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## Water Reuse

### Introduction

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Meeting water demand and supplying water for future generations is a significant challenge for the water industry. Although water scarcity is an issue of critical importance in drier areas,<sup>1</sup> communities across our nation are increasingly experiencing water shortages, calling into question the longevity of a national water supply that is threatened by droughts, consumption patterns and continued population growth. By the year 2015, it is estimated that 36 states will face serious water shortages,<sup>2</sup> and water demand is expected to soon outpace water supply in megacities like Los Angeles. Water reuse offers an essential, viable and drought-proof solution for managing our critically limited natural resources.

### Background: Applications and Treatment

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The water cycle is a natural process that recycles water, but with advancements in treatment technologies, water can now be recycled more efficiently to meet our needs. Water reuse is a term describing the reclamation, treatment and recycling of wastewater (sewage derived from industrial use, washing or toilet flushing) or stormwater collected from homes, commercial buildings and industrial facilities.<sup>3</sup> Reused water *is not used for drinking*, which accounts for only one percent of overall consumption.<sup>4</sup> As such, tremendous opportunity lies in reusing water for a variety of other non-potable (non-drinking) purposes.

Water is reused in two main ways: non-potable (non-drinking) reuse, which involves taking treated wastewater to use for agriculture and landscape irrigation, industrial use (such as cooling processes), toilet flushing and fire protection; and indirect reuse, which involves using wastewater to recharge ground water supplies. Indirect reuse, also called land application, allows treated wastewater to percolate down to aquifers to replenish water sources. Non-potable reuse is already a widely accepted practice that will continue to grow, and indirect potable reuse is becoming an increasingly favored and applied method of reuse over discharging water into surface water, which ultimately evaporates or runs off into the ocean.<sup>5</sup>

Since the vast majority of water goes toward industrial use or irrigation, using wastewater as an alternative supply for such applications can help protect existing supplies. Water reuse also helps the environment by decreasing the amount of wastewater discharged into bodies of water, which

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<sup>1</sup> Refer to the American Water White Paper: Meeting Demand in the West for more information.

<sup>2</sup> U.S. Government Accountability Office. "Natural Resources, Energy, and the Environment Challenges for the 21st Century." February 2005.

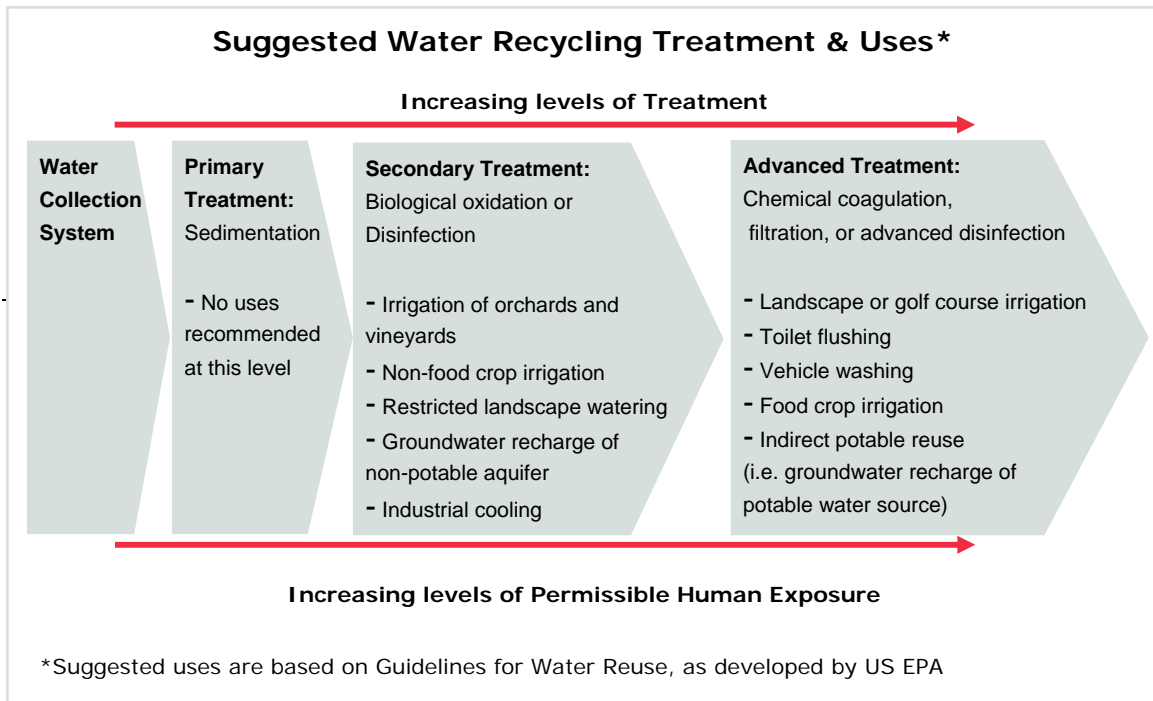
<sup>3</sup> This paper will refer to wastewater or stormwater reuse as simply water reuse.

<sup>4</sup> Zinkevich, Andre, Vice President American Water Applied Water Management. Personal interview. 28 Nov. 2007.

<sup>5</sup> Environmental Protection Agency. <http://www.epa.gov/region09/water/recycling/index.html>

has long been considered a pollutant and problem, and by beneficially utilizing the nutrients in the discharge as fertilizers in irrigation applications.<sup>6</sup> Water reuse can also be an economical long-term water management solution, since treating water to non-potable, versus potable, standards is energy efficient, and it precludes the need to purchase from or draw upon new water sources.

The table below shows how reused water is subject to differing levels of treatment and quality criteria, as determined by its end use.<sup>7</sup> As a means of ensuring public safety, water that is more likely to come into contact with human beings is subjected to further treatment and more stringent standards.



## Technology in Practice

Water reuse in the United States is a growing practice, with more than 2 billion gallons per day reused,<sup>8</sup> and reused water volume is growing at an estimated 15 percent per year.<sup>9</sup> With so many communities experiencing a reduction in water supply, wastewater reuse is increasingly being explored to meet water demand in an environmentally friendly as well as an economically feasible way. Utilities, municipalities and the industrial private sector are now, more than ever, seeking ways to implement such solutions as a way to reserve water resources and meet demand. Additional drivers of putting water reuse systems in place include: alleviating stress on our nation's water infrastructure by reducing water volumes; implementing water reuse systems while repairing or updating pipes and facilities; regulatory mandates and incentives, such as water rate and tax subsidies; and shifting expectations toward sustainability.

<sup>6</sup> Environmental Protection Agency, <http://www.epa.gov/region09/water/recycling/index.html>

<sup>7</sup> Environmental Protection Agency, <http://www.epa.gov/region09/water/recycling/index.html>

<sup>8</sup> WaterReuse Association, <http://www.watereuse.org/files/images/04-006-01.pdf>

<sup>9</sup> Environmental Protection Agency, <http://www.epa.gov/nrmrl/pubs/625r04108/625r04108.pdf>

Recycling nearly two billion gallons of water annually, American Water's Applied Water Management Group has a long history of designing, implementing and operating water reuse systems across the United States. Notable projects include:

- **Residential buildings** – The Solaire and Tribeca Green buildings in Battery Park City, Manhattan employ an underground double piping system to recycle and deliver wastewater for a variety of purposes, including toilet flushing, air conditioning and irrigation of roof gardens and an adjacent park. By reusing wastewater for non-potable applications, Tribeca Green's potable water needs are reduced by nearly half.
- **Community developments** – The Homestead at Mansfield in New Jersey is an active adult, residential development connected to a dedicated wastewater treatment plant. The water reuse system provides up to 250,000 gallons per day of reclaimed water to irrigate landscaped spaces at personal residences and open common areas.
- **Sports facilities** – Gillette Stadium, the home of the New England Patriots, would not have been in Foxboro, Massachusetts, a town with limited water supplies, had it not been for the stadium's water reuse system. The facility's double piping system treats recycled wastewater from the stadium, as well as from adjacent office complexes and stores, saving 250,000 gallons of water for every major event.
- **Commercial complexes** – Wrentham Mall has undertaken the first commercial water reuse project in Massachusetts. Facing space and environmental constraints for wastewater discharge, an onsite water recycling and disposal system was necessary. Now the mall can meet its water requirements, supporting the operation of the facility's 130-store outlet center, office complex, hotel, movie theater and restaurant.
- **Schools** – The Copper Hill School in Raritan Township, New Jersey recycles wastewater from school toilets, the cafeteria and gym showers to be used for toilet flushing, saving the elementary school about 12,000 gallons of wastewater each day. The 20 percent of treated wastewater that is not used in the recycling process is recharged to groundwater.
- **Golf courses** – The Hawk Pointe Golf Course in Washington, New Jersey reclaims and treats wastewater to supply the significant volumes of water required to irrigate the course.

### Implementation

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While the benefits of water reuse are clear, only a small percentage of American communities have implemented such systems and technologies. In order to successfully implement water reuse projects, communities need to prioritize the financing of wastewater infrastructure projects. Public-private partnerships, as well as the Clean Water State Revolving Fund, offer solutions for funding such investments. Collaboration between wastewater and water agencies is also needed to set policies and develop system and facility plans that optimize water recycling opportunities. Community leaders must also perform public outreach to educate consumers about water reuse and mitigate any public safety and cost concerns.

### Conclusion

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As discussed in this paper, water reuse will play an increasingly important role in safeguarding our long-term water supply as water demand grows. While water reuse cannot solve scarcity issues alone, it is an essential part of a sustainable approach toward water resource management.