

Rebuttal Report on Water Conservation and Efficiency in Southern Nevada

PRESENTATION TO THE OFFICE OF THE NEVADA STATE ENGINEER

Prepared by



**SOUTHERN NEVADA
WATER AUTHORITY**

August 2011

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Suggested citation:

Bennett, D.B., 2011, Rebuttal report on water conservation and efficiency in southern Nevada: Presentation to the Office of the Nevada State Engineer: Southern Nevada Water Authority, Las Vegas, Nevada.

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Pertaining to:
Groundwater Applications 54003 through 54021 in
Spring Valley
and
Groundwater Applications 53987 through 53992 in
Cave, Dry Lake, and Delamar Valleys

August 2011

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17 Aug 2011
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In 2007, the Pacific Institute, in partnership with Western Resource Advocates (WRA), released a report titled “*Hidden Oasis: Water Conservation and Efficiency in Las Vegas*” (Hidden Oasis). The report assessed conservation efforts of the Southern Nevada Water Authority (Authority) in Las Vegas, Nevada. The report was commissioned at the request of the Progressive Leadership Alliance of Nevada, an opponent of the Authority’s efforts to expand and diversify its water resource portfolio.

Subsequently, Peter Gleick and Heather Cooley of the Pacific Institute submitted to the Nevada State Engineer a follow-up report titled “Report on Water Use Efficiency and Conservation in the Las Vegas Valley,” dated June 29, 2011. This rebuttal report addresses content from both Hidden Oasis and the Gleick and Cooley documents.

Hidden Oasis was largely based upon the Authority’s responses to a pre-defined set of survey questions and documents available to the authors upon request or via the internet. The Authority was allowed to review and comment on the final draft of the document approximately one week prior to its release. Some, but not all, of the Authority’s corrections and comments were integrated into the final report.

The report contends that “a serious effort at water conservation and efficiency improvements can reduce water demand for the single-family residential sector, hotels and casinos by more than 86 KAFY (86,000 acre feet per year).”¹ The Authority is committed to furthering water efficiency in southern Nevada, but considers the Pacific Institute’s estimates to have been derived using inflated baselines and unrealistic assumptions about market penetration and cost efficiency of water-efficiency programs. Furthermore, the data presented in the report is now almost seven years old, during which time the Authority has continued to advance water efficiency.

Gleick and Cooley (2011) designate outdoor conservation “especially important because of the consumptive use aspects of outdoor water use, and especially valuable for reducing the need for new sources of supply².” The Authority concurs and has made outdoor water efficiency the primary target for our conservation programs. Although indoor conservation does not extend the region’s resources, the Authority also has effectively pursued indoor conservation as a component of a comprehensive, multi-faceted conservation program.

Furthermore, all indoor water collected by the Authority's member agencies’ regional wastewater treatment plants is already directly or indirectly reused. In fact, more than seven billion gallons of wastewater are directly recycled annually for use at parks, golf courses, and power plants. Gleick and Cooley (2011) suggest that “expanding indoor efficiency efforts and improving implementation of

1. Pacific Institute, *Hidden Oasis* (2007), page 36.
2. Gleick and Cooley (2011) page 3.



water treatment and recycling would provide substantial water savings by providing water that can be reused for a wide range of uses, without finding new supplies.³ Gleick and Cooley fail to acknowledge that direct reuse does not provide a water resource benefit to southern Nevada, since all wastewater is currently directly or indirectly reused. In addition, research conducted by Dr. Dale Devitt of the University of Nevada Las Vegas⁴ indicates that irrigating with reuse water, which is higher in salinity than potable water, actually increases demand due to the increased leaching fractions required to maintain plant health.

Graywater reuse is another technique that is often promoted with the expectation of reducing potable water demand. Graywater is untreated wastewater from bathroom sinks, showers, baths and laundering machines. While graywater reuse has been successful in many cases, it has also produced unintended consequences. When the Water Corporation of Western Australia (Perth) provided incentives to 64 households to install a graywater reuse system, the average annual potable water use increased by more than 16,000 gallons per household.⁵ Since graywater's secondary use is typically landscape irrigation, reuse projects have the potential to increase southern Nevada's consumptive demand.

The Authority contends that the efficiency potential suggested by Hidden Oasis is grossly inflated and that substantial errors were incurred in the report's assumptions and calculations:

1. The 165 gallons per single family residential (SFR) occupant per day shown in the report was reasonably comparable to the Authority's calculation of 162 gallons per SFR occupant per day for the year 2004. By 2009, the most recent year assessed by the Authority, SFR use decreased to 146 gallons per single family resident per day⁶.
2. Although the report contains a city-by-city graphical comparison of single family homes' indoor water use, Hidden Oasis's estimate of the Authority's current per capita residential indoor water use was not derived from actual data. In acknowledging that the study used by Hidden Oasis is fairly dated, the report estimates that demand may be lower, stating: "*we assume that indoor demand is between 60 and 70 GPCD, or about 65 GPCD.*"⁷

In 2007, the Authority collected metered water use data from 214 single family homes using datalogging devices. The study home population was selected to represent the construction age structure of the total SFR sector in the region. Through collection and analysis of water use data, the Authority is able to differentiate outdoor irrigation by identifying recurring cycles of use consistent with the operation of an automated irrigation controller. Once outdoor use was disaggregated, remaining water use was attributed to indoor uses. Using a population of 2.97 persons per household,⁸ the analysis estimated SFR indoor per person use to be approximately 55.2 gallons per day.

3. Gleick and Cooley (2011), pages 4 and 700.

4. D.A. Devitt et al. (2007), *Agronomy Journal* 99:692-700.

5. Waterwise rebate scheme review 2007 (2008). Data Analysis Australia Pty Ltd.

6. Total SFR metered demand for all agencies/estimated SFR residents/365 (from T. Maher, July 26, 2011).

7. Pacific Institute, *Hidden Oasis*, (2007), page 37.

8. Clark County Comprehensive planning – Single family population divided by occupied SFR units (2007).

3. In addition to using an inflated baseline (65 gpcd instead of 55.2 gpcd) for indoor water use, the estimate of potential indoor residential water savings assumes every existing household and business purchases, installs, uses and maintains the highest performing appliances and fixtures currently available in the market. *“Replacing all water-using appliances and fixtures with more efficient models would reduce current SFR indoor demand from 78 KAFY to 46 KAFY, or from 65 GPCD to 39 GPCD. Using this approach, we estimate that Las Vegas’ current SFR indoor conservation potential is 31 KAFY.”*⁹

A scenario of replacing 100 percent of existing appliances and fixtures is unachievable by any agency under any circumstance, therefore, it cannot be utilized as a scenario for demand planning due to the significant risk of experiencing a water supply shortage if conservation goals are not met due to less than 100 percent compliance.

The report offers two different projections of efficient per person indoor use in single family homes: 43 gpcd (Figure 7) which is derived from research studies, and 39 gpcd, which is used in calculating southern Nevada’s water efficiency potential. While per person indoor use values in the 40 gpcd range have been proven achievable in individual households,¹⁰ no major American city has yet shown a consistent ability for their entire single family customer base to meet such a target except as a response to a short-term water-supply crisis. The recently completed California Single Family Home Water Efficiency Study (Aquacraft, 2011) found average per person per day indoor use to be approximately 58 gallons in California communities, with the lowest per person indoor use of 53.5 gpd reported for the City of San Diego.

The Authority’s goal to achieve 199 gpcd calls for indoor demand reductions and projects residential indoor water use may decline by approximately 20 percent by 2035 through adoption of more efficient appliances and plumbing fixtures. While these reductions will increase efficiency of energy and infrastructure use, indoor water conservation does not extend southern Nevada’s water resources because Las Vegas already recycles all water used non-consumptively indoors. Only reductions in consumptive water uses extend southern Nevada’s water resources by allowing the conserved water to be diverted to another use.

4. Hidden Oasis’ baseline estimates for specific uses are also incorrect. For example, Table 9 suggests 12 KAF of demand reduction could be achieved by equipping homes with 1.6 gallon per flush (gpf) toilets. As demonstrated by Table 8 (page 38) and Appendix D, the baseline scenario incorrectly assumes all Las Vegas homes are currently equipped with 3.5 gpf toilets. (Table 8 estimates that each resident in a single family home uses 17.8 gallons per day for toilet flushing. Appendix D applies an average of 5.04 flushes per person per day. These figures demonstrate that the report estimated an average flush volume of 3.53 gallons in calculating the baseline.)

9. Pacific Institute, *Hidden Oasis* (2007), pages 21 and 39.

10. Estimate derived by applying fixture replacement rates found in the California Single Family Home Water Efficiency Study (Aquacraft, 2011) to Las Vegas region homes built prior to 1994.



The federal Energy Policy Act of 1992 (EPACT) required all new homes to be equipped with 1.6 gpf toilets. Since EPACT allowed depletion of remaining inventories, it is estimated that all homes built in 1994 or later were equipped with 1.6 gpf toilets. Sixty-one percent of homes in Las Vegas were built since 1994 and already equipped with 1.6 gpf or 1.28 gpf toilets. Of the 172,000 homes built in 1993 and earlier, 60 percent are estimated to have one or more 1.6 or 1.28 gpf toilets.¹¹ As a result, the Authority estimates the average flush volume in single family homes to be just over 2 gpf, not the 3.5 gpf estimated in Hidden Oasis.

5. Hidden Oasis' estimates of baseline resort water use and efficiency potential are not based upon any study or analysis of data and, therefore, cannot be considered credible. As an example, the report assumes 2.4 gallons of water use for each pound of resort linens laundered. All resorts in the region use industrial scale laundering facilities that utilize state-of-the art equipment that typically uses from 0.4 gallons to 1.5 gallons per pound. The Authority has worked closely with all industrial launderers on water-efficiency improvements. Based upon metered water use and regulatory reports submitted to Clark County, the Authority has determined approximately 25 percent of resort water use is consumptive and 75 percent is non-consumptive use, making it available for subsequent direct or indirect reuse. As such, the resort industry is estimated to consume less than 3 percent of southern Nevada's water resources while generating the bulk of the community's economy.

6. The report suggests reductions of approximately 48 KAFY of outdoor water savings are achievable in the SFR sector through landscape conversion (page 39), but this estimate is devoid of any actual data on existing quantities of landscape styles and their water use. The Authority currently operates the world's largest known landscape conversion program. As of July 1, 2011, the Water Smart Landscapes Program has incentivized conversion of more than 3,500 acres of lawn and paid incentives of \$172 million. This program, now in its eleventh year, has reduced southern Nevada's consumptive demand by an estimated 26,361 AFY. Achieving the additional landscape demand reductions suggested by the Pacific Institute would be equivalent to converting an additional 6,500 acres of SFR turfgrass to water-efficient landscape. A 2010 Authority analysis of aerial multi-spectral images estimated a total of 3,100 acres of turfgrass are on SFR properties. As such, even the conversion of all SFR grass, including functional turf areas, would be insufficient to yield even half of the water savings suggested by the Pacific Institute report. There simply is not enough turfgrass left in Las Vegas to meet Hidden Oasis's estimates.

The report made 12 recommendations for water-efficiency programming. Many accomplishments and programs of the Authority were not mentioned in the report or were relegated to Appendix A, which was not distributed with the printed report.

11. Penetration rates from California Single Family Home Water Efficiency Study. Aquacraft (2011).

Following are the 12 major recommendations of the Pacific Institute, accompanied by facts and statistics about the Authority's efforts and accomplishments related to the issue.

1. Pacific Institute Recommendation: Expand efforts to reduce outdoor water demand, using incentives for conservation and penalties for excessive water use.

- Since 2000, the Authority has operated the largest incentive program in the nation. Over 154 million square feet of lawn have been converted to desert-adapted landscape on more than 40,000 individual projects. Over \$172 million dollars invested. Water savings of 8.6 billion gallons annually.
- The Authority's per capita investment in water-efficiency programming over the past decade is the highest of any comparable water agency in the United States.
- The Authority initiated the national effort to expand the marketplace for "smart" irrigation controllers and was among the first agencies in the nation to offer incentives for these devices. (Smart controllers can adjust irrigation rates based on climate or soil moisture conditions).
- The Authority has redeemed more than 39,000 instant rebate coupons for pool covers, rain sensors and smart irrigation controllers at a cost of \$1.16 million.
- The Authority's Water Efficient Technologies Program provides financial support for capital improvements with large users and has produced a cumulative savings of over 2 billion gallons.
- Authority member agencies operate the most aggressive water waste enforcement programs in the nation, conducting up to 40,000 field inspections and assessing over \$400,000 in water waste fees annually. The largest Authority member agency has the nation's most aggressive fees for water waste, assessing as much as \$5,120 per violation.
- Authority member agencies use four water rate tiers with top tier rates typically more than three times of first tier rates. The volumes of water allowed in each tier have been compressed, such that users incur the higher rates at lower volumes of use.
- Golf courses have specifically calculated water budgets with overuse penalties of up to 9 times of upper tier water costs.

2. Pacific Institute Recommendation: Implement indoor water-efficiency programs targeting older homes and high users.

- More than two thirds of southern Nevada's existing buildings were constructed with fixtures and appliances that meet or exceed the most current national water-efficiency



standards. The majority of structures older than 1994 have replaced fixtures with models that meet current federal standards for water efficiency.

- As part of a market transformation initiative, the Authority issued incentives for the installation of 3,441 high-efficiency toilets in new single family homes.
- A cost-benefit analysis comparing SFR toilet retrofit programs to Water Smart Landscapes found:
 - Landscape retrofits produce 41 percent more water savings per dollar invested.
 - Landscape retrofit creates 117 acre feet of consumptive water demand reduction per \$1 million. Toilet programs produce none.
 - Landscape retrofit creates 3.3 times more jobs per unit of investment than toilet retrofit programs.
 - Water savings from landscape retrofit produce 25 percent more energy savings in water treatment and delivery than toilet retrofit programs. These energy savings also reduce CO₂ discharge commensurately.
- The Authority audited use of a representative group of older public schools and then paid to retrofit fixtures in 30 public school facilities identified to have the greatest water efficiency potential.
- The Authority operated fixture retrofit programs for older buildings until slowing demand indicated market saturation in the late 1990s. Over 20,000 households received indoor retrofit products, which constitutes more than one of every ten homes built prior to the most current water-efficiency standards.
- Retrofit products have been continuously available without charge to all customers for over a decade. Any customer may request a kit.
- Kits offered by the Authority include EPA WaterSense components which exceed current efficiency standards for such devices.
- The Authority issued 5,747 rebates for high-efficiency washing machines from 1999 to 2003. Customer research conducted in 2002 showed that these appliances were successful in the marketplace without subsidies. Over 85 percent of rebate recipients surveyed disclosed that the rebate was not a major influence in their purchasing decision. Rebate programs are intended to stimulate and accelerate market acceptance of new technology. The Authority determined that high-efficiency washers had gained broad acceptance in the local market. As a result of this positive finding, the program was discontinued in 2003 and the program resources were diverted to the Water Smart Landscapes Program.

- In terms of cost efficiency, programs that target outdoor, consumptive water use produce greater returns than indoor water use. This holds true in terms of water resources, energy conservation and infrastructure costs.
- One hundred percent of wastewater received at regional treatment plants is treated and directly or indirectly reused. Five to eight percent of all wastewater is treated at satellite facilities at higher elevations and reused directly for irrigation.

3. Pacific Institute Recommendation: Develop tiered block rate structure with low fixed costs, low rates for water sufficient to meet basic indoor needs, and a sharply increasing rate for higher-volume outdoor uses.

- All Authority member agencies use tiered rate structures. Top tier rates may be 350 percent more costly than the first tier. Tier ranges have been aggressively abbreviated for greater conservation effect.
- First tier water rates are structured to meet a family's basic needs at a low (or even subsidized) rate. First tier rates are typically around \$1.00 per Kgal.
- Agencies have committed to review and adjust rates frequently to assure not only that revenue needs are met, but also that the conservation effect is sustained.

4. Pacific Institute Recommendation: Adopt ordinances that target indoor water use, such as retrofit-on-resale ordinances.

- Retrofit on resale is a controversial regulatory method with broad impact on commerce. Considering the majority of homes have efficient fixtures and the high natural replacement rate of older fixtures, such a regulatory measure would be burdensome and costly. In lieu of this strategy, the Authority is promoting marketplace transformation for highest efficiency fixtures, both through the development of national-level standards and through local efforts such as the Water Smart Home Program.

5. Pacific Institute Recommendation: Expand efforts to work with resorts and other businesses to improve efficiency.

- Major resort corporations have made efficiency improvements for both indoor and outdoor use, including showers, toilets, landscaping and cooling. The Past President of the Nevada Professional Facility Managers Association, Peter Ricardo, estimates that more than 95 percent of resort fixtures meet or exceed current EPACT requirements as a result of frequent rehabilitation of hotel properties.
- The Authority has conducted efficiency projects with every major resort management corporation operating in southern Nevada.
- Las Vegas resorts are among the most efficiently-operated and best-maintained facilities in the nation. Less than two percent of the land use of a Las Vegas "mega-resort" is



dedicated to water (spas, swimming pools, and fountains). Less than four percent of a mega-resort parcel is irrigated landscape.

- Southern Nevada is one of the only cities with an active business-to-business conservation organization, the Water Conservation Coalition.
- The Authority influenced electric power producers in the region to develop dry-cooled generation facilities.

6. Pacific Institute Recommendation: Develop more aggressive ordinances to further limit turf area in new developments.

- Turf limitations have been in use since 1995. Current restrictions are among the most aggressive of any western city.
- Lawns are prohibited in all commercial/industrial development.
- Lawns are prohibited in front yards of new residential development. Backyard turf is limited to 50 percent of total landscape area.

7. Pacific Institute Recommendation: Provide better incentives to developers who install water-efficient landscapes and devices that exceed current-efficiency standards.

- More than 8,800 new homes have been built through the Water Smart Home Program, the nation's largest water-efficiency program for new homes. Water Smart Homes exceed all national and local codes for efficiency of appliances, fixtures, landscape and cooling.
- Authority research has shown that WaterSmart Homes use about half as much water as the standing stock built prior to 2003, largely as a result of smaller and more efficient landscapes.
- The Authority Water Smart Home Program is integrated with the Southern Nevada Green Building standards and compliant with the Draft LEED standards for new homes.
- The Authority's Water Smart Home Program served as the principal program model for EPA's WaterSense New Home Program.

8. Pacific Institute Recommendation: Encourage developers to install community pools rather than private pools.

- The compactness of new development has dramatically reduced the potential of new residential pools. Currently, 22 percent of all homes, of all ages, have a swimming pool. Pool ownership as a percentage of housing units is most pronounced in homes built from 1965 to 1980, with one of every three such homes having a swimming pool. Among the 122,000 homes built since 2004, just 12 percent have a swimming pool.
- More than 25,000 Authority incentives have been issued for swimming pool covers.

- The Water Smart Home Program restricts the maximum surface area of pools in private backyards and encourages appropriately-sized community pools in lieu of private pools at individual residences.
- 9. Pacific Institute Recommendation: Create a culture of conservation by developing a consistent message about the importance of indoor and outdoor conservation.**
- Southern Nevada has one of the largest and most aggressive public outreach programs in the nation.
 - A full suite of commercial partnership programs assures that citizens are exposed to water-efficiency messaging from multiple sources.
 - Marketing research conducted by the Authority determined that specific messaging targeted at the most vital issue (landscape water use) was more effective than generalized messaging or multiple messages.
- 10. Pacific Institute Recommendation: Offer public awards for innovative conservation programs.**
- The Authority has long-standing annual awards programs to recognize outstanding conservation efforts. The Authority operates both Water Hero awards and the Authority Landscape Awards. The Landscape Awards are now entering their 14th year.
- 11. Pacific Institute Recommendation: Institute a market-based system by which private groundwater can be conserved and sold to the Authority.**
- Such opportunity already exists and is managed through the Nevada Division of Water Resources. Transferring ownership of local groundwater rights, however, typically produces no net gain in regional water resources. All groundwater in the Las Vegas Valley has already been allocated for existing beneficial uses. As such, any ongoing demand currently met with private groundwater would have to be substituted with water from a municipality if the groundwater rights were sold.
 - The Authority provides water-efficiency incentives for conservation of privately-held groundwater rights.
- 12. Pacific Institute Recommendation: Evaluate opportunities to utilize shallow groundwater and manage urban runoff and floodwaters so as to improve groundwater infiltration and recharge.**
- The Authority continually evaluates the potential of all potential water resources, including shallow groundwater, desalination, condensate recovery, rainwater harvesting and other innovative concepts. Currently, the Las Vegas Valley groundwater aquifer is near practical capacity as a result of storage and recovery operations.



- Many proposals for recovery of rainwater are not cost-effective due to the sporadic nature of rain events. In 2009, for example, the Las Vegas Valley received just one inch of rainfall. Rainfall which does not infiltrate into the soil is conveyed to the Colorado River.

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