Rebuttal Report on Water-Use Efficiency in the Las Vegas Area

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on behalf of
Great Basin Water Network

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Introduction

This rebuttal report revisits the points made in my June report, taking into account the materials submitted by the Southern Nevada Water Authority (SNWA) on July 1, 2011, relating to water conservation, water use efficiency and the purported need for the groundwater development project associated with SNWA's water rights applications in Spring, Cave, Dry Lake and Delamar Valleys.

The Las Vegas Valley has been one of the fastest growing regions in the United States, although the recent economic downturn has greatly reduced growth rates. To meet projected long-term water demand, the regional water authority, SNWA, is pursuing a range of options, including the development of additional in-state resources in the form of surface water from the Muddy and Virgin Rivers and groundwater from counties north and east of Las Vegas. One such proposal consists of building a 300-mile pipeline to move groundwater from five valleys, including Snake Valley, which spans the Nevada-Utah border. Acquisition of these resources is already creating social and political tension throughout Nevada and bordering states, particularly Utah. The environmental and economic implications of these projects may also be high.

Conservation and efficiency efforts have reduced Las Vegas per-capita demand in recent years, from 315 gallons per capita per day (gpcd) in 2000 to 223 gpcd in 2010 but despite these efforts the Las Vegas Valley still has much higher than average per-capita water use than most of the western United States, suggesting that significant cost-effective conservation potential still remains. An estimated 60 percent of all water used in SNWA's service area is applied outdoors.

The Pacific Institute is one of the nation's leading independent research centers for assessing water conservation and efficiency potential. In this analysis, the Pacific Institute evaluates water demand projections and conservation and efficiency efforts in SNWA's service area. The analysis reveals the following:

- Long-term planning efforts fail to include substantial conservation improvements that have been successfully and economically implemented widely in other western arid cities, and thus appear to overestimate future demand.

- Given recent economic and demographic trends, the population projections used for the water demand projections now appear too high, thereby further overestimating future demand.

- Las Vegas could significantly expand efforts to reduce inefficient and wasteful water use.

- Cost-effective water conservation and efficiency improvements in Las Vegas can defer or eliminate the need for new water supply facilities and investments.

- Increased indoor and outdoor water-use efficiency improves the reliability of the existing supply and does not result in so-called "demand hardening."

Per Capita Water Use is Declining But More Can Be Done

Recent reductions in per capita demand suggest that while water agencies in Southern Nevada have made significant water-use efficiency improvements over the past thirty years, far more can and should be done.[1] In 1990, per capita demand was 347 gpcd. By 2000, demand had declined to 315 gpcd. By 2010, per capita water use in SNWA's service area had fallen to 223 gpcd,[2] a dramatic reduction from the extremely high rate of 1990. The current goal, which drives future water demand projections, is to reduce water demand to 199 gpcd by 2035, still substantially above average for cities in similar climates. As shown by the trend line in Figure 1, the current goal is very unambitious and suggests a significant retreat from trends over the past 20 years.

SNWA's per capita demand has declined more quickly than that most other agencies within the Colorado River Basin. However, absolute per capita demand remains significantly higher than the median per capita demand (180 gpcd in 2008) for these agencies.[3] Denver, Phoenix, and

[1] Per capita demand trends over time should be viewed with some caution, as changes in the level and type of industry, income, the mix of single-family and multi-family homes may affect per capita demand.
[2] SNWA. 2011. SNWA's Conservation Program. Presentation to the Office of the Nevada State Engineer.
[3] Cohen, MJ. 2011. *Municipal Deliveries of Colorado River Basin Water*. Pacific Institute. Oakland, California.

Tucson, for example, already have much lower per capita demand today than SNWA is projecting for its service area in 2035 – more than two decades from now.

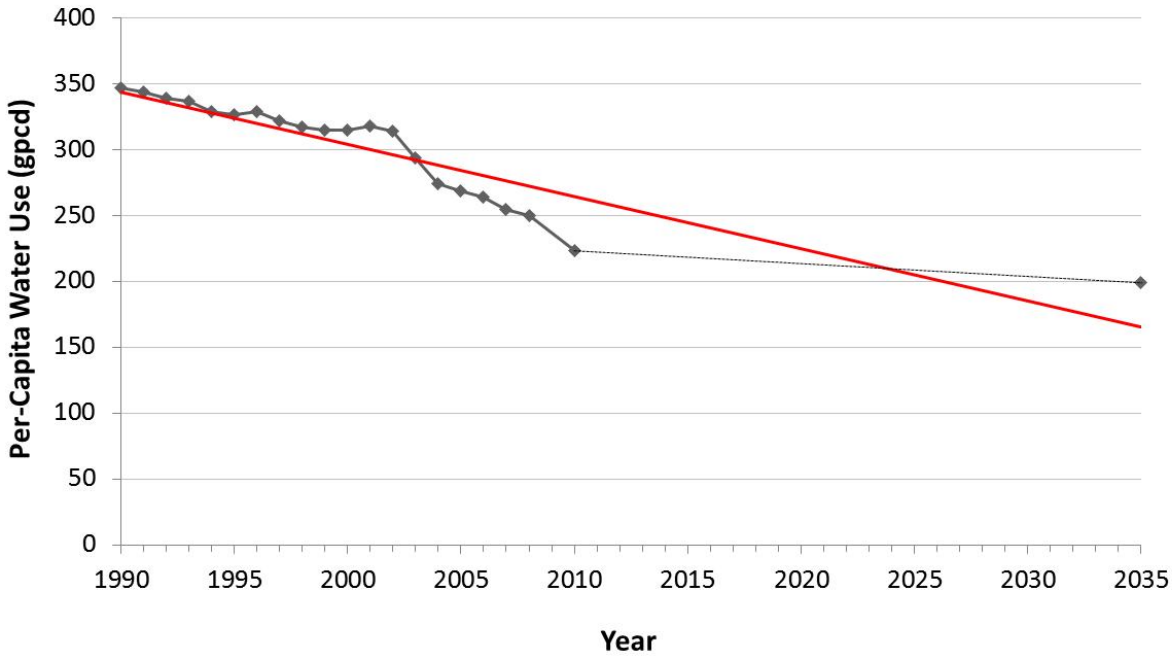

Figure 1. Per Capita Demand in the Southern Nevada Water Authority Service Area, 1990–2035.
Note: 1990 to 2010 reflect actual data. The value for 2035 represents the SNWA projections.
Source: Southern Nevada Water Authority. 2009. Appendix C in Conservation Plan: 2009-2013. Las Vegas, Nevada.

Reliance on Return Flow Credits Inflates Future Demand Projections

SNWA earns return flow credits for treated wastewater that is returned to Lake Mead via the Las Vegas Wash. These return flow credits allow SNWA to withdraw water in excess of Nevada's 300,000 acre-feet basic consumptive use apportionment from the Colorado River. Because SNWA receives credit for return flows, it has long argued that any water-efficiency improvement that reduces indoor, non-consumptive water demand reduces return flow credits and thus does not increase Southern Nevada's water resource portfolio. This argument, however, ignores six points. Increasing indoor water-use efficiency:

- permits more people to be served with the same volume of water, without affecting return flows;

- reduces dependence on water sources vulnerable to drought and political conflict;

- delays or eliminates the need for significant capital investment to expand conveyance and treatment infrastructure;

- reduces energy and chemical costs associated with pumping water from Lake Mead, treating it for use, transporting it, and treating it again as wastewater;

- reduces energy-related greenhouse gas emissions; and

- saves the customer money over the life of those improvements through reductions in energy, water, and wastewater bills.

Furthermore, SNWA projects future water demand based on total deliveries rather than consumptive use. Thus, both excessive use of water for return flow credits and projections based on delivery rather than actual consumption, inflate water demand estimates. These demand estimates are then used to justify the development of new water supplies. Reductions in indoor water demand thus represent a real savings based on SNWA's own demand projections and can help delay or defer the need to develop new, expensive water resources.

Additional Effort is Needed to Expand Indoor Conservation Efforts

According to their Water Conservation Plan, "SNWA has developed and implemented one of the most progressive and comprehensive water conservation programs in the nation."[4] Yet as noted above, water conservation efforts in Las Vegas largely ignore the potential for indoor efficiency improvements, particularly for single-family homes. Those measures targeting indoor water waste have been poorly implemented. While many water agencies in the western United States offer homeowners rebates and other incentives to replace wasteful fixtures and appliances with

[4] Southern Nevada Water Authority. 2009. Conservation Plan: 2009 – 2013. Las Vegas, Nevada.

more efficient models, these incentives are not available to many Las Vegas residents. The Water Efficient Technologies (W.E.T.) Program provides rebates for some efficient appliances to multi-family, commercial, and industrial customers, but only 29 projects are currently enrolled in the program.[5] Expanding indoor efficiency efforts and improving implementation could provide substantial water and energy savings.

Recent conservation assessments indicate that there are a substantial number of cost-effective technologies that can dramatically reduce residential water demand – both indoor and outdoor – to levels far below those projected for SNWA service area. For example, a 1997 study by the American Water Works Association (AWWA) found that conservation could reduce indoor water use from an average of 65 gpcd to 45 gpcd for single-family homes, a savings of over 30 percent.[6] The largest reductions were realized by replacing inefficient toilets and clothes washers with more efficient models and reducing leaks.

Similarly, a 2000 Seattle study found that conservation and efficiency could substantially reduce indoor water use. Installing new, water-efficient fixtures and appliances reduced single-family indoor water use from 64 gpcd to 40 gpcd, a savings of nearly 40 percent. Again, the largest reductions were achieved by installing efficient toilets and clothes washers. Further, homeowners rated the performance, maintenance, and appearance of the efficient appliances higher than the older appliances.[7] It is of note that these studies were completed 6–10 years ago and do not include newer, more efficient appliances, such as dual-flush toilets, that would reduce per capita demand even further.

Furthermore, other conservation assessments have concluded that there is significant water savings in the non-residential sector. A 2004 report by the Pacific Institute finds that existing, cost-effective technologies could reduce California's current (2000) water use for the non-residential sector by 26 percent. Savings vary by industry, but are largest for schools, office buildings, golf courses, retail stores, and restaurants. Recirculating cooling towers, x-ray water recycling units, and restaurant pre-rinse spray valves are among a few of the most promising

[5] Southern Nevada Water Authority. 2010. 2010 Annual Report. Las Vegas, Nevada.
[6] AWWA WaterWiser. 1997. Residential Water Use Summary – Typical Single Family Home.
[7] Mayer, P.W., W.B. DeOreo, and D.M. Lewis. 2000. Seattle Home Water Conservation Study: The Impacts of High Efficiency Plumbing Fixture Retrofits in Single-Family Homes. Aquacraft, Inc. Water Engineering and Management.

technologies.[8] Similarly, the Santa Clara Valley Water District , a water agency serving communities along the southern edge of the San Francisco Bay, commissioned a survey of 26 commercial, industrial, and institutional facilities and found that water conservation measures could reduce water use by 38 percent.[9]

Outdoor water savings potential is also large. While estimates for efficient outdoor water demand will vary regionally according to local climate, reducing Las Vegas' outdoor water demand to the levels achieved in Tucson or Albuquerque, e.g., 57 and 42 gpcd, respectively, could cut consumptive use substantially. While some progress has been made by SNWA in outdoor residential and commercial water efficiency improvements, far more can be done. Recent ordinances in the Las Vegas area prohibiting turf in front yards and limiting turf in backyards in new developments will help reduce overall outdoor water demand in coming years, and could be expanded to gradually apply to existing homes (upon resale, for example). Furthermore, existing, cost-effective technologies can reduce demand from the non-residential sector by 25 percent to 40 percent.[10,11] In summary, significant indoor and outdoor conservation potential exists for the Las Vegas Valley.

Population Projections Overestimate Future Water Demand

Future water demand and use depend on many factors. One of the most important and influential is the size of the population that will have to be served. Population and water demand in SNWA's service area have grown tremendously since 1990 but future population remains uncertain. The 2009 Water Resource Plan forecasts water demands based on the June 2008 Clark County Population Forecast prepared by the University of Nevada Las Vegas Center for

[8] Gleick, P.H., D. Haasz, C. Henges-Jeck, V. Srinivasan, G. Wolff, K. Cushing, and A. Mann. 2003. Waste Not, Want Not: The Potential for Urban Water Conservation in California." Pacific Institute for Studies in Development, Environment, and Security. Oakland, California.

[9] Pollution Prevention International, Inc. 2004. Commercial, Institutional, and Industrial Water Use Survey Program: Final Report. Prepared for the Santa Clara Valley Water District. http://www.cuwcc.org/uploads/tech_docs/CII_H2OUse_Survey_Prgrm_Final_Rpt_04-05-25.pdf

[10] Gleick, P.H., D. Haasz, C. Henges-Jeck, V. Srinivasan, G. Wolff, K. Cushing, and A. Mann. 2003. Waste Not, Want Not: The Potential for Urban Water Conservation in California." Pacific Institute for Studies in Development, Environment, and Security. Oakland, California.

[11] Pollution Prevention International, Inc. 2004. Commercial, Institutional, and Industrial Water Use Survey Program: Final Report. Prepared for the Santa Clara Valley Water District. http://www.cuwcc.org/uploads/tech_docs/CII_H2OUse_Survey_Prgrm_Final_Rpt_04-05-25.pdf

Business and Economic Research (CBER). In 2007, an estimated 2.0 million people lived in Clark County. According to CBER, the population within Clark County was projected to reach an estimated 3.65 million people by 2035.[12] Based on this forecast, SNWA projects that water demand will increase by nearly 34 percent during this period, from an estimated 553,000 acre-feet per year in 2010 to 739,000 acre-feet per year in 2035.

More recent analyses suggest that the population assumptions in the 2009 Water Resource Plan are significantly higher than are likely to materialize and that this assumption alone has a large influence on future water demand projections. Newer population projections released by CBER in June 2009 and again in June 2010 project that the Clark County population will reach 3.13 million people by 2035, about half a million fewer people than was the basis of the 2009 Water Resource Plan.[13,14] If we assume that per capita demand in 2035 is 199 gallons per person per day and that about 97 percent of the population in Clark County is served by SNWA and its member agencies, then 500,000 fewer people in the region would reduce water demand within SNWA's service area by about 100,000 acre-feet per year. This dramatic result alone strongly suggests the need for a re-evaluation with another, more realistic population projection.

Furthermore, combining reductions in both projected population ***and*** per capita demand may completely eliminate the need for the new supplies. If SNWA reduced per capita demand to about 166 gpcd – higher than Los Angeles's *current* rate, and comparable to the *current* delivery rates of Albuquerque and Phoenix – by the year 2035, and population within Clark County grows to 3.13 million people instead of 3.65 million,[15] total water demand in SNWA's service area would be about the same as it is now.

The recent economic downturn has resulted in a significant reduction in future population, and thus water demand. When and how the region will recover is not known. Rising temperatures

[12] "Clark County Nevada Population Forecast 2008-2035," June 2008, Center for Business and Economic Research (CBER) at the University of Nevada, Las Vegas.
[13] Center for Business and Economic Research (CBER). 2009. Population Forecasts: Long-Term Projections for Clark County, Nevada: 2009 – 2050. University of Nevada, Las Vegas.
[14] Center for Business and Economic Research (CBER). 2010. Population Forecasts: Long-Term Projections for Clark County, Nevada: 2009 – 2050. University of Nevada, Las Vegas.
[15] We assume that SNWA and its member agencies provide water to about 97 percent of the population of Clark County.

and changes in precipitation patterns resulting from climate change will also affect water supplies and demand. Given this uncertainty, it is wise to consider pursuing water supplies or demand management options that can be expanded incrementally. Unlike most other water supply options, water conservation and efficiency can be expanded when water demand pressures are high and relaxed when demand pressures subside.

Significant Conservation Potential Remains in the Las Vegas Valley

While per capita demand comparisons can be extremely valuable in gauging an agency's performance in promoting water conservation and efficiency and evaluating the strengths and weaknesses of a city's water conservation efforts, they also have limitations.[16] Per capita demand, for example, is affected by a variety of factors, including the level and type of industry, income, climate, and mix of single-family and multi-family homes. Thus, a city with a high degree of water-intensive industrial or commercial development would tend to have a higher per capita demand than a largely residential city. Likewise, a city in a hot, dry climate, like Las Vegas, would likely have higher outdoor demand requirements than a city in a cool, wet climate, all other things being equal.

An end-use analysis, which evaluates the potential savings for every water use within a given region, provides a means to evaluate the conservation potential. A 2007 analysis by the Pacific Institute found that water demand in Las Vegas is substantially higher than in many other western communities. While data limitations prevented a full end-use analysis of all water users in the Las Vegas Valley, our review of single-family residential customers, hotels, and casinos indicates that installing water-efficient fixtures and appliances could reduce current *indoor* water demand by 40 percent in single-family homes and nearly 30 percent in hotels and casinos. Installing water-efficient landscapes could further reduce current *outdoor* demand by 40 percent in single-family homes. In total, water conservation and efficiency improvements for just these three sectors could reduce current water diversions by more than 86,000 acre-feet per year. While behavioral changes and efforts in other water-using sectors can produce even greater reductions, these were not included in the 2007 Pacific Institute analysis, but they are often

[16] Cooley, H., T. Hutchins-Cabibi, M. Cohen, P.H. Gleick, and M. Heberger. 2007. Hidden Oasis: Water Conservation and Efficiency in Las Vegas. Pacific Institute and Western Resource Advocates.

included in the conservation portfolios of western municipal water agencies and should be evaluated for SNWA.

Demand Hardening

Both the 2009 Water Resource Plan and the 2009 Conservation Plan raise concerns about demand hardening. Specifically, the report states that

> "While conservation is an important water management tool, the more aggressive and responsive a community is to calls for conservation, the more difficult it becomes to realize additional conservation gains. This phenomenon of diminishing returns is referred to as 'demand hardening.' For communities where a majority of the water supply comes from one source (such as Southern Nevada), the prospect of demand hardening requires development of additional alternative water supplies regardless of conservation levels achieved" (SNWA 2009).

Demand hardening refers to the concern that implementation of short term drought response measures may be ineffective if permanent water-use efficiency measures have previously been employed. Some water planners, including SNWA, argue that extensive conservation removes the slack in the system, hindering their ability to reduce demand in the event of a water shortage.

Demand hardening could be a concern for water providers in certain situations, but its importance has been overstated.[17,18] The demand hardening argument ignores a number of key points:

- Most providers can use a significant portion of water they conserve to serve new customers without harming reliability, provided that the overall demand does not increase during a shortage.

[17] Chesnutt, T., D. Pekelney, and D. Mitchell. (1997). Valuing Conservation. Proceedings of AWWA Annual Conference, 1997, Atlanta, GA. American Water Works Association.
[18] Howe, C.W. and C. Goemans. (2007). The Simple Analytics of Demand Hardening. Journal of the American Water Works Association, October 2007, Volume 99 Number 10.

- Customers who participate in long-term conservation measures and reduce their demand through technological improvements, such as low-flow toilets and efficient clothes washers, can still reduce their water use through behavioral changes during a shortage.[19]

- The technologies and economics of water-use efficiency are constantly changing. New, more efficient technologies are coming on to the market, and the price of those that are already on the market is dropping, thereby continuing to expand the cost-effective conservation savings potential of existing and new customers.

- For many water providers, conservation allows more water to be kept in storage (either in reservoirs or in aquifers underground), thereby reducing the risk and potential impacts of drought.

Furthermore, a recent AWWA article notes the economic pitfalls of relying upon the demand hardening concept: "to ignore long-term conservation benefits and to build excess water supply capacity simply to facilitate cutbacks during drought can be highly uneconomical."[20]

Conclusions

Our analysis concludes that there are a number of flaws with current water planning efforts in the SNWA service area that overestimate future water demand and underestimate the importance of conservation and efficiency, including the failure to incorporate cost-effective conservation improvements, the use of outdated population projections, and the concern about "demand hardening." As a clear example of this, simple forecasts that use more up-to-date population projections and a per capita water demand target of 166 gpcd (lower than the current SNWA estimate but well in line with current practice in most western, arid-climate cities, total water demand in SNWA's service area would be about the same as it is now. This approach would delay or even eliminate the need for new water supplies, with substantially lower economic and

[19] Mayer, P., D. Little, and A. Ward. (2006). System Reliability and Demand Hardening. Colorado Statewide Water Supply initiative, Conservation and Efficiency Technical Roundtable, March 2006.
[20] Howe, C.W. and C. Goemans. (2007). The Simple Analytics of Demand Hardening. Journal of the American Water Works Association, October 2007, Volume 99 Number 10.

political risks. These factors deserve equal consideration in any long-term water planning strategy.