# The Business Case for Water Conservation in Texas


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## 1.0 Executive Summary

Water conservation is of growing importance as a service of water suppliers and utilities throughout Texas. Increasing water use efficiency is not just good policy; it makes good business sense to include water conservation as a water resource strategy.

In the 2007 State Water Plan, 14 of the 16 regional water planning groups recommended municipal water conservation strategies as a potential way to meet future water needs. These strategies account for seven percent of the water required in 2060 (23 percent including agricultural and industrial strategies). The statewide average for municipal water conservation strategies was $254 per acre foot whereas new major reservoirs averaged $374 per acre-foot, other surface water projects averaged $254, and new ground water sources average $260 per acre-foot. Attachment A shows the ranges of estimated cost per acre-foot for various conservation measures that each water planning region adopted. These costs do not take into account avoided water treatment and maintenance costs, another financial benefit of conservation that the City of Austin and San Antonio Water System have used to justify costs of conservation programs. Numerous utilities have found that the cost/benefit ratios are sufficient to justify programs such as offering rebates or free water-saving fixtures and water audits to their customers as part of their overall water conservation program. For example, avoided cost analysis, which accounts for the total costs of new water supplies, has shown a 4:1 to 7:1 benefit-to-cost ratio for water conservation programs in the SAWS water service area.

In recent decades, the rate of increase in utility costs has outstripped the rate of inflation. This is due to increases in infrastructure replacement costs, energy costs, and in the costs of building new water supply projects. The costs of new supply are not only related to the costs of materials; it takes longer to build a new reservoir as sites become more difficult to locate, obtaining permits is more complicated, and conflicts with others users of a water source and interventions by interested third parties involve greater public relations and legal costs.

Utilities and regional water authorities around the country and in Texas have found that conservation programs help them manage demand and foster good customer relations while maintaining the health of their organizations. Toilet replacement rebates, water system audits, increasing block rate structures and publicity campaigns such as Water IQ are all examples of Best Management Practices (BMPs) have all been used successfully to achieve greater water use efficiency. These BMPs can be categorized into structural, operational, economic, and educational measures. The scope and limits of conservation efforts are defined by the potential water savings and costs. For example, El Paso Water Utilities cost per acre foot savings for conservation programs ranges from $5 for air conditioning cooling clamps to $490 for turf replacement, well below the cost of the next water supply. Since conservation planning in Texas is voluntary, adoption at the local decision-making level by a utility, water district, or regional water authority yields the greatest success.

Texas can benefit from the conservation lessons learned and tools developed in other states and regions. Regional partnerships, web-based reporting, and clearinghouses to promote conservation can all be tailored to Texas situations. Important state services should include increased technical support and consistent message development, such as the Water IQ campaign, that communicate to end-users the importance of using water efficiently. In addition, the state should develop new avoided-cost methodologies to assist utilities to properly calculate total costs of water, including sunk costs like replacement of infrastructure, and assist utilities in preparing for the increased impact of energy costs in the future. This includes the development of new web-based tools for estimating water savings and costs, and uniform reporting of conservation results. A mechanism for providing state grants or low-interest loans to utilities could accelerate implementation of conservation measures for long-term efficiency.

Whether because of strains on water supply due to growth, desire to keep costs down, concerns for the environment, or assisting customers to reduce their water bills as costs of service rise, implementing water conservation measures can be a cost-effective strategy for a water supplier or utility.

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## 2.0 Situational Assessment

Texas water utilities have increasingly encouraged conservation since the 1980s, but water conservation became a statewide priority in 1997 with the passage of Senate Bill (SB) 1, when regional planning groups were required to consider water conservation strategies first as a water management strategy. SB1 also included an interbasin transfer provision that requires the entity requesting an interbasin transfer to implement a water conservation plan that will result in the highest practicable levels of water conservation and efficiency achievable within the jurisdiction of the applicant.

In 1999, TCEQ rules were adopted that required major water rights holders to develop and implement conservation plans. In 2003, SB 1094 passed that formed the Texas Water Conservation Implementation Task Force, to develop a series of statewide conservation program and policy recommendations. During that same legislative session, the TCEQ rules were revised to require that water conservation plans include 5 and 10 year goals, with the first report on implementation due to the TCEQ in May of 2009.

Finally, significant water conservation legislation was passed during the 2007 session which will require more utilities to develop and implement plans. All entities required to have plans will now be required to provide an annual report to the state on plan implementation, Other significant pieces of legislation include development of a Water Conservation Advisory Council and a statewide water awareness campaign.

### 2.1 Water Supply and Water Supply Planning

Projected and actual population growth in Texas drive increased water demands. The Texas Water Development Board's (TWDB) State Water Plan covers a 50-year horizon and, based upon current data, projects water demands to grow by 27 percent while population more than doubles.

How can Texas meet this increasing demand for water? Water conservation as a statewide priority has been growing since 1997. The 2002 State Water Plan recommended that water conservation measures meet 13.5 percent of projected unmet demands by 2050 or 987,914 acre-feet. In the 2007 State Water Plan, conservation measures more than double, to satisfy 2 million acre-feet or almost 23 percent of unmet demands in 2060. More than 2/3 of this conservation is projected to meet agricultural demand, as compared to municipal water conservation strategies, which are projected to meet 616,679 acre-feet (7 percent) of water demand in 2060 (TWDB, 2007).

The 2007 State Water Plan presents weighted average costs for major categories of water management strategies. The capital costs average $374 per acre-foot for new major reservoirs and $254 per acre-foot for other surface projects. New ground water sources average $260 per acre-foot. Conservation strategies average $254 per acre-foot, water reuse strategies average $248 per acre-foot and desalination strategies average $671 per acre-foot. Attachment A shows the ranges of estimated costs for various conservation measures that each water planning region adopted. The regional water planning groups were not required to report the cost per acre-foot for individual conservation measures, so in many of the plans, the costs are "bundled" into a grouping of conservation strategies. The costs range widely due to some strategies requiring more active involvement by utility staff and defined expenses (e.g. rebate programs), and others requiring little or no active involvement or long-term cost (natural replacement of clothes washers, water conservation pricing). Most regions used TWDB's cost quantification study (TWDB/GDS, 2002) and TWDB's BMP Guide to determine conservation costs. In some regions, conservation strategies that had no cost associated with them in a given decade were averaged in, resulting in lower averages in the 2007 Water Plan Database than in the Regional Water Plan text. Both the conservation strategies selected, as well as the calculations of cost savings, varied greatly between regions.

### 2.2 Water Utility Infrastructure and Operations

Overall, water rates are rising faster than the rates of inflation and other utilities. Significant portions of these costs are for energy to move new water supplies further distances and repair and replacement of aging infrastructure. Reliable estimates of the nationwide gap between current spending and the cost to meet needs over the next 20 to 30 years range from $70 billion to more than $500 billion (US EPA, 2002; Congressional Budget Office, 2002; AWWA, 2004).

For utilities with high summertime peaking factors, both pipes and pump stations must be sized to handle increased capacity. The greater the peak demand, the greater will be the costs of these additions. Requirements for fire protection and use of water for outdoor landscape irrigation both affect the maximum flow recorded for the peak hour. Treatment plant, distribution, and storage sizing decisions are based upon growth projections of 10 to 20 years. Cities that have reduced or delayed their infrastructure replacement costs by managing peak demand include Seattle, WA, and Austin, TX. Seattle's "1 Percent" program is designed to maintain level demand for a period of 10 years despite population growth (Dietemann, 1998). Analysis of Austin's water conservation efforts in the 1990s indicates the city delayed construction of a new water treatment plant by 2.7 years.

### 2.3 Customer Service

Utilities often consider conservation a potential loss of revenue to the system as they conduct their financial evaluations. Utilities may focus on potential negative customer feedback from implementing increasing block rate structures, or water waste ordinances, but often overlook the positive effects conservation programs can have on customer relations. The LCRA has found that customers are often very pleased with the individual attention that comes with irrigation audits conducted due to high bill complaints or high water use mailouts. This situation may be the only time the customer has ever met a utility representative. Conservation education programs can also portray the utility in a very positive light. The Major Rivers program teaches students and teachers not only about conservation but about the services that LCRA provides. Statewide, the Major Rivers program has increased awareness of conservation and water supply issues among teachers, students and utility representatives.

## 3.0 The Economics of Water Conservation

### 3.1 Average versus Marginal Cost of Water

The typical water utility's financial model uses water rates to recoup the cost of serving its customers. It treats water as a commodity, and the price set reflects the combined capital costs for storage, distribution, and treatment and, sometimes, the cost of water. In Texas, most municipal water use is metered, and generally customers are charged according to their actual water use. Most utilities also recoup some of their high proportion of fixed costs in the form of a meter fee. Commercial rates are typically different from residential rates. Commercial customers' usage profiles tend to be more consistent throughout the year, with less demand for summer peaking capacity. The economic motivation for customers to conserve is that their bill will be lower, although rates may rise seasonally or with time.

For ease of calculation, average cost of service is typically used rather than a rate calculated for each unit of water supplied. Thus, those with lower demand are actually subsidizing higher quantity users, because the utility is developing expensive water supplies and infrastructure in order to sustain peak delivery capacity. The value of the water itself is often lost in all of these calculations – the actual value of a unit of water is often set at zero (Griffin, 2006). The much greater costs, associated with developing, delivering, and treating water supplies, are expected to take the place of actually valuing the water itself.

During drought or time of stress on water demand, as when a utility approaches its distribution system's capacity to deliver water or its reservoir capacity is reached, the limitations of the average-cost method become obvious. When a utility must put water-use restrictions in place in order to avoid exceeding its capacity to deliver water, a price based upon average cost results in the utility losing revenue. At the same time the utility needs new and continuing revenue for a new water supply, to make up for shortfalls from limited deliveries, or to repair pipes damaged by shrinking soils and changes in water pressure as peak-day demands increase. Pricing mechanisms like surcharges have been used to reduce the financial impact of drought and to send a stronger price signal to those who continue to use high quantities of water during a shortage (LaFrance, 2006). Drought is an emergency, but the limits on supply and capacity and the impending financial impacts are margins good water resource planning can anticipate.

One method of reflecting these marginal impacts of higher than average water demand on the system is in the water rate structure. The impact of high use on the water system overall can be reflected in multi-tier increasing block rate structures. Seasonal rates send a similar price signal during times when demand is highest and the utility is most likely to suffer shortfalls in supply. Although the cost of water in a customer's budget is oftentimes not significant enough for price alone to stimulate conservation, experience has shown that some customers will reduce demand if their bills rise sufficiently. (See section 4.3.)

Careful analysis of demand and supply curves and cost comparisons with new supplies demonstrate the attractiveness of water conservation programs. The net present value of most conservation programs compares favorably in the short run with higher expenditures for new water supplies, treatment plants or increased system capacity (specific examples are provided in section 3.2). Therefore, the financial goal of a conservation program, in purely economic terms, is to delay into the future the need to invest in one of these more expensive options.

San Antonio Water System (SAWS) developed a unique conservation rate structure in the 1990s. To ensure that long-term conservation was not subject to the whims of future water managers, the San Antonio City Council acted in 1994 to dedicate 50 percent of the fourth-tier residential revenue to conservation. Three years later a fee per meter was approved for ICI customers. SAWS's conservation budget is a separate line item in cost-of-service calculations.

### 3.2 Avoided Cost of Water Conservation

Water conservation is not the same as purchasing a material good, but is, rather, avoiding the demand and cost for a new source. It is necessary to calculate the total cost of the next unit of water — the long-run marginal cost — in order to properly value the avoided cost of a water resource. More conservation measures can be justified by cost/benefit analysis using avoided cost calculations.

Smaller utilities lack the budget or internal skills to perform such analyses. The regional planning process lacks the funding to develop the data to provide the differences in value to each water user group. While the State Water Planning process appears to show that water conservation is a cost-effective water resource strategy in most parts of the state, the calculated savings are less than would be expected, because all the costs of the next unit of water are not included.

In 2003 SAWS commissioned a cost/benefit analysis (BBC, 2003) that shows a likely value of water conservation to Texas utilities. The analysis looked at costs avoided by their conservation program: capital costs of new water supplies, as well as operational and maintenance savings for both potable water delivery and wastewater treatment from 2010 to 2060. Based upon a low estimate of demand increase, the study showed these measures — without conservation — provided fiscal benefits with a net present value of $870 million to $1.43 billion. The cost of the conservation programs that would yield commensurate results was $210 million. The benefit-to-cost ratio thus ranges from a little more than 4:1 on the low end of savings to a high of almost 7:1. The study also mentioned specifically that savings from conservation programs allowed SAWS to optimize the use of existing wastewater treatment plants to avoid building a new plant. The average cost per acre foot for SAWS conservation programs was $222 in 2004 (see Attachment B). That cost is expected to rise as lower cost programs saturate the service area.

A study commissioned in 2006 by the City of Austin compared the programs of the four Texas water utilities with the largest conservation programs and their success, as measured in per capita daily savings. Reported as trailing five-year averages, the savings were 7 percent for Austin, 33 percent for SAWS and 38 percent for El Paso (Austin, 2006). Dallas currently reports (Strong, 2006) that, since it began its water conservation program in 2001, it has seen an 11 percent reduction in water demand (Enviromedia, 2004). Costs for these savings ranged from $6 million a year for SAWS to $3.6 million for Dallas in the most recent year reported. It is challenging to appropriately compare results from different parts of the state due to differing motivation for conservation (e.g. high alternative water supply costs, reduction in peak day demand to avoid/delay new infrastructure costs, or environmentally sensitive habitat requiring spring flow), but it is clear that these four cities are making progress through conservation.

The TWDB has two models that have been used to calculate the cost-effectiveness of water conservation. These models employ widely accepted engineering cost-estimating techniques and net-present-value calculations to make the results developed for any specific region comparable with other regional water supply strategies presented in the State Water Plan. The GDS study and the BMP Guide spreadsheet model that was built off of it offer cost benefit analysis for a limited number of common water conservation practices (TWDB & GDS, 2002; TWDB, 2004). However, these models would likely be utilized more by water utilities if they were updated and expanded to something similar to the "Conserve Florida Water Conservation Guide" website (see section 5.3).

## 4.0 Conservation Business Case Models

Water conservation programs range from structural changes focused on the utility or its customers, to educational or pricing programs designed to influence behavior. Successful conservation programs typically combine such efforts. Conservation best management practices, or BMPs, are readily categorized as structural, operational, rates, or educational. The Texas Water Conservation Implementation Task Force developed a list of municipal, agricultural and industrial BMPs, presented in Attachment D. The following conservation business case models provide examples of these approaches.

### 4.1 Structural Approach

Structural approaches include those programs which focus on reduced demand through changes in water using equipment or appliances. Two Texas programs, San Antonio and Austin, have commercial and residential programs, small- and large-scale rebates, and outdoor and indoor programs. The City of El Paso offers rebates for toilets and for replacing turf grass with desert landscaping materials. The *Residential End Use Study* published by the AWWA, which included more than 1,100 households in 12 cities, reported toilets accounted for 27.7 percent of domestic water use in the U.S. and approximately 20.1 gallons per capita per day (Mayer et al., 1999). In 2004 SAWS retrofitted 4,525 toilets through its rebate program, saving 1,303 acre-feet per year, at a cost of $256 per acre-foot. The SAWS distribution program retrofitted 4,261 toilets at a savings of 1,227 acre-feet per year, at a cost of $191 per acre-foot (see Attachment B). These local programs are described in more detail in Section 5.1.

### 4.2 Water Utility Operations Approach

Utilities can improve efficiency by focusing on reduced water losses, good metering, and up-to-date systems operations. In 2003, House Bill (HB) 3338 required more than 4,000 retail water utilities in the state to submit a water system audit report to the TWDB. The water loss audit divides water losses into two categories — apparent and real. Apparent loss includes meter losses due to under-registering, billing adjustments/waivers that result in unbilled consumption, and unauthorized consumption (theft). Real losses are defined as those occurring from leaks and breaks on mains, valves and service lines, and storage tank overflows.

For example, the 2005 Lubbock water utility audit found 563.7 million gallons in total apparent water loss, or 4.3% of total use. Most of this apparent loss (78 percent) represented consumption adjustments which were not verifiable. Almost all of the rest of the apparent loss represented estimated unregistered flow on large meters. The financial cost of apparent loss was nearly $1 million ($984,000) per year, based on an average retail water cost of $1.75 per thousand gallons. The financial cost to the Utility in 2005 of real losses (leaks, etc.) was $268,000, based on a production cost of $0.84 per thousand gallons.

By analyzing water loss in these two categories, the utility developed a persuasive case for policy makers to authorize increased expenditures on billing system upgrades, to improve operational measures to capture and correct billing errors, and to fund a large meter replacement program, which put an extra meter testing and replacement crew into the field. The utility viewed these improvements not as conservation measures, but as operation efficiency measures implemented to generate additional revenue.

Another example of an effective operational conservation program is the El Paso Water Utilities leak detection program. From 2004 to 2005, El Paso installed 10,000 Permalog (R) leak detection loggers, estimated to now save approximately 700 million gallons of water per year. Permalog detects leaks in water distribution systems. As soon as a leak is detected, the logger transmits a radio signal to indicate a leak condition. Leak characteristics are transmitted to the Patroller, which identifies the approximate location of the logger, and a crew is dispatched to repair the leak. (EPWU, 2006)

### 4.3 Rates Approach

Many utilities across the country have implemented increasing block rate structures to motivate water conservation. However, results of studies that looked at using price to motivate conservation have been inconclusive or found only small impacts of price on water use (Olmstead, et al, 2003). A study completed in Texas in the late 1990s found a price elasticity of about –0.2 for single family residential customers. This means that for every doubling of price, consumption is reduced by 20 percent (Whitcomb, 1999). In economic terms, this is referred to as inelastic demand, since the reduction in demand is less than 1 percent for every 1 percent increase in price. However, the term “inelastic” does not mean that demand is inflexible or rigid. In fact, the average price of water may be so low compared to average income levels that price is insignificant when measured against the convenience of use. More recent analysis focused on increasing block rates suggests that demand is more elastic than found by earlier studies (Olmstead, et al, 2003) and that the rate structure itself, rather than the marginal price of water, is more important in increasing the elasticity of demand.

Seattle Public Utilities (SPU) calculates a value of water saved through the price elasticity of its water-rate structure. The SPU residential rate structure is an increasing block rate, with three tiers and a seasonal rate adjustment. The commercial rate structure is flat, with a single price per hundred cubic feet, a variable fee based upon meter size, and a seasonal component. SPU estimated that the conservation resulting from its rate structure, based upon its own elasticity study, is 0.5 MGD out of 2.8 MGD. That is, in 2002, about 18 percent of long-term savings resulted from water conservation (Saving Water Partnership, 2003).

### 4.4 Education Approach

Changing customer behaviors are an important aspect in reducing municipal water demand. However, water savings and cost effectiveness are difficult to quantify in evaluating public education efforts. Results of the programs are likely to be confounded with the ordinances which they publicize and are hard to separate from the structural changes they promote. Unlike structural or operational approaches, specific measures of gallons-saved-per-commercial-aired or -ad-printed are estimates, at best. Due to changes in demand patterns, however, some general conclusions can be drawn.

From 2002 to 2006, the City of Dallas Water Utilities (DWU), contracted with the firm Enviromedia, to help promote water-awareness and conservation messages in connection with the passage of a new water conservation ordinance. The ordinance restrictions, grass-roots efforts and publicity campaign themed, "Save water. Nothing can replace it," have worked in tandem to save approximately 34 billion gallons over 5 years. The publicity awareness campaign, which included evaluation of public perception as well as actual expenditures, was $15.1 million (this includes added value advertising) over five years. The savings was a combination of the public information efforts, the introduction of increasing block rates, and the ordinance restricting water use outdoors. The estimated cost per acre foot was $144 and the savings per acre foot was $336 (Davis, pers. comm., 2007).

SAWS has tied public awareness and outreach campaigns with their direct rebate programs for about 10 years. During that time, water use in the SAWS service area decreased by an average of 2 gpcd per year, but direct programs could only account for 1 gpcd per year. The rest of that water savings is attributed to behavior change, which is a result of education through these outreach efforts (Guz, 2007)

Finally, North Texas Municipal Water District (NTMWD) and LCRA launched their "Water IQ - Know Your Water" public awareness campaigns in the summer of 2006. Surveys taken after the NTMWD campaign found that 89% of the respondents were more likely to save water after learning about ways to save water and 86% said they conserved more water in 2006 than in 2005. The District saw a 30% water savings due to both the Water IQ campaign as well as mandatory drought restrictions (Hickey, 2007). After a three month campaign, LCRA found that 47% of respondents in the targeted Water IQ market were aware of the Water IQ campaign.

## 5.0 Local, Regional and State Conservation Program Examples

A number of successful conservation programs at the local, regional and state levels provide case-study examples of financial savings achieved through conservation.

### 5.1 Local Programs

SAWS offers the largest single water conservation program in the state of Texas, with an annual budget of more than $6 million. Since the mid 1990's water use in San Antonio has remained level at around 180,000 acre-feet per year, although annual population growth has ranged from 1 to 2 percent. The programs target residential, commercial, and industrial customers. Within each class are outdoor and indoor programs. Program examples include free residential water conservation audits, and for commercial customers, SAWS offers rebates for commercial customers who replace high-water-use equipment with a low- or no-water-use process. A commercial cooling tower audit helps customers run their cooling towers efficiently, reducing water and energy costs, as well as extending the life of the cooling tower. A comprehensive list of the 2004 programs and their costs can be found in Attachment B (SAWS, 2005).

The City of Austin was the first municipality in Texas to have commercial and residential water conservation programs. Programs include toilet and clothes washer rebates, irrigation audits, rainwater harvesting rebates, and irrigation system rebates. In 2005, the City of Austin started a program to inform the highest 1,000 residential water users how much they are overwatering by comparing estimated landscape water needs based on evapotransporation (ET), and actual water use. During the peak use month of 2006, 5.5% of city residential customers used over 35,000 gallons per month, and 13% used over 25,000 gallons per month. Evaluation of this program found an average water use reduction of 37.5% in the month following the audit and 19.5% reduction after two months. Austin also has a nationally recognized conservation program targeting the industrial/commercial/institutional sectors (Dewees, 2007).

The City of El Paso focuses much of its effort on ordinance enforcement, school outreach and community education. They conduct an essay contest and produced a widely recognized "Desert Bloom" CD focusing on landscaping appropriate to the West Texas desert. They distribute conservation supplies in "Camel Kits," and games and videos link entertainment to the educational efforts. The El Paso Water Utilities offers a variety of rebate programs for residential and commercial customers. The cost per acre foot saves ranges from a low of $5 for air conditioning cooling clamps to $490 for turf replacement (see Attachment C). A program that is unique within Texas to El Paso is a rebate for customers who exchange their evaporative coolers for air conditioners.

The City of San Marcos is a good example of a small city that is running an effective program with limited resources. Their program includes water audits, school education, public information, enforcement of conservation and drought ordinances, a toilet rebate program, and a clothes washer rebate program. The toilet rebate program has been running since 1995 and costs an average of $268 per ac ft. The washer rebate has been in effect since 2001 and costs an average of $272 per ac ft. (Klein, pers. comm., 2007)

### 5.2 Regional Programs

In Seattle, WA, a regional consortium known as the Saving Water Partnership has combined the efforts of 26 local water utilities. The partnership's goal, set in 1999, was to reduce per capita water consumption by 1 percent per year through a 10-year water conservation program. Over the last several years the consortium has more than achieved its 1 percent goal. Working together, the utilities gain efficiencies in program delivery and report overall savings. They take advantage of different demographics throughout the region by delivering targeted programs that would not be cost-effective for smaller utilities working alone. According to a 2006 report published by Seattle Public Utilities, the package of conservation measures chosen as most cost effective averaged $426/acft/yr (Seattle Public Utilities, 2006).

The Metropolitan Water District of Southern California (MWDSC) is a cooperative of 26 cities and water agencies serving 18 million people in six counties. Much of its water is imported from the Colorado River and Northern California, therefore, they risk drought in the Colorado River basin and must accommodate the high cost of energy to pump water long distances. Overall reduction in per capita consumption since 1990 is estimated at 35 gallons per person per day. Their conservation programs cost about $250 per ac ft compared to $800 per ac ft for desalination. Their residential programs include toilet and showerhead replacements, and rebates for clothes washers, ET controllers, and rotating stream or precision sprinkler heads. MWDSC also gives an $0.80 per square foot incentive to builders to install higher efficiency sprinklers and irrigation controllers (Lipinski, pers. comm., Ritchie, 2007). The result of these regionally coordinated programs has been to flatten the overall demand curve in southern California so, while population has grown since the late 1980's, the demand today is essentially the same as it was almost two decades ago. Over 10 years the District has invested more than $234 million dollars in conservation activities. In 2005 alone, the District issued about 300,000 rebates for devices that are now saving nearly three billion gallons of water a year in Southern California.

### 5.3 Statewide Programs

Statewide conservation programs can provide valuable tools that leverage money for public awareness campaigns, and provide technical assistance to enable small utilities with limited resources to conduct more effective conservation programs. An example of technical assistance is creating standardized Best Management Practices and coordinating their implementation using online applications that perform cost/benefit analysis.

The California Urban Water Conservation Council (CUWCC or Council) is a unique and influential non-governmental organization created to increase efficient water use statewide through partnerships and memoranda of understanding among urban municipal water agencies, public interest groups, and private entities. The Council was created in 1991 as a voluntary response to demands from courts that California utilities demonstrate in a verifiable manner that they were achieving real water savings through their conservation programs. The Council's 350 members have agreed to develop and implement 14 comprehensive water conservation BMPs. The Council provides technical resources to assist its members in meeting regulatory requirements to report on water conservation savings and efforts during the five-year period of their state water resource plans. One of the newest of these resources is a guide for performing avoided cost analysis (CUWCC, 2006).

Conserve Florida, housed at the University of Florida in Gainesville, operates a statewide clearinghouse and web application similar to CUWCC, which was created through a joint agreement between the Florida Department of Environmental Protection, the five regional water management districts in the state, and water associations such as the American Water Works Association. Their web-based water conservation guide application allows participating utilities to create a tailored suite of standardized BMPs and evaluate potential water savings based on detailed utility profile inputs. One of the elements in their web-based water conservation guidance document is a minimum set of water conservation practices that is defined and scaled to utility size, with larger utilities expected to implement more practices than smaller utilities (Indelgia, pers. comm.). This is similar to the efforts of the Edwards Aquifer Authority in San Antonio, TX, which requires larger utilities to implement more BMPs than smaller ones.

The Texas Commission on Environmental Quality (TCEQ) and the Texas Water Development Board (TWDB) are the two state agencies involved in statewide municipal conservation programming. The TCEQ accepts and reviews water conservation plans, while the TWDB handles water conservation technical assistance. TWDB’s program currently focuses on reviewing water conservation plans for utilities seeking large water infrastructure loans, distributing water conservation literature and education programs such as Major Rivers statewide, providing technical assistance with such measures as water loss audits and rainwater harvesting, and loaning leak detection equipment.

## 6.0 Challenges to Successful Implementation

There is a continuum of risk associated with conservation program investment by water suppliers and water utilities. At one end is over-investing, followed by failure to meet demand reduction goals. At the other is the choice to decline to invest in cost-effective long-term conservation programs, which may then result in unanticipated and, therefore, more costly water supply projects or increased water management costs to reduce per capita water use. Both extremes of risk are addressed here.

The economic means of water customers is related to their average and peak monthly water demand, with more affluent customers using greater amounts of water (Gregg, T, 2006; SAWS, 1993). This is important since these customers are often in new subdivisions with large lots and they end up driving peak summer demands. Increasing block or other types of conservation rates are an attempt to address this issue.

On the other side, conservation efforts that rely too heavily on conservation rates can lead to a type of “rate shock” in which customers reduce water use beyond the level anticipated. Such reductions in demand can lead to revenue shortfalls, prompting the need to increase rates, which usually results in customer dissatisfaction. In order to avoid such negative feedback loops, the process of rate increases needs to include both public education about the need for additional income, public input on the rate structure and level of increase, and investment in conservation to show the public that they are being asked to purchase water efficiently. (Postel, S, 1992)

The existence of conservation programs in neighboring communities also leads to demand for similar programs by a customer’s own utility. For example, the demand for conservation programs by LCRA retail water customers is impacted by the existence of programs in Austin, and the expectation that similar programs should be available to themselves. Running regional water conservation programs, or increased coordination of conservation efforts from the state, will help ameliorate the risk of customer dissatisfaction from the perception that some utilities are not “doing enough” compared to their neighbors.

An additional category of risks is regulatory, which include the potential for public water suppliers to have increased compliance costs as TCEQ enforces water conservation and drought planning requirements in the future. Continued exposure to cyclical droughts and the rising number of areas of the state facing water shortages, has led to greater scrutiny of utilities regarding compliance with these rules. Environmental advocates will be able to use the lack of conservation programs as a reason to limit obtaining any additional water supply and expanding water plant capacity. Austin’s current controversy over construction of a new water plant is a good example.

The State Water Plan assumes that farming will become more uneconomical in the state, reducing agricultural demand for water and increasing its availability for rising municipal demand. Should this fail to occur, the incentives for municipal conservation would escalate. In fact, if fuel costs rise sufficiently, the economic incentives to grow more food crops locally may reinvigorate farming at the outskirts of large urban areas, although fuel costs also affect irrigated farming by increasing the cost of pumping water.

Energy costs are assumed to increase with time, thus increasing the value of conservation as a means of avoiding costs. If efforts to slow climate change bring carbon taxes or carbon sequestration costs related to pollution control measures, the economic pressure to reduce energy use will increase.

## 7.0 Conclusions

Successful water programs are a mix of utility operations, structural changes to water use, pricing or financial incentives and education of customers. The scope and limits of conservation efforts are defined by potential water savings and cost. Since conservation planning in Texas is voluntary, adoption at the local decision-making level by a utility, water district or regional water authority should yield the greatest success.

State agencies should increase technical assistance and consistent message development, such as the Water IQ campaign, that communicate to end-users the importance of using water efficiently. In addition, the state should develop new avoided-cost methodologies to assist utilities to properly calculate the costs of water, and assist utilities in preparing for the increased impact of energy costs in the future. These could include the development of web-based tools for estimating water savings and costs, as well as uniform reporting of conservation program results. A mechanism for providing state grants or low-interest loans to utilities could accelerate implementation of conservation measures for long-term water efficiency.

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# Attachment A

## Municipal Conservation Water Management Strategies and Average Cost in the 2007 State Water Plan

| | | | | Average Cost per Acre-foot per year of projected water conserved from 2010-2060 | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| RWPG[1] | WMS Grouping | Water Management Strategy | Cost per Strategy[2] | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| A | | Conservation Water Management[3] | N/A | | $488 | $489 | $490 | $490 | $489 |
| B | | • Public and School Education<br>• Reduction of Unaccounted for Water through Water Audits<br>• Water Conservation Pricing<br>• Federal Clothes Washer Rules | N/A | $593 | $282 | $238 | $247 | $238 | $239 |
| C | Basic conservation package[4] | • Public and School Education<br>• Water System Audit, Leak Detection and Repair, Pressure Control<br>• Water Use Reduction due to Increasing Water Prices<br>• Federal Residential Clothes Washer Standards | N/A | $228 | $121 | $104 | $91 | $81 | $72 |
| C | Municipal Expanded Package[4] | • Water Conservation Pricing Structure<br>• Water Waste Prohibition<br>• Coin-operated clothes washer rebate | N/A | $202 | $303 | $248 | $251 | $251 | $254 |

[1] Regional Water Planning Group according to the 2007 State Water Plan
[2] Most regions did not break down costs by strategy. Instead, they presented the cost of "bundled" strategies.
[3] Strategy detail not provided
[4] Cost reported per 1,000 gallons from a table in the Region C Plan. These numbers were converted to acre-feet using 1 acre-foot= 325,851 gallons. The 2007 Water Plan Database averages are different.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | • Residential customer water audit | | | | | | | |
| D | | • Clothes Washer Rebate[5]<br>• Irrigation Audit- High User<br>• Rainwater Harvesting<br>• Rain Barrels | N/A | | | | | | |
| E | | • Plumbing fixture rebates[6]<br>• Turf replacement rebates<br>• Public education<br>• Enforcement of ordinances<br>• Conservation rate structure | N/A | $136 | $137 | $152 | $166 | $175 | $171 |
| F | | • Public and School Education | | $219 | $173 | $145 | $125 | $109 | $97 |
| F | | • Reduction of Unaccounted for Water through Water Audits | | $1998 | $661 | $636 | $608 | $576 | $553 |
| F | | • Water Conservation Pricing | | 0 | $654 | $329 | $331 | $331 | $329 |
| F | | • Federal Clothes Washer Rules | | 0 | 0 | 0 | 0 | 0 | 0 |
| G | Sources: GDS Associates report, TWDB BMP Guide | • Toilet Retrofit[7]<br>• Showerhead and Aerator replacement<br>• Irrigation Audit- High User<br>• Landscape Irrigation BMP<br>• Public Education Programs | N/A | $379 | $380 | $382 | $380 | $379 | $378 |
| H | Population <3,300 | • Unaccounted-for-water | $72 [8] | $154 | $154 | $154 | $154 | $154 | $154 |
| | | • Public Education | $273 | | | | | | |
| | | • Water Wise Program | $118 | | | | | | |
| H | Population | • 3 strategies listed above[8] | | $156 | $156 | $156 | $156 | $156 | $156 |

[5] These conservation strategies were evaluated using a TWDB/GDS study on cost quantification for conservation but none were recommended due to cost.
[6] This represents only the City of El Paso's water conservation programs, not a region-wide approach
[7] Region G used the TWDB/GDS study and the TWDB BMP Guide. The average cost per acre foot range listed in the Region G Plan text was $325-$400. The numbers listed per decade are from the 2007 State Water Plan Database.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 3,300-10,000 | • Indoor/Exterior Audits | $162 | | | | | | |
| H | Population >10,000 | • 4 strategies listed above[8] | | $161 | $161 | $161 | $161 | $161 | $161 |
| | | • Commercial Indoor Audits | $218 | | | | | | |
| | | • Cooling Tower Audits | $144 | | | | | | |
| | | • Pool/Fountain Standards | $43 | | | | | | |
| | | • Pool/Fountain Audits | $83 | | | | | | |
| | | • City of Houston In-House Programs | $5 | | | | | | |
| I | | • Public and School Education[9]<br>• Water Conservation Pricing<br>• Federal Clothes Washer Rules | | $430 | $299 | $255 | $187 | $155 | $131 |
| J | | • Water Audit<br>• Public Education | N/A | $477[10] | $463 | $454 | $454 | $442 | $439 |
| K | Urban[11] | • Plumbing Fixture Savings | $590 | $473[12] | $214 | $133 | $82 | $64 | $61 |
| | | • Irrigation Savings | $455 | | | | | | |
| | Suburban | • Plumbing Fixture Savings | $473 | | | | | | |
| | | • Irrigation Savings | $453 | | | | | | |
| | Rural | • Plumbing fixture savings | $403 | | | | | | |

[8] Cost per acre-foot for individual strategies as listed in the Region H plan text. Costs by decade are from the 2007 Water Plan Database.
[9] No cost per acre-foot was listed in the Region I plan text. Costs by decade are from the 2007 Water Plan Database
[10] Cost per acre-foot by decade from the 2007 Water Plan Database for the water audit strategy only, no cost attributed to education. Cost listed in the Region J plan text was $165 per acre-foot
[11] Cost listed in Region K plan text for each strategy bundle are broken into urban, suburban and rural categories. Plumbing fixture savings includes toilet retrofits, showerhead/aerators, and clothes washer rebates. Source: TWDB BMP Guide and TWDB/GDS study
[12] Costs by decade obtained from 2007 Water Plan Database, which averages $0 costs for a decade in which strategies implemented previously are still saving water such as toilet replacements

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | • Irrigation Savings | $432 | | | | | | |
| L | Urban | • Plumbing fixture savings[13] | $458 | $552 | $496 | $482 | $480 | $484 | $490 |
| | | • Lawn watering and landscape water conservation | $400 | | | | | | |
| | Suburban | • Plumbing fixture savings | $520 | | | | | | |
| | | • Lawn watering and landscape water conservation | $400 | | | | | | |
| | Rural | • Plumbing fixture savings | $588 | | | | | | |
| | | • Lawn watering and landscape water conservation | $400 | | | | | | |
| M | | Municipal Water Conservation | N/A | $112 | $112 | $112 | $112 | $112 | $112 |
| N | | • Public & School Education<br>• Residential Clothes Washer Installation | $323-$342[14] | 0 | 0 | 0 | 0 | 0 | 0 |
| O | Urban | • Plumbing fixture savings | $520 | $526 | $469 | $457 | $438 | $420 | $418 |
| | | • Lawn watering and landscape water conservation | $400 | | | | | | |
| | Suburban | • Plumbing fixture savings | $542 | | | | | | |
| | | • Lawn watering and landscape water conservation | $400 | | | | | | |
| | Rural | • Plumbing fixture savings | $561 | | | | | | |
| | | • Lawn watering and landscape water conservation | $400 | | | | | | |
| P | | No Municipal Water Conservation Strategies Selected | | | | | | | |

[13] Cost listed in Region L plan text for each strategy bundle broken into urban, suburban and rural categories. Source: TWDB/GDS study

[14] No costs listed in the 2007 Water Plan Database. This cost per acft comes from a table in the Region N plan, which is not explained in detail in the text.

# Attachment B

## San Antonio Water System Conservation Measures
## Water Savings and Costs 2004

| Program Name | FY 2004 Expenses | 2004 Units | 2004 Water Saved (ac-ft) | 2004 Unit Cost ($/ac-ft) |
|---|---|---|---|---|
| Plumbers to People | $189,254 | 505 | 456 | $415 |
| Kick the Can Rebate | $334,650 | 4,525 | 1,303 | $256 |
| Kick the Can Distribution | $234,355 | 4,261 | 1,227 | $191 |
| WashRight Rebate | $219,400 | 2,194 | 360 | $594 |
| Watersaver Landscape | $42,495 | 104 | 86 | $494 |
| Residential Hot Water on Demand | $7,950 | 53 | 17 | $468 |
| Residential Rain Sensor | $839 | 17 | 21 | $40 |
| Irrigation System Analysis | $8,568 | 119 | 49 | $175 |
| Large Scale Audit/Retrofit Program | $15,923 | 6 | 225 | $71 |
| Commercial Toilet Rebate Program | $93,150 | 1,242 | 358 | $260 |
| Commercial Toilet Distribution (Industrial) | $322,920 | 2,691 | 1,167 | $276 |
| Commercial Toilet Distribution (Basic) | $470,701 | 6,113 | 1,957 | $241 |
| Non-profit Distribution and Installation (Housing) | $189,576 | 1,469 | 423 | $448 |
| Non-profit Distribution and Installation (Schools) | $402,085 | 1,744 | 1,008 | $399 |
| Restaurant Toilet Installation | $135,960 | 618 | 751 | $220 |
| Restaurant Certification | $262,280 | 1,660 | 3,575 | $73 |
| Commercial Rain Sensor | $3,395 | 43 | 212 | $16 |
| Annual Totals | $2,933,501 | | 13,195 | $222 |

## Attachment C

# El Paso Water Utilities
# Conservation Measures Cost Benefit Analysis

| Program Name | Unit Cost ($/ac-ft) |
|---|---|
| Air Conditioner Clamps | $5 |
| Showerheads | $9 |
| Waterless Urinals | $275 |
| Commercial Washing Machines | $295 |
| Refrigerated Air Rebate | $316 |
| Ultra Low Flow Toilet Rebate | $405 |
| Residential Washing Machine Rebate | $455 |
| Turf Rebate | $490 |

# Attachment D

## SB 1094 Water Conservation Implementation Task Force
## Recommended Best Management Practices

## Municipal BMPs

### Structural

| | |
|---|---|
| Metering of New Accounts and Retrofit of Existing Accounts | Reuse of Treated Effluent |
| Showerhead Aerator Plumbing and Toilet Flapper Retrofits | New Construction Graywater Systems |
| Residential Clothes Washer Replacement | Residential ULFT Replacement Programs |
| Water Wise Landscape Design and Conversion Programs | Conservation Programs for Industrial, Commercial and Institutional Accounts |
| Rainwater Harvesting and Condensate Reuse | |

### Operational

| | |
|---|---|
| System Water and Water Loss Audits | Water Waste Prohibition |
| Water Surveys for Single-Family and Multi-Family Customers | Conservation Programs for Industrial, Commercial, and Institutional Accounts |
| Golf Course Conservation | Park Conservation |
| Wholesale Agency Assistance Programs | Athletic Field Conservation |
| Water Conservation Coordinators | |

### Economic

| | |
|---|---|
| System Water Audit and Water Loss | Water Conservation Pricing |
| Residential ULFT Replacement Programs | Wholesale Agency Assistance Programs |
| Rainwater Harvesting and Condensate Reuse | Conservation Programs for Industrial, Commercial, and Institutional Accounts |

### Education

| | |
|---|---|
| School Education | Public Information BMPs |
| Water Wise Landscape Design and Conversion Programs | |

## Agricultural BMPs

### Structural

| | |
|---|---|
| Surge Flow Irrigation For Field Water Distribution Systems | Conversion Of Supplemental Irrigated Farmland To Dry-Land Farmland |
| Replacement Of Irrigation District Canals And Lateral Canals With Pipelines | Volumetric Measurement of Irrigation Water Use |
| On-Farm Water Delivery Systems | Lining of On-Farm Irrigation Ditches |
| Replacement Of Irrigation District Canals And Lateral Canals With Pipelines | Low Pressure Center Pivot Sprinkler Irrigation Systems |
| Linear Move Sprinkler Irrigation Systems | Drip/Micro-Irrigation System |
| Lining of District Irrigation Canals | Gated and Flexible Pipe for Field Water Distribution Systems |
| Tailwater Recovery and Reuse Systems | |

### Operational

| | |
|---|---|
| On-Farming Irrigation Audits | Crop Residue Management and Conservation Tillage |
| Land Leveling | Irrigation Scheduling |
| Contour Farming | Furrow Dikes |
| Nursery Production Systems | |

## Industrial BMPs

### Structural

| | |
|---|---|
| Boiler and Steam Systems | Industrial Submetering |
| Refrigeration (including chilled water) | Cooling Towers |
| Industrial Alternative Sources and Reuse of Process Water | Cooling Systems (other than Cooling Towers) |
| Industrial Landscape | Once-through Cooling |
| Rinsing/Cleaning | Water Treatment |

### Operational

| | |
|---|---|
| Industrial Water Audit | Industrial Water-Waste Reduction |
| Industrial Site-Specific Conservation Programs | Management and Employee Programs |
| Industrial Landscape | Cooling Towers and Cooling Systems |
| Rinsing/Cleaning | Water Treatment |

### Educational

Management and Employee Programs