Legislative Report

Recommendations for Water Efficiency Standards for Water-Using Fixtures in Residential and Commercial Buildings

As Required by North Carolina Session Law 2008-143- Section 18

Prepared by the N.C. Department of Environment and Natural Resources
January 2009

Executive Summary

Water resources in North Carolina have been strained in recent years through a combination of population increase and recurring drought conditions. Improved water use efficiency is one way to meet the future water supply needs of North Carolina communities.

This report is in response to N.C. Session Law 2008-143, "An act to improve drought preparedness and response in North Carolina," which mandated the development of recommendations regarding water efficiency standards for water-using fixtures. This report will focus on sink faucets, showerheads, urinals and toilets in residential and commercial settings.

Installing high-efficiency water fixtures can result in significant water savings. The greatest water savings can be found through replacing pre-1994 fixtures with high-efficiency ones. The use of high-efficiency water fixtures can be mandated by law, as has been done for toilets and urinals in California. However, there are some legal and technical issues which must first be addressed. While this option is being studied, there are a number of voluntary approaches that could be implemented such as financial incentives and awareness programs which have already been proven effective.

Summary of Recommendations in this Report:

1. The N.C. General Assembly should study implementing a phased approach to requiring all new residential and commercial construction to use high-efficiency toilets, urinals, showerheads and faucets.
2. The N.C. General Assembly should study establishing incentives for the purchase and installation of high-efficiency water fixtures.
3. Mandate all state buildings to use WaterSense labeled or high-efficiency fixtures when existing fixtures are replaced.
4. Require only WaterSense labeled or high-efficiency fixtures be made available on state purchasing contract.
5. Have DENR provide water users with information on the availability, performance and cost effectiveness of new water conservation fixtures and other water saving techniques.
6. Encourage the North Carolina Building Code Council to investigate requiring high-efficiency fixtures to be used in all new residential and commercial construction.
7. Request the N.C. Community College system and other educational institutions develop programs to train and retrain plumbing professionals on the installation and maintenance of high-efficiency fixtures.

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Acknowledgements

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I. Introduction

The population of North Carolina is expected to grow from 8.5 million in 2004 to 12 million by the year 2030. Water consumption is expected to increase from 241 billion gallons per year for all households to 335 billion gallons if current trends continue. Increasing water use efficiency can play a significant role in ensuring adequate water supplies in the future.

Water efficiency can also have significant cost savings for residents and municipalities. Municipalities realize savings through reduced energy costs from water treatment and transport and avoided infrastructure costs from water and wastewater treatment plant construction and expansion and the development of new surface water sources. Residents save energy through the reduced usage of heated water. This energy savings makes water efficiency an important part of North Carolina's energy future, too.

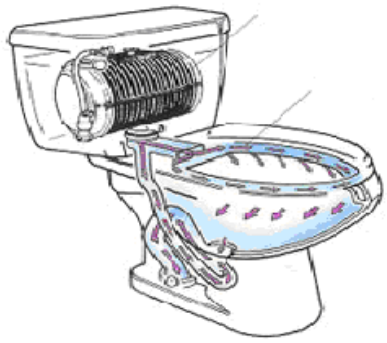
The Massachusetts Water Resource Authority began a water conservation program in 1986 with an estimated cost of $20 million. As part of the program, 370,000 homes were retrofitted with low-flow plumbing devices, conservation-minded water/sewer rate structures were put in place at the municipal level, leaking pipes were detected and repaired statewide, and extensive public information and school education programs were conducted. As a result of the program, average daily demand for water decreased by 80 million gallons per day from 1987 to 1997. This decrease in demand allowed for a reduction in the size of a planned treatment plant, as well as a 20-year deferral of the need for an additional supply of water, resulting in a total savings of $111 million to $153 million.

In 2008, the N.C. General Assembly enacted "An act to improve drought preparedness and response in North Carolina, as recommended by the Environmental Review Commission," (Session Law 2008-143). Section 18 of the law mandated the N.C. Department of Environment and Natural Resources to develop recommendations regarding water efficiency standards for water-using fixtures in residential and commercial buildings. This report will focus specifically on plumbing fixtures: sink faucets, showerheads, urinals (not including waterless) and toilets. These fixtures use a significant portion of the total water used in both residential and commercial buildings.

Faucets and showerheads have basically one type of design. However, there are multiple types of toilet and urinal designs. One toilet design uses a tank to provide the needed water pressure to flush waste, while the other uses a flush valve on the water line that uses the pressure in the pipe to flush waste as described below:

- Gravity flush or tank type and pressure assisted flush are the two main types of toilets. Gravity flush toilets are the most common type and utilize the weight of the water and head pressure (height of the water in the tank) to promote the flush. Pressure assisted toilets use the pressure in the

Pressure Assisted Toilet



water line to compress air in a special sealed tank in the toilet, which is released along with the water when the handle is tripped. Dual-flush toilets are also an option. These toilets are most often gravity flush toilets, and have both a half-flush (.8 gallons per flush) and a full-flush (1.6 gpf) option.

- Flush valve toilets, also called flushometer or flushometer-valve toilets, consist of a flush valve and a bowl. The flush valve is used in place of a tank to flush the bowl. These toilets, usually found in high-use commercial settings, utilize water line pressure to discharge water into a bowl when the handle is tripped. The flush valve incorporates a mechanism that closes it after a preset volume of water is discharged. These are typically used in commercial settings.
- Each of these designs can be either a standard (1.6 gpf) or high-efficiency (20 percent more efficient than standard or 1.28 gpf) toilet.

Flush Valve (Flushometer) Toilet

Urinals have four types: flush valve, same as the toilet type above; siphonic-jet, similar to pressure-assisted, which has no flush valve but uses an elevated flush tank that empties when the water reaches a certain level; blowout, which operates similar to a siphonic-jet except that it relies on a hydraulic flushing mechanism to empty the tank; and waterless, which does not flush but utilizes a cartridge or oil layer to prevent odor issues. Waterless urinals are not covered in this report because they are not water-using fixtures.

In 1992, Congress passed the Energy Policy Act which, among other things, mandated maximum flow rates for faucets, showerheads, toilets and urinals sold in the United States (See Appendix B). These mandated maximum flow rates became effective Jan. 1, 1994. These very aggressive national standards significantly reduced the amount of water used in home and commercial fixtures. The legislation preempted states from adopting their own standards (See Appendix C). However, there is a legal controversy over whether the preemption is still in effect. At this time no waivers of preemption have been granted.

Building and plumbing codes regulate fixture design specifications and how they must be installed. The North Carolina Building Code Council, staffed by the Department of Insurance, establishes the plumbing codes for the state of North Carolina as a part of the building code. These are based on the International Plumbing Code, promulgated by the International Code Council, but draw from a broad range of professionals that include plumbers, inspectors and industry representatives. The IPC is developed through a consensus process and can draw on a number of sources including standards set by the American Society of Mechanical Engineers. The current standards for plumbing fixtures in the IPC must at least meet the levels set by the EPAct of 1992, which became effective in 1994. These standards have been adopted into the North Carolina Building Code as shown in the right hand column below:

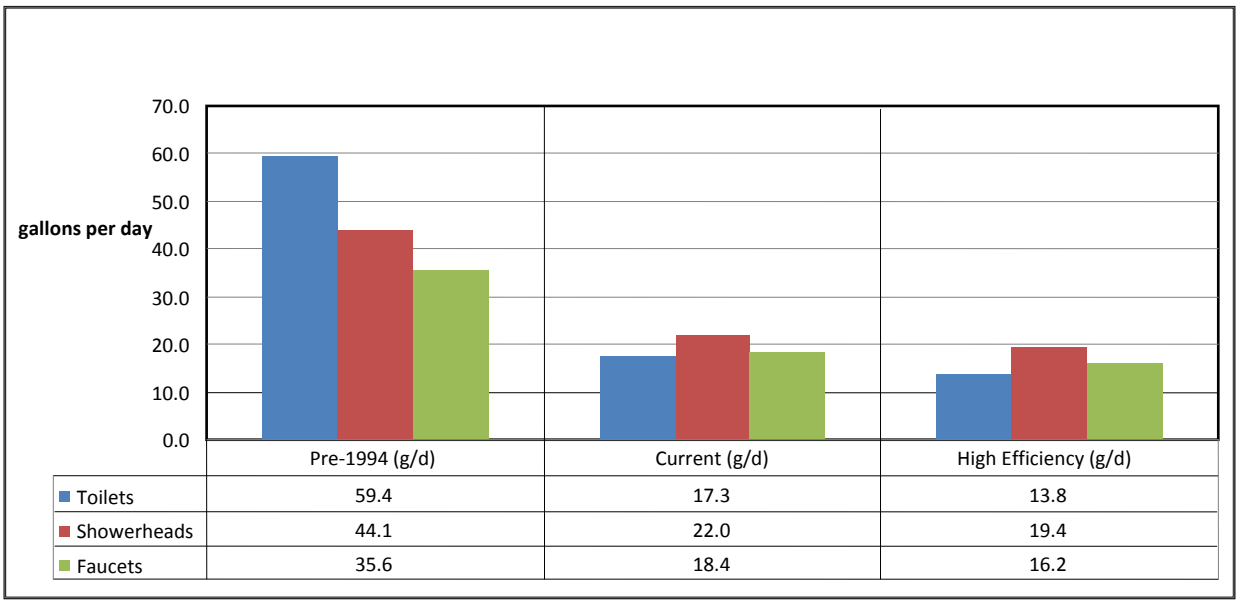
Table 1 - Flow Rates and Consumption for Plumbing Fixtures, pre- and post-1994

Plumbing Fixture or Fixture Fitting	Typical Water Usage pre-1994	Maximum Water Usage post-1994
Toilet (all types)	3.5 – 5.5 gallons per flush (gpf)	1.6 gallons per flush (gpf)
Urinal	1.5 – 5 gpf	1 gpf
Showerhead	3 – 8 gallons per minute (gpm)	2.5 gallons per minute (gpm) at 80 psi
Bathroom sink faucet, residential	2.5 – 7 gpm	2.2 gpm at 60 psi
Kitchen sink faucet	2.5 – 7 gpm	2.5 gpm at 60 psi
Bathroom sink faucet, commercial (other than metered)	2.5 – 7 gpm	0.5 gpm at 60 psi
Sink faucet, commercial (metered)	NA	0.25 gallons per metering cycle

(N.C. Plumbing Code, 2006; Vickers, 2001)

Most residential water used indoors is for cleaning and sanitation purposes. Older homes, pre-dating 1994, are characterized as having high-flow fixtures. The average indoor water use in these older homes is 69.3 gallons per capita per day. The average indoor water use in homes built after 1994 is 45.2 gallons per capita per day, or 35 percent less. Figure 1 below illustrates the considerable water use difference between pre-1994 homes and more recently built homes.

Figure 1: Residential Water Use Savings from High-Efficiency Fixtures



(Vickers, 1990, adaptation)

In pre-1994 residences, toilets account for the single largest category of unnecessary water use related to fixtures (see Figure 2). Replacing toilets gives an immediate and ongoing significant reduction of water use. In Raleigh, the resulting water and sewer usage savings of replacing a toilet would average $44.22 per year in a typical single bath household with payback periods of 2.2 to 6 years.

In post-1994 homes, showerheads and faucets are the fixtures of highest water use as shown in Figure 2. Replacing showerheads and faucet aerators (which reduce flow) are low cost and have quick payback periods. For example, in Raleigh, replacing a showerhead with a high-efficiency model would result in average annual savings of $23.90, which is less than a one year payback period. Faucet aerators cost from $0.50 – $3.00, resulting in even shorter payback periods. Replacing out-dated, inefficient fixtures in homes of all ages will result in considerable water savings.

This report will outline potential regulatory and voluntary approaches followed by practical recommendations regarding water efficiency standards for water-using fixtures in residential and commercial buildings.

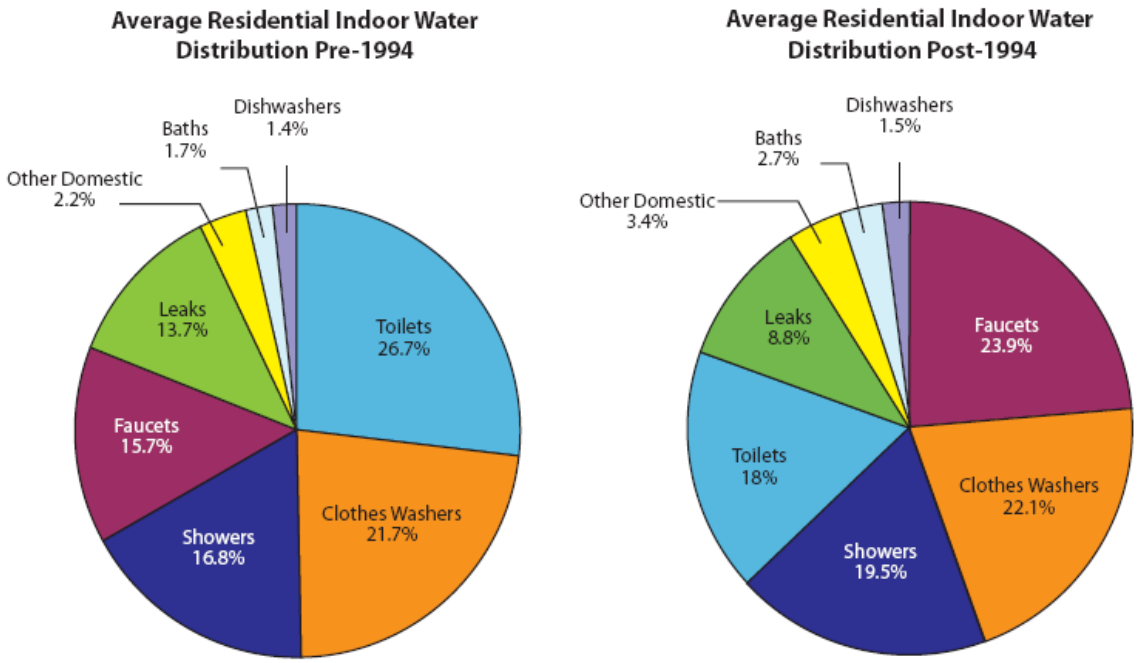


Figure 2: Comparison of average indoor water use.
(Vickers, 2001, adaptation)

II. Mandated Fixture Standards Approach

The Energy Policy Act of 1992 set targets, created mandates and amended utility laws to increase clean energy use and advance overall energy efficiency in the United States. The act consists of 27 titles, detailing a variety of measures intended to lessen the nation's reliance on imported energy, offer incentives for clean and renewable energy and encourage energy

conservation in buildings. Title I established efficiency standards for fixtures, mandating maximum flow rates for residential and commercial toilets, urinals, showerheads and faucets. Table 1 listed fixtures and the required flow rates that were mandated in the EPAct of 1992 and are now part of the International Plumbing Code adopted by North Carolina.

Congress directed the U.S. Department of Energy to periodically reevaluate the efficiency flow rates to determine if more stringent standards should be developed and implemented. Since the EPAct of 1992, only one additional water efficiency standard has been adopted. The Energy Policy Act of 2005 required commercial pre-rinse spray valves to have a maximum flow rate of 1.6 gpm. The EPAct is codified in U.S. Code 42 Chapter 77, Subchapter III, Part A §6295 Energy Conservation Standards (parts j, k, dd) (See Appendix D). At this time, no other standards concerning residential and commercial water-using fixtures have been developed or implemented.

The Energy Policy Act preempted state and local standards for water using fixtures unless they are identical to the federal standards. In order for a state to set more stringent standards in its building code than those prescribed in the federal standard, the state must petition the Secretary of Energy for a waiver of federal preemption. When determining whether to grant a waiver of federal preemption, the Secretary of Energy requires clear evidence that such state regulation is needed to meet unusual and compelling state or local energy or water interests. The term, "unusual and compelling state or local energy or water interests" means interests which:

- are substantially different in nature or magnitude than those prevailing in the United States generally; and
- are such that the costs, benefits, burdens and reliability of energy or water savings resulting from the state regulation make such regulation preferable or necessary when measured against the costs, benefits, burdens and reliability of alternative approaches to energy or water savings or production, including reliance on reasonably predictable market-induced improvements in efficiency of all products subject to the state regulation.

It does not appear, however, that Congress intended to allow efficiency standards to remain stagnant while also prohibiting states from acting independently. The law requires the Secretary of Energy to publish a final ruling waiving the preemption provisions if the maximum flush or flow rate recommended by the American Society of Mechanical Engineers standards for toilets, urinals, showerheads and faucets are not revised to improve the efficiency of water use of these fixtures for a period of five consecutive years.

Although the ASME standards for toilets, urinals, showerheads and faucets have not been revised since the adoption of standards based on the EPAct of 1992, the DOE has never published a rule removing the preemption provisions. Because the DOE missed the five-year deadline and never removed the preemptive provisions, there is some legal controversy about whether or not more stringent state standards are still preempted. The California legislature has moved forward to set its own standards despite this controversy. In 2007, California passed legislation phasing in higher water efficiency standards for toilets and urinals. The legislative

analysis of the bill stated that: "The federal preemption was conditioned on enactment of subsequent improvements in toilet efficiency within five years. These improvements did not happen and the federal preemption expired." The following summary outlines the legislation, which can be found in its entirety, along with the bill analysis, in Appendices F and G.

> In October of 2007, Assembly Bill No. 715-Chapter 499 was signed into law in California. This legislation mandates that beginning Jan. 1, 2014, all toilets and urinals installed and sold in California must be high-efficiency fixtures. This is defined as 1.28 gpf or less for toilets and 0.5 gpf or less for urinals. Additionally, plumbing manufacturers are required to offer high-efficiency toilet and urinal models for sale in a specified percentage of all models offered. The percentage of high-efficiency models to be offered and timeline is as follows:
>
> - 50 percent by 2010;
> - 67 percent by 2011;
> - 75 percent by 2012;
> - 85 percent by 2013; and
> - 100 percent by 2014 and thereafter.
>
> This law exempts a number of fixtures, which include fixtures installed in historical buildings, and certain institutional toilets and urinals such as those used in prisons and hospitals. The bill was also supported by the Plumbing Manufacturers Institute and others in the plumbing industry.

Florida's Miami-Dade County is an example of a locality making strides in the spirit of water conservation, evident in their newly revised water-using fixture efficiency standards. The county made localized technical amendments to the Florida Building Code, resulting in more stringent standards for water-using fixtures in new development, effective as of January 2009. These structural ordinance amendments (residential, industrial, commercial and institutional) for maximum fixture flow and water usage require baseline specifications meet or exceed fixture criteria for 20 percent more water efficient products than currently in the marketplace. The ordinance modifications also required the development of a water use standards manual, which thoroughly explains all new development design requirements.

Table 2. Standards Developed for Miami-Dade County, Florida, Effective January 2009.

Fixture	Miami-Dade County Standards
Toilets (commercial and residential)	1.28 gpf
Bathroom and kitchen sink faucets (residential)	1.5 gpm at 60 psi
Bathroom sink faucets (commercial)	0.5 gpm at 60 psi
Residential showerheads	1.5 gpm
Urinals	0.5 gpf or waterless

ASME is currently working on developing standards for high-efficiency fixtures. No date is set for adoption. The standards may be similar to those established by the U.S. Environmental Protection Agency's WaterSense program, as shown in Table 3 and discussed in the next section. Once established, these standards could be adopted as national standards by the DOE as required in the EPAct. As of January 2009, DOE is not planning on addressing this in the foreseeable future. Any new ASME standards could become part of the International Plumbing Code and in turn could be incorporated into the North Carolina Building Code.

There is some concern that high-efficiency showerheads pose some risk of causing thermal shock. High-efficiency showerheads can make plumbing systems more sensitive to the pressure changes created when other fixtures are operated while the shower is being used. This can theoretically result in rapid temperature changes, increasing the risk of thermal shock. The risk can be higher when the high-efficiency replacement showerheads are installed in existing plumbing systems designed for higher flow rates. The likelihood of this happening can be decreased by installing pressure balancing valves that are designed to work with high-efficiency fixtures. This issue is being taken into consideration as the ASME develops any new standards and is also being investigated by EPA's WaterSense program.

Another issue that has been raised is the use of high-efficiency fixtures in older structures. In structures on private wells with lower water pressure, high-efficiency showerheads and sink faucets may not perform properly. Also of concern is the use of high-efficiency fixtures in non-residential applications where there is the potential for blocked drains that could result from reduced flush volumes. This concern is mainly for older buildings with substandard drains and long drain lines, where there is also no supplementary water from sinks, showers, etc. These issues are also being taken into consideration as the ASME develops any new standards.

There is a convergence on the range of minimum water use levels that fixtures can obtain while still meeting performance expectations. Right now the WaterSense criterion is, for the most part, the best consensus standard currently available. This is especially true for new fixture installations. However, any standards will need to have some specific exemptions for local conditions and performance requirements.

III. Voluntary Fixture Standards Approaches

There are a number of market forces driving the development and use of high-efficiency water fixtures. This includes the green building movement driven by the U.S. Green Building Council's Leadership in Energy and Environmental Design standard and EPA's WaterSense program which, like the very successful ENERGY STAR program, is setting high levels of efficiency and performance standards for fixtures that qualify to use the program's logo. Additionally, water systems across the country are implementing programs that encourage the use of high-efficiency plumbing fixtures in response to drought impacts and growing water needs. To meet this growing demand, the plumbing fixture industry is developing new water conservation fixtures that go far beyond the current North Carolina Plumbing Code.

WaterSense is a public-private partnership program sponsored by the U.S. EPA to promote and enhance the market for water efficiency products and programs with a simple, easy-to-identify

label. The products allowed to use the WaterSense label must be at least 20 percent more water efficient than similar products in the marketplace with comparable or better performance. Independent, third-party agencies certify that products meet WaterSense criteria for water efficiency and performance by following testing and verification protocols specific to each product category. At present, WaterSense has set criteria for toilets and faucets and is in the process of developing them for urinals and showerheads, as detailed below:

Table 3: Existing WaterSense Criteria for Water-Use Fixtures

Fixture	Current Standard	WaterSense Criteria
Toilets (commercial and residential)	1.6 gpf	1.28 gpf (with tank) Flushometer criteria under development
Faucets (residential)	2.2 gpm	1.5 gpm
Residential showerheads	2.5 gpm	1.5 to 2 gpm (under development)
Urinals	1 gpf	0.5 gpf (under development)

(N.C. Plumbing Code 2006 and WaterSense)

There is increasing interest in North Carolina in using green building techniques to reduce environmental impact and, in many cases, lower the building's long-term energy and water usage. As a result, there are a number of green building initiatives that successfully promote the use of high-efficiency fixtures. The best known program is the U.S. Green Building Council's Leadership in Energy and Environmental Design rating tool. The LEED whole building approach encourages and guides a collaborative, integrated design and construction process. LEED certified buildings seek to be more water efficient than buildings built to standard specifications. Therefore, to get credit toward LEED certification, potable water use must be reduced by at least 20 percent with additional credit given for a 30 percent reduction. These reductions can be obtained through using high-efficiency fixtures, waterless products, and/or water reuse and reclamation strategies. The 20 to 30 percent reductions over current standards will meet and can even exceed WaterSense criteria.

What is happening across the nation is an emergence of fixtures that meet and exceed the standards set by the current plumbing code and WaterSense criteria. There is a convergence on the range of minimum water use levels that fixtures can obtain while still meeting performance expectations. These levels will keep decreasing, though at a slower rate, as more efficient and effective plumbing fixture designs are developed. The WaterSense criterion is, for the most part, the best consensus standard currently available.

Savings from Retrofitting Existing Fixtures

As detailed in Table 4, retrofitting just 10 percent of North Carolina's pre-1994 built homes with fixtures that meet the current code can save 8.7 billion gallons per year. Taking the next step and retrofitting with high-efficiency fixtures can reduce water use by more than 9.4 billion gallons per year.

Table 4. Water Use if 10 percent of Pre-1994 Homes in N.C. were Retrofitted:

Fixtures	Water Usage with Pre-1994 Fixtures (million gallons per day)	Water Usage with Current Standard Fixtures (mgd)	Water Usage with High-Efficiency Fixtures (mgd)
Toilets	17	4.6	4
Showerheads	12.6	6.3	5.6
Faucets	10.2	5.3	4.6
Total	40.1	16.2	14.2

(Vickers, 2001, adaptation; See Appendix E)

Rather than attempting to mandate fixture standards, an alternative approach to meet permanent water efficiency goals is to upgrade fixtures through a combination of incentives, assistance and educational programs. A number of different non-regulatory approaches have been used in North Carolina and across the country to try and get older fixtures replaced with more efficient ones. These are presented and discussed in the following sections.

In the summer of 2007, the 148 residents of Orme, Tennessee ran out of water. Water was trucked in daily, but this was only enough for three hours of average residential use every day. In October 2007, seeking an opportunity to set a positive example for citizens and public water utilities, members of the Plumbing Manufacturers Institute volunteered to retrofit all the homes in the town with high-efficiency toilets, showerheads and faucets in a weekend campaign called "Race to Save the Water." The retrofits resulted in at least 45 percent greater water efficiencies without sacrificing performance, while providing six hours of average home water in addition to saving at least ninety gallons of water per day per resident.

Incentives for New Construction

Promoting the construction of green buildings is an excellent way to increase the use of high-efficiency fixtures in new and even renovated structures. These commercial and residential buildings can use at least 20 percent less water than conventional structures. To promote sustainable building practices at the local level, North Carolina law allows all counties and cities to provide reductions or partial rebates for building permit fees. To qualify for a fee reduction, buildings must meet guidelines established by the LEED program, the Green Globes program, N.C. HealthyBuilt Homes program or another nationally-recognized certification program.

N.C. Session Law 2007-241 grants authority to a few select jurisdictions to provide density bonuses, make adjustments to otherwise applicable development requirements, or provide other incentives to a developer or builder who builds or reconstructs developments that make a significant contribution to the reduction of energy consumption. The local jurisdiction is free to determine their own eligibility criteria based on generally recognized standards including LEED or other certification programs. In order to promote water efficiency, the state should

consider incorporating water efficiency incentives similar to the sustainable building incentive mentioned above.

For example, the city of Asheville waives fees for building permits and plan reviews for certain green building certifications for homes and mixed-use commercial buildings. Waivers for building permit fees may apply to residences with the N.C. HealthyBuilt Homes certification. Building permit and plan review fees must be paid in full but will be rebated upon certification. Fee waivers also apply to mixed-use commercial buildings if they include residential space. The city will also reduce plan review fees by 50 percent for any building that is seeking LEED certification. Commercial plan review fees must be paid in full but will be rebated upon certification.

An example of a voluntary approach that was driven by local market demand can be found in Chapel Hill, where the first WaterSense labeled home in the country was just built by Vanguard Homes in the Brier Chapel community. WaterSense homes are designed to use significantly less water inside and out, through efficient plumbing fixtures, hot water delivery, appliances, landscape design and irrigation systems. The Briar Chapel home was designed to be at least 20 percent more water efficient than homes currently being built under traditional standards, saving the homeowner more than 10,000 gallons of water per year.

To incentivize builders in different markets to utilize this approach, the state could offer tax credits to builders of water efficient homes. This could be similar to the approach proposed during the 2007 General Session in Senate Bill 505/House Bill 526 - Income Tax Credit for Energy Efficient Homes. This bill was intended to provide an income tax credit to builders of energy-efficient homes. A similar approach to develop an income tax credit for water efficient homes could be used. EPA's WaterSense partnership program has established specifications for new water-efficient single-family homes that could be used as guidelines to qualify for this income tax credit.

The Greensboro Utilities Department's water conservation program, known by the message "PLEASE CONSERVE...our tanks go out to you," promotes the installation of new water-saving hardware by distributing free water saving devices to its customers. The city's EPA award-winning Early Closing Toilet Flapper $4.00 Rebate program has sold 12,000 of the high-tech devices. Moreover, nearly 7,000 old showerheads have been traded in for high-efficiency replacements which are distributed through local libraries. These programs are estimated to save 3,000 to 4,000 gallons of water per dollar of investment.

Incentives for Retrofitting

One approach taken in other states is a tax-free holiday for WaterSense labeled fixtures. This would be similar to North Carolina's tax-free holiday for selected ENERGY STAR labeled products that encourages consumers to purchase energy efficient items. This tax-free holiday should also be expanded to at least twice a year. Both Georgia and Virginia have combined their ENERGY STAR and WaterSense tax-free holidays, as discussed below:

- Starting in 2008, WaterSense labeled water-efficient products were added as qualified purchases during Georgia's annual ENERGY STAR sales tax holiday. For four days in October, Georgia shoppers received a sales tax exemption for all products awarded either the ENERGY STAR or WaterSense EPA label. The sales tax exemption is intended for individuals and their residential use.

- ENERGY STAR and WaterSense qualified products with a sales price of $2,500 or less are eligible for tax-free purchase in the Commonwealth of Virginia. The exemption is provided during two four-day periods per year, in spring and autumn. The purchase can be for either residential or commercial use.

Another approach to encourage homeowners to replace their older fixtures with high-efficiency ones would be a tax credit for the purchase price of the fixtures, such as WaterSense labeled ones. A model could be the recently extended federal home improvement tax credits for energy efficiency home improvements. This covers a range of building materials and equipment that meet or exceed certain standards, including ENERGY STAR labeled products. The maximum amount that a taxpayer may claim from all of these tax credits combined is $500 over the lifetime of the tax credit.

A third option would be to encourage local water supply systems to offer free or reduced cost fixtures to their citizens to help them reduce residential water usage. These could include rebates, vouchers, financing programs, exchange programs or do-it-yourself retrofit kits. Examples include:

- Cary: In 2008, Cary established the high-efficiency toilet retrofit program to provide a water bill credit of $150 per toilet to residential and commercial water customers who replace older toilets that use 3.5 gallons or more per flush with WaterSense branded high-efficiency toilets that use 1.28 gallons per flush. The town started this program with funding for 400 rebates in the first year and increased this to 566 due to high demand.

- Asheville: The city of Asheville has an effective retrofit program that has distributed more than 34,000 residential retrofit kits, resulting in seven percent water savings. The Asheville Housing Authority has upgraded faucets, showerheads and toilets with high-efficiency devices for a savings of more than 20 million gallons annually.

- Charlotte: In 2000, Charlotte Mecklenburg Utilities started an education program to encourage customers to use less water all year, called WaterSmart. As part of this program, CMU offers free retrofit kits to customers who complete an online home water audit. Kits include high-efficiency devices and conservation information.

The City of Durham's Department of Water Management is working with Niagara Conservation Corporation to provide residents with high-efficiency water fixtures. Its toilet rebate program promotes residential replacement of inefficient, high water-use toilets with high-efficiency toilets. Individual consumers will receive a credit of $100 on their water bill. Approximately 3,000 rebates will be available during the first phase of the program. When the 3,000 toilet upgrades take effect, the community is estimated to save nearly 21 million gallons of water per year. Additionally, the city of Durham recently partnered with local Home Depot stores to offer two in-store water efficiency clinics. Residents who attended the clinics learned practical water-saving tips and received a free "I Save Water" kit, estimated to save each family $500 per year in water, sewer and energy costs. With approximately 3,000 high-efficiency toilets replacing conventional toilets, and 200 kits distributed, there are considerable water savings that will be gained for Durham through implementing these programs.

One way to encourage these types of efforts would be by giving credit for fixture replacement programs as part of the efficiency criteria for loans or grants from the Wastewater Reserve or Drinking Water Reserve, as listed in N.C. G.S. 159G-23 (3), or requiring a percentage of these grants or loans be spent on pre-1994 fixture upgrades. Increasing water efficiency could be more cost effective than increasing supply. These loans are available from state and local government for funding public water infrastructure needs.

Alternately, the governor or legislature could seek federal funds for these types of programs and allow the funds to be spent on fixture replacement efforts by local governments.

IV. Outreach and Education

Voluntary approaches have two main barriers: perceptions and availability. Both of these must be addressed in order to achieve water efficiency with respect to water-using fixtures.

One misperception is that high-efficiency fixtures are plagued with installation and maintenance dilemmas. This common misperception is echoed by the public and the plumbing and construction industries and is a major barrier to implementation. It stems from performance problems experienced in the early 1990s with first-generation water-conserving fixtures. Today, high-efficiency fixtures have proven performance records. As stated earlier, the WaterSense program includes a performance requirement for fixtures to receive certification. In order to overcome this barrier, the public and the plumbing and construction industries must be educated about recent high-efficiency fixture models, which have performance ratings equal to or exceeding standard fixtures. Additionally, public education about the performance, usage and cost savings of high-efficiency fixtures will help to increase demand, further diminishing the availability barrier.

There will also be a growing need for skilled plumbers and other trades to install high-efficiency water fixtures and plumbing systems. The state should work to provide training and education to plumbing professionals on the installation and maintenance of high-efficiency fixtures and other water conservation technologies, such as the certification offered by the Green Plumbers

program. The state should consider making this training part of the licensing requirements. Additionally, DENR, the N.C. Building Code Council and relevant trade and professional associations should work with the N.C. Community College system to train and retrain the skilled labor force needed. This would fit into the current efforts of the N.C. Community College system to increase the education and training it provides for the new energy economy.

Another misperception concerns the cost of high-efficiency fixture replacement. High-efficiency fixtures are thought to cost more than that of standard fixtures, when in fact they come in a similar range of costs. However, installation costs can add to the total cost of upgrading.

A third perception is that the up-front cost of replacing a functioning fixture with a high-efficiency model is money not well spent. This may not be the case for replacing older showerheads and sink faucet aerators with high-efficiency models, which can generate savings in a short time. Savings from replacing older toilets with high-efficiency models depends on a number of factors, such as the water use or functionality of the old fixture, usage rates and water and sewer costs.

Another challenge is the lack of availability of high-efficiency fixtures. Many home improvement stores in North Carolina carry a limited number of high-efficiency water fixtures. Even informed consumers may find it difficult to locate the high-efficiency models in stores, and the choices for style, finish/color and price range may be limited. In order to overcome this barrier, retail locations must be encouraged or required to carry a range of high-efficiency options and to make those options easily identifiable to consumers in stores.

Outreach and educational efforts targeted to North Carolina's businesses, industries, citizens and local governments should include information on the availability, performance and cost effectiveness of new water conservation fixtures and other water saving techniques. It is also essential to have a consistent statewide message on efficient water use, an accessible repository of water efficiency information, a system of networking with others across the state working on water efficiency issues and expert technical assistance. This could be done at the state level with DENR working in partnership with local water systems to provide their customers with up-to-date information, education and training.

DENR should work with state and national stakeholders to keep abreast of current and emerging water conservation fixtures and to track new standards and regulatory developments. This should be a collaborative effort with the North Carolina Building Code Council. Stakeholders include EPA's WaterSense program, trade associations (such as the Plumbing Manufactures Institute and the N.C. Home Builders Association), retail merchants, ASME and other interested parties. DENR should report to the legislature future regulatory and non-regulatory approaches along with emerging trends that are being used by other states, regions and local governments.

V. Leadership by Example

Under North Carolina Session Law 2007-546, all new major facility projects of state agencies are required to have 20 percent less indoor water usage overall than if they were built to current North Carolina plumbing code. However, there is not a similar requirement when current fixtures are replaced. The state could take the next step toward increased water efficiency in state facilities by requiring state agencies to retrofit only with high-efficiency plumbing fixtures that are WaterSense labeled or are at least 20 percent more efficient than required by the current plumbing codes.

If the state moves in the direction of retrofitting with water efficient fixtures, all plumbing fixtures that are on state purchasing contract should be either WaterSense labeled or at least 20 percent more efficient than current plumbing code. This includes toilets (tank and flushometer models), urinals, showerheads and faucets. This would also allow local governments and school districts to access these products at a cost savings. Exceptions will be needed for special requirements in institutions such as prisons and hospitals.

NC Project Green, the sustainability effort for state and local government, should keep focusing on water conservation efforts. NC Project Green is coordinated by DENR and provides education, networking and communication for government agencies at all levels on sustainability efforts. This project is one of the best ways to provide any needed education and training to state agencies on high-efficiency plumbing fixture purchase, installation and operation. It also allows agencies to provide support to each other on these issues. The state's Utility Savings Initiative also can be utilized to promote the implementation of WaterSense labeled products and help track state agency water use trends.

An example of an exceptional state agency dedicated to water conservation is the University of North Carolina at Chapel Hill. The university has installed 300 waterless urinals in new buildings on campus, and retrofitted 30 older buildings with dual flush toilets. The installation of these 300 units is estimated to save the university 12 million gallons of water annually. In high-use areas, waterless urinals save at least 40,000 gallons per unit per year. In addition, high-efficiency showerheads and faucets have been installed in all new residence halls.

VI. Recommendations

DENR makes the following recommendations regarding water efficiency standards for water-using fixtures in residential and commercial buildings.

1. The N.C. General Assembly should study implementing a phased approach to requiring all new residential and commercial construction to use high-efficiency toilets, urinals, showerheads and faucets. This could include:
    - Establish the maximum flow rate and performance of high-efficiency toilets, urinals, showerheads and faucets, which could be based on EPA's WaterSense criteria.
    - Setting a date after which only high-efficiency toilets, urinals and faucets can be sold and installed in the state.
    - Setting a date after which only high-efficiency showerheads can be sold and installed in the state once thermal shock issues have been addressed.
    - Requiring manufactures to sell an increasing annual percentage of high-efficiency water-using fixtures over this time frame.
    - Evaluate the legal ability of the state to implement such standards.

2. Evaluate the use of economic incentives, such as a sales tax holiday and tax credits to encourage the use of high-efficiency water fixtures.

3. Mandate all state buildings use WaterSense labeled or high-efficiency fixtures when existing fixtures are replaced. Provide exemptions for special situations, such as prisons and hospitals.

4. Require only WaterSense labeled or high-efficiency fixtures be made available on state purchasing contract. Provide exemptions for special situations, such as prisons and hospitals.

5. Provide water users with information on the availability, performance and cost effectiveness of new water conservation fixtures and other water saving techniques through DENR's outreach and education efforts. DENR should also partner with the EPA's WaterSense program on a statewide awareness effort.

6. Encourage the North Carolina Building Code Council to investigate the benefits and implications of requiring high-efficiency fixtures to be used in all new residential and commercial construction.

7. Request the NC Community College system and other educational institutions develop programs to train and retrain plumbing professionals on the installation and maintenance of high-efficiency fixtures and other water conservation technologies.

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VIII. Appendices

Appendix A – Water Efficiency Definitions

As used in report, the following terms have the following meanings:

- **American National Standards Institute (ANSI)-** the institute responsible for the creation, promulgation, and use of U.S. Standards and conformity assessment systems.
- **American Society of Mechanical Engineers (ASME)-** the non-profit organization that recommends U.S. Standards for plumbing fixtures to ANSI.
- **Energy Policy Act of 1992 (EPAct)-** a federal low that established maximum allowable water-use requirements for toilets, urinals, showerheads, and faucets manufactured, sold, or installed in the U.S.
- **Flow Rate-** the amount of water transmitted, such as through a pipe, fixture, or appliance.
- **Flushometer-Valve Toilet-** a tankless toilet with the flush valve attached to a pressurized water supply line. When activated, the connecting pipe supplies water to the toilet at a flow rate necessary to flush waste. Also know as a *Flushometer toilet*.
- **GPCD-** gallons per capita per day.
- **GPD-** gallons per day.
- **GPF-** gallons per flush.
- **GPM-** gallons per minute.
- **GPMC-** gallons per metered cycle.
- **Green Building-** the practice of increasing the efficiency with which buildings use resources: energy, water, and materials, while reducing building impacts on human health and the environment during the building's lifecycle, through better design, construction, operation, maintenance, and removal.
- **Green Plumbers Program –** A free training and certification program for plumbers to promote water efficiency technologies and techniques. www.GreenPlumbersUSA.com.
- **High-Efficiency Toilets** (**HET's**)-a toilet that is either of the following: (A) A *dual flush* toilet with an effective flush volume that does not exceed 1.28 gallons, where effective flush volume is defined as the composite, average flush volume of two reduced flushes and one full flush. Flush volumes shall be tested in accordance with ASME A112.19.2 and ASME A112.19.14. (B) A *single flush* toilet where the effective flush volume shall not exceed 1.28 gallons. The effective flush volume is the average flush volume when tested in accordance with ASME A112.19.2.
- **NC HealthyBuilt Homes Program-** a collaborative program between the NC Solar Center, the State Energy Office, NC Department of Administration, and local building professional organizations; that provides a certification for healthy and affordable built homes that reduce energy and water usage and protects the environment.
- **LEED (Leadership in Energy and Environmental Design)-** a green building rating and certification program from the U.S. Green Building Council for residential and commercial buildings that are environmentally healthy.

- **Faucet aerator-** a screenlike device that screws onto or is enclosed in a faucet and that reduces flow by adding air to the water.
- **High-Efficiency Urinal** (**HEU**)- a urinal that uses no more than 0.5 gallons per flush.
- **Metered Faucet-** a faucet that delivers a predetermined amount of water and then shuts-off.
- **MGD**- million gallons per day.
- **Plumbing Fixture**- a lavatory faucet, lavatory faucet replacement aerator, kitchen faucet, kitchen faucet replacement aerator, shower head, urinal, and toilet. Plumbing fixture does not include parts necessary for routine maintenance.
- **Potable Water**- water suitable for drinking.
- **Pre-Rinse Spray Valve- a** spraying device used for rinsing and cleaning with automatic shut-off valves to supply water only when needed.
- **PSI**- pounds per square inch of water pressure.
- **Reclaimed water**- treated, recycled wastewater of a quality suitable for non-potable applications.
- **Retrofit**- to change, alter, or adjust plumbing fixtures or other equipment or appliances to save water or make them operate more efficiently.
- **Toilet**- a fixture that consists of a water flushed bowl, any associated flush valve, and that is used for the disposal of all wastes from the human body.
- **Urinal**-a fixture that consists of a water flushed bowl, and any associated flush valve used for the disposal of human urine.
- **Wall-mounted/wall-outlet toilets**- models that are mounted on the wall and discharge to the drainage system through the wall.
- **Water Conservation**- reducing use of water.
- **Water Efficiency**- to continually use the least amount of water to satisfy a specific need.
- **Water Free Urinal-** a plumbing fixture that does not require a water supply or flushing device to receive and convey only liquid waste through a trap seal and into the gravity drainage system for such function and that meets the requirements of the American Society of Mechanical Engineers (ASME) standard A112.19.2M-95 or the American National Standards Institute (ANSI) standard Z124.9-94 or any equivalent standard**.**
- **WaterSense®**- a public-private partnership program sponsored by the U.S. EPA to promote and enhance the market for water-efficient products and programs with a simple, easy-to-identify label.

Appendix B - Federal Fixture Standards Development

The Energy Policy and Conservation Act of 1975 [Title III, Part B] created the *Energy Conservation Program for Consumer Products other than Automobiles* within the U.S. Department of Energy. The products covered under this program include faucets, showerheads, water closets and urinals. This program consisted of three parts: testing, labeling and energy / water conservation standards (Alliance for Water Efficiency, 2008).

The U.S. Energy Policy Act of 1992 established nationwide maximum flow standards for residential and commercial fixtures. Fixtures manufactured for use in the U.S. market must have water use characteristics equal to or more efficient than EPAct 1992 Water Use Standards (Energy Policy Act, 1992).

Fixture	**EPAct 1992 Water Use Standard (Summary)**
Commercial and Residential Toilets	1.6 gpf
Faucets	2.5 gpm at 80 psi
Residential Showerheads	2.5 gpm at 80 psi
Urinals	1.0 gpf

(Energy Conservation Standards, 42 U.S.C.)

In 1994, American Society of Mechanical Engineers A112.18.1M-1994 – Plumbing Supply Fittings set the maximum flow rate for lavatory faucets at 2.2 gpm at 60 psi. In response to industry requests for conformity with a single standard, in 1998, the Department of Energy issued a final rule that resulted from EPCA 1975 (63 *Federal Register* 13307; March 18, 1998). This final rule codified in 10 CFR Part 430, established maximum allowable flow for faucets as 2.2 gpm @ 60 psig; showerheads as 2.5 gpm at 80 psig; water closets as 1.6 gallons per flush (gpf); and urinals at 1.0 gpf (Energy Conservation Program for Consumer Products, 10 *CFR* Part 430.32).

The Energy Policy Act of 2005 requires that pre-rinse spray valves manufactured after January 2006 must have a maximum flow rate of 1.6 gpm (U.S Department of Energy Web page). This was the only water efficiency standard set by EPAct 2005.

Both EPAct 1992 and 2005 are codified in U.S. Code Title 42, Chapter 77, Subchapter III, Part A § 6295, *Energy Conservation Standards*. Parts (j), (k) and (dd) completely detail current efficiency standards for water fixtures. Appendix B contains a copy of these elements of the U.S. Code (U.S. Code Collection, Cornell University Law School Web page).

Federal legislative maximum flow standards are the basis for design and manufacture of all water fixtures used in this country and this process is referred to as standard setting.

Standards Setting for Fixtures

The American National Standards Institute is responsible for administration of the complex standard setting process. ANSI has accredited both the American Society of Mechanical Engineers and the International Association of Plumbing and Mechanical Officials to develop U.S. standards for plumbing fixtures and fittings. As the state-of-the-art of plumbing evolves the ASME A112 and IAPMO Z124 committees are developing and maintaining standards related to toilets, urinals, showerheads, faucets, pre-rinse spray valves and other fixtures and fittings used in indoor plumbing systems.

ANSI requires a balance of stakeholder interests in standard setting committees and these project groups are comprised of member representatives from manufacturers, government,

laboratories, academia, consultants and others. The following are examples of plumbing fixture standard setting committees:

- ASME/ANSI A112.19.2 - Vitreous China Plumbing Fixtures
- ASME/ANSI A112.19.5 - Trim For Water Closet Bowls, Tanks and Urinals
- ASME/ANSI A112.19.14 - Dual Flush for 6-liter Water Closets
- ASME/ANSI A112.4.7 - Point of Use and Branch Water Sub-Metering Systems
- ASME/ANSI A112.19.19 – Vitreous China Non-Water Urinals
- ASME/ANSI A112.18.1 – Plumbing Supply Fittings
- IAPMO/ANSI Z124 - Plastic Plumbing Fixtures

ANSI approved national standards are voluntary consensus-based standards (Alliance or Water Efficiency, 2008).

Plumbing Code and Water Efficiency

The basis of plumbing codes dates back to the early 1900s when proper sanitation and safety was a much greater concern than water efficiency. Plumbing codes have been updated to incorporate federal law but the codes have never implemented measures solely to ensure water efficiency.

A plumbing code does not have legal status until it is adopted by a governmental jurisdiction. A version of national plumbing code is often amended to better suit local conditions before it is adopted and implemented as a matter of law. Codes are designed for adoption by reference only, by making necessary additions, deletions and amendments in their adopting document only. Codes are copyrighted and incorporation of any part into a published document is prohibited.

At one time there were five plumbing code development organizations in the U.S., but now there are only two. The International Association of Plumbing and Mechanical Officials produces the *Uniform Plumbing Code*). The International Code Council produces the *International Plumbing Code*.

Like the standards setting process, code development is a stakeholder process. Water efficiency representatives participate in the continuous code development process. Plumbing code amendment is a three-year development cycle for the authoring organization. When a new updated version of code is published, IAPMO and ICC encourage all jurisdictions to adopt the newest version of the code. In general, the IPC is more prevalent in the eastern part of the U.S., and the UPC is more prevalent in the west. Both codes are a result of constant amendments of plumbing codes written in early part of the 1900s (Alliance or Water Efficiency, 2008).

ICC Writes the IPC

The ICC was formed in 1994 as a composite of the following three code organizations, with the express purpose of promulgating a single set of model codes in the best interest of the building community and the general public:

- Building Officials and Code Administrators International;
- International Conference of Building Officials; and
- Southern Building Code Congress International.

The Building Owners and Managers Association International supports the IPC as superior to the UPC because of scientifically based health and safety concerns, and input is received from a diverse, nationwide body of building, plumbing, mechanical and fire officials, as well as industry representatives. Support is also extended to the IPC because it is part of the family of "I" codes, recommended for adoption to bring consistency to the US building regulatory structure (BOMO International Web page).

NC Plumbing Code

In the past, North Carolina relied upon the State Board of Health to review and revise or amend the N.C. plumbing code (North Carolina General Statute 143, Article 9 § 143-138). Now the N.C. Building Code Council committees collaborate to periodically revise the NCPC. The 2002 version of the NCPC adopted the 2000 IPC and the 2006 version of the NCPC adopted the 2003 IPC (2006 North Carolina Plumbing Code).

The 2002 and 2006 NCPC water efficiency requirements are identical for fixtures. These are shown in Appendix C (2002 North Carolina Plumbing Code, 2006 North Carolina Plumbing Code). Both versions of the code are based upon EPAct 1992.

Appendix C - Federal Preemption Rule

The general rule of preemption is Title 42, US Code, § 6297, *Effect on other law*. This federal law precludes state and local regulations setting efficiency standards more stringent than the national voluntary consensus standard. Part (d), *Waiver of Federal preemption*, describes how a state or river basin commission may petition the Secretary of Energy requesting a rule that will allow a state regulation become effective with respect to a product covered by federal law (42 U.S.C. § 6297). The state may regulate water efficiency where the federal government has not acted or, if the federal government has acted, where a waiver is granted. Any state regulation that sets forth procurement standards for a state (or political subdivision thereof) more stringent than the corresponding federal energy conservation standards will not be superseded.

42 U.S.C. *§ 6297: Effect on other law (Excerpt)*

(b) **General rule of preemption for energy conservation standards before Federal standard becomes effective for product**

Effective on March 17, 1987, and ending on the effective date of an energy conservation standard established under section 6295 of this title for any covered product, no State regulation, or revision thereof, concerning the energy efficiency, energy use, or water use of the covered product shall be effective with respect to such covered product, unless the State regulation or revision—

(1) was prescribed or enacted before January 8, 1987, and is applicable to products before January 3, 1988, or in the case of any portion of any regulation which establishes requirements for fluorescent lamp ballasts, was prescribed or enacted before June 28, 1988, or in the case of any portion of any regulation which establishes requirements for fluorescent or incandescent lamps, flow rate requirements for showerheads or faucets, or water use requirements for water closets or urinals, was prescribed or enacted before October 24, 1992;

(2) is a State procurement regulation described in subsection (e) of this section;

(3) is a regulation described in subsection (f)(1) of this section or is prescribed or enacted in a building code for new construction described in subsection (f)(2) of this section;

(4) is a regulation prohibiting the use in pool heaters of a constant burning pilot, or is a regulation (or portion thereof) regulating fluorescent lamp ballasts other than those to which paragraph (5) of section 6295 (g) of this title is applicable, or is a regulation (or portion thereof) regulating fluorescent or incandescent lamps other than those to which section 6295 (i) of this title is applicable, or is a regulation (or portion thereof) regulating showerheads or faucets other than those to which section 6295 (j) of this title is applicable or regulating lavatory faucets (other than metering faucets) for installation in public places, or is a regulation (or portion thereof) regulating water closets or urinals other than those to which section 6295 (k) of this title is applicable;

(5) is a regulation described in subsection (d)(5)(B) of this section for which a waiver has been granted under subsection (d) of this section;

(6) is a regulation effective on or after January 1, 1992, concerning the energy efficiency or energy use of television sets; or

(7) is a regulation (or portion thereof) concerning the water efficiency or water use of low consumption flushometer valve water closets.

(c) **General rule of preemption for energy conservation standards when Federal standard becomes effective for product**

Except as provided in section 6295 (b)(3)(A)(ii) of this title, subparagraphs (B) and (C) of section 6295 (j)(3) of this title, and subparagraphs (B) and (C) of section 6295 (k)(3) of this title and effective on the effective date of an energy conservation standard established in or prescribed under section 6295 of this title for any covered product, no State regulation concerning the energy efficiency, energy use, or water use of such covered product shall be effective with respect to such product unless the regulation—

(1) is a regulation described in paragraph (2) or (4) of subsection (b) of this section, except that a State regulation (or portion thereof) regulating fluorescent lamp ballasts other than those to which paragraph (5) of section 6295 (g) of this title is applicable shall be effective only until the effective date of a standard that is prescribed by the Secretary under paragraph (7) of such section and is applicable to such ballasts, except that a State regulation (or portion thereof) regulating fluorescent or incandescent lamps other than those for which section 6295 (i) of this

title is applicable shall be effective only until the effective date of a standard that is prescribed by the Secretary and is applicable to such lamps;
(2) is a regulation which has been granted a waiver under subsection (d) of this section;
(3) is in a building code for new construction described in subsection (f)(3) of this section;
(4) is a regulation concerning the water use of lavatory faucets adopted by the State of New York or the State of Georgia before October 24, 1992;
(5) is a regulation concerning the water use of lavatory or kitchen faucets adopted by the State of Rhode Island prior to October 24, 1992;
(6) is a regulation (or portion thereof) concerning the water efficiency or water use of gravity tank-type low consumption water closets for installation in public places, except that such a regulation shall be effective only until January 1, 1997; or
(7)
(A) is a regulation concerning standards for commercial prerinse spray valves adopted by the California Energy Commission before January 1, 2005; or
(B) is an amendment to a regulation described in subparagraph (A) that was developed to align California regulations with changes in American Society for Testing and Materials Standard F2324;
(8)
(A) is a regulation concerning standards for pedestrian modules adopted by the California Energy Commission before January 1, 2005; or
(B) is an amendment to a regulation described in subparagraph (A) that was developed to align California regulations to changes in the Institute for Transportation Engineers standards, entitled “Performance Specification: Pedestrian Traffic Control Signal Indications”.
(d) **Waiver of Federal preemption**
(1)
(A) Any State or river basin commission with a State regulation which provides for any energy conservation standard or other requirement with respect to energy use, energy efficiency, or water use for any type (or class) of covered product for which there is a Federal energy conservation standard under section 6295 of this title may file a petition with the Secretary requesting a rule that such State regulation become effective with respect to such covered product.
(B) Subject to paragraphs (2) through (5), the Secretary shall, within the period described in paragraph (2) and after consideration of the petition and the comments of interested persons, prescribe such rule if the Secretary finds (and publishes such finding) that the State or river basin commission has established by a preponderance of the evidence that such State regulation is needed to meet unusual and compelling State or local energy or water interests.
(C) For purposes of this subsection, the term “unusual and compelling State or local energy or water interests” means interests which—
(i) are substantially different in nature or magnitude than those prevailing in the United States generally; and
(ii) are such that the costs, benefits, burdens, and reliability of energy or water savings resulting from the State regulation make such regulation preferable or necessary when measured against the costs, benefits, burdens, and reliability of alternative approaches to energy or water savings or production, including reliance on reasonably predictable market-induced improvements in efficiency of all products subject to the State regulation.

The factors described in clause (ii) shall be evaluated within the context of the State's energy plan and forecast, and, with respect to a State regulation for which a petition has been submitted to the Secretary which provides for any energy conservation standard or requirement with respect to water use of a covered product, within the context of the water supply and groundwater management plan, water quality program, and comprehensive plan (if any) of the State or river basin commission for improving, developing, or conserving a waterway affected by water supply development.

[Subsequent related part below]

(e) **Exception for certain State procurement standards**
Any State regulation which sets forth procurement standards for a State (or political subdivision thereof) shall not be superseded by the provisions of this part if such standards are more stringent than the corresponding Federal energy conservation standards.

Appendix D - US Code Title 42 (Excerpt)

U.S.C. 42 Chapter 77, Subchapter III, Part A §6295. Energy Conservation Standards (parts j, k, dd)

(j) Standards for showerheads and faucets
(1) The maximum water use allowed for any showerhead manufactured after January 1, 1994, is 2.5 gallons per minute when measured at a flowing water pressure of 80 pounds per square inch. Any such showerhead shall also meet the requirements of ASME/ANSI A112.18.1M–1989, 7.4.3(a).
(2) The maximum water use allowed for any of the following faucets manufactured after January 1, 1994, when measured at a flowing water pressure of 80 pounds per square inch, is as follows:

Lavatory faucets	2.5 gallons per minute
Lavatory replacement aerators	2.5 gallons per minute
Kitchen faucets	2.5 gallons per minute
Kitchen replacement aerators	2.5 gallons per minute
Metering faucets	0.25 gallons per cycle

(3)
(A) If the maximum flow rate requirements or the design requirements of ASME/ANSI Standard A112.18.1M–1989 are amended to improve the efficiency of water use of any type or class of showerhead or faucet and are approved by ANSI, the Secretary shall, not later than 12 months after the date of such amendment, publish a final rule establishing an amended uniform national standard for that product at the level specified in the amended ASME/ANSI Standard A112.18.1M and providing that such standard shall apply to products manufactured after a date which is 12 months after the publication of such rule, unless the Secretary determines, by

rule published in the Federal Register, that adoption of a uniform national standard at the level specified in such amended ASME/ANSI Standard A112.18.1M—
(i) is not technologically feasible and economically justified under subsection (o) of this section;
(ii) is not consistent with the maintenance of public health and safety; or
(iii) is not consistent with the purposes of this chapter.
(B)
(i) As part of the rulemaking conducted under subparagraph (A), the Secretary shall also determine if adoption of a uniform national standard for any type or class of showerhead or faucet more stringent than such amended ASME/ANSI Standard A112.18.1M—
(I) would result in additional conservation of energy or water;
(II) would be technologically feasible and economically justified under subsection (o) of this section; and
(III) would be consistent with the maintenance of public health and safety.
(ii) If the Secretary makes an affirmative determination under clause (i), the final rule published under subparagraph (A) shall waive the provisions of section 6297 (c) of this title with respect to any State regulation concerning the water use or water efficiency of such type or class of showerhead or faucet if such State regulation—
(I) is more stringent than amended ASME/ANSI Standard A112.18.1M for such type or class of showerhead or faucet and the standard in effect for such product on the day before the date on which a final rule is published under subparagraph (A); and
(II) is applicable to any sale or installation of all products in such type or class of showerhead or faucet.
(C) If, after any period of five consecutive years, the maximum flow rate requirements of the ASME/ANSI standard for showerheads are not amended to improve the efficiency of water use of such products, or after any such period such requirements for faucets are not amended to improve the efficiency of water use of such products, the Secretary shall, not later than six months after the end of such five-year period, publish a final rule waiving the provisions of section 6297 (c) of this title with respect to any State regulation concerning the water use or water efficiency of such type or class of showerhead or faucet if such State regulation—
(i) is more stringent than the standards in effect for such type of class of showerhead or faucet; and
(ii) is applicable to any sale or installation of all products in such type or class of showerhead or faucet.
(k) Standards for water closets and urinals
(1)
(A) Except as provided in subparagraph (B), the maximum water use allowed in gallons per flush for any of the following water closets manufactured after January 1, 1994, is the following: Gravity tank-type toilets 1.6 gpf. Flushometer tank toilets 1.6 gpf. Electromechanical hydraulic toilets 1.6 gpf. Blowout toilets 3.5 gpf.
(B) The maximum water use allowed for any gravity tank-type white 2-piece toilet which bears an adhesive label conspicuous upon installation consisting of the words “Commercial Use Only” manufactured after January 1, 1994, and before January 1, 1997, is 3.5 gallons per flush.
(C) The maximum water use allowed for flushometer valve toilets, other than blowout toilets, manufactured after January 1, 1997, is 1.6 gallons per flush.

(2) The maximum water use allowed for any urinal manufactured after January 1, 1994, is 1.0 gallon per flush.
(3)
(A) If the maximum flush volume requirements of ASME Standard A112.19.6–1990 are amended to improve the efficiency of water use of any low consumption water closet or low consumption urinal and are approved by ANSI, the Secretary shall, not later than 12 months after the date of such amendment, publish a final rule establishing an amended uniform national standard for that product at the level specified in amended ASME/ANSI Standard A112.19.6 and providing that such standard shall apply to products manufactured after a date which is one year after the publication of such rule, unless the Secretary determines, by rule published in the Federal Register, that adoption of a uniform national standard at the level specified in such amended ASME/ANSI Standard A112.19.6—
(i) is not technologically feasible and economically justified under subsection (o) of this section;
(ii) is not consistent with the maintenance of public health and safety; or
(iii) is not consistent with the purposes of this chapter.

[Subsequent related part below]

(dd) Commercial prerinse spray valves
Commercial prerinse spray valves manufactured on or after January 1, 2006, shall have a flow rate of not more than 1.6 gallons per minute.

(42 U.S.C. § 6295)

Appendix E – Water Savings Calculations
Using housing data from 2000 Census, 2.87 million homes in N.C. were built pre-1994.
10 percent = 287,000 homes built pre-1994.

Reference all values below from the Vickers 1991 Chart:

For Pre-1994 homes -

Toilet use (5.5 gal/flush) in 2.7 person home is 59.4 gal/day;
Showerhead use (3.4 gal/min) in 2.7 person home is 44 gal/day;
Faucet use (3.3 gal/min) in 2.7 person home is 36.6 gal/day.

So, daily respective totals of water used in 10 percent of pre-1994 homes:
Toilet use = (59.4 gal/day)(2.87E5 pre-1994 homes) = 17.0 million gallons per day, MGD
Showerhead use = (44 gal/day)(2.87E5 pre-1994 homes) = 12.6 MGD
Faucet use = (36.6 gal/day)(2.87E5 pre-1994 homes) = 10.5 MGD

For current standard homes -

Toilet use (1.6 gal/flush) in 2.7 person home is 16.2 gal/day;

Showerhead use (1.7 gal/min) in 2.7 person home is 22.1 gal/day;
Faucet use (1.7 gal/min) in 2.7 person home is 18.4 gal/day.

So, daily respective totals of water used in 10 percent of pre-1994 homes:
Toilet use = (16.2 gal/day)(2.87E5 pre-1994 homes) = 4.6 MGD
Showerhead use = (22.1 gal/day)(2.87E5 pre-1994 homes) = 6.3 MGD
Faucet use = (18.4 gal/day)(2.87E5 pre-1994 homes) = 5.3 MGD

For High-Efficiency homes (uses WaterSense values with the same assumptions for use from the Vickers 1991 chart) -
Toilet use = (1.28 gal/flush)(4 flushes per person per day)(2.7 person per home) = 13.8 gal/day;
Showerhead use (1.5 gal/min) (4.8 shower-use-minutes per person per day)(2.7 person per home) = 19.4 gal/day;
Faucet use (1.5 gal/min) (4.0 faucet-use-minutes per person per day)(2.7 person per home) = 16.2 gal/day.

So, daily respective totals of water used in 10 percent of pre-1994 homes:
Toilet use = (13.8 gal/day)(2.87E5 pre-1994 homes) = 4.0 MGD
Showerhead use = (19.4 gal/day)(2.87E5 pre-1994 homes) = 5.6 MGD
Faucet use = (16.2 gal/day)(2.87E5 pre-1994 homes) = 4.6 MGD

When totals in the table are added and multiplied by 365 days per year:
23.9 mgd x 365 days/year = 8.72 billion gallons per year, BGY
25.9 mgd x 365 days/year = 9.45 BGY

Appendix F - California Legislation
California Assembly Bill 715, Chapter 499

Assembly Bill No. 715

CHAPTER 499

An act to amend and renumber Section 17921.5 of, to add Sections 17921.4 and 18944.11 to, and to repeal and add Section 17921.3 of, the Health and Safety Code, relating to water conservation appliances.

[Approved by Governor October 11, 2007. Filed with Secretary of State October 11, 2007.]

legislative counsel's digest

AB 715, Laird. Water conservation: low-flush water closets and urinals.

(1) The State Housing Law requires all water closets sold or installed in this state to be water closets and associated flushometer valves, if any, that use no more than an average of 1.6 gallons per flush and urinals and associated flushometer valves, if any, that use no more than an average of one gallon per flush and requires these water closets, urinals, and associated

flushometer valves to meet performance standards established by the American Society of Mechanical Engineers standards. Violation of the State Housing Law is punishable as a misdemeanor.

This bill would require that all water closets sold or installed in this state shall use no more than an average of 1.6 gallons per flush and that all urinals sold or installed in this state use no more than an average of one gallon per flush. It would require that, on and after January 1, 2014, all water closets and all urinals, other than blow-out urinals, sold or installed in this state shall be high-efficiency water closets and urinals. These provisions would remain operative only until January 1, 2014, or until the date on which the California Building Standards Commission includes standards in the California Building Standards Code that conform to these requirements, whichever date is later.

The bill also would require manufacturers selling water closets or urinals in this state to offer high-efficiency models for sale in a specified percentage of all models offered, including 50% by January 1, 2010, 67% by January 1, 2011, 75% by January 1, 2012, 85% by January 1, 2013, and 100% by January 1, 2014. It would require these manufacturers, by January 30 of 2010, 2011, 2012, and 2013, to inform, in writing, the California Energy Commission of the percentage of high-efficiency models it is offering for sale that year. These provisions would remain operative only until January 1, 2014, or until the date on which the California Building Standards Commission includes standards in the California Building Standards Code that conform to these requirements, whichever date is later.

The bill would require a nonwater-supplied urinal approved for installation or sold in this state to satisfy specified requirements.

The bill would require, on or before July 1, 2009, any state agency that adopts or proposes building standards for plumbing systems to consider developing building standards that would govern the use of nonwater-supplied urinals for submission to the California Building Standards Commission, as specified.

By changing the definition of a crime, this bill would impose a state-mandated local program.

(2) The California Constitution requires the state to reimburse local agencies and school districts for certain costs mandated by the state. Statutory provisions establish procedures for making that reimbursement.

This bill would provide that no reimbursement is required by this act for a specified reason.

The people of the State of California do enact as follows:

SECTION 1. Section 17921.3 of the Health and Safety Code is repealed.

SEC. 2. Section 17921.3 is added to the Health and Safety Code, to read:

17921.3. (a) All water closets and urinals installed or sold in this state shall meet performance, testing, and labeling requirements established by the American Society of Mechanical Engineers standard A112.19.2-2003, or A112.19.14-2001, as applicable. No other marking and labeling requirements shall be required by the state. All water closets and urinals installed or sold in this state shall be listed by an American National Standards Institute accredited third-party certification agency to the appropriate American Society of Mechanical Engineers standards set forth in this subdivision. No other listing or certification requirements shall be required by the state.

(b) (1) All water closets sold or installed in this state shall use no more than an average of 1.6 gallons per flush. On and after January 1, 2014, all water closets, other than institutional water closets, sold or installed in this state shall be high-efficiency water closets.
(2) All urinals sold or installed in this state shall use no more than an average of one gallon per flush. On and after January 1, 2014, all urinals, other than blow-out urinals, sold or installed in this state shall be high-efficiency urinals.
(3) Each manufacturer selling water closets or urinals in this state shall have not less than the following percentage of models offered for sale in this state of high-efficiency water closets plus high-efficiency urinals as compared to the total number of models of water closets plus urinals offered for sale in this state by that manufacturer:
(A) Fifty percent in 2010.
(B) Sixty-seven percent in 2011.
(C) Seventy-five percent in 2012.
(D) Eighty-five percent in 2013.
(E) One hundred percent in 2014 and thereafter.

(4) Each manufacturer that sells water closets or urinals in this state shall inform the State Energy Resources Conservation and Development Commission, the department, and the California Building Standards Commission, in writing, of the percentage of models of high-efficiency water closets plus high-efficiency urinals offered for sale in this state as compared to the total number of models of water closets plus urinals offered for sale in this state by that manufacturer for each year 2010 to 2013, inclusive, by January 30 of that year.
(c) Any city, county, or city and county may enact an ordinance to allow the sale and installation of nonlow-consumption water closets or urinals upon its determination that the unique configuration of building drainage systems or portions of a public sewer system within the jurisdiction, or both, requires a greater quantity of water to flush the system in a manner consistent with public health. At the request of a public agency providing sewer services within the jurisdiction, the city, county, or city and county shall hold a public hearing on the need for an ordinance as provided in this subdivision. Prior to this hearing or to the enactment of the ordinance, those agencies responsible for the provision of water and sewer services within the jurisdiction, if other than the agency considering adoption of the ordinance, shall be given at least 30 days' notice of the meeting at which the ordinance may be considered or adopted.
(d) Notwithstanding subdivision (b), on and after January 1, 1994, water closets and urinals that do not meet the standards referenced in subdivision
(b) may be sold or installed for use only under either of the following circumstances:
(1) Installation of the water closet or urinal to comply with the standards referenced in subdivision (b) would require modifications to plumbing system components located beneath a finished wall or surface.
(2) The nonlow-consumption water closets, urinals, and flushometer valves, if any, would be installed in a home or building that has been identified by a local, state, or federal governmental entity as a historical site and historically accurate water closets and urinals that comply with the flush volumes specified in subdivision (b) are not available.
(e) (1) This section does not preempt any actions of cities, counties, cities and counties, or districts that prescribe additional or more restrictive conservation requirements affecting either of the following:

(A) The sale, installation, or use of low-consumption water closets, urinals, and flushometer valves that meet the standards referenced in subdivision (a), (b), or (c).
(B) The continued use of nonlow-consumption water closets, urinals, and flushometer valves.
(2) This section does not grant any new or additional powers to cities, counties, cities and counties, or districts to promulgate or establish laws, ordinances, regulations, or rules governing the sale, installation, or use of low-consumption water closets, urinals, and flushometer valves.
(f) The California Building Standards Commission or the department may, by regulation, reduce the quantity of water per flush required pursuant to this section if deemed appropriate or not inconsistent in light of other standards referenced in the most recent version of the California Plumbing Code, and may refer to successor standards to the standards referenced in this section if determined appropriate in light of standards referenced in the most recent version of the California Plumbing Code.
(g) As used in this section, the following terms have the following meanings:
(1) “Blow-out urinal” means a urinal designed for heavy-duty commercial applications that work on a powerful nonsiphonic principle.
(2) “High-efficiency water closet” means a water closet that is either of the following:
(A) A dual flush water closet with an effective flush volume that does not exceed 1.28 gallons, where effective flush volume is defined as the composite, average flush volume of two reduced flushes and one full flush. Flush volumes shall be tested in accordance with ASME A112.19.2 and ASME A112.19.14.
(B) A single flush water closet where the effective flush volume shall not exceed 1.28 gallons. The effective flush volume is the average flush volume when tested in accordance with ASME A112.19.2.
(3) “High-efficiency urinal” means a urinal that uses no more than 0.5 gallons per flush.
(4) “Institutional water closet” means any water closet fixture with a design not typically found in residential or commercial applications or that is designed for a specialized application, including, but not limited to, wall-mounted floor-outlet water closets, water closets used in jails or prisons, water closets used in bariatrics applications, and child water closets used in day care facilities.
(5) “Nonlow-consumption flushometer valve,” “nonlow-consumption urinal,” and “nonlow-consumption water closet” mean devices that use more than 1.6 gallons per flush for toilets and more than 1.0 gallons per flush for urinals.
(6) “Urinal” means a water-using urinal.
(7) “Wall-mounted/wall-outlet water closets” means models that are mounted on the wall and discharge to the drainage system through the wall.
(h) For purposes of this section, all consumption values shall be determined by the test procedures contained in the American Society of Mechanical Engineers standard A112.19.2-2003 or A112.19.14-2001.
(i) This section shall remain operative only until January 1, 2014, or until the date on which the California Building Standards Commission includes standards in the California Building Standards Code that conform to this section, whichever date is later. SEC. 3. Section 17921.4 is added to the Health and Safety Code, to read: 17921.4. (a) A nonwater-supplied urinal approved for installation or sold in this state shall satisfy all of the following requirements:

(1) Meet performance, testing, and labeling requirements established by the American Society of Mechanical Engineers standard A112.19.19-2006.
(2) Be listed by an American National Standards Institute accredited third-party certification agency to the American Society of Mechanical Engineers standard A112.19.19-2006.
(3) Provide a trap seal that complies with the California Plumbing Code.
(4) Permit the uninhibited flow of waste through the urinal to the sanitary drainage system.
(5) Be cleaned and maintained in accordance with the manufacturer's instructions after installation.
(6) Be installed with a water supply rough-in to the urinal location that would allow a subsequent replacement of the nonwater-supplied urinal with a water-supplied urinal if desired by the owner or if required by the enforcement agency.
(b) As used in this section, the following terms have the following meanings:
(1) "Building" means any structure subject to this part, and any structure subject to the California Building Standards Law as set forth in Part 2.5 (commencing with Section 18901).
(2) "Water supply rough-in" means the installation of water distribution and fixture supply piping sized to accommodate a water-supplied urinal to an in-wall point immediately adjacent to the urinal location.
(c) Nothing in this section shall restrict the authority of the California Building Standards Commission to require any additional conditions on the installation and use of nonwater-supplied urinals.

SEC. 4. Section 17921.5 of the Health and Safety Code is amended and renumbered to read:

17921.6. Except as provided in Sections 18930 and 18949.5, the department shall prepare and adopt minimum standards regulating the use and application of cellular concrete as it determines are reasonably necessary for the protection of life and property.

SEC. 5. Section 18944.11 is added to the Health and Safety Code, to read:

18944.11. On or before July 1, 2009, any state agency that adopts or proposes building standards for plumbing systems shall consider developing building standards that would govern the use of nonwater-supplied urinals for submission to the California Building Standards Commission in accordance with Sections 17921.4 and 18930.

SEC. 6. No reimbursement is required by this act pursuant to Section 6 of Article XIII B of the California Constitution because the only costs that may be incurred by a local agency or school district will be incurred because this act creates a new crime or infraction, eliminates a crime or infraction, or changes the penalty for a crime or infraction, within the meaning of Section 17556 of the Government Code, or changes the definition of a crime within the meaning of Section 6 of Article XIII B of the California Constitution.

Appendix G - California Assembly Bill 715, Chapter 499 Bill Analysis

Date of Hearing: April 11, 2007

ASSEMBLY COMMITTEE ON HOUSING AND COMMUNITY DEVELOPMENT
Lori Saldana, Chair
AB 715 (Laird) - As Introduced: February 22, 2007

SUBJECT: Water conservation: low-flush water closets

SUMMARY: Phases in requirements that water closets and urinals have lower flush volumes, generally reducing toilets from 1.6 to 1.3 gallons per flush and urinals from 1.0 to 0.5 gallons per flush. Specifically, this bill:

1) Defines "floor-mounted/floor-outlet water closets" as models that are mounted with the fixture base on the floor and discharge to the drainage system through the floor.

2) Defines "nonlow-consumption flushometer valve," "nonlow-consumption urinal," and "nonlow consumption water closet" as devices that use more than 1.6 gallons per flush for toilets and more than 1.0 gallons per flush for urinals.

3) Defines "wall-mounted/wall-outlet water closets" as models that are mounted on the wall and discharge to the drainage system through the wall.

4) Defines "washdown urinals" as models that operate primarily on a dilution only, nonsiphonic principle.

5) Updates California's standards for toilets and urinals to the current standards set by the American Society of
Mechanical Engineers Standards.

6) Requires, on or after Jan. 1, 2010, tank type water closets, including pressure tank water closets installed in new buildings, must use no more than an average of 1.3 gallons per flush for single-flush water closets, and dual- flush toilets must use no more than an average of 1.6 gallons per flush for solids and 1.1 gallons per flush for liquids.

7) Requires, on or after Jan. 1, 2010, all floor-mounted/floor outlet and wall-mounted/wall-outlet flushometer water closets installed in new buildings must use no more than an average of 1.3 gallons per flush for single flush, and dual-flush water closets use no more than an average of 1.6 gallons per flush for solids and 1.1 gallons per flush for liquids.

8) Requires, on or after Jan. 1, 2010, all wash-down urinals installed in new buildings must use no more than 0.5 gallon per flush.

9) Provides, on or after Jan. 1, 2011, tank type water closets including pressure tank water closets sold or installed must use no more than an average of 1.3 gallons per flush for single-flush water closets, and for dual-flush toilets no more than an average of 1.6 gallons per flush for solids and 1.1 gallons per flush for liquids.

10) Provides, on or after Jan. 1, 2012, all flushometer-type water closets sold or installed in this state shall use no more than an average of 1.3 gallons per flush for single flush, and for dual flush use no more than an average of 1.6 gallons per flush for solids and 1.1 gallons per flush for liquids.

11) Provides, on or after Jan. 1, 2010, all washdown urinals sold or installed in the state must use no more than 0.5 gallons per flush.

12) Allows the California Building Standards Commission, upon the recommendation of the Department of Housing and Community Development, to delay the implementation of the new requirements for water closets and urinals through regulation by up to two years if the Commission determines that manufacturers are not capable of producing enough units to meet demand or if there are significant technical problems.

13) Allows CBSC to reduce the quantity of water per flush required by this bill based on the future versions of the California Plumbing Code.

14) Requires all nonwater-supplied urinals sold or installed until Jan. 1, 2010 to satisfy the following performance standards:

a) Be certified to meet standards established by the American Society of Mechanical Engineers;

b) Provide a barrier liquid sealant to maintain a trap seal;

c) Permit the uninhibited flow of waste;

d) Be cleaned and maintained in accordance with the manufacturer's instructions after installation; and,

e) Be installed with a water supply rough-in to the urinal location that allows replacement with a water-supplied urinal.

15) Requires, by Jan. 1, 2009, those state agencies responsible for proposing building standards for plumbing systems to determine whether or not to propose building standards to the CBSC for nonwater-supplied urinals.

16) Provides if new building standards are adopted for nonwater-supplied urinals that they at least meet list of requirements of those sold until Jan. 1, 2009.

EXISTING LAW :

1) Requires that on or after Jan. 1, 1994, all water closets sold or installed in this state use less than 1.6 gallons per flush and that all urinals use an average of one gallon per flush.

2) Restricts the sale of nonlow-flush requirements to the following:

a) The installation of the low-flush water closets and urinals which would require the modification of the plumbing system beneath a finished wall; and

b) Low-flush water closets and urinals which are to be installed at a recognized historical site, for which no historically accurate low-flush models are available.

3) Allows any city or county to enact an ordinance which authorizes the installation of water closets and urinals which exceed the low-flush requirements if the unique configuration of building drainage systems or public sewer system requires more water to function properly. Furthermore, the bill requires a local government to hold a hearing on a proposed ordinance at the request of a public sewer agency.

4) Stipulates that these low-flush requirements do not pre-empt the actions of any city, county, city and county, or district which require greater water or energy savings.

5) Requires that all low-flush water closets and urinals be labeled with specified language by the retailer and that the label be removed by the purchaser only.

6) Requires all water closets, urinals, and any associated flushometer values installed or sold in the state be listed by an American National Standards Institute accredited third-party certification agency to the appropriate American Society of Mechanical Engineers.

FISCAL EFFECT: Unknown.

COMMENTS:

The statewide standards for toilet water flush volume were last updated in 1992. In 1992, the law was expanded to not require not just toilets and urinals installed in new buildings but all toilets sold or installed in California to use no more than an average of 1.6 gallons per flush

and urinals which use an average of one gallon per flush and which meet the performance standards established by the American Society of Mechanical Engineers by January 1, 1994.

According to the author, it was difficult for toilet manufacturers to meet the requirements established until

several years later. By 1995, toilets had been redesigned to operate more efficiently. After 1992, the federal government established the California standard as the national standard preempting the standards of other states. The federal preemption was conditioned on enactment of subsequent improvements in toilet efficiency within five years. These improvements did not happen and the federal preemption expired.

AB 715 requires a reduction in the amount of water required for each flush as follows: 1) single flush from 1.6 gallons to 1.3 gallons; 2) dual flush from 1.6 gallons to 1.6 for solid and 1.3 gallons for liquid; and 3) urinals from 1.0 gallons to 0.5 gallons per flush. The new standards would apply to residential and commercial toilets and urinals, but would largely exclude those that are used in very specialized buildings and require special fittings and molds used in prisons.

AB 715 would not require all toilets and urinals to immediately comply with new standards but rather would

incorporate a phased in approach. Toilets installed in new buildings would be required to meet the new water flush volume standards by 2010.

By 2012, all toilets sold would need to meet the new volume standards. According to the author, at the present time there are 24 manufacturers producing 111 models of toilets and nine manufacturers producing 34 models of urinals that meet the standards proposed in this bill.

The process for establishing building code regulations are found in the California Building Standards Law which established CBSC. Under this law, the appropriate state agency makes recommendations to CBSC for building code regulations that should be adopted. The Commission then reviews the recommendations of the state agency and either adopts or rejects the building code standards. AB 715 incorporates this process by allowing CBSC, upon the recommendation of HCD to delay the implementation of the new requirements for water closets and urinals through regulation by up to two years if the Commission determines that manufacturers are not capable of producing enough units to meet demand or if there are significant technical problems.

Last year the author carried a similar bill, AB 2496, which would have revised the requirements for toilet water flush volume standards with the ultimate goal of creating greater water conservation by saving as much as eight billion of water per year after all of the new standards have been in operation for ten years.

AB 2496 was vetoed and carried the accompanying veto message:

California has long been a leader in water conservation. The states movement to low-flow toilets in the early 1990s paved the way for the federal government to adopt similar standards soon thereafter. We should continue to be leaders in this area.

However, before imposing new mandates on builders and homeowners, we must conduct a thorough study of the new technology to determine its readiness for widespread use.

For instance, the movement to the current low-flow toilets, though ultimately successful, was accompanied at first by legitimate complaints from consumers of product failures. A number of questions have arisen regarding the toilets required by this bill, including whether sufficient laboratory testing has verified compatibility with existing plumbing infrastructure.

> This issue is best left to the California Building Standards Commission, which is comprised of experts
> qualified to lead an investigation into how best Californians can integrate water-saving technology into
> our homes and commercial buildings. I encourage the proponents of this measure to work with the Commission to adopt these changes through the Commission process.

According to the author, one of the concerns raised in the veto message, that the reduced quantity of water would not be sufficient to carry wastes in under-floor pipes has been addressed by a recent study of the federal EPA which found that the amount of water is sufficient to carry waste.

Arguments in opposition:

AB 715 is opposed by the Plumbing-Heating-Cooling Contractors-National Association which feels it is premature to mandate a change in water-closets and urinals until it is demonstrated that sufficient properly functioning products, adequate to meet the new standard are available to the public and technology is adequate to meet the new standard with a fully functioning system. Plumbing contractors anticipate complaints from consumers based on the complaints received when the last set of low-flow standards were adopted.

REGISTERED SUPPORT / OPPOSITION :

Support

California State Pipes Trades Council (Sponsor)
Association of California Water Agencies
East Bay Municipal Utility District
El Dorado Irrigation District
Natural Resources Defense Council
Planning and Conservation League

Opposition

Plumbing-Heating-Cooling Contractors-National Association

Appendix H– Alliance for Water Efficiency

The Alliance for Water Efficiency has created a template of suggested water use thresholds for various water-using fixtures. The table below shows the water using fixture and its corresponding prescribed water use threshold, outlining reference standards/specifications for each fixture. The table also highlights other parameters relating to fixture applications and also provides additional comments water-users may find useful.

AWE Template of Suggested Water Use Thresholds

Fixture, Fitting, Appliance, or Equipment	Probable Application	Reference Standard or Specification (if any)	Prescribed Threshold of Water Use (maximum)	Other parameters	Comments	For information and comparison only: Threshold prescribed in ASHRAE Std 189.1
Water Closet (Tank-type)	Residential & Commercial	WaterSense specification for HETs: www.epa.gov/watersense/docs/spec_het508.pdf	1.28-gpf effective flush volume	Applies only to tank-type fixtures	Support WaterSense. Fixture must be certifed in accordance with WaterSense requirements; category includes light commercial applications.	WaterSense (1.28 effective flush volume)
Water Closet (Flushometer valve/bowl)	Non-Residential	ASME A112.19.2 & related stds for valves; WaterSense formula for effective flush volume for dual-flush	1.28-gpf effective flush volume	Applies only to flushometer valve/bowl combination fixtures	Effective flush volume for dual-flush fixtures determined in accordance with WaterSense specification. See cautionary statement.	1.28-gpf effective flush volume
Urinal	All	ASME A112.19.2, ASME A112.19.19, IAPMO Z124.9, and related stds for valves	0.5-gpf	None at this time	Support WaterSense when spec issued for flushing urinals. Category includes flushing and non-water urinals, but non-water urinals are not included in the first WaterSense Urinal NOI.	0.5-gpf
Lavatory Faucet	Residential	WaterSense specification for Resid Lav Faucets: www.epa.gov/watersense/docs/faucet_spec508.pdf	1.5-gpm	0.8-gpm minimum	Support WaterSense by adopting their thresholds (max & min)	WaterSense (1.5-gpm max; 0.8-gpm min)
Kitchen Faucet	Residential	ASME A112.18.1/CSA B125.1	2.2-gpm	None	Same as EPAct 92 maximum	2.2-gpm
Pre-Rinse Spray Valve	Commercial	ASME A112.18.1/CSA B125.1	1.3-gpm	None	Could use the California list by the CEC if necessary. That spec requires a maximum 30 second cleaning time when tested using ASTM test method.	1.3-gpm
Showerhead	Residential & Hospitality	ASME A112.18.1/CSA B125.1	2.0-gpm	Lower flow rates must be accompanied by automatic compensating valve tested & certified to the same flow rate or less.	WaterSense showerhead spec likely to be implemented in multiple phases due to the need to develop a full performance spec; phase 1 will establish a max flow rate in the region of 2.0 and phase 2 will define performance along with possibly a lower flow rate.	2.0-gpm
Ice Machine	Commercial	Energy Star	None	Energy Star only lists air-cooled machines	By specifying Energy Star, water cooled machines are automatically excluded	Energy Star

Revised: January 23, 2009