



LADWP 2017-18 WATER INFRASTRUCTURE PLAN



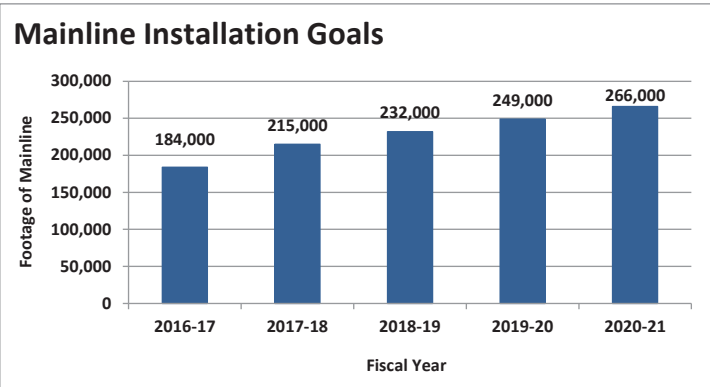
Los Angeles
Department of
Water & Power

Introduction

All major components of the Water System infrastructure are evaluated as part of the ongoing Asset Management (AM) Program. The goal of AM is to systematically manage assets in a way that will result in the lowest cost of ownership, including capital and operations and maintenance costs. The Water Infrastructure Plan (WIP) includes infrastructure upgrades that are a part of the \$6.3 billion five-year Water System capital plan. The main elements of the WIP are discussed below. The AM Program data and analysis is continuously being improved and refined.

Distribution Mainline

Distribution mainlines (pipes 20 inches or less in diameter) constitute the backbone of LADWP’s water distribution system. There are approximately 6,780 miles of mainline throughout the City of Los Angeles. Over 28% (about 1,912 miles) of LADWP’s mainlines are over 80 years old, while the average lifespan of an iron water main is about 100 years. Moving forward, LADWP plans to ramp up the installation of water distribution mainline to bring the pipe replacement cycle closer to the expected pipe life cycle by 2023.



2016-17 Achievements:

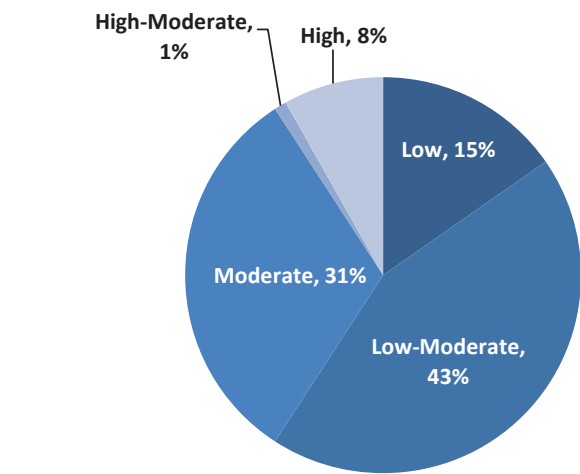
- Installed over 190,000 feet of mainline pipe, exceeding target.

Priorities are based on the following factors:

- Leak history (number and type of leaks, most recent leak count, and duration between leaks)
- Soil conditions (corrosiveness, hillside, landslide, fault line, and liquefaction potential)
- Age of pipe (including design and construction method used at time of installation)
- Risk of service interruption and community disruptions
- Coordination with planned projects by Bureau of Street Services

Using the prioritization factors listed above, LADWP assigns a score to pipe segments. Based on the analysis, about 8% of LADWP’s water distribution mainlines have a high level of needing improvement. Installing these pipes is a high priority.

Mainline Condition (Needing Improvement)



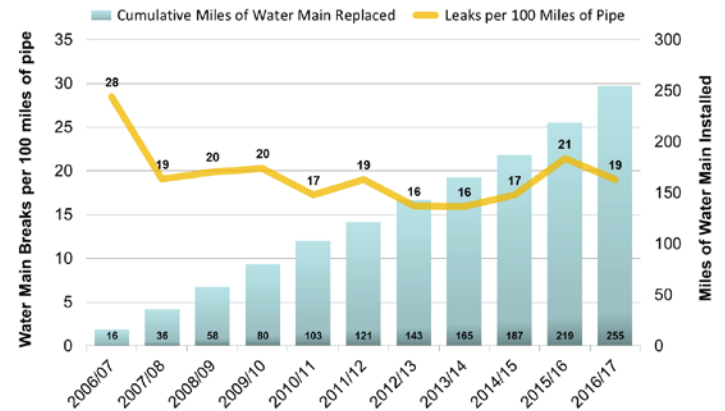
Key Points:

- LADWP’s FY 2016-17 leak rate of 19.5 per 100 miles is better than the national industry average of 25 per leaks per 100 miles.

2017-18 Goal: Replace 215,000 feet of mainlines

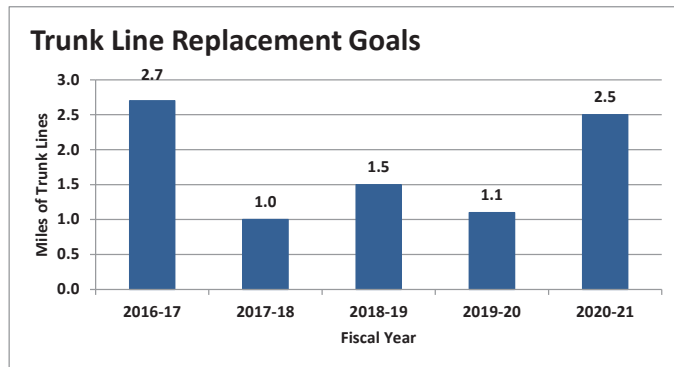
- Continue to increase hiring mainline crews to achieve an installation rate of 300,000 feet per year, to correspond with the life cycle of pipes.
- Install 500 miles of leak-prone and high-risk mainlines throughout the city in the next 10 years.
- Enhance the water distribution pipeline network through the use of earthquake resistant pipe.
- Further improve customer service through a resilient water distribution infrastructure.
- Minimize water distribution system life cycle costs, including capital and operations and maintenance costs.

Mainline Installation and Number of Leaks



Trunk Lines

Trunk lines (pipes greater than 20 inches in diameter) provide the transmission capacity to move large amounts of water around the city – from reservoirs and tanks to the smaller distribution mainlines. There are approximately 560 miles of transmission pipelines throughout the City of Los Angeles. Prioritization for trunk line replacement is similar to the process for mainlines, taking into account leak history, soil conditions, and pipe age, along with other factors.



2016-17 Achievements:

- Replaced approximately 2.7 miles of trunk line pipe, exceeding target by 11.7 percent.
- City Trunk Line South Unit 4 completed.
- City Trunk Line North and Western Trunk Line began design phase.

Key Points:

- Trunk line replacements are typically multi-year projects. As such, it is important to identify and implement mitigation measures as needed during construction.
- Trunk line ruptures are infrequent with two major breaks occurring in the past decade.

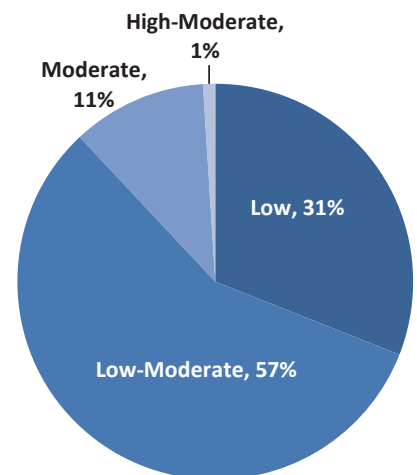
2017-18 Goals:

- Replace approximately 1 mile of trunk line, including portion of Foothill Trunk Line with new earthquake resistant pipe.

Long-Term Goals:

- Accelerate design and construction of trunk line projects to replace moderately high risk trunk lines.
- Replace approximately 40 miles of trunk lines with a high-moderate score for needing improvement.
- Continue the corrosion protection program.
- Continue pipe replacements required to meet drinking water regulatory compliance.
- Enhance trunk line piping network through the use of earthquake resistant pipe.
- Continue to work with stakeholders to communicate projects and implement mitigation measures to minimize impacts due to construction.
- Minimize trunk line system life cycle costs, including capital and operations and maintenance expenses.

Trunk Line Condition (Needing Improvement)



Large Valves

LADWP has 2,806 large valves (16 inches or greater in diameter) in the water system network. Large valves are flow control devices that are critical for water system operations.



Large valve replacement is based on operational needs. LADWP's goal has been to replace five large valves per year, based on recommendations from the Large Valve Assessment Program. There are currently 22 valves identified for replacement. LADWP's plan is to continue with a targeted large valve replacement program that strategically prioritizes replacements on large valves in the

water distribution system. As changes to the Water System are made, replacement priorities are adjusted.

2016-17 Achievement:

- Replaced 5 large valves.

2017-18 Goal:

- Replace 5 large valves

Long-Term Goals:

- Maintain and update a complete list of broken and/or difficult to operate valves.
- Continue the periodic valve exercise program to minimize valve damage and extend the valves' useful life.
- Continue the installation and renewal of large valves in conjunction with trunk line construction projects.

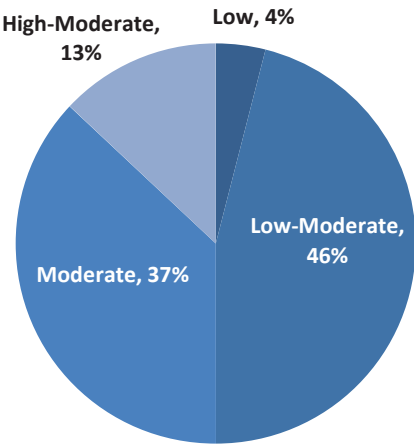
Pump Stations

There are 84 pump stations that pump water to customers or storage tanks at higher elevations in the city.

Objectives:

- Prevent service disruptions.
- Maintain operations during construction/replacement.
- Minimize operational costs.
- Reduce repair costs through appropriate preventative maintenance.

Pump Station Condition (Needing Improvement)

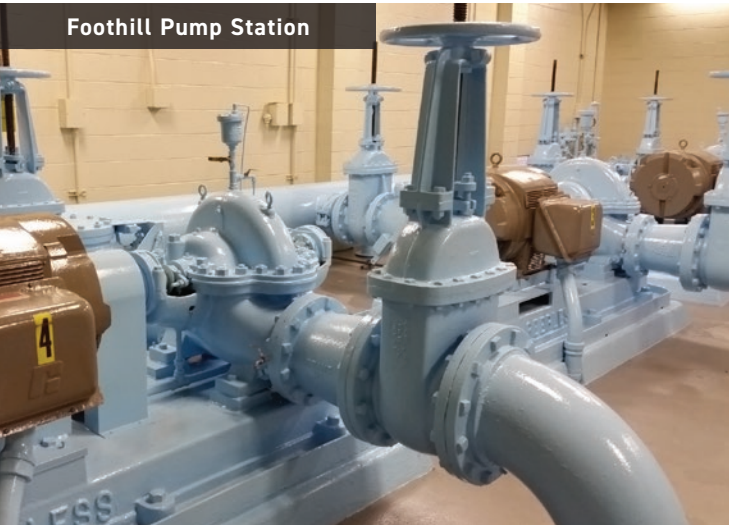


2016-17 Achievement:

- Replaced or rehabilitated 12 pumps/motors, meeting the fiscal year goal.

2017-18 Goal:

- Replace or rehabilitate 12 pumps/motors.



Pressure Regulator and Relief Stations

There are 234 regulator stations and 94 relief stations, totaling 328 stations combined. Regulator and relief stations control water pressure by adjusting for changes in flow and accommodating customer peak usage.

Objectives:

- Prevent service disruptions.
- Maintain system operations during construction.
- Minimize life-cycle costs.

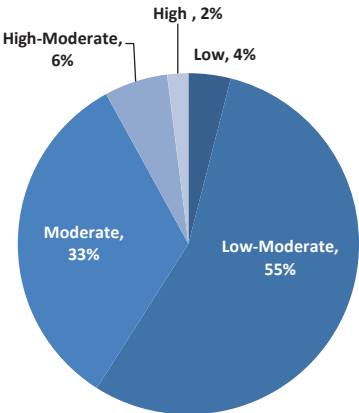
2016-17 Achievement:

- Retrofitted 4 stations that were highly corroded, leaking, and inoperable. The fiscal year goal was achieved.

2017-18 Goals:

- Retrofit 4 regulator stations per year through 2022.
- Some full station replacements are required due to structural requirements and expanded operational needs.
- Focus on structural integrity of pipes in the near future.

Pressure Regulator Station and Relief Station Condition (Needing Improvement)

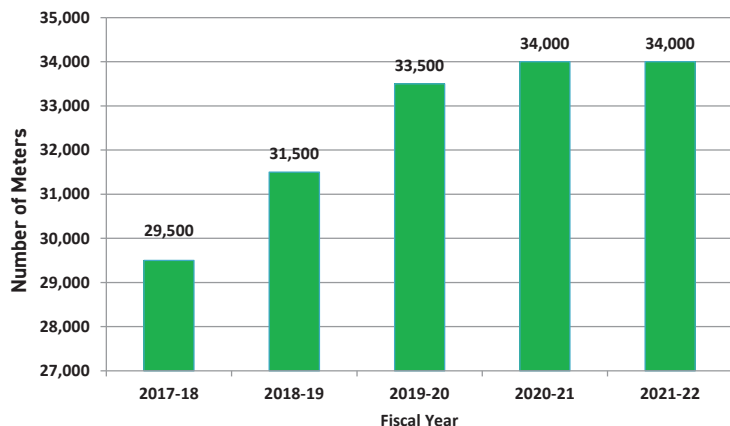


Water Meter Replacement Program

There are about 3,000 large meters (3 inches and larger) and 700,000 small meters (less than 3 inches) in the water distribution system. Accurate metering is necessary to fully account for water use by all customers as well as quantify water loss within the distribution system. LADWP has completed its cycle for large meter replacement, and is focused on replacing small meters, which constitute the vast majority of the Water System's meter inventory.

LADWP's current small meter replacement goal is 29,500 meters per year, which equates to a 24-year replacement cycle. The industry average life cycle of a small meter is 20 years, before wear and tear on its moving parts cause loss of measuring accuracy. Over the next five years, LADWP plans to ramp up to a replacement cycle of 20 years.

Small Meter Replacement Goal



2016-17 Achievement:

- Replaced 27,500 meters, meeting the adjusted goal.

2017-18 Goal:

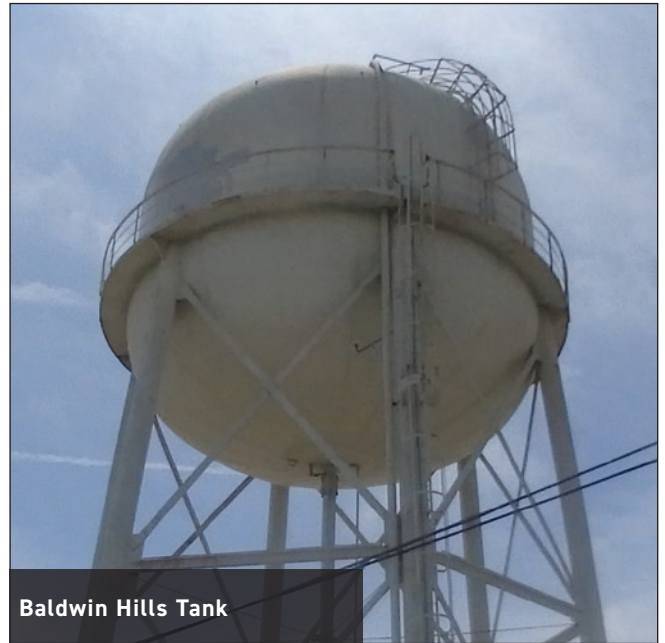
- Replace 29,500 meters

Long-Term Goals:

- Increase the small meter replacement rate to achieve a 20-year replacement cycle.
- Continue to evaluate automated meter programs that may provide the highest value to LADWP and our customers through real-time water use monitoring.
- Achieve at least 80% completion rate for repair and/or replacement of stuck or defective meters within 30 days after the service order is released by the Field Investigations Group.



Water System tank newly cleaned to improve water quality and protect tank from corrosion.



Baldwin Hills Tank

In-City Reservoirs and Tanks

Within the Los Angeles basin, LADWP operates eight major active reservoirs and 110 smaller storage facilities, all of which create operational flexibility to balance water supplies and customer demands. The following is an update on the eight major active reservoirs: Eagle Rock, Elysian, Lower Franklin No. 2, Santa Ynez, and Lower Van Norman Bypass reservoirs are protected with a roof or floating membrane; Headworks East is a buried structure; Los Angeles Reservoir utilizes shade balls and ultraviolet disinfection; and a floating cover is being installed at Upper Stone Canyon. A new buried reservoir, Headworks West, is currently in construction.

Additionally, the following six large reservoirs are no longer in service but contain water: Encino, Lower Hollywood, Upper Hollywood, Silver Lake, Lower Stone Canyon, and Ivanhoe Reservoir. Various levels of maintenance are necessary at these locations to allow for potential emergency use of the water as well as limited public access.

Similar to the in-city reservoirs, storage tanks provide the needed daily and emergency supplies for the community. Having capacity ranges from 9,000 gallons to 30 million gallons, the typical useful life for steel and concrete tanks is 60 years and 100 years, respectively.

Objectives:

- Preserve water quality and structural integrity.
- Replace reservoir floating covers based on a 20-year useful life, or earlier if needed due to deterioration and damage, or as required by the Division of Drinking Water.
- Retrofit and/or replace tanks based on condition assessment of tank structural and mechanical elements, materials, and seismic stability.
- Maintain dam surveillance on reservoirs as required by the Division of Safety of Dams.
- Continue inspection and maintenance program for reservoirs and tanks.

2016-17 Achievements:

- Lower Franklin Reservoir No. 2 returned to service with new floating cover, meeting water quality requirements and improving reliability.
- Began construction of Upper Stone Canyon floating cover.
- Began construction of ultraviolet (UV) treatment plant at Los Angeles Reservoir.

2017-18 Goals:

- Complete/update inundation maps and emergency plans for dams at Stone Canyon, Encino, Eagle Rock, Santa Ynez, Elysian, and Hollywood.
- Complete Elysian Reservoir floating cover installation.

Long-Term Goals:

- Complete Upper Stone Canyon Reservoir cover.
- Replace Green Verdugo Reservoir cover.
- Complete the UV treatment plant for the Los Angeles Reservoir outflow.

Los Angeles Aqueduct (LAA) Reservoirs & Dams

There are eight LAA reservoirs and dams beyond the city limits.

Objective:

- Evaluate and maintain dam structural integrity by conducting site-specific stability studies and maintain a reservoir surveillance program, as required and overseen by the Division of Safety of Dams.

2016-17 Achievements

- Finished design Phase 1 of North Haiwee Dam No. 2.
- Completed the seismic stability evaluations at Bouquet Canyon dam.

Goals:

- Complete the design for seismic improvements to North Haiwee Dam No. 2 and identify a risk reduction project for Tinemaha Dam by FY 2018-19.
- Complete Long Valley Dam Spillway Assessment.



Los Angeles Aqueduct System

There are approximately 300 miles of LAA tunnels, open channels, covered channels, and sag pipes that convey water from the Eastern Sierra and Owens Valley to Los Angeles.

Objective:

- Maintain operations through in-place refurbishment of the entire LAA system.

2016-17 Achievements:

- Aqueduct relining work completed three weeks ahead of schedule.
- One mile of Aqueduct original top removed on schedule. Goal of three miles could not be achieved due to excessive snowpack run-off.
- Also due to high run-off, crews spread 250,000 acre-feet of water augmenting groundwater supplies.

Long-Term Goals:

- Structural lining of 3 miles of concrete channel.
- Re-coat exterior of sag pipes. Completed 9.5 miles to date with 5 miles remaining.
- Construct 2 cathodic protection stations a year. Out of 30 stations in total, 14 are completed to date.
- Replace an average of 3 miles of concrete lid on the covered channels annually. Of these, 21 miles are completed to date with 77 miles remaining. The goal for top cover replacement is 15,000 feet per year.
- Re-drill and replace groundwater wells in the Owens Valley averaging 2 per year. There are 35 wells operating out of a total of 130 due to various constraints.
- Design and build a sedimentation facility at Fairmont Reservoir to meet long-term water quality requirements for water supplied through the LAA and east branch of the State Water Project.
- Design mitigation for a San Andreas Fault rupture at the Elizabeth Tunnel.





The LADWP Water System's mission is to deliver a dependable supply of safe, high quality water to our customers in an efficient and publicly responsible manner.

LADWP serves 148 billion gallons of water per year to 681,000 service connections.

Infrastructure

7,337 miles of pipe

LA Aqueduct: 300 miles

118 tanks and reservoirs

84 pumping stations

2,806 large valves

21 chlorination stations

328 regulator and relief stations

60,747 fire hydrants



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