

# A Tale of Three Cities

New Water Infrastructure in Los Angeles, San Francisco and San Diego

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## Summary

This case study investigates the water supply contexts and water conservation programs of three large cities in California: Los Angeles, San Francisco and San Diego. The water departments of these cities serve over 7 million people, so their conservation efforts have an important impact on statewide water consumption. California is also experiencing ongoing and severe statewide droughts, which have spurred efforts to reduce water consumption.

For such reasons, the state of water in these Californian cities deserves closer analysis. This research is part of the ongoing efforts of the POLIS Water Sustainability Project (WSP) to look at leaders in water sustainability. The WSP aims to highlight communities testing and incorporating comprehensive demand management programs and the concept of “new water infrastructure” into their water management programs. These notions include conservation programs, decentralized technologies and alternative sources of water, such as rainwater harvesting, water reuse and recycling.

This work builds on the research in the report *Thinking Beyond Pipes and Pumps: Top Ten Ways Communities Can Save Water and Money*, which is available on the Water

Sustainability Project website at <http://www.waterdsm.org/> It focuses particular attention on the concept of the Water Soft Path, which is discussed in more detail in the report *The Soft Path for Water in a Nutshell*. The present case study considers the efforts of international leaders such as California to see how they are incorporating tenets of the water soft path approach into everyday planning.



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## **The Californian Water Context**

The system for supplying and delivering water in California is incredibly inefficient. Treating and transporting water great distances from the Sierra Nevada Mountains to southern parts of the state require huge amounts of energy; in fact, the California Department of Water Services is the biggest consumer of electricity in the state.<sup>1</sup>

2009 is the third consecutive year of drought in California. This situation has prompted many new initiatives to conserve water. The state has also received 98% of the federal Recovery Act funding earmarked for water recycling projects; this represents \$131.8 million out of a total \$134.3 million. This funding will be leveraged to build 26 different recycled water projects, to a total cost of \$675 million.<sup>2</sup>



## **Los Angeles**

### **Water Conservation Goal**

Water consumption in Los Angeles will likely increase 15% by 2030, compared to 2008 levels. The City has promised to meet all of this new demand through water conservation and recycling. Each measure would account for 50% of total new demand. To meet this goal the City will have to save 32.6 billion gallons of water per year.<sup>3</sup>

### **Water Supply**

Los Angeles grew in size by building long networks to distance sources of water. Overall, about 80% of LA's water is imported.<sup>4</sup> Yet recent court rulings, environmental agreements, and competition from other cities in Southern California are cutting flows and increasing the price of water.

Los Angeles draws water from four main sources:

- The 375 km Los Angeles Aqueduct transports water from the Sierra Nevada Mountains. This water comprises on average 35% of LA's total supply, though depending on climatic conditions this figure can range from 20-75%
- The Metropolitan Water District (MWD) of Southern California transports water from the California Aqueduct and the Colorado River Aqueduct. It supplies on average 53% of LA's total supply, though it ranges between 10-60%
- Local groundwater consistently makes up about 11% of LA's total supply
- Recycled water provides consistently about 1% of total supply

Changing climatic conditions greatly affect the supply of water to Los Angeles. The Los Angeles Aqueduct draws off surface (snowmelt) runoff in the Sierra Nevada Mountains, making it quite vulnerable to dry conditions.



For instance, from 1995 through 2000 Los Angeles received 63% of its water from the Eastern Sierra through the Los Angeles Aqueduct. Yet from 2001 through 2004 only 34% of the city's water came from this source. Its significant annual variations are inversely proportional to MWD water purchases.<sup>5</sup>

### The Impetus Behind Conservation

Several successful legal challenges against the Los Angeles Department of Water and Power (LADWP) have compelled the City to rely more on water conservation for its future water needs. The history of Los Angeles' water supply is complex and quite controversial. The LADWP built

lengthy aqueducts that diverted rivers flowing into the Owens Valley and the Mono Lake Basin, which lie several hundred kilometres north of Los Angeles. This practice continued for many years, despite the obvious damage it caused to natural resources and wildlife in these areas.

Concerned citizens living in the affected areas resisted in a number of ways. One method was to form coalitions to raise legal challenges against the LADWP. Over time these challenges have been successful in forcing the City to conserve water and reduce its water exports from these basins.

### Significant events include:

Inyo County successfully sued the LADWP in 1972 over the utility's increased groundwater pumping in the Owens Valley. It argued that the LADWP had violated the 1970 *California Environmental Quality Act* by failing to complete an Environmental Impact Report before

increasing its water exports. In response, Los Angeles installed water meters in residences and threatened to cut off water to those who leased it for recreational and agricultural uses.

The Mono Lake Committee, the National Audubon Society, Friends of the Earth and local landowners filed a lawsuit against the LADWP in 1979 after water diversions reduced lake levels. They argued that the LADWP had violated the public trust doctrine by draining the lake and thus adversely affecting local fish and wildlife.<sup>6</sup> The plaintiffs won their lawsuit in 1983. In response, Los Angeles undertook state-funded conservation and recycling measures to restore water levels in Mono Lake.

California Trout, Inc., the National Audubon Society and the Mono Lake Committee sought a court order in 1985 that directed the State Water Resources Control Board (SWRCB) to rescind



Los Angeles' water rights licenses. The plaintiffs successfully argued that the water licenses did not comply with provisions in the Fish and Game Code that limit water diversions to protect fish. The SWRCB in 1994 required the LADWP to reduce its exports from the Mono Lake Basin by 20% in order to protect fish and other wildlife.

A State Implementation Plan in 2003 required the LADWP to complete dust control measures on the dry Owens Lake bed. The LADWP had diverted tributary streams into the Los Angeles Aqueduct, which caused the lake to dry out. The wind-blown dust violated *Clean Air Act* standards and is one of the biggest sources of air pollution in the southwestern United States. The biggest phase of remediation has cost the City over \$105 million.



A federal judge ordered the City of Los Angeles in 2005 to reduce its water exports and restrict groundwater pumping in Owens Valley in order to replenish groundwater tables. He also levied \$5000 per day in fines until river flows met satisfactory levels.<sup>7</sup>

Due to these commitments and climate change impacts, the LADWP projects that average future deliveries from the Los Angeles Aqueduct will be about one-third of the city's water needs.<sup>8</sup>

### **Water Consumption in Los Angeles**

Los Angeles installed residential water meters in the mid-1970s. By the mid-1980s, per capita consumption was about 178 gallons per day; this was roughly half of the per capita consumption of cities without water meters.<sup>9</sup>

Water consumption has remained at 1990 levels, despite a 15% increase in population. This is mainly due to water conservation measures. In the mid-1990s, the City mandated low-flow toilets and showerheads for the entire city.<sup>10</sup>

By 2030 water use in LA is expected to increase by 15% from 2008 levels. The City has promised to meet this new demand through water conservation and recycling. Each measure will meet 50% of new demand. To meet its goal the City will have to save 32.6 billion gallons per year.<sup>11</sup>

There is great public opposition in California to using recycled water to recharge groundwater supplies. The City of Los Angeles' 2008 water plan includes this measure, but a similar plan was scuttled in the 1990s because the public perceived it as a 'toilet-to-tap' plan and put up strong opposition. Water experts maintain that there is no evidence that the practice is unsafe.<sup>12</sup>



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The City's 2008 water strategy, *Securing L.A.'s Water Supply*, is a multifaceted plan to ensure future water supplies:

#### **Short-term conservation measures**

- Enforce existing restrictions on watering lawns and serving water to restaurant patrons who did not order it; the City has not diligently enforced these since 1990
- Expand restrictions on watering lawns, washing cars and using inefficient hoses
- Public outreach campaign promoting water conservation and rebates from the City
- Encourage water conservation at the regional governance level

#### **Long-term conservation measures**

- Free distribution of 'smart sprinklers' that adjust watering based on weather conditions
- \$250 instant rebates for water-efficient washing machines purchased in LA; free water-saving faucet taps and showerheads are already available to residents
- \$400 rebates for businesses to retrofit urinals with waterless urinals; rebates for installing smart sprinklers and low-flush toilets and urinals are already available
- Retrofit three City parks per year for five years with smart sprinklers and upgraded distribution systems
- Goal of 10% reduction in indoor and outdoor water use at the various City departments
- The Green Building program, which creates incentives and requirements for developers to meet LEED standards, includes water efficiency measures

#### **Increase water recycling**

- The City will develop detailed plans to increase the use of recycled water from one to six percent of total demand
- This five percent increase means the City will meet 50% of expected growth in water demand through water recycling
- Expand the network of pipes distributing recycled water for irrigation and industrial uses
- Upgrades to water treatment plants to recycle wastewater for potable uses; the treated water would be piped to spreading basins for groundwater recharge



#### **Increase local groundwater supply**

- Measures to clean up a key groundwater basin and expand its capacity



### Stormwater capture

- The City is exploring how it can increase the capture of rainfall into groundwater basins, instead of letting it flow out into the ocean
- Upgrades to groundwater spreading facilities to increase their capacity

### Retrofit on Resale Ordinance

- Residential property owners in LA are required to install low-flow showerheads and ultra low-flow toilets prior to the close of escrow<sup>13</sup>
- Non-residential property owners must install low-flow showerheads and flush reduction devices; it does not include the replacement of toilets because this might trigger costly accessibility improvements required under the *Americans with Disabilities Act*
- The owner, buyer and a qualified inspector must sign and file a Certification of Completion
- The City of LA offers free low-flow showerheads and ultra low-flow toilets, free installation for such devices and rebates for devices previously installed

### San Francisco

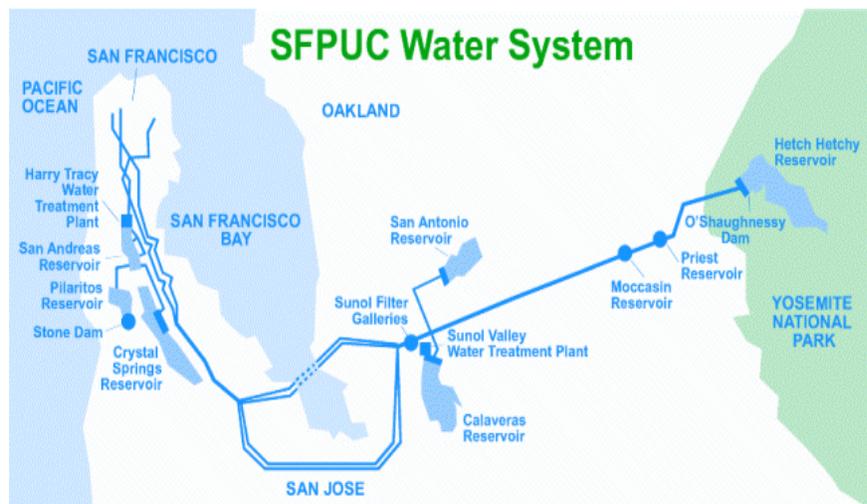
#### Water Conservation Goal

San Francisco and its surrounding urban areas are projected to increase their consumption of imported water by roughly 13% by 2030. This is an increase of 35 million gallons per day (MGD), from 265 MGD to 300 MGD. The City has provisionally agreed to meet this new demand through water conservation, recycling and increased reliance on local groundwater. It will revisit these targets in 2018, under a compromise with environmental groups who pushed for a ban on new water supplies until 2030. Under this plan, San Francisco will need to conserve an additional 10 MGD relative to 2008 levels, while the goal for surrounding areas is 25 MGD.

#### Water Supply

San Francisco currently draws **85%** of its water supply from the Hetch Hetchy Reservoir in Yosemite National Park, located in the Sierra Mountains. Spring snowmelt flows down the Tuolumne River to fill the reservoir; as such, it is very vulnerable to climatic changes and reduced snowfall. The San Francisco Public Utility Commission (SFPUC) treats this water but

does not filter it because it is of very high quality. The water system also stretches 270 km and crosses five active fault lines, making it vulnerable to earthquakes.



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The other **15%** of San Francisco's water comes from the Alameda and Peninsula watersheds, which are located closer to the city. Surface water, rainwater and local runoff are captured in reservoirs and then filtered and treated.<sup>14</sup>

The Hetch Hetchy Reservoir is subject to environmental controversy, as groups including the Environmental Defense Fund and Discover Hetch Hetchy wish to see the O'Shaughnessy Dam demolished and the valley restored to its pre-reservoir state. Such groups assert that water supplies to San Francisco would be virtually uninterrupted if this occurred.<sup>15</sup>



### **Water Consumption**

There are two recent developments that are important for understanding the state of water consumption in San Francisco:

1. The \$4.4 billion Water System Improvement Program, announced October 2008
2. The Water Supply Agreement, approved mid-2009

The SFPUC approved a new \$4.4 billion **Water System Improvement Program** in October 2008. It involves 17 regional water projects to repair and upgrade San Francisco's ageing water infrastructure.<sup>16</sup>

The plan also sets aggressive targets for water conservation and recycling, reflecting the pressure environmental groups put on the City to reduce its demands for new water. The SFPUC will continue to draw a maximum of 265 MGD from the Hetch Hetchy Reservoir until at least 2018. Environmental groups had pushed for this restriction to last until 2030, but the City contended that this was too long in the event of a prolonged drought, which would empty the reservoirs.

The original water plan called for an increase in water supplies to 300 MGD, which reflected the growing population of the Bay area. This means that the SFPUC must make up the 35 MGD difference through water conservation and recycling. The breakdown is as follows:

Surrounding communities, utilities and water districts that purchase water from the SFPUC must conserve and recycle an additional 25 MGD by 2018. In the draft plan, the target for these wholesale customers was 15 MGD. They expressed concern because the SFPUC did not consult with them on this increase, and it is unclear who decided on the increased amount. They also worried that they had already picked the "low-hanging fruit" and such efficiency gains would be difficult to realize.



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The City of San Francisco must conserve or recycle an additional 10 MGD by 2018. This is the same amount as was in the draft report. This target has created some controversy in the city. Some assert there is less opportunity for conservation in San Francisco compared to outlying areas, as the city is already quite efficient in its water use. Others suggest the city could save an additional 5 MGD through water recycling alone.<sup>17</sup>

The **Water Supply Agreement** is a separate agreement between the City of San Francisco and the surrounding cities, utilities and water districts that purchase water from it. The previous 25-year plan expired in June 2009. This new agreement again stretches 25 years, ending in 2034. In negotiating it, wholesale customers had hoped to increase their draw on the Hetch Hetchy Reservoir. Instead, they will need to double their level of conservation.

This agreement works within the 265 MGD limit set out in the October 2008 water plan. It stipulates that San Francisco is limited to 81 MGD, and it must distribute the remaining 184 MGD at cost to its wholesale customers. More specifically, this guarantees 92 gallons per person per day in the surrounding cities, while setting a goal of 54 gallons per person per day in San Francisco (down from current consumption of 57 gallons per person per day). Everyone's quota would be cut in case of a drought.

However, a 2004 SFPUC study estimated that San Francisco would consume 92.4 MGD by 2010. To meet its 81 MGD limit, the City will increase its consumption of local groundwater, use recycled water for irrigation at selected sites and enhance its water conservation campaign.<sup>18</sup>

### Water Conservation

- Cash rebates for water-saving toilets and clothes-washing machines for residential and commercial properties
- Free educational materials on water conservation for renters
- Free water conservation evaluations for homes and businesses
- Free water-saving devices and fixtures for homes and businesses
- 'Retrofit on Resale' ordinance (see below)

### Water Recycling

- Currently three proposed projects involving recycled water for irrigation at parks, zoos, golf courses and street medians would deliver two million gallons of water per day
- Though a big feature in the City's water strategy, it represents only 2.2% of current use



### Groundwater

- Installation of up to six groundwater pumps in 2009 to supplement the supply of water
- Groundwater use during dry years; no use during normal or wet years to allow recharge



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## **Desalination**

- The Bay area's four largest water agencies are currently exploring the use of desalination

## **Rainwater Harvesting**

- Clarified standards for rainwater harvesting systems and re-use of water for non-drinking purposes such as flushing toilets and outdoor irrigation
- Initiative offers a price reduction for rainwater barrels

## **Retrofit on Resale Ordinance**

San Francisco City Council approved the Retrofit on Resale Ordinance in May 2009 and it came into effect on July 1, 2009. The ordinance establishes statutory guidelines in the Housing and Building Codes to retrofit residential or commercial properties with water efficient plumbing fixtures upon resale.

This ordinance came about through partnerships with City Departments, water conservation advocates, homeowner representatives and commercial interests.<sup>19</sup> The City asserts that it could save four million gallons of water per day by 2017. It builds on existing cash rebates for replaced toilets, urinals and clothes washing machines and the continued free distribution of showerheads and aerators.

## **Background**

Similar policies have existed since the early 1990s in Californian cities such as San Diego, Los Angeles, Irvine, North Marin and San Luis Obispo. San Francisco passed an ordinance in 1991 that required residential owners to replace toilets if they used more than 3.5 gallons (13.2 litres) of water per flush. However, new federal standards came into effect in 1994 and they exceeded those of San Francisco.

The San Francisco Public Utility Commission is a signatory to the California Urban Water Conservation Council Memorandum of Understanding Regarding Urban Water Conservation, which compels it to actively promote the replacement of high-volume toilets and showerheads with more efficient models. The SFPUC estimated in 2004 that 40% of toilets within the city still failed to meet federal standards of 1.6 gallons (6.0 litres) per flush.<sup>20</sup>

## **Certification**

Compliance must be completed through the San Francisco Department of Building Inspection, using a qualified private inspector. A certificate of completion must be filed with the San Francisco Recorder's office before or concurrently with the transfer of the property.



Ordinance regulations for residential properties include:

- All showerheads have a maximum flow of 2.5 gallons (9.5 litres) per minute
- All showers have no more than one showerhead per valve
- All faucets and faucet aerators have a maximum flow rate of 2.2 gallons (8.3 litres) per minute
- All toilets have a maximum rated water consumption of 1.6 gallons (6.0 litres) per flush
- All urinals have a maximum flow rate of 1.0 gallons (3.8 litres) per flush
- All water leaks have been repaired
- A seller can transfer responsibility for compliance to the buyer if 1% of the purchase price is held in escrow to pay for the conservation measures within 180 days of sale
- The remaining balance of the escrow is released to the seller after a certificate of completion is filed with the Department of Building Inspection

For commercial properties, between July 1, 2009 and January 1, 2017 the following actions trigger retrofit of non-compliant fixtures:

- Any tenant improvements costing more than \$150,000 require the retrofit of non-compliant fixtures that serve the specific area of alteration or improvement
- Commercial building additions that increase the floor area of the space in the building by more than 10 percent require the retrofit all non-compliant fixtures in the entire building
- Alterations or improvements to a room containing any non-compliant fixtures require the retrofit of the non-compliant fixtures in that room

## **San Diego**

### **Water Conservation Goal**

The City in 2008 estimated that water consumption in San Diego would increase by 20% by 2030, with a population increase of 50%. It is developing conservation plans to meet this target. Climatic, population and regulatory changes have together reduced the amount of water available to the City. This has put pressure on the City to use existing supplies more efficiently.

### **Water Supply**

San Diego currently imports up to 90% of its water through purchase from wholesale agencies: the Metropolitan Water District of Southern California and the San Diego County Water Authority. These two agencies transport water via two important routes:

- The California Aqueduct carries water 730 km from the Sacramento-San Joaquin River Delta and supplies almost 25 million people; this water originates as snowmelt in the Sierra Nevada Mountains
- The Colorado River Aqueduct brings water 392 km from reservoirs on the Colorado River

Local rainfall captured in reservoirs comprises the remaining 10% of San Diego's water supply.

San Diego faces a constrained water supply from its two main sources due to climatic, regulatory and population changes.





Reduced snowmelts have lowered the quantity of water available from the Sierra Nevada Mountains and the Colorado River. Warmer temperatures and dryer conditions also increase evaporation off reservoirs and other bodies of water. A telling example is Lake Mead, which lies behind the Hoover

Dam and is the largest reservoir in the United States. There is a 50% chance it will be completely dry by 2021, given current rates of climate change and water usage.<sup>21</sup>

The Sacramento-San Joaquin River Delta is currently a huge source of controversy in the state. Federal judges and regulatory agencies have ordered reductions in water exports from the delta. They cite the risk over-pumping poses to several endangered species and the overall health of the delta ecosystem. State water managers have filed lawsuits against such decisions, asserting that federal agencies failed to properly complete environmental impact assessments. They have had success so far, but water exports are still far below historic levels.<sup>22</sup>

California can also no longer consume excess water from the Colorado River, due to an order from the Secretary of the Interior and a population explosion in Colorado, Arizona and Nevada. The river currently supplies 27 million people in seven states and Mexico. This further reduces the amount of water available to San Diego.<sup>23</sup>

### **Water Consumption**

San Diego consumed about 68 billion gallons of water in fiscal year 2008, which translates into roughly 186 million gallons per day.<sup>24</sup> The city's population has increased 18% since 1990, but its water consumption increased only 2%. This is largely due to a conservation campaign in 1991 that installed efficient toilets and showerheads across the city.<sup>25</sup>

The City predicted in 2006 that the area's population would increase by 50% in the next 25 years, while water consumption would increase by 25%. In 2008 the City set a water increase target of 20% by 2030. It is developing plans to meet this number.<sup>26</sup>

There is an inclining block rate for residential customers, though the highest rate is only 22% more than the lowest rate. Commercial and industrial users pay a constant rate per unit of water consumed. The cost for recycled water is \$0.80 per hundred cubic feet (HCF) of water, which is equal to 748 gallons.



By comparison, as of July 1, 2009, the potable water rate for irrigation customers is \$3.309 per HCF.<sup>27</sup> While potable water costs over four times more than recycled water, most irrigation customers say it is not cost-effective to make the switch.

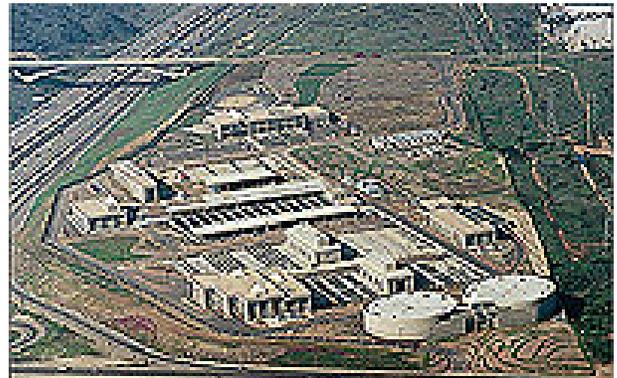
The City of San Diego's Water Department has promoted conservation efforts and water reclamation (recycling) as means to reduce its dependence on imported water.

### Conservation

- Rebates on low-flow toilets for residential, commercial and industrial users
- The San Diego County Water Authority offers rebates and incentives for various water-conserving fixtures
- Plumbing Retrofit Ordinance<sup>28</sup> (see below)
- Guaranteed Water for Industry Program<sup>29</sup> (see below)

### Water Reclamation

- Two water reclamation plants can treat 45 million gallons of wastewater per day
- Distinct water pipes deliver reclaimed water from the North City plant for industrial, commercial and irrigation uses
- The North City plant is powered by electricity generated from an adjacent landfill gas capture facility
- South Bay plant discharges the reclaimed water into the Pacific Ocean or passes it through further treatment for use as reclaimed water
- Reclamation plants built after an eight-year legal battle involving the Sierra Club, over the level of treatment needed at the Point Loma sewage treatment plant
- The US Environmental Protection Agency allowed the City to build these plants to avoid a \$3 billion upgrade to Point Loma
- Most of the reclaimed water is pumped back into the sewer system, where it improves the overall quality of pre-treated water entering Point Loma; only a small amount used for irrigation<sup>30</sup>



### Retrofit on Resale Ordinance

- The San Diego Municipal Code requires the retrofit of all buildings with water-conserving devices; all new construction must also have water-conserving devices
- This ordinance applies to all residential, commercial and industrial water customers who receive water service from the City of San Diego Water Department
- The seller/transferor must ensure that the property is in compliance; the seller and buyer may mutually agree to transfer responsibility to the buyer, who then has 90 days to complete the retrofits and another 30 to file a Water Conservation Certificate
- The City continues to offer free low-flow showerheads and faucet aerators, as well as a rebate program for ultra low-flow toilets



Ordinance regulations include:

- All showerheads have a maximum flow of 2.5 gallons (9.5 litres) per minute; showerhead flow restrictors are not acceptable
- All toilets have a maximum rated water consumption of 1.6 gallons (6.0 litres) per flush; flow-modification devices are not acceptable
- Faucets and aerators must have a maximum flow rate of 2.2 gallons (8.3 litres) per min.
- All urinals have a maximum flow rate of 1.0 gallons (3.8 litres) per flush
- Reverse osmosis systems require automatic shut-off valves

### **The Guaranteed Water for Industry Program**

The San Diego City Council created this program in 1998 in response to concerns from local industries. Industries worried that the City could not guarantee a dependable water supply for manufacturing and research and development purposes, which are often highly dependent on water for industrial processing and cooling.

The program grants exemptions to some water customers from potential mandatory water conservation measures in the event of a future drought. This creates 'certainty' over their use of water for irrigation, cooling research, product development and production. It also provides ongoing cost savings to businesses through discounted rates for recycled water usage.

Participating firms must use recycled water wherever possible in their manufacturing areas, cooling towers, or other uses within their buildings. They must also implement "Best Management Practices for Potable Water Conservation," which includes the use of water-efficient fixtures, such as ultra low-flow toilets and water conserving showerheads.

After certification, such firms are exempt from reducing their consumption of potable or reclaimed water during a drought situation, which legally occurs when the Water Department cannot meet the needs of its customers.

### **Conclusion**

Los Angeles, San Francisco and San Diego share a legacy of supply-side thinking and future uncertainty over water supplies. Each city experienced huge population growth in the last century, thanks partly to the construction of enormous aqueducts, reservoirs and pumps. Each city can also expect continued population growth in the coming decades. But they now face growing water scarcity due to climate changes, new regulations and environmental concerns.

The water departments of these three cities are applying elements of the water soft path approach, though they probably do not conceive of their plans in these terms. For instance, Los Angeles and San Francisco have committed to 'no new water' by meeting all new water demand through increased conservation and recycling. San Diego is 'backcasting' by setting a target for future water usage and developing policies and programs to meet that goal.

A key lesson here is that outside pressure from environmental groups was essential for the initial uptake of water conservation programs. Measures such as legal action pushed water managers to think beyond traditional supply-side approaches and begin to work within the natural limits of surrounding ecosystems.



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- <sup>1</sup> Reuters, "California DWR cuts output at Hyatt hydropower plant," July 22, 2009 <http://www.reuters.com/article/rbssUtilitiesMultiline/idUSN2234869420090723>
- <sup>2</sup> Environmental News Service, "Dry California Sucks Up Federal Water Recycling Dollars," July 6, 2009 <http://www.ens-newswire.com/ens/jul2009/2009-07-06-091.asp>
- <sup>3</sup> Mayor Antonio R. Villaraigosa and City of Los Angeles Department of Water and Power, *Securing L.A.'s Water Supply*, May 2008, pg. 1.
- <sup>4</sup> Pamela Reynolds, "On the way to a Green LA?" 2003, <http://journalism.berkeley.edu/projects/greenla/water.html>
- <sup>5</sup> Villaraigosa and LADWP, *Securing L.A.'s Water Supply*, pg. 6.
- <sup>6</sup> This doctrine holds that certain resources are preserved for public use and the government must maintain such resources in the public interest. Navigation, commerce and fishing on navigable waters falls within this understanding. More recently, courts have interpreted the doctrine to protect a variety of natural resources and activities in the vicinity of navigable waters and non-navigable tributaries of navigable waters.
- <sup>7</sup> 1994 SWRCB Mono Lake Decision 1631 (text) <http://www.monobasinresearch.org/images/legal/d1631text.htm>; Owens Valley Committee, "A brief overview: recent Owens Valley water history and OVC," <http://www.ovcweb.org/OwensValley/Waterhistory.html>; Business Wire, "LADWP & Great Basin Unified Air Pollution Control District Announce Proposed Settlement," July 23, 2007 <http://www.allbusiness.com/government/environmental-regulations/3938746-1.html>; Owens Valley Committee, "Judge threatens to stop exports," July 25, 2005 <http://www.ovcweb.org/Item/NewsPart.asp>; Dan Bacher, San Francisco Bay Area Independent Media Centre, "Judge Issues Final Order to Protect Smelt as Delta Fish Populations Plummet," January 3, 2008 <http://www.indybay.org/newsitems/2008/01/03/18469882.php>
- <sup>8</sup> Villaraigosa and LADWP, *Securing L.A.'s Water Supply*, pg. 7
- <sup>9</sup> Los Angeles Department of Water and Power, "The Story of the Los Angeles Aqueduct," <http://wsoweb.ladwp.com/Aqueduct/historyoflaa/>
- <sup>10</sup> Micki Krimmel, City Mayors Environment, "No more freeways: Los Angeles is on the road to become one of the greenest American cities," City [http://www.citymayors.com/environment/la\\_green.html](http://www.citymayors.com/environment/la_green.html)
- <sup>11</sup> Villaraigosa and LADWP, *Securing L.A.'s Water Supply*, pg. 2.
- <sup>12</sup> Rich Connell, *Los Angeles Times*, "L.A prepares massive water-conservation plan," May 15, 2008
- <sup>13</sup> Escrow is a trust account established by the broker that is used to pay obligations such as property taxes or insurance premiums. It closes and the seller receives the remaining balance once agreed-upon obligations are met.
- <sup>14</sup> San Francisco Public Utilities Commission [http://sfwater.org/Dept.cfm/MO\\_ID/83](http://sfwater.org/Dept.cfm/MO_ID/83)
- <sup>15</sup> Environmental Defense Fund – Discover Hetch Hetchy <http://www.edf.org/page.cfm?tagID=152>
- <sup>16</sup> Peter Jamison, SFWeekly.com "Will the new Hetch Hetchy plan wring San Francisco dry?" November 14, 2008 [http://blogs.sfweekly.com/thesnitch/2008/11/will\\_the\\_new\\_hetch\\_hetchy\\_plan.php](http://blogs.sfweekly.com/thesnitch/2008/11/will_the_new_hetch_hetchy_plan.php); Kelly Zito, *San Francisco Chronicle*, "Big step for Hetch Hetchy system upgrade," October 1, 2008 <http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2008/10/01/MNH4139160.DTL>
- <sup>17</sup> Kelly Zito, *San Francisco Chronicle*, "Big step for Hetch Hetchy system upgrade," October 1, 2008
- <sup>18</sup> Matt Smith, SFWeekly.com "S.F.'s tasty tap water about to get a little murkier," May 19, 2009 <http://www.sfweekly.com/2009-05-20/news/take-me-to-the-river/1>
- <sup>19</sup> In the past, the San Francisco Real Estate Board and associations representing landlords, housing owners and property managers opposed such ordinances. They argued that: low-flow toilets operate



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inefficiently, often resulting in a net increase in water consumption; such ordinances unfairly place the burden and costs of water conservation solely on residents, and will cost residents too much money; and the SFPUC had no authority to sign the Memorandum of Understanding and thus bind the City and its water users in such a manner. For more information, see San Francisco Association of Realtors, "Toilet Ordinance Revived," February 2003 [http://www.sfrealtors.com/news/alert\\_1.html](http://www.sfrealtors.com/news/alert_1.html)

<sup>20</sup> SFPUC, "New Retrofit Legislation Will Save Millions of Gallons of Water for San Francisco," July 14, 2009 [http://sfwater.org/detail.cfm/MC\\_ID/13/MSC\\_ID/168/MTO\\_ID/357/C\\_ID/4642/ListID/2](http://sfwater.org/detail.cfm/MC_ID/13/MSC_ID/168/MTO_ID/357/C_ID/4642/ListID/2)

<sup>21</sup> Tim Barnett and David Pierce, "When will Lake Mead go dry?" Scripps Institution of Oceanography, University of California, San Diego, February 12, 2008 <http://scrippsnews.ucsd.edu/Releases/?releaseID=876>

<sup>22</sup> Reuters, "State Water Contractors Sue Federal Agencies Over Flawed Delta Smelt Biological Opinion," March 5, 2009 <http://www.reuters.com/article/pressRelease/idUS228314+05-Mar-2009+PRN20090305>; Colin Sullivan, New York Times, "U.S. plans to toughen California water restrictions," June 5, 2009 <http://www.nytimes.com/gwire/2009/06/05/05greenwire-us-plans-to-toughen-calif-water-restrictions-91201.html>;

<sup>23</sup> U.S. Water News Online, "Interior secretary cuts California's share of Colorado River water," December 2002 <http://www.uswaternews.com/archives/arcsupply/2intsec12.html>

<sup>24</sup> Eric Yates, San Diego News Network, "Conservation key for San Diego's top 10 water users," June 1, 2009 <http://www.sdn.com/sandiego/2009-06-01/special-sections/water/conservation-key-for-san-diegos-top-10-water-users>

<sup>25</sup> Rob Davis, VoiceofSanDiego.Org, "If You Want to Build Here, Save Some Water," May 20, 2008 <http://www.voiceofsandiego.org/articles/2008/07/23/environment/885water052008.txt>

<sup>26</sup> City of San Diego, "Water Reuse Study," March 2006, pg. 1-1; Davis, "Save Some Water," May 20, 2008

<sup>27</sup> City of San Diego, "Water & Sewer Bill/Rates," <http://www.sandiego.gov/water/rates/rates.shtml>

<sup>28</sup> City of San Diego, "Plumbing Retrofit Ordinance Compliance," <http://www.sandiego.gov/water/conservation/selling.shtml>

<sup>29</sup> The City of San Diego, "The Guaranteed Water for Industry Program," <http://www.sandiego.gov/economic-development/business-assistance/expansion/clusters.shtml>

<sup>30</sup> City of San Diego, "Facilities," <http://www.sandiego.gov/mwwd/facilities/index.shtml>; Water Online, "City's water reclamation plant has struggled to find customers," November 15, 2003 <http://www.wateronline.com/article.mvc/Citys-water-reclamation-plant-has-struggled-t-0001?VNETCOOKIE=NO>

