers and Forecasting

Water demands are driven by a number of factors:

- Demographics – population, number of single-family homes, and number of employees
- Socioeconomics – price of water, personal income, family size, economy, drought conservation effect, and passive water conservation
- Conservation – passive conservation from plumbing codes and landscape ordinances, passive conservation from behavioral changes, and active conservation from the City's various active conservation programs
- Weather – historical weather patterns including daily maximum temperature and precipitation
- Non-Revenue Water – the difference between total water consumption and billed water use

For the development of LADWP's 2015 UWMP, a new water demand forecast was prepared for the major categories of demand. This forecast will allow the City to better understand water-use trends and develop effective conservation programs.

Demographics and Economic Conditions

Nearly 4 million people reside in the LADWP service area, which is slightly larger than the legal boundary of the City of Los Angeles. LADWP provides water service outside the City's boundary to portions of West Hollywood, Culver City, Universal City, and small parts of the County of Los Angeles. The population within LADWP's service area increased from 2.97 million in 1980 to 3.99 million in 2015, an average annual growth rate of approximately 1 percent. The total number of housing units increased from 1.10 million in 1980 to 1.39 million in 2015, an average annual growth rate of 0.8 percent. During this time, average household size increased from 2.70 persons in 1980 to 2.77 persons in 2015. Employment grew by about 0.7 percent annually from 1980 to 1990, but declined from 1990 to 2010 as a result of two economic recessions. The first recession began in 1991 and was followed by a larger recession beginning in 2008. Only recently has employment begun to return to levels experienced in 1990. Overall, employment decreased by about 0.3 percent annually from 1990 to 2010, and between 2010 and 2015 increased by approximately 1.4 percent, reflecting the recovery from the 2008 recession.

Demographic projections were provided for the LADWP service area by MWD, who received the data from Southern California Association of Governments (SCAG). SCAG applied its 2012 Regional Transportation Plan demographic data to water service areas for MWD's member agencies. This data was used for water demand projections in the UWMP. Exhibit ES-C summarizes these demographic projections for the LADWP service area. Service area population is expected to continue to grow over the next 25 years at a rate of 0.5 percent annually. While this is substantially less than the historical 1.0 percent annual growth rate from 1980 to 2010, it will still lead to approximately 493,200 new residents over the next 25 years.

Mediterranean Climate

Weather in Los Angeles is considered mild, which is a major attribute that attracts businesses, residents, and tourists to the City. It also significantly impacts water demand, especially the need for irrigating landscapes. Because of its relative dryness, Los Angeles' climate has been characterized as Mediterranean. Exhibit ES-D provides a summary of average monthly rainfall, maximum temperatures, and evapotranspiration (Eto) readings.

Exhibit ES-C
Demographic Projections for the LADWP Service Area

Demographic	2020	2025	2030	2035	2040
Population	4,026,891	4,168,131	4,210,042	4,351,408	4,441,545
Housing					
Single-Family	650,746	635,348	652,379	675,540	682,412
Multi-Family	828,744	900,523	940,549	973,978	1,031,239
Total Housing	1,479,490	1,535,871	1,592,928	1,649,518	1,713,651
Persons per Household	2.66	2.66	2.59	2.58	2.54
Employment					
Commercial	1,704,864	1,749,994	1,788,566	1,807,774	1,869,383
Industrial	136,023	135,594	134,061	131,686	131,285
Total Employment	1,840,887	1,885,588	1,922,628	1,939,460	2,000,667

Source: SCAG Regional Transportation Plan (2012), modified to represent LADWP's service area.

Exhibit ES-D
Average Climate Data for Los Angeles

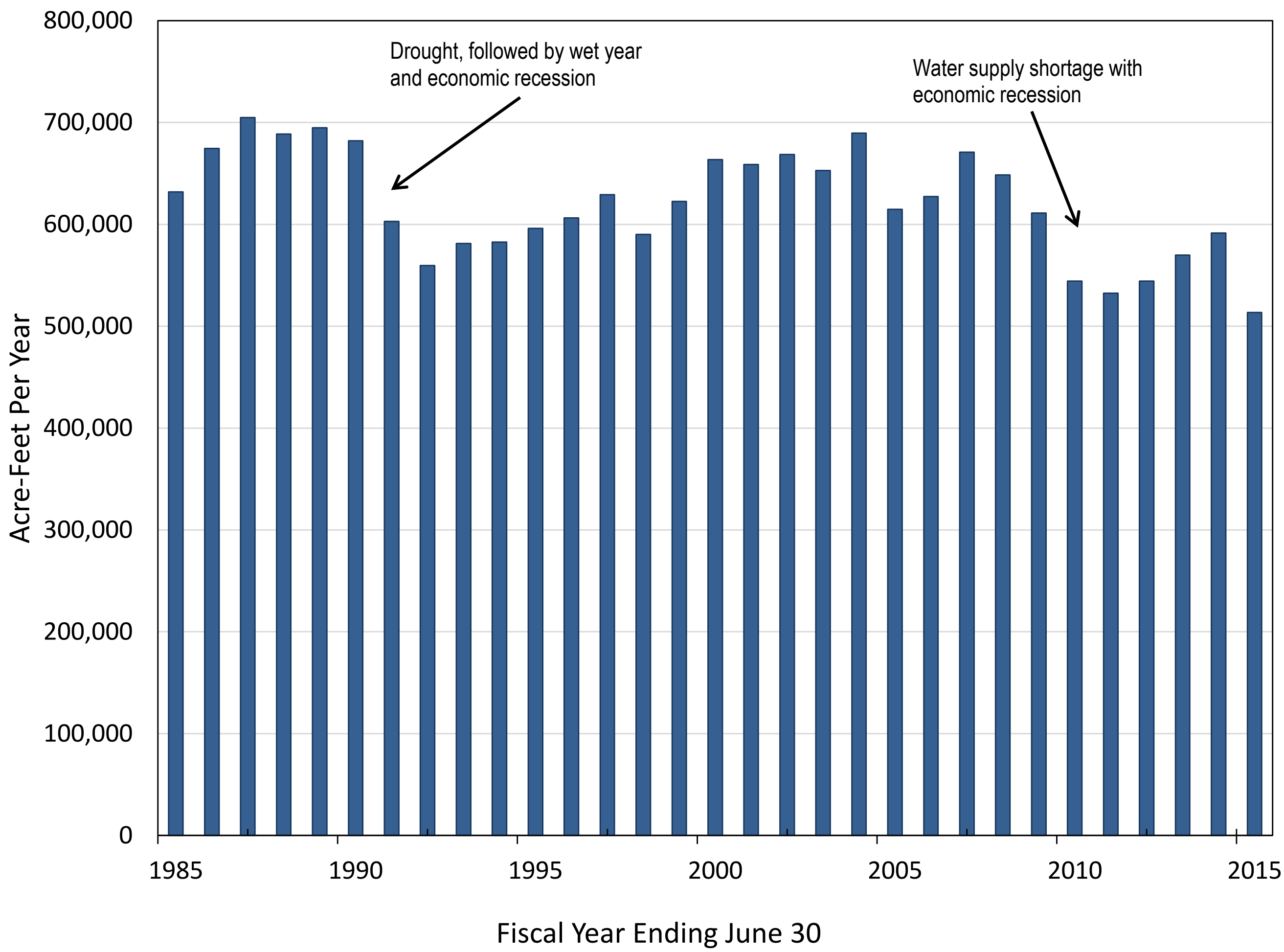
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Maximum Temperature (°F)[1]	69	68	70	73	75	78	83	84	84	79	73	68	75
Average Precipitation (inches)[1]	3.17	3.87	2.21	0.71	0.33	0.06	0.01	0.01	0.06	0.63	0.75	2.42	14.25
Average Eto (inches)[2,3]	2.03	2.26	3.53	4.27	4.96	5.24	5.89	5.60	4.53	3.25	2.17	1.74	45.47

1. 1990-2014, Los Angeles Downtown USC Weather Station, GHCND:USW00093134
2. Average of Glendale (Station Id. 133), Chatsworth (Station Id. 215), and Long Beach (Station Id. 174)
3. www.cimis.water.ca.gov

Historical Water Use

Exhibit ES-E presents the historical water demand for LADWP. Total water demand varies from year to year and is influenced by a number of factors including population growth, weather, water conservation, drought, and economic activity. In 2009, a 3-year water supply shortage coinciding with an economic recession required LADWP to impose mandatory conservation. Phase III water restrictions were put in place between June 2009 and August 2010. Following an ordinance amendment, Phase II implementation began on August 25, 2010 which allows outdoor watering three days per week. Starting in FY 2012/13 drought conditions returned, and the City experienced some of its driest weather on record. These conditions continued through FY 2014/15 and have triggered State and City mandatory conservation measures. As a result, FY 2014/15 water use decreased by 13 percent compared to FY 2013/14.

Exhibit ES-E
Historical Total Water Demand in LADWP's Service Area



Prior to 1990, population growth in Los Angeles was a good indicator of total water demand. From 1980 to 1990, population in the City grew at 1.7 percent annually. Water demand during this same period also grew at 1.7 percent annually. However, after 1991, LADWP began implementing water conservation measures. These conservation efforts over the last 25 years have been very successful, reducing overall demand to levels from the 1970's, despite the fact that over 1 million additional people now live in Los Angeles.

Analyzing Historical Water Use

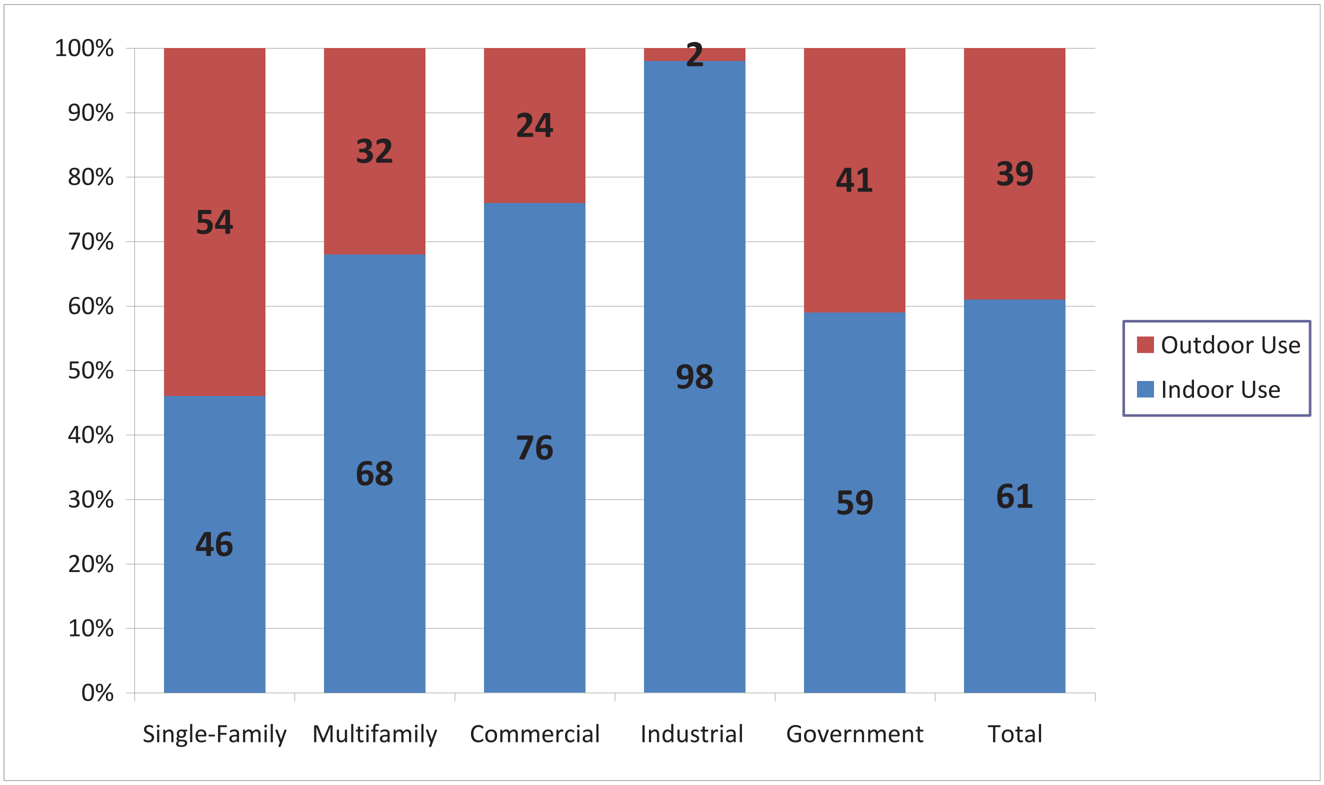
Exhibit ES-F shows the breakdown in average total water use by LADWP's major billing categories, including non-revenue water. Non-revenue water consists of unbilled but authorized consumption of water and water losses. Unbilled authorized consumption is water used for such things as firefighting and mainline flushing to improve water quality. Water losses are broken down into two categories: apparent losses and real losses. Apparent losses include meter inaccuracies and theft. Real losses come from system leakage. Historically, non-revenue water has averaged 5.9 percent of total water demand from FY 1990/91 through 2013/14. This consistently low percentage demonstrates that LADWP has an efficient, well-maintained water system. Although total water use has varied substantially from year to year, the breakdown in percentage of total demand among the major billing categories has been consistent.

Exhibit ES-F
Breakdown in Historical Water Demand for LADWP's Service Area

Fiscal Year Ending Average	Single-Family		Multi-Family		Commercial		Industrial		Government		Non-Revenue		Total
	AF	%	AF	%	AF	%	AF	%	AF	%	AF	%	AF
2011-2014	209,651	37%	165,364	29%	98,994	17%	17,663	3%	42,543	8%	32,774[1]	6%	566,990
2006-2010	236,154	38%	180,277	29%	106,964	17%	23,196	4%	42,956	7%	30,617	5%	620,165
2001-2005	239,754	37%	190,646	29%	109,685	17%	21,931	3%	41,888	6%	52,724	8%	656,628
1996-2000	222,748	36%	191,819	31%	111,051	18%	23,560	4%	39,421	6%	33,696	5%	622,295
1991-1995	197,322	34%	177,104	30%	110,724	19%	21,313	4%	38,426	7%	39,364	7%	584,253
24-Year Average	221,126	36%	181,042	30%	107,484	18%	21,533	4%	41,047	7%	39,100	6%	611,331

1. Calculated using AWWA Water Audit worksheet

Exhibit ES-G
Indoor and Outdoor Water Use in LADWP's Service Area



In order to assess the potential for water use efficiency and target conservation programs, it is important to characterize water use in terms of indoor and outdoor demands. As with most water utilities, LADWP does not have separate irrigation meters for most of its customers. LADWP conducted an analysis to determine indoor and outdoor water uses for its major billing categories. The analysis concluded that the City's total outdoor water use was approximately 39 percent of the total water use during the study period from 2004 to 2007 (see Exhibit ES-G).

Water Demand Forecast

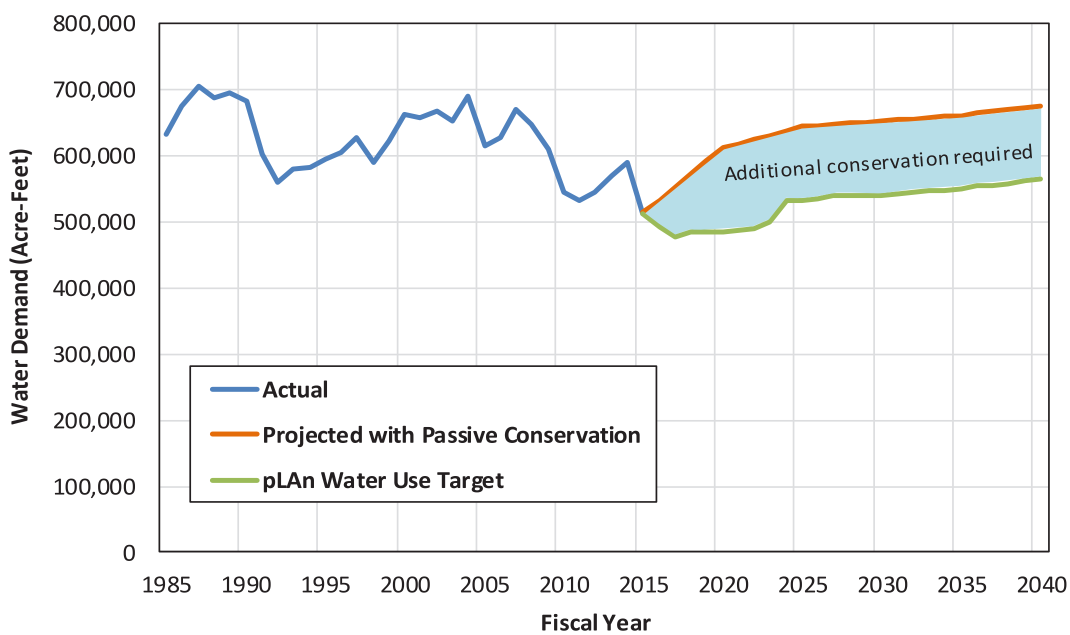
Based on historical demand and analyses, LADWP has developed a water demand forecast for each of its major categories of demand. This allows LADWP to better understand trends in water use, develop effective conservation programs, and invest appropriately in water supply development projects. The methodology used for the demand forecast is called a modified unit use approach. Exhibit ES-H presents the water demand forecast with passive water conservation savings incorporated from codes, ordinances, and conservation phases for each of the major categories of demand. The targeted water demands based on the water use reduction goals established in the Sustainable City pLAn are also listed for reference.

Exhibit ES-H
Water Demand Forecast with Passive Conservation Savings from Codes, Ordinances, and Conservation Phases for LADWP Service Area

Fiscal Year Ending	Water Demands by Sector (Acre-Feet)						
	Single-Family	Multi-Family	Commercial/ Government	Industrial	Non Revenue	Total	pLAn Target Use[1]
2020	222,958	184,679	148,600	18,869	36,709	611,815	485,600
2025	224,729	206,065	155,994	19,235	38,682	644,706	533,000
2030	226,770	211,454	156,788	18,701	39,173	652,886	540,100
2035	231,776	216,071	156,186	18,104	39,711	661,848	551,100
2040	231,767	225,994	159,554	17,829	40,541	675,685	565,600

[1] Targeted water demands set forth in the Mayor's Sustainable City pLAn

Exhibit ES-I
Comparing Water Demand Forecast with Passive Conservation to Water Use Targets in the pLAn



In the Sustainable City pLAn (pLAn), per capita water use targets refer to potable water demand. The pLAn Target Use shown in ES-H above reflects adding LADWP's planned recycled water supply to the pLAn's potable water demand target. This overall water demand target is compared to the water demand forecast with only code-base passive conservation to identify the additional conservation needed in the future (see Exhibit ES-I). Additional water conservation can come from increasing active conservation led by LADWP, as well as additional passive conservation. Passive conservation includes long-term behavioral changes in customer water use and compliance with codes and ordinances that mandate increased efficiency. LADWP is completing a comprehensive Water Conservation Potential Study that will identify remaining active and passive conservation opportunities. The results from this study will guide LADWP's future water conservation planning and program development.

Exhibit ES-J
Water Demand Variability from Historical Weather

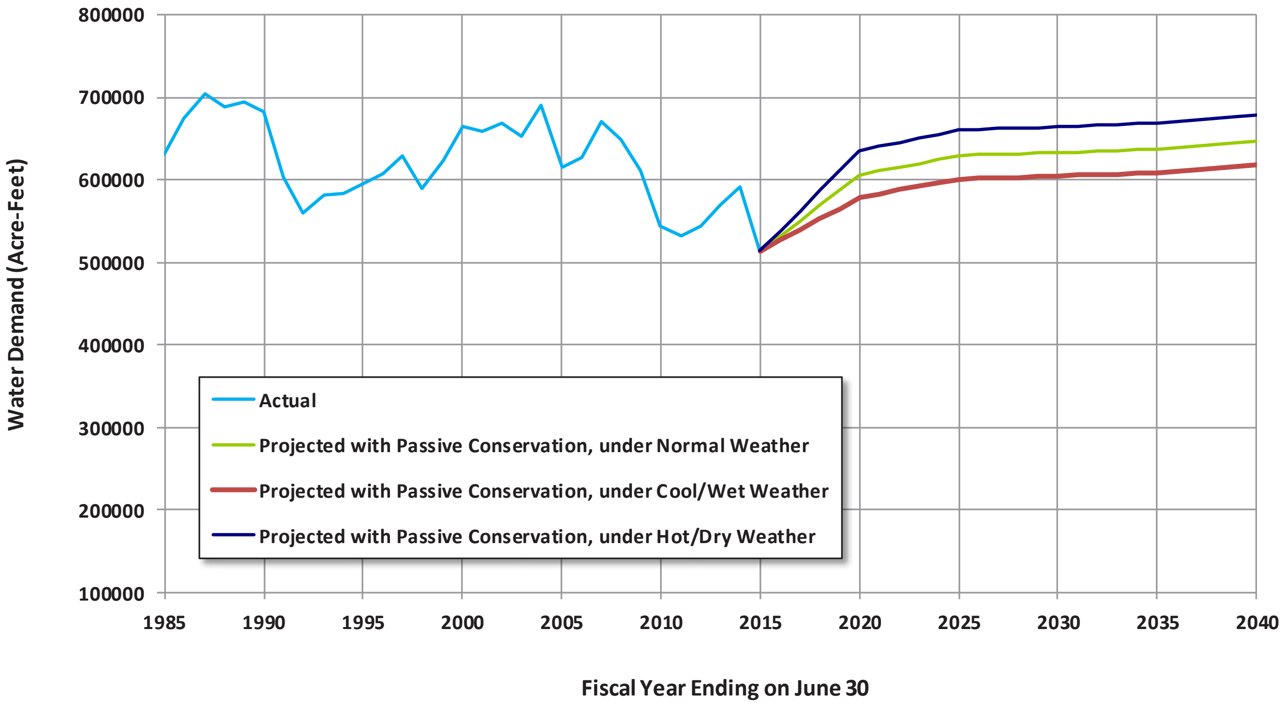


Exhibit ES-J shows that projected water demands can vary by approximately ± 5 percent in any given year due to weather variability. This means that water demands under cool/wet weather conditions could be as much as 5 percent lower than normal demands; while water demands under hot/dry conditions could be as much as 5 percent higher than normal demands.

ES-4 Water Conservation

Conservation has had a tremendous impact on Los Angeles' water use patterns and has become a permanent part of LADWP's water management philosophy. The City of Los Angeles has long recognized water conservation as the foundation for multiple strategies to improve water supply reliability. Through its investments in conservation, Los Angeles has become a national leader in water use efficiency. In the future, conservation will continue to be an important part of maintaining supply reliability and is a key component of ED5 and pLAn, which ultimately call for a 25 percent reduction in per capita water use by 2035 compared with 2013 levels.

Historical Conservation

The City's water usage is about the same as it was in the 1970s despite an increase in population of more than 1.1 million people. Exhibit ES-K shows both hardware and non-hardware conservation savings from FY 1990/91 through FY 2014/15, Hardware savings are achieved mainly through installation of conservation devices subsidized by rebates and incentives. Cumulative annual water savings since the inception of LADWP's subsidized hardware programs totals 118,034 AFY. Additional non-hardware water savings have been achieved through changes in customer behaviors and lifestyle.

Exhibit ES-K
Historical City of Los Angeles Conservation

Fiscal Year	Additional Annual Hardware Installed Savings (AF)	Cumulative Annual Hardware Savings (AF)	Annual Non-Hardware Savings (AF)	Annual Total Savings (AF)
Prior to 1990/1991	31,825	31,825		
1990/1991	4,091	35,916	76,350	112,266
1991/1992	8,670	44,586	105,593	150,179
1992/1993	3,286	47,872	58,546	106,418
1993/1994	4,961	52,832	60,928	113,760
1994/1995	4,041	56,873	62,084	118,957
1995/1996	4,642	61,516	52,648	114,164
1996/1997	2,376	63,892	33,720	97,612
1997/1998	2,637	66,529	30,434	96,963
1998/1999	2,781	69,310	38,305	107,615
1999/2000	3,532	72,842	80,909	153,751
2000/2001	3,078	75,920	79,527	155,447
2001/2002	2,452	78,371	95,428	173,799
2002/2003	2,630	81,002	94,463	175,465
2003/2004	3,257	84,259	84,023	168,282
2004/2005	3,299	87,558	114,428	201,986
2005/2006	2,404	89,963	118,574	208,537
2006/2007	2,095	92,058	116,922	208,980
2007/2008	782	92,840	110,628	203,468
2008/2009	3,127	95,967	149,567	245,534
2009/2010	4,269	100,236	183,080	283,316
2010/2011	2,495	102,731	185,640	288,371
2011/2012	1,993	104,724	183,852	288,576
2012/2013	2,122	106,846	187,444	294,290
2013/2014	3,977	110,823	189,689	300,512
2014/2015	7,211	118,034	272,721	390,755

Driven mainly by the drought beginning in 2008, residential customers have attained conservation levels exceeding 30 percent, measured during the period between FY 2006/07 and FY 2014/15. Furthermore, the City has updated its Emergency Water Conservation Plan Ordinance's enforceable water waste provisions and mandatory outdoor watering restrictions. The City has also implemented a restructured Water Rate Ordinance that promotes conservation through an expanded 4-tiers rate structure. As a direct result of conservation, imported water purchases from MWD are well below baseline allocations for FY 2014/15.

Water Conservation Goals

Conservation is the foundation for LADWP's water resource planning, and will continue to be over the long term. Water conservation reduces demand that typically rises over time with growth in population and commerce. Preventing these increases in demand improves water supply reliability, reduces costs, and for Los Angeles decreases reliance on purchased imported water from MWD. LADWP must meet multiple water conservation goals established in ED5, pLAn, and the Water Conservation Act of 2009.

ED5 and pLAn Goals

ED5 and pLAn stipulate water savings goals as follows:

- By 2017, reduce per capita potable water use by 20 percent;
- By 2025, reduce per capita potable water use by 22.5 percent; and
- By 2035, reduce per capita potable water use by 25 percent.

Achieving these goals will require an aggressive approach by LADWP, employing the following strategies:

- Investments in state-of-the-art technology
- Rebates and incentives promoting water-efficient appliances such as weather-based irrigation controllers (WBICs), efficient clothes washers, and waterless urinals
- Expansion and enforcement of prohibited water uses, including reductions in outdoor water use
- Extension of education and outreach efforts that encourage regional conservation.
- Tiered water pricing
- Technical Assistance Program (TAP) for business and industry
- Large landscape irrigation and efficiency programs

Water Conservation Act of 2009

The Water Conservation Act of 2009, Senate Bill x7-7, requires water agencies to reduce per capita water use by 20 percent by 2020 (20x2020). This includes potable water use reductions due to expanded use of recycled water. Water suppliers are required to set a water use target for 2020 and an interim target for 2015 using one of four methods. Requirements for each method are stipulated by the Department of Water Resources (DWR). The 2020 urban water use target may be updated in a supplier's 2015 UWMP. Failure to meet adopted targets puts a water supplier at risk of being ineligible for water grants or loans administered by the State. In 2015, urban retail water suppliers are required to report interim compliance followed by actual compliance in 2020. Exhibit ES-L provides LADWP's 20x2020 base and target data using DWR's Method 3. These targets are less stringent than those established in ED5 and pLAn.

Exhibit ES-L
20x2020 Base and Target Data Based on Method 3

20x2020 Required Data	Gallons Per Capita Per Day (GPCD)
Base Per Capita Daily Water Use	
10-Year Average[1]	154
5-Year Average[2]	152
2020 Target Using Method 3[3]	
95% of Hydrologic Region Target (149 gpcd)	142
95% Of Base Daily Capita Water Use 5-Year Average (152 gpcd)	144
2020 Target	142
2015 Interim Target	**148**
2015 Actual Use	**114**

1. Ten-year average based on fiscal year 1995/96 to 2004/05
2. Five-year average based on fiscal year 2003/04 to 2007/08
3. Methodology requires smaller of two results to be actual water use target to satisfy minimum water use target.

Existing Conservation Programs and Practices

LADWP is currently involved in many programs and employs multiple technologies to achieve its water conservation goals. These efforts are implemented in conjunction with State and local ordinances and plumbing code modifications. Specifically, these include:

- **State Laws and City Ordinances** - such as the Model Water Efficient Landscape Ordinance, installation of efficient fixtures, Plumbing Retrofit on Resale Ordinance, and Emergency Water Conservation Plan Ordinance;

- **Conservation Pricing** – use of four tier water rates for single-dwelling-unit residential customers, which promotes conservation while recovering higher cost of providing water to high users;

- **California Urban Water Conservation Council (CUWCC) Best Management Practices BMPs** – As a signatory to the CUWCC's Memorandum of Understanding (MOU), LADWP must complete a biennial report detailing progress in implementing the BMPs specified in the MOU;

- **Public Outreach** – including education in schools, public service announcements, and training seminars;

- **Rebate Programs** – participation in MWD's SoCal Water$mart Program for single-family and multi-family residences, and CII customers ; and implementation of LADWP in-house and partnership programs.

Water Conservation Potential Study

LADWP's Water Conservation Potential Study (WCPS) will help prioritize future water conservation investments. The WCPS has identified initial conservation potential for the LADWP service area, that includes a cost-effective strategy to maximize water savings. Final results of the WCPS will play an important role in LADWP's plans to meet both the State 20x2020 requirements and the City's more aggressive conservation targets in ED5 and pLAn.

ES-5 Future Water Supplies

LADWP's commitment is to provide a highly reliable water supply by implementing cost-effective conservation, recycled water, and stormwater capture programs, ultimately meeting the targets established in ED5 and pLAn. In addition, LADWP is also pursuing water to replace a portion of the LAA water used for environmental mitigation in the Eastern Sierra Nevada.

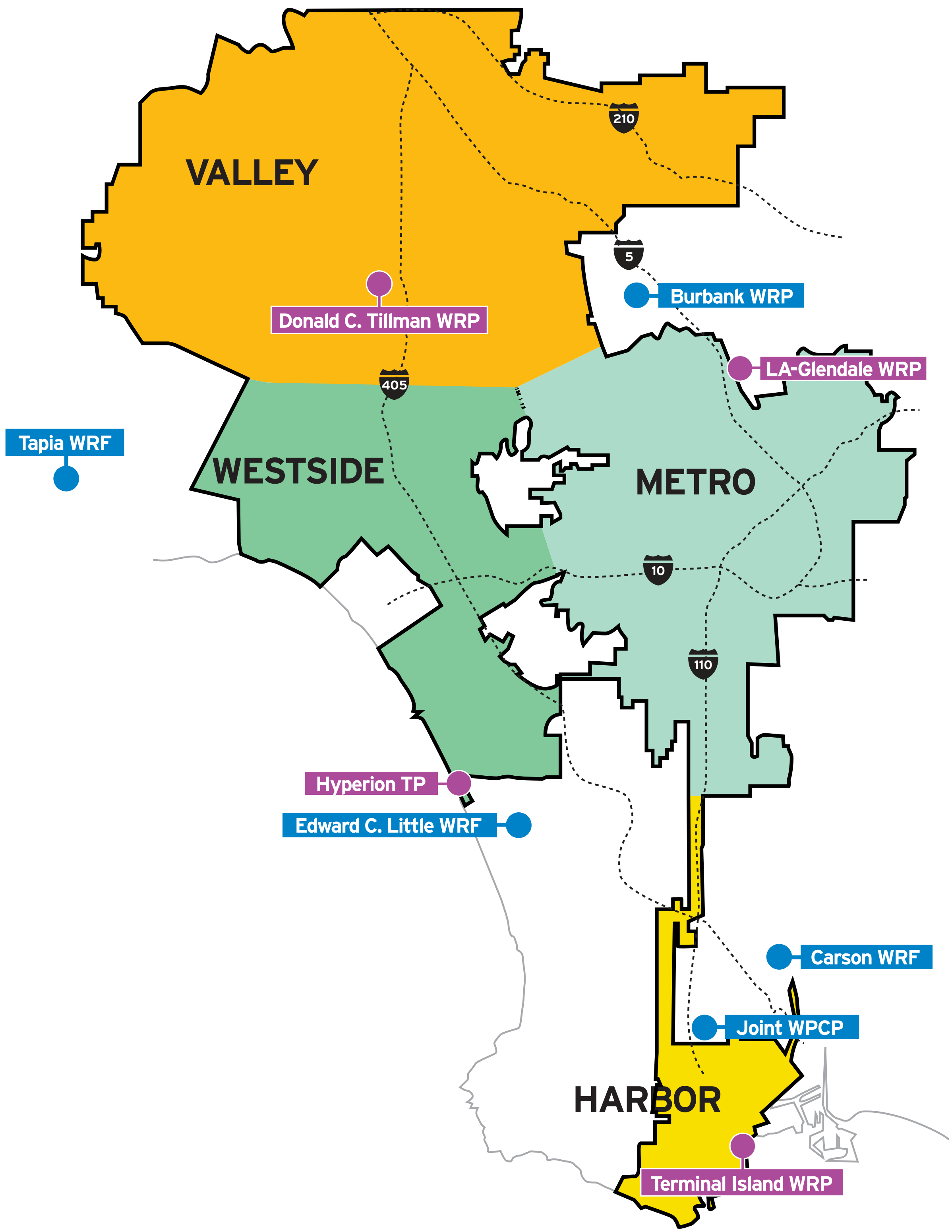
Water Recycling

LADWP is committed to significantly expanding the use of recycled water. Future recycled water projects will build on the success of prior projects. Expanding recycled water use to offset potable demands will help LADWP achieve goals set down in ED5 and pLAn, including reducing imported water purchases from MWD. The pLAn also establishes specific goals for recycled water use. In order to meet these goals, LADWP is working with the Los Angeles Department of Public Works Bureau of Sanitation (LASAN) and Bureau of Engineering (BOE), to develop new recycled water projects for irrigation and industrial uses. In addition, the City is pursuing a Groundwater Replenishment Project to replenish the SFB with purified recycled water. LADWP is also studying additional opportunities to expand the use of recycled water over the long-term.

Wastewater Treatment Infrastructure

LADWP's water recycling program depends on the City's wastewater treatment infrastructure and facilities located within and outside of the City's boundaries. LASAN is responsible for the planning and operation of the City's wastewater treatment infrastructure. This wastewater system serves 573 square miles, 456 square miles of which are within the City. Wastewater service is also provided by the City to 29 non-City agencies through contract services. The treated water from the City's four wastewater plants is utilized by LADWP to meet its recycled water demands. Upon completion of currently planned recycled water projects, LADWP will then enter into agreements with neighboring agencies to obtain additional recycled water. Exhibit ES-M shows the City's four recycled water service areas in relation to the City's four wastewater treatment plants (purple) and sources of recycled water located outside of the LADWP service area (blue).

Exhibit ES-M
Wastewater Treatment Plants and Existing and Future Sources of Recycled Water for LADWP Service Area



Recycled Water Planning Efforts

Given current drought and City initiatives, LADWP is rapidly accelerating the development of recycled water. LADWP, in partnership with LASAN and BOE, completed a Recycled Water Master Planning documents (RWMP) in 2012 to identify future recycled water opportunities and programs. The primary objective of the RWMP was to develop plans for achieving and exceeding a recycled water target of 59,000 AFY by 2035, which was established in the 2010 UWMP. Two major strategies from the RWMP are:

- Development of a groundwater basin replenishment program using highly purified recycled water, often referred to as indirect potable reuse; and
- Expansion of the existing non-potable recycled water systems.

Since completion of the RWMP, recycled water targets have been increased by the initiatives in ED5 and pLAn. The pLAn established the following recycled water goals:

- By 2017, expand production of recycled water by 6 million gallons per day (mgd) at the Terminal Island Water Reclamation Plant;
- Convert 85% of public golf courses to recycled water;
- Develop a strategy to convert the City's lakes to recycled water and implement a pilot project; and
- Expand recycled water production, treatment, and distribution to incorporate indirect and direct potable reuse.

Groundwater Replenishment

As part of the RWMP, the City proposed a Groundwater Replenishment Project using highly purified recycled water from the Donald C. Tillman Water Reclamation Plant (DCTWRP). This water will be delivered to the existing Hansen Spreading Grounds and Pacoima Spreading Grounds in the San Fernando Valley area. The project will require construction of an Advanced Water Purification Facility (AWPF) which will further treat tertiary effluent from DCTWRP. The new AWPF is expected to include microfiltration, reverse osmosis, and advanced oxidation. Goals for AWPF include:

- Recharge up to 30,000 AFY by 2024 in the SFB, a major potable water supply for LADWP
- A plant capacity of 35 mgd
- Establish no regulatory limitations on spreading amounts; and,
- Produce water that complies with Regional Water Quality Control Board and SWRCB requirements, suitable for indirect potable reuse.

Recycled Water Use Projection

Recycled water use projections in five year increments beginning in FY 2019/20 through 2039/40 are presented in Exhibit 4ES-N. These projections outline, by recycled water category, LADWP's plans to increase recycled water use and meet ED5 and pLAn goals. Recycled water use is projected to reach 59,000 AFY in FY 2024/25 and further increase to 75,400 AFY by FY 2039/40. The goal of 75,400 will be achieved by adding the following amounts to the existing supply of 10,400 AFY: 19,000 AFY of planned municipal and industrial use, 16,000 AFY of customer growth, and 30,000 AFY from groundwater replenishment. Environmental reuse is expected to remain constant at 26,740 AFY.

Exhibit ES-N
Recycled Water Use Projections

Category	Project Use (AFY)				
	FY 19/20	FY 24/25	FY 29/30	FY 34/35	FY 39/40
Municipal and Industrial Uses[1]	19,800	29,000	39,000	42,200	45,400
Indirect Potable Reuse (Groundwater Replenishment)	0	30,000	30,000	30,000	30,000
Subtotal	19,800	59,000	69,000	72,200	75,400
Environmental Use[2]	26,740	26,740	26,740	26,740	26,740
Total	46,540	85,740	95,740	98,940	102,140

1. LADWP Recycled Water Group, UWMP 2015 Recycled Water Projections 2015.08.29.xlsx. Does not include deliveries of 58,247 AFY to Edward C. Little Water Recycling Facility.
2. Historical water use has been 26,600 for environmental uses associated with DCTWRP. Actual yearly use will fluctuate based on conditions. 26,600 AFY is used for future planning purposes for environmental uses associated with DCTWRP plus 140 AFY for Machado Lake. Water associated with DCTWRP environmental uses is ultimately discharged to the Los Angeles River, providing additional environmental benefits.

Stormwater Capture

Stormwater runoff from urban areas is an underutilized local water resource. Within the City of Los Angeles, the majority of stormwater runoff is directed to storm drains and is ultimately channeled into the ocean. Unused stormwater reaching the ocean carries with it many pollutants that are harmful to marine life and public health. In addition, local groundwater aquifers that should be replenished by stormwater are receiving less recharge than in the past due to increased urbanization. Urbanization increases the City's hardscape, which results in less infiltration of stormwater and a decline in groundwater levels. In response, LADWP completed a Stormwater Capture Master Plan (SCMP) in 2015 to comprehensively evaluate stormwater capture potential within the City.

Stormwater capture can be achieved by increasing infiltration into groundwater basins (i.e., groundwater recharge) and by onsite capture and reuse of stormwater for landscape irrigation (i.e., direct use). Conservatively, additional stormwater capture projects will increase groundwater recharge by 66,000 AFY and increase direct use by 2,000 AFY, using both centralized and distributed approaches. This leads to a conservative scenario estimate of total stormwater capture potential of 132,000 AFY by 2035, which includes both existing and new stormwater capture volumes. Under a more aggressive scenario approach, total stormwater capture potential in 2035 could be as high as 178,000 AFY.

Groundwater recharge using stormwater is essential for halting the long-term decrease in stored groundwater, protecting the safe yield of the groundwater basin, and maintaining the SFB as a reliable water resource. Centralized projects will allow the City to sustainably utilize its stored water credits while preventing basin overdraft. By 2040, this UWMP projects that LADWP will be able to pump a minimum of 15,000 AFY additional from the SFB due to stormwater projects that increase infiltration. Anticipating that stored groundwater will rebound in response to enhanced groundwater replenishment, LADWP will work with the Upper Los Angeles River Area Watermaster to continue monitoring water levels and to re-evaluate basin safe yield. Over time, this may allow for additional increases in groundwater production as SFB elevations rebound.

By 2040, the UWMP projects 2,000 AFY of additional water conservation through direct-use stormwater projects that offset potable water use. These water savings contribute to meeting the Mayor's overall water conservation goals.

Water Transfers

LADWP plans to replace a portion of the Los Angeles Aqueduct water currently being reallocated for environmental enhancements with water transfers of up to 40,000 AFY. The plan would authorize purchases of water when water is available and economically beneficial to LADWP. Transferred water could be stored, or delivered directly to LADWP's transmission and distribution system. Most of the of transferred water will come from the State Water Project (SWP), but LADWP is also seeking opportunities to transfer water from other sources. Having water transfer agreements in place increases operational flexibility and provides cost savings for LADWP customers.

To enable water transfers from the SWP, LADWP has constructed the Neenach Pumping Station which provides an interconnection between the LAA and the East Branch of SWP's California Aqueduct. The pumping station is located where the two aqueducts intersect in the Antelope Valley, and is estimated to be operational in 2017/18.

ES-6 Water Supply Reliability

With its current water supplies, planned future water conservation, and planned future water supplies, LADWP will be able to reliably provide water to its customers through the 25-year period covered by this UWMP. LADWP's reliability projections account for water quality issues with source waters and the impacts of climate change on both supplies and demands. To meet targets established in ED5 and pLAn, LADWP will reduce water consumption through conservation, increase recycled water use (including both non-potable and indirect potable reuse), and reduce reliance on imported water from MWD.

Exhibit ES-O shows the current supply mix for the five-year average from FY 2010/11 to FY 2014/15. Exhibits ES-P and ES-Q show the future supply mix for FY 2039/40 under single/multiple dry years and average weather conditions respectively. Direct stormwater reuse projections are combined with new water conservation. The groundwater portion of the portfolio reflects the impacts of groundwater replenishment using recycled water, and increases in captured stormwater. The exhibits show that the City's locally-developed supplies will increase from 14 percent to 49 percent in dry years, or to 47 percent in average years. These local supplies are not influenced by variability in hydrology, and will become the cornerstone of LA's future water supplies. As a result, the City's combined imported supplies will decrease significantly from 86 percent to 51 percent in dry years, or to 53 percent in average years. As for the City's imported supplies, they are still impacted by hydrology. The LAA has limited storage capacity, which means it is very susceptible to variations in hydrology, while MWD (with much greater storage capacity) can provide a water supply to the City that is less susceptible to hydrologic conditions. By FY 2039/40 LAA deliveries are projected to be 7 percent in dry years, or 42 percent in average years. MWD will make up the remaining 44 percent in dry years, or provide 11 percent of the City's needs in average years.

Exhibit ES-O
LADWP Supply Reliability FYE 2011-2015 Average

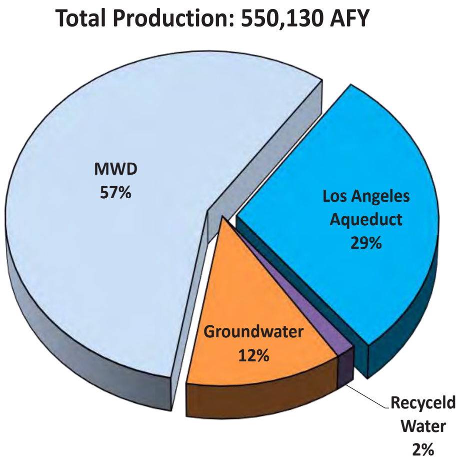


Exhibit ES-P
LADWP Supply Reliability Under Single/Multiple Dry Year Conditions in Fiscal Year 2039-40

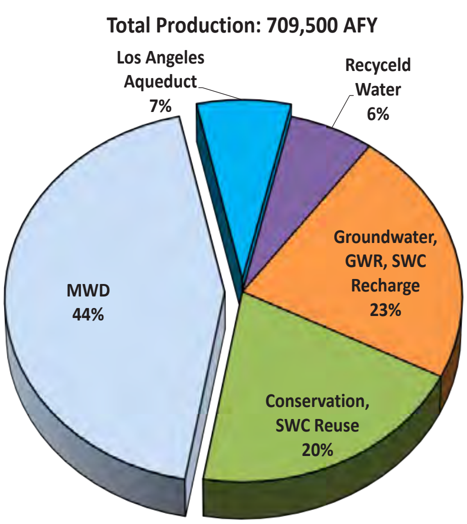
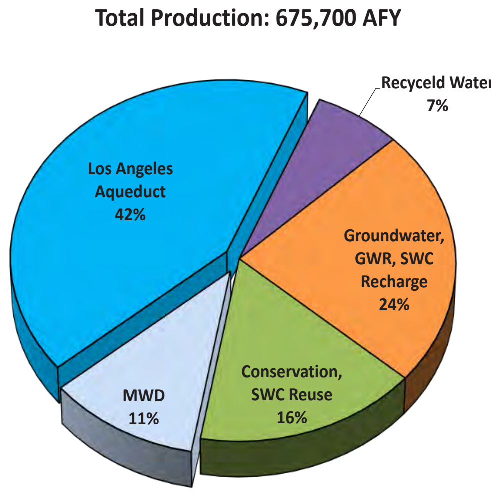


Exhibit ES-Q
LADWP Supply Reliability Under Average Year Conditions in Fiscal Year 2039-40



Note: Charts do not reflect 118,034 AF of existing conservation

Supply Reliability Assessment

To demonstrate LADWP's water supply reliability, Exhibit ES-R summarizes the water demands and supplies for single dry year conditions through FY 2039/40. This represents the City's planned supply portfolio under the most critical hydrologic conditions. Exhibit ES-S summarizes the water demands and supplies for average year conditions, which has the highest probability of occurring.

Exhibit ES-R
Service Area Reliability Assessment for Single Dry Year

Demand and Supply Projections (in acre-feet)	Single Dry Year (FY2014-15) Fiscal Year Ending on June 30				
	2020	2025	2030	2035	2040
Total Water Demand[1]	**642,400**	**676,900**	**685,500**	**694,900**	**709,500**
pLAn Water Demand Target	**485,600**	**533,000**	**540,100**	**551,100**	**565,600**
Existing / Planned Supplies					
Conservation (Additional Active[2] and Passive[3] after FY14/15)	156,700	143,700	145,100	143,500	143,500
Los Angeles Aqueduct[4]	32,200	51,900	51,400	51,000	50,600
Groundwater[5] (Net)	112,670	110,670	106,670	114,670	114,070
Recycled Water					
- Irrigation and Industrial Use	19,800	29,000	39,000	42,200	45,400
- Groundwater Replenishment	0	30,000	30,000	30,000	30,000
Stormwater Capture					
- Stormwater Reuse (Harvesting)	100	200	300	300	400
- Stormwater Recharge (Increased Pumping)	2,000	4,000	8,000	15,000	15,000
Subtotal	323,470	369,470	380,470	396,670	398,970
MWD Water Purchases					
With Existing/Planned Supplies	318,930	307,430	305,030	298,230	310,530
Total Supplies	**642,400**	**676,900**	**685,500**	**694,900**	**709,500**
Potential Supplies					
Water Transfers[6]	40,000	40,000	40,000	40,000	40,000
Subtotal	40,000	40,000	40,000	40,000	40,000
MWD Water Purchases					
With Existing/Planned/Potential Supplies	278,930	267,430	265,030	258,230	270,530
Total Supplies	**642,400**	**676,900**	**685,500**	**694,900**	**709,500**

1. Total Demand with existing passive conservation
2. Cumulative hardware savings since late 1980s reached 118,034 AFY by 2014-15.
3. Additional non-hardware conservation required to meet water use reduction goals set in the Sustainable City pLAn.
4. LADWP anticipates conserving 20,000 AFY of water usage for dust mitigation on Owens Lake after the Master Project is implemented in FY 2023-24. Los Angeles Aqueduct supply is estimated to decrease 0.1652% per year due to climate change impact.
5. Net GW excludes Stormwater Recharge and Groundwater Replenishment supplies that contribute to increased pumping. The LADWP Groundwater Remediation project in the San Fernando Basin is expected in operation in 2021-22. Storage credit of 5,000 AFY will be used to maximize pumping in 2019-20 and thereafter. Sylmar Basin production will increase to 4,170 AFY from 2015-16 to 2038-39 to avoid the expiration of stored water credits, then go back to its entitlement of 3,570 AFY in 2039-40.
6. Potential water transfer occurs in dry years with stored water acquired in average and wet years.

Exhibit ES-S
Service Area Reliability Assessment for Average Weather Year

Demand and Supply Projections (in acre-feet)	Average Weather Conditions (FY 1961/62 to 2010/11) Fiscal Year Ending on June 30				
	2020	2025	2030	2035	2040
Total Water Demand[1]	**611,800**	**644,700**	**652,900**	**661,800**	**675,700**
pLAn Water Demand Target	**485,600**	**533,000**	**540,100**	**551,100**	**565,600**
Existing / Planned Supplies					
Conservation (Additional Active[2] and Passive[3] after FY14/15)	125,800	110,900	111,600	109,100	108,100
Los Angeles Aqueduct[4]	275,700	293,400	291,000	288,600	286,200
Groundwater[5] (Net)	112,670	110,670	106,670	114,670	114,070
Recycled Water					
- Irrigation and Industrial Use	19,800	29,000	39,000	42,200	45,400
- Groundwater Replenishment	0	30,000	30,000	30,000	30,000
Stormwater Capture					
- Stormwater Reuse (Harvesting)	400	800	1,200	1,600	2,000
- Stormwater Recharge (Increased Pumping)	2,000	4,000	8,000	15,000	15,000
Subtotal	536,370	578,770	587,470	601,170	600,770
MWD Water Purchases					
With Existing/Planned Supplies	75,430	65,930	65,430	60,630	74,930
Total Supplies	**611,800**	**644,700**	**652,900**	**661,800**	**675,700**
Potential Supplies					
Water Transfers[6]	40,000	40,000	40,000	40,000	40,000
Subtotal	40,000	40,000	40,000	40,000	40,000
MWD Water Purchases					
With Existing/Planned/Potential Supplies	35,430	25,930	25,430	20,630	34,930
Total Supplies	**611,800**	**644,700**	**652,900**	**661,800**	**675,700**

1. Total Demand with existing passive conservation
2. Cumulative hardware savings since late 1980s reached 118,034 AFY by 2014-15.
3. Additional non-hardware conservation required to meet water use reduction goals set in the Sustainable City pLAn.
4. LADWP anticipates conserving 20,000 AFY of water usage for dust mitigation on Owens Lake after the Master Project is implemented in FY 2023-24. Los Angeles Aqueduct supply is estimated to decrease 0.1652% per year due to climate change impact.
5. Net GW excludes Stormwater Recharge and Groundwater Replenishment supplies that contribute to increased pumping. The LADWP Groundwater Remediation project in the San Fernando Basin is expected in operation in 2021-22. Storage credit of 5,000 AFY will be used to maximize pumping in 2019-20 and thereafter. Sylmar Basin production will increase to 4,170 AFY from 2015-16 to 2038-39 to avoid the expiration of stored water credits, then go back to its entitlement of 3,570 AFY in 2039-40.
6. Potential water transfer occurs in dry years with stored water acquired in average and wet years.

Exhibit ES-T presents the supply reliability for the driest three-year sequence from Fiscal Year Ending (FYE) 2016 to 2018, as required by the UWMP Act, indicating LADWP will be able to maintain reliability under this sequence.

Exhibit ES-T
Driest Three-Year Water Supply Sequence

Demand and Supply Projections (in acre-feet)	Actual FY	Driest Three Consecutive Years (FY2012-13 to FY2014-15) Fiscal Year Ending on June 30		
	2015	**2016**	**2017**	**2018**
Total Water Demand[1]	**513,540**	**538,900**	**580,700**	**601,300**
pLAn Water Demand Target		**492,300**	**478,700**	**484,300**
Existing / Planned Supplies				
Conservation (Additional Active[2] and Passive[3] after FY14/15)	0	46,600	102,000	116,900
Los Angeles Aqueduct[4]	53,546	77,800	111,400	33,700
Groundwater[5] (Net)	87,046	72,803	73,641	90,748
Recycled Water				
- Irrigation and Industrial Use	10,437	11,000	13,000	19,000
- Groundwater Replenishment	0	0	0	0
Stormwater Capture				
- Stormwater Reuse (Harvesting)	0	0	0	100
- Stormwater Recharge (Increased Pumping)	0	0	0	0
Storage Change	96	0	0	0
Subtotal	150,933	208,203	300,041	260,448
MWD Water Purchases				
With Existing/Planned Supplies	362,607	330,697	280,659	340,852
Total Supplies	**513,540**	**538,900**	**580,700**	**601,300**

1. Total Demand with existing passive conservation
2. Cumulative hardware savings since late 1980s reached 118,034 AFY by 2014-15.
3. Additional non-hardware conservation required to meet water use reduction goals set in the Sustainable City pLAn.
4. LADWP anticipates conserving 20,000 AFY of water usage for dust mitigation on Owens Lake after the Master Project is implemented in FY 2023-24. Los Angeles Aqueduct supply is estimated to decrease 0.1652% per year due to climate change impact.
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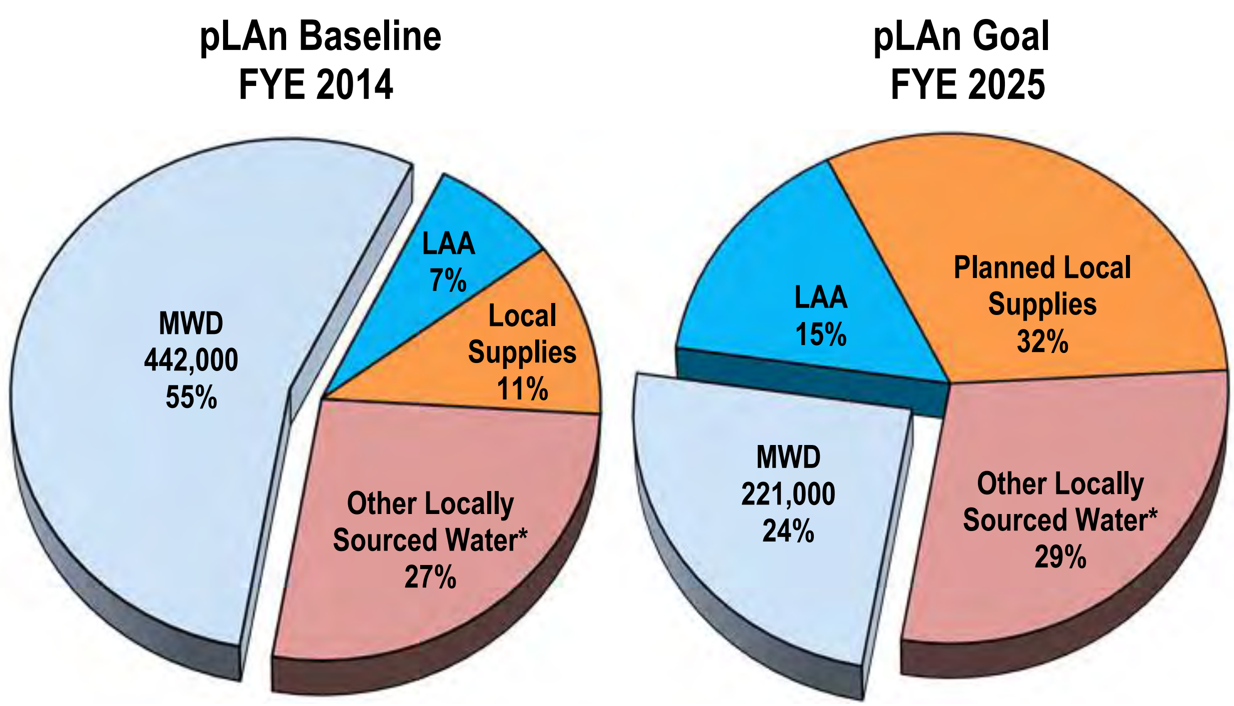
City pLAn Targets

In April 2015 the Mayor released the City's first ever Sustainable City pLAn, with a focus of improving the environment, economy, and equity in Los Angeles. The pLAn contains a number of water resources goals, including:

- Reduce average per capita potable water use by 20 percent from FY 2013/14 by 2017
- Reduce average per capita potable water use by 22.5 percent from FY 2013/14 by 2025
- Reduce imported water purchases from MWD by 50 percent from 2013/14 by 2025
- Reduce per capita potable water use by 25 percent from 2013/14 by 2035; and,
- Expand all local sources of water so that they account for at least 50 percent of the total supply by 2035

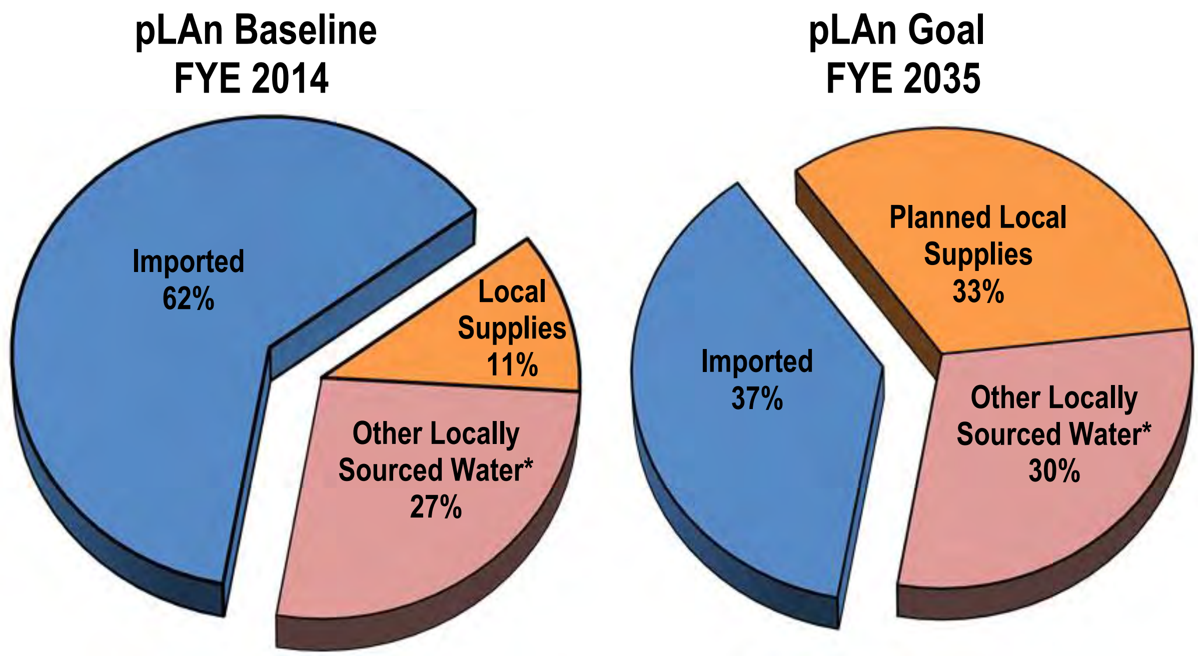
Using the targets for LAA, recycled water, groundwater, conservation, and stormwater captured presented in Exhibit ES-S, plus accounting for past conservation, beneficial reuse of treated wastewater and stormwater capture, LADWP demonstrates its commitment to meeting the water resources goals established in the City's pLAn. Exhibit ES-U presents the strategy towards reducing imported water purchases from MWD by 50 percent in 2025. In FY 2013/14, MWD purchases were 442,000 AFY. In FY 2025, accounting for the planned local supplies summarized in Exhibit ES-S, MWD purchases will achieve 50 percent reduction under most hydrologic conditions and total 221,000 AFY or less. Only during extremely dry hydrologic conditions for the LAA (approximately 11 percent of the time) will MWD purchases be greater than the target established by the City's pLAn.

Exhibit ES-U
Achieving 50 Percent Reduction in MWD Water Purchases by 2025



*Other Locally Sourced Water consists of: Historical Conservation, Stormwater Capture, Beneficial Reuse/Other

Exhibit ES-V
Expanding Local Sources of Water to Account for 50 Percent of Total Supply by 2035



*Other Locally Sourced Water consists of: Historical Conservation, Stormwater Capture, Beneficial Reuse/Other

Exhibit ES-V presents the strategy towards expanding local supplies to account for 50 percent of the total water supply by 2035 will be achieved. In FY 2013/14 all local sources of water (inclusive of past conservation, stormwater capture and beneficial reuse of treated wastewater) accounted for 38 percent of the total water supply. In FY 2035, accounting for the planned local supplies summarized in Exhibit ES-S, local sources of water are projected to account for 63 percent of the total water supply.

Water Quality Issues

Water quality is an important consideration when managing water resources and ensuring future water reliability. LADWP closely monitors water quality issues and their effect on source water reliability, and tracks proposed regulations at the local, state and federal levels. LADWP proactively researches and invests in advanced technologies to ensure continued safety and reliability of the City's water supplies.

LADWP is committed to cost effectively meeting or exceeding water quality regulations and the water quality needs of its customers. LADWP meets this commitment by employing state-of-the-art water treatment processes, maintaining and operating treatment facilities, and diligently monitoring water quality. Drinking water standards are set by the U.S. Environmental Protection Agency and the SWRCB Division of Drinking Water.

Global Climate Change

LADWP has integrated the potential impacts of climate change into its long-term water supply planning. Climate change is a global concern, but is particularly important in the Southwest

United States where water tends to be less abundant. This means that climate change can have significant impacts on water resources, and the level of planning necessary to ensure future water reliability. With respect to Los Angeles, climate change can impact surface supplies from the LAA, imported supplies from Metropolitan Water District (MWD) that originate from the Western Sierra watershed and Colorado River basin, and local supplies.

Scientists use complex computer generated global climate models (GCMs) to simulate climate systems and predict future climate change scenarios. Although most of the scientific community agrees that climate change is occurring and will cause an increase in mean global temperatures, the specific degree of this increase cannot be accurately predicted. Predictions of changes in precipitation are even more speculative, with some showing precipitation increasing in the future and others showing the opposite. But climate change clearly increases uncertainty about the future availability and consistency of traditional water sources. Water supply planning must consider this increased uncertainty and mitigate the risks.

A widely held belief in the scientific community is that increases in concentrations of greenhouse gas emissions (GHGs) in the atmosphere are a contributing factor to climate change. As such, California is leading the way with laws that require reductions in GHG emissions, and require that climate change impacts be integrated into long range water resource planning. A substantial amount of energy use, and therefore GHG emissions, occur as a result of moving, treating, and distributing water to customers with adequate water pressure. LADWP has taken the initiative to study the nexus between water and energy consumption, and to evaluate the associated carbon footprint of its water system.

Water Demand and Local Impacts

Climate change can impact the local climate and in turn alter projected water demands. A range of GCMs were analyzed to establish three models representative of potential climate change for the Los Angeles area:

- **Hot & Dry** – Micro-ESM-Chem.1 for an RCP of 8.5 – This model was developed by the Japan Agency for Marine Earth Science and Technology, Atmosphere and Ocean Research at the University of Tokyo, and the National Institute for Environmental Studies.

- **Warm & Wet** – GISS-E2.R.1 for an RCP of 4.5 – This model was developed by the NASA Goddard Institute for Space Studies.

- **Average** (or central tendency of all 34 models and RCP variations) – IPSL-CM5B-LR.1 for an RCP of 4.5 – This model was developed by the Institut Pierre Simon Laplace.

The hot & dry and warm & wet models represent a high and low forecast under climatic change conditions and are used to determine impacts on Los Angeles' demands. Projected average annual precipitation and average daily maximum temperatures for the period 2030 to 2050 were developed. Overall, there is a 9-inch range between the hot & dry and warm & wet models. Even the average model shows an increase in the average daily maximum temperature ranging between 2.01 and 4.54°F.

The impacts of these climate effects will likely influence projected water demands. The greatest increase in demands over the baseline in 2040 with passive conservation is associated with the hot & dry scenario resulting in an increase in demands of 42,900 AF (7% increase). This is followed by the central tendency scenario at 23,400 AF (4% increase), and the warm & wet scenario at 2,200 AF (less than one percent increase).

Los Angeles Aqueduct Impacts

To address the challenges posed by climate change on the LAA, LADWP completed a climate change study in 2011. The study evaluated the potential impacts of climate change on the Eastern Sierra Nevada watershed and therefore LAA water supply and deliveries. It also investigated opportunities to improve the LAA system in order to mitigate against potential impacts. Projected changes in temperature (warmer winters) will change precipitation patterns. Rain will occur more frequently than in the past, and peak Snow Water Equivalent (SWE) and runoff are projected to occur earlier in the spring.. This study is helping water managers plan and develop measures to enhance the performance of the LAA and ensure future reliability.

State Water Project Impacts

More recent information about the nature of expected climate change in California is provided in the California Water Plan Update 2013 (Update 2013). Released by DWR on October 30, 2014, Update 2013 is the State government's strategic plan for understanding, managing and developing water resources statewide. According to the report, higher temperatures are melting the Sierra Nevada snowpack earlier in the year and driving the snowline higher. This reduces the snowpack, and snowpack amounts to stored water for Californians and the environment. The Update 2013 also predicts that droughts are likely to become more frequent and persistent. Intense rainfall events are expected to continue, possibly leading to more frequent and/or more extensive flooding. Storms and snowmelt may coincide and produce higher winter runoff. Sea level rise could cause higher surges during coastal storm events. Rising sea levels also increase susceptibility to coastal flooding and increase salt water intrusion into coastal groundwater basins. Sea level rise will also place additional constraints on water exports from the Sacramento-San Joaquin Delta. Findings from these reports further illustrate the climate change challenges facing water purveyors and utilities.

Colorado River Aqueduct Impacts

Climate change impacts on the Colorado River Basin (Basin) are comprehensively addressed by the US Bureau of Reclamation in the Colorado River Basin Water Supply and Demand Study, completed in 2012. This is one of four hydrologic supply projections incorporated into a scenario planning process. The climate change hydrology analysis from the study predicts lower average river flows throughout the Basin, and predicts compromised Basin reliability over a wide range of demand and operational scenarios. Climate change projections from 2011 to 2060 predict continued warming throughout the basin, causing earlier snowmelt and shifting peak streamflow from June to May at many locations. This warming also causes more precipitation to fall as rain instead of snow.

Water and Energy Nexus

Much of the carbon dioxide released into the atmosphere, and the emission of other GHGs, result from the burning of fossil fuels, for example crude oil and coal in the generation of energy. Since significant energy is required to move water over long distances and elevations, there is a link between managing the water supply and GHG emissions. Source water extraction, treatment, and local distribution also use significant amounts of energy. The measure of GHG emissions, sometimes referred to as "carbon footprint," is expressed in tons (T) of carbon dioxide ($CO2$). This carbon footprint can be estimated for specific water resources and water utility activities. Once the magnitude of the carbon footprint is known, strategies can be developed to better manage and reduce impacts on the atmosphere and therefore climate change.

LADWP has taken the initiative to study the nexus between water and energy consumption, and to evaluate the associated carbon footprint of its water supply sources. The most energy intensive source of water for LADWP is water purchased from MWD, which imports SWP supplies via the California Aqueduct and Colorado River supplies via the Colorado River Aqueduct. LADWP also imports water via the LAA, which is a net producer of energy because the water is used to generate electricity that is used by Angelinos. Local sources of water for LADWP include groundwater and recycled water. The energy to produce groundwater may increase because of the need for more intensive treatment. However, groundwater is expected to remain a relatively low energy water source compared to imported water from MWD. Producing recycled water is more energy intensive than groundwater, but still uses less energy per unit volume than imported MWD water.

Climate Change Adaption and Mitigation

Climate change strategies fall under two main categories: adaptation and mitigation. For water resources, a climate change adaptation strategy involves counteracting the impacts of climate change through conservation and increasing efficiency, and relying on water resources that are less vulnerable to climate change. A mitigation strategy involves proactive measures that reduce GHG emissions. LADWP's plans to dramatically increase conservation, water recycling, and stormwater capture all represent both adaptation and mitigation strategies. LADWP Power System resource planning efforts have also complemented Water System strategies to address climate change.

ES-7 Financing

Funding for water resource programs and projects are primarily provided through LADWP water rates, with supplemental funding provided by MWD and state and federal grants. LADWP is also seeking reimbursement from responsible parties to assist with groundwater treatment costs. To fund future programs, LADWP will utilize the following funding sources:

- **Water Rates** – The revenue collected through LADWP's current water rates is the primary funding source for resource programs designed to achieve the City's goals. This includes conservation, water recycling, stormwater capture, and remediating the contamination in the San Fernando Basin.

- **Funding Support from MWD** – MWD provides funding through their Local Resources Program (LRP) for the development of water recycling, groundwater recovery, and seawater desalination. The LRP incentive structure offers three options: 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. MWD also promotes conservation through its Conservation Credits Program, providing up to $195/AF. Since its inception in 1990, the Conservation Credits Program has provided $487 million in rebates and incentives, producing cumulative water savings of 2.2 million AF through 2015.

- **State Funds** – Funds for recycling, groundwater, conservation, and stormwater capture have been available on a competitive basis though voter approved initiatives, such as Propositions 50, 84 and 1. Proposition 1 allocates $900 million to prevent or clean up contaminated groundwater. Occasionally, low or zero-interest loans are also available through State Revolving Fund programs.

- **Federal Funds** – Federal funding for recycling is available through the U.S. Army Corps of Engineers, via periodic Water Resource Development Act legislation, and the U.S. Bureau of Reclamation's Title XVI program.

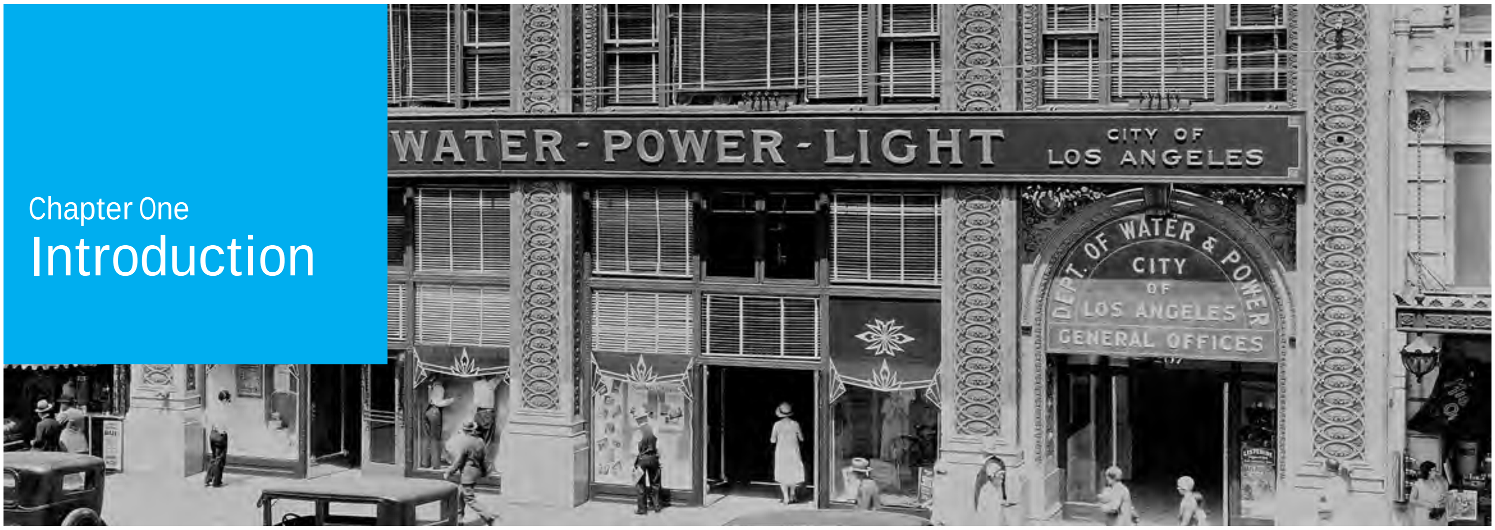
- **Responsible Parties Funding** - LADWP may be able to recover some of the costs for groundwater cleanup from those parties deemed responsible for the contamination.

ES-8 Conclusion

LADWP's 2015 Urban Water Management Plan is not only designed to meet the current requirements of the UWMP Act, but also demonstrate LADWP's commitment to provide a reliable and sustainable water supply over the next 25 years as well. It outlines a detailed plan for achieving the targets established in ED5 and pLAn for increasing water conservation and reducing dependence on imported supplies. It defines an evolving water supply portfolio that includes significant increases in both water conservation and local water supplies. It addresses confidence in the water supply by analyzing the uncertainties associated with climate change and integrating this analysis into water supply plans. Finally, it reinforces the need to address the water/energy nexus and continuing efforts to reduce carbon footprint. It is important to note that planning and investing in water reliability is an ongoing process that includes continuously evaluating the most recent conditions, updating plans, and sharing these plans with the community. The 2015 UWMP provides a snapshot of LADWP's ongoing efforts to ensure future water reliability for the residents and businesses of Los Angeles. With its current water supplies, planned future water conservation, and planned future water supplies, LADWP has available supplies to meet all demands under all three hydrologic scenarios through the 25-year planning period covered by this UWMP.

Chapter One

Introduction

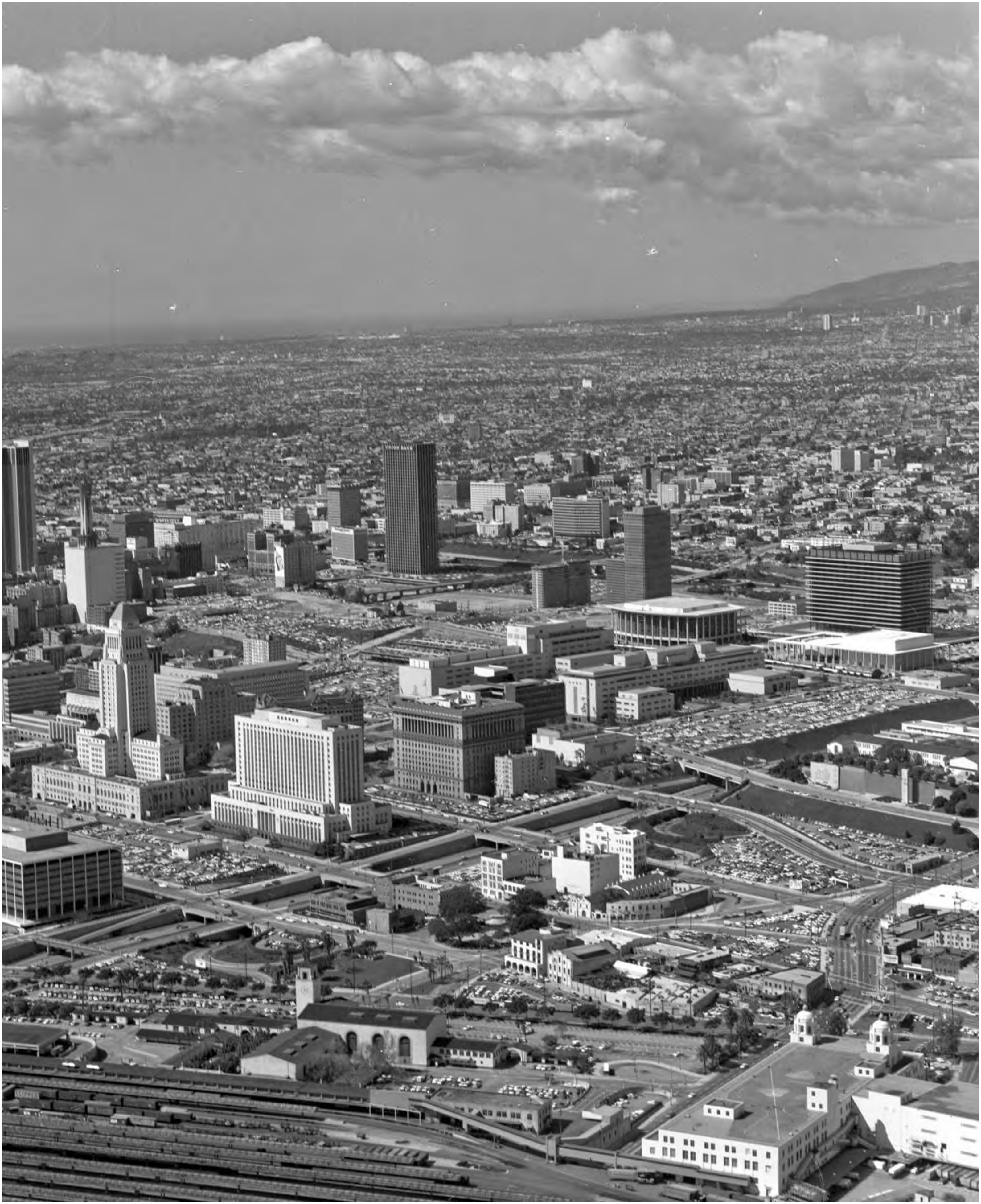


1.0 Overview

In 1902, the City of Los Angeles (City) had a population of approximately 146,000 residents and formed a municipal water system by acquiring title to a private water company. In 1925, the Los Angeles Department of Water and Power (LADWP) was established by city charter. LADWP met the City's increasing need for water resources as Los Angeles developed into the nation's second largest city with nearly 4.0 million residents, encompassing a 469-square-mile area. As the largest municipal utility in the nation, LADWP delivers safe and reliable water and electricity services at an affordable price to the residents and businesses of Los Angeles.

Faced with increasing demands for additional water supplies and multi-year drought conditions, LADWP and other water agencies in Southern California are addressing the challenge of providing a reliable water supply for a growing population. Since the completion of the 2010 Urban Water Management Plan (UWMP), multiple City goals and policy objectives have reshaped future plans for water supply in Los Angeles. In January 2014, Governor Brown proclaimed a drought state of emergency and directed state officials to take all necessary actions to prepare for the consequences of ongoing drought. In April 2014, Governor Brown issued an Executive Order to increase state drought actions. In October 2014, Mayor Eric Garcetti issued Executive Directive 5 (ED5), which mandated City goals and actions in response to the drought. In April 2015, LA's Sustainable City pLAn (pLAn) was released establishing short-term and long-term targets for the City to strengthen and promote sustainability. Within the pLAn category of local water, a multi-faceted approach to reducing water use and developing a locally sustainable water supply was developed. LADWP plans to meet the City's water needs while complying with these various initiatives through the following actions:

- Achieving significant water conservation enhancements, stormwater capture, and water recycling projects to increase supply reliability, reduce imported water purchases, and increase locally produced water.
- Remediating contamination of the San Fernando Groundwater Basin.
- Ensuring continued reliability of the water supplies from the Metropolitan Water District of Southern California (MWD) through active representation of City interests on the MWD Board.
- Maintaining operational integrity of the Los Angeles Aqueduct and in-City water distribution systems.
- Meeting or exceeding all Federal and State standards for drinking water quality.



1.1 Purpose

The LADWP's 2015 UWMP serves two purposes: (1) as a master plan for water supply and resources management consistent with the City's goals and policy objectives, and (2) for compliance with the California Water Code (CWC) and the California Urban Water Management Planning Act (Act).

1.1.1 UWMP Requirements and Checklist

This 2015 UWMP complies with the Act's Sections 10610 and 10656 of the CWC, and details how LADWP plans to meet all of the City's water supply goals and objectives while serving customer's water needs. The Act became effective on January 1, 1984 and mandates that every urban water supplier that provides municipal and industrial water to more than 3,000 customers (or supplies more than 3,000 acre-feet per year) prepare and adopt a UWMP every five years in compliance with state guidelines and requirements.

The Act was originally developed due to concerns regarding potential water supply shortages throughout California. It required information that focused primarily on water supply reliability and water use efficiency measures. Since its original passage in 1983, there have been several amendments with the most recent amendment adopted in 2014. Some of the recent amendments include: extension of the submittal date from December 31, 2015 to July 1, 2016 (Assembly Bill (AB) 2067), a requirement for narrative description of water demand measures implemented over the past five years and future measures planned for implementation to meet 20 percent demand reduction targets by 2020 (AB 2067), standard methodology for calculating distribution system water loss (Senate Bill (SB) 1420), mandatory electronic filing of UWMPs (SB 1420), voluntary reporting of passive conservation savings (SB 1420), voluntary reporting of energy intensity (SB 1036), and a requirement to analyze and define water features that are artificially supplied with water (CWC Section 10632). A copy of the Act is provided in Appendix A. A checklist cross-referencing Act requirements to applicable pages in this UWMP is provided in Appendix B.

With the passage of SB 610 and 221 in 2001 and SB x7-7 in 2009, UWMPs took on even more importance. SB 610 and 221 require counties and cities to consider the availability of adequate water supplies for certain new large developments and to have written verification of sufficient water supply to serve them. UWMPs are identified as key source documents for this verification. Based on these statutes LADWP prepares individual Water Supply Assessments for these new large developments. SB x7-7, the Water Conservation Act of 2009, requires water agencies to reduce per capita water use by 20 percent by 2020. Water users were required to set an interim target for 2015 and a final target for 2020 using one of four methodologies to calculate per capita water use. Excluding certain exceptions, failure to meet adopted targets will result in the ineligibility of a water supplier to receive state grants or loans.

LADWP's 2015 UWMP not only meets the current requirements of the Act, but also serves as the City's master plan for water supply and resource management. The UWMP helps guide policy makers both in the City and at the City's wholesale water provider the Metropolitan Water District of Southern California (MWD). The plan also provides information on the City's water supplies to the citizens of Los Angeles. The UWMP presents the basic policy principles that guide LADWP's decision-making process to secure a sustainable water supply for Los Angeles.

1.2 Water Supply Planning Developments

LADWP has a long history of working to ensure that its customers have reliable water. These efforts date back to the early 20th century with the building of the Los Angeles Aqueduct (LAA). City investments in regional supplies, water rights, aqueducts, reservoirs, conservation, and more recently in recycled water, groundwater basin remediation, and stormwater capture have allowed residents to enjoy a reliable water supply. Sound planning and timely investments in water supply infrastructure and water use efficiency have played a critical role in meeting the City's water needs, despite the region's semi-arid climate and growing population.

Over the last 30 years LADWP's water supply mix has changed to reflect significant reductions in LAA supplies due to environmental reallocations and periods of dry hydrology, as well as significant reductions in groundwater pumping due to contamination in the City's largest groundwater aquifer, the San Fernando Basin (SFB). Despite significant conservation, efficiency and water management efforts, reliance on purchased imported water has increased heavily due to various challenges facing other City water supply sources. As discussed in the associated sections of this UWMP, major challenges to LADWP's water supplies include:

- Groundwater contamination;
- Urbanization;
- Rising cost of LAA imported water;
- Reduced reliability of LAA and MWD imported supplies due to environmental constraints and obligations, competing demands for finite supplies, and climate change impacts, and
- Rising cost of and heavy reliance on MWD purchased imported water.

The year 2012 marked the start of a multi-year drought that by late 2013 would garner statewide attention. In January 2014, following the state's driest year on record, Governor Brown proclaimed a drought state of emergency. The continued dry conditions in California triggered immediate consequences, including: drinking water supplies becoming at risk in many communities; reduced agricultural production that would threaten the farming industry; low-income communities heavily dependent on agricultural employment would suffer heightened unemployment and economic hardship; threats to many endangered species; declining groundwater basins; declining surface reservoirs; declining flows in rivers and streams; and greatly increased risk of wildfires across the state. On April 25, 2014, the Governor directed the State Water Resources Control Board (SWRCB) to implement State regulations to help achieve 20 percent water use reduction Statewide. In response, on July 29, 2014, the SWRCB issued its Emergency Water Conservation Regulation (Emergency Regulation). The Emergency Regulation directed Californians and urban water suppliers to take actions to reduce water use which included:

- Requiring urban water suppliers to implement their water shortage contingency plans to a level where restrictions on outdoor watering are mandatory;
- Requiring urban water suppliers to report monthly water production to the SWRCB;
- Setting a list of prohibited water uses for all Californians

The Emergency Regulation was further expanded on March 17, 2015 to require urban water suppliers to implement their water shortage contingency plan to a level equivalent to 20 percent water use reduction and added additional prohibited uses to residential users as well as prohibitions to businesses.

With worsening drought conditions, on April 1, 2015, Governor Brown issued Executive Order B-28-14 directing the SWRCB to establish regulations to mandate 25 percent water use Statewide. In response, on May 18, 2015, the SWRCB amended its Emergency Regulation to mandate conservation targets for urban water suppliers to achieve a 25 percent water use reduction Statewide for the period from June 2015 through February 2016. Urban water suppliers' conservation targets were established based on their per capita potable water use from July through September 2013. Thanks to a long-standing history of conservation achievements and its low per capita potable water use, LADWP was assigned a 16 percent water use reduction target by the SWRCB.

LADWP was able to stay in compliance with the SWRCB's mandate through multiple short and long-term conservation strategies developed to meet the City's sustainability initiatives. In October 2014, Mayor Eric Garcetti issued Executive Directive No. 5, a strategy to comply with state-wide conservation orders and address the City of Los Angeles' ongoing challenges to water supply reliability. ED5 set a water related framework for the subsequent Los Angeles Sustainable City pLAn (pLAn), which was issued by Mayor Garcetti in April 2015. The pLAn set short and long-term targets for the City to strengthen and promote sustainability. The pLAn addressed water related challenges within the Environment section under Local Water, and set a multi-faceted approach to reducing water use and developing a locally sustainable water supply. The City's ED5 and pLAn form the guidance documents for the 2015 UWMP's water use reduction and local supply development goals.

1.2.1 Mayor's Executive Directive No. 5

In response to ongoing extreme drought conditions that started in 2012, on October 14, 2014, Mayor Eric Garcetti issued Executive Directive No. 5, Emergency Drought Response – Creating a Water Wise City (ED5). ED5 addresses the City's heavy reliance on imported water, which represents up to 80 percent of the City's water supply. Over reliance on imported water is not only expensive, but could create hardships for Los Angeles if supplies are curtailed. Potential challenges to imported supplies include drought, seismic events, and climate change. Therefore, reducing over reliance on imported water is of critical importance to the City. In response to these short and long term threats, ED5 set the following goals utilizing a FY 2013/14 baseline:

- Reducing per capita potable water use by 20 percent by 2017;
- Reducing LADWP's purchase of imported potable water by 50 percent by 2024; and
- Creating an integrated water strategy to increase local water supplies and improve water security in the context of climate change and seismic vulnerability.

To address the immediate drought conditions, ED5 established actions to curtail water use. ED5 recommended immediate actions for all city residents, these voluntary actions included: reducing watering from three to two days per week, replacing turf lawns with native climate-appropriate landscaping, replacing high water use plumbing fixtures and appliances, and ensuring pools have covers.

ED5 also established a list of mandates for City departments to reduce their water use and lead by example. All City departments were tasked with reducing their water use via 2-day watering restrictions, making landscaping changes, and initiating public education on department conservation measures. The general fund departments were also tasked with developing plans to convert City car wash facilities and public golf courses to recycled water, developing a plan to convert street medians to water efficient landscaping, and compiling conservation related changes to the building code for new and retrofitted buildings. LADWP was specifically tasked with increasing water conservation rebates, investigating new potential water conservation programs, reporting on leak detection and protection program, and reporting on City-owned facility water use and the impacts of climate change.

Specific timeframes and water use reduction targets were established in ED5 to increase water conservation. These targets are a 10 percent gpcd reduction by July 1, 2015, 15 percent reduction by January 1, 2016, and a 20 percent reduction by January 1, 2017. As of January 1, 2016, LADWP has met ED5's January 2016 target and is on track to meet the 20 percent reduction target in January 2017.

1.2.2 Sustainable City pLAn

On April 8, 2015, the Sustainable City pLAn (pLAn) was released establishing short-term and long-term targets for the City over the next 20 years in 14 categories to strengthen and promote sustainability of the environment, economy, and equity in Los Angeles. Water use in the City falls within the category of local water, which is within the environment framework, and lead by example directive. In addition, multiple facets of sustainability outlined in the pLAn are applicable to LADWP operations, including, but not limited to, carbon emission reduction and climate change leadership, preparedness and resiliency.

Local Water

Local water not only encompasses sustainability of local water supplies, but includes sustainability of rivers and beaches. pLAn has established the following vision for the local water category:

"We lead the nation in water conservation and source the majority of water locally."

A multi-faceted approach to developing a locally sustainable water supply was developed through the pLAn. The pLAn incorporates the targets established in ED No. 5 and further builds upon those targets to establish short-term, mid-term, and long-term goals.

Near term outcomes desired by **2017** include:

- Secure additional funding for SFB clean-up;
- Reduce average per capita potable water use by 20 percent from FY 2013/14;
- Establish a Water Cabinet to implement key local water policy;
- Expand recycled water production by at least 6 million gallons per day (mgd);
- Replace 95 miles of water pipe infrastructure;
- Identify funding mechanism(s) to implement Enhanced Watershed Management Programs necessary for Municipal Separate Storm Sewer System (MS4) permit compliance.

Mid-term and long-term desired outcomes related to water supplies include:

2025

- Reduce imported water purchases by 50 percent from FY 2013/14
- Reduce average per capita water use by 22.5 percent from FY 2013/14

2035

- Source 50% of water locally, including 150,000 AFY of stormwater capture
- Reduce average per capita water use by 25 percent from FY 2013/14

Five strategies with multiple priority initiatives were identified in the pLAn to meet these targets.

1. Create an integrated water strategy for Los Angeles
    a. Create Water Cabinet
    b. Develop integrated stakeholder-driven "One Water Plan", a comprehensive water strategy for Los Angeles
2. Ensure safe, secure, and reliable drinking water supply and system
    a. Clean the SFB
    b. Ensure the City obtains its fair share of California Water Bond Funding
    c. Prioritize water system funding for local water supply development and infrastructure reliability
    d. Improve pipe infrastructure quality
    e. Expand recycled water production, treatment, and distribution to incorporate indirect or direct potable reuse (IPR/DPR)
    f. Educate public on need/benefits of IPR and DPR
3. Reduce per capita potable water use and increase recycled water
    a. Execute key conservation steps in ED No. 5
    b. Expand scope and financing of LADWP's turf replacement incentive program
    c. Implement and expand other LADWP conservation incentives
    d. Educate and engage residents and businesses through on-going awareness, social media, and action campaigns
    e. Benchmark customer use and recognize innovative water-reduction initiatives
    f. Develop more water and wastewater rate tiers to encourage conservation
    g. Ensure private buildings are retrofitted with high efficiency, water conserving fixtures
    h. Revise building code to encourage water use reduction, on-site water reuse, and recycling
    i. Produce at least 6 mgd of advanced reuse recycled water at Terminal Island Wastewater Reclamation Facility
    j. Expand customer use of recycled water and expand purple pipe infrastructure
4. Increase stormwater capture and protect marine life
    a. Identify funding mechanism(s) to implement the Enhanced Watershed Management Plans necessary for MS4 compliance
    b. Expand use of permeable pavement in large infrastructure projects (e.g. LAX)
    c. Expand number of green infrastructure sites and green streets (e.g. bioswales, infiltration, cut-outs, permeable pavement, and street trees)Expand rain barrel program
    d. Eliminate once through cooling to improve water quality and protect marine life
    e. Lead by example through increased municipal water conservation
    f. Increase municipal conservation through actions in ED No. 5

Lead by Example

Lead by example is based on the premise that the City's government should lead by example to inspire others to follow, including residents. The pLAn has established the following vision for the lead by example category:

"We have a municipal government that leads by example throughout every department in the City of Los Angeles."

Near term outcomes desired by 2017 specifically related to water supplies include:

- Reduce water use at City facilities and proprietary departments by 20 percent

There are additional near-term outcomes more general to City operations, but applicable to LADWP, including reducing greenhouse gas emission.

Mid-term and long-term desired outcomes specifically related to water supplies include:

2025

- Reduce municipal water use by at least 25 percent from FY 2012/13

2035

- Reduce municipal water use by at least 30 percent from FY 2012/13

Applicable strategies and priority initiatives are derived from ED No. 5 and were selected to meet the near, mid, and long-term outcomes:

1. Reduce municipal water consumption

   a. Convert road medians and parkway strips to low or no-water use landscaping

   b. Reduce potable water use by 10 percent in City parks

   c. Reducing watering to two times per week at City facilities

   d. Convert 85% of public golf courses acreage to recycled water

   e. Wash City vehicles only at facilities with 100 percent recirculated water

   f. Publish water use at each City-owned facility

   g. Retrofit municipal and proprietary buildings and adjacent landscapes

   h. Incorporate additional low water use and permeable materials into standard parkway guidelines

   i. Develop strategy to convert City lakes to recycled water and implement pilot

As part of the pLAn program annual reports will chart progress towards reaching overall goals and desired outcomes. Major updates to the pLAn will occur every four years. The local water vision, strategies, and priority initiatives outlined in the pLAn are integrated into this UWMP. Combined pLAn and ED No. 5 serve as a blueprint for creating sustainable water supplies to serve the future needs of the City, and outline responsible water resource management and planning.

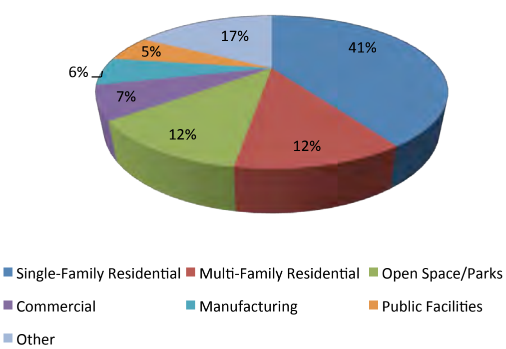
1.3 Service Area Description

In order to properly plan for water supply, it is important to understand the factors that influence water demands over time. These factors include land use, demographics, and climate.

1.3.1 Land Use

The City of Los Angeles is comprised of approximately 300,117 acres. Residential development constitutes approximately 53 percent of the total land use within the City. Within the residential land use category, single-family residential is the largest at approximately 122,000 acres or 41 percent of the total land use within the City. Multi-family residential is at approximately 35,000 acres or 12 percent of the total land use within the City. After residential use, open space/parks is the second largest land use within the City at approximately 12 percent. Commercial, public facilities and manufacturing land uses combined account for approximately 19 percent of the total. Public facilities include land uses such as libraries, public schools, and other government facilities. Exhibit 1A provides a breakdown of the land uses within the City of Los Angeles. The "Other" category includes City port and airport master plans, transportation, freeways, parking, rights of way, hillsides, and other miscellaneous uses that are not zoned.

Exhibit 1A
City of Los Angeles Land Uses



Land Use Types	Acres
Single-family Residential[1]	122,206
Multi-family Residential	35,358
Subtotal Residential	157,564
Open Space/Parks	35,492
Commercial	21,077
Manufacturing	17,706
Public Facilities	16,994
Other[2]	51,284
Total	300,117

Source: http://planning.lacity.org/

1. Includes agriculture use as defined by City of Los Angeles, Department of City Planning
2. Includes specific plans, transportation, freeways, parking, rights of way, hillsides, and other miscellaneous areas that are not zoned.

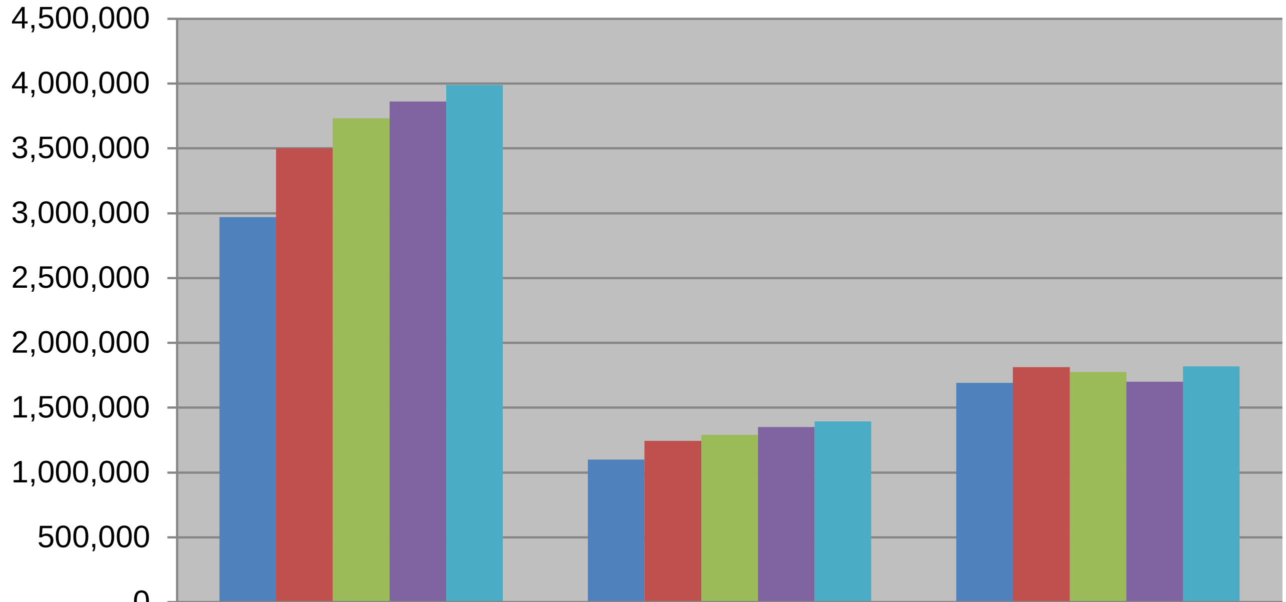
1.3.2 Demographics

Over 3.9 million people reside in the LADWP service area, which is slightly larger than the legal boundary of the City of Los Angeles. In addition to the City, LADWP also provides water service to portions of West Hollywood, Culver City, Universal City, and small parts of the County of Los Angeles.

The population within LADWP's service area increased from 2.97 million in 1980 to 3.99 million in 2015, representing an average annual growth rate of approximately 1 percent. The total number of housing units increased from 1.10 million in 1980 to 1.39 million in 2015, representing an average annual growth rate of 0.8 percent. During this time, average household size increased from 2.7 persons in 1980 to 2.77 persons in 2015. Employment grew by about 0.7 percent annually from 1980 to 1990, but declined from 1990 to 2010 as a result of two economic recessions. The first recession began in 1991 and was followed by another larger recession beginning in 2008. Only recently has employment begun to return to the employment level experienced in 1990. Overall, employment decreased by about 0.3 percent annually from 1990 to 2010 and between 2010 and 2015 increased by approximately 1.4 percent reflecting an improved economy. Exhibit 1B summarizes the historical demographics for the LADWP service area.

Demographic projections were provided for the LADWP service area by MWD who received projected demographic data from Southern California Association of Governments (SCAG). SCAG allocated its 2012 Regional Transportation Plan (RTP) demographic data into water service areas for MWD's member agencies. For population estimates, SCAG relies on the California Department of Finance (DOF). However, after the 2000 U.S. census and before the 2010 U.S. census, there was a large gap between DOF and U.S. Census population estimates. DOF released revised historical population estimates resetting the historical demographics for

Exhibit 1B
Historical Demographics for LADWP Service Area



	Population	Housing	Employment
1980	2,970,000	1,100,000	1,692,000
1990	3,501,602	1,243,022	1,813,615
2000	3,732,579	1,290,440	1,773,895
2010	3,860,514	1,351,458	1,700,575
2015	3,987,622	1,393,994	1,817,840

the period 2000 to 2010 based on results from the 2010 U.S. Census. Demographic data for 2010, as provided in this UWMP, has been adjusted by SCAG based on the revised DOF data and therefore does not match the 2010 data contained in the 2010 UWMP. Exhibit 1C summarizes these demographic projections for the LADWP service area.

LADWP's service area population is expected to continue to grow over the next 25 years at a rate of 0.5 percent annually. While this is substantially less than the historical 1.0 percent annual growth rate from 1980 to 2010, it will still lead to approximately 493,200 new residents over the next 25 years. According to SCAG's 2012 RTP, total housing is expected to grow at a slightly higher rate than population over the next 25 years at 0.8 percent annual growth versus 0.5 percent annual growth for population, and it is anticipated that household size will decline over the projection period.

The 2012 RTP projects that by 2040 the average household size will decrease to 2.54 persons per household. Throughout the projection period, multi-family housing units are expected to increase at three times the rate of single-family housing units (1.32 percent annual growth vs. 0.41 percent annual growth).

Employment is expected to increase by 0.4 percent annually throughout the projection period. This growth is primarily driven by the current and long-term opportunities available from the economic base within the five-county metropolitan region of Southern California. The

Exhibit 1C
Demographic Projections for LADWP Service Area

Demographic	2020	2025	2030	2035	2040
Population	4,026,891	4,168,131	4,210,042	4,351,408	4,441,545
Housing					
Single-Family	650,746	635,348	652,379	675,540	682,412
Multi-Family	828,744	900,523	940,549	973,978	1,031,239
Total Housing	1,479,490	1,535,871	1,592,928	1,649,518	1,713,651
Persons per Household	2.66	2.66	2.59	2.58	2.54
Employment					
Commercial	1,704,864	1,749,994	1,788,566	1,807,774	1,869,383
Industrial	136,023	135,594	134,061	131,686	131,285
Total Employment	1,840,887	1,885,588	1,922,628	1,939,460	2,000,667

Source: 2012 Regional Transportation Plan, Southern California Association of Governments

economic base is wide-ranging and includes professional and business services, wholesale and retail trade, manufacturing, public administration, financial service industries, information, transportation, warehousing, utilities, construction, education and health services, and leisure and hospitality. Over the 25-year forecast period, industrial growth is expected to slightly increase reaching a peak in 2020 and then gradually declining to 2040. Over the projection period industrial growth is expected to increase by less than 0.1 percent annually. Commercial employment is expected to increase by about 0.4 percent annually.

The 2015 UWMP presents demographic projections that are lower for population, lower for employment, and unchanged for housing, when compared to the data presented in the LADWP's 2010 UWMP. Although no overall change, the housing projection displays less single-family housing units and more multi-family housing units when compared to the 2010 UWMP. The demographic projections in the 2010 UWMP were based on SCAG's 2008 RTP. The current 2012 projections incorporate the latest population, households, and employment data from multiple local, state, and federal agencies. Projected 2012 RTP data reflect adjustments in future 2035 population growth related to the aforementioned demographic adjustments as a result of the 2010 U.S. Census; declining mortality, labor force participation, net immigration, and net domestic migration; slightly increasing overall fertility; household headship rates ranging slightly above to slightly below 2010 rates; and an employment shift from the manufacturing sector to the service sector. The SCAG 2012 RTP was adopted by the Regional Council of the SCAG on April 4, 2012. Exhibit 1D shows the differences between the SCAG demographic projections for the RTP in 2008 and 2012.

For the forecast year 2035, Los Angeles population was projected to be 4.47 million under the SCAG 2008 RTP and 4.35 million under the 2012 RTP, a difference of approximately 120,000. Housing was projected to be 1.64 million in 2035 under the SCAG 2008 RTP and slightly more under the SCAG 2012 RTP at 1.65 million. Employment was forecast to be less in 2035 under the newest RTP. It is projected to be 2.01 million under the SCAG 2008

RTP versus 1.94 million with the 2012 RTP. It is important to recognize that projected total employment under both the 2008 RTP and 2012 RTP continue to increase from 2010 to 2035. The 2012 RTP simply projects a lower rate of employment growth compared to the 2008 RTP. In a similar manner, the rate at which the population increases is expected to be lower with the 2012 RTP as compared with the 2008 RTP. Exhibit 1D compares these different demographic projections for the LADWP service area for the Year 2035.

Demographic projections are primary drivers of water demand forecasting. It is important to use the latest and best information available, as the accuracy of these projections may lead to an over-estimate or under-estimate of future water demands. During the UWMP planning process, LADWP used the latest available demographic projections for its water demand forecast. Currently, the latest available projections come from the 2012 RTP.

1.3.3 Climate

Weather in Los Angeles is considered mild, which is a major attribute that attracts businesses, residents, and tourists to the City. Because of its relative dryness, Los Angeles' climate has been characterized as Mediterranean. Exhibit 1E provides a summary of average monthly rainfall, maximum temperatures, and evapotranspiration readings.

The City's average monthly maximum temperature is 75 degrees Fahrenheit based on the period of 1990-2014. This is based on data from the Los Angeles Downtown weather station. Total precipitation averages 14.25 inches per year, with over 92 percent of this total amount typically falling during the period of November through April. The standard annual average evapotranspiration rate (ETo) for the Los Angeles area is 45.47 inches per year. ETo measures the loss of water to the atmosphere by

Exhibit 1D
Comparison of SCAG Demographic Projections for LADWP Service Area Between 2008 and 2012 RTP Forecasts for Year 2035

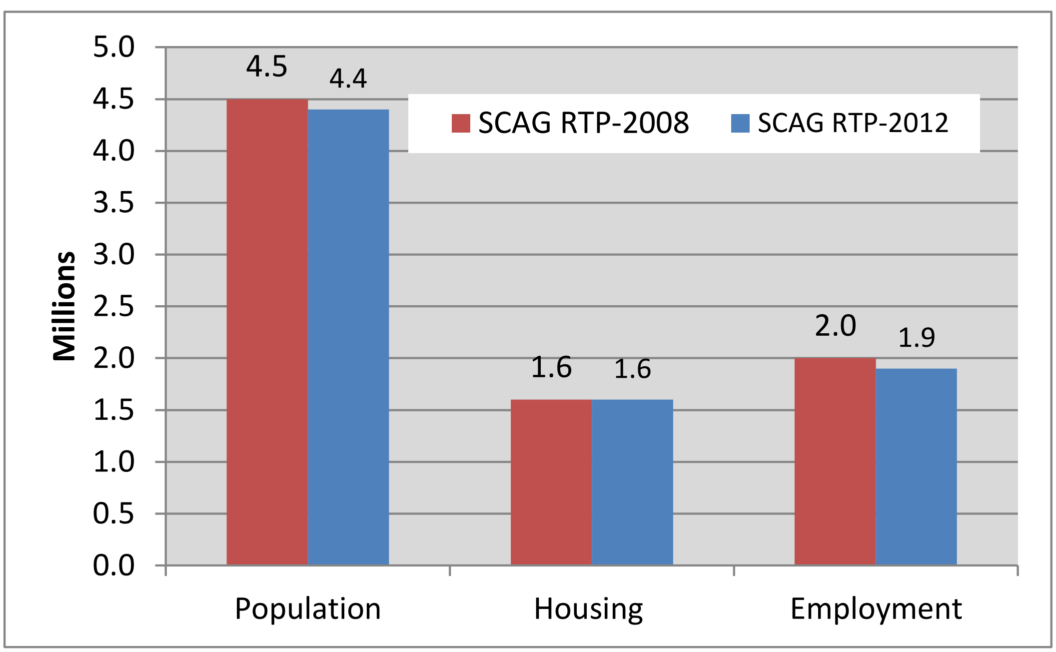


Exhibit 1E
Average Climate Data for Los Angeles 1990-2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Maximum Temperature (°F)[1]	69	68	70	73	75	78	83	84	84	79	73	68	75
Average Precipitation (inches)[1]	3.17	3.87	2.21	0.71	0.33	0.06	0.01	0.01	0.06	0.63	0.75	2.42	14.25
Average Eto (inches)[2,3]	2.03	2.26	3.53	4.27	4.96	5.24	5.89	5.60	4.53	3.25	2.17	1.74	45.47

1. 1990-2014, Los Angeles Downtown USC Weather Station, GHCND:USW00093134
2. Average of Glendale (Station Id. 133), Chatsworth (Station Id. 215), and Long Beach (Station Id. 174)
3. wwwcimis.water.ca.gov

evaporation from soil and plant surfaces and transpiration from plants. ETo serves as an indicator of how much water plants need for healthy growth.

1.3.4 Water Demand and Supply Overview

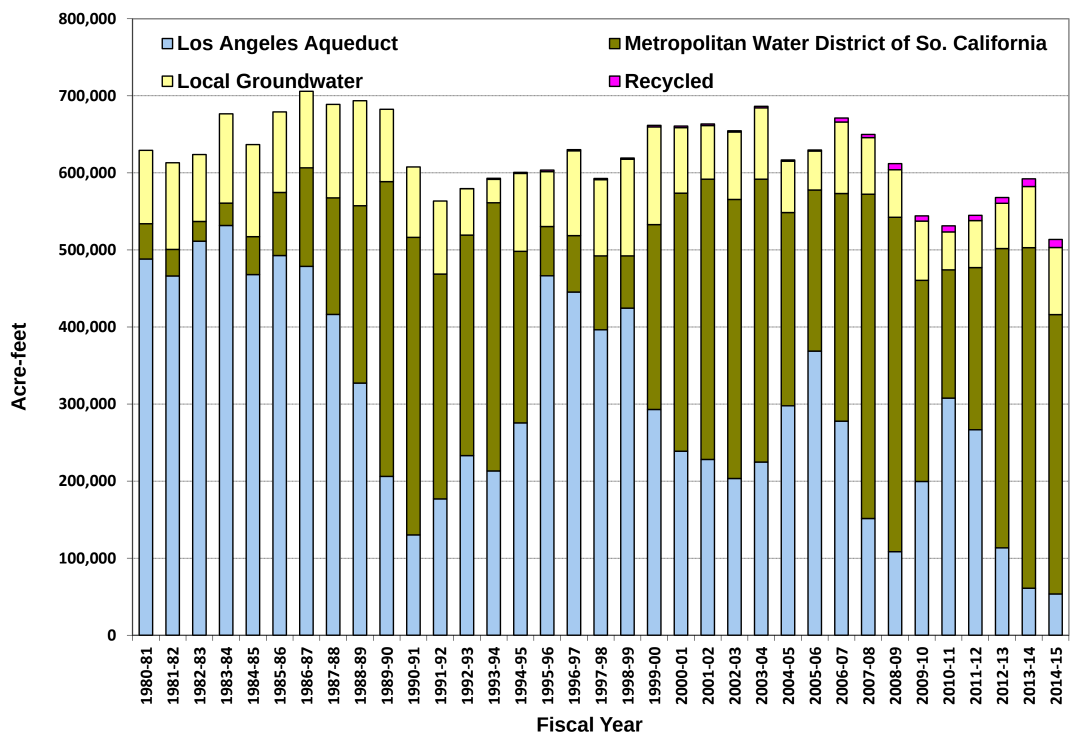
LADWP maintains historical water use data separated into the following categories: single-family residential, multi-family residential, commercial, industrial, government, and non-revenue water. Single-family residential water use is the largest category of demand in LADWP's service area, representing about 37 percent of the total. Multifamily residential water use is the next largest category of demand, representing about 28 percent of the total. Industrial use is the smallest category, representing only 3 percent of the total demand. Non-revenue water is the difference between total water delivered to the city and total water sales and has averaged 7 percent in recent years. Chapter 2 – Water Demands provides an in-depth look at water demand trends and projections for the next 25 years.

Primary sources of water for the LADWP service area are the LAA, local groundwater, and imported supplemental water purchased from MWD. An additional fourth source, recycled water, is becoming a larger part of the overall supply portfolio. Water from the LAA and MWD is classified as imported because it is obtained from outside LADWP's service area. Groundwater is local and obtained within the service area. Historical supply sources are under increased multiple constraints including minimal snowfall, potential impacts of climate change, groundwater basin contamination, and reallocation of water for environmental concerns. To mitigate these impacts on supply sources, LADWP is developing a path towards sustainability as outlined in ED No. 5 and the pLAn by accelerating investments in conservation, water recycling, stormwater capture, and local groundwater development and remediation.

The primary water supply sources are vital to maintaining LADWP's water system reliability. Pressure on one resource, such as the recent minimal snowfall in the Eastern Sierra Nevada Mountains, results in an increased reliance on another resource, such as purchased MWD water. Supplies available from each source are determined using computer models in an attempt to balance total projected supplies with projected demands. Exhibit 1F illustrates historical water supplies from FY 1980/81 to 2014/15. Over the last ten years, demands have undergone a drastic reduction from a peak of 670,970 AFY in FY 2006/07.

Several sequences of multi-year drought have led to diminishing supplies and increased efforts in conservation. Most recently, the start of a multi-year drought in 2012 resulted in diminished supplies from the LAA and historically heavy reliance on purchased MWD water. This drove increased efforts in conservation that resulted in a 22 percent demand reduction in 2014/15 from 2006/07. Reliance on MWD reached a peak in FY 13/14 as a result of limited LAA supplies due to minimal snowfall in the Eastern Sierra Nevada Mountains. Supplies in 2014/15 totaled 513,540 AF with 10 percent from the LAA, 17 percent from local groundwater, 71 percent from MWD, and 2 percent from recycled water. The five-year water supply averages (FY 20010/11 to FY 2014/15) included the following: 29 percent from the LAA, 12 percent from local groundwater, 57 percent from MWD, and 2 percent from recycled water. The imported water (LAA water plus MWD water) supplied over the last five years totaled, on average, approximately 87 percent of the City's demands.

Exhibit 1F
LADWP Historical Water Supply Sources FY 1980/81 to 2014/15



Chapter Two

Water Demand

2.0 Overview

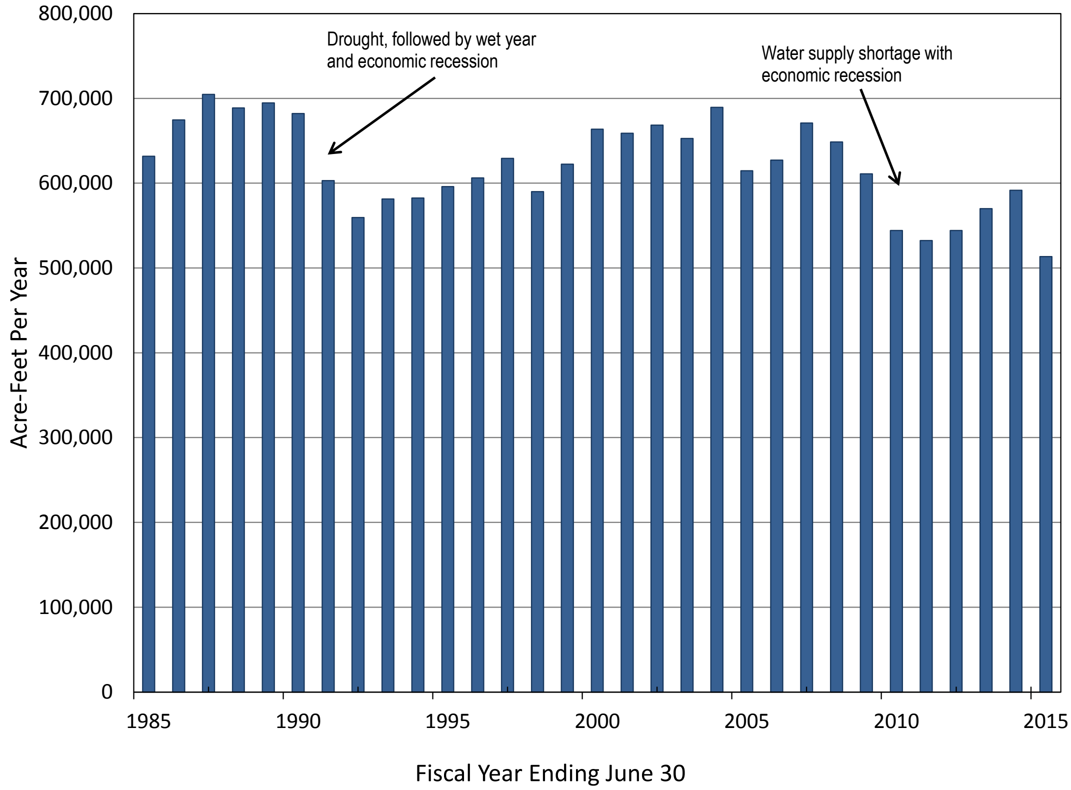
In order to properly plan for water supply, it is important to understand water demands and the factors that influence them over time. LADWP maintains historical water use data separated into six categories: single-family residential, multifamily residential, commercial, industrial, governmental, and non-revenue water. This categorization of demands allows better evaluation of trends in water use over time and more precise targeting of water conservation measures.

2.1 Historical Water Use

Exhibit 2A presents the historical water demand on LADWP. As seen in this exhibit, total water demand varies from year to year, and is influenced by a number of factors such as population growth, weather, climate change, water conservation, drought, and economic activity. In 2009, a 3-year water supply shortage coinciding with an economic recession required LADWP to impose mandatory conservation. Phase III water restrictions were put in place between June 2009 and August 2010. Following an ordinance amendment, Phase II implementation began on August 25, 2010 which allows outdoor watering three days per week. With the beginning of the economic recovery in FY 2009/10 and the end of the drought, customer demands began increasing. Starting in FY 2012/13 drought conditions returned, and the city experienced some of its driest weather on record. These conditions continued through FY 2014/15 and have triggered state and city mandatory conservation measures. As a result, FY 2014/15 water use decreased by 13 percent over FY 2013/14.

Prior to 1990, population growth in Los Angeles was a good indicator of total demands. From 1980 to 1990, population in the city grew at 1.7 percent annually. Water demands during this same ten year period also grew at 1.7 percent annually. However, after 1991, LADWP began implementing aggressive water conservation measures which prevented water demands from returning to pre-1990 levels. Average water demands in the last five years from FY 2010/11 to FY 2014/15 are about the same as they were 45 years ago despite over 1 million additional people now living in Los Angeles. This is evidenced by examining per person (or per capita) water use since 1990 (see Exhibit 2B). In FY 1989/90, per capita water use was 173 gallons per day (gpd). By FY 1999/00, per capita water use fell to 159 gpd, which represents an 8 percent reduction. In FY 2014/15, per capita water use (excluding recycled water) is estimated to be 114 gpd, which represents a 34 percent decrease from FY 1989/90—reflecting the state and city mandates to reduce water use in response to the record California drought.

Exhibit 2A
Historical Total Water Demand in LADWP's Service Area



2.1.1 Water Use by Sector

Exhibit 2C shows the breakdown of average total water use between LADWP's major demand categories and non-revenue water. The breakdown is shown in five-year intervals (except for FYE 2011-2014) for the past 24 years. Single-family residential water use comprises the largest category of demand in LADWP's service area, representing about 36 percent of the total. Multifamily residential water use is the next largest category of demand, representing about 30 percent of the total. Commercial, Industrial, and Institutional/Governmental (CII) water use combined represents 29 percent of the total. Finally, Non-revenue use is the smallest category, representing the remainder of the total demand. Although total water use has varied substantially from year to year, the breakdown in percentage of total demand between the major demand categories has not.

Exhibit 2B
Historical Per Capita Water Use in LADWP's Service Area

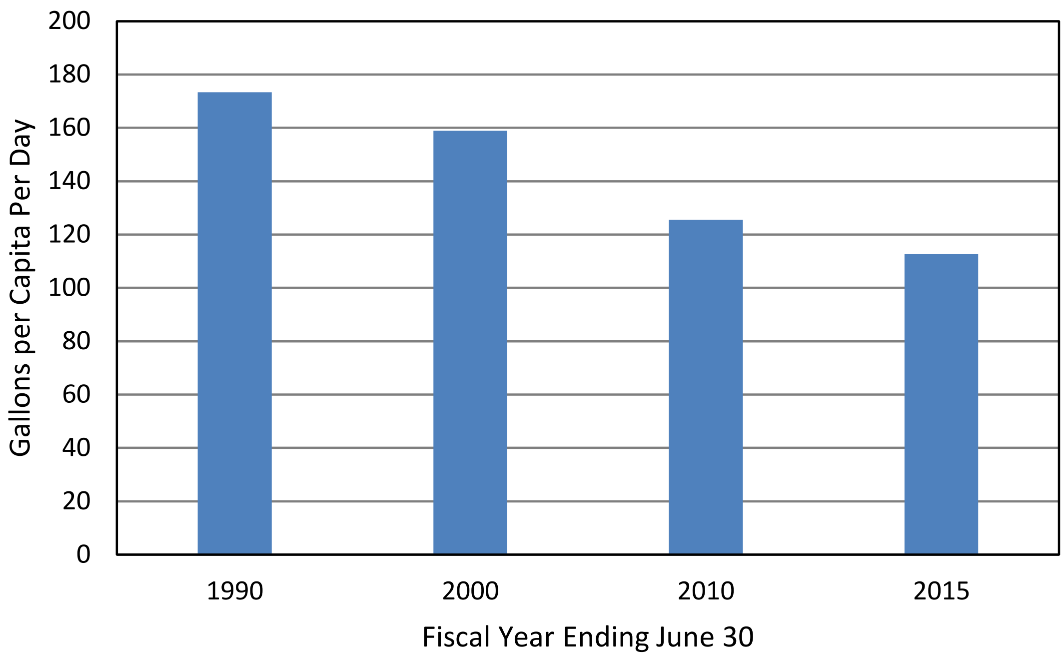


Exhibit 2C
Breakdown in Historical Water Demand by Customer Class

Fiscal Year Ending Average	Single-Family		Multi-Family		Commercial		Industrial		Government		Non-Revenue		Total
	AF	%	AF	%	AF	%	AF	%	AF	%	AF	%	AF
2011-2014	209,651	37%	165,364	29%	98,994	17%	17,663	3%	42,543	8%	32,774[1]	6%	566,990
2006-2010	236,154	38%	180,277	29%	106,964	17%	23,196	4%	42,956	7%	30,617	5%	620,165
2001-2005	239,754	37%	190,646	29%	109,685	17%	21,931	3%	41,888	6%	52,724	8%	656,628
1996-2000	222,748	36%	191,819	31%	111,051	18%	23,560	4%	39,421	6%	33,696	5%	622,295
1991-1995	197,322	34%	177,104	30%	110,724	19%	21,313	4%	38,426	7%	39,364	7%	584,253
24-Year Average	221,126	36%	181,042	30%	107,484	18%	21,533	4%	41,047	7%	39,100	6%	611,331

1. Calculated using AWWA Water Audit worksheet

Water Loss Audit

Non-revenue water consists of unbilled authorized consumption and water losses. Unbilled authorized consumption is the volume of non-revenue water for uses such as mainline flushing to improve water quality and firefighting, etc. Water losses are broken down into two categories: apparent losses and real losses. Apparent losses include meter inaccuracies and theft. Real losses are piping distribution system leakage.

Non-revenue water has significantly decreased in recent years. In FY 2013/14 non-revenue water was estimated at 5.6 percent, based on the American Water Works' Association's (AWWA) Free Water Audit Software. The AWWA Water Audit worksheets for FY 2013/14 are provided in Appendix G. Historically, non-revenue water has averaged 5.9 percent of total water demand over the period FYE 1991-2014. This consistently low level of non-revenue water over the last 24 years indicates that LADWP has an efficient, well-maintained water system. LADWP is committed to continuing to reduce its non-revenue water loss percentages through its Water Loss Task Force, as is discussed in the Conservation Chapter (Chapter 3).

2.1.2 Indoor and Outdoor Water Use

In order to assess the potential for water use efficiency and accurately target conservation programs, it is important to accurately characterize water use in terms of indoor and outdoor demands. As with most water utilities, most of LADWP's customers do not have separate irrigation meters. A small fraction of LADWP's customers, mostly parks and golf courses, do have designated irrigation meters. Therefore, measuring indoor vs. outdoor water demands involves the use of other data and assumptions. In 2010, LADWP estimated total outdoor water use using two methods: (1) estimation of supplemental water needed for landscape irrigation in accordance with the Model Water Efficient Landscape Ordinance definition of an un-rehabilitated landscape; and (2) comparison of wastewater flows to total water consumption. The first method uses the following formula to estimate the water needed to supplement outdoor landscape irrigation beyond the effect of natural precipitation:

$$LW = (Eto - Eppt) \times 0.62 \times A \times ETAF$$

Where:

LW = Supplemental water needed for irrigation;

Eto = Reference evapotranspiration for Los Angeles;

Eppt = Effective precipitation;

0.62 = Conversion factor to gallons;

A = Total greenscape area; and

ETAF = Evapotranspiration (Et) adjustment factor

In 2007, an infrared analysis of the City was conducted as part of the City's Million Trees Program to determine tree canopy and landscape coverage. The infrared analysis methodology used two types of remotely sensed data, infrared imagery and aerial imagery to determine the total greenscape areas within the City. Results of this effort indicated that there were approximately 83,699 acres of greenscape in Los Angeles in 2007. The ETAF (or Et adjustment factor) of 0.8 for the City was derived from the types of plants to be irrigated and an assumed irrigation efficiency. It is consistent with the ETAF for non-rehabilitated landscapes as defined in the California Model Water Efficient Landscape Ordinance. The 2004-2007 average total water demand was selected as the basis for calculating outdoor water use percentage. This period was considered to be about average in terms of weather for Los Angeles and there were no irrigation restrictions in effect. Using the formula described previously, the supplemental water required for outdoor landscaping in the City was estimated to be 249,000 AFY. During this same period, total water demand averaged 647,000 AFY. Therefore, it is estimated that the City's total outdoor water use represents approximately 39 percent of the total demand.

The second method of estimating overall outdoor water use compares wastewater flows to total water consumption. Since wastewater flow represents indoor water use that flows into the sanitary sewer system, the difference between total water consumption and wastewater flows represents outdoor water use. However, groundwater infiltration and wet weather runoff may also enter sanitary sewer systems through cracks and/or leaks in the sanitary sewer pipes or manholes and results in overestimation of indoor water use. To minimize overestimation, only data from summer months were used to estimate average monthly wastewater attributable to indoor water use. In Los Angeles, the summer months typically have little or no measurable rainfall. Using the same pre-water restriction period of 2004-2007 selected in the first method, the average monthly wastewater flow (using only the summer months of June through September) yields approximately 365 million gallons per day (MGD) or 403,000 AFY of estimated indoor water use. Subtracting this estimated indoor water use from the total water consumption of 647,000 AFY results in an estimated total outdoor demand of 244,000 AFY or 38 percent, which is similar to the 39 percent obtained with the landscape irrigation method.

Therefore, two entirely different methods produced very similar results in estimating the total outdoor water use for the City.

To obtain an estimate of indoor vs. outdoor water use for each major billing category, a minimum-month method was used. Monthly water use for single-family, multifamily, commercial, industrial, and government was obtained for 2004-2007. The water use in the minimum month, usually one of the cool/wet winter months, is assumed to be predominantly indoor use. The difference between any selected month and the minimum month is attributed to outdoor water use. However, based on the two prior methods, a certain amount of outdoor water use occurs even during the minimum month. Therefore, estimates of the outdoor water use that occurs in the minimum month were developed for each major billing category. Then the outdoor use of each major billing category was totaled and compared with the total outdoor water use obtained from the previously described outdoor water demand calculations.

Exhibit 2D presents the estimated indoor and outdoor water use for the City using all three methods.

Exhibit 2D
Indoor vs. Outdoor Water Use in LADWP's Service Area

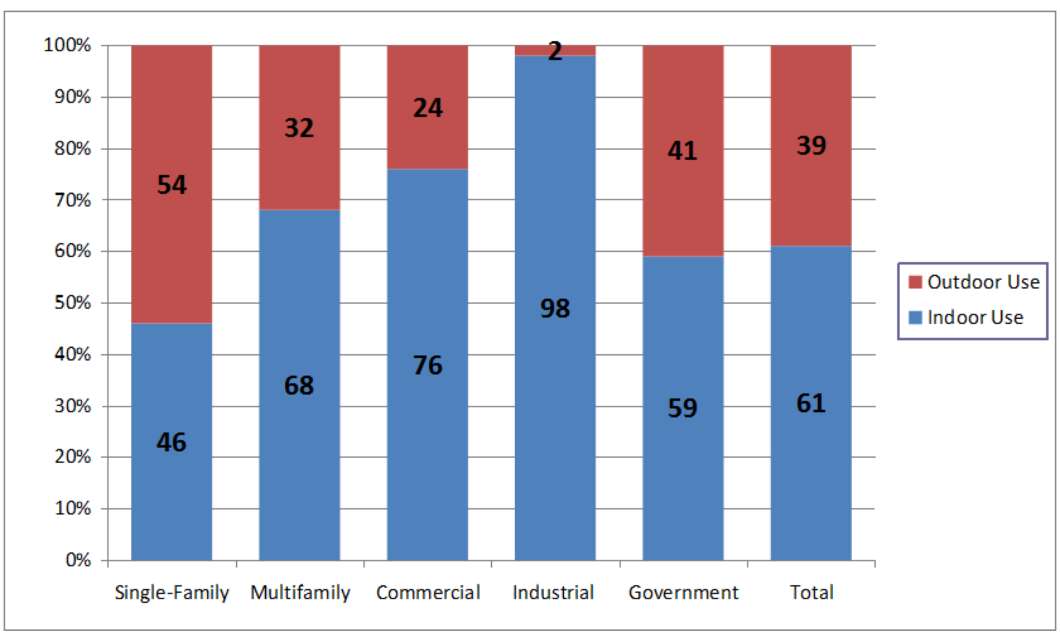
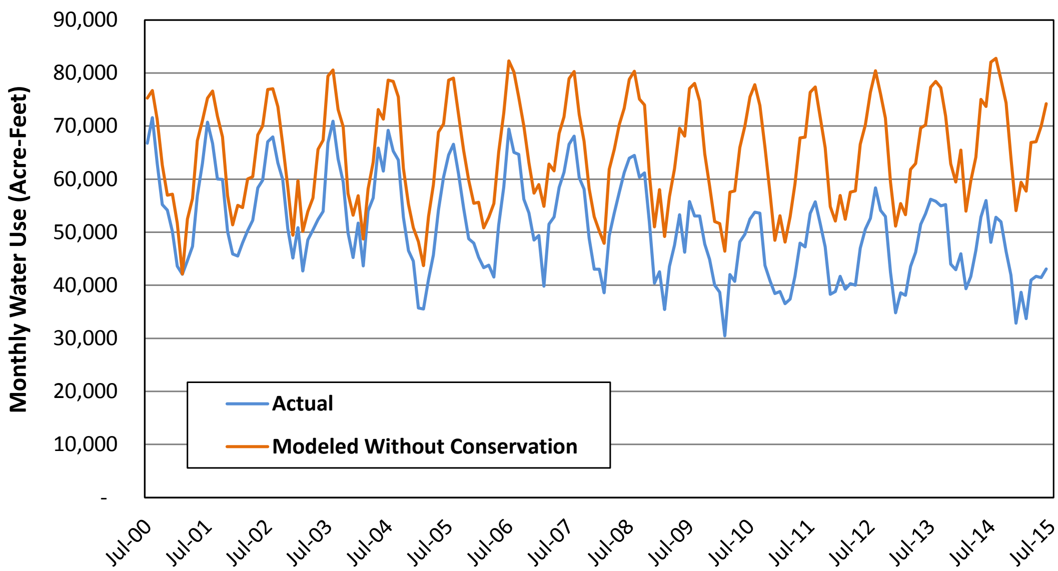


Exhibit 2E
Modeled vs. Actual Monthly Water Consumption for LADWP



It is important to note that the indoor and outdoor water use percentages will vary greatly during water shortage periods. For example, during the current drought, LADWP implemented multiple drought response strategies to meet both State and Local water use reduction mandates. One of LADWP's most reliable drought response strategies is its Emergency Water Conservation Plan. LA is currently in Phase II, which restricts outdoor watering for all customers to three days per week. The watering restrictions are estimated to reduce water use by up to 20 percent. In addition, LADWP has greatly expanded its Water Conservation Outreach Campaign to increase water conservation through indoor and outdoor customer behavior changes. The drought response strategies are primarily geared towards outdoor water use, so outdoor water use percent will typically be lower during drought years than what is shown above. Exhibit 2D represents average year conditions when drought response strategies are not in effect.

2.2 Quantification of Historical Water Conservation

Since 1990, LADWP has invested hundreds of millions of dollars in water conservation. These conservation investments include various programs such as high efficiency toilet rebates, commercial/industrial water audits, education and public outreach, and much more which are discussed in Chapter 3, Conservation. During periods of water shortage, public education and outreach are especially important and have contributed to significant reductions in water use.

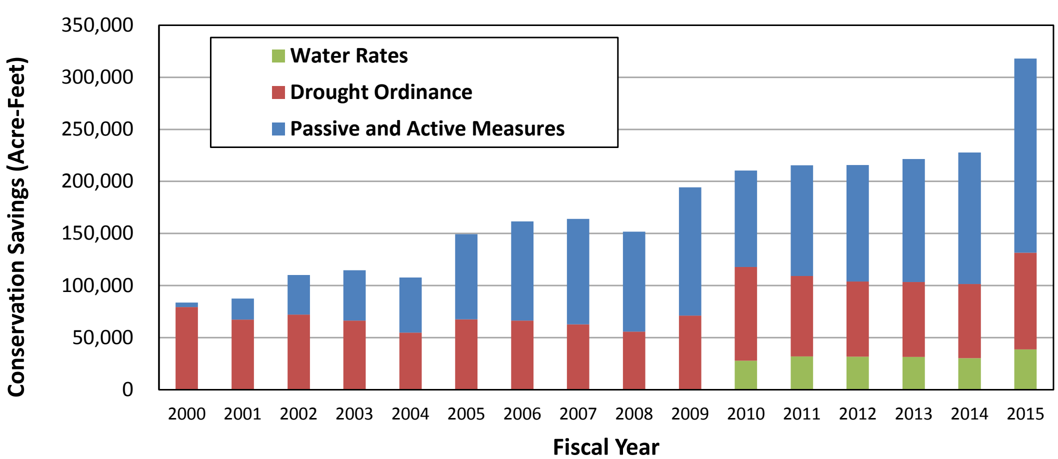
In an effort to quantify its water conservation efforts, LADWP developed a statistical Conservation Model that correlates total monthly water use in the City with variables of population, weather, price of water, passive and active conservation, periods of water use restrictions, and periods of economic recession. The model used data from January 2000 to December 2014, with a base year of 2000. The base year was established to measure all conservation from this point in time forward. Conservation includes: (1) passive conservation from plumbing codes and landscape ordinances; (2) customer responses to the price of water; (3) active conservation from rebate programs to incentivize customers to install high-efficiency water using fixtures; and (4) behavioral conservation in response to public messaging and mandatory water use restrictions in response to droughts. The model can predict what water demand would have been had no conservation occurred; given the actual weather, population and economic conditions that took place.

This modeled water consumption without conservation is then compared to actual water consumption—with the difference being attributed to water conservation. The model has an adjusted correlation coefficient value of 0.93, indicating a very high level of statistical correlation between the dependent variable water use and all of the explanatory variables.

Exhibit 2E presents modeled and actual monthly water consumption from 2000 to 2015. The total conservation increases every year since 2000 (base year), with the greatest levels of conservation occurring in the summer months.

Exhibit 2F summarizes the estimated annual water conservation by type, using the Conservation Model. Conservation attributed to water rates was a result of changes in tiered water rates and implementation of penalty water rates starting in 2008. Conservation attributed to drought ordinance reflects the levels of mandatory restrictions on outdoor watering imposed by LADWP. Conservation attributed to passive and active measures reflects savings from plumbing codes and landscape ordinances, as well as savings from rebate and other incentives provided by LADWP. Fiscal Year 2015 saw a significant increase in active and passive conservation among LA residences. This was a result of state and local mandates in water use reduction responding to the multi-year drought.

Exhibit 2F
Components of Water Conservation Savings since Fiscal Year 2000



2.3 Water Demand Forecast

2.3.1 Demand Forecast Methodology

LADWP has developed a water demand forecast for each of its major categories of demand. This allows the City to better understand trends in water use and develop effective conservation programs. The methodology used for the demand forecast is called a modified unit use approach. The following steps are used in this approach:

Step 1. Estimate baseline per unit water use – take each billed category of water demand (e.g., single-family, industrial, etc.) for a base (or starting) period and divide by associated demographic driver (e.g., number of single-family homes or number of industrial employees). This baseline per unit water use includes all water conservation up until this point of time.

Step 2. Modify the estimated baseline per unit water use to account for future changes in the following socioeconomic variables: price of water, personal income, family size, economy, drought conservation effect, and passive water conservation (which accounts for efficiencies in water use from state and local plumbing codes and ordinances).

Step 3. Estimate current passive conservation from current plumbing codes and landscape ordinances, and reduce the modified per unit water use factors by estimated percent savings from passive conservation.

Step 4. Multiply modified per unit water use, reduced by passive conservation, for each category in Step 2 and Step 3 by the associated projected demographic drivers in order to obtain projected water demands by billed category. Note that these per unit water use factors do not include future active or additional passive conservation from new or potential codes and ordinances.

Step 5. Estimate non-revenue water (the difference between total water consumption and billed water use) by applying a non-revenue water use factor, and add non-revenue water to the billed category water demands in Step 4 in order to get a forecast of total water consumption with passive conservation from current codes and ordinances.

Step 6. A final water use adjustment is made by reducing each customer classes' (and non-revenue) total water use by a percentage reflective of the assumed mandatory Conservation Phase in effect. Once this is applied we have the total post-conservation water use projection for LA's service area.

2.3.2 Applying the Methodology

In Step 1 of this method, historical water demands for single-family, multifamily, commercial/government, and industrial were averaged from 2010 to 2013 to determine the baseline. This period was used because on average, it represented normal weather conditions, it was post economic recession, and it was before mandatory water restrictions were established by Mayor Garcetti and Governor Brown in response to the current California Drought. For each of these categories, the average water demand was divided by a demographic driver that could be projected into the future. The result of this calculation is a water demand expressed as a unit water use. The estimated demographics for the period 2010 to 2013 were estimated based on 2010 census numbers and projected 2015 values that were provided by the Metropolitan Water District of Southern California, using the Southern California Association of Governments' 2012 Regional Transportation Plan demographic forecast (2012 SCAG RTP).

Exhibit 2G presents the 2012 SCAG RTP demographic projections for LADWP's service area. Exhibit 2H presents the unit use calculation for the baseline.

Exhibit 2G
Projected Demographic Drivers Based on 2012 SCAG RTP

Fiscal Year Ending	Single-Family Homes	Multifamily Homes	Commercial/ Government Employees	Industrial Employees
2015	618,934	775,060	1,687,715	130,124
2020	650,746	828,744	1,704,864	136,023
2025	635,348	900,523	1,749,994	135,994
2030	652,379	940,549	1,788,566	134,061
2035	675,540	973,978	1,807,774	131,686
2040	682,412	1,031,239	1,869,383	131,285

Exhibit 2H
Baseline Unit Water Use (2010-2013)

Demand Category	Average Water Demand (AFY)	Demographic Driver Category	Average Demographic Driver[1]	Average Unit Water Use (gallons/day/ driver)
Single-Family	204,549	Single-Family Homes	607,088	337.2
Multifamily	166,597	Multifamily Homes	750,479	219.0
Commercial/ Government	137,488	Commercial/Gov. Employment	1,616,886	84.7
Industrial	17,849	Industrial Employment	128,143	135.1
Landscaping	204	Multifamily Homes	750,479	0.3

[1] Represents the average between 2010 Census and 2012 SCAG RTP forecast for 2015.

Exhibit 2I
Socioeconomic Variables

	Income Elasticity	Family Size Elasticity
Single-Family	+0.270	+0.550
Multifamily	+0.310	+0.450

Source: MWD 2010 Integrated Water Resources Plan Update Appendix A.1 Demand Forecast

Step 2 in the methodology involves modifying these baseline unit water use to account for changes in the following socioeconomic variables: price of water, personal income, family size, drought conservation effect, and passive water conservation. Using the Conservation Model described in Section 2.2, a price elasticity of demand was estimated to be -0.089 for all sectors. The price elasticity represents a percent change in water use as a result of a percent change in the real price of water. Economic theory suggests that as the real price of water increases, customers are further incentivized to reduce water use. Assuming a 10 percent real increase in the price of water, the estimated price elasticity from the Conservation Model described in Section 2.2 would translate into a 0.84 percent decrease in water use. This low impact suggests that water demand in Los Angeles is inelastic with regard to price of water. This is not surprising given how much passive and active conservation has already occurred in the City since 1990—leaving little extra incentive for customers to reduce water use based on price alone.

In addition to price of water, two other socioeconomic elasticities were used to modify the baseline unit water use: personal income and family size. As the real value of personal income increases, water use tends to increase (all other things being equal), as income is tied to larger lot sizes, bigger homes, greater presence of swimming pools, and more water using fixtures. As family size of a home increases, water use per home increases.

For the socioeconomic variables of personal income and family size, elasticities from MWD's Econometric Water Demand Model, developed as part of MWD's 2010 Integrated Water Resources Plan, were used as shown in Exhibit 2I.

2.3.3 Passive Conservation from Current Codes and Ordinances

In Step 3, the current California and City of Los Angeles plumbing codes and landscape ordinances were used to determine the passive conservation that would occur from 2020 to 2040 assuming 100 percent compliance with codes and ordinances for high-efficiency plumbing fixtures and the new California Model Efficient Water Landscape Ordinance for all new construction. The water savings factors are applied to these new homes, relative to existing non-complying homes in order to derive percent savings from passive conservation over time. Exhibit 2J presents the percent savings from passive conservation projections in LADWP's service area.

As more homes and businesses in Los Angeles become compliant with state and city conservation ordinances, per unit water use will decrease. Codes and ordinances require new construction to comply with water efficient practices which still allow us to maintain a high quality of life while not wasting water. Exhibit 2K shows the projected unit water use with water savings from current codes and ordinances.

Exhibit 2J
Passive Conservation Savings from Current Codes and Ordinances

Years	Percent Conservation Savings			
	Single-Family Plumbing Codes	Multifamily Plumbing Codes	CII Plumbing Codes	Landscape Ordinance
2020	-4%	-3%	-2%	-2%
2025	-3%	-2%	-2%	-2%
2030	-4%	-4%	-3%	-2%
2035	-6%	-5%	-3%	-3%
2040	-7%	-5%	-4%	-3%

Exhibit 2K
Projected Unit Water Use with Savings from Current Codes and Ordinances

Years	Single-Family (gal/SF home)	Multi-Family (gal/MF home)	Commercial/ Government (gal/employee)	Industrial (gal/employee)	Landscaping (gal/MF home)
Baseline	337.2	219.0	84.7	135.1	0.3
2020	324.4	211.0	82.4	131.3	0.3
2025	326.8	211.4	82.2	131.1	0.3
2030	321.1	207.7	80.8	128.9	0.3
2035	317.0	205.0	79.7	127.0	0.3
2040	313.8	202.5	78.7	125.5	0.3

2.3.4 Water Demand Forecast Results

Steps 4 and 5 of the water demand forecast method involve reducing the modified per unit water use factors by the passive conservation savings shown in Exhibit 2J, then multiplying these unit use factors by the projected demographics for LADWP shown in Exhibit 2G, and adding the non-revenue water percentage. Non-revenue water is projected to be 6 percent of total billed water consumption, and includes all unmetered water for fire protection, distribution system flushing, and other unaccounted water. Finally in Step 6, the total water use for each customer class and non-revenue water are reduced by the conservation savings from the assumed Emergency Water Conservation Plan ordinance phase; the result of these steps is the water demand forecast with passive conservation including codes, ordinances, and conservation phases for each of the major categories of demand (see Exhibit 2L). The targeted water demands based on the water use reduction goals established in the Sustainable City pLAn are also listed for reference.

In the Sustainable City pLAn, per capita water use targets are established for potable water demand. Adding LADWP's planned recycled water supply to the pLAn's potable water demand targets yields an overall target for total water demands. This water demand target is compared to the water demand forecast with passive conservation to identify the additional levels of water conservation needed into the future (see Exhibit 2M).

This additional water conservation can come from continued and increased levels of active conservation that LADWP implements, as well as additional passive conservation from long-term behavioral changes in customer water use, and compliance with new codes and ordinances mandating levels of future efficiency standards.

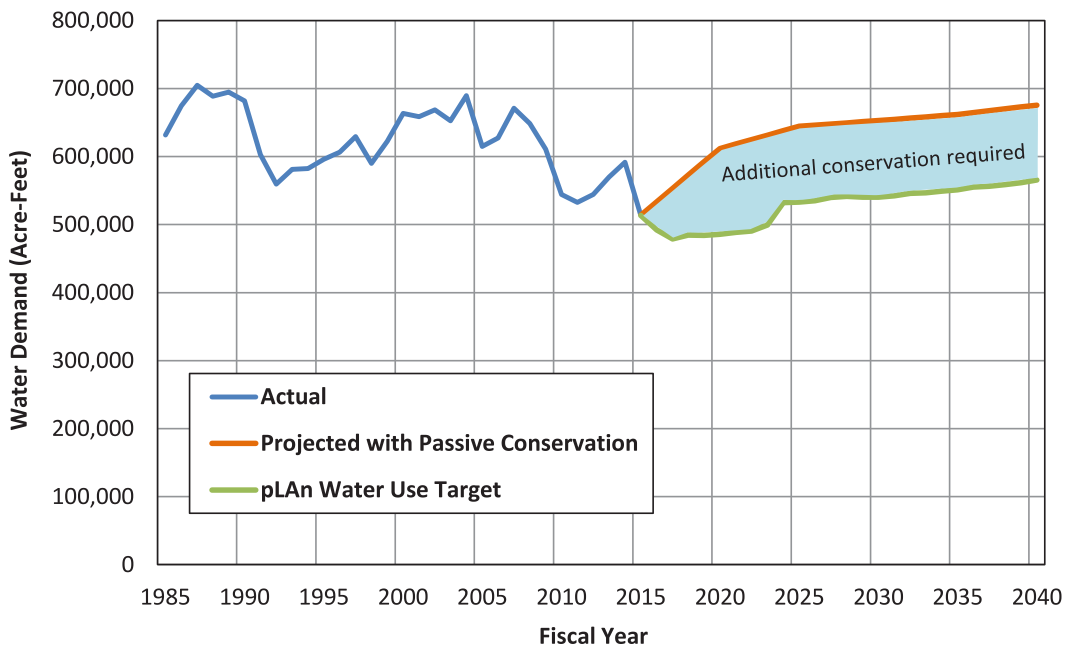
LADWP is completing a comprehensive Water Conservation Potential Study that is evaluating the remaining active and passive conservation that exists citywide. This study also evaluates new conservation measures from technical, customer acceptance and cost-effectiveness perspectives. The results from the study will guide LADWP in its future water conservation planning and program development. Additional commentary on the study can be found in Chapter 3, Conservation.

Exhibit 2L
Water Demand Forecast with Passive Conservation Savings from Codes, Ordinances, and Conservation Phases for LADWP Service Area

Fiscal Year Ending	Water Demands by Sector (Acre-Feet)						
	Single-Family	Multi-Family	Commercial/ Government	Industrial	Non-Revenue	Total	pLAn Target Use[1]
2020	222,958	184,679	148,600	18,869	36,709	611,815	485,600
2025	224,729	206,065	155,994	19,235	38,682	644,706	533,000
2030	226,770	211,454	156,788	18,701	39,173	652,886	540,100
2035	231,776	216,071	156,186	18,104	39,711	661,848	551,100
2040	231,767	225,994	159,554	17,829	40,541	675,685	565,600

[1] Targeted water demands set forth in the Mayor's Sustainable City pLAn

Exhibit 2M
Comparing Water Demand Forecast with Passive Conservation to Water Use Targets in the City's pLAn



2.3.5 Water Demand Forecast with Historical Weather Variability

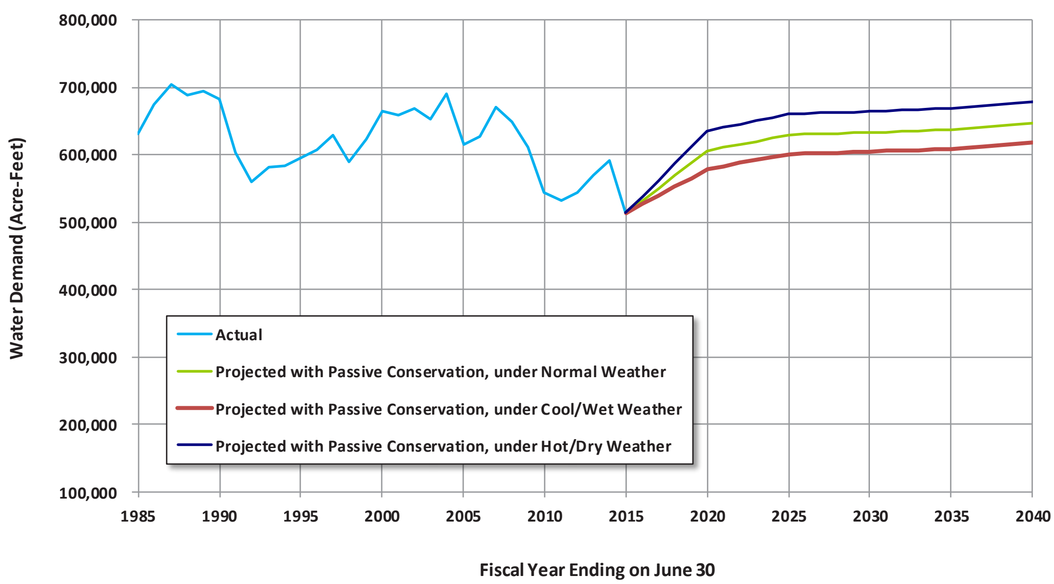
Water demand fluctuates year to year primarily due to variations in weather. The Demand Model estimated the impacts of historical variations in temperature and precipitation on annual water demand. This is accomplished by projecting water demands assuming long-term normal weather, and then comparing normal-weather demand to demands under historical cool/wet weather and historical hot/dry weather. Using this method, projected water demands can vary by approximately ± 5 percent in any given year due to historical weather variability. This means that water demands under cool/wet weather conditions could be as much as 5 percent lower than normal demands; while water demands under hot/dry weather conditions could be as much as 5 percent higher than normal demands. Exhibit 2N presents LADWP's historical and forecasted total water demands with passive water conservation, under the 3 different weather scenarios.

2.3.6 Low-Income Water Demand Projections

The requirements for the 2015 UWMP call for projections of water demands for low-income customers. For rate relief purposes, LADWP maintains records of low-income water customers. For the FY 2014/15, approximately 8.5 percent of the total number of single-family homes in the City are classified as low-income. On average, these customers used about 20 percent less water per household than overall single-family customers. To forecast low-income single-family water demand, the 8.5 percent ratio of low-income to total single-family homes was applied to determine the total number of low-income single family homes. The system wide per unit water use for single-family homes was reduced by 20 percent and multiplied by the total number of low-income single-family homes to determine low-income single-family water demand.

Because the water services of multifamily residential customers are not typically

Exhibit 2N
Projected Water Demand Variability from Historical Weather



metered individually, a multifamily water account can represent upwards of 100 homes. Therefore, a different approach was used to determine low-income multifamily households. LADWP's power system does individually meter multifamily homes and classifies homes as low-income for rate relief purposes. Therefore, the ratio of current low-income multifamily power accounts to total multifamily homes in the City was applied to the total projection of multifamily homes in order to determine the estimated number of future low-income multifamily homes. For the FY 2014/15, approximately 19.6 percent of the total number of multifamily homes in the City is classified as low-income. Assuming that low-income multifamily homes also use 20 percent less water than overall multifamily homes, an adjusted per unit water use for multifamily homes was multiplied by the projected number of low-income multifamily homes to determine low-income multifamily water demand. Exhibit 20 presents the water demand forecast for low-income residential water customers.

Exhibit 20
Water Demand Forecast for Low-Income Residential Customers
Fiscal Year Ending June 30

Low-Income Single-Family Customers	2020	2025	2030	2035	2040
Number of Homes	55,146	53,841	55,284	57,247	57,829
Household Water Use (Gallons/Day)*	245	253	248	245	243
Demand Forecast (Acre-Feet/Year)	15,113	15,233	15,371	15,711	15,710
Low-Income Multifamily Customers	**2020**	**2025**	**2030**	**2035**	**2015**
Number of Homes	162,358	176,420	184,262	190,811	202,029
Household Water Use (Gallons/Day)*	159	163	161	158	157
Demand Forecast (Acre-Feet/Year)	28,940	32,291	33,136	33,859	35,414
Total Low-Income Residential Customers	**2020**	**2025**	**2030**	**2035**	**2015**
Demand Forecast (Acre-Feet/Year)	44,053	47,524	48,507	49,570	51,124

* Assumes same percent conservation as system for single-family and multifamily homes.

Chapter Three
Water Conservation

Rowena Reservoir

3.0 Overview

Multiple factors, such as more frequent and severe droughts, climate change, and environmental regulations, are increasingly restricting LADWP's traditional water supply sources. The City of Los Angeles has long recognized that water conservation should be at the core of multiple strategies to improve overall water supply reliability for its customers. As such, Los Angeles has taken a leadership role in managing its demand for water, resulting in the City's per capita (per person) water use being lower than other large cities in California and the western United States.

Water conservation benefits Los Angeles in numerous ways, such as: (1) improvement in water supply reliability; (2) deferment and reduction in the size of water and wastewater system improvements; (3) monetary savings for customers that reduce their water consumption; (4) reduction in dry weather urban runoff from irrigation of landscaping that decreases the amount of pollutants flowing into local rivers and the Pacific Ocean; and (5) reduction in energy use for water and wastewater treatment, pumping for water conveyance and sewer collection, and within homes and businesses for water heating/cooling and clothes/dish washing. Because water conservation reduces energy needs, it also has the added benefit of reducing greenhouse gas emissions. In the end, the primary beneficiaries of conservation are LADWP's water customers and the natural environment.

The civic cultural ethics of water conservation and water use efficiency in Los Angeles began with the installation of water meters on all services in the early 1900's. At that time, this foundational conservation measure resulted in a 30 percent reduction in water use. When faced with significant supply shortages, City residents have responded with unprecedented reductions in their water use. Los Angeles was one of the first cities in southern California to invoke mandatory water rationing during the 1976-77 drought. The longer drought from 1987 to 1992 was more challenging to southern California and left a permanent imprint on Los Angeles water customers. In response to the water shortages caused by this five-year drought, LADWP expanded its voluntary water conservation program. This program included an extensive public awareness program and education campaign and involved providing incentives for customers to install low-flow showerheads and conserving toilets in their homes and businesses. These hardware changes, coupled with more water efficient use habits, have significantly reduced the amount of imported water that the City needs to buy as its population and commerce continued to grow. Through the years that followed, LADWP expanded its water conservation program to include industrial process water use efficiency, smart irrigation devices, and turf replacement.

The current drought is considered one of the worst in California's history, and has impacted the state like no other. As a result of the water shortages caused by this drought, the following occurred: (1) Metropolitan Water District of Southern California (MWD) implemented its drought allocation of imported water in early 2015; (2) the Governor implemented the first ever statewide mandatory water use restrictions with a state target of 25 percent reduction in water use from 2013 levels; and (3) Mayor Garcetti released his Executive Directive No. 5 (ED5) and the first ever Sustainable City pLAn (pLAn) that included aggressive water conservation and local water management goals for Los Angeles. Also, in response to the current drought, the City expanded its Water Conservation Outreach Program and updated its Emergency Water Conservation Plan Ordinance's enforceable water waste provisions and mandatory outdoor watering restrictions. Comparing FY 2014/15 to FY 2006/07, total water use in the City was 31 percent lower; single family use was 35 percent lower; multi-family use was 24 percent lower; commercial use was 16 percent lower; industrial use was 14 percent lower; and government use was 13 percent lower. As a result of the sustained water conservation ethic of LADWP's water customers, the City's water usage today is about the same as the 1970s despite an increase in population of over 1,000,000 additional people (see Exhibit 3A).

Exhibit 3A
Historical City of Los Angeles Water Use

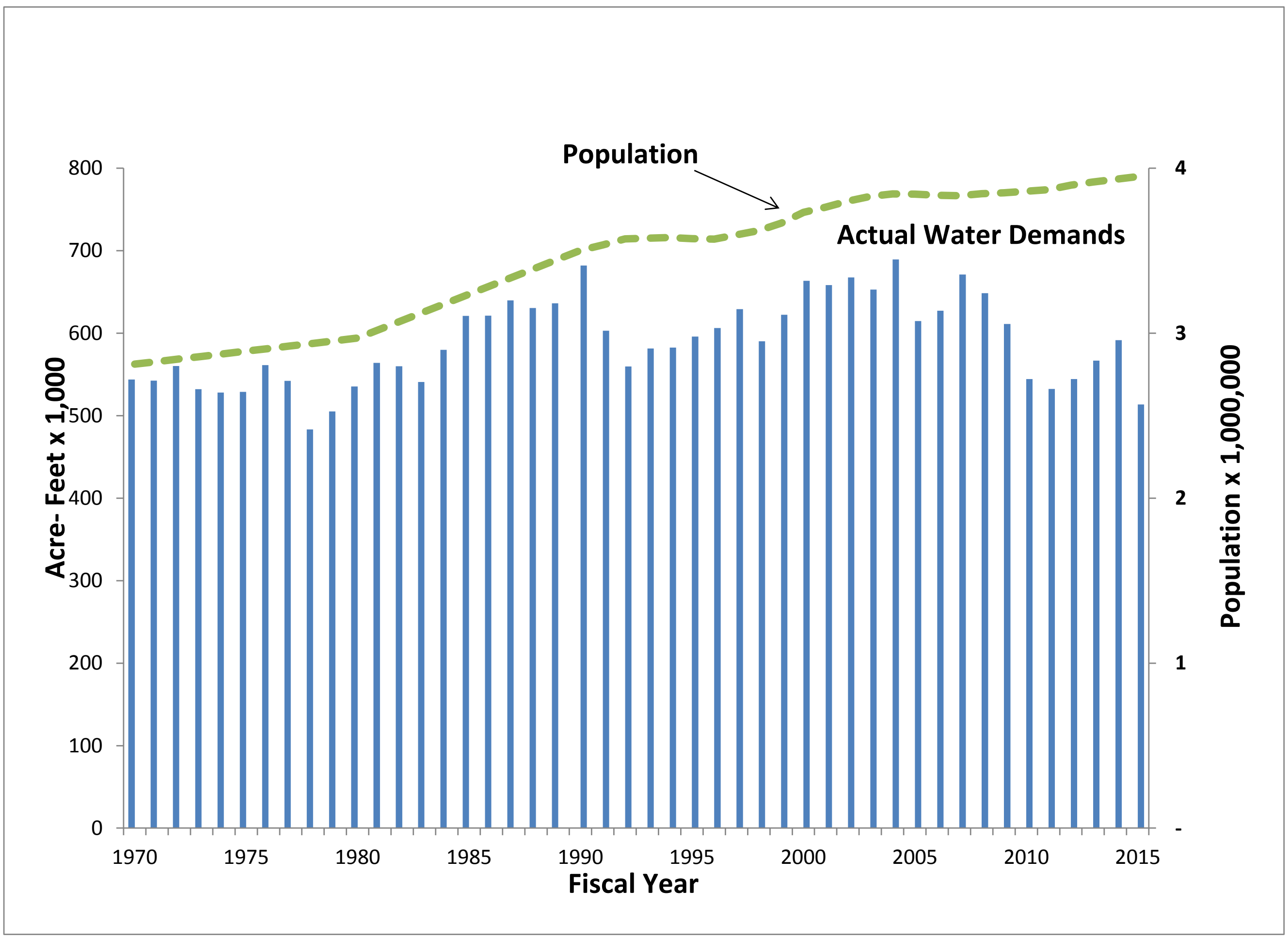


Exhibit 3B shows historical conservation savings from FY 1990/91 through FY 2014/15 based on the installation of conservation devices subsidized through rebates and incentives. Cumulative annual hardware savings since the inception of LADWP's conservation program totals 118,034 AFY. Additional conservation was achieved through changes in customers' behavior to use water more efficiently.

Exhibit 3B
Historical City of Los Angeles Conservation

Fiscal Year	Additional Annual Hardware Installed Savings (AF)	Cumulative Annual Hardware Savings (AF)	Annual Non-Hardware Savings (AF)	Annual Total Savings (AF)
Prior to 1990/1991	31,825	31,825		
1990/1991	4,091	35,916	76,350	112,266
1991/1992	8,670	44,586	105,593	150,179
1992/1993	3,286	47,872	58,546	106,418
1993/1994	4,961	52,832	60,928	113,760
1994/1995	4,041	56,873	62,084	118,957
1995/1996	4,642	61,516	52,648	114,164
1996/1997	2,376	63,892	33,720	97,612
1997/1998	2,637	66,529	30,434	96,963
1998/1999	2,781	69,310	38,305	107,615
1999/2000	3,532	72,842	80,909	153,751
2000/2001	3,078	75,920	79,527	155,447
2001/2002	2,452	78,371	95,428	173,799
2002/2003	2,630	81,002	94,463	175,465
2003/2004	3,257	84,259	84,023	168,282
2004/2005	3,299	87,558	114,428	201,986
2005/2006	2,404	89,963	118,574	208,537
2006/2007	2,095	92,058	116,922	208,980
2007/2008	782	92,840	110,628	203,468
2008/2009	3,127	95,967	149,567	245,534
2009/2010	4,269	100,236	183,080	283,316
2010/2011	2,495	102,731	185,640	288,371
2011/2012	1,993	104,724	183,852	288,576
2012/2013	2,122	106,846	187,444	294,290
2013/2014	3,977	110,823	189,689	300,512
2014/2015	7,211	118,034	272,721	390,755

LADWP will continue to invest in cost-effective water conservation programs and measures. Looking forward, it will expand its focus on landscape water use efficiency and conservation opportunities in the commercial/industrial/institutional (CII) customer sectors. LADWP's conservation planning process includes working with other City departments to ensure that mutual needs are addressed and goals are achieved (e.g., landscape water use efficiency and dry weather runoff reduction).

3.1 Water Conservation Goals

Water conservation reduces demand that typically rises over time with growth in population and commerce. By mitigating those increases in demand, water supply reliability is improved while costs are reduced. In the early 1990s, City residents responded with conservation levels exceeding 20 percent due to mandatory conservation resulting from increasingly drier conditions. As normal water supply conditions returned and LADWP's conservation program continued, conservation levels stabilized at approximately 15 percent. With the recent water shortage and reduced deliveries of imported water from MWD, residential customers have achieved conservation levels exceeding 30 percent in the period between FY 2006/07 and FY 2014/15. From July 2007 through June 2015, 422 billion gallons of water was saved through conservation of all sorts. As a direct result of conservation, imported water purchases from MWD are 23 percent below baseline allocations for FY 2014/15.

3.1.1 ED5 and pLAn Water Conservation Goals

In response to the recent persistent drought, Mayor Garcetti issued the Executive Directive No. 5, Emergency Drought Response—Creating a Water Wise City, in October 2014. Following this action, in April 2015 the Mayor released the City's first ever Sustainable City "pLAn" that focuses on sustainability, with special focus on the environment, the economy, and equity. The pLAn incorporates water savings goals as follows:

- By 2017 reduce per capita potable water use by 20 percent
- By 2025, reduce per capita potable water use by 22.5 percent
- By 2035, reduce per capita potable water use by 25 percent

Achieving these goals will reduce the City's reliance on imported water while providing a drought-proof resource that is not subject to weather conditions. This aggressive approach includes multiple strategies: investments in state-of-the-art technology; a combination of rebates and incentives promoting installation of water-efficient appliances such as weather-based irrigation controllers; efficient clothes washers and urinals; expansion and enforcement of prohibited water uses; reductions in outdoor water use; extending education and outreach efforts; and encouraging regional conservation. LADWP's commitment to conservation is a successful multi-faceted approach that includes tiered water pricing, education and awareness, financial incentives for the installation of a variety of conservation measures, free water saving showerheads and faucet aerators, a Technical Assistance Program (TAP) that provides incentives for business and industry, and large landscape irrigation efficiency programs. Conservation is a foundational component of LADWP's water resource planning efforts and will continue to be central to the City's water use efficiency goals over the long term.

3.1.2 Water Conservation Act of 2009

The Water Conservation Act of 2009, Senate Bill x7-7, requires water agencies to reduce per capita water use by 20 percent by 2020 (20x2020). This includes increasing recycled water use to offset potable water use. Water suppliers are required to set a water use target for 2020 and an interim target for 2015 using one of four methods. The 2020 urban water use target may be updated in a supplier's 2015 UWMP. Failure to meet adopted targets will result in the ineligibility of a water supplier to receive water grants or loans administered by the State unless one of two exceptions is met. Exception one states a water supplier may be eligible if they have submitted a schedule, financing plan, and budget to Department of Water Resources (DWR) for approval to achieve the per capita water use reductions. Exception two states a water supplier may be eligible if an entire water service area qualifies as a disadvantaged community.

Four methodologies are stipulated for calculating the water use target. Three of the methods are listed in Water Code § 10608.20(a)(1). The fourth method was developed by DWR. The four methodologies are:

- Method 1 – Eighty percent of the water supplier's baseline per capita water use.

- Method 2 – Per capita daily water use estimated using the sum of performance standards applied to indoor residential water use, landscape area water use, and commercial, industrial, and institutional water uses.

- Method 3 – Ninety-five percent of the applicable State hydrologic region target as stated in the State's draft 20x2020 Water Conservation Plan.

- Method 4 – Developed through a public process. This method allows flexibility in its calculation to account for the highly diverse conditions of each agency's landscape, commercial, industrial, and institutional water needs and to give credit for past conservation efforts. For more information please go to: http://www.water.ca.gov/urbanwatermanagement/uwmp2015.cfm

In the 2015 UWMP, urban retail water suppliers are required to report interim compliance followed by actual compliance in 2020. The interim target is halfway between the baseline water use and 2020 target. Baseline, target, and compliance-year water use estimates are required to be reported in gallons per capita per day (gpcd). As part of the 2015 UWMP cycle, agencies are given the opportunity to update their 2020 target and change the method used to calculate the water use target.

Actual population growth during the period 2000 through 2010 occurred at a lower rate than projected in the 2010 UWMP as discussed in Chapter 1, Introduction. After the 2000 census and before the 2010 census, there was a large gap between DOF and US Census population estimates. In September 2011, DOF released revised historical population estimates resetting the historical demographics for the period 2000 to 2010 based on results from the 2010 US Census. DWR has recognized there is a significant difference between DOF's projected 2010 population based on 2000 US Census data and the actual 2010 population based on 2010 US Census. As a result, LADWP was required to recalculate its baseline population using 2000 and 2010 US Census data.

For consistent application of the Act, DWR produced Methodologies for Calculating Baseline and Compliance Urban Water Per Capita Use in February 2011. By following requirements provided in this document, LADWP calculated its baseline per capita water use, its urban use target for 2020, and its interim water use target for 2015 during the 2010 UWMP cycle. As part of the 2015 UWMP cycle, LADWP has recalculated its baseline population and targets for 2015 and 2020. LADWP has also shown its compliance with the interim daily per capita target for 2015 as revised herein. Exhibit 3C presents results of the calculations. LADWP's recalculated baseline per capita water use is 154 gpcd using a ten-year average ending on June 30, 2005 and 152 gpcd using a five-year average ending on June 30, 2008. During the 2020 UWMP cycle, reporting compliance with the 2020 daily per capita water use will be required.

During the 2010 UWMP cycle, LADWP selected Method 3 to set its 2015 interim and 2020 water use targets. LADWP investigated all four methods and selected Method 3 because it is the most straightforward and reliable calculation method that adequately accounts for the City's past conservation investments. Method 3 requires setting the 2020 water use target to 95 percent of the applicable State hydrologic region target as provided in the State's Draft 20x2020 Water Conservation Plan. LADWP is within State hydrologic region 4, the South Coast region. LADWP was required to further adjust the calculated 2020 target to achieve a minimum reduction in water use. The gpcd at 95 percent of the hydrologic region was 142 gpcd and using 95 percent of the five-year average base daily per capita water use was equal to 144 gpcd. Therefore, LADWP was required to set its 2020 target at the smaller of the two resultant values. LADWP's interim 2015 target developed in 2010 was 145 gpcd and LADWP's 2020 target was 138 gpcd. In 2015 these targets were recalculated using revised 2010 US Census population data at 148 gpcd for the interim 2015 target and 142 gpcd for 2020. LADWP's actual gpcd in 2015 was 114 gpcd, 34 gpcd less than the revised interim target for Method 3.

Exhibit 3C
20x2020 Base and Target Data Based on Method 3

20x2020 Required Data	Gallons Per Capita Per Day (GPCD)
Base Per Capita Daily Water Use	
10-Year Average[1]	154
5-Year Average[2]	152
2020 Target Using Method 3[3]	
95% of Hydrologic Region Target (149 gpcd)	142
95% Of Base Daily Capita Water Use 5-Year Average (152 gpcd)	144
2020 Target	**142**
2015 Interim Target	148
2015 Actual Use	114

1. Ten-year average based on fiscal year 1995/96 to 2004/05
2. Five-year average based on fiscal year 2003/04 to 2007/08
3. Methodology requires smaller of two results to be actual water use target to satisfy minimum water use target.

As mention in Section 3.1, the Mayor released an aggressive Sustainable City "pLAn" that focuses on long term sustainability. One of the targets is to reduce per capita water use by 20 percent by 2017, 3 years earlier than the Water Conservation Act of 2009, SB x7-7 target of 20 percent water reduction by 2020. LADWP calculated what its target would be from Method 1, which is 80 percent of its 10 year baseline gpcd. Method 1 calculated to 123 gpcd with interim 2015 target at 138 gpcd. Through its accelerated conservation efforts to meet the Mayor's pLAn, LADWP is 24 gpcd less than the interim target for Method 1. As of the end of 2015, LADWP is on track to meet the Mayor's accelerated 20 percent reduction goal and plans to meet future targets of 22.5 percent and 25 percent reduction in gpcd for 2025 and 2035.

3.2 Existing Programs, Practices, and Technology to Achieve Water Conservation

LADWP has developed a number of progressive water conservation programs to address State laws and to meet City goals outlined in ED5 and the pLAn for 2020, 2025 and 2035. LADWP uses multiple programs, practices, and technologies in conjunction with enactment of state and local conservation ordinances and plumbing code modifications to achieve its current water conservation levels throughout its service area and customer classes.

3.2.1 State Laws and City Ordinances

State Laws

In addition to the Water Conservation Act of 2009, multiple legislative bills have been enacted in the past few years requiring water agencies to create measures increasing water conservation, establishing new plumbing standards, and linking grants and loans to the implementation of best management practices (BMPs).

The Water Conservation in Landscaping Act of 2006, Assembly Bill 1881, reduces outdoor water waste through improvements in irrigation efficiency and selection of plants requiring less water. The act required an update to the existing Model Water Efficient Landscape Ordinance and adoption of this ordinance or an equivalent ordinance by local agencies no later than January 1, 2010. If any agency failed to adopt the ordinance or its equivalent, then the Model Water Efficient Landscape Ordinance (MWELO) was automatically mandated by statute. For new construction and redevelopment projects, the ordinance requires development of water budgets for landscaping, reduction of erosion and irrigation related runoff, utilization of recycled water if available, irrigation audits, development of requirements for landscape and irrigation design, and scheduling of irrigation based on localized climate.

On April 1, 2015, Governor Edmund G. Brown Jr issued an executive order to revise the State MWELO. The Ordinance was revised on July 15, 2015 and represents a new statewide standard for irrigation of urban landscapes. In its simplest form, it increases water efficiency standards for new landscaping and retrofits via more efficient landscape irrigation systems, graywater systems, onsite stormwater capture, and it places limits on total turf areas allowed. The threshold size for applicability was reduced from 2,500 square feet to 500 square feet for new residential, commercial, industrial and institutional projects.

For sites under 2,500 square feet, a less prescriptive checklist can be used for compliance rather than the more complex approach required in the Ordinance. The prescriptive checklist limits the maximum turf area to 25 percent of the landscape area for residential areas and prohibits turf in non-residential areas.

The prescriptive checklist also allows the option of utilizing graywater to meet compliance requirements.

For sites greater than 2,500 square feet, and for smaller sites choosing the standard approach required in the ordinance, may have turf areas exceeding 25 percent of the landscape area. However, the sites must comply with a more stringent maximum applied water allowance than what is contained in the 2010 MWELO. The maximum allowed water allowance has been lowered from 70 percent of the reference evapotranspiration to 55 percent for residential projects and 45 percent for non-residential projects. Additionally, high water use plants with a plant water use factor greater than 0.7 are prohibited from use in street medians. According to *"A Guide to Estimating Irrigation Water Needs of Landscape Plantings in California, The Landscape Coefficient Methods and Water Use Classification of Landscape Species"* prepared by the University of California Cooperative Extension and DWR, cool season turf grasses have a plant water use factor of 0.8, effectively prohibiting cool season turf from street medians.

Compliance with the Governor's revised State MWELO or a local ordinance at least as effective was required of water agencies by December 1, 2015. If any agency fails to adopt the ordinance or its equivalent, then the 2015 MWELO is automatically mandated by statute.

In 2009, Assembly Bill 1465, Urban Water Management Planning, was approved to include language in the UWMP Act requiring water suppliers that are members of the California Urban Water Conservation Council (CUWCC) and are complying with the CUWCC's "Memorandum of Understanding Regarding Urban Water Conservation in California (MOU)" to describe their water demand management measures in their respective UWMPs. A more detailed discussion of the CUWCC and BMP compliance is provided in Section 3.2.3.

Assembly Bill 1420 links state funding for water management by urban water suppliers to implementation of water conservation measures. Urban water suppliers are required to be in compliance with the CUWCC MOU to be eligible for water management grants or loans. Senate Bill X7-7 further clarifies that the grant funding conditions required by AB 1420 will be repealed as of July 1, 2016 and replaced with eligibility determined by compliance with 20x2020 targets.

In recent years, there have been numerous regulations approved that increase the water use efficiency requirements of plumbing devices, specifically, Assembly Bill 715 (2007), Senate Bill 407 (2009), and the CALGreen Building Standards. AB 715 requires that all toilet and urinal fixtures sold through retail or installed in existing and new residential and commercial building meet the high efficiency standards by January 1, 2014. SB 407 does not address the sale of plumbing fixtures but adds a requirement that beginning in January 1, 2017 all residential and commercial property sales must disclose all non-efficient plumbing fixtures. CALGreen has an effective date of January 1, 2011 and requires use of water-efficient plumbing fixtures for all new construction and renovations of residential and commercial properties. On April 8, 2015, the California Energy Commission approved new standards for urinals not to use greater than 0.125 gallons per flush, pursuant to the Governor's Emergency Drought Response Executive Order (EO B-29-15). Also included are new standards reducing the flow of bathroom faucets to 1.2 gallons per minute (gpm).

City Ordinances

Since 1988, Los Angeles has utilized ordinances as a tool to reduce water waste, beginning with the adoption of its first version of a plumbing retrofit ordinance. The ordinance mandated installation of conservation devices in all existing residential and commercial properties and installation of water-efficient landscaping in all new construction. Toilets were required to use less than 3.5 gallons per flush (gpf), urinals less than 1.5 gpf, and showerheads less than 2.5 gpm. Customers with three acres or more of turf were required to reduce water consumption by 10 percent from 1986 levels or face a 100 percent surcharge on their water bills.

In 1998 the ordinance was amended, requiring the installation of Ultra Low Flush (ULF) toilets and water-saving showerheads in single family and multi-family residences prior to the close of escrow. This progressive requirement is now being implemented with the help of local real estate professionals. LADWP has explored the expansion of the City's Retrofit on Resale Ordinance to include nonresidential properties.

Los Angeles further increased its water efficiency mandates in 2009 with adoption of the Water Efficiency Requirements Ordinance. This ordinance establishes water efficiency requirements for new developments and renovations of existing buildings by requiring installation of high efficiency plumbing fixtures in all residential and commercial buildings. Exhibit 3D summarizes the minimum requirements for new construction and replacement of fixtures in existing buildings.

Exhibit 3D
Water Efficiency Requirements Ordinance Summary

Device	Requirement
High Efficiency Toilets	1.28 gallons per flush
Urinals	0.125 gallons per flush
Faucets	
Indoor Faucets (Maximum)	2.2 gallons per minute
Private Lavatory Faucets	1.5 gallons per minute
Public Use Lavatory Faucets[1]	0.5 gallons per minute
Pre-rinse Spray Valve	1.6 gallons per minute
Showerheads	2.0 gallons per minute
Dishwashers	
Commercial Dishwashers	varies by type between 0.62 and 1.16 maximum gallons per rack
Domestic Dishwashers	5.8 gallons per cycle
Cooling Towers	5.5 cycles of concentration
Single-Pass Cooling Systems	Prohibited[2]

1. Metering faucets shall not deliver more than 0.25 gallons per cycle.
2. Single pass cooling systems are prohibited unless installed for health and safety purposes that cannot otherwise safely operate.

Mediterranean Style Garden at LADWP Headquarters

In an effort to lead by example, LADWP has been retrofitting all of its own facilities with high efficiency plumbing fixtures prior to the effective date of the ordinance. As of early January 2016, LADWP is 80 percent complete in upgrading its 600 buildings to high efficiency faucets, toilets, urinals, showers, flexible hose connectors, angle valves, as well as correcting leaks and removing existing water damage.

In May 1996, the City's Landscape Ordinance (No. 170,978) became effective with an overarching goal to improve the efficient use of outdoor water. This ordinance was amended in 2009 to comply with the previously discussed Water Conservation in Landscaping Act of 2006 and the State MWELO. On July 15, 2015, the State MWELO was revised to set higher standards for outdoor water use efficiency, and the City is currently implementing the standards set by this update.

LADWP first adopted an Emergency Water Conservation Plan Ordinance in the early 1990's in response to drought conditions. Subsequently, in response to recent water shortage conditions, LADWP has adopted four amendments to expand prohibited uses, increase penalties for violating the ordinance, add an additional phase, modify water conservation requirements, and add a new violation to deter unreasonable use of water. The amendment on June 9, 2015 added an additional phase after Phase II and before the prior Phase III to allow LADWP additional flexibility to address water shortage conditions. The new Phase III fills a gap in the previous ordinance by adding a phase that restricts watering to two days per week. In response to the current drought, Phase II is currently in effect, which restricts watering to three days per week.

On May 3 2016, LADWP's latest amendment to the Ordinance was approved. The amendment strengthens the Ordinance's effectiveness against repeat violators through increased penalties for each additional written violation issued. In addition, the amendment adds a new violation against unreasonable use of water. Prior to this amendment, LADWP lacked the ability to effectively monitor and address high water users who are using unreasonable amounts of water. The amendment gives LADWP the tools and authority to penalize these users who are wasting large amounts of water. For information on the new penalties, refer to Chapter 11, Section 11.4.6.

Six phases of water conservation are incorporated into the Ordinance with prohibitions and water conservation measures steadily increasing by phase. Phase I prohibited use requirements are in effect permanently. Exhibit 3E summarizes the six phases as defined in the latest amendment approved June 9, 2015.

Exhibit 3E
Emergency Water Conservation Plan Ordinance Restrictions by Phase

Phase	Restrictions
I	No use of a water hose to wash paved surfaces except to alleviate immediate safety or sanitation hazards.
	No use of water to clean, fill, or maintain levels in decorative fountains, ponds, lakes or similar structures used for aesthetic purposes unless a recirculating system is used.
	No drinking water shall be served unless expressly requested in restaurants, hotels, cafes, cafeterias, or other public places where food is sold, served, or offered for sale.
	No leaks from any pipes or fixtures on a customer's premises; failure or refusal to fix leak in a timely manner shall subject the customer penalties for a prohibited use of water.
	No washing vehicles with a hose if the hose does not have a self-closing water shut-off device attached or the hose is allowed to run continuously while washing a vehicle.
	No irrigation during rain or within 48 hours after a measureable rain event.
	No irrigation between 9am and 4pm, except for public and private golf courses and professional sports fields to maintain play areas and event schedules. System testing and repair is allowed if signage is displayed.
	All irrigation of landscape with potable water using spray head and bubblers shall be limited to no more than ten minutes per water day per station. All irrigation of landscape with potable water using standard rotors and multi-stream rotary heads shall be limited to no more than 15 minutes per cycle and up to 2 cycles per water day per station. Exempt from these restrictions are irrigation systems using very low-flow drip-type irrigation when no emitter produces more than 4 gallons of water per hour and micro-sprinklers using less than 14 gallons per hour.
	No watering or irrigation of any lawn, landscape, or other vegetated area shall occur in a manner that causes or allows excess or continuous water flow or runoff onto an adjoining sidewalk, driveway, street, gutter, or ditch.
	No installation of single-pass cooling systems shall be permitted in buildings requesting new water service.
	No installation of non-recirculating systems shall be permitted in new conveyor car wash and new commercial laundry systems.
	Operators of hotels and motels shall provide guests with the option of choosing not to have towels and linens laundered daily.
	No large landscape areas shall have irrigation systems without rain sensors that shut off the irrigation systems. Large landscape areas with approved weather-based irrigation controllers registered with LADWP are compliant.
II	All prohibited uses in Phase I shall apply, except as provided.
	No landscape irrigation shall be permitted on any day other than Monday, Wednesday, or Friday for odd-numbered street address and Tuesday, Thursday, or Sunday for even-numbered street addresses. If a street address ends in 1/2 or any fraction it shall conform to the permitted uses for the last whole number in the address. For non-conserving nozzles (spray head sprinklers and bubblers) watering times shall be limited to no more than 8 minutes per watering day per station for a total of 24 minutes per week. For conserving nozzles (standard rotors and multi-stream rotary heads watering times shall be limited to no more than 15 minutes per cycle and up to two cycles per watering day per station for a total of 90 minutes per week.
	Irrigation of sports fields may deviate from non-watering days to maintain play areas and accommodate event schedules with written notice from LADWP. However, a customer must reduce overall monthly water use by LADWP's Board of Water and Power Commissioners adopted degree of shortage plus an additional 5% from the customer baseline water usage within 30 days.
	If written notice is received from LADWP, large landscape areas may deviate from the non-watering days if the following requirements are met: 1) approved weather-based irrigation controllers registered with LADWP; 2) Must reduce overall monthly water use by LADWP's Board adopted degree of shortage plus an additional 5% from the customer baseline within 30 days; 3) Must use recycled water if available
	These restrictions do not apply to drip irrigation supplying water to a food source or to hand-held hose watering of vegetation, if the hose is equipped with a self-closing water shut-off device, which is allowed every day during Phase II, except between the hours of 9am and 4pm.

Phase	Restrictions
III	All prohibited uses in Phases I and II shall apply, except as provided.
	No landscape irrigation shall be permitted on any day other than Monday and Friday for odd-numbered street address and Thursday, or Sunday for even-numbered street addresses. If a street address ends in 1/2 or any fraction it shall conform to the permitted uses for the last whole number in the address. For non-conserving nozzles (spray head sprinklers and bubblers) watering times shall be limited to no more than 8 minutes per watering day per station for a total of 16 minutes per week. For conserving nozzles (standard rotors and multi-stream rotary heads watering times shall be limited to no more than 15 minutes per cycle and up to two cycles per watering day per station for a total of 60 minutes per week.
	Recommend use of pool covers.
	Recommend washing of vehicles at commercial car wash facilities.
	Upon written notice from LADWP irrigation of sports fields may deviate from non-watering days to maintain play areas and accommodate event schedules. However, a customer must reduce overall monthly water use by LADWP's Board of Water and Power Commissioners adopted degree of shortage plus an additional 5% from the customer baseline water usage within 30 days.
	If written notice is received from LADWP, large landscape areas may deviate from the non-watering days if the following requirements are met: 1) approved weather-based irrigation controllers registered with LADWP; 2) Must reduce overall monthly water use by LADWP's Board adopted degree of shortage plus an additional 5% from the customer baseline within 30 days; 3) Must use recycled water if available
	These restrictions do not apply to drip irrigation supplying water to a food source or to hand-held hose watering of vegetation, if the hose is equipped with a self-closing water shut-off device, which is allowed every day during Phase III, except between the hours of 9am and 4pm.
IV	All prohibited uses in Phases I, II, and III shall apply, except as provided.
	No landscape irrigation shall be permitted on any day other than Monday for odd-numbered street address and Tuesday for even-numbered street addresses. If a street address ends in 1/2 or any fraction it shall conform to the permitted use for the last whole number in the address. For non-conserving nozzles (spray head sprinklers and bubblers) watering times shall be limited to no more than 8 minutes per watering day per station for a total of 8 minutes per week. For conserving nozzles (standard rotors and multi-stream rotary heads watering times shall be limited to no more than 15 minutes per cycle and up to two cycles per watering day per station for a total of 30 minutes per week.
	Use of swimming pool covers on all residential swimming pools when not in use.
	No washing of vehicles allowed except at commercial car washes.
	No filling of decorative fountains, ponds, lakes, or similar structures used for aesthetic purposes, with potable water.
	Irrigation of sports fields may deviate from the specific non-watering days with written notice from LADWP. However, a customer reduce overall monthly water use by LADWP's Board of Water and Power Commissioners adopted degree of shortage plus an additional 10% from the customer baseline water usage within 30 days.
	If written notice is received from LADWP, large landscape areas may deviate from the specific non-watering days if the following requirements are met: 1) approved weather-based irrigation controllers registered with LADWP; 2) Must reduce overall monthly water use by LADWP's Board adopted degree of shortage plus an additional 10% from the customer baseline within 30 days; 3) Must use recycled water if available
	These restrictions do not apply to drip irrigation supplying water to a food source or to hand-held hose watering of vegetation, if the hose is equipped with a self-closing water shut-off device, which is allowed every day during Phase IV, except between the hours of 9am and 4pm.
V	All prohibited uses in Phases I, II, III, and IV shall apply, except as provided.
	No landscape irrigation is allowed.
	No filling of residential swimming pools and spas with potable water.
	If written notice is received from LADWP, golf courses and professional sports fields may apply water to sensitive areas, such as greens and tees, during non-daylight hours and only to the extent necessary to maintain minimum levels of biological viability.
VI	All prohibited uses in Phases I, II, III, IV, and V shall apply, except as provided.
	The LADWP Board of Water and Power Commissioners is authorized to implement additional water prohibitions based on the water supply situation.

Specific procedures for determining the initiation and termination of a phase are provided in the Emergency Water Conservation Plan Ordinance. Phases are initiated through recommendations provided by LADWP to the Mayor and City Council (Council).

3.2.2 Conservation Pricing

Since 1993, Los Angeles has used an ascending tier rate structure that is completely volumetric pricing. Los Angeles' water rates have been recently restructured to incorporate and further reinforce foundational water use efficiency and financial principles. The rates, approved by the City Council on March 15, 2016, were first proposed to the Board of Water and Power Commissioners in July 2015 followed by 5 months of extensive community outreach at over 90 Neighborhood Council, community, business and civic meetings and webinars.

LADWP's rate design is influenced by a variety of factors, especially the importance of additional conservation in light of the unprecedented drought facing California and the need to comply with several legal requirements. These considerations headline the following objectives LADWP has established to guide its rate design. Primary objectives of the rate restructuring include:

- Minimizing individual bill impacts for low usage customers;
- Continuing to promote water conservation as envisioned by the Mayor's goal for a 20% per capita reduction in consumption by 2017;
- Complying with all guiding legal principles;
- Recovering costs identified in the new water cost of service study;
- Aligning water supply costs to sources of supply;
- Retaining water-budget rate structure and marginal-cost based conservation principles;
- Achieving full recovery of costs (without over-billing) in a cost causative manner;
- Implementing symmetrical decoupling mechanism for base rate revenue;
- Helping facilitate economic development;
- Simplifying where possible;
- Making bills easier to understand; and
- Considering implications for customer care and billing system (CC&B).

Particular unique features of the rate restructuring include:

- Budget based allocations based on 5 lot size groups and 3 temperature zones – This structure was first introduced in the early 1990's rate process through a Blue Ribbon Commission appointed to promote conservation and rate equity.
- Seasonal rates – Allocations are adjusted seasonally to reinforce the opportunity to conserve in winter months beyond summer outdoor usage.
- Four tiered rate for single dwelling-unit residential – The four tiers build on the previous 2 tier structure, providing a first tier indoor base allocation, a second tier based on California Friendly Landscaping efficient outdoor allocation, a third tier capturing high outdoor water use, and a fourth tier of excessive use. In keeping with cost of service principles, the incremental pricing for the tiers is based on the cost of water supply and, for the third and fourth tiers, added pumping and storage costs.

- 100% Volumetric Pricing – Rates do not include a flat-rate charge. This is perhaps the single greatest pricing signal the rates structure provides. Minimizing water use directly minimizes billing.

- Decoupling – LADWP included a method to allow recovery of revenue if sales decrease due to increased conservation and to eliminate over collection of revenue if water sales increase. By eliminating the linkage between volume of sales and revenue collection (decoupling) the rate structure provides financial stability and removes inherent barriers to conservation.

- Revenue predictability – The five year rate increase provides LADWP the opportunity to plan ahead with a greater level of certainty for project funding..

3.2.3 CUWCC Best Management Practices

The CUWCC is the voice of urban water conservation in California, and LADWP has been an active member since its inception in 1991. Instrumental in the development of the CUWCC MOU, LADWP was also one of the original signatories to this MOU. The MOU identifies BMPs as proven conservation measures as determined by the CUWCC. The most recent amendment to the MOU, adopted on September 17, 2014, updated compliance alternatives with the adopted BMPs. A water agency can now comply with the MOU through one of three methodologies: BMP compliance, accomplishing water conservation through a set of measures equal or greater than the water savings provided by the BMPs (Flex Track Menu), or accomplishing water conservation goals as measured in gpcd. All Group One (urban water suppliers) signatories to the MOU are committed to implementing the BMPs.

Over the last 25 years, LADWP has played a significant role in the governance and policy making at the CUWCC, holding a seat on the Board of Directors, Strategic Planning Committee, By-Laws Committee, Research and Evaluation Committee, CII Committee, co-chair of the Membership Committee, and chair of the Group One Representation Selection Committee. To date, LADWP has been actively involved in all of the revisions that the MOU has undergone.

One of the obligations as a signatory to the MOU is to submit a Best Management Practices Retail Water Agency Report to the CUWCC. Previously submitted annually, this report is now submitted biennially, to detail progress in implementing the foundational and programmatic BMPs currently specified in the MOU. LADWP actively implements the BMPs, and the CUWCC BMP reports are available for public review by accessing CUWCC's website at www.cuwcc.org.

In the early 1990s, the State Water Resources Control Board identified urban water conservation as a major means for resolving problems in the Bay-Delta. Large water agencies, including LADWP, actively participated in work groups to develop conservation strategies. The result of this effort is in the aforementioned MOU.

The MOU commits signatory water suppliers to develop comprehensive conservation programs using sound economic criteria and to consider water conservation on an equal footing with other water management options. The MOU established the CUWCC to monitor implementation of the BMPs and to maintain the list of BMPs.

A BMP is defined as:

(a) An established and generally accepted practice among water suppliers resulting in more efficient use or conservation of water.

(b) A practice for which sufficient data are available from existing water conservation projects to indicate that significant conservation or conservation-related benefits can be achieved; that the practice is technically and economically reasonable and not environmentally or socially unacceptable; and that the practice is not otherwise unreasonable for most water suppliers to carry out.

LADWP implements all of the BMP requirements in the MOU that are applicable to retail water agencies like LADWP. Foundational BMPs are considered as essential BMPs for any water utility and are ongoing practices not subject to time limitations. Programmatic BMPs are minimal activities required to be completed by each utility within the timeframe of the implementation schedules provide in the MOU. A listing of the BMPs is shown in Exhibit 3F.

CA Friendly Landscaping at Distribution Station 28

Exhibit 3F
CUWCC BMPs and Implementation Status

Category	Sub-category	Practices	Status
Foundational			
Utility Operations	Operations Practices	Maintain the position of a trained conservation coordinator	Implemented
		Prevent water waste – enact, enforce or support legislation, regulations, and ordinances	Implemented
		Wholesale agency assistance programs	Not applicable
	Water Loss Control	Conduct Standard Water Audit and Water Balance	Implemented
		Measure performance using AWWA software	Implemented
		Calculate economic value of real loss recovery based upon agency's avoided cost of water	Implemented
		Analyze apparent and real losses and their causes by quantity and type	Implemented
		Reduce real losses to the extent cost-effective	Implemented
		Advise customers whenever it appears possible that leaks exist on customer's side of meter	Implemented
	Metering with Commodity Rates	100% of existing unmetered accounts to be metered and billed by volume of use	Implemented
	Conservation Pricing	Maintain a water conserving retail rate structure	Implemented
Education	Public Information Programs	Maintain active public information program to promote and educate customers about water conservation	Implemented
	School Education Programs	Maintain active program to educate students about water conservation and efficient water use	Implemented
Programmatic			
Residential		Residential Assistance – provide leak detection assistance	Implemented
		Landscape water survey programs for single family and multi-family residential accounts	Implemented
		High efficiency clothes washer incentive program	Implemented
		Watersense Specification (WSS) for new residential development	Implemented
		WaterSense Specification (WSS) for toilets	Implemented
Commercial/ Industrial/ Institutional (CII)		Implement unique conservation programs to meet annual water savings goals for CII customers	Implemented
		Implement measures on the CII list with well-documented savings	Implemented
Landscape		Identify accounts with dedicated irrigation meters and assign ETo based water use budgets equal to no more than an average of 70% of ETo, provides notices with bills showing water use budgets and relationship between budget and actual consumptions, offer site specific technical assistance to reduce water to those accounts over 20% of budget	Implemented
		Offer technical assistance and surveys upon request	Implemented
		Develop and Implement a strategy targeting and marketing large landscape water use surveys to CII accounts with mixed meters.	Implemented

Southwest Style Garden at LADWP Headquarters

3.2.4 Existing Conservation Program

LADWP develops cost effective programs to achieve multiple goals of demand reduction, customer service, environmental responsibility, and compliance with CUWCC BMPs. Conservation potential is considered in determining program approach and duration. Some types of conservation programs result in savings that are more easily measured than others. LADWP's programs include traditional demand-side management measures, as well as infrastructure improvement programs that contribute to water waste reductions. Demand-side management programs, like the rebate programs for water-saving toilets and high-efficiency washing machines, produce results that are measurable. Public information, education, and other general conservation awareness programs are intended to alter customers' behavioral patterns on water use and thus, are more difficult to quantify. It is such behavioral change in water use that the City can point to as the primary reason for significant reduction in water consumption during water shortage periods. Combined with LADWP's conservation pricing structure discussed in Section 3.2.2, these programs increase system reliability and efficiency and will provide a secondary benefit of reducing runoff.

LADWP dedicates staff in support of the Water Conservation Programs. Key personnel include the full-time water conservation coordinator who serves as LADWP's CUWCC representative, oversees conservation policies, and coordinates with other LADWP staff on the implementation of all the LADWP programs to ensure fulfillment with the annual water saving goals and CUWCC BMPs. Additional staff include the water conservation group that implement the various residential and commercial programs, and the Water Conservation Response Unit that educate customers about prohibited water uses, investigate claims of water waste, and issue citations for water waste when warranted.

Specific conservation programs (past and present) associated with the CUWCC BMP categories are listed and discussed in Exhibit 3G. Appendix H contains the latest biennial reports provided to the CUWCC showing that LADWP has met all the BMP requirements.

Exhibit 3G
Current and Past Conservation Programs

CUWCC BMP Category	Conservation Measures	pre 1985	Year in Service
Awareness/Support			
	Pricing		
Utility Operations – Water Waste Prohibition	Retrofit on Resale Ordinance		1998
Utility Operations - Pricing and Operations	Tiered Rate Structure		1993
Utility Operations – Water Waste Prohibition	Drought Buster Program		1990
Utility Operations – Water Waste Prohibition	Emergency Water Conservation Plan Ordinance		1990
Utility Operations –Conservation Coordinator	Full-time dedicated staff to conservation	x	
Utility Operations - Metering	Full Metering and Volumetric Pricing	x	
Utility Operations - Pricing	Sewer Charge using Volumetric Pricing	x	
Education - Public Information Programs	**Public Information**		
	Save The Drop Outreach Campaign		2015
	Community Partnership Grants		2014
	Drought Response Outreach		2008
	Hotel & Restaurant Water Conservation Campaign		2008
	ULFT Customer Satisfaction Survey		1992
	Advertising	x	
	Bill Inserts	x	
	Brochures	x	
	Community Involvement Program	x	
	Exhibits	x	
	Hotline	x	
	Speakers Bureau	x	
	School Education		
	LAUSD MOU		2008
	High School in concert with the Environment - Student Home Water/Energy Survey		1994
	Lower Elementary	x	
	Upper Elementary	x	
	Junior High	x	
Residential			
Residential	Rain Barrel and Cistern Rebate		2013
Residential	Direct Install Partnership Program – Home Energy Improvement Program (HEIP)		2013
Residential	Residential Drought Resistant Landscape Incentive Program		2009
Residential	High Efficiency Clothes Washer Incentive Program		1998

Residential	Better Idea/Neighborhood Bill Reduction Service Program --Showerhead installation		1993
Residential	Community-Based Organization Toilet Distribution Centers, Direct Install		1992
Residential	High Efficiency Toilet Rebate		1990
Residential	Home Water Surveys		1990
Residential	Retrofit Kits Distribution		1988
Commercial/Industrial/Government			
Commercial/Industrial/Institutional	Commercial/Industrial Drought Resistant Landscape Incentive Program		2009
Commercial/Industrial/Institutional	Water Efficiency Requirements Ordinance		2009
Commercial/Industrial/Institutional	General Services Dept. MOU to Retrofit Plumbing		2009
Commercial/Industrial/Institutional	Public Agency Plumbing Audit and Training Program		2009
Education - Public Information Programs	Targeted Literature Mailing		1993
Commercial/Industrial/Institutional	Commercial/Industrial Conservation Guidebook		1992
Commercial/Industrial/Institutional	Cooling Tower Manual and Workshops		1992
Commercial/Industrial/Institutional	Commercial Rebate Program		1991
Commercial/Industrial/Institutional	Interior Water Use Audits		1991
Commercial/Industrial/Institutional	Technical Assistance Program (TAP)		1991
Landscape; Commercial/Industrial/ Institutional	Typical Audits		1991
Landscape			
Landscape	California Friendly Landscaping Website		2014
Landscape	Recreation and Parks MOU		2007
Landscape	Large Turf Irrigation Controller Pilot Program		2000
Landscape	Protector del Agua -- English and Spanish Language Workshops		1995
Landscape	Improving Irrigation Performance Manual & Workshop		1993
Landscape	Large Turf Audits and Audit Training		1993
Education - Public Information Programs	Lawn Water Guide Direct Mailing (as requested)		1989
Education - Public Information Programs	Demonstration Gardens		1988
Landscape	Ten Percent Large Turf Water Reduction Program		1988
System Maintenance Measures			
Utility Operations - Water Loss Control	Water Loss Task Force & Action Plan		2015
Utility Operations - Water Loss Control	Water Loss Audit and Component Analysis Study		2013
Utility Operations - Water Loss Control	Large Meter Replacement Program		2001
Utility Operations - Water Loss Control	Fire Hydrant Shutoffs		1991
Utility Operations - Water Loss Control	Meter Replacement Program		1988
Utility Operations - Water Loss Control	Cement Mortar Lining of Pipelines	x	
Utility Operations - Water Loss Control	Corrosion/Cathodic Protection	x	
Utility Operations - Water Loss Control	Infrastructure Program	x	

Awareness/Support Measure Programs

Awareness/support measures can be classified as active or passive. Active components include full metering of water use, assessment of volumetric sewer charges, and a conservation rate structure. Passive components typically include providing educational materials for schools, community and customer presentations, maintaining a conservation hotline, and a wide range of information distributed through customer bills, advertising in public venues, LADWP's website, and direct mail. Passive awareness/support measures provide the foundation for the conservation movement by raising water use awareness, water conservation program visibility, and encouraging community involvement.

Over the last several years, LADWP has greatly expanded its Water Conservation Outreach Program. The program calls on customers to increase their conservation efforts and is designed to instill the understanding that water conservation is the cultural norm in Los Angeles. These goals are achieved through the joint implementation of innovative marketing strategies and community outreach activities.

The program includes the following strategies:

- Earned Media Opportunities: Through the distribution of regular and timely news releases, the LADWP Communications Team generates broadcast interviews and print articles in various media outlets about water conservation and available programs.
- Social Media: Program facts, web links, reminders, videos, photos, and other water conservation relevant information shared regularly via Twitter, Facebook, and YouTube.
- Print Materials: Branded print materials including flyers, Frequently Asked Questions, and fact sheets available for distribution at all relevant venues, such as community fairs.
- Media Advertising Campaign: Campaign messages using paid advertising in the following: television, radio, newspapers, magazines, bus tails, movie screens, and online ads.

Marketing strategies are complemented by year-round community outreach activities including LADWP-hosted water conservation and landscaping workshops, garden shows, neighborhood council meetings, and community events. These public information opportunities are further enhanced by sponsorships and strategic partnerships with elected officials, other water agencies, non-profit organizations, and businesses like home improvement stores that host other related activities that can help LADWP reach customers effectively with our key messages.

Special emphasis has been placed on providing water conservation education in Los Angeles Unified School District schools. LADWP has several longstanding outreach partnerships that provide direct and indirect outreach to students from elementary school through high school.

- Los Angeles Times in Education: Provided newspapers to students in grades 4-12 and lesson packages for teachers on supply sources and conservation. Students are encouraged to illustrate concepts they have learned by participating in an annual art contest.
- "Thirsty City" Live Performances: Play presented on-campus that introduces students to water supply sources, water supply challenges, and conservation.

LADWP's Water Conservation Media Advertising Campaign is continually updated to keep customers engaged and to avoid message fatigue. In 2013, LADWP focused its Media Advertising Campaign on its California Friendly Incentive Program. As a result of the messaging, the program saw a 10-fold increase in applications. LADWP's 2014 campaign focused on educating residents on the importance of conserving during the drought. Media messaging concentrated on LADWP's three day per week outdoor watering restrictions, voluntary conservation measures residents could take, and LADWP's water conservation rebates.

On April 9, 2015, the new "Save the Drop" Water Conservation Outreach Campaign was launched. The campaign is a partnership between the Mayor's Office and LADWP. Outreach materials include public service announcements, radio spots, event handouts, and signage on the sides of Bureau of Sanitation trucks. The campaign also partnered with celebrities such as Steve Carrell, Jaime Camil, and Moby for public service announcements airing on TV, cinema and radio.

Residential Programs

Residential conservation programs were first developed and launched by LADWP during the drought of 1987 through 1992. In 1990, the ULF Toilet Rebate Program was initiated, followed two years later by the ULF Toilet Distribution Program. In 2003, a well-received free installation service component was added to the ULF Toilet Distribution Program that included free water-saving showerheads, faucet aerators and replacement toilet flapper valves. Today distribution of free faucet aerators and showerheads continues for all single family, multi-family, and commercial customers.

In 2008, MWD initiated the region-wide SoCal Water$mart Program for residential water conservation. This program replaced previous LADWP rebate programs, and rebate programs offered by individual water service providers throughout the MWD service area. This MWD sponsored program sets uniform rebate requirements across the MWD service area, and provides a clearinghouse for processing rebates for all MWD member agency customers. Local agencies have the option of supplementing baseline rebate amounts to their customers through the program. LADWP has increased baseline rebates for several of the qualifying products. Eligible customers include residential customers residing in single family and multi-family homes, even if multi-family residents do not receive a water bill. Exhibit 3H summarizes the residential conservation savings programs from FY 2010/11 through FY 2014/15. During this period, an estimated annual savings of 5,781 AFY was achieved, inclusive of LADWP in-house programs. This is in addition to previous cumulative conservation savings. Rebate amounts provided in Exhibit 3H are the total device rebates, which includes the base MWD rebates plus supplemental rebate amounts provided by LADWP.

Residential Turf Removal and Replacement with CA Friendly Landscape

Exhibit 3H
Residential Conservation Programs and New Savings for FY 2010/11 through 2014/15

Device Type/Program	Rebate Amount Retrofit	Devices Installed	Estimated Annual Savings (AFY)
SoCal Water$mart Program			
High Efficiency Toilets (1.28 gpf or less)[1]	$100	64,234	1,740.3
High Efficiency Washing Machine Water Factor < 5.0[2]		9,668	301.6
High Efficiency Washing Machine Water Factor < 4.0[3]	$300	29,899	1,031.5
Sprinklerhead Rotating Nozzles (30 minimum)	$6 each	21,456	94.4
Weather Based Irrigation Controller	$200 per controller for landscape area < 1 acre and $35 per station for landscape areas > 1 acre	918	42.8
Turf Replacement	$1.75 per square foot	12,643,808	1,707.2
Soil Moisture Sensors	$200 per controller for landscape area < 1 acre and $35 per station for landscape areas > 1 acre	2	0.1
Rain Barrels (Maximum of 4, minimum size of 50 gallons each)	$100 per barrel	1,852	3.5
Subtotal SoCal Water$mart Programs	**-**		**4,921.4**
LADWP In-house Programs			
High Efficiency Showerheads	-	33,093	545.0
Residential Faucet Aerators	-	56,897	159.0
Home Energy Improvement Program - Showerheads	-	4,283	71.0
Home Energy Improvement Program - Faucet Aerators	-	5,520	15.0
Home Energy Improvement Program - High Efficiency Toilets of 1.28 gpf or less replacing 1.6 gpf or greater	-	1,824	66.9
Drip Irrigation Starter Kits[4]		431	3.0
Subtotal LADWP In-house	**-**		**859.9**
Total Single Family Residential	**-**		**5,781.3**

1. As of November 1, 2015, program revised to provide rebates for installation of premium high efficiency toilets using 1.06 gallons or less per flush. New toilet must replace a toilet using 1.6 gallons or greater per flush.
2. As of April 1, 2011 rebates for washing machines with a water use factor of less than 5.0 were discontinued and replaced by a water use factor of less than 4.0.
3. As of July 1, 2015 rebates are only available for washing machines with a water use factor of less than 1.0.
4. Program has been discontinued.

In November 2015, the SoCal Water$mart Program replaced its rebate for high efficiency toilets (HET), with requirements for installation of premium HETs. Premium HETs use 1.06 gallons or less per flush. To be eligible for a rebate a premium HET must replace a toilet using 1.6 gallons per flush or more. LADWP supplements the rebates for its single-family customers, offering a total of $100 per toilet. The HET rebate program has been highly successful with 64,234 units installed between FY 2010/11 and 2014/15, equating to over 1,740 AFY in water savings.

Prior to initiation of the SoCal Water$mart Program, LADWP was assisted by community-based organizations (CBOs) to reach the milestone of more than 1.27 million toilets installed through December 31, 2006. CBOs were integral to LADWP's success, reaching into the communities they serve to convey the conservation message and directly undertake conservation activities. Benefits of this approach accrued to community participants through reduced water bills, to CBOs through employment opportunities and revenues earned, and to the City through significant water savings achieved. Prior to its discontinuation, the program was funded at more than $7 million annually. The toilets replaced through the program continue to produce estimated water savings of more than 44,000 AFY today.

LADWP initiated a High Efficiency Washer Rebate Program in 1998 promoting the purchase and installation of high efficiency washing machines saving both water and energy. In February of 2009, the High Efficiency Washer Rebate Program transferred from LADWP to the SoCal Water$mart Program with co-funding provided by MWD. 39,567 rebates were paid, between FY 2010/11 and 2014/15, for machines purchased and installed throughout the City, saving a total of 1,333 AFY annually. In the past rebates were $300 per washing machine with a water factor (a measure of efficiency) of 5.0 or less changing to 4.0 or less as of April 1, 2011. As of July 1, 2015 rebates are only issued for washing machines with a Consortium of Energy Efficiency standard of 1.0 or less.

A sprinklerhead rotating nozzle retrofit rebate of $6 per nozzle is available through the SoCal Water$mart Program for a minimum of 30 nozzles. Replacing standard sprinkler heads with rotating nozzles can use up to 20 percent less water. Rotating nozzles are able to distribute water uniformly across a landscape, in a more water-efficient manner than standard sprinklers. Spray from rotating nozzles is less likely to result in misting and misdirection from winds, resulting in less runoff onto impervious surfaces thus reducing dry-weather runoff. Between FY 2010/11 and 2014/15, over 21,456 rotating nozzle rebates were issued to LADWP customers saving approximately 94.4 AFY.

Rebates for installation of weather-based irrigation controllers are also available through the SoCal Water$mart Program. Rebate amounts are $200 per controller for landscape areas of less than one acre and $35 per station for landscape areas greater than one acre. Weather-based irrigation controllers provide customized irrigation schedules based on local site conditions and in response to weather changes. These smart controllers receive weather updates to automatically adjust the schedule and amount of water applied. Between FY 2010/11 and FY 2014/15, 918 LADWP customers received rebates for installation of the controllers for landscape areas of less than one acre, saving approximately 42.8 AFY.

LADWP, through the SoCal Water$mart program, is offering turf removal rebates of $1.75 per square foot up to 1,500 square feet per residence for LADWP customers. Not all MWD member agencies are currently offering a turf removal program to their customers as MWD funds for the program were exhausted in mid-2015. LADWP's current program was re-launched on July 15, 2015 and is entirely funded by LADWP. Over 12.6 million square feet of turf rebates were issued between FY 2010/11 and FY 2014/15, which equates to savings of approximately 1,700 AFY.

Through participation in the SoCal Water$mart Program, LADWP customers are also eligible for soil moisture sensor system rebates. Rebates are available at $200 per unit for landscape areas less than 1 acre and for landscape areas greater than 1 acre rebates are available at $35 per station.

Rain barrel rebates are available for a maximum of four rain barrels up to $100 per rain barrel with a minimum size of 50 gallons. Between October 2013, when the program was initiated, and FY 2014/15, rebates were issued for 1,852 rain barrels with a savings of approximately 3.4 AFY. In November 2015, cistern rebates became available for $400 per cistern with a minimum size of 200 gallons.

Upon request, water-saving showerheads and faucet aerators remain available to LADWP customers, free of charge. Approximately 33,090 high efficiency showerheads and 56,900 faucet aerators were distributed between FY 2010/11 and FY 2014/15 saving approximately 704 AFY. During past water shortages, more than 1.5 million water conservation retrofit kits were distributed throughout Los Angeles; the kits included one-gallon toilet displacement bags, low-flow showerheads, and toilet leak detection tablets.

Additional water saving opportunities are available to residential customers through participation in LADWP's Home Energy Improvement Program (HEIP). LADWP offers customers free assessments of their homes to identify areas where the most cost-effective upgrades and repairs should be made to improve water and energy efficiency of the home. Through this program between FY 2013/14 and 2014/15 approximately 4,283 showerheads, 5,520 faucet aerators, and 1,824 premium and regular HETs were installed saving approximately 153 AFY.

Commercial/Industrial/ Institutional (CII) Program

This category represents some of the largest volume water users in LADWP's customer base, and represents a great deal of conservation potential. LADWP, in partnership with MWD, has developed and implemented a commercial rebate program entitled the Save Water Save a Buck Program, designed specifically for customers in the CII sector and multi-family residences with five or more units, and represented by a homeowners association. In the CII sector, the program provides rebates for water saving plumbing fixtures, food service equipment, and landscaping equipment. Within the multi-family sector the program provides rebates for high efficiency washers, high efficiency toilets, and landscape equipment. In addition, packaged water use efficiency solutions are being developed for specific business sectors. Efforts are also underway to better promote the financial incentives available that make water conservation retrofits more cost effective for business and industry. LADWP takes full advantage of regional programs offered through MWD for the CII sector and for many product rebates, and provides supplemental funding to boost the base rebate provided by MWD.

The Save Water Save a Buck Program was launched in 2001 to provide menu-based rebates for water conserving measures applicable to many types of CII facilities. Categories of products eligible for rebates, rebate amounts, number of rebates for the LADWP service area, and estimated savings for the period FY 2010/11 through FY 2014/15 are provided in Exhibit 3I. During this period, an estimated annual savings of 12,015 AFY was achieved, inclusive of LADWP in-house programs, Technical Assistance Program (TAP), LADWP facility retrofits, Recreation and Parks Department facility retrofits, Small Business Direct Install (SBDI) program, and Multi-Family Direct Thermal Savings (MFDT) program. This is in addition to previous cumulative conservation savings. Rebate amounts provided in Exhibit 3I include the base MWD rebate plus supplemental rebate provided by LADWP.

Exhibit 3I
CII Current Conservation Programs and New Savings for FY 2010/11 through 2014/15

Device Type/Program	Rebate Amount	Devices Installed	Estimated Annual Savings (AFY)
	Retrofit		
Save Water Save a Buck Program			
High Efficiency Toilets (1.28 gpf or less)	$150 each ($50 new construction)	281,231	6,919.4
Premium High Efficiency Toilets (1.06 gpf or less replacing ≥ 1.6 gpf)	$200	12,117	445.3
Zero and Ultra Low Water Urinals (upgrade from ≥ 1.5 gpf)	$500 each	4,379	535.4
Cooling Tower pH Controller	$3000 each	82	159.4
Cooling Tower Conductivity Controller	$625 each	30	19.3
Air Cooled Ice Machine	$1,000 each	0	0
Connectionless Food Steamer	$600 compartment	0	0
Dry Vacuum Pump (maximum 2.0 horsepower)	$125 per 0.5 horsepower	4	0.4
Weather Based Irrigation Controller	$50 per station or central computer	14,334	189.3
Soil Moisture Sensor System	$35 per station	24	0.3
Large Rotary Nozzle (8 head minimum)	$13 per head	1,290	46.4
Rotating Nozzles for Pop-up Spray Heads (30 minimum)	$6 each	26,161	115.1
Turf Replacement	$1 per square foot	9,150,468	702.5
In-stem Flow Regulator (25 device minimum)	$2 per device	7,965	23.9
Plumbing Flow Control Valve (20 device minimum)	$5 per device	343	2.9
Laminar Flow Restrictor (20 device minimum)	$10 per restrictor	926	21.8
Water Brooms[1]	-	10	1.5
Total Current Save a Buck Program	**-**	**-**	**9,182.9**
LADWP In-house Programs			
Commercial Showerheads	-	6,011	99
Commercial Faucet Aerators	-	14,068	65.1
Pre-Rinse Spray Nozzles	-	296	45.3
Water Brooms	-	59	9.1
Technical Assistance Program	-	-	1,610.5
LADWP Facility Retrofits	-	-	46.0
Recreation and Parks Department Irrigation Efficiency Program		-	193.1
SBDI Program	-	2,074	30.8
Multi-Family Direct Thermal Savings Program	-	97,463	733.1
Subtotal LADWP In-house	-		**2,832.0**
Total CII	**-**		**12,014.9**

1. Program has been discontinued.

Similar to the residential turf removal program, LADWP has a turf removal program for commercial properties. This program started in September 2009, and the rebate as of November 2015 is $1.00 per square foot of turf for the first 10,000 square feet and a minimum area of 250 square feet. For projects greater than 10,000 square feet the rebate is $0.50 per square foot for the portion of the area greater than 10,000 square feet and up to a maximum area of 43,560 square feet. Between FY 2010/11 and 2014/15 approximately 9.15 million square feet of turf was removed savings approximately 703 AFY.

Upon request, water-saving showerheads, faucet aerators, and pre-rinse spray nozzles are available to LADWP commercial customers, free of charge. Bathroom faucet aerators are provided in 1.5, 1.0, or 0.5 gpm, kitchen faucet aerators are provided in 1.5 gpm, and showerheads are provided in 2.0 gpm. Approximately 6,011 showerheads, 14,068 faucet aerators, and 296 pre-rinse spray valves were distributed between FY 2010/11 and 2014/15 saving approximately 210 AFY combined.

In March 2013, a Direct Install Partnership Program was implemented with LADWP and the Southern California Gas Company. Individual programs include:

- Los Angeles Unified School District Water Conservation Device Replacement Program – This program provides upgrades in energy, water, and gas efficiency. LADWP's Water Conservation Program provides funding for water efficient devices, including showerheads, faucet aerators, toilets, and urinal valves.

- Small Business Direct Install Program – This program targets business customers to reduce energy, water, and gas use. LADWP's Water Conservation Program provides funding for water efficient devices, including showerheads, faucet aerators, and pre-rinse spray nozzles.

- Multi-Family Direct Thermal Savings Program – This program targets multi-family units to reduce water and gas use. LADWP's Water Conservation Program provides funding for water efficient devices, such as showerheads and faucet aerators.

LADWP created the TAP in 1992 to provide custom-type incentives for retrofitting water-intensive equipment. Different from the Save Water Save a Buck Program, the TAP encourages site-specific projects, and TAP incentives are based on a given project's water savings. Financial incentives up to $250,000 are available for products demonstrating water savings. Incentives are calculated at the rate of $1.75 per 1,000 gallons saved over a two-year period with a cap not to exceed the actual cost of the installed product. Projects must save a minimum of 150,000 gallons over a two-year period and operate for a minimum of five years. Eligible customers are CII or multi-family residential customers. Past TAP projects include cooling tower controller upgrades and x-ray processor recirculation systems. Between FY 2010/11 and 2014/15, savings from new TAP projects are estimated at approximately 1,610.5 AFY. The following case studies highlight two of our successful TAP projects for supermarket evaporative condensers and coffee shops reverse osmosis machines.

Case Study:
WATER CONSERVATION – Retrofit of Evaporative Condensers at Supermarkets

Many supermarkets in the LADWP service area have cooling towers with evaporative condensers, presenting an excellent opportunity for significant water savings.

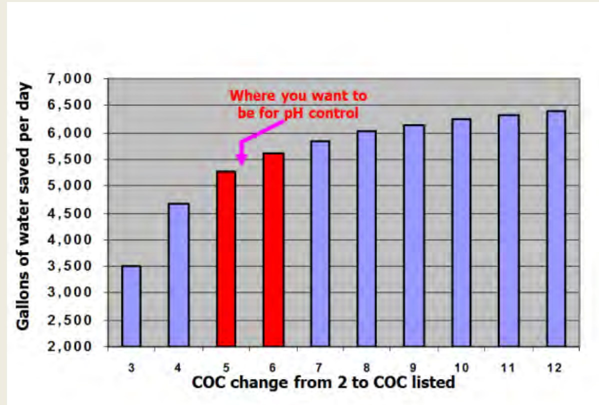
A cooling tower is a heat rejection device that extracts heat waste from the inside of a building to the atmosphere through the cooling of a water stream. Warm water is fed into the top of the cooling tower while air comes in from below. The water cools as it descends downward by gravity and is transferred back to the condenser in the cooler.

This case study addresses "evaporative" condensers, wherein a small portion of the cooled water evaporates into a moving air stream, providing cooling. The most common application of evaporative condensers in supermarkets is the cooling of circulating water used in the HVAC systems for temperature regulation.

Evaporative Condenser (note scale buildup on front right)

When pure water is evaporated, minerals are left behind in the recirculating water. As this process continues, the water becomes more concentrated, leading to saturated conditions. The term "Cycles of Concentration" (COC) compares the concentration of solids within recirculating water to that within the source water. Minerals in water are measured in µmhos (micromhos). Incoming LADWP water has a dissolved mineral concentration range of 300–600 µmhos. Therefore, if the mineral concentration in the evaporative condenser water is 3 times that of incoming water, then this is 3 COC. The majority of cooling towers are designed to maintain mineral concentrations between 2–3 COC, which is accomplished by bleeding water when 2-3 COC is reached and adding fresh water.

Increasing and optimizing COC is the key to water conservation. The following graph plots increasing COC against corresponding water savings. Research shows that the "sweet spot" for maximizing water savings is between 5–6 COC.



Increasing COC Yields Significant Water Savings

Water conservation can be achieved by retrofitting evaporative condensers with new water treatment equipment, such as upgraded controllers that measure conductivity, control the bleed valve, and monitor pH, all of which can be used to control COC.

New Generation Controller

Ralph's Supermarket teamed with U.S. Water Services to retrofit 55 evaporative condensers with new water treatment equipment, including: a 2-way communication controller, gravity-fed bromine dispenser (kills bacteria), educator (replacement for a normal pump in that there is a vacuum created to force the corrosion-scaling inhibitor chemical to go into the cooling tower), pH and conductivity probes, pulse make-up and pH meters, and a solenoid bleed valve. All equipment is connected to the controller, wherein adjustments can be made by an IT specialist in a remote location

.

By operating with higher COC, this project has resulted in significant water conservation, with water savings by store ranging from 300,000 gallons per year (gpy) to 1,000,000 gpy. Given the predominance of supermarkets in the LADWP service territory, there is opportunity to expand on this case study and achieve significant water conservation.

Case Study:

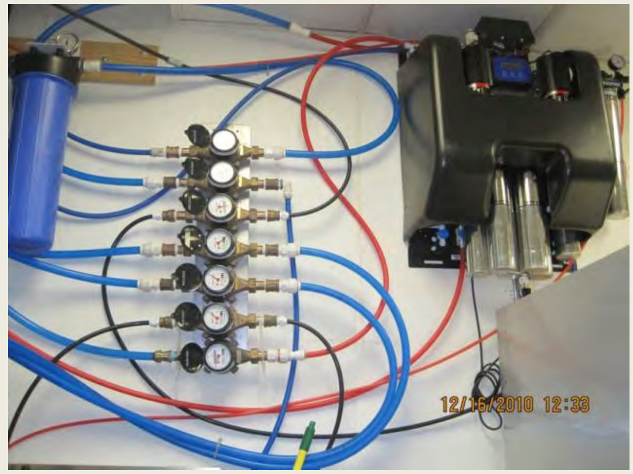
WATER CONSERVATION - Installation of New & More Efficient Reverse Osmosis Machines at Coffee Shops

Coffee shops are abound throughout the City. LADWP's water contains Total Dissolved Solids (TDS) (i.e., the organic & inorganic minerals contained in a liquid). TDS must be carefully controlled in the coffee-making process to: (1) achieve the desired product water and (2) protect the equipment. If there are no minerals present in the water used to make coffee, then minerals can be leached from the coffee and espresso machines, destroying pricey equipment. However, when the concentration of TDS in the water is too high, the solids can precipitate from the water, forming scale on heat transfer surfaces in equipment. Furthermore, minerals in the water enhance the taste of the coffee.

For a coffee shop, maintaining the appropriate TDS balance in product water is accomplished by using reverse osmosis (RO). RO separates dissolved solids from water by forcing water through a semi-permeable membrane. The resultant purer water is used as the product water, and the remaining water has concentrated amounts of dissolved solids that are discarded as waste, referred to as the RO waste stream.
One coffeehouse chain in the LADWP service territory uses RO, with a waste stream of approximately 75%. In other words, for every 1 cup of coffee produced, 3 cups of water are discarded in the RO waste stream.

For every 1 cup of coffee produced 3 cups of water are discarded in the RO waste stream

This coffeehouse chain applied to LADWP's Technical Assistance Program (TAP) for financial assistance to perform a water conservation study at 2 stores (from 2010-2011) using a more efficient RO machine, the *EverPure MRS-600HE-II High-Efficiency RO System*. Water conservation was achieved because this machine: (1) is more efficient, producing less waste stream and (2) includes a blend system. With the blend system, a portion of water undergoes treatment, and this treated water is then mixed with untreated water to maintain the desired TDS concentration, while markedly reducing the waste stream



Meters Installed on New RO Water Treatment System

To quantify water savings between the existing and new machine, meters were installed on the existing equipment, and consumption was measured for 53 days. Next, the new RO machine and appropriate metering were installed, after which consumption was measured for 53 days. The resulting water conservation was significant:

- Water treated at Store 1 was reduced from an average of 653 gallons per day (gpd) to 301 gpd.
- Water treated at Store 2 was reduced from an average of 903 gpd to 357 gpd.

Based on the average water savings at the test stores, the TAP incentive payment was calculated at $391 per store. Equipment and installation costs were $5,038 per store.

The coffeehouse chain built on the success of this study and went on to retrofit 28 additional stores, receiving an incentive of $391 per store. LADWP continued to monitor water consumption at the newly-retrofitted stores.

In 2013, changes were made to the TAP program that doubled the incentive payments. As a result, the coffeehouse chain was paid $738 per store for the next 15 stores retrofitted, and $757 per store for the following 13 retrofits. To date, the coffeehouse chain has retrofitted its RO systems at 58 stores in the LADWP service territory.

The primary water resource benefit from this project is enhanced water conservation. Not only do the new RO machines produce less waste stream, but they also require less water to be treated using the blend system. Additionally, this project offers an environmental benefit as less waste stream disposal is required.

Landscape Program

Recognizing that a substantial amount of water is used outdoors for irrigation, LADWP offers a variety of resources to assist customers interested in transforming traditional, high water using landscape to water-efficient sustainable landscaping. LADWP is committed to advancing a water efficient landscape transformation through promoting educational opportunities. Customers are encouraged to attend classroom and outdoor workshops that explain the benefits of installing low water use California Friendly plants, efficient irrigation systems, mulch, and water capture features.

Residents are encouraged to register for LADWP's bi-monthly California Friendly Landscape Training classes. The classes offer fundamental information about the benefits of using California Friendly plants and outdoor best management practices that result in lower water usage. Participants learn about the soil composition, site design, plant selection and efficient irrigation. Attendees of the California Friendly Landscape Training classes are eligible to participate in Hands On Workshops, located in the yard of a residential home with an active turf removal application, where they can apply principles learned in the classroom training. Additionally, participants learn turf removal techniques, rain barrel installation, rain water capture, and healthy soil construction.

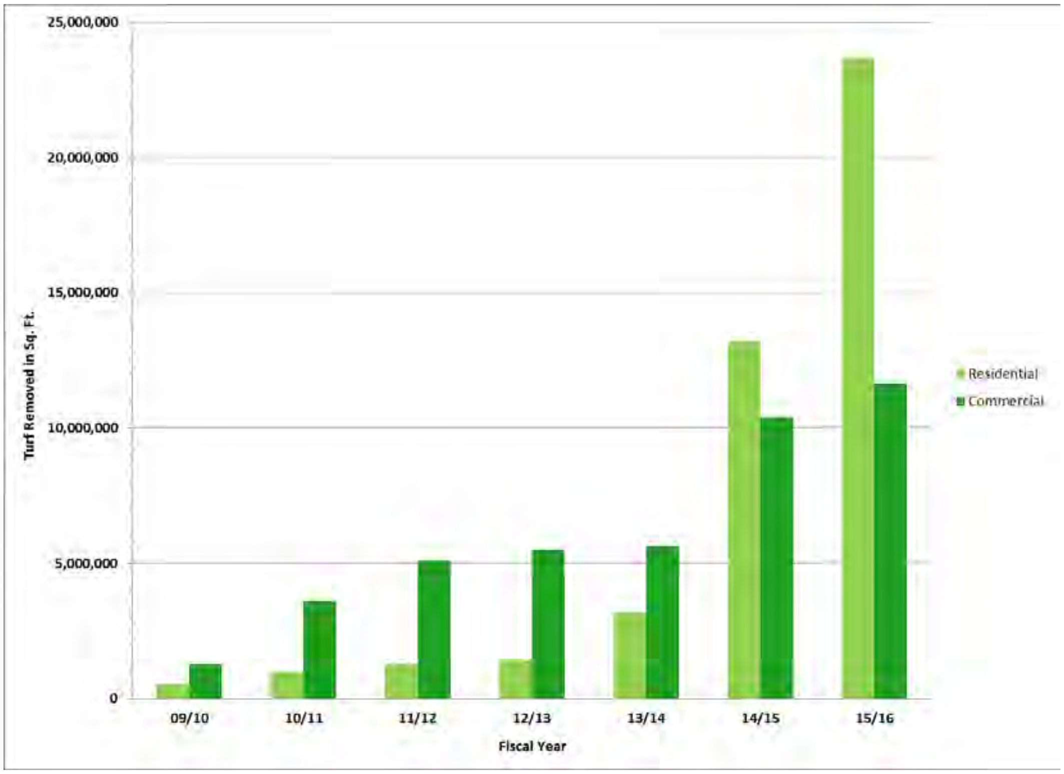
In Fall 2014, LADWP created its dedicated California Friendly Landscaping Website (www.ladwp.cafriendlylandscaping.com) to provide resources to residents interested in removing turf and switching to California Friendly plants. The California Friendly Landscape website is an interactive tool that allows customers to take virtual tours of California Friendly gardens, search for climate appropriate plants, and create shopping lists of plants for easy reference when visiting nurseries. Customers can also access planting templates created for Los Angeles' four regional climates. The templates can be used by the homeowner or provided to a contractor for installation of a California Friendly landscape. The website has been very popular with residents. In calendar year 2015, over 50,000 unique visitors used the website with over 1.2 million page visits.

Leading by example, LADWP has implemented a program to retrofit outdoor landscaping at LADWP's own facilities to California Friendly and native plantings with efficient irrigation systems. To date, over 827,449 square feet of retrofitted or newly constructed California Friendly landscaping has been installed. To demonstrate the beauty and appeal of a water-conserving landscape, LADWP's John Ferraro Building's California Friendly Garden was redesigned to showcase a variety of plants used primarily in Mediterranean and southwest designs. The newly designed garden includes educational signage explaining the benefits of introducing California Friendly and native plants and plant specific information accessible by scanning QR (quick response) codes on a mobile device.

Public engagement is an important component in advancing the water efficient landscape paradigm. Partnerships with other non-profits and organizations are used as leverage to reach large numbers of potential customers at well-attended community events. LADWP staff attend these community events to disseminate information about resources available to customers to reduce outdoor water use. Notable events include the Los Angeles Auto Show, Theodore Payne Native Garden Tour, the Natural History Museum's Nature Fest, and Summer Nights in the Garden series.

Thanks to LADWP's generous residential and commercial turf removal rebates, and its extensive outreach and education on California Friendly landscaping, participation has grown tremendously over the last few years. As of the end of calendar year 2015, LADWP has removed over 35 million square feet of turf as shown in Exhibit 3J.

Exhibit 3J
Cumulative Residential and Commercial Square Feet of Turf Removed By Fiscal Year



A joint effort between the Department of Recreation and Parks and LADWP is targeting public parks through the City Park Irrigation Efficiency Program. City parks with inefficient irrigation systems, leaks, and runoff problems are identified and upgraded with water efficient distribution systems and sprinkler heads, installation of smart irrigation controllers, and planting of California Friendly landscaping. In many cases, parks are connected to recycled water to reduce the dependence on our potable system. Since the program began in 2007, 21 parks have been completed. An additional benefit of this program is the educational, trade training, and employment opportunity given to the youth of Los Angeles.

Sustainable Landscaping

LADWP recognizes that, in addition to furthering water-efficient landscaping, it needs to focus on a more sustainable, "Watershed Approach" to landscaping. The Watershed Approach is a holistic and integrated approach for landscape sustainability that transcends water-use efficiency to address a variety of related benefits including abatement of dry-season runoff, onsite retention of stormwater, embedded energy savings, reduced green waste generation, reduced greenhouse gas emissions, reduced pesticide application, and enhance wildlife and insect habitat in urban settings. The Watershed Approach is meant to be a system-wide upgrade to the urban landscape environment.

In efforts to promote sustainable landscaping, LADWP is offering a variety of outreach and educational opportunities to the community. Currently, we are partnering with non-profit organizations to offer sustainable landscaping classes, hands-on-workshops, and professional training which incorporate different aspects of the Watershed Approach in the curriculum. In the near future, we plan to provide one-on-one landscape architectural consultations, develop landscape design templates, and expand sustainable landscaping outreach and classes to provide additional intermediate to advance level trainings. By adopting the Watershed Approach, LADWP will not only work towards its water conservation goals, but it will also promote a balance between water efficiency, watershed protection, environmental stewardship, and quality of life.

There is also potential for the use of non-potable water for irrigation, which can further promote sustainable landscaping and reduce the need for the City's traditional potable water supplies. Through the increased use of recycled water and stormwater capture, imported surface water and local groundwater used for landscape irrigation can be conserved. The potential to use such non-potable water supplies is further discussed in the Recycled Water and Watershed Management chapters (Chapters 4 and 7, respectively).

New Low Impact Development (LID) projects implemented within the City, along with innovative work by non-profit organizations, have also demonstrated pioneering ways to implement sustainable landscapes. As discussed in Chapter 7, LADWP's Watershed Management Group is proactively developing programs in conjunction with other departments to highlight water conservation through implementation of LID and stormwater BMPs. Additionally, a local non-profit, TreePeople, has partnered with various City departments, including LADWP on a number of stormwater capture projects.

For over a decade, TreePeople has demonstrated that rainwater is a viable local water resource. The Open Charter Elementary School Stormwater Project is one of several sustainable stormwater management systems that TreePeople installed in Los Angeles. Other examples include: the Center for Community Forestry which harvests rainwater from its entire hardscape into a 216,000 gallon underground cistern for landscape irrigation use; a retrofitted single family residential home in South Los Angeles that captures a 100-year storm event on site; and a 7,600 square foot subsurface stormwater infiltration gallery on the Broadous Elementary School campus in Pacoima. Additionally, TreePeople partnered with the Council For Watershed Health, LADWP, and other state and federal agencies to retrofit an entire residential block on Elmer Avenue in Sun Valley. This project now intercepts stormwater from 40 acres upstream and infiltrates it back to the aquifer while also demonstrating effective distributed stormwater BMPs on residential homes.

Most recently, TreePeople partnered with the Los Angeles County Flood Control District, Los Angeles Bureau of Sanitation, and LADWP on a pilot project to install cisterns on seven residential properties throughout Los Angeles. These cisterns will be connected to real-time weather controls, and will demonstrate the viability of increasing stormwater capture for groundwater recharge and on-site reuse in lieu of potable water. This project is scheduled to be completed by February 2016 and will be tested during the upcoming rain season.

In partnership with the Los Angeles County Department of Public Works, TreePeople was instrumental in developing the Sun Valley Watershed Management Plan: an alternative stormwater management plan that prioritizes green infrastructure and multi-benefit stormwater capture projects instead of stormdrains. Many projects have been completed, and more are scheduled for construction. These activities create the foundation for more sustainable landscaping that will lead to further landscape water conservation and stormwater capture to increase the water use efficiency of the City's limited water supplies.

LADWP has also partnered with The River Project on development of watershed management plans and stormwater capture projects. This partnership, in conjunction with various agencies and departments, was instrumental to the development of the Tujunga Wash Feasibility Study in 2000 and the Tujunga-Pacoima Watershed Plan in 2007. The River Project's emphasis of the Watershed Approach to stormwater management is evident in the implementation of the Woodman Avenue Green Infrastructure Project and the Water LA Pilot and Program of 2011 and 2014, respectively. The Woodman Avenue Green Infrastructure Project is discussed further in Chapter 7.

Water Loss Control

Maintaining water system infrastructure reduces water waste and allows for greater water accountability. Infrastructure maintenance is a high priority for LADWP. As discussed in Chapter 2, LADWP non-revenue water has an impressive historical 24-year average of 7 percent of the total water demand. LADWP maintains a 24 hour, 7 days per week leak response operation. Major blowouts that impact public safety are repaired immediately, and smaller leaks are fixed within 72 hours. Ongoing programs such as pipeline replacement, pipeline corrosion control, and meter replacement preserve the operational integrity of City water facilities and aim to reduce water losses.

In 2013, LADWP completed a full-scale Water Loss Audit and Component Analysis Study that complied with the requirements of California Assembly Bill 1420 (2009) and the California Urban Water Council's Best Management Practice 1.2. The study also included a full-scale assessment of LADWP's system databases and tracking efforts, as well as a pilot project that performed leak detection and analyzed system pressure and leakage in three service zones within the distribution system. The goal of the study was to identify system losses, determine economic optimum level of water losses, and identify, prioritize, and recommend efficient, cost-effective loss intervention strategies to minimize water loss.

Upon the completion of the Water Loss Audit and Component Analysis Study, LADWP established a Water Loss Task Force (Task Force) in 2014 consisting of over 100 staff from 8 different divisions in LADWP's Water System and Chief Administrative Office to work on addressing the recommendations from the previous study. The resulting Water Loss Action Plan (Action Plan) serves as a strategic guide that will coincide with LADWP's ongoing pipe maintenance plan to maintain the infrastructure for proficiency and reliability. The Action Plan addresses meter inaccuracies, database management, equipment testing, leak detection and prevention, and improved tracking of loss volumes. The Action Plan includes an assessment of feasibility, cost-effectiveness, and other benefits associated with implementation of the recommendations from the previous Water Loss Audit and Component Analysis Study, as well as a determination of how the recommendations may improve LADWP's Water System efficiency and meet California's regulatory requirements related to system water losses.

In recent years, the LADWP has ramped up its pipeline replacement program from 95,000 linear feet annually to 150,000 linear feet annually. Additionally, the LADWP Water System's Asset Management Group along with the Water Distribution Division are working to develop a predictive model that uses existing data relative to the factors which contribute to water main deterioration to determine a replacement priority for all pipe segments in the system. The results of this model along with criticality assessments and leak history can be used to focus replacement resources on pipe segments that are more likely to fail and disrupt service.

LADWP has also made significant progress in replacing and/or retrofitting water meters through its meter replacement program that started in 1988. As a result of extended flow or usage, the moving parts in a water meter can wear down and begin to under-register the actual water consumption. The meter replacement program has been valuable in ensuring the accuracy of the approximately 700,000 meters within the City. Recently, all of the large-sized meters (3-in and larger) in the system were replaced as part of a Large Meter Replacement Program, and the LADWP is also replacing 35,000 small meters annually.

As a result of proactive water loss strategies, LADWP has been able to keep its non-revenue and water loss numbers very low. For FY 2013/14, LADWP's non-revenue percentage was 5.6 percent and its real loss percentage was 3.9 percent. Non-revenue percentage for FY 2014/15's is currently unavailable as LADWP is still finalizing analysis on parameters required for the AWWA Water Balance. Non-revenue percentage from FY 2010/11 to 2013/14 averaged 5.9 percent, which shows that LADWP has an efficient, well-maintained Water System. LADWP's Water Loss Task Force will implement water loss strategies as detailed in the Action Plan to maintain low non-revenue and real loss percentages going forward.

3.3 Future Programs, Practices, and Technology to Achieve Water Conservation

Home Water Use Report Pilot Study

In December 2014, LADWP started its Home Water Use Report Pilot Study (Pilot). The Pilot is a water conservation engagement program that provides customer-specific education and outreach. A pilot group of approximately 72,000 single family customers are receiving bi-monthly home water use reports. These reports provide the customers with easy-to-understand information on their water usage, statistics on how they compare to similar households with average and efficient water use, and customized water saving tips and rebate recommendations.

The pilot study group also has access to an online web portal, which provides additional information and tools to help them reduce their water use. The portal provides information on historical water use, estimated breakdowns of how the customer is using their water, and videos provide additional resources on how to save water in their homes.

The Pilot will be completed by the end of 2017. At the end of the Pilot, LADWP will analyze results to determine the savings potential and cost-effectiveness of the program. Other utilities that have completed similar pilots have reported single family residential savings of up to 5 percent. The results of the Pilot will assist LADWP in planning a long-term program that targets the entire single family customer sector.

Advanced Metering Infrastructure

Advanced metering infrastructure (AMI) is the use of radio-based technology that provides for two-way communication between water meters and the utility's system. AMI provides real-time water meter data and provides an improved means to conserve water. Both the end user and the utility can monitor water use. On the utility side, the entire distribution system can be continuously monitored rather than attempting to analyze historic data based on meter reads. In turn, this allows the utility to find leaks at an earlier stage and reduce non-revenue water losses. On the customer side, AMI allows customers to determine their water use more often than a traditional bi-monthly or monthly bill. With the recently adopted rate structure, this type of information would motivate customers to proactively increase conservation sooner rather than after they receive their bill. Customers can also receive instant alerts if their usage is abnormally high, such as in response to a leak on their side of the meter that they previously might not have noticed until after they received a bill.

AMI coupled with a meter data management system, allows a water utility to create a long-term storage system for meter data that is collected and then allows the data to be analyzed overtime. Integration of AMI with a meter data management system allows a utility to improve conservation and achieve other benefits. With a meter data management system, utilities can instantly be alerted to system leaks. Additionally, conservation efforts can be quantified by accessing long-term data to review trends and benchmarks in response to conservation efforts. Without a data management system, historic analysis is limited solely to billing data.

Currently, LADWP is working on three different pilot projects to test the installation of AMI for the water distribution system:

- ACLARA/So Cal Gas AMI Pilot Project – This pilot project will explore the potential benefits of partnering with So Cal Gas in service overlap areas. The pilot will utilize the existing So Cal Gas utility network to explore the feasibility and reliability of obtaining meter readings using this system.

- Metron/Verizon Cellular – This pilot project will take advantage of the existing Verizon cell phone network to facilitate the installation of AMI units. The existing infrastructure and extensive phone network of transmission towers within the City boundaries facilitate the rapid installation of AMI. Due to the ease of installation and setup, the system is well suited for investigation of unusual usage.

- Itron AMI Pilot – This pilot project will offer the opportunity to utilize AMI technology for both water and power data by utilizing existing power infrastructure.

3.4 LADWP Water Conservation Potential Study

In early fall of 2014, LADWP initiated the Water Conservation Potential Study (WCPS) which will provide a better understanding of how historical water conservation investment efforts have impacted existing water use efficiency and device saturation levels. The WCPS will identify remaining water conservation opportunities to increase the City's water use efficiency into the future. The WCPS is the largest and most comprehensive conservation study in the US.

LADWP initiated the WCPS for multiple reasons:

- LADWP has always been a leader in conservation and this study will further advance its knowledge of conservation;

- LADWP has had a long running successful conservation program since the late 1970's that has resulted in savings of over 118,000 AFY related to hardware device savings, thus there is a need to understand the saturation levels of water appliances;

- LADWP needs to fully understand the remaining conservation potential in each customer sector to adequately plan for the future;

- Demand hardening effects in southern California need a carefully crafted response to achieve additional conservation; and

- LADWP's service area is very large with many diverse customer water needs, and a better understanding of this diversity may offer additional opportunities for water conservation savings.

3.4.1 Purpose of Study

An overarching goal of the WCPS is to help LADWP prioritize future water conservation investments in the City by understanding the remaining potential in water conservation for its service area. The remaining conservation potential will be identified for each customer sector: single family residential, multi-family residential, commercial, industrial, and governmental. The results from the WCPS will help LADWP develop a targeted conservation strategy to maximize water savings going forward. In addition, the WCPS will play an important role in LADWP's management of its water resources to meet both the State's requirement of a 20 percent reduction in per capita water use by 2020, and the City's pLAn goals for per capita potable water use reductions.

The main focus of the WCPS is to estimate the water conservation potential for four different levels (Exhibit 3K):

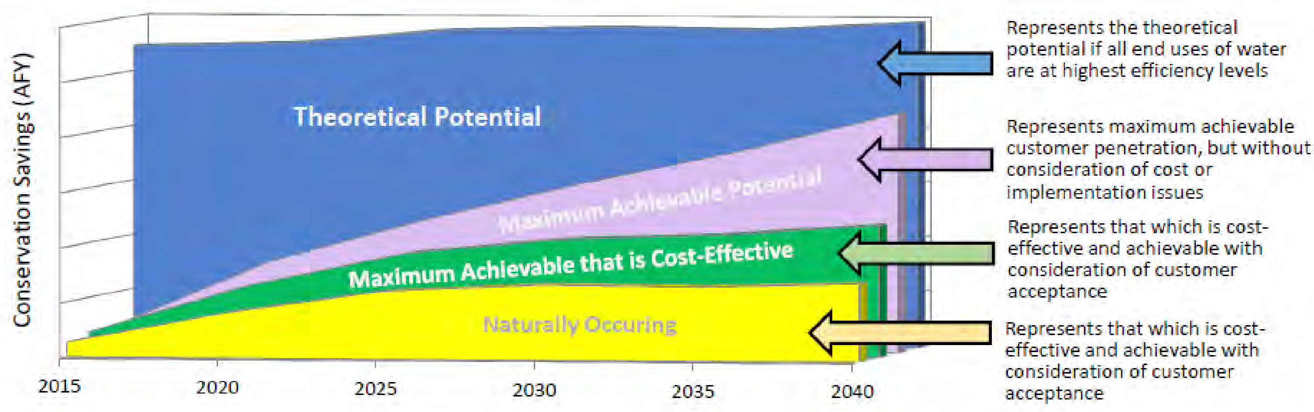
Naturally Occurring- The first step in estimating potential conservation is to estimate the natural occurring savings in water use that will occur through normal market forces, such as new development, remodeling, and compliance with plumbing/building codes and landscape ordinances. This is sometimes referred to as "passive" water conservation as it does not require incentives or significant utility costs to drive conservation. The City of Los Angeles has relatively extensive building codes related to water conservation as previously discussed in this chapter. In addition to local ordinances, there are state and federal codes related to water conservation that effect water use within LADWP's service area, with state standards being more stringent than the national efficiency standards. Thus, both internal and external market forces will affect water use efficiency in the City.

Theoretical Maximum Potential- The theoretical maximum potential represents the water conservation savings that is achieved when all end uses of water are at the most efficient level given the current or emerging technology. Engineering estimates of technical efficiency and emerging technologies were researched from extensive literature review. The theoretical maximum potential is an estimate of the maximum potential conservation savings, regardless of cost or social acceptability.

Maximum Achievable Potential- The maximum achievable potential is a function of widespread adoption of new technology or behaviors by water customers. The maximum achievable potential does not consider cost, but does consider some levels of social acceptability. To achieve this maximum achievable potential would likely require significant increases in utility funding and customer education, and would also likely require additional City ordinances and conservation mandates for all water customers. As defined, the maximum achievable potential is a reflection of maximum, reasonable market saturation that can be achieved with unrestrained funding and aggressive program support, and would include implementation of many measures that are not yet cost-effective.

Maximum Achievable Potential that is Cost-Effective- The maximum achievable potential that is cost-effective represents the potential which is achievable, cost-effective, and considers customer acceptance. Economic potential savings is determined by applying economic tests to the maximum achievable potential with the goal of developing cost-effective measures when compared to the relative cost of an alternative water supply (in this case, imported water from MWD). This maximum achievable potential that is cost-effective would require increased financial incentives and perhaps implementation of direct install programs for many of LADWP's water conservation programs.

Exhibit 3K
Levels of Conservation Potential



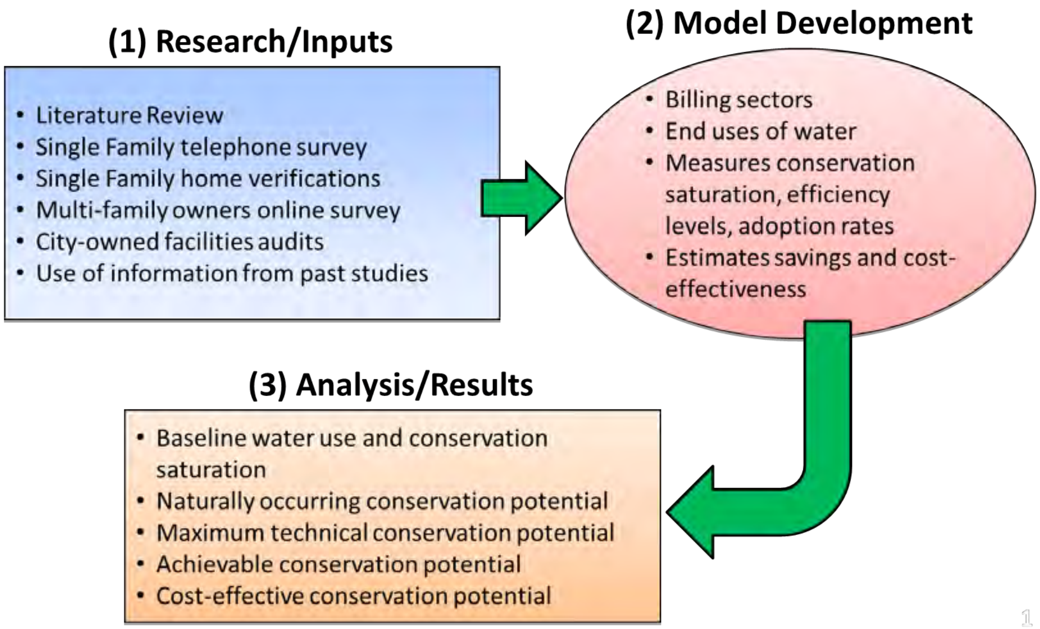
3.4.2 Study Approach

To develop the conservation potential for Los Angeles, an approach was developed containing three broad elements (see Exhibit 3L). Inputs to the study include reviewing existing literature and conducting water use surveys and audits throughout the City. Extensive research was conducted to locate and then review existing conservation literature for applicability to the WCPS. Literature reviews included both LADWP specific literature, where LADWP was a partial focus of the data and results, and other applicable literature sources. Included in the literature review were LADWP's CII Water Study and MWD's CII Study, which included audits of commercial facilities in LADWP's service area. Additionally, literature reviews were conducted to collect data on emerging water saving technologies applicable to the LADWP service area.

Single family home phone surveys and onsite verification surveys were conducted to determine saturation rates in the largest customer sector with over 450,000 accounts. Detailed telephone surveys were conducted for 615 single family residences. Telephone survey questions included age of home, presence of water using fixtures and appliances, lot size, type of landscape, method of landscape irrigation, and participation in LADWP's conservation rebates and programs. For a sub-set of these telephone survey respondents, 75 onsite verification surveys were conducted to provide for direct measurements and verify accuracy of telephone surveys. For these verification surveys, teams were sent to homes of customers who agreed to be visited and direct measurement/ assessment was conducted of: lot size and irrigable areas; type of landscaping and irrigation method; flow rates for toilets, faucets, and showerheads; and presence of high-efficiency clothes and dish washers. Both of these single family surveys (telephone and onsite verification) provided a wealth of information on the presence and saturation level of water efficient devices in homes within LADWP's service area.

While there have been many single family water surveys conducted in the United States, assessing the potential for multi-family residents is much more difficult because most multi-family residents do not receive a water bill, and thus are not able to be identified for a survey. In addition, most multi-family residents are

Exhibit 3L
Major Elements of Water Conservation Potential Study



not able to change out water using fixtures and appliances without permission from landlords or owners of the multi-family units. To address this difficulty, LADWP decided to survey the multi-family owners/landlord/management companies in order to determine the current saturation of water appliances within the multi-family sector. This first-of-its-kind multi-family survey was conducted by sending an online survey link to all of LADWP's multi-family account holders (approximately 90,000). Approximately 4,000 responses were received. Survey data collected included the number of units serviced by the account, the type of multi-family property (e.g., apartments, condos, mobile homes, townhomes), age of the units, occupancy rate, common water using features, type of landscaping and method of irrigation, types of water using appliances in units or at site, when toilets were replaced, and participation in LADWP's conservation programs.

To help understand how water is currently being used within the government sector, detailed onsite water use audits were conducted for 100 city-owned facilities. Facilities audited included offices, libraries, Port of LA, Los Angeles International Airport, maintenance yards, wastewater treatment plants, parks, animal shelters, police and fire stations, and large street right away areas/medians. Data collected included the number of employees, ratio of male to female employees, average number of daily visitors, types of water using devices, fixture flow rates, number of restrooms, types of outdoor landscaping and methods of irrigation, presence of pools, ponds, or fountains, onsite laundry data, cooling tower operational data, car/equipment washing data, and kitchen/food preparation/break room areas.

To assess the conservation potential for commercial and industrial sectors, the WCPS utilized past studies on end uses of water from MWD and LADWP, as well as other studies obtained from literature review. The data from these other studies will be refined with data on water use per establishment and with information regarding LADWP's conservation program for commercial and industrial customers.

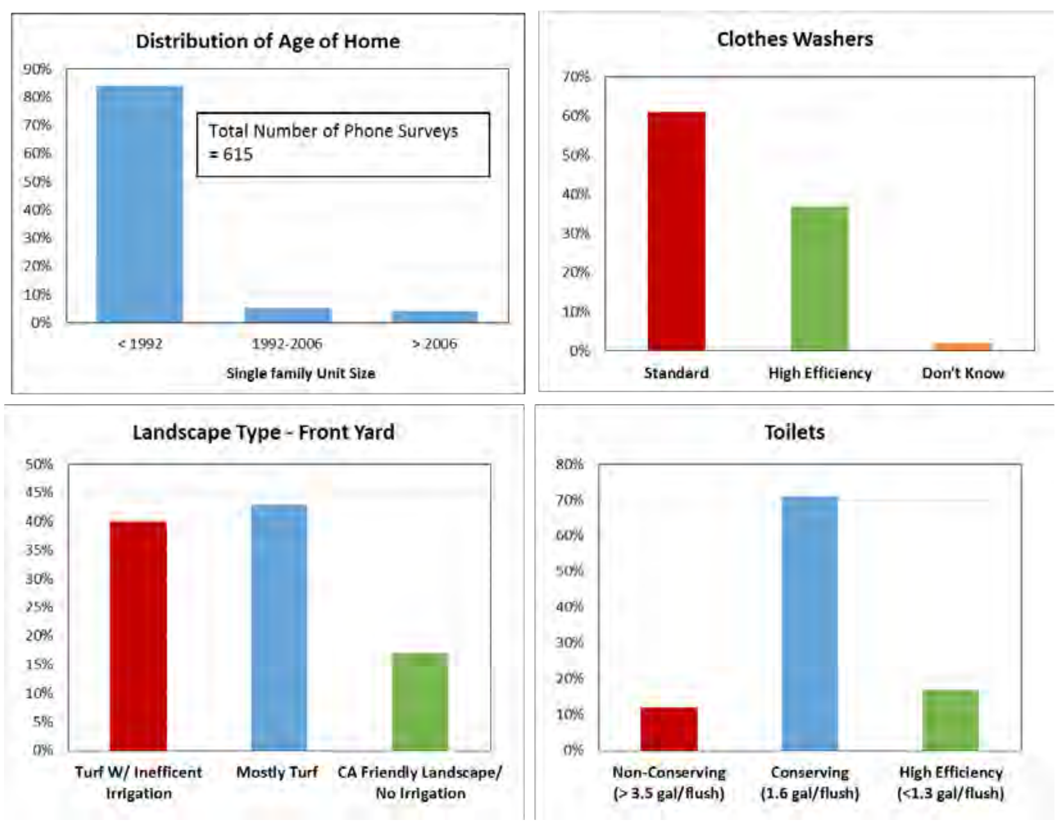
All of the collected data from these surveys and past studies are being entered into the Water Conservation Model (WCM). The model consists of 8 billing sectors and 19 end uses of water. End uses of water represent such things as toilet use, shower use, faucet use, clothes washing, landscape irrigation, and car washing for residential sectors; and sanitary uses, cleaning, cooling towers, water for cooking, and industrial process water use for non-residential sectors. The model measures presence, saturation and efficiency levels of end uses of water rolled up to single family, multi-family, commercial, industrial, and government sectors of water use. The WCM is being used to determine the conservation savings associated with different levels of potential. The WCM will also test the cost-effectiveness of new conservation measures in order to help LADWP design and implement its on-going conservation program.

3.4.3 Preliminary Saturation Findings

Single Family

Using data from the single family telephone surveys and onsite verification surveys, preliminary saturation of conservation was estimated for several end uses of water (see Exhibit 3M). The preliminary results indicate that despite the fact that over 80 percent of the single family homes in LADWP's were built prior to 1992 (when the California plumbing code required new homes to have 1.6 gallon per flush toilets), the saturation of conserving and high-efficiency toilets is quite high (over 80 percent). This would indicate that toilet rebate programs are reaching a saturation threshold and that natural market forces will drive efficiency for this end use of water.

Exhibit 3M
Preliminary Saturation for Select End Uses in Single Family Sector



However, the end uses of water for clothes washers and landscaping have far greater potential for increased water efficiency. The preliminary results show that less than 40 percent of single family homes have high-efficiency clothes washers and less than 20 percent of single family homes have California Friendly landscapes or are not using water for irrigation. This would indicate that rebates that target clothes washers and sustainable landscaping will have a significant impact on reducing these end uses of water for the single family sector.

Multi-Family

Using data from the multi-family online survey, preliminary saturation of conservation was estimated for several end uses of water (see Exhibit 3N). Similar to the single family sector, the preliminary results indicate that older, non-conserving toilets are even more saturated in the multi-family sector with little potential remaining. In fact, over 50 percent of multi-family toilets are already at high-efficiency, which is in large part thanks to LADWP's high-efficiency toilet rebate it offers to multi-family customers. The survey results also indicate a remaining conservation potential for the multi-family sector for common area clothes washers and landscape conversion. The preliminary results show that around 35 percent of multi-family homes have high-efficiency clothes washers and a little over 20 percent of the multi-family homes have California Friendly landscapes or no landscapes at all.

Exhibit 3N
Preliminary Saturation for Select End Uses in Multi-Family Sector

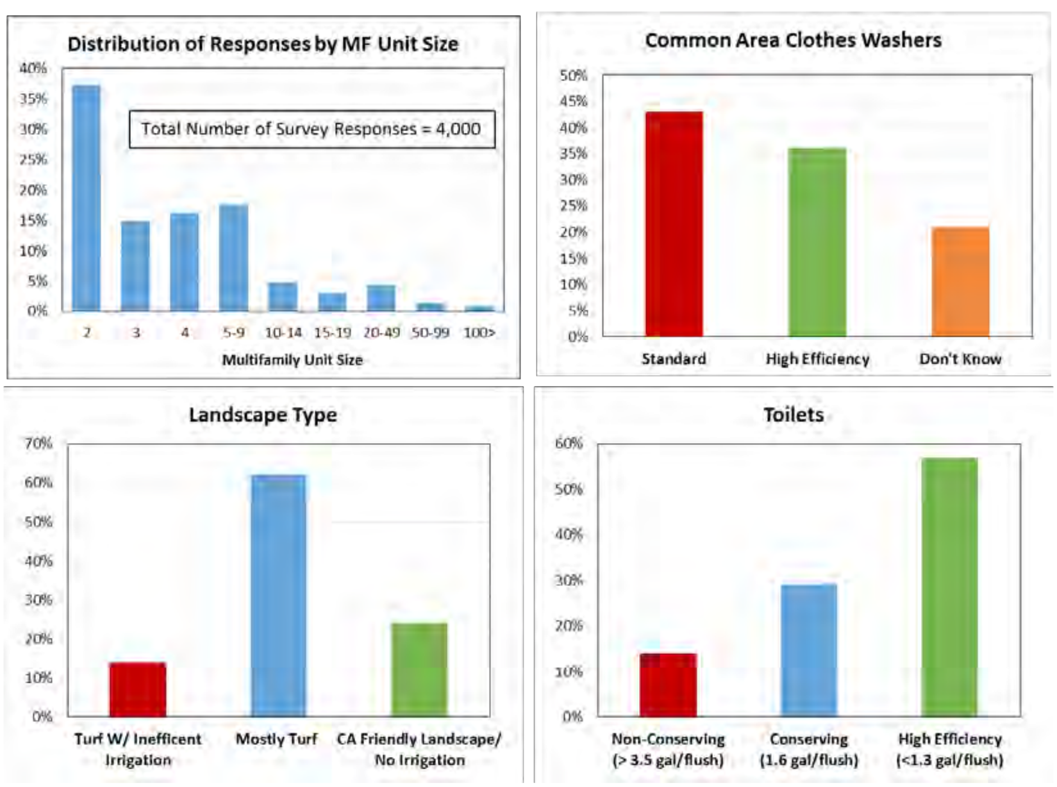
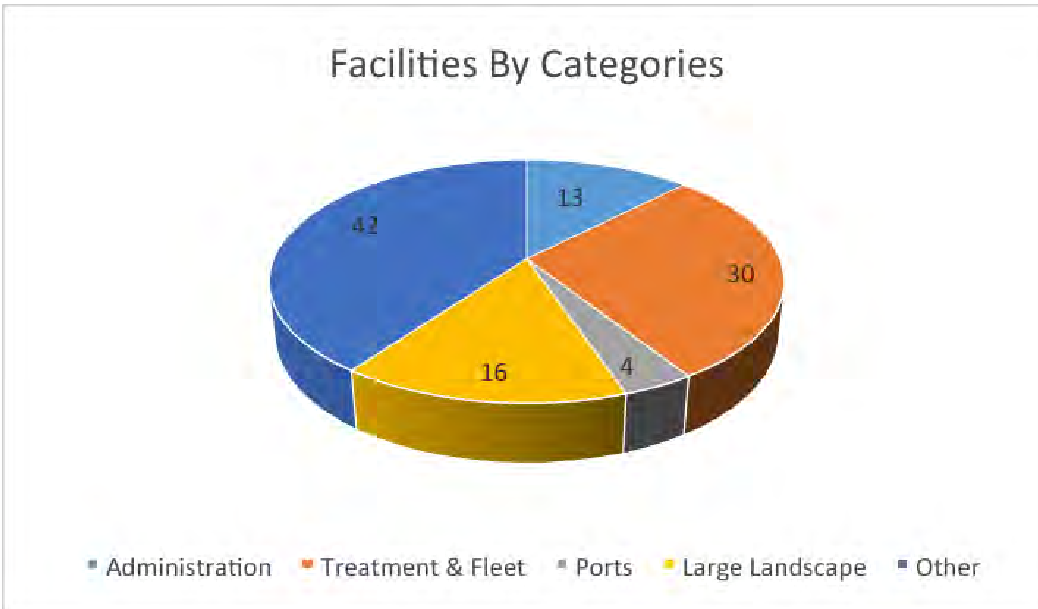


Exhibit 30
Breakdown of 100 City-Owned Facility Water Surveys



City-Owned Facility Surveys

The initial conservation potential summarized in Section 3.4.4 will be refined once the data from the City-owned facility water surveys has been thoroughly analyzed and entered in the WCM. Results from these surveys will provide water use refinements to the governmental and commercial sector of the WCM. During the past five months, detailed water surveys of 100 City-owned facilities were conducted on-site. Exhibit 30 presents the breakdown of the 100 facilities that were surveyed.

Trained water surveyors took measurements of water using devices and fixtures, took note of manufacturing details for cooling towers, measured landscape areas, identified landscape plants and irrigation sprinkler systems, and collected other important information. Preliminary results of indoor water using fixtures in LADWP's service territory show that toilets and urinals are over 70 percent saturated with high efficient devices (1.6 gallons per flush toilet and 0.5 gallons per flush urinal). The largest remaining potential for indoor water use for City-owned facilities, based on this sample, is showers, pre-rinse spray valves, and ice makers.

For those facilities with landscaping, preliminary results show about 15 percent have California-friendly plants (e.g., succulents, native warm-weather grasses and shrubs). This indicates a significant potential for more outdoor water efficiency improvements as the City moves towards sustainable landscaping.

In the next several months, survey data on irrigation efficiency/sprinkler systems and cooling towers will be analyzed. The final results of the City-owned facility water surveys will be used to refine the conservation potential for the entire City.

3.4.4 Conservation Potential Summary

The WCPS has two phases of analysis. Phase 1 represents an initial conservation potential that was estimated using the WCM (described earlier in this section) and the best available information regarding current end uses of water for single family, multi-family, commercial, industrial, and governmental sectors. Data from extensive and comprehensive residential surveys were used to determine the current saturation of conserving devices and practices. For non-residential sectors, a combination of previous studies conducted by both LADWP and MWD were used, as well as expert judgement from water conservation professionals with substantial experience in commercial and industrial water use and efficiency.

Phase 2, currently ongoing, will incorporate results from a comprehensive water survey of 100 City-owned facilities. The City-owned facility water surveys are still being fully analyzed and will be incorporated into a revised conservation potential that will be presented in the final WCPS report.

Initial Conservation Potential

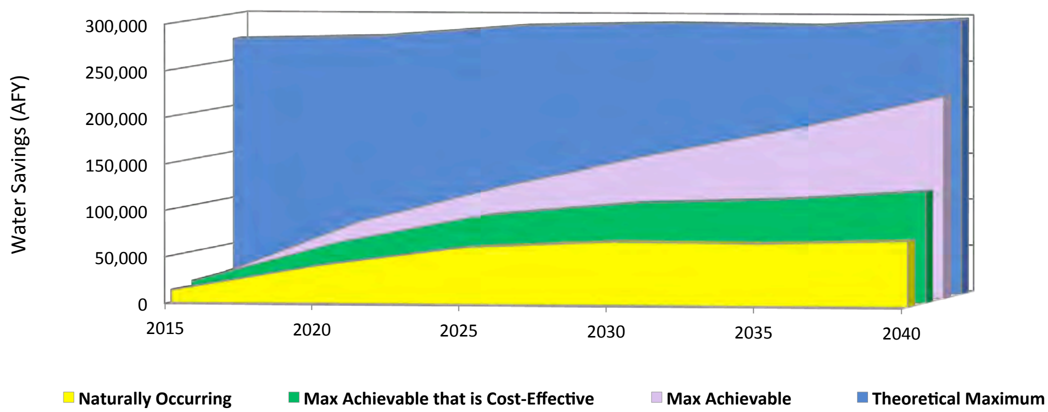
The initial conservation potential results are shown for the year 2040 in Exhibit 3P. These conservation savings represent the additional water savings, post FYE 2015, that could occur under the different levels of potential that were evaluated in this study. Naturally occurring savings represents the conservation from natural replacement, new development adhering to building/plumbing codes, and ordinances for landscape water use. By 2040, approximately 71,000 AFY of additional conservation is expected to be achieved naturally, with multi-family and single family residential being the largest contributors.

When LADWP funding for conservation programs is increased (sometimes double of current program levels), the conservation potential increases to maximum potential that is cost-effective increases to approximately 120,000 AFY (which is inclusive of the 71,000 AFY from naturally occurring savings). Assuming that roughly 75 percent of the theoretical maximum conservation potential could occur by 2040, the maximum achievable conservation potential increases to approximately 218,000 AFY (which is inclusive of naturally occurring and maximum achievable that is cost-effective savings).

Exhibit 3P
Water Conservation Potential Post FYE 2015 (AFY)

FYE	Naturally Occurring	Maximum Achievable that is Cost-Effective	Maximum Achievable	Theoretical Maximum
2020	41,000	61,000	79,000	276,000
2025	62,000	92,000	119,000	289,000
2030	68,000	106,000	153,000	292,000
2035	67,000	110,000	183,000	290,000
2040	71,000	120,000	218,000	298,000

Exhibit 3Q
Water Conservation Potential Post FYE 2015 Over Time (AFY)



The above conservation potential is also graphically illustrated and presented over time, as shown in Exhibit 3Q. For the theoretical maximum potential, the assumed efficiency of all end uses of water occurs on day one. The remaining conservation potentials increase over time based on the level of customer participation, derived by examining 1) historical levels of participation in LADWP's conservation programs; 2) advanced levels of participation assuming direct install conservation programs, and; 3) very aggressive levels of customer participation that would likely be driven by utility rebates that are in excess of cost-effective levels and by City regulatory mandates and additional ordinances.

3.5 Cost & Funding

More than $350 million has been invested in water conservation by LADWP during the last ten years. Conservation is the cornerstone of LADWP's water demand management activities. Ongoing investments will be made in cost-effective programs, subject to funding availability and LADWP's ability to implement such programs. The cost range of conservation rebates, incentives, and hardware installation programs ranges from about $50/AF to $1300/AF based on current LADWP conservation programs. LADWP's overall Water Conservation Program currently saves water at an average cost of approximately $400/AF. Outside sources of funding are sought to supplement the City's budget for conservation. A stronger commitment is also being made to acquire additional grant funding for City conservation projects and programs.

Currently, the funding sources for conservation are:

- **Water Rates** – Water conservation programs are primarily funded through water rates.
- **MWD Conservation Credits Program** - MWD offers both commercial and residential rebates to member agency customers that install qualifying conservation devices. In addition, MWD reimburses LADWP for pre-approved Technical Assistance Program projects when completed.
- **Outside Agency Co-Funding** - Other outside agencies that realize benefits from conservation programs are solicited to co-fund program costs.

- **Grant Funding** - LADWP will actively pursue available water conservation grant funding from Proposition 1 and other State and Federal grants. Some recent grants LADWP has received include:

- **Water Loss Audit and Component Analysis Study:** A Bureau of Reclamation Water Conservation Field Services Program grant was applied towards a professional services contract to retain an independent consultant to conduct LADWP's first comprehensive Water Loss Audit & Component Analysis Study. Total grant award of $100,000 for LADWP's $300,000 project. Completion Date in 2013.

- **Commercial/Industrial Drought Resistant Landscape Incentive Program**: A Bureau of Reclamation Water Use Efficiency Grant was applied towards LADWP's CII Turf Removal Program to replace turf with California Friendly landscaping. Total grant award of $1,000,000. Completion Date in 2013.