MWD
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

Report

Water Resource Management

• Water Resource Management January 2006 Activity Report

Summary

The following is a summary of Water Resource Management Group key activities for the month of January 2006.

Detailed Report

Colorado River Aqueduct Contract Administration

Colorado River Basin Salinity Control Forum Work Group – Consistent with Metropolitan's policy principle on Colorado River Basin Management, staff participates in the Colorado River Basin Salinity Control Forum Work Group. At its January meeting, the Work Group recommended to the Bureau of Reclamation that nine proposals be funded this year from $1.8 million in cost sharing monies available from the Lower Colorado River Basin Development Fund and the Upper Colorado River Basin Fund to advance the salinity control program. Power contractors in California and Nevada, including Metropolitan, provide funding for salinity control program cost sharing through a 2.5 mills per kilowatt-hour surcharge on energy purchased from Hoover and Parker power plants. Entities that contract for Colorado River Storage Project energy in the Upper Basin also provide funding.

The recommendations include funds for an irrigation water supply pipeline in Wyoming to eliminate the seepage of water and prevent 4,700 tons of salt from entering the Big Sandy River, a tributary of the Colorado River. Completion of this project would control 0.5 percent of the 937,000 tons planned for control by 2025. In addition to this funding, federal appropriations and additional cost sharing monies totaling $42 million will be expended on Upper Colorado River Basin salinity control this year.

Palo Verde Irrigation District Land Management Program – Consistent with the business plan, the program is being implemented through interim and long-term land fallowing agreements. Combined, these agreements will provide 96,000 acre-feet in calendar year 2006. As of mid-January, long-term contracts covering 86 percent of the program acreage have closed escrow and are operational. Metropolitan and PVID staff are working with landowners of the remaining 14 percent of the program acreage to bring closure to their long-term contracts. The interim program will conclude in July 2006.

State Water Project Contract Administration

Tehachapi East Afterbay (TEA) - Consistent with the CEO's Business Plan to provide cost-effective water supplies, Metropolitan will soon begin to benefit from the California Department of Water Resources' construction of a 1,250 acre-feet afterbay just downstream of the Edmonston Pumping Plant lift. The afterbay will provide increased opportunities to pump off-peak for the "string" of five central valley pumping plants. This $70 million project will save between $10 to $20 million annually in power costs. Although the project will not be completed until February 2007, an interim connection will make 95 percent of the project benefits available this March.

Conservation

Metropolitan Testing Leads to New Toilet Standards - On November 29, 2005, the American National Standards Institute approved proposed revisions to ASME A112.19.5 - Trim for Water-Closet Bowls, Tanks, and Urinals. These revisions incorporate a durability standard for flush valve seals (flappers) and a part number and marking/labeling requirement such that consumers can identify and locate a replacement, when needed, for their flapper. These modifications to the national standard are a direct result of the extensive testing work performed by Metropolitan during the 1990s. This new standard will ensure that water savings from Metropolitan's ultra-low flush toilet retrofit programs continue into the future.

American Society of Mechanical Engineers will publish the new standard.

Date of Report: January 31, 2006

Zero Water Consumption Urinals and Graywater Systems in Residential Properties - In response to questions raised by the Water Planning, Quality and Resources Committee at its December 2005 meeting, staff prepared two documents summarizing information on the role of zero water consumption urinals in Metropolitan's water conservation strategy and the use of graywater systems on residential properties. Attachments 1 and 2 provide background information on plumbing standards, Metropolitan incentive levels, and current issues related to both approaches.

California Friendly Model Homes - The program continues to make good progress. In January, Water Resource Management and External Affairs staff provided support to Otay Water District, the San Diego County Water Authority and Eastern Municipal Water District outreach activities. Staff addressed an annual meeting with local building industry leaders hosted by Otay and assisted in the development of a promotional packet distributed by Eastern Municipal Water District to a targeted list of Riverside County builders. These activities generated several new building industry leads, including a program-briefing request for a major builder's executive team and the receipt of a completed Statement of Interest for four additional model homes in the Menifee area.

Resource and Facility Planning

Integrated Area Studies - Metropolitan staff continued to meet with member agency staff to refine the work plan for the Integrated Area Studies. The area studies will have three elements: technical, level of service and financial. The technical element will consist of Metropolitan and member agency staff developing technical alternatives to meet member agency demands. These alternatives will consider Metropolitan and local facilities and potential operational improvements on either the regional or local level. The level of service element will consider Metropolitan's policies and practices with regard to conveyance, treatment and distribution of water. Staff will report to the Board on its progress at the June Board Meeting. Following June, the Integrated Area Studies will begin to consider financial issues.

South Delta Improvements Program - The California Department of Water Resources and the Bureau of Reclamation have prepared a joint Draft Environmental Impact Statement/Environmental Impact Report to implement the South Delta Improvements Program. Physical components include the construction of permanent operable gates at up to four locations in the south Delta channels to protect fish and meet the water level and water quality needs for local irrigation diversions, channel dredging to improve water conveyance, and modification of 24 local irrigation diversions. The operational component considers raising the permitted diversion limit into the SWP Clifton Court Forebay from 6,680 cfs to 8,500 cfs. Staff is reviewing the documents, and coordinating comments with the State Water Contractors. Comments focus on increasing the technical strength of the EIA/EIS and its consistency with other obligations and commitments.

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WATER CONSERVATION AND ZERO WATER CONSUMPTION URINALS

Introduction

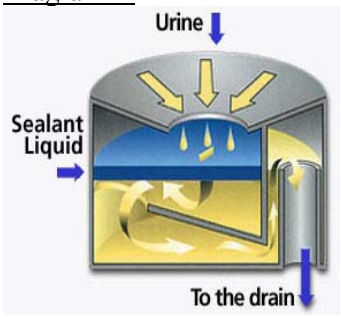
This report addresses questions raised at the December 2005 meeting of the Water Planning, Quality and Resources Committee regarding the role of zero water consumption urinals in Metropolitan's water conservation strategy. Metropolitan offers financial incentives to replace existing high water use urinals with low flush or zero flush units thereby giving the commercial, institutional and industrial managers choices in achieving water savings, in light of the distinct differences in operation and maintenance responsibilities required for using the alternative devices.

Device	Metropolitan Incentive	Annual Water Savings
Zero water consumption urinals	$400	40,000 gallons per year
High-Efficiency Urinals (half gallon per flush or less)	$200	20,000 gallons per year

Background on Zero Water Consumption Urinals

The national standard for new urinals specifies a maximum flush volume of 1.0 gallon per flush. Urinals that function without water (and therefore without a flush valve) were first offered in the U.S. marketplace around 1991 (see photo below). The typical design of zero water consumption urinals uses a cartridge in the urinal that contains a special biodegradable liquid within a unique trap system. This special liquid is lighter than water, and therefore, floats on and seals the urine from the room atmosphere. The urine then drains to a standard waste line (see Diagram A).

Diagram A



Water Savings and Rebates

Prior to the December 2005 Board action on incentives, Metropolitan offered the same incentive of $60 for retrofitting with 1.0 gallon per flush or zero water use urinals. A zero water consumption urinal can save approximately 40,000 gallons of water per year. As a result of the Board action, Metropolitan now offers an incentive of up to $400 per fixture for zero water consumption urinals. Some member and retail agencies have supplemented Metropolitan's incentive with their own funding or grant funding to cover installation costs.

Issues

While zero water consumption urinals save water, issues have been raised regarding odor, human health and the plumbing code. Amongst plumbing and water supply officials, there are differing perspectives on remaining issues in interpreting the State Plumbing Code. Local agencies have the authority to override the State Plumbing Code with their own ordinance to guide permitting and installation of zero water consumption urinals within local jurisdiction. However, enactment of new ordinances is a major decision for local governing bodies that is not easily achieved.

Odor: A concern has been that zero water consumption urinals would have an odor to them since no water was being used to flush the liquid waste away. However, a recent study has addressed this concern. In 2000, the University of California at Los Angeles conducted a study comparing a zero water consumption urinals to an older 3.0-gallon per flush urinal. The study looked at comparing bacteria growth rates, odor, water usage, and lifecycle cost analysis. The UCLA research team found that because water provides a breeding ground for bacteria, zero water consumption urinals actually prevent the harboring and growth of bacteria. No water means no bacteria and, therefore, a more hygienic operation. These findings were confirmed by a study conducted by a German government agency, Ladesgewerbearmt of Bavaria, in a school, an office building, a hospital, and a service station. In side-by-side bacterial counts, zero water consumption urinals had a lower count than flush urinals.

Human Health: Metropolitan staff is not aware of any adverse health effects directly linked to the use or maintenance of zero water consumption urinals. However, some individuals believe that maintenance of these devices can briefly expose janitorial maintenance workers to hazards associated with an open drain line to the sewer. Further, one German study suggested that bacterial growth is greater in the drain lines of these devices since no water is used to dilute or flush liquid wastes. The American National Standard Institute is currently writing plumbing standards for these devices to establish specific design and performance criteria for these devices. In their deliberations, the American National Standard Institute reviewed the report and discounted its findings because the study was performed overseas under different plumbing codes and standards related to drain line slope and venting requirements.

Plumbing Code: Most plumbing codes were written prior to the introduction of zero consumption urinals. Therefore, much of the language in the Uniform Plumbing Code talks about usage of water in urinals. For example: Section 218.0 Definition of Plumbing Fixture: *Plumbing fixture an approved type installed receptacle, device or appliance which is supplied with water or which receives liquid or liquid borne wastes and discharges such wastes into the drainage system to which it may be directly or indirectly connected.* This definition could be interpreted by the local authority (city) to read that a zero consumption urinal is not a plumbing fixture (not supplied with water) or the opposite, that it is a plumbing fixture since it receives liquid waste and discharges to the drainage system. Local interpretation is the key. These and other discrepancies are trying to be addressed by water agencies through the plumbing standards community.

In order to clarify the issue and not leave it to interpretation, the City of Santa Monica became the first city to adopt zero water consumption urinals as a Plumbing Fixture (8.32.060) in September 2005. The new plumbing code section establishes voluntary standards for the use of zero water consumption urinals as plumbing fixtures in all occupancies and types of construction throughout the City.

Other Water Efficient Urinal Alternatives

High-Efficiency Urinals: High-efficiency urinals flush water at a maximum of a half-gallon per flush (standard is 1.0 gallon per flush). Currently on the market is a urinal that flushes at the upper limit of a half-gallon per flush. This is suitable for businesses that want efficiency but do not want a zero water urinal. Urinals that flush at less than a half-gallon are expected in the market place in 2006. One manufacturer is testing a one-quarter gallon

(quart per flush) and another one-eighth gallon (pint per flush) per flush urinal. When available, these other urinals will offer more water efficiency options for the business owner. High-efficiency urinals save approximately 20,000 gallons of water per year and Metropolitan offers each of these at $200 incentive per fixture.

Conclusion

Metropolitan will continue to work with member agencies and the California Urban Water Conservation Council to resolve outstanding issues. With advances in new technology, staff anticipates achieving similar water savings with other devices that use limited quantities of water as described above. As a result, Metropolitan is taking a broad view in exploring all options available for conserving water. Metropolitan will continue to rely on local agency approval within their respective jurisdiction to determine appropriate choices for water-saving urinals.

RESIDENTIAL GRAYWATER AS A CONSERVATION OPTION

Introduction

This report addresses questions raised at the December 2005 Water Planning, Quality and Resources Committee meeting regarding the use of graywater systems on residential properties. Metropolitan does not offer financial incentives for installation of residential graywater reuse systems.

Graywater falls within an array of water reuse options characterized as decentralized reuse. Metropolitan continues to explore opportunities for decentralized water reuse and is presently offering incentives for methods that prove cost-effective, such as cooling tower conductivity controllers to reuse water and x-ray water recirculation systems in hospitals. Over the last decade, staff has explored the feasibility of providing incentives for the installation of graywater systems for single-family residences as a conservation option. This report addresses the current status of that effort.

Graywater: Definition, Use and Standards

The California Uniform Plumbing Code defines graywater as:

> *" waste water which has not come into contact with toilet waste. Graywater includes used water from bathtubs, showers, bathroom washbasins, clothes washing machines and laundry tubs or an equivalent discharge as approved by the Administrative Authority. It does not include waste water from kitchen sinks, photo lab sinks, dishwashers or laundry water from soiled diapers*.[1]"

For health reasons, the plumbing code requires separate piping, valves and other graywater system components from potable water systems. Because graywater can contain bacteria and pathogens, the system must be designed and operated to prevent graywater from reaching the land surface or becoming airborne. Consequently, graywater use is restricted to subterranean irrigation and cannot be used to water vegetables or fruit that grows on the ground.

As part of the Uniform Plumbing Code, enforcement of these standards falls within the purview of local cities and counties.

System Components and Costs

Graywater system configurations can vary from simple, homeowner installed gravity-fed systems with simple leach fields to professionally installed, sophisticated automated systems with subsurface drip irrigation. The latter system includes tanks that collect graywater, sump pumps for discharge, media filters, back-flow prevention devices to prevent potable water contamination, an array of irrigation piping and drip emitters, three-way electronic flow control valves, and automated electronic graywater controllers. The cost of retrofitting a single-family structure with a graywater system appears expensive. Therefore, the primary target market for graywater systems has been newly constructed residential homes.

In 1999, the City of San Diego analyzed possible water and/or sewer discount fees to promote the installation of graywater systems and developed cost estimates for three different types.

- Basic – gravity-fed system with no pumps or filters.
- Intermediate - system consisting of a tank filter and pump, controller and direct potable water connection to backwash filters.

[1] California Uniform Plumbing Code, Appendix G-A, p. 249.

- Advanced - configured similar to intermediate systems with the addition of direct connection for supplemental water (necessary during times when the graywater system cannot supply total irrigation needs) and a fully automated controller for both potable and graywater. This system is most likely preferred by homeowners.

Estimated capital and operations and maintenance costs for each type of graywater system are listed in the following table:

System Type	Basic	Intermediate	Advanced
Capital Cost	**$650**	**$3,700**	**$4,200**
Annual O & M		**$162**	**$162**

Estimates exclude the cost of the basic irrigation system, cost to dual plumb new single-family residences, and mark-up to retrofit existing residences built on concrete slabs.

Water Savings

The amount of potable water displaced by graywater irrigation depends on a number of factors, including amount of graywater produced by permitted sources, soil type, plant material, the size and nature of the irrigated area, rainfall and plant evapotranspiration rates. Since irrigation requirements are seasonal (typically less during winter and more in summer), graywater systems may produce a surplus of usable water during part of the year and require supplemental potable water during other parts of the year.

Accounting for Southern California's cyclical pattern in the demand for graywater, Dr. Bahman Sheikh (April 2002) estimated that a "typical" household with an irrigated area of 1,200 square feet and an average of three residents per home could save 46,000 gallons of potable water per year, or roughly half of the household's total demand. For a single-family home with 3,100 square feet of irrigated land, it was estimated that 76,000 gallons, or roughly 62 percent of total demand, could be saved by a graywater system. In comparison, one new high-efficiency toilet retrofit would save about 14,000 gallons per year and one zero water consumption urinal about 40,000 gallons per year, both with reliable device lives of 20 years.

Cost-Effectiveness

In the 1999 City of San Diego study, assuming a 15-year system life and a discount rate of six percent, the cost of purchasing and maintaining a graywater system over its useful life would be approximately $5,365 for an "intermediate" system and $5,897 for an advanced system. This number equals the sum of the initial purchase and installation price plus the $162 annual maintenance cost discounted over 15 years. During the 15-year period, the intermediate system would save about 2.1 acre-feet of potable water and the advanced system would save about 3.5 acre-feet. The cost per acre-foot of water saved by the graywater system would therefore be roughly $2,500 for an intermediate system and $1,700 for an advanced, fully automated system assuming, in both cases, a sufficient supply of graywater.

Public Health Concerns

Based on staff contact with water agency and public health and safety officials, a commonly expressed concern about the use of graywater was the potential for cross-connection problems and the lack of professional system maintenance by homeowners. In the two pilot projects discussed below, the cities' health departments required annual inspections of the backflow prevention devices.

Pilot Project Experience

The City of San Diego conducted a pilot project in 2001 that installed 14 of the sophisticated graywater subsurface irrigation systems on turf in front yards of a new single-family housing development. As of

January 2004, only four of the 14 graywater systems remained intact. Common participant complaints included problems with the system's backwash function, and over-saturation and ponding of landscape areas. After January 2004, the City discontinued the pilot project.

Padre Dam Municipal Water District in the City of Santee initiated another pilot project in 2000. Three graywater systems were installed. To date, water savings resulting from graywater use has been inconclusive.

Conclusion

Graywater systems have the potential for saving water under certain conditions. However, the current cost of purchasing and installing these systems appears prohibitive for the average homeowner relative to the water savings. In addition, there are long-standing health concerns about inadequate maintenance of sophisticated graywater equipment by untrained or disinterested homeowners.

On a continuum with potable reuse, non-potable reuse and satellite recycling, graywater has the least expectation of professional management and the highest expectation of operational problems. Staff continues to monitor and assess new ideas in decentralized water reuse and reclamation systems. In this regard, Metropolitan is offering incentives for commercial, industrial and institutional reuse systems for process and cooling system water that does not involve contact by humans or kitchen waste and are applied on a case-by-case basis.

Metropolitan staff has monitored trial applications, code requirements and general progress of graywater systems over that past decade. At present, staff sees the following advances needed before recommending Metropolitan incentives:

- Improved implementation technology that would lead to graywater systems being sufficiently accepted by homeowners to ensure persistent water savings for a reliable number of project years in order to quantify water savings and calculate an appropriate water conservation incentive,
- Operational and maintenance simplification of the systems on par with the abilities and acceptance of the average homeowner, and
- Broad scale confidence of graywater system by public health officials to support routine permitting and to reduce burdensome annual inspections of single-family homes.