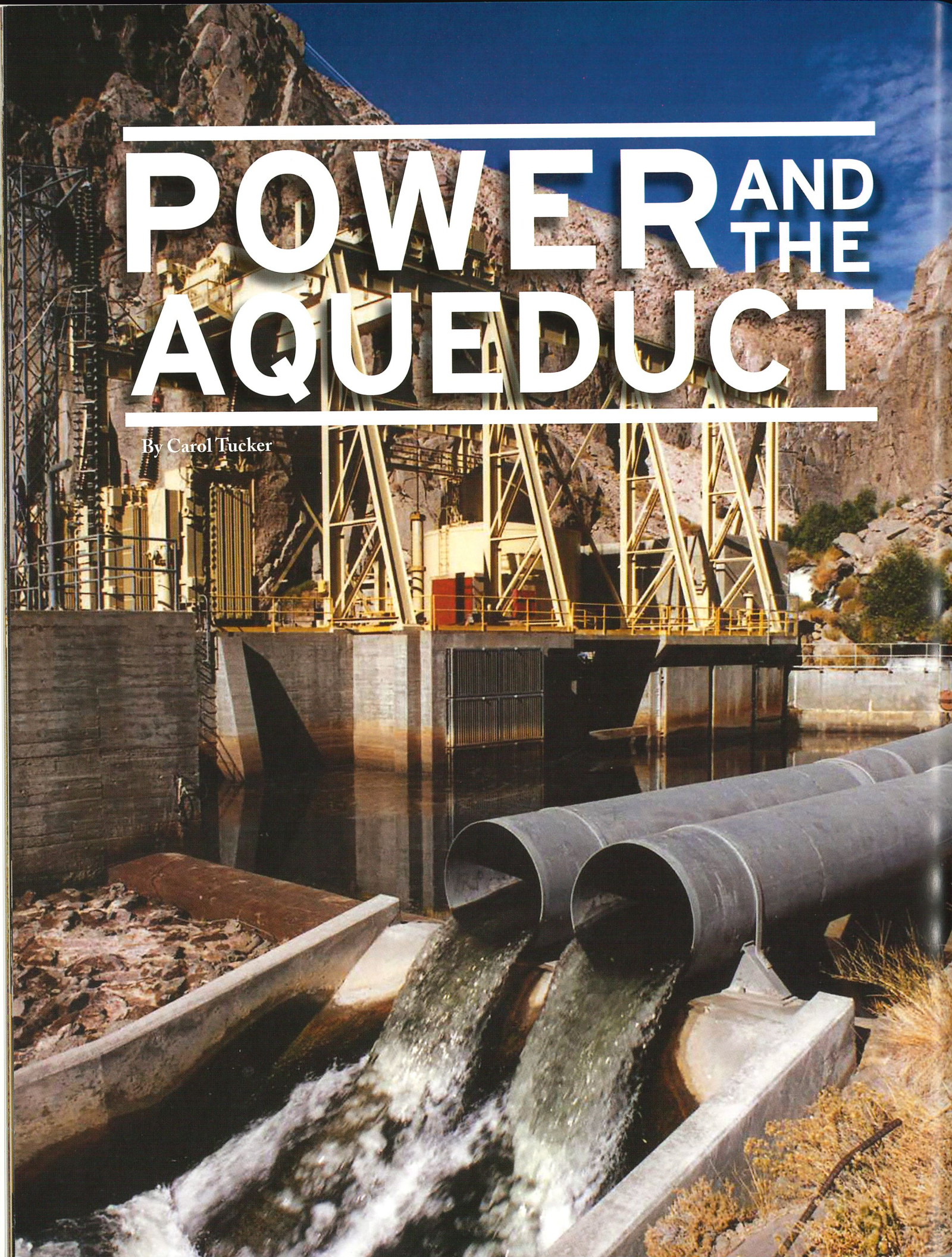


POWER AND THE AQUEDUCT

By Carol Tucker



Most people know the Los Angeles Aqueduct is historically significant for bringing a steady, reliable water supply to Los Angeles that enabled the city to grow into the major metropolis it is today.

But less is known about the aqueduct's role in providing the city's first power generation resource. Today, the 14 small hydroelectric generating stations in the Owens Valley, the Owens Gorge, San Francisquito Canyon, and northern Los Angeles provide over 160 megawatts of combined net capacity when all generating units are operating. Equally important is the fact that these power plants produce clean, renewable energy, averaging about six percent of LADWP's renewable power and three percent of its total power supply each year.

"The hydropower plants in San Francisquito Canyon and along the L.A. Aqueduct marked the beginning of the city as a municipal power utility. Yet these plants are just as significant today, providing a highly valued renewable resource to help meet our renewable energy goals and transition out of using coal power," said Aram Benyamin, Senior Assistant General Manager of the LADWP Power System.

William Mulholland and his team of engineers designed the aqueduct with hydroelectricity generation in mind, realizing power opportunities along the aqueduct and natural streams could provide enormous benefits for the city. These opportunities resulted from several dramatic elevation drops that assured power generation from water consistently flowing between 400 and 430 feet per second. In fact, early boosters of the aqueduct touted the potential for power generation as a selling point. In her book

William Mulholland and the Rise of Los Angeles, Catherine Mulholland quotes one of the first engineers appointed to the Board of Public Works, "urging the city to develop hydroelectric power, as the subsequent revenues would pay for the entire project."

In 1909 the Bureau of Los Angeles Aqueduct Power was created to build hydroelectric power plants along the Los Angeles Aqueduct. When Los Angeles acquired water rights in the Owens Valley to construct the L.A. Aqueduct, it also obtained water-power sites along the way.

Ezra F. Scattergood was selected as the Bureau's first chief electrical engineer. Scattergood led the way in developing hydroelectric power along the aqueduct and became Mulholland's counterpart for the Power System. Together, they were a visionary and unstoppable duo.

The first small hydroelectricity generators were built at Cottonwood and Division Creeks to provide power for the aqueduct construction. In conjunction, workers built a 212-mile, 30,000-volt transmission line extending along the aqueduct from the Owens Valley Intake to Pinto Hills near Mojave. The two power plants and 45 miles of transmission in the Owens Valley were intended to remain as permanent power supply infrastructure.





The ultimate goal was to generate enough power for the city itself, which required 200,000 horsepower during periods of peak demand in the early 1900s. (Horsepower was the standard measure of power at that time. 200,000 horsepower is equivalent to about 150 megawatts.)

Locations of hydroelectric power plants, and related elevation drops, along the L.A. Aqueduct route.

PROFILE OF AQUEDUCT POWER PLANTS AND RESERVOIRS

From the Library of Congress, *Historic American Engineering Record*.

LEGEND

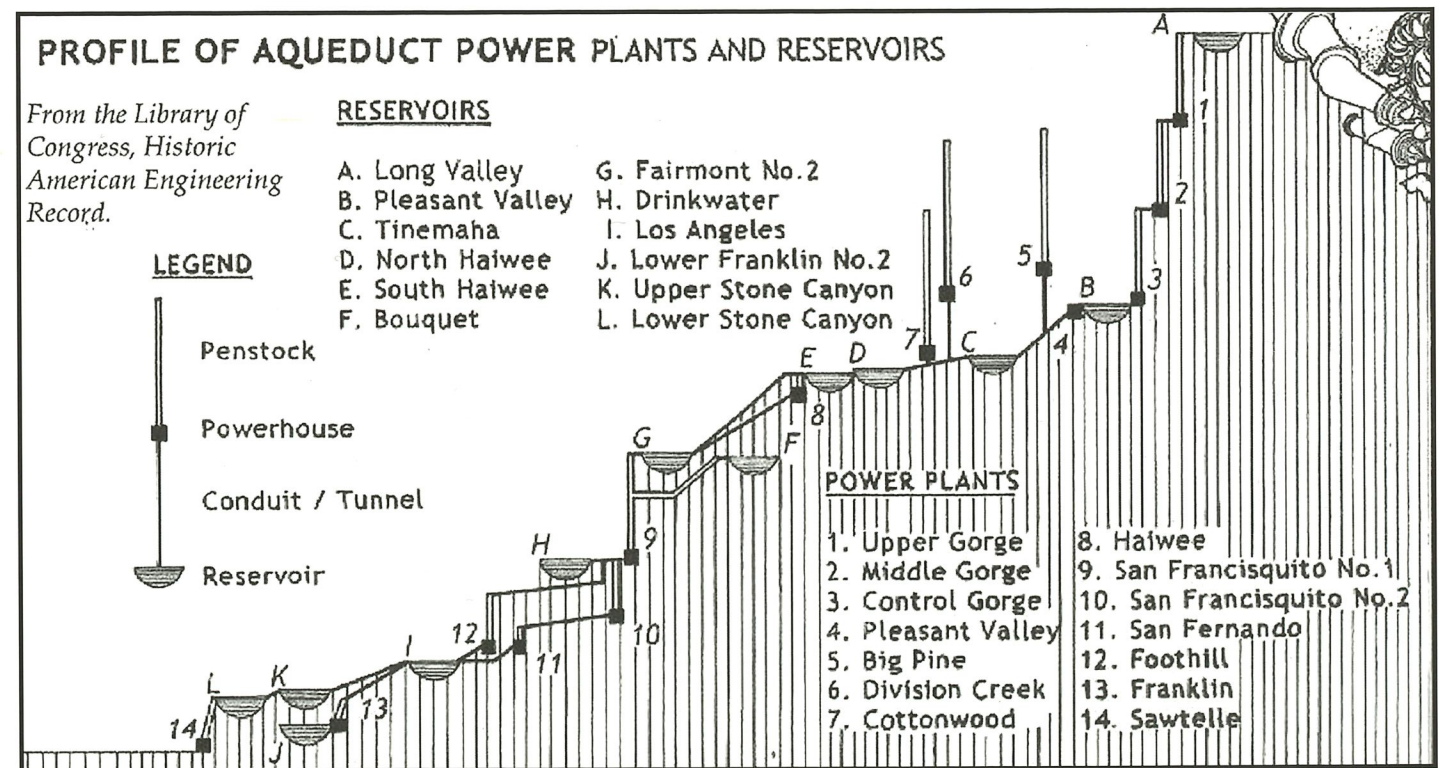
-  Penstock
-  Powerhouse
-  Conduit / Tunnel
-  Reservoir

RESERVOIRS

- A. Long Valley
- B. Pleasant Valley
- C. Tinemaha
- D. North Haiwee
- E. South Haiwee
- F. Bouquet
- G. Fairmont No. 2
- H. Drinkwater
- I. Los Angeles
- J. Lower Franklin No. 2
- K. Upper Stone Canyon
- L. Lower Stone Canyon

POWER PLANTS

- 1. Upper Gorge
- 2. Middle Gorge
- 3. Control Gorge
- 4. Pleasant Valley
- 5. Big Pine
- 6. Division Creek
- 7. Cottonwood
- 8. Haiwee
- 9. San Francisquito No. 1
- 10. San Francisquito No. 2
- 11. San Fernando
- 12. Foothill
- 13. Franklin
- 14. Sawtelle



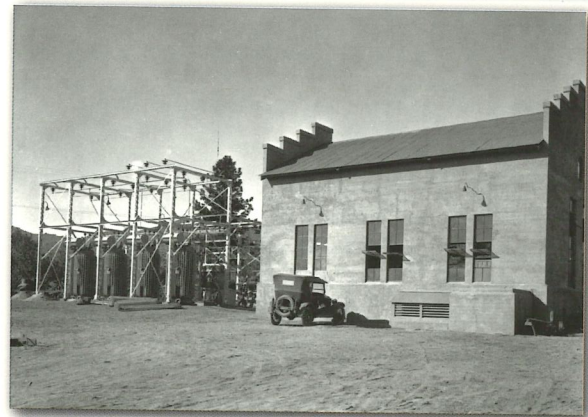
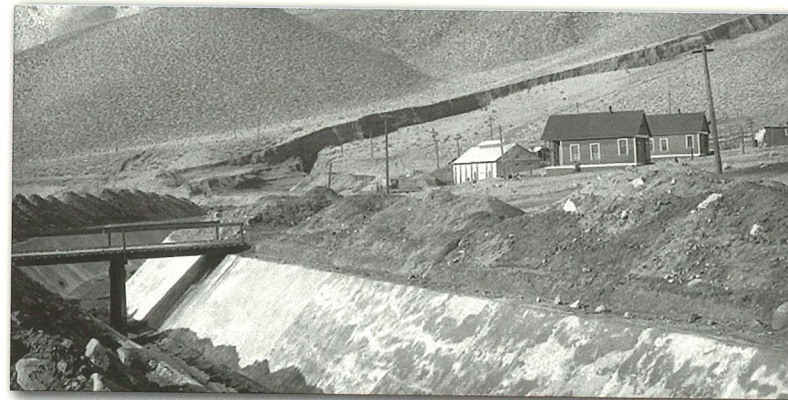
The general plan for power development called for four power houses along the aqueduct at points with the biggest elevation changes: the San Fernando plant with 9,000 horsepower; two in San Francisquito Canyon that would produce a combined 113,000 horsepower, and a fourth at Haiwee reservoir, which provided 6,000 horsepower.

On March 18, 1917, the San Francisquito Power Plant No. 1, Unit 1 was placed in service and energy was delivered to Los Angeles over a newly constructed 115 kV transmission line. The 200 kilowatts generated by Unit 1 were the first commercial kilowatts generated by the newly established Los Angeles Bureau of Power and Light. Subsequently, on April 16 and April 28, 1917, Units 2 and 3 respectively were placed in operation. This was the bureau's first step in becoming an independent electricity provider.

"We are quite proud of the distinctive role that all of the aqueduct hydroelectric plants have played in LADWP's history, and indeed the City of Los Angeles, and we are pleased to be associated with Mr. Mulholland's aqueduct," said Galen Steward, LADWP Manager of Hydro and Renewable Generation. "The hydroelectric plants built nearly 100 years ago remain a vital part of our power system and a reliable source of energy for the city."



Ezra F. Scattergood



To maintain and upgrade these vital power plants, LADWP's Internal Generation Division has embarked upon a \$54 million capital rehabilitation project to improve the reliability, efficiency, and life expectancy of the three Owens Gorge Power Plants built in the early 1950s. Supported in contract administration and project management by the Energy Services Division, the rehabilitation of these key renewable power plants will result in the continued reliable delivery of water supplies for Los Angeles, as well as providing up to 112MW of reliable and clean green power for Los Angeles. The project is scheduled to be completed in late 2014.

"Whether old or new, our hydro-generation power facilities along the aqueduct will continue to play a significant role in LADWP's renewable energy goals going forward," Steward said.

"The opportunity for development of large quantities of hydroelectric power along the line of the Aqueduct and on certain natural streams tributary to the Aqueduct water supply...(is) destined to be of immense value as a reliable source of hydroelectric power, which may be developed and supplied at very low cost, thus assuring low rates to electric consumers..."

—from the *Complete Report on Construction of the Los Angeles Aqueduct*, 1916

