CONSERVATION WHITE PAPER

prepared at the request of the

City-County Water Infrastructure, Supply & Planning Study, PHASE 2

Val L. Little

As early as 1950, President Truman had a Water Resources Policy Commission, which noted:

> *"We can no longer be wasteful and careless in our attitude towards our water resources. Not only in the West, where the crucial value of water has long been recognized, but in every part of the country, we must manage and conserve water if we are to make the best use of it for future development."*

The City of Tucson embraced that message early on and has a long and distinguished history of leadership in the efficient use of its water sources. Those of us who have been around a long time know that this community, and indeed this entire region, had a conservation ethic long before having a conservation ethic was cool.

We now find ourselves 60 years down the road, having done all the easy things to use our water more efficiently and, luckily, there is still a great deal of support and desire for additional conservation. Water CASA has a clear history of working to keep the region at the forefront of this increasingly important field and we hope this white paper contribution to Phase 2 of the City and County's Water Infrastructure, Supply & Planning Study process will further that goal.

BY ANY OTHER NAME - STILL OUR CHEAPEST WATER SOURCE

> *We conclude that . . ., it is much cheaper to conserve water and encourage efficiency than to build new water supplies or even, in some cases, expand existing ones. . . and that the savings can be had without the many social, environmental, and economic consequences that any major water project will bring.*
>
> *Waste Not, Want Not, Pacific Institute, 2003*

Conservation has many variations and definitions but most of us know it when we see it. Whether you call it demand management, increased efficiency, or plain old water conservation, to most of us it probably means one or more of the following: the socially beneficial reduction of water use or water loss, the reduction of water use without decreasing services or life style, 'economic efficiency' which equates to the level of conservation reached when the incremental cost of reducing demand is the same as the incremental cost of augmenting supply, any action or technology that increases the productivity of water use, or reducing the amount of water needed for any goal while still accomplishing that goal.

Any or all of these definitions and descriptions have in common the move toward, dare we write it, our larger goal of sustainability.

CONSERVATION TOOLS AVAILABLE TO US

There are many different ways to categorize conservation, demand management, or water use efficiency efforts.

Public Information/Education
Incentives
Public Policy (Laws, Regulation, Ordinances)
Rates
Research/Evaluation/Analysis
Technology/Industry Standards
Reuse /Recycling
Leak Detection

An important thing to keep in mind is that, even though Water CASA typically uses all of the above tool descriptors, very few if any efforts in these categories stand alone. Everything is interrelated and used in tandem. One entity's ordinance is another's incentive; one entity's leak reduction effort is another's public education campaign, etc.

PUBLIC INFORMATION/EDUCATION

This is an important component of any and all other conservation efforts. The target audiences (decision-makers, rate payers, school children, etc.) need to be made aware of the why and the how of all conservation and efficiency efforts in order to achieve the buy-in necessary for program success.

This tool includes every conceivable communication method, every media:

Public Education - via workshops, lectures, print materials, electronic resources, etc. The public wants to know how to save as well as why and what savings in water dollars, energy, environmental resources etc. will accrue from the effort.

Public Awareness campaigns can take the form of radio or television public service announcements (PSAs), interviews, or newspaper articles.

Training and Certification in key water conservation related fields such as Landscape Architecture, Green Plumbers, Irrigation Auditors, Irrigation Installers, Certified Water Auditors, etc.

One of the difficulties associated with this all-important tool is the inability to easily and inexpensively track or assess the effectiveness of the messaging, how much learning has actually occurred, or how opinions have been modified. The importance of making the efforts to communicate in a variety of ways with the general public or segments thereof is all too often largely an article of faith.

Examples:

The granddaddy of all successful public awareness campaigns is Tucson's own **Beak the Peak** campaign. Begun 32 years ago, it was brilliant in its simplicity and highly effective in getting the general public to meet and even exceed the goals set by the

program. It was envisioned as a peak demand mitigation measure but proved even more effective as a conservation program in reducing total demand.

In more recent years, the **Southern Nevada Water Authority** has been very effective in positioning their region in the minds of the public as saving massive amounts of water. They have spent vast amounts of money on programs and the promotion of their efforts. Water use has been reduced substantially but it should be noted that is easy to achieve a high percentage of water use reduction when you begin at around 400 gpcd. As it is, today their residential water use is still approximately 100 gallons per person per day more than Tucson.

As a part of Water CASA's **Outdoor Water Use IDEALS**, we continue to advocate with clear, consistent messages that are not requirements but rather goals for the region to reach: **No Lawn Just for Looks, Use Mother Nature as Your Primary Irrigator,** and **Go Wild, Go Native!**

The **San Antonio Water System** is recognized nationally for the effectiveness and sophistication of its water use reductions during the past 25 to 30 years. Their programs are many, varied and increasingly targeted with excellent public communication messaging. San Antonians have lowered per capita water use 40 percent since 1980, despite a population increase of 70 percent. As a community, their water use has been reduced from 213 gallons per capita per day (gpcd) in 1984 to approximately 121 gpcd in 2004.

INCENTIVES

Conservation incentives are generally considered to be of three types: regulatory, educational, or financial. They are usually offered by an agency, a municipality or a utility as a way to reduce overall water use for a specific customer base or to target high water use in a certain class of water user, a particular demographic, or a specific water use.

Examples:

Incentives such as the tax credits currently offered in Arizona to encourage graywater plumbing for new construction and the installation of rainwater and graywater harvesting systems is **regulatory** in its nature. It was approved by the State Legislature, is offered for a limited period of time and for a not-to-exceed total amount.

Here in Tucson, **educational** incentives include training for the general public through the WaterSmart Workshop series or the SmartScape Certificate Series for the green industry professionals. The Zanjero Program can either be considered an educational incentive, a facet of the utility's public education programs, a customer service or all of the above.

For **financial** incentives, you can't beat the programs offered by the Seattle Public Utilities. They have a variety of rebates on water-efficient fixtures for both existing buildings and new construction projects. For example, all customers are eligible to either get free toilets, or rebates worth up to $120 for replacing each toilet or urinal fixture with an efficient WaterSense model. There are also rebates available along with technical assistance to upgrade existing automatic underground sprinkler systems. Commercial customers are eligible to receive $1,500 to replace inefficient food steamers. Laundromats can receive a $500

rebate on coin-operated clothes washers replaced with high-efficiency models. And, to cover all else, customers are eligible to receive 50% off the installed cost of many other water conservation measures.

PUBLIC POLICY (LAWS, REGULATIONS, ORDINANCES)

Public policy initiatives that affect water use permeate every level of our society and every facet of our water use. Everyone, or everyone in a target group, must comply. A basic advantage of these types of efforts is that they cost little or nothing for the government agency, municipality, or utility to implement. The costs are generally borne by the public, or a portion thereof (ratepayers, developers, etc.) except in the case of tax credits.

Generally public policy initiatives relating to water demand management fall in two categories: those targeting new construction and those that seek to bring existing water using housing or businesses up to a current standard of efficiency. The recent graywater and rainwater harvesting ordinances approved for the City of Tucson and the retrofit on resale ordinances becoming the norm in California and the Southeast are, respectively, prime examples of these two types of initiatives.

As stated earlier, all public policy efforts have components of other conservation tools and do not exist in a vacuum. And, efforts such as ordinances are only as effective as the humans who implement and enforce them.

Examples:

The only toilets that can be purchased in this country are ULF models that use 1.6 gallons per flush or less. This is a **federal** law that went into effect in 1992. The amount of water saved by this initiative alone is inestimable. It is probable that this requirement will be stiffened within five years to require that all toilets purchased will be approved HET models (high-efficiency toilets using 20% less water than the currently required ULF models).

In the **State** of Arizona we operate under the 1980 groundwater management code and the decadal management plans that flow from this law. We are about to be regulated in our AMA by a new regulatory program targeting the water conservation efforts of utilities and municipalities. This program offers the move from a prescriptive (GPCD) program to a performance-based program (BMP).

Pima **County** recently adopted a Sustainability Action Plan that, among other things, sets targets for water use decreases in all County facilities. The plan calls for a reduction in the County's baseline water use by at least 5% by 2012; 10% by 2017; and 15% by 2025. It is likely they will easily exceed these goals.

The **City** of Santa Monica has had in place since 1993 a retrofit on resale ordinance that requires any building (residential and commercial) that changes ownership to be certified as being retrofitted with water efficient plumbing fixtures if such fixtures are not already in place. Compliance with this ordinance is a condition of escrow. The compliant fixtures include ultra-low flush toilets that use a maximum of 1.6 gallons per flush, urinals that use a maximum of 1 gallon per flush, showerheads that emit a maximum of 2.5 gallons per minute, faucets that emit a maximum of 2.5 gallons per minute, and residential reverse osmosis water filtration systems which must be equipped with shut-off valves.

RATES

Water utility rate structures are typically designed to recover the costs to provide all water service and billing based upon actual metered water use. Conservation pricing should do all that plus provide incentives to customers to reduce average use, peak use, or both. Additionally, the conservation rate structure needs to be designed to be revenue neutral, using demand forecasting to account for use reductions as a result of the price increases or other external factors such as the current economic downturn. Rate setting is considered both an art and a science.

Rate structures are considered to send a conservation message if water usage fees contain any or all of the following: seasonal differentials, inclining block rates, peak load pricing.

Rate analysis and scenario development that lead to rate recommendations is dependent on the utility's desire to send however strong a message and ability to accurately forecast demand in conjunction with the rates structure. The art is to hit that sweet spot where costs are recovered and the decrease in demand does not necessitate additional rate increases or create a budget deficit.

Examples:

Indian Wells Valley Water District in California has an increasing block rate structure that is unique as it varies its rate blocks by meter size rather than customer class, and has no volume tiers.

In its 2003 report titled Smart Water, Western Resource Advocates singled out **Tucson Water** as having a rate structure that sends a clear, consistent conservation message via its water pricing. This is most effectively done through a steeply increasing block rate structure. "The City of Tucson's water rate structure offers a prime example of this strategy."

Sandy City, Utah has a conservation rate structure that is seasonal. During the summer months (April - September), the variable rate is 81% higher than in the winter months. The first 8,000 gallons of water are included in the customer's base charge throughout the year.

RESEARCH

This is an extremely broad category that includes everything from cost benefit assessment of conservation measures, to product testing, to social marketing. The gaps in our testing of water using products makes it difficult to set appropriate Industry Standards (see next tool) and there is a lack of understanding of what and how the consumer (read customer) wants to receive conservation messaging.

Cost-benefit comparison and complete analysis of conservation measure effectiveness is clearly an underutilized tool in the field of water conservation. The gaps in our knowledge about how a certain conservation measure or set of measures compares to the costs to acquire and deliver an additional supply of water is not well documented studied or understood.

"Since each water-conservation measure is an alternative to new or expanded physical water supply, measures are considered cost-effective when their unit cost – what we call "the cost of conserved water" – is less than the unit cost of the cheapest alternative for new or expanded water supply."

Waste Not, Want Not, Pacific Institute, 2003

Clearly the majority of water providers have not fully assessed the cost-effectiveness of their particular programs and this is one of the areas in which Water CASA has devoted a good deal of time and effort. Since our inception we have worked to combat the lack of solid, verifiable measurements of program effectiveness. Our findings in the Evaluation & Cost Benefit Analysis (ECoBA) study confirmed that the ACTUAL water saved by any particular program or measure has been poorly tracked and published. There is a tendency to make estimates of what is to be saved in terms of water or dollars prior to commencing a program as a way to gain support for the effort, but little is done to look back and see what was actually saved or accomplished. Unless or until this issue is resolved for the field of demand management, it is unlikely it will get its just due from the supply side heavily dominated with engineered solutions to water management issues.

In this region we have done all the cheap and easy things to save water and extend their supplies so everything done from here on out must be justifiable fiscally, environmentally, and socially (triple bottom line) and must be weighed against any and all other engineered or acquisition solutions to water supply issues.

Examples:

Tucson Water has effectively used customer **survey** research as a method of determining what level of TDS is acceptable to their customer base and focus group research as well to assist decision makers in selection of conservation measures and methods of working with the public that will meet with the greatest degree of success.

As referenced above, Water CASA's ECoBA work looked at **actual water savings** for actual water conservation programs and established the cost to save and acre-foot of water for each case study, enabling the apples-to-apples comparison between various measures.

Another type of research, related to Industry Standards, which is best exemplified by the **product research** known as Maximum Performance (MaP) Testing of Popular Toilet Models. Funded by the Canadian Water Works Association, the California Urban Water Conservation Coalition, and the Alliance for Water Efficiency and implemented by Veritec Consulting Inc. and Koeller and Company, this testing gives anyone in the field the ability to tell which toilets are worthy of recommendation and to offer all of us a way to comfortably advocate for the next generation of toilets, the High-efficiency toilets that use 1.2 gallons per flush or less.

TECHNOLOGY / INDUSTRY STANDARDS

Technological advances are coming all the time so it is very important to stay current, to avoid getting stuck on one particular thing or at one point in time. The growing support for HET Toilets (<1.2 gpf) rather than staying with ULF toilets (1.6 gpf) is a good case in point.

Akin to the limitations of ordinances, technology is far ahead of our ability to influence human behavior and fallibility. Using the example of irrigation systems, the irrigation technology available to us today is absolutely amazing, but it is only as effective a conservation tool as the humans who design the system, install the system, inspect the plan, manage the system and the operator who must keep the system operating at optimal levels. Citing the AWWA report on the Residential End Uses of Water (which we consider a Research tool as well as a Technology and Public Education tool):

> *Households with drip irrigation systems use 16% more water outdoors than those without drip systems.*
>
> *Households that employ an automatic timer to control their irrigation systems used 47% more water outdoors than those that do not.*
>
> *Households that water with a hand-held hose use 33% less water outdoors than other households.*

These findings led directly to Water CASA's IDEAL that stresses the critical need for all of us to use Mother Nature as the primary irrigator. Too often we place our faith and reliance on technology when, in actuality, human nature can easily override our technological advances.

Examples:

The last generation of **pre-rinse spray valves** used 1.6 gallons per minute and cleaned a plate in 26 seconds. The new models, just recently tested and approved by the Food Service Technology Center, use <.7 gallons per minute and cleanability is 20 seconds. (.69 gpplate vs. .23 gpp) reducing water use by two-thirds. Imagine what that savings amounts to in terms of all the water used to pre-rinse dishes in every restaurant throughout this country.

The **MaP testing of toilets** mentioned above in Research is revised and updated every six months so it is a consistent and current source of information. This testing is the gold standard for the sorts of industry standards and technology dissemination that is needed by all in the water field, the building industry and many others.

EPA's WaterSense program is making strides in the area of water product labeling much as they have with their EnergyStar program. They are even piloting a WaterSense New Home rating that is being tested several places around the nation, including Dorn Homes in Tubac.

To cite a new innovation that has huge potential: **Aquatain**, a product from Australia that cuts loss from evaporation up to 50% was originally developed for use in agriculture ponds. This cheap, inert product was introduced in the US a year or so ago and is finding wide acceptance in the swimming pool industry and aquaculture. Future applications for golf course ponds, storage reservoirs, and other water features are likely to follow.

REUSE / RECYCLING

Though it may seem radical today, Water CASA fully believes that in the not too distant future, all outside water use in this region should be (and probably will be) required to be from renewable supplies: either residential graywater reuse, harvesting of rain water/storm water, and the use of reclaimed water. These three sources of water are critical for us to increasing embrace for several reasons, not the least of which is that they move us toward matching the appropriate quality of water to the most suitable water use. Second, they are our sources, generated by us and they present us with secure, renewable, sustainable sources of water.

These three sources of supply are generated at various scales. Reclaimed water is generated and supplied at the system or municipal level, graywater is generated and usable only at the individual residential level, and the harvesting of rainwater can be an individual effort or at the development, utility, or watershed level. Each of these renewable supplies can be thought of as water sources and as conservation measures in the broadest sense.

Consistent with the goal of using water of a quality that matches its intended use, every responsible wastewater utility has a sewer maintenance program that includes main flushing (along with physical inspection, closed circuit television, and root and debris removal). PCWWM is no exception and they use main flushing as a regular and routine maintenance tool, particularly in the mature and aging portions of our sewer conveyance system. Flushing needs doing no matter the amount of water used by the customer and it can serve to extend the life of the system. More important, from Water CASA's perspective, is the source of that flushing water. Using a water source other than potable is a must. Additionally, new conveyance system standards and requirements for lower-water-using new portions of the wastewater system must be developed and approved.

FIND / FIX LEAKS

Though not considered strictly a conservation program at the system level, water utilities have a requirement to keep their 'lost and unaccounted for water' below 10% (Lost and unaccounted for water is calculated by subtracting total deliveries from water used -- ADWR).

And, just as the cheapest source of water is inevitably the water not used, water lost to leaks is a source of supply that is an expense not recovered by the utility, it is also water not productively used and represents revenue not generated. Similarly, water leaks on the customer side of the meter are a cost to the customer in both water and sewer fees.

Just as public education must be continuous and ongoing, so must the hunt for and the elimination of leaks for both the utility and water customers.

Examples:

Pacific Institute estimated in 2003 that 7.2% of residential water use in California was lost to leaks. That is water that the utility had to develop and deliver, water that customers had to pay for and not have beneficial use from, and that they paid sewer fees on as well.

Tucson Water has recently stepped up its leak detection efforts to get its lost and unaccounted for water below the 10% requirement. The utility will undoubtedly comment on this program in their own white paper.

In mid-2008, **Water CASA** offered toilet dye strips to every customer of each of our members. The strips, along with instructions for how to check for silent leaks, were included in utility bills. One member, Oro Valley, was able to target the dye strips mailing to their housing stock built before 1992, when the requirement for 1.6 gpf toilets began.

EFFORTS ELSEWHERE

For the most part there is nothing being done in the US that hasn't been done here, or at least considered in this region. There are however areas where more money is currently being spent on conservation than we are currently investing, also there are municipalities that are setting more rigorous water reduction targets than we have done thus far. Additionally, there are now places that have lower gpcds than ours. However, these communities are typically caught in a crisis that they have failed to anticipate, or they have a socio-economic base different from our own. Southern Arizona is well aware of its precarious position (sitting atop our groundwater, several hundred miles up hill from our current renewable supply, and facing shortages of that supply in the all too near future, plus the complicating effects of climate change).

All that being said, it is worthwhile to take a brief look at efforts in a few other countries.

AUSTRALIA has a very different water policy history than ours and has chosen paths the combat their drought and general water supply issues in ways that may have limited transferability to our situation. But, they certainly can be considered the most water efficient users of any developed nation.

The "Target 140 Campaign" adopted in 2007 in Queensland set a goal of 140 liters per capita per day (that is 37, yes 37 gpcd). The Queenslanders met and exceeded that goal and are currently at 128 liters pcd (33.8 gpcd). Other states and municipalities are following suit with similar goals such as Melbourne with a 155 liters pcd goal (41 gpcd).

In the space of 10 years several states in Australia have gone from not allowing rainwater collection to requiring rainfall-harvesting systems. This year saw the beginning of a federal rebate for rainwater harvesting systems and graywater reuse systems of up to $500 per household. Various cities and states throughout Australia offer additional rebates as well.

Several cities have adopted a "One Less Flush A Day" campaign. It's not a policy but a public awareness effort.

All over the nation there are fixture exchange programs that allow customers to turn in their high water using showerheads and faucets and exchange them for low water using models.

As early as 1994, in many areas of the Country, a permanent ban on sprinkling irrigation during daylight hours was implemented.

There is little need for conservation programs targeting toilets as the requirement for low water using dual flush toilets has been the law in Western Australia since 1982, a full 10 years before we required low water using models in the US.

A recent National Water Use Survey showed that, like Southern Arizona, the population is desirous of doing even more and, like us, they are investigating which efforts will gain them the most water savings for their next efforts.

CHINA has any and all of the water supply, quality and delivery issues imaginable. There is primary focus in urban areas such as Beijing on the huge losses within systems. It should be noted that water use in Beijing is 300 cu. meters per year, which is equivalent to less than 22 gpcd.

In urban areas of **INDIA** the definition of rainwater harvesting is collecting rainwater on roofs of buildings and storing it underground as on-site recharge for later use. Groundwater depletion is a major concern and they have chosen to do recharge in this unique way. All over the country, laws are being passed that make rainwater harvesting compulsory. This also includes the requirement for a borehole or dry well on the property to facilitate the recharge.

It is commonly accepted throughout the country that conservation is less expensive and more environmentally sound than new supply investments, and minimizes future capital requirements. "Water conservation is to be achieved through more effective maintenance mechanisms, which can help to overcome the problems of pilferage and leaks. Demand management can be achieved through water recycling, through financial incentives and technological interventions," per the 1999 Assessment of Water Supply Options for Urban India.

CONSTRAINTS/BARRIERS

Three steps are required to move us toward a more water-efficient world. We must first identify the potential for improving water-use efficiency. Second, we must honestly determine the institutional, economic, and technological barriers that impede these improvements. The all-important third step is implementation of appropriate economic, educational, and regulatory policies needed to remove the barriers and capture all available savings.

One reason the efficiency programs are difficult for traditional water agencies to fully embrace is that they shift the burden from engineering logistics to social ones. Typically, water utilities are led by and, heavily comprised of, highly trained engineering experts who know how to design and build large structures and systems. These same experts are less familiar or comfortable with methods for designing and implementing conservation programs that reach individual customers.

Sustainable solutions are going to have to come from all of us. It is a mistake to let decisions regarding water use be left entirely in the hands of professionals. Each facet of the water community has a bias and it is imperative that the public be

engaged enough to understand the complexities of the options available and to be able to ask smart, tough questions; to get workable answers.

Typically there is a disconnect between the conservation staff and the rest of the water resource management team in many utilities. A corollary, there is often an even a greater disconnect between the conservation folks and those who are the utility data 'gatekeepers'. These issues need to be addressed in order to achieve the most meaningful program selection, implementation and evaluation.

There is also a tendency to want to recommend something to decision makers in the way of conservation programming that is unique and does not appear to be copying what has been done by neighboring utilities or municipalities. Example: entity A adopts ordinance X; entity B doesn't want to be seen as following the lead of entity A so B adopts nothing or tries to come up with something more, different or better. This reality runs counter to the lip service virtually every participant in this City-County process has expressed, namely 'Don't Reinvent the Wheel'. We all know our most effective solutions will be regional in scope so we must learn from and adopt from one another. The public needs and deserves consistency but there is currently no carrot or stick for municipalities to overcome this natural barrier.

On the flipside, there is no one solution. Each community, municipality, utility, county, or state has differing situations and constraints and, more importantly, unique values, which serve to inform the degree of efficiency in water use to be required or expected. How efficient do we want to be in Southern Arizona?

There are no more quick, easy or cheap solutions. In this region we have done all the simple things. We now have to be more strategic in our decisions to ensure we are being cost effective with any additional demand management strategies we implement.

The balance between soft conservation efforts (public awareness, customer service, utility goodwill) and the hard, goal based (gallons or AF saved) and targeted programs needs to be more clearly understood by the public and by decision-makers. Though all types of program efforts are very necessary, programs are often described as a conservation effort when in fact little in savings has been achieved. Additionally, the effort is not evaluated by the utility for its ability to either raise public awareness or to save water.

DEMAND PROJECTIONS / WHAT THE FUTURE MAY HOLD

It is a good bet that within 10 years, all outdoor water use in this region will be exclusively from 3 sources: reclaimed water, harvested rain water and residential graywater.

As mentioned earlier, **EPA** is developing a specification to label new homes that will be designed to reduce water consumption through efficient plumbing fixtures, hot water delivery, appliances, landscape design, and irrigation systems. WaterSense labeled new home will be designed and built to be about 20 percent more efficient than similar new homes being built today. At this level of efficiency, households can save more than 10,000 gallons of water per year. WaterSense labeled new homes will also realize significant energy savings, due to the reduced amount of hot water used.

Mary Ann Dickenson, the doyenne of water conservation and head of the **Alliance for Water Efficiency**, recently outlined her predictions for the future of water use in the United States. By 2020 she expects the following:

> Water use in new homes will be down to 35 gpcd.
>
> No potable water will be allowed for irrigation or toilet flushing.
>
> When sold, existing homes will be required to be retrofitted to 100% of new home standards.
>
> There will be special water rates for EPA WaterSense homes.
>
> All homes will be equipped with a beacon device that will alert the homeowner if the household is approaching or exceeding its water use target or budget.
>
> There will be a dramatic increase in training and certification requirements for all those working in fields that use water.

The cover story in the current issue of Atlantic Monthly is, **How the Crash Will Reshape America**. Observations by author Richard Florida are particularly relevant to the issues with which all of us are grappling.

> *. . . in the heady days of the housing bubble, some Sun Belt cities . . . developed economies centered largely on real estate and construction. . . . much of the cities' development came from, well, development itself. At a minimum, these places will take a long, long time to regain the ground they've recently lost in local wealth and housing values. It's not unthinkable that some of them could be in for an extended period of further decline.*
>
> *Yet the boom itself neither followed nor resulted in the development of sustainable, scalable, highly productive industries or services. It was fueled and funded by housing, and housing was its primary product. Whole cities and metro regions became giant Ponzi schemes.*
>
> *Will people wash out of these places as fast as they washed in, leaving empty sprawl and all the ills that accompany it? Will these cities gradually attract more businesses and industries, allowing them to build more-diverse and more-resilient economies? Or will they subsist on tourism—which may be meager for quite some time—and on the Social Security checks of their retirees? No matter what, their character and atmosphere are likely to change radically.*
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> *Atlantic Monthly, March 2009*

Though it is tempting to credit the **recent down turn in water use** throughout the region to our conservation efforts, other factors are probably playing a larger role. Water CASA believes there are several other factors at work here that overshadow even our most effective efforts:

Reporting about the drought, the well-publicized potential for shortages on the Colorado River, and coverage of climate change in general over the past few years has served as a region-wide de facto public awareness campaign.

Publicity about the recent passage of ordinances requiring residential graywater plumbing and commercial rainwater harvesting in new construction has served to heighten interest in these strategies.

Vacancies in the single-family housing sector created by the collapse of the housing market and accompanying foreclosures.

Overall downturn in the economy.

Efficiency in new construction brings down average use, particularly in the period of rapid growth we have recently experienced.

This reduction in water use also points to a more elastic demand for water than was the previous conventional wisdom and, by extension, may mean our job of reducing water use in the future may be easier that expected.

RECOMMENDATIONS & OPPORTUNITIES

Though this white paper is written at the request of the City and County's Water Infrastructure, Supply & Planning Study, it speaks to the entire region.

1. Chart a path to full utilization of indirect potable reuse. Continuing to ignore wastewater as a future source of supply could cost our community hundreds of millions of dollars. And, because the Groundwater Code enables local water utilities to engage in the indirect recharge of wastewater, and recover that recharge under the same rules that apply to CAP recharge, there is simply no alternative, regardless of expense, that is as remotely reliable for balancing our supply and demand. On top of everything else, this is one of the least expensive alternatives available to our watershed.

> *"From a technical and chemical perspective, public health and safety aren't issues. Even so, convincing the public and politicians that the end product of a water reclamation facility can meet drinking water standards requires extensive public relations efforts."*
>
> *AWWA Opflow, February 2009*

2. Develop a plan to achieve the elimination of potable water for outdoor use in a five to ten year time frame. This means all outdoor water use must be from harvested rainwater, graywater reuse or reclaimed water.

3. Institute retrofit upon resale ordinances as an equitable method to bring existing properties up to the water efficiency standards of new

construction. Target among other things, toilets, hot water heaters, and irrigation systems.

4. Establish water efficiency messaging and media campaigns on a regional basis. We are all in the same media market and coordinated efforts create consistency throughout the region and increase the impact of our efforts.

5. Strive for rate adjustments and ordinance development every year. Just as rate increases should be regular, adoption of increasingly stringent water use restrictions, coupled with incentives, should be done regularly (every year something should come forward in every municipality and utility) and in increments that are meaningful to customers but not so burdensome that a backlash is created. Additionally, a long-range plan for these additional requirements or restrictions should be implemented comprehensively, not piecemeal, and laid out for a certain time frame so the general public and the business community know what is coming and when.

6. Embrace a requirement that by a certain date, all toilets sold and installed in this county be High Efficiency models rated 500 grams-per-flush or higher by MaP testing.

7. Incorporate the concepts of STRUCTURED PLUMBING including trunk, branch and twig piping systems, and pipe insulation into the plumbing code.

8. Fully enforce all the conservation requirements and ordinances already in place.

9. Establish a method to implement consistent conservation and water related ordinances throughout the region.

10. Institute addition training and certification requirements for the entire range of practitoners in water using fields. This includes all facets of the landscape industry, plumbing industry, water auditors, managers, etc. as well as field service and customer service staff in our water utilities.

11. Analyze the outcomes of existing and previous efforts as a way to inform our next generation of efforts. Has the expected decrease in water use been realized, have the desired changes in water use patterns occurred, has the maximum water savings relative to dollars savings been achieved?

12. In this region we have done all the cheap and easy things to save water and extend their supplies so everything done from here on out must be justifiable fiscally, environmentally, and socially (triple bottom line) and must be weighed against any and all other engineered or acquisition solutions to water supply issues.

13. Use each and every one of the tools discussed in this paper. Decide, how and when and to what extent each tool can most effectively be used.

14. Target areas of actual high inefficiency rather than just overall high water use.

As long as it is cheaper in dollars, environmental and social terms to do increased conservation than to find the next source of water, we have more work to do. The difficulty rests with the public will. How do we want to be identified? Will we rise as the Solarcon Valley? Will we be the absolute leader in water use efficiency for this nation?

And, regionally we need to make a conscious shift from a growth-based economy to one that is more sustainable: we have entered the uncharted waters of limits and drastically changing priorities. So, we better pay attention and get busy.

POST SCRIPT FOR JIM

Overall water use in this region estimated as near as can be through 2006 and 2007, from sources such as ADWR, TW.

AMA Water Use By Sector: If water use in the Tucson AMA is X, **Municipal water use is 55%X.** Agriculture is 30%X, Mining 10%X, Other Industrial 5%X.

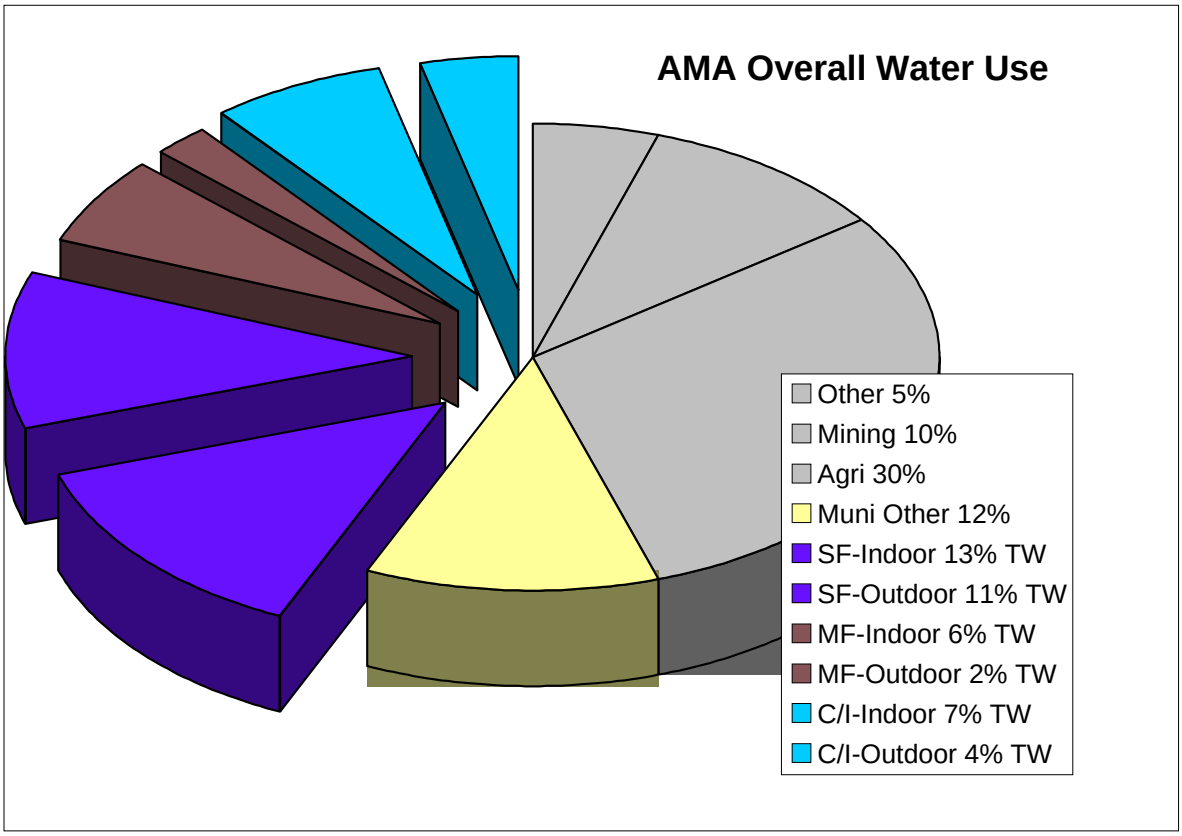
TW Water Use By User Class: **Water use by the City of Tucson's** water utility is 79% of the total municipal water use in the AMA, which translates to **43.5%X**.

Single Family water use by Tucson Water is 56% of its total use; therefore this customer class uses approximately 44% of all single-family usage in the AMA, which translates to **24%X**.

Multi Family water use by Tucson Water is 19% of its total use; therefore this customer class uses approximately 15% of all multi family usage in the AMA, which translates to **8.25%X**.

Commercial/Industrial water use by Tucson Water is 25% of its total use; therefore this customer class uses approximately 20% of all commercial/industrial usage in the AMA, which translates to **11%X**.

TW Water Use Divided By Indoor and Outdoor Usage:
45% of Single Family water use by Tucson Water is outdoor usage = **11%X**.
26% of Multi Family water use by Tucson Water is outdoor usage = **2%X.**
35% of Coml/Ind. water use by Tucson Water is outdoor usage = **4%X.**



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