Recycled Municipal Water

Photo caption. Water treatment plant at Elsinore Valley Municipal Water District.

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Chapter 11. Recycled Municipal Water

One way to meet the current and future water demands of Californians is to recycle water, that is, treat and reuse wastewater. Wastewater which is treated to a specified quality in order to be able to use it again is called recycled water. Although there are varied sources of wastewater, this chapter only addresses recycling of municipal wastewater from treatment plants. Recycling water from other sources is addressed in other chapters of the Water Plan Update 2009.

Municipal wastewater originates primarily from domestic sources, but also includes wastewater from commercial, industrial, and institutional sources that discharge to a common collection system where it mixes with domestic wastewater before treatment. The California Water Code provides the following definition for recycled water: "water which, as a result of treatment of wastewater, is suitable for a direct beneficial use or a controlled use that would not otherwise occur and is therefore considered a valuable resource." "Recycled water" and "reclaimed water" have the same meaning (see Box 11-2).

Recycled water use can serve many purposes:

- an additional water source, which may also offset the need for additional freshwater supplies;
- a drought resistant water supply;
- a green alternative for treatment and disposal of wastewater;
- a natural treatment through land application and a reduction in discharge of excess nutrients into surface waters;
- a source of nutrients for crops or landscape plants;
- a means to enhance environmental features, such as wetlands.

State regulations mandate that producers and users of recycled water comply with treatment and use restrictions to protect public health and water quality. The California Department of Public Health (CDPH) adopt water recycling criteria which are based on water source and quality, and specify sufficient treatment based on intended use and human exposure. The treatment objective is to remove pathogens and excess nutrients, making the water clean and safe for the intended uses. The criteria are regulated by the Regional Water Quality Control Boards (Regional Water Boards) through the permits which specify wastewater treatment methods, approved uses of recycled water, and performance standards.

As the treatment level is increased from primary, secondary, tertiary to advanced, the permitted uses of recycled water are also increased. For example, municipal wastewater that has completed tertiary treatment—a higher level of treatment—can be used to irrigate school yards, parks and residential landscape, and may be suitable for industrial applications or use in office and institutional buildings for toilet flushing. Wastewater

Box 11-1 Acronyms and Abbreviations

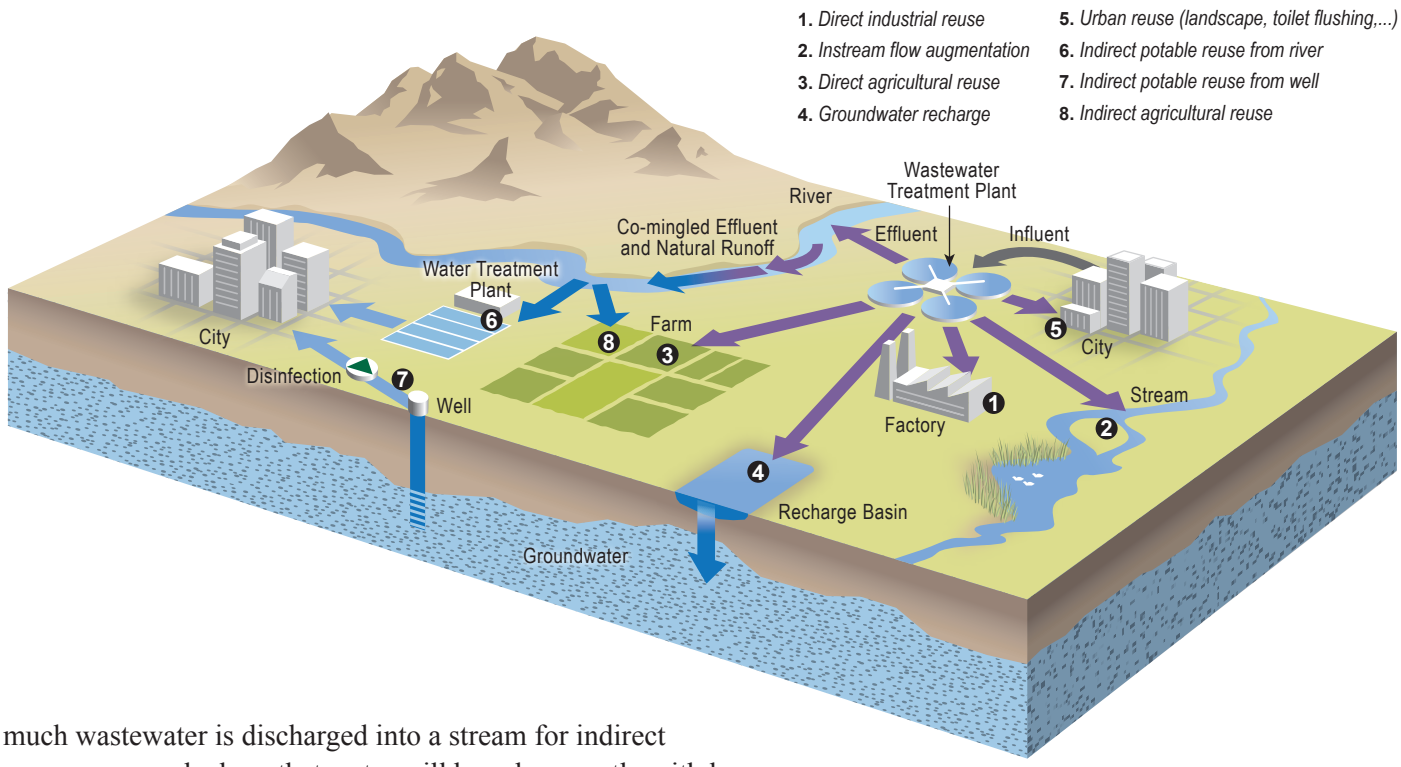
AB	California State Assembly bill
Cal/EPA	California Environmental Protection Agency
CARB	California Air Resources Board
CAT	Climate Action Team
CDPH	California Department of Public Health
DHS	California Department of Health Services
DWR	Department of Water Resources
General Permit	general waste discharge requirements
GHG	greenhouse gas
IAPMO	International Association of Plumbing and Mechanical Officials
IRWMP	Integrated Regional Water Management Program
Prop.	ballot proposition
RO	reverse osmosis
Regional Water Boards	Regional Water Quality Control Boards
State Water Board (SWRCB)	State Water Resources Control Board
Task Force	Recycled Water Task Force
WRFP	Water Recycling Funding Program

that has been treated to secondary levels is generally suitable for uses that do not include contact with food or people. Agricultural irrigation of animal feed crops is an example of such use. Refer to the discussion on West Basin Municipal Water District for examples of recycled water treatment processes presented in Chapter 16, Matching Water Quality to Use.

Municipal water recycling is a strategy that increases the usefulness of water by reusing a portion of the existing water supply. Municipal water recycling captures wastewater that would be discharged, redirecting the water to another local application. This action does not necessarily increase the amount of water in the water supply, but it achieves greater use of existing water. It is important to recognize that in many locations, discharged wastewater becomes part of a stream that serves as a water source for downstream communities and beneficial uses. When a downstream entity withdraws water from the stream, a portion of that water is wastewater from an upstream discharge that has comingled with the ambient stream flow. This manner of reuse is termed "indirect reuse." It is estimated that between 86 and 100 percent of wastewater discharged in some Central Valley hydrologic basins is indirectly reused. Indirect reuse is illustrated in Figure 11-1.

Most indirect reuse is unplanned. Treated municipal wastewater is discharged to streams as a means of disposal without the intention to provide a water supply to a downstream water user. Planned indirect reuse can occur if there is an agreement which defines how

Figure 11-1 Direct and indirect recycled water use



much wastewater is discharged into a stream for indirect conveyance and where that water will be subsequently withdrawn for a specific use. Another, more frequent type of planned indirect reuse is the replenishment of groundwater through recharge with recycled water. The actual reuse occurs when the groundwater is pumped for use. Unplanned indirect reuse is not categorized as municipal water recycling in the context of this section.

An illustration of the many paths that recycled water can take for reuse is shown in Figure 11-1. The terms used in the figure are defined in Box 11-2.

Unlike treated wastewater discharged to streams, water that is discharged to the ocean or other saline water bodies is considered no longer practically available for use and is termed "irrecoverable water." Where water recycling can capture municipal wastewater that would otherwise become irrecoverable water, water recycling represents a strategy that increases water supply. The State recognizes this distinction by classifying water recycling projects in coastal areas as new water supply. An estimated 0.9 million to 1.4 million acre-feet of "new water" could be realized by 2030 through recycling municipal wastewater that is discharged into the ocean or saline bays. Because discharges to the ocean or brackish water bodies support few, if any, downstream beneficial uses, such discharges are excellent sources of wastewater for future recycling efforts (RWTF, 2003).

As communities increase their level of recycling, the volume of water that is discharged into a stream will be reduced, potentially adversely affecting downstream water rights

Box 11-2 Definitions

Water Code section 13550 states that “recycled water” is “water which, as a result of treatment of waste, is suitable for a direct beneficial use or a controlled use that would not otherwise occur and is therefore considered a valuable resource”. Water Code section 26 states that "recycled water” and “reclaimed water” have the same meaning as defined in Water Code section 13550.

Note that this definition is broad and includes both treated agricultural wastewater and treated municipal wastewater.

“Water reclamation” or “wastewater reclamation” can have two meanings:

1. the process of treating wastewater for beneficial use, storing and distributing recycled water, and the actual use of recycled water. This definition is the more common meaning, depending on the context.
2. the treatment of water of impaired quality to produce a water of suitable quality for intended use.

“Water recycling” has two meanings 1) the first definition of “water reclamation” above or 2) the reuse or recirculation of water through the same series of processes, pipes, or vessels more than once by one user, often without treatment between uses, such as in cooling towers or cascading uses within an industry where the wastewater from one process is the source water for another process. The first definition is the most common usage currently.

“Water reuse” is the additional use of previously used water, with or without treatment. This term also often takes on the more encompassing meaning in the first definition of “water reclamation” above.

“Direct reuse” is the use of recycled water that has been transported from a wastewater treatment plant to a reuse site without passing through a natural body of either surface or groundwater. This is also called “pipe-to-pipe” reuse where the recycled water is conveyed in a distribution system after treatment.

“Indirect reuse” is the use of recycled water indirectly after it has passed through a natural body of water after discharge from a wastewater treatment plant. Groundwater recharge is an example. Another is the reuse of Sacramento's wastewater after discharge by downstream users.

“Planned reuse” is the deliberate direct or indirect use of recycled water without relinquishing control over the water during its delivery. Direct reuse is always considered planned because it involves delivery in a distribution system leading from the wastewater treatment plant to the point of reuse.

“Unplanned reuse” or “incidental reuse” is the unplanned use of wastewater after disposal. The reuse of Sacramento's effluent by downstream users is considered unplanned; there is no planned intent by Sacramento to have the SWP pump a portion the effluent to Southern California.

“New water” denotes, in part, recycled water that is an augmentation to the state's overall water supply, such as reuse of wastewater discharged to the ocean, rather than planned reuse of wastewater inland where unplanned indirect reuse may already be occurring downstream. The Recycled Water Task Force made this distinction in estimating future potential. Of an estimated potential of 1.5 million AF/year of additional recycled water use by 2030, 1.2 million AF/year was estimated to be “new water”.

“Irrecoverable water” is water that is discharged to the ocean or other saline water bodies is considered no longer practically available for use because of the additional energy and expense needed. Where water recycling can capture municipal wastewater that would otherwise become irrecoverable water, water recycling represents a strategy that increases water supply. The State recognizes this distinction by classifying water recycling projects in coastal areas as new water supply.

or instream beneficial uses. Recognizing this, California Water Code requires that prior to making any change in the point of discharge, place of use, or purpose of use of treated wastewater, that change shall be reviewed by the State Water Resources Control Board (State Water Board) to ensure potential impacts to beneficial uses are considered before authorizing a change in the permitted discharge of municipal wastewater (Wat. Code §1211).

Recycled Water Use in California

Californians have recycled water since the late 1800s and public health protections have been in effect since the early part of the 1900s. Yet water recycling remained an isolated practice for most of the 20th century. Ample supplies of water to satisfy demand, the availability of inexpensive energy to move water great distances, and the absence of adequate treatment technology delayed implementation of water recycling practices in most communities. California's requirements for water to support continued growth, coupled with finite water supplies, have generated a renewed interest in water recycling in recent decades. For the base year of 2002, from 450 to 580 thousand acre-feet of treated municipal wastewater was reused in California annually, almost three times more than in 1970. Approximately two-thirds of all recycled municipal wastewater is used for irrigation, including 46 percent for agriculture and 21 percent for landscaping (Figure 11-2). There is an estimated potential of about 1.85 to 2.25 MAF of water supply which could be realized annually through water recycling by the year 2030, as shown in Figure 11-3 (RWTF, 2003).

Figure 11-2 Where recycled water is used in California

Recycled water use has dramatically increased in the past several decades for irrigated agriculture and landscapes, groundwater recharge and other uses. In 2001, California's water agencies recycled about 500,000 acre-feet of wastewater annually, almost three times more than in 1970.

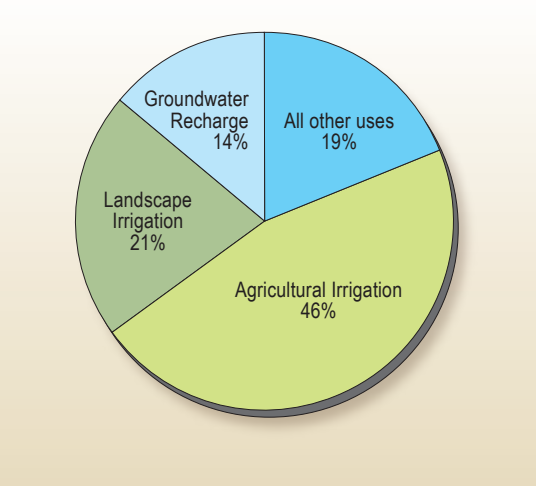
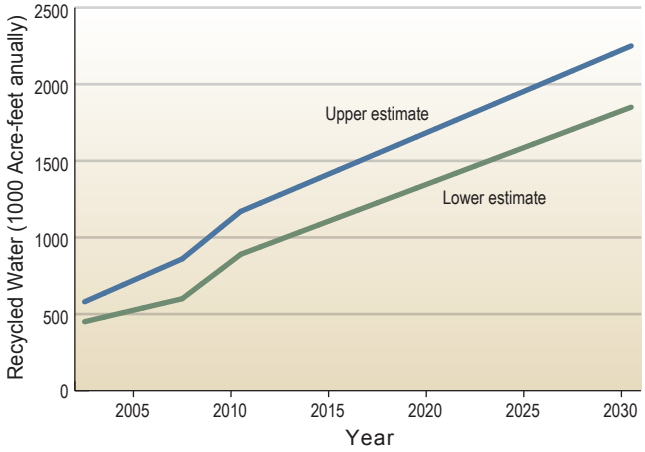


Figure 11-3 Range of potential water recycling



All indications are that California will experience continued population growth and development for the foreseeable future. Recurring periods of drought and changing climatic conditions threaten to alter and/or reduce the availability of water to sustain such growth. Therefore, it is imperative that the existing water supply is used as efficiently as practical before it is discharged to an unrecoverable water body such as the ocean or saline sinks.

Potential Benefits of Water Recycling

Water recycling has the potential to provide a variety of benefits including reduced costs, increased reliability of supply, and increased availability of potable water. All of these benefits are derived from the primary benefit of using recycled water to increase local water supplies.

Water recycling plays a role in California's climate change mitigation efforts. Combustion of fossil fuels at power plants is a major source of greenhouse gas (GHG) emissions. A significant amount of the energy produced by those power plants is used by the water sector. Water recycling can provide a comparatively low energy source of local water using less energy than importation of water from other regions or desalination of ocean or brackish water. This benefit is greatest where recycled water is available for applications, such as agricultural irrigation of nonfood crops, which do not demand the advanced levels of treatment. The provision of recycled water for most urban applications requires tertiary treatment, which requires a greater amount of energy, reducing the potential GHG savings.

Global warming and climate change are predicted to impact the state's water supply, most notably altering the seasonal availability of water. Less snow accumulation in the mountains will reduce snowmelt that traditionally provides water supply during the spring and summer. Municipal water recycling is one of several water resource management tools that may be utilized by regions working cooperatively to help develop sustainable local water resources and meet water management goals and objectives. Recycled water cannot be directly used for potable applications, but recycled water can increase the availability of local potable water. Potable water is often used for applications, like irrigation, which do not require potable quality. Using recycled water for such applications provides potable water for more appropriate uses. Additional discussion of the appropriate use of water based on quality is presented in Chapter 16, Matching Water Quality to Use.

Potential Costs of Recycled Water

An estimated 1.4 million to 1.7 million acre-feet of additional wastewater could be recycled in California by the year 2030, of which 0.9 million to 1.4 million acre-feet (62 to 82 percent) would be recycled from discharges that would otherwise be lost to the ocean, saline bays, or brackish bodies of water (RWTF, 2003). The potential capital cost to implement that level of water recycling is estimated to be about $9 billion to $11 billion (ibid.). Given the variability of local conditions and their effect on treatment and distribution costs, the estimated range of capital and operational costs of water recycling range from $300 to $1,300 per acre-foot of recycled water, but in some instances costs above of this range are encountered. The actual cost will depend on the quality of the wastewater, the level of treatment required, and the proximity of potential users to the sources of recycled water. Uses that require higher water quality and/or have greater public health concerns will incur higher costs.

The cost to install new distribution systems is a major obstacle to the expansion of water recycling. Because recycled water is not classified as potable, regulatory constraints prohibit conveying recycled water and potable water in the same pipelines. Recycled water must be conveyed in a separate purple pipe distribution system that is labeled and readily distinguished from traditional water lines. The cost to install new purple pipe distribution mains from treatment plants to users can be prohibitively expensive. As a consequence, extension of recycled water service to areas near treatment plants is more cost-effective than extending infrastructure and service to more distant users. Ironically, many of the users that could use large volumes of recycled water, such as agricultural users, are often the most distant from urban wastewater treatment plants. Some water agencies have constructed satellite water recycling facilities to provide recycled water at locations near large users. Establishment of local ordinances requiring upgrades to dual water distribution systems (purple pipe) could bolster the acceptance and implementation of recycled water projects.

The potential for cross-connections is one of the challenges of separate pipeline systems for potable and nonpotable water. As the name implies, a cross-connection refers to the accidental connecting of potable and nonpotable systems, essentially contaminating potable water systems. The potential for such errors will likely increase as a greater number of offices, commercial centers, and residences incorporate dual plumbing to provide nonpotable water for irrigation, toilet flushing, and other permitted uses.

Incorporation of dual plumbing in existing buildings and new construction may be facilitated by the presence of an adopted dual plumbing building code in California. On November 18, 2009, the Building Standards Commission unanimously voted to approve the California Dual Plumbing Code that establishes statewide standards to install both potable and recycled water plumbing systems in commercial, retail, and office buildings, theaters, auditoriums, condominiums, schools, hotels, apartments, barracks, dormitories, jails, prisons, and reformatories as determined by the State Department of Public Health.

Major Issues Facing More Recycled Water Use

Data Availability

The last comprehensive inventory of water recycling facilities was completed for the year 2001 to support the efforts of the Recycled Water Task Force (see Recycled Water Use Policies, below). Without a systematic inventory and reporting system, it is impossible to quantify water recycling efforts, characterize success and/or failures, or make informed decisions as to future endeavors and funding priorities.

Affordability

The cost to provide recycled water can exceed the current consumer price of fresh water, but may be less than other new water sources such as importing water from other regions or desalination. Because a significant portion of the cost to implement water recycling is associated with the installation of core infrastructure such as treatment equipment and

distribution mains, recycled water can be prohibitively expensive at the local level, and more cost effective at the regional or state scale.

Much of the water provided by federally funded projects is provided at discounted prices. Artificially low rates discourage adoption of water recycling and similar conservation programs. Consequently, there is growing recognition that pricing should more closely reflect the true costs to provide water and thus encourage more efficient use of existing water supplies.

As the number of water recycling projects increases, resulting advancements in recycling technology should reduce costs providing greater incentive for additional water recycling projects. The cost to install infrastructure for recycled water continues to represent a significant obstacle to the provision of recycled water to existing communities. Within the urban setting, retrofitting existing development to incorporate new pipelines can be prohibitive. However, the cost to install "purple pipe" is reduced when included in new projects during original construction.

The shortage of local funding to plan recycled water projects can slow the construction of new projects. Public funding and incentive measures should be provided to advance water recycling projects that provide local, regional, and statewide benefits. The primary source of state funding has been the Water Recycling Funding Program administered by the State Water Board, providing low-interest loans and grants to local agencies. The Department of Water Resources administers the Integrated Regional Water Management (IRWM) Grant Program. Water recycling is a resource management strategy that must be considered by an IRWMP, and may be utilized as an active component of the plans to help the region meet water management goals and objectives. In addition, water recycling projects associated with IRWMPs in which it has been identified as a key strategy may qualify for IRWM grant funding. The federal government through the US Bureau of Reclamation provided state agencies with $131,834,693 in funds for 26 water recycling projects as part of the American Recovery and Reinvestment Act of 2009 (ARRA).

Water Quality

Public acceptance of recycled water depends on confidence in the safety of the water. The following four water quality characteristics have been identified as being of particular concern (1) microbiological quality, (2) salinity, (3) heavy metals, and (4) organic and inorganic substances (pharmaceuticals and personal care products, household chemicals and detergents, fertilizers, pesticides, fungicides, and animal growth hormones). Applying appropriate levels of treatment for specific uses assures the safe use of recycled water. With respect to nonpotable applications, such as irrigation or commercial uses, microbiological pathogens are the primary concern. Heavy metals, nitrogen compounds, and organic and inorganic chemicals can pose problems when recycled water is used to recharge groundwater that is a source of drinking water. Salinity has more impact on plant growth and commercial and industrial processes than on public health.

Conventional wastewater treatment plants are not designed to remove all organic wastes. The fate of organic waste constituents is variable and in some cases unknown. Some are removed and destroyed through physical and biological processes at treatment facilities. Others may concentrate in the residual solids. Some pass through the treatment processes unchanged and are present in discharged effluent or recycled water. For these reasons, further study is necessary to assess the health effects of these constituents. Organic chemicals are often present is extremely low concentrations that are difficult to measure. There is a need to establish analytical methods and protocols to measure their presence and assess the health impacts.

Concentrations of heavy metals have been a concern and are closely monitored in recycled water. However, modern wastewater treatment processes are able to routinely remove more than 90 percent of heavy metals from wastewater before discharge. As technology continues to advance, concerns about the presence of heavy metals are expected to diminish.

The salinity of recycled water can limit its usefulness in salt sensitive applications such as landscaping, golf courses, and agriculture. Salt is not removed by traditional wastewater treatment processes and as a result occurs in most recycled water. Reverse osmosis or similar advanced filtration is required to remove salts. Reverse osmosis is an energy-intensive and expensive process that is not used in conventional water recycling. Without advanced treatment, the simplest way to produce recycled water with low salt concentrations is to obtain wastewater from sources that are low in salts. Wastewater that is high in salts is more difficult and expensive to recycle. The use of water softeners increases salts (by mass), as does water conservation which reduces the dilution (by concentration). Because each cycle of recycling concentrates additional salt, there are a limited number of times that water can be recycled unless advanced treatment, such as reverse osmosis, is used to remove the salts.

The introduction of recycled water with elevated salt levels into groundwater potentially limits the future uses of that water. Reverse osmosis and advanced treatment techniques are required to remove excessive salts to protect groundwater sources. Disposal of salts is recognized as a challenge in some areas. The idea to construct a brine line to convey salts to the ocean is a controversial proposal that some associate with water recycling in some locations. Discussion of salinity issues is presented in Chapter 18, Salt and Salinity Management.

Water quality criteria for recycled water, established by the California Department of Public Health (CDPH), define water quality and treatment requirements to protect public health for most expected uses of recycled water. These requirements are incorporated into the waste discharge or water reclamation permits which are issued by the Regional Water Boards to producers and users of recycled water. Extensive monitoring assures compliance with the requirements.

Public Acceptance

There is public acceptance and support for most recycled water applications, such as agricultural and landscape irrigation; however, public acceptance of a few indirect potable water recycling projects has been an obstacle. A factor that may raise some public concern is a perceived conflict between assurances that recycled water is safe and the necessity of regulations to protect the public from misuse. Outreach and education programs can assure the public that recycled water is adequately regulated to protect public health. Additional public education is warranted to increase public understanding and acceptance.

The demand for fresh water to serve the growing California population coupled with uncertain availability of future supplies has increased interest in water recycling. Use of recycled water for nonpotable applications is generally tolerated by the public, but the proposed use of recycled water to increase potable supplies is more controversial. Public resistance as a result of the "yuck factor" has proven an obstacle in a few cases.

As a result of climate change, using recycled water to recharge groundwater supplies is a subject of increasing interest. Groundwater basins and aquifers have the potential to store significant amount of water from a variety of sources, potentially including storm water and treated wastewater for later recovery. The use of wastewater to recharge groundwater basins addresses two fundamental challenges of climate change adaptation: 1) Wastewater discharges represent a potential source of additional water that is currently underutilized or not utilized, and 2) Groundwater recharge provides a practical storage solution. It is recognized that some obstacles remain to be addressed, including drinking water standards as administered by the CDPH, and the public resistance to the addition of recycled water to potable supplies. The CDPH is currently developing comprehensive regulations to address groundwater recharge projects for indirect potable reuse. Currently, wastewater that is used for groundwater recharge is subject to tertiary treatment with disinfection and in some cases microfiltration or reverse osmosis before being discharged for infiltration or injected. Public concern about mixing recycled water with groundwater appears to be partly alleviated by the knowledge that infiltration, percolation, and underground residence time expose the water to natural cleansing processes. Nonetheless, outreach and education programs will be increasingly important as supplies of local groundwater and imported water decrease and reliance on recycled water increases.

Potential Impacts

Communities that discharge wastewater to rivers, streams, or percolate to groundwater, contribute to the ambient water that is available for use by downstream users. The implementation of water recycling in upstream communities would reduce the volume of such discharges, potentially reducing the volume of ambient water available for downstream reuse and/or fulfillment of environmental needs. In some circumstances, downstream users may have rights to the use of discharged wastewater, potentially preventing upstream communities from implementing recycling.

Whether for storage or planned indirect use, the discharge of recycled water to wells, infiltration sites, or other locations underlain by permeable soil and geologic materials has the potential to introduce contaminants, including salts, into potable groundwater sources and aquifers. Modern microfiltration, reverse osmosis, and disinfection practices produce exceedingly high quality recycled water, but lingering concerns about pathogens, emerging contaminants, or other potentially unknown contaminants warrant continued research to advance the science and technology in this area. Presently, California does not approve direct potable reuse projects, that is, where recycled water is piped directly from a treatment plant into a drinking water supply.

Recycled Water Use Policies, Regulations and Funding in California

Recycled Water Use Policies

The State of California has the goal to provide our citizens with sufficient water of a reasonable quality while protecting public health. To that end, recycled water has been recognized for many years as an important component of the state's water supply. According to State law, "It is hereby declared that the people of the state have a primary interest in the development of facilities to recycle water containing waste to supplement existing surface and underground water supplies and to assist in meeting the future water requirements of the state" (Wat. Code § 13510). The state strengthens its purpose by stating in the Water Code that under certain conditions the use of potable water for nonpotable purposes is a waste or unreasonable use of water if recycled water is available (Wat. Code § 13550 et seq.).

The state recognizes that recycled water is an important resource in the water supply portfolio. In 1984, the State Water Board issued Water Quality Order No. 84-7 expressing the intent that, pursuant to California Water Code, Section 13142.5(e), in cases where discharges of wastewater to the ocean are proposed in "water-short" areas, the report of waste discharge should include an explanation as to why the effluent is not being recycled for further beneficial use (SWQCB, 1984).

In 2001, Assembly Bill 331 established a 40-member Recycled Water Task Force (Task Force) to evaluate the current framework of State and local rules, regulations, ordinances, and permits to identify the opportunities for and obstacles or disincentives to increasing the safe use of recycled water. The Task Force was composed of 40 people representing federal, State, local government, public health professionals, private sector entities, environmental organizations, University of California, internationally recognized researchers, public interest groups, and was a cooperative effort of DWR, the State Water Board and DHS (now CDPH).

In 2003, the Task Force presented its findings and recommendations in a final report titled *Water Recycling 2030, Recommendations of California's Recycled Water Task*

Force. The Task Force estimated the future potential and costs of water recycling and made a wide variety of findings, many of which are reflected in this chapter. The Task Force issued 26 recommendations to increase water recycling. The recommendations are broad, and are not limited to legislative actions or statutory changes and as of this update are still worthy recommendations in need of being fully implemented. Work has been accomplished on a few of the recommendations and the results are reflected in this and subsequent sections of this chapter.

The State Water Board adopted the Recycled Water Policy for implementing state statutes, regulations, and policies for recycled water projects to establish more uniform interpretation (SWRCB, 2009a, 2009b). This policy aims to increase the use of recycled water from municipal wastewater sources (as defined in Wat. Code § 13050(n)), in a manner that implements state and federal water quality laws.

Recycled Water Educational Curriculum for fifth grade was developed under the leadership of the WateReuse Foundation and with participation of the DWR and local agencies. There is still a need to develop comprehensive recycled water education curricula for institutions of higher education.

Recycled Water Use Regulations

To maximize the water quality for water recycling, the state has passed legislation which authorizes local agencies to adopt regulations governing water softeners or conditioning appliances that discharge salt into the community sewer system (AB 334 in 2003). The Water Softening and Conditioning Appliances bill specifically authorizes local agencies, by ordinance, to limit the availability or use, or prohibit the installation, of water softening or conditioning appliances that discharge to the community sewer system.

The State Water Board issued memorandum in which provides appropriate options on incidental runoff regulation and enforcement to Regional Water Boards (SWRCB, 2004). The State Water Board reviewed the legal requirements of federal and State statutes and regulations that relate to the regulation of incidental runoff and to determine the available regulatory and enforcement options, conducted legal analysis, and conducted stakeholder meeting to arrive at the decisions in the memorandum.

In 2007, the Governor approved Assembly Bill 1481 requiring the Regional Water Boards to prescribe general waste discharge requirements (General Permit) for landscape irrigation that uses recycled water for which the CDPH has established uniform statewide recycling criteria. The State Water Board adopted this General Permit for Landscape Irrigation of Municipal Recycled Water which further supports the use of recycled water in California while protecting the water quality (SWRCB, 2009c).

The State Water Board partially funded research project to develop an Uniform Analytical Method for Economic Analysis framework for evaluating the benefits and costs of water reuse by the WateReuse Foundation (August 2006). The State Water

Board has convened an Economic Analysis Task Force with participation from state, federal and university members in fall 2008.

The California Environmental Protection Agency (Cal/EPA) oversees the Climate Action Team (CAT) which was created to formulate measures to mitigate the effects of climate change. Water recycling can contribute to the reduction of GHG emissions by replacing energy intensive imported water with local recycled water. To that end, the CAT formulated a water recycling measure to require the development and implementation of wastewater recycling plans. The Water Recycling CAT measure is identified in the AB32 Climate Change Scoping Plan prepared by the California Air Resources Board (CARB).

DWR has revised the Uniform Plumbing Code which addresses plumbing within buildings with both potable and recycled water systems, and is in the process of adopting a California version that will be enforceable in the state effective in 2010. This section of the plumbing code will provide guidance throughout the state to safely plumb buildings for indoor use of recycled water for toilet and urinal flushing.

The Department of Housing and Community Development adopted a recycled water symbol code change to remove the requirement for the skull and crossbones symbol in sections 601.2.2 and 601.2.3 of the California Plumbing Code. Now the symbol is a picture of a glass containing liquid encircled with a line slashed through, indicating the liquid should not be ingested.

Recycled Water Use Funding

The Department of Water Resources administers the Integrated Regional Water Management Program (IRWMP). Water recycling is one of many resource management strategies that may be considered by IRWM regions in developing their water resource management portfolios. IRWM grant funding has enabled many communities in IRWM regions to implement water recycling projects.

The primary source of State funding for water recycling is the Water Recycling Funding Program administered by the SWRCB, providing low-interest loans and grants to local agencies. The Water Boards' Strategic Plan Update: 2008-2012 identifies priorities and direction for the State Water Board and its nine Regional Water Boards. Water recycling is a key objective in the Strategic Plan Update (SWRCB, 2008). The State Water Board's a statewide Recycled Water Policy provides consistency and uniform direction for water recycling.

State Water Board has sustained state funding for research using Prop. 13 bond funds. The WateReuse Association has used data provided by State Water Board to support new state bond initiatives.

Comprehensive funding information is not yet done in a single Web site location; however, each state department has advertised the available funds on the Internet and

provided information at workshops. Additionally, the Division of Financial Assistance sponsored state funding fairs with participation of many agencies and water and wastewater funding programs.

Status of California Recycled Water Task Force Recommendations

1. Water softeners: In 2003, the State Legislature passed AB 334 to ease the ability of local agencies to address salinity source control by regulating water softeners. In 2009, AB 1366 was signed into law, which addresses excess salinity from residential water softeners by giving greater discretion to local water agencies where surface water and groundwater supplies are particularly susceptible to salt contamination with additional authority to manage these salt discharges.

2. Recycled water symbol code change: The California Department of Housing and Community Development enacted a code change to adequately notify the public not to drink recycled water.

3. Leadership Support for Water Recycling
    a. Recycled Water Policy: The State Water Board adopted a Recycled Water Policy for implementing state statutes, regulations, and policies for recycled water projects to establish more uniform interpretation.
    b. General Permit: Pursuant to AB 1481, the State Water Board adopted a general permit for landscape irrigation.
    c. State agencies responded to requests for information and provided guidance recycled water concerns.

4. Educational Curriculum: The WateReuse Curriculum Committee worked with DWR and local agencies to develop a stand-alone fifth grade education booklet to teach about recycled water. The booklet incorporated the appropriate state education standards.

5. Federal Funding: The US Bureau of Reclamation provided a one-time funding opportunity for water recycling projects as part of ARRA, 2009.

6. Incidental Runoff: The State Water Board Executive Director issued a memorandum on February 24, 2004, providing appropriate options on incidental runoff regulation and enforcement to Regional Water Boards.

7. Research Funding: The State Water Board provided sustained state funding for research program using Prop. 13 bond funds.

Task Force recommendations in the process of implementation:

1. Uniform Interpretation of State Standards Ombudsman: The State Water Board has begun the process to acquire a dedicated individual to provide guidance on water recycling permits issued by the various regional boards.

2. DWR is scheduled to adopt an enforceable Uniform Plumbing Code to safely plumb buildings with both potable and recycled water systems for indoor use of recycled water, effective in 2010.

3. CDPH is updating Code of California Regulations Titles 17 and 22 and the draft regulations are currently available.

4. Uniform Analytical Method for Economic Analysis framework: In August 2006, the WateReuse Foundation (with funding participation from the State Water Board) developed an economic framework for evaluating the benefits and costs of water reuse. In fall 2008, the State Water Board convened the Economic Analysis Task Force to develop uniform analytical method for economic analysis of water recycling projects.

However, work still remains to some extent on many other recommendations such as to increase funding for water recycling programs, to perform public outreach, and to develop academic programs for water recycling.

Recommendations to Increase Recycled Water Use

1. The Recycled Water Task Force presented 26 recommendations to increase water recycling in their report, *Water Recycling 2030, Recommendations of California's Recycled Water Task Force*. The status of the recommendations is presented in this chapter. State and local agencies and stakeholders should implement as appropriate the Recycled Water Task Force recommendations. These recommendations constitute the culmination of intensive study and consultation by a statewide panel of experts drawing on the experience of many agencies. Such recommendations can be used as a toolbox for communities to improve their planning of recycled water projects.

2. Although it is increasingly evident that water recycling projects have been, and continue to be, implemented throughout the state, a comprehensive current inventory of recycling facilities and programs does not exist. The State Water Board should establish a centralized data repository of recycling facilities and programs that contains basic information such as the type of treatment, volume of water recycled, uses of recycled water, and costs of operation. A systematic reporting process should be established to ensure maintenance and integrity of the data for future reference. Without such a system it is impossible to quantify water recycling efforts, characterize successes and failures, or make informed decisions as to future endeavors and funding priorities.

3. State agencies including the State Water Board, Regional Water Boards, CDPH, and DWR should develop a uniform interpretation of State standards for inclusion in regulatory programs and IRWMPs, and clarify regulations pertaining to water recycling including permitting procedures, health regulations and the impact on water quality. It is important to recognize that uniformity in State standards does not mean uniformity in permit terms and conditions, however as implementation should account for the variability in local conditions and local needs.

4. The State should expedite the availability of funding for the preparation of regional Salt Management Plans in order to increase the potential of recycled water.

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