

# Water Supply System Losses in San Diego County

The water-energy connection and opportunities to reduce future losses



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Given the current extreme drought conditions in California, water efficiency is a high priority. While there is extensive funding and development for technologies and appliances that perform effectively while using less water, one source of significant savings is continually overlooked: leaking distribution infrastructure.

The American Water Works Association (AWWA) reports that nationwide water agencies have a median water loss of 46 gallons per service connection per day (GSCD) between treatment facilities and the consumer. While the San Diego region is doing slightly better than average, at almost 39 GSCD,<sup>1</sup> every drop counts and more can be done to save this precious resource from being wasted.

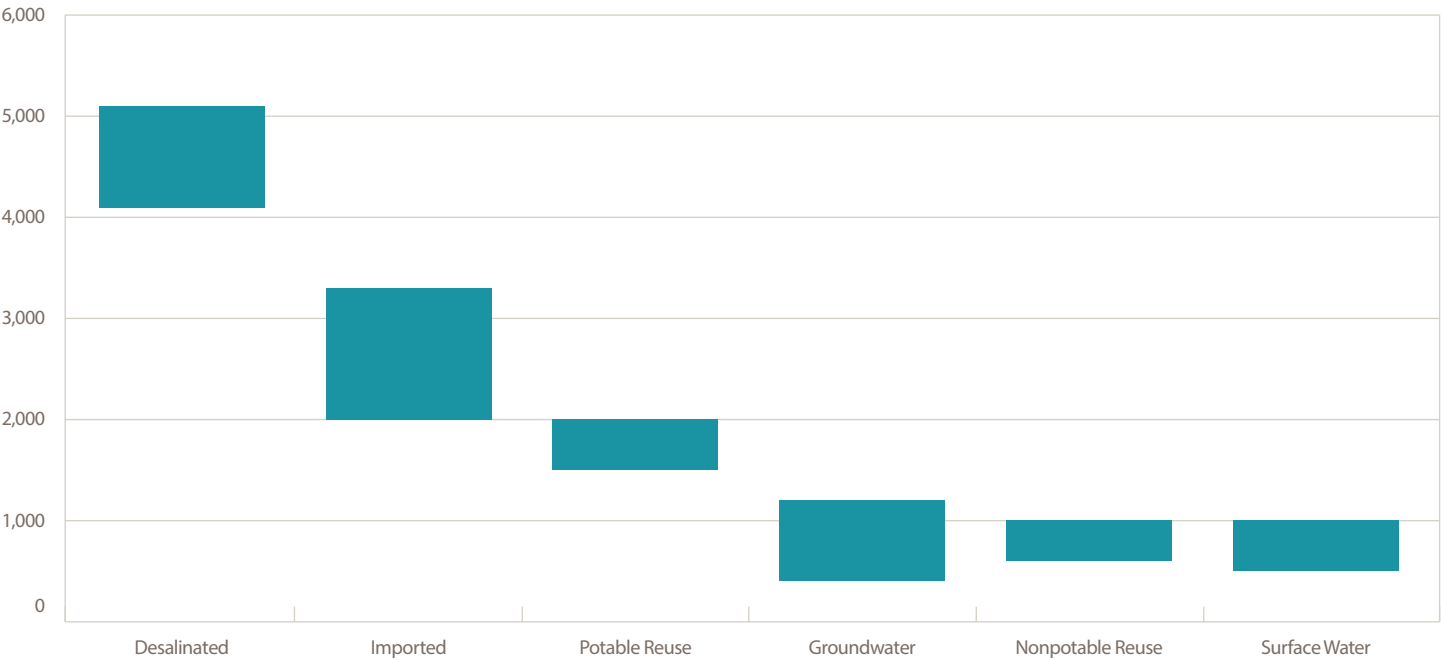
Saving water also results in energy savings. In an Equinox 2010 report, *San Diego's Water Sources: Assessing the Options*,<sup>2</sup> developed with the Fermanian Business & Economic Institute, energy intensity of acquiring and treating water from various water sources in San Diego County was estimated (see Figure 1), demonstrating that water loss prevention can produce valuable energy savings.

According to a 2005 report from the California Energy Commission, water-related energy consumption accounts for nearly 20 percent of all electricity

used in the state.<sup>3</sup> When water leaks out of the distribution system and does not reach its end use, the energy that was used to treat the water is wasted. These losses can be prevented by updating regional infrastructure.

### Energy Use by Water Source 2010 (equivalent)

Kilowatt-hours per acre-foot (325,851 gallons)



**Figure 1.** Energy costs for treating water from various sources. Recycled water is broken down into treatment for drinking water (potable) vs. treatment for agricultural water (nonpotable).

### Background

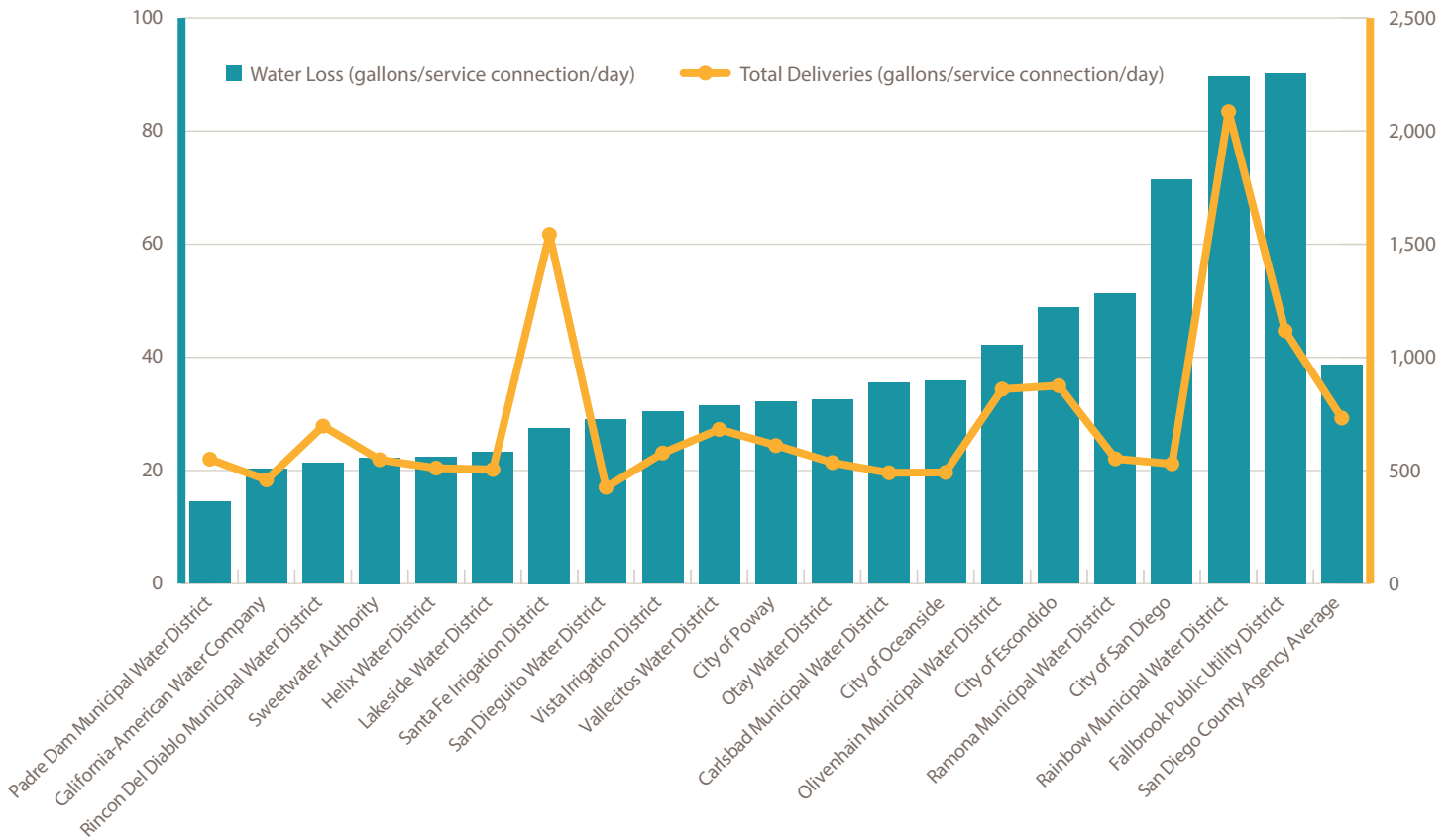
Water districts serving more than 3,000 customers or delivering more than 3,000 acre-feet of water per year are required to report water loss rates to the state Department of Water Resources every five years via urban water management plans. The most recent data for districts in the San Diego region shows losses between 14.5 and 90.2 GSCD reported in 2010 (see Figure 2). While better than the national average, these losses total 37,345 acre-feet a year (more than 12 billion gallons) and waste at minimum 55 million kilowatt-hours, which is enough to power more than 9,000 San Diego households for a year,<sup>4</sup> based on estimates of minimum energy requirements of the county’s 2010 water source portfolio.<sup>5</sup>

Fortunately, following the passing of Senate Bill 555 in October 2015, water audits and loss reporting will happen annually starting in 2017, and the state will set performance standards for allowable leak volumes. This law will automatically prompt water companies and districts to measure these leaks and implement methods for locating them for the purpose of repairs.

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## Water System Losses vs. Total Deliveries\*

(Select Water Districts, 2010)



**Figure 2.** Water system loss vs. total deliveries in 2010 retail water districts in the San Diego region that produce annual urban water management plans.

\*Self-reported in 2010 Urban Water Management Plans

## Preventing water infrastructure failures is better than tracking and detecting them.

### Best Practices

One current method for monitoring leaks and potentially reducing energy costs is a supervisory control and data acquisition (SCADA) system. A central computer network monitors feedback from control points like pumps, reservoirs and metering stations and can increase efficiency by prioritizing the most cost-effective wells, optimizing pumping based on up-to-date electricity rates and controlling water-line pressure, which reduces leakage and line breaks. A SCADA system was implemented in Fresno, Calif., in 1988 and saved the city \$725,000 in annual energy and water costs, according to a Natural Resources Defense Council report.<sup>6</sup> Newer technology has even more to offer than the SCADA system, however, according to Bloomberg, “only about 20 percent of utilities worldwide – and fewer still in the U.S. – are using smart sensors in their infrastructure.”<sup>7</sup>

Preventing water infrastructure failures is better than tracking and detecting them. One method is to replace parts before the end of their service life. According to inewsourc, there were 306 main breaks in San Diego between January 2012 and September 2015, wasting approximately 35 million gallons (110 acre-feet) of water.<sup>8</sup> The California Department of Public Health requires the replacement of at least 10 miles of cast-iron water mains per year, and the City of San Diego had replaced around 50 miles of these in 2012, with 129

remaining by 2017.<sup>9</sup> However, the majority of main breaks are not in cast-iron pipes, but asbestos cement, which is now starting to be addressed.

Another strategy for avoiding infrastructure failure is advanced management of pressures in the pipe network, which generally proves to be far less expensive than infrastructure replacement. Pressure management aims to identify and eliminate damaging pressure transients (hammers) that can occur regularly, as well as eliminating excess pressures that cause undue depletion of useful life of the pipe network. Pressure management has been proven effective at reducing leakage volumes, reducing the occurrence of new main and service line breaks, reducing energy required for water delivery and extending the useful life of the pipe assets.<sup>10</sup>

Internationally, the Israeli company TaKaDu is developing technology using big data, cloud-based methods to provide water networks with information needed to detect and prevent water loss.<sup>11</sup>

## Conclusion

Moving forward, San Diego and California need to take advantage of AWWA best practices and new technologies to update current infrastructure and reduce water lost in distribution. Senate Bill 555 is the first step toward implementing monitoring systems throughout California and setting performance standards, but water districts need to prioritize advanced monitoring systems to save on costs as well as reducing waste of precious natural resources.

1 Calculated from the 2010 Urban Water Management Plan Data (published 2014), California Department of Water Resources (<http://www.water.ca.gov/urbanwatermanagement/UWMP2010.cfm>)

2 "San Diego's Water Sources: Assessing the Options," published July 2010, produced by the Fermanian Business & Economic Institute. ([http://www.pointloma.edu/sites/default/files/filemanager/Fermanian\\_Business\\_\\_Economic\\_Institute/WaterReport.pdf](http://www.pointloma.edu/sites/default/files/filemanager/Fermanian_Business__Economic_Institute/WaterReport.pdf))

3 From the California Energy Commission's "Refining Estimates of Water-Related Energy Use in California" (<http://www.energy.ca.gov/publications/displayOneReport.php?pubNum=CEC-500-2006-118>)

4 SDG&E area Consumption per Household estimate (<http://www.sdge.com/residential/2013-rates>)

5 From the San Diego County Water Authority's 2010 Urban Water Management Plan (<http://www.sdcwa.org/2010-urban-water-management-plan>)

6 From the National Resources Defense Council's 2004 report "Energy Down the Drain" (<https://www.nrdc.org/water/conservation/edrain/edrain.pdf>)

7 <http://www.bloomberg.com/news/articles/2015-01-08/takadu-helps-israel-be-a-most-efficient-water-manager>

8 <http://inewssource.org/2015/11/10/new-culprit-in-san-diego-water-main-breaks-asbestos-cement/>

9 <http://inewssource.org/2012/02/27/cost-of-main-breaks-water-loss-add-up-for-city/>

10 Thornton, Julian. Pressure Management Successes Around the World. North American Water Loss 2015. Conference Proceedings. <https://www.dropbox.com/s/hq62t1n2nbrgl6q/Session%2011%20Thornton.pdf?dl=0>

11 <https://www.greenbiz.com/blog/2013/12/17/5-reasons-our-thirst-water-technology-will-grow-2014>

This report is available online at [energycenter.org/equinox](http://energycenter.org/equinox).

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