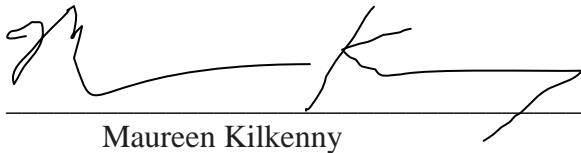


**SNWA's Proposed Groundwater Withdrawals and Interbasin Transfers  
Will Harm and Unduly Limit Future Growth and Development**

Rebuttal of Materials Submitted by SNWA pertaining to  
Groundwater Applications 54003 through 54021 in Spring Valley  
and Groundwater Applications 53987 through 53992 in Cave, Dry Lake, and Delamar Valleys.

By  
Maureen Kilkenny, PhD.  
2915 Susileen Dr., Reno NV 89509  
maureenkilkenny@gmail.com



Maureen Kilkenny

August 24, 2011

## OVERVIEW

The Southern Nevada Water Authority (SNWA; “Applicant”) has proposed to appropriate and export in perpetuity 91,200 afa (acre-feet annually) of groundwater from Spring Valley of eastern Nevada and 34,700 afa of groundwater from Cave, Dry Lake and Delamar Valleys of eastern Nevada. (Table 1-1, page 1-5, SNWA, March 2011 “GWD Project - Conceptual Plan of Development” [http://www.snwa.com/assets/pdf/wr\\_gdp\\_concept\\_plan\\_2011.pdf](http://www.snwa.com/assets/pdf/wr_gdp_concept_plan_2011.pdf)).

This report refutes the arguments that the proposed withdrawals would not harm, and supports protestants’ assertions that the proposed groundwater withdrawals will harm and will unduly limit, the future growth and development in the targeted basins and surrounding communities in the Great Basin thereby harming the public interest (Nevada Revised Statutes 533.370).

The proposed withdrawals will negatively impact the basins of origin, as well as neighboring and downgradient basins in roughly a quarter of the state of Nevada, including the Great Basin National Park (Elliott, et al, 2006; SNWA Exhibit 069). According to numerous hydrologists and hydrogeologists (Bredehoeft 2006; 2007, 2011; Elliot, et al., 2006; Durbin 2006; Myers 2011; Van Liew 2006) the proposed withdrawals exceed the sustainable yield of the targeted valleys or significantly draw down water levels in the interbasin flow systems of which they are major components. Withdrawing more groundwater in perpetuity than the perennial yield is not allowed in Nevada.

Three immediate socio-economic implications of these facts are that (1) the proposed withdrawals would affect a far larger geographic area than the Applicant’s testimonies admit, (2) the proposed withdrawals would undermine most of the economic activity in White Pine and Lincoln counties in perpetuity, and (3) expectations of both aforementioned outcomes stifles investment in the region.

The Applicants’ arguments that there is no economic or social justification for keeping the groundwater in the four valleys are fatally flawed in at least seven ways outlined below and explained subsequently:

(1) The appropriate geographic scope of the social and economic impact is not limited to the four basins as implied by the Applicant. Given the scope of the project and likely extent of the ecological impacts, the relevant geographic scope is the broader surrounding region of the Great Basin that is hydrologically and economically tied to these four valleys. The environmental implications and potential legal precedents make the proposed project a state-wide concern. The SNWA Exhibits incorrectly focus only on the four basins of origin, suggest that the communities surrounding and dependent on the valleys are an easily dismissed second-order concern, and erroneously suggest that the majority of the citizens of the state approve the proposed interbasin transfers. Not so. The Applicant’s evidence provides incomplete and biased estimates of the scope and severity of human and social impacts, and it underestimates the values at stake.

(2) The appropriate temporal scope is not limited to one decade before the present and a few decades into the future. By limiting its analysis to a single prior decade and explicitly refusing to acknowledge that local feed and livestock trends reflect the dozen-year-long national cattle cycle, SNWA’s Exhibit 103 does not provide credible information about the future economic development potential of agriculture in White Pine or Lincoln Counties.

(3) The Applicant’s experts also failed to address the facts that investment decisions are inherently forward-looking, and that the threat of groundwater mining has hung over White Pine and Lincoln counties for more than two decades-- since 1989 when the applications were originally filed. A downtrend in either county must be understood to be in part a consequence of the water withdrawal applications rather than a justification for the withdrawals.

(4) In SNWA Exhibit 241 the Applicant seriously misrepresented the findings of the report (Aldrich and Kusmin, 1997; SNWA Exhibit 248) upon which the Applicant based the erroneous claim of no growth prospects in the counties containing the targeted valleys. In Exhibit 241 the Applicant also ignored the actual findings in that same report which suggest growth in White Pine and Lincoln Counties. These misrepresentations undermine the claims made in Exhibit 241.

(5) The Applicant failed to recognize the lessons of Clark County's own history over the past 70 years when purporting to predict the growth prospects of White Pine or Lincoln Counties over the next 70 years. The Applicant's reports do not provide sufficient information to rule out future economic development in White Pine or Lincoln County.

(6) By focusing exclusively on short-run local time-series and ignoring long-run cross-sectional patterns underlying the unrefuted scientific principle commonly known as Central Place Theory and the Rank-Size Rule, the Applicant incorrectly underestimated the urban growth prospects in White Pine. The Applicant's biased and incomplete evidence does not provide credible information sufficient to justify the proposed interbasin water transfers.

(7) SNWA Exhibits 103 and 241 incorrectly ignore the deleterious effects of the groundwater mining. The proposed interbasin transfer will excessively limit the key natural resource, water, upon which almost all economic activity in the region is based. By ignoring the circular flow of income through local expenditure, inter-industry interdependencies, the lack of redundancy, and the cumulative economic effects in White Pine and Lincoln Counties, the Applicant's experts failed to consider the full long-run damage to the local economies of those counties. The Applicant's evidence does not provide sufficient information to persuasively contradict the likelihood that the proposed withdrawals will unduly limit future growth and development of the local communities.

Arguments- pro or con- about estimates of economic growth in the targeted valleys or in White Pine and Lincoln Counties are relevant insofar as those counties are home to the state's most dedicated stewards of the region's natural resources. The state does not remunerate the citizens of White Pine and Lincoln Counties for that service. The residents work to earn their livings using the regions' resources sustainably. Their economic activities are 'canaries in the coal mine.' Who will make beneficial use of our land and environmental resources after all the sales, closures, retirements, and out-migrations caused by the proposed interbasin water transfers? Groundwater withdrawals and interbasin transfers that threaten the local communities are the tip of the iceberg of a greater set of threats.

Among the wider long run threats to the public interest are the conversion of this vast rural area into an uninhabitable and economically vacant wasteland, and the initiation of a trend toward doing the same to more of rural Nevada in the name of promoting urban growth. Because the Applicant's proposed project would profoundly undermine the continued economic viability of this rural region, it would undermine the economic diversity and resilience of Nevada as a whole, which is also contrary to the state's long-term greater public interest.

The deleterious impacts of the proposed project are likely to be geographically far-reaching, multifaceted, and unmitigatable. The choice is not between allocating groundwater to either a small number of ranchers or a large number of urbanites in one metro area. It's about ensuring the long run inhabitability of the state beyond one city's limits, or not. Society has created habitable cities in deserts. But we must not create uninhabitable deserts in an attempt to grow cities. It would be a futile attempt in any case. Groundwater mining is unsustainable and ultimately both the city and the rest of the state would lose.

The following pages briefly elaborate and document the seven rebuttal arguments outlined above. The evidence that the proposed withdrawals will desiccate the watersheds, and rebuttals to erroneous claims that the withdrawals will not unduly harm the natural balance in a significant section of the Great Basin, are being provided by other experts in other testimony.

### **(1) Appropriate Geographic Scope for Economic and Social Impact Analysis**

The appropriate geographic scope for the analysis of the economic and social impact of the proposed water withdrawals and transfers is, at a minimum, the rural counties containing the four valleys and the downgradient basins in the same flow systems that also will experience a drawdown in their groundwater levels. The Bureau of Land Management (BLM) has reported that the impacts of the withdrawals on water availability extend well beyond the targeted valleys (BLM 2011). According to Nevada Revised Statutes § 534.110 (4.):

In determining a reasonable lowering of the static water level in a particular area, the State Engineer shall consider the economics of pumping water for the general type of crops growing and may also consider the effect of using water on the economy of the area in general.

The State Engineer could at a minimum apply the national standard practiced by the (BLM) in the draft environmental impact statement (BLM, 2011):

“The study area for socioeconomics and environmental justice is defined in terms of local county boundaries and includes Clark, White Pine, and Lincoln counties in Nevada and Juab and Millard counties in Utah. These five counties encompass virtually the entire extent of the four basic areal geographies associated with the proposed development and operation of the proposed ROW, groundwater development areas, and most of the area of potential indirect effects from groundwater level declines associated with groundwater pumping.” DEIS at p. 3.18-1.

The State Engineer should consider the area in general in order to adjudicate equitably and to avoid using a double standard. For the Applicant to argue that the focus should be only on the targeted valleys themselves would be disingenuous. The Applicant has stated that “the impacts on water resources will likely be in the developed areas such as Ely, Baker, and Caliente, where visitor and guest services are available, and not in the basins themselves.” SNWA Exhibit 241, at p. 5 (June 2011).

With respect to equitable treatment it must be noted that the Applicant, in basin 212 (Las Vegas Valley), is permitted to argue that it is the most relevant human community with respect to water rights issues in any hydrologic basins in its neighborhood, such as the contiguous basins 210 (Coyote Springs Valley), 215 (Black Mountain Valley), and 216 (Garnet Valley), for example. By the same token, the towns of Ely, in basin 179, (Steptoe Valley), and the towns of Pioche, Panaca, Caliente and other urbanized areas in basins contiguous to Spring, Cave, Dry Lake, and Delamar Valleys are communities that depend directly and indirectly on consumptive and non-consumptive uses of the water in the origin basins. According to the US Environmental Protection Agency, Steptoe and Spring Valleys are in the same watershed, the Spring-Steptoe Watershed ([http://cfpub.epa.gov/surf/huc.cfm?huc\\_code=16060008](http://cfpub.epa.gov/surf/huc.cfm?huc_code=16060008)). And just like Las Vegas’ concerns about future access to water in its neighboring basins, these towns also have future interests in locally available groundwater.

The Applicant is also allowed to concern itself with non-contiguous basins, including basins in other watersheds, such as basin 213 (Colorado Valley). Basins 213 and 212 are not even in the same watershed as Las Vegas. Basin 213 is in the Lake Mead watershed while 212 is in the Las Vegas Wash watershed.

However, the most important point is that even a county-wide focus is too narrow. The owners of the groundwater in the basins of origin are the citizens of the entire state of Nevada (NRS § 533.025).

The citizens of Nevada made their preferences known about the disposition of the groundwater by responding to an opinion poll commissioned by the pro-pipeline Las Vegas Review Journal in 2009 (Brean, 2009). Economics is the study of choice among competing alternatives for the allocation of limited resources. Preferences are the foundation of choice.

The 2009 Mason-Dixon poll found that only 39 percent of Nevada's citizens statewide (plus or minus a 5 percent margin of error) favor the pipeline; 26 percent were undecided, and 35 percent opposed. That statewide measure reflects the opinions of a preponderance of Las Vegas metro area resident respondents, proportional to the metro area's share of state population. Yet, among the subset of the respondents who are from Clark County-- the purported beneficiaries-- only a slight majority of 52 percent (+/- 6%) supports it. In the rest of the State of Nevada outside Clark County, support for the project was measured at 13 percent. Thirteen percent in favor. The proposed withdrawals might serve the interests of one metro area, but not indefinitely; and in contradiction of public preferences statewide.

The choice the State Engineer must make is not between two competing local interests of vastly unequal magnitudes, as the Applicant insists, but between the long-term general public interest and a short-run local interest.

The State Engineer is responsible for ensuring the general public interest:

...history has indicated that water resources should be developed, but cautiously, as it would threaten to prove detrimental to the public interest to allow large scale development of water resources to go forward in support of municipal development when the confidence in predictions as to water availability long-term without damaging impacts is low and dire consequences could result." State Engineer Ruling #5746, at p. 42 (2007).

In contrast, the Applicant is of course responsible to a specific local interest:

"We're responsible, essentially, that this valley can become what it wants to become and that water is not a limiting factor." Patricia Mulroy, quoted October 20, 2002 in the Las Vegas Review-Journal (Berns, 2002)

The unfortunate fact is that water *is* a limiting factor. It is not available in unlimited quantities. It cannot be in two places at the same time. The Las Vegas-Paradise metropolitan area is not exempt from nature's limitations. Not unless one is willing to pay exorbitant prices to cover the true cost of the infrastructure, which was estimated to be \$14 - 18 billion in current (2011) dollar terms (or \$9.6-12.4 billion in 1992 dollars) by Mifflin, et al. (1992). And not unless one is willing to desiccate many thousands of acres of meadows, woodlands, and wildlife habitat in the process.

Nevada Revised Statute § 534.120 authorizes the State Engineer to make rules, regulations and orders where groundwater is being depleted as are deemed essential for the welfare of the area involved. Nevada Revised Statute § 533.370(6)(c) states that in determining whether an application for an interbasin transfer of ground water must be rejected the State Engineer shall consider whether the proposed action is environmentally sound as it relates to the basin from which the water is exported, among other things, as well as any other factor the State Engineer determines to be relevant.

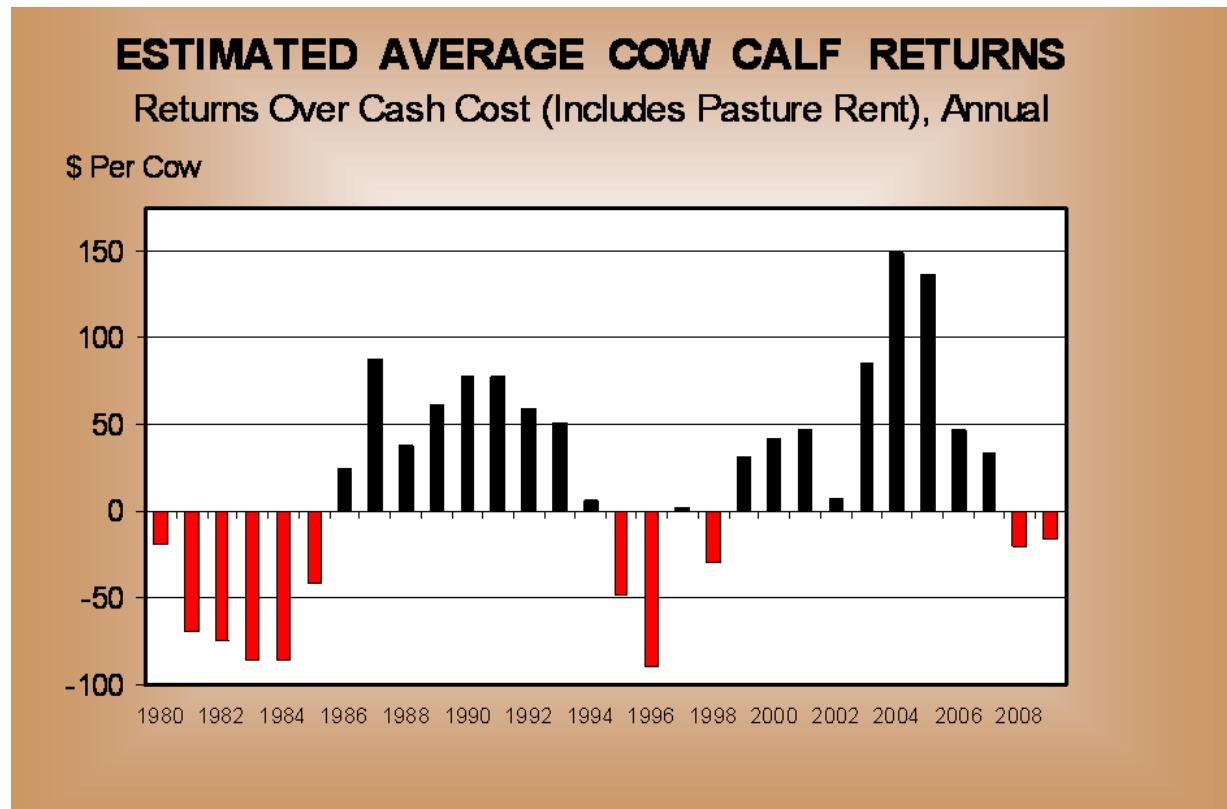
In sum, the geographic scope of the project is a large portion of the Great Basin, and the economic and social impacts extend far beyond the basins of origin. The eastern quarter of the state that currently

contains towns, ranches, fisheries, and nature preserves could become an uninhabited economic wasteland. The choice the State Engineer must make is not between two competing local interests, but between the long-term general public interest of the state and a short-run local interest. The local-interest application should be rejected.

## (2) Appropriate Temporal Scope for Economic and Social Impact Analysis

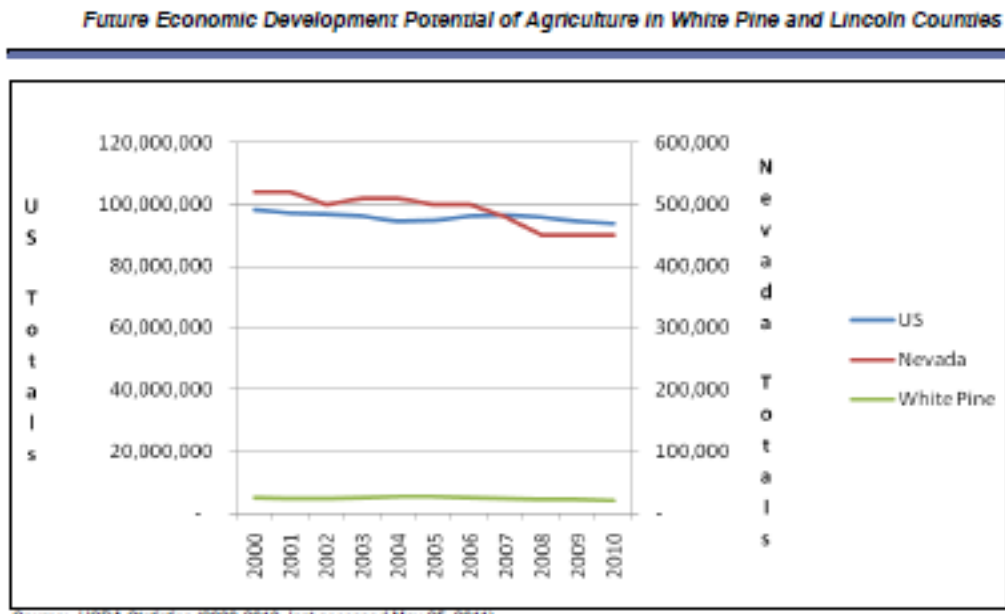
The appropriate temporal scope is not limited to just one decade before the present and two decades into the future. One recent decade of observation is insufficient information for a long-term forecast. There are two reasons that are particularly relevant to this case. One is that ten years is not long enough to observe multi-decade cycles. The implications of the Applicant's failure to recognize cycles are documented in this section. The second key reason is that current economic activity reflects previous investment decisions. The implications of the Applicant's refusal to recognize that fact will be discussed in the subsequent section. Numerous hydrologists and geologists estimate that it may take 70 years for the proposed withdrawals to desiccate a quarter of the State of Nevada. Thus a much longer view of the past and national trend data is required for a reasonable forecast of the potential for agriculture in White Pine and Lincoln County.

In particular, in SNWA Exhibit 103, the Applicant's experts erroneously interpreted a short-run decline that is in fact but one segment of the long-run national cattle cycle as the local long-run trend. The national long-run cattle cycle is illustrated below.

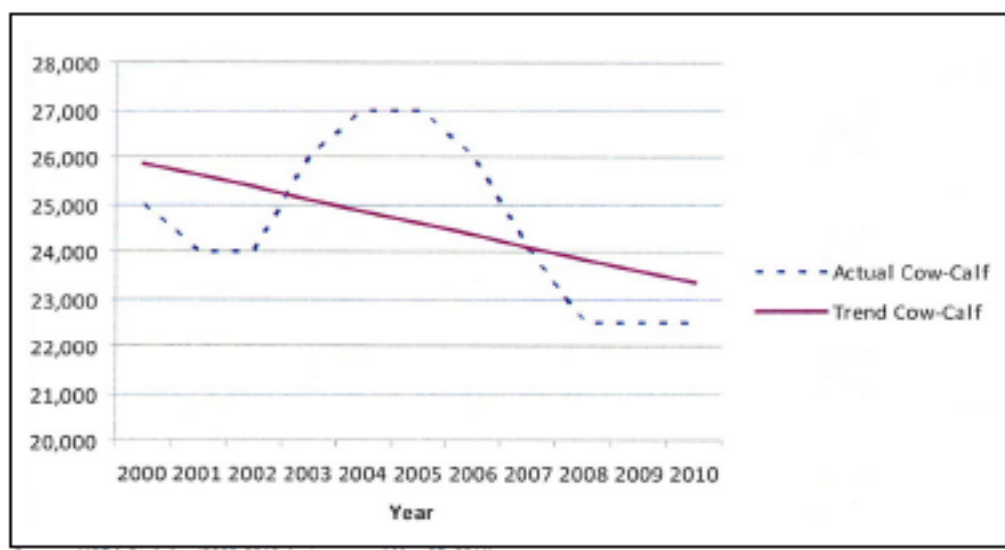


**Source:** Livestock Marketing Information Center *Chart of the Week*;  
<http://www.lmic.info/memberspublic/pubframes.html> date accessed: May, 2008.

Compare the cycle shown above to the portion of the cycle illustrated in SNWA Exhibit 103, Figures 10 and 11 reproduced below:



**Figure 10  
Cow Calf Inventory**



**Figure 11  
White Pine County Cow-Calf Inventory**

Source: Page 15 in Peseau & Carter, 2011; SNWA Exhibit 103

Figure 11 shows a build up and decline in the number of cattle in White Pine County that mirrors the national cycle in net returns, which is the market signal for herd size management, with at most a one year lag as expected (Foster and Burt, 1992). This coherence is to be expected from market-oriented producers like the ranchers in White Pine County.

In contrast, the Applicant's analysts insisted that:

“From a practical standpoint however, efforts to correlate and then extrapolate broader national and international economic and spatial factors that ordinarily influence agricultural markets are largely irrelevant to this distant and remote region of eastern Nevada.<sup>1</sup>

<sup>1</sup> This opinion is based on several sources examined and identified throughout this report (see Section 11.0, References). (SNWA Exhibit 103, ES-1)

It must be noted that there is not a single refereed journal article listed in the reference section, much less one that justifies their opinion. For example, they might have consulted Foster and Burt 1992; Dahlgren and Blank 1992; or Marsh 1994 or 1999; all well-known refereed articles in top peer-reviewed journals, for examples of how to test or verify such a claim. Instead the authors simply proceeded to base the conclusions of their report on that untested opinion. They erroneously extrapolated the long run from a short-term segment of a cycle.

The recent decade downtrend in cow-calf inventory in White Pine County reflects, in part, economically-rational local feed and livestock producer responses to national long run cattle cycle net revenue trends. Thus SNWA Exhibit 103's conclusion of no potential for agricultural intensification in the valleys is simply an ill-informed opinion. The conclusions in SNWA Exhibit 103 are not scientifically sound and not credible.

SNWA Exhibit 103 also predicted no growth in alfalfa production because “[n]ew investment in irrigation pivots for new land put into alfalfa production is not economic even at higher prices,” “[l]imited grazing allotment expansion and associated lack of demand for alfalfa for supplemental grazing feed,” and “[a] relatively flat production of and markets for local calves and lambs.” (Peseau and Carter (2011) page 8).

In this case the error is that all three of those proximate explanations are arguably consequences of the proposed water withdrawals. The ultimate explanations are that it is “not economic” to make investments that are not expected to have salvage value. Rational producers pull back from the sector in anticipation of declining capacity in the vertical market chain, and an expected dismantling of the local input supply sector. Those expectations have in fact been based on observations of the sales of a significant share of local ranches (regardless of the consolidation of herds into a single operation). A rational local feed and livestock sector would not expand given those expectations.

Thus the Applicant may have confounded consequences with causes with respect to “lack of demand for alfalfa and supplemental grazing feed” and “flat production of and markets for local calves and lambs” because the analysts wholly ignored the buyouts by SNWA of seven producers (twelve ranches) in Spring Valley that occurred mid-decade. The buyout reduced the number of rancher-customers in White Pine County's Spring Valley by 60 percent, from twenty to eight. These facts are well-known by the Applicant and the public at large:

“In July 2006, a month after the deadline lapsed for White Pine County to withdraw its protest, she [SNWA General Manager Pat Mulroy] announced the purchase of the huge Spring Valley Robison Ranch for \$22 million. Soon, almost every ranch in Spring Valley was in negotiation with Las Vegas, and the sales were going too fast to count: Harbecke, Phillips, Bransford, Wahoo, El Tejon, Huntsman. **The ranchers figured that once a big city started pumping and the water table fell, they would have no way to keep their alfalfa irrigated or water troughs full. Their ranches would all be worthless. Better to get out at the front end.** As one of them



explained as she wept with shame in a local grocery store, she had no choice. None of them did.” Green (2008) **emphasis added** <http://www.lasvegassun.com/news/2008/jun/22/not-water/>

As well as noted by the BLM (2011):

“Among the more tangible effects to date of the proposed project on the social context of the rural part of the assessment area are SNWA’s purchase of seven ranches [sic] in Spring Valley and the subsequent relocation of some of the ranching families whose properties were acquired. Residents of Snake Valley also cite the inability to obtain commercial water rights due to the SNWA water filings as a dampening effect on growth and development in the valley.” Page 3.18-32 Draft EIS.

A lack of recent growth does not justify limiting future growth. There is little doubt that the appropriation and export of water in excess of perennial yield will render the valleys inhospitable to agriculture within one’s lifetime. The expectation of the collapse of agriculture in the future rationally undermines any investment in agriculture today. This is related to the third and seventh fundamental errors in the SNWA’s arguments.

### **(3) A Downtrend in Either County Must Be Understood To Be a Consequence of the Water Withdrawal Applications Rather Than a Justification for the Withdrawals.**

Investment decisions are inherently forward-looking. The threat of groundwater mining has hung over White Pine and Lincoln counties since 1989 when the applications were originally filed. The purchases of land and surface water rights have been widely debated and discussed for three decades. One example of the widespread public awareness of the consequences of these expectations is an internet posting by Rick Spilsbury on Friday, September 01, 2006:

“...a number of counties in Rural Nevada already have been forced to stop growth. ... Back in the late 1980's SNWA applied to the State of Nevada for much of Central Nevada's water rights. Since then, growth in many places in Rural Nevada has been put on permanent hold. ... In a way it's as if their applications have already been approved.”  
<http://noshootfoot.blogspot.com/2006/09/snwa-halts-growth-in-rural-nevada.html> (date accessed August 15, 2011).

The effect of expectations on local investment cannot be disputed. The Applicant itself has warned that expectations of future water scarcity results in current economic contractions. For example, in 2006 an SNWA official observed that:

“...State Engineer Tracy Taylor, will have hearings in September [2006] and then decide in the coming months whether to approve the agency's proposal to pump the water more than 200 miles south. *If he does not, Mulroy said, the economic effect on Las Vegas will be immediate. Even before the agency could appeal the decision in court, lenders who bankroll construction and business expansion in Las Vegas would begin turning down loans,*” she said. Without the rural water, "the whole economic confidence of Southern Nevada would start eroding," she said. "There's a whole market collapse that would happen." (Rake; August 19, 2006 [Las Vegas Sun](http://www.lasvegassun.com/news/2006/aug/16/a-matter-of-survival/) <http://www.lasvegassun.com/news/2006/aug/16/a-matter-of-survival/> **emphasis added**).

A downtrend in either White Pine or Lincoln County therefore must be understood to be a consequence of the water withdrawal applications rather than a justification for the withdrawals.

#### **(4) SNWA Exhibit 241 Misrepresents SNWA Exhibit 248 to Support a Claim of No Growth Prospects in Origin Basin Counties**

In SNWA Exhibit 241 the Applicant seriously misrepresented the report (Aldrich and Kusmin, 1997; SNWA Exhibit 248) upon which the Applicant based the erroneous claim of no growth prospects in the origin basin counties.

The author of the Applicant's exhibit, SNWA Deputy General Manager of Engineering/Operations Richard Holmes (2011) wrote:

“Academic studies related to growth and development are often applied in more practical terms by agencies such as the USDA in their work to enhance rural prosperity. For example, the 1997 report by the USDA Economic Research Service titled, “Rural Economic Development; What Makes Rural Communities Grow?” identifies certain factors that lend economic growth potential to a region. Some of the most fundamental factors include close proximity to large, established metropolitan centers and markets, a sufficient population size and skilled labor force, a diversity of employment opportunities, location along a major transportation corridor, substantial infrastructure, including electricity, roads, and access to modern communications, and the availability of basic public utilities and services.

All of the above listed factors that are fundamental and typical for economic development to occur are absent within the Basins of Origin.” Page 2-1, Holmes (2011)

The fact is, Aldrich and Kusmin (1997) did not identify those factors. They identified other factors that were positively associated with rural county growth, and most of the identified factors are features of White Pine and Lincoln Counties:

“Recent research on county economic development found some factors that were consistently associated with rural growth in the 1980's, when tested by a variety of statistical methods. The factors included low initial labor costs (earnings per job), retirement county status, high education spending per pupil, and the presence of a passenger service airport within 50 miles. Some other factors were consistently associated with lagging growth. These were relatively large transfer payments to county residents and the relative size of the African-American population. Other factors positively associated with rural growth, when the preferred statistical methods were used, included State right-to-work laws, the percentage of adults who had completed high school, and access to the interstate highway system.” (page 1)

All but one of the seven factors positively associated with growth named above are present in White Pine and Lincoln Counties. Labor costs (wage rates) are relatively low. County demographics clearly indicate the attraction and retention of retirees. 15 and 28 percent are over age 65 in White Pine and Lincoln Counties, respectively, compared to 8.1 percent statewide. There is a passenger airport in Ely, and the town is linked to both coasts by U.S. Route 50. Nevada is a right-to-work state. There is also a higher percentage of adults with high school degrees than statewide: 84.9 and 85.6 in White Pine and Lincoln Counties respectively compared to 83.7 statewide. The data source is the 2010 U.S. Census, accessed at <http://quickfacts.census.gov/qfd/states/32/32033.html>. Education spending per pupil, however, is well-known to be relatively low in Nevada compared to elsewhere in the U.S.

Clark County has a lower percentage of adults who have completed high school, 83 percent, than either rural county. Clark County is not rural, however, and we do not misapply the findings of SNWA Exhibit 248 to predict the decline of Clark County.

Aldrich and Kusmin also noted that:

“Industry structure was an important determinant of county earnings growth. Counties experienced significantly greater earnings growth if they had higher concentrations of employment in transport services, real estate, hotels, miscellaneous business services, education services, or State and local government.” (page 3).

Again, all Exhibits from both the Applicant and protestants have documented that White Pine County and Lincoln County have relatively high concentrations of employment in service and public sectors.

In addition to Aldrich and Kusmin’s unrefereed bulletin, there is also uncontested support in the refereed scientific literature that subsequent rural growth is statistically significantly positively associated with both relatively larger initial employment shares in service and public sectors (Kilkenny and Partridge, 2009) and, relatively more natural and scenic amenities (Deller, et al, 2001). White Pine and Lincoln Counties display both of those key features as well. Finally, peer-reviewed refereed scholarly journal articles conclude that rural counties with robust service sectors sustain despite downturns in mining or manufacturing employment (e.g., Kilkenny and Partridge, 2009).

The list of misinterpretations by Holmes, however, is not yet complete. Aldrich and Kusmin explicitly stated that most of the factors Holmes called “fundamental and typical for economic growth to occur,” were not even statistically significant. Quoting Aldrich and Kusmin:

“Some variables yielded little or no evidence of a significant relationship with earnings growth. These variables include total population of nearby metro areas, urban population within the county itself, presence of an airport within the county itself, presence of an intersection of two major highways within the county, population aged 25 to 64, ...college completion rate, ... and topography.” (page 3).

In sum, Holmes got it backwards. The analysis contained in Exhibit 241 is incorrect. It is invalid and should be ignored.

##### **(5) An Important Lesson from Clark County History**

The Applicant failed to recognize the lessons of Clark County’s own history over the past 70 years when analyzing the need for water for the growth of White Pine or Lincoln Counties over the next 70 years. The Applicant’s testimony does not provide sufficient information to rule out future economic development in White Pine or Lincoln County if the counties are not water-constrained. As White Pine Commissioner Gary Perea, quoted in an August 16, 2006 article in the Las Vegas Sun said, "Who's to say that it's not White Pine County that is the future of Nevada? ... The future of Nevada is not necessarily in Clark County." (Rake, 2006).

Over the 70 years since 1940, a similarly remote low-density place in a hotter and less hospitable desert grew into the Las Vegas-Paradise metropolitan area. It could not have grown without its water resources. In 1928 there were fewer people in Clark County than in either Lincoln or White Pine County today. Who would have thought at that time that the county needed or deserved much more water? Las Vegas believes it was poorly represented in the State of Nevada’s negotiations of the Colorado Compact in 1928,

“Only when Las Vegas began to outgrow its water did the Colorado Compact and its 1928 allocations come to be seen as a blunder, one that hits a regional nerve. Richard Bunker [Clark County manager in 2008] will tell you that it’s Northern Nevada’s fault. There were no Southern Nevadans at the table. Moreover, according to Bunker, the Northern ones just might have been

drunk... ..”For them to say 300,000 acre-feet was a lot of water for a place that was sand dunes, mosquitoes and rattlesnakes sounds fair,” Bunker says. “But when you look at what Arizona got, 2.8 million ...” he drifts off, then sighs. “It is what it is.”” SOURCE: Green (2008) <http://www.lasvegassun.com/news/2008/jun/01/satiating-booming-city/>

“Those who cannot remember the past are condemned to repeat it.” George Santayana.

**(6) The Applicant Incorrectly Underestimates the Urban Growth Prospects in The Counties:**

By focusing exclusively on short-run local historic time-series trends and ignoring cross-sectional patterns underlying the unrefuted scientific evidence commonly known as the Central Place Theory and the Rank-Size Rule, the Applicant incorrectly underestimates the urban growth prospects in White Pine and Lincoln Counties. The Applicant’s biased and incomplete testimony does not provide credible information to justify the proposed water withdrawals and transfers.

The pattern of urban settlement, even in the west, possesses an amazing regularity called Zipf’s Law. More commonly known as the Rank-Size Rule, the law holds that the magnitude of the  $r^{\text{th}}$  observation in rank equals  $1/r^{\text{th}}$  of the magnitude of the first or largest observation (see, for example, Gabaix, 1999). The table below shows how well western U.S. cities conform to Zipf’s Law (note the correspondence between the predicted and observed  $1/r$ ):

Rank “r”	State	City	population	Predicted 1/r	Observed 1/r
1	CA	Los Angeles city	3,831,868	100%	100%
2	AZ	Phoenix city	1,593,659	50%	42%
3	CA	San Diego city	1,306,300	33%	34%
4	CA	San Jose city	964,695	25%	25%
5	CA	San Francisco city	815,358	20%	21%
6	NV	Las Vegas city	567,641	17%	15%
7	AZ	Tucson city	543,910	14%	14%
8	CA	Fresno city	479,918	13%	13%
9	AZ	Mesa city	467,157	11%	12%
10	CA	Sacramento city	466,676	10%	12%

The alert reader might notice that the example above is based on cities, and may well wonder if the regularity applies to metropolitan areas as well. The answer is yes:

Rank “r”	State	Metropolitan Area	population	Predicted 1/r	Observed 1/r
1	CA	Los Angeles-Long Beach-Santa Ana	12,874,797	100%	100%
2	AZ	Phoenix-Mesa-Scottsdale	4,364,094	50%	34%
3	CA	San Francisco-Oakland-Fremont	4,317,853	33%	34%
4	CA	Riverside-San Bernardino-Ontario	4,143,113	25%	32%
5	CA	San Diego-Carlsbad-San Marcos	3,053,793	20%	24%
6	CO	Denver-Aurora-Broomfield	2,552,195	17%	20%
7	OR	Portland-Vancouver-Beaverton	2,241,841	14%	17%

8	CA	Sacramento—A-A—Roseville	2,127,355	13%	17%
9	NV	Las Vegas-Paradise	1,902,834	11%	15%
10	CA	San Jose-Sunnyvale-Santa Clara	1,839,700	10%	14%

Data Source: <http://www.census.gov/compendia/statab/cats/population.html>; tabulations by author

This empirical regularity has been documented at all spatial scales around the world for many centuries. The exceptions to the pattern are the cities of the People’s Republic of China, where city size is directed by government fiat rather than free market forces. Historical, in-sample analyses also show that this long-run cross-sectional relationship also predicts the locations of new cities as well as their long-run size. And the law suggests that more medium size metro areas can be predicted to develop in the State of Nevada.

A related well-known and easy to visualize model of the location and sizes of cities, Central Place Theory (Berry and Garrison, 1958; Mulligan, 1984) can be applied to predict where Nevada’s future urbanized areas might be. Since the late nineteenth century, after the initial development of port locations into cities (Los Angeles, San Francisco, Sacramento) the west has seen the rise of ‘in-fill’ cities, efficiently located between the original metro areas. This second wave of metro areas such as Phoenix, Fresno, and Las Vegas did not, however, cover the region. There remains plenty of room for more metro areas. To be connected by yet-to-be-developed interstate transport corridors.

The map originally provided in SNWA Exhibit 241 has been elaborated to show the predictive power of Central Place model over space and time. Notice how Las Vegas fits into the geography between Los Angeles and Phoenix.

The original version of this map showed the four valleys and the towns near them, plus the concentric circles around Ely at 50 and 100 ‘crow-fly’ miles. The dashed 100 mile crow fly circles have been added to illustrate that Ely, NV is efficiently located midway between the existing interior metro areas of Salt Lake City, Las Vegas, and Reno. The development of Ely, NV as a regional central place would provide coverage of the region in which metropolitan central places are within about a half-day’s drive.

With its scenic beauty, variety of local amenities, hospitable climate, and the amount of water currently available locally, there is every reason to anticipate the future development of a central place in White Pine County, such as Ely, Nevada; according to Central Place Theory, Zipf’s Law, and the consensus of research on rural development.



Figure 2-1  
Proximity to Major Metropolitan Centers

## **(7) SNWA Fails to Account for the Cumulative Damage to Local Economies**

SNWA Exhibits 103 and 241 incorrectly ignore the deleterious effects of the proposed water mining. By ignoring the circular flow of income through local expenditure, inter-industry interdependencies, and ignoring the lack of redundancy in White Pine and Lincoln counties, the Applicant's experts failed to account for the widespread and cumulative damage to the local economies associated with the proposed interbasin transfer of the limiting natural resource upon which all economic activity in the region is based. Thus the Applicant's testimony does not provide sufficient information to refute the likelihood that the proposed withdrawals will unduly limit future economic growth and development and harm the public interest.

It has been argued that the construction of the pipeline will benefit the communities in the valleys (Ruling #5476, 2007). This may be true in the short term during pipeline construction, but the benefit would only last a few years after which the anticipated negative impacts accelerate. The claim that there will be no further declines in the agricultural sectors in White Pine and Lincoln Counties as a result of the pipeline project has already been disputed in this rebuttal. The fact that the valleys generate business for other households employed in agricultural supply and tourism support activities in the towns is documented in Harris and colleagues (1994, 2004) as well as in Rajala, Spring Valley Exhibit 3054 (2006), summarized in Kilkenny, GBWN Exhibit 066 (2011). The wider economic impact also has been amply noted in the BLM's 2011 DEIS:

“The seasonal nature of tourism has implications for local businesses and the jobs they provide. As noted above, a sense of tenuousness exists across the rural counties regarding their economic future. Tourism and recreation, though much smaller in scale than in Clark County, are viewed as vital elements of the local economies. Many local businesses are economically dependent on tourism and recreation, at least to a degree, whether they cater to all-terrain vehicle (ATV) enthusiasts, shed hunters (collection of antlers shed by deer and elk), big game hunters, overnight visitors drawn by scenic vistas, solitude and the night skies, or part-time residents owning second homes in the region. The purchases of private ranches by non-local corporate and institutional interests, including the Southern Nevada Water Authority, and future groundwater development are seen as threatening the region's tourism and recreation industry. Possible threats include limits on historical hunter access, changes in farming and ranching practices that affect wildlife, the potential indirect effects of groundwater drawdown and soil stability that affect visibility, night skies, and travel patterns of tourists; all of these could adversely affect the level of tourism and the economic contributions it provides. Tertiary effects of the water rights appropriation process and long-term groundwater drawdown effects on wildlife and tourism are viewed as threatening long-term second home development, which is viewed as another important dimension of economic development in the rural areas.” Draft EIS: SNWA's Clark, Lincoln, White Pine Counties Groundwater Development Project – June 2011 Chapter 3, Page 3.18-18 and 18.

There are three more critical economic processes. The first is human behavior with respect to investment. That topic was briefly addressed in point three of this rebuttal. The other two are lumpiness and time. Lumpiness, or the fact that all economic activity requires set-up costs and therefore requires a minimum scale to survive, is scientifically known as imperfect divisibility. Over time, responses to initial changes accumulate. The ultimate outcome may be qualitatively quite different from the initial impact.

Very briefly, the implications of lumpiness and time are that:

“...traditional marginal analysis doesn't work when assessing the effect of ag transfers on rural communities, because there is no margin. “There is only one of everything. It's not a matter of



one food store leaving the rural community; it's the *only* food store leaving the community.”  
Page 44, Arkansas Round Table, 2008.

“... impacts become important when the accumulation of net impacts crosses some threshold and has either a qualitatively different impact, or exceeds some line or standard. Losing the last medical service or grocery store is different from losing one of three big stores or losing a specialist. Biologically, the problems of cumulative impact are common. That is why we recommend that all considerations be examined for cumulative as well as site specific impacts.”  
Page 8, Arkansas Round Table, 2008.

## CONCLUSION

In conclusion, White Pine and Lincoln Counties are home to the state's most dedicated stewards of the region's natural resources. Their economic activities are 'canaries in the coal mine.' Who will make beneficial use of our land and environmental resources after all the sales, closures, retirements, and out-migrations caused by the proposed interbasin water transfers? Groundwater withdrawals and interbasin transfers that threaten the local communities are the tip of the iceberg of a greater set of threats. One of the wider long run threats to the public interest is the conversion of this vast rural area into an uninhabitable and economically vacant wasteland. These threats to our society and economy are consequences of the environmental threats described by numerous hydrologists, hydrogeologists, plant scientists, and others.

The proposed groundwater withdrawals and transfers will harm and unduly limit the future growth and development of the local communities in the near term and ultimately the whole state. The applications should be denied to ensure the long run inhabitability of the state beyond one city's limits. Society has created habitable cities in deserts. But we must not create uninhabitable deserts in an attempt to grow cities. It would be a futile attempt in any case. Groundwater mining is unsustainable and ultimately both the city as well as the rest of the state would lose.

## References

Arkansas Basin Roundtable (2008) “Considerations for Agriculture to Urban Water Transfers” Water Transfer Guidelines Committee; Compiled and Edited by MaryLou Smith, <http://cwcb.state.co.us/water-management/basin-roundtables/documents/arkansas/agtourbanreportabrtnov08.pdf>.

Berns, Dave (October 20, 2002) “Mulroy Key Player In Region's Water Picture” Las Vegas Review-Journal.

Berry, Brian J. L. and William L. Garrison (1958) “Note on Central Place Theory and the Range of a Good” *Economic Geography* 34(4 ):304-311.

Brean, Henry (August 20, 2009) “Water pipeline backed in county” Las Vegas Review-Journal <http://www.lvrj.com/news/53787162.html> (date accessed: August 18, 2011).

Bredehoeft, John D. (2006) “Effects of Proposed Groundwater Development by the Southern Nevada Water Authority on the Hydrogeology of Spring Valley, White Pine and Lincoln County, Nevada.” Spring Valley Exhibit 3010.

Bredehoeft, John D. (2006) “Review of the Evidence Provided by the Southern Nevada Water Authority of Proposed Development on the Hydrogeology of Spring Valley, White Pine and Lincoln County, Nevada.” Spring Valley Exhibit 3062.

Bredehoeft, John D. (2007) “Report on The Impacts of Proposed SNWA Groundwater Development in Cave, Dry Lake, and Delamar Valleys, White Pine and Lincoln Counties, Nevada.” CDD Exhibit 1130.

Bredehoeft, John D. (2007): “Impacts of Proposed SNWA Groundwater Development Cave, Dry Lake, and Delamar Valleys, White Pine and Lincoln Counties, Nevada. Review of SNWA Hydrogeology Reports.” CDD Exhibit 1210.

Bredehoeft, John D. (2011) Report on The Hydrogeology of Proposed Southern Nevada Water Authority Groundwater Development. GBWN Exhibit 009.

Bredehoeft, J.D. (2011) “Monitoring regional groundwater extraction; the problem” *Ground Water*, DOI: 10.1111/j.1745-6584.2011.0079.x.

Bredehoeft, J.D. and T.J. Durbin (2009) “Ground water development—the time to full capture problem” *Ground Water* 47: 506-514.

Bureau of Land Management (June 2011) Draft Environmental Impact Statement (EIS): SNWA’s Clark, Lincoln, White Pine Counties Groundwater Development Project.

Dahlgran, Roger A. and Steven C. Blank (1992) “Evaluating the Integration of Contiguous Discontinuous Markets” *American Journal of Agricultural Economics* 74(2):469-479.

Deacon, James E. (2011) Report on the Probable Effects of Proposed Groundwater Pumping by Southern Nevada Water Authority in Spring, Cave, Dry Lake and Delamar Valleys, Nevada on Spring and Wetland-Dependent Biota. GBWN Exhibit 014.

Deller, Steven C., Tsung-Hsiu Tsai, David W. Marcouiller and Donald B. K. English (2001) “The Role of Amenities and Quality of Life in Rural Economic Growth” *American Journal of Agricultural Economics* 83(2):352-365.

Durbin, Timothy (2006) “Development and Use of a Groundwater Model for the Spring Valley Area” SNWA Spring Valley Exhibit 508.

Elliott, P.E., Beck, D.A., and Prudic, D.E. (2006) “Characterization of surface-water resources in the great basin National Park area and their susceptibility to ground-water withdrawals in adjacent valleys,” (SNWA Exhibit 069, July 2011) White Pine County, Nevada U.S. Geological Survey Scientific Investigations report 2006-5099 <http://pubs.water.usgs.gov/sir2006-5099>

Foster, Kenneth A. and Oscar R. Burt (1992) “A Dynamic Model of Investment in the U.S. Beef-Cattle Industry” *Journal of Business & Economic Statistics* 10(4): 419-426.

Gabaix, Xavier (1999) “Zipf’s Law for Cities: An Explanation” *The Quarterly Journal of Economics* 114(3): 739-767.



Green, Emily (June 22, 2008) "Not This Water: In a bid to save his family's livelihood after Las Vegas laid the groundwork for a water pipeline that could reduce his land to dust, a White Pine County rancher joins forces with Utah." *Las Vegas Sun* <http://www.lasvegassun.com/news/2008/jun/22/not-water/> accessed August 20, 2011.

Hardcastle, Jeff (2010) *Nevada County Population Projections 2010 to 2030: October 2010*; The Nevada State Demographer's Office. Pdf available on request from [jhardcas@unr.edu](mailto:jhardcas@unr.edu).

Harris, Thomas R., and Joan Wright (2004) "Estimated Economic Impacts of The Cattle Ranching And Farming Sector On The White Pine County Economy" Report submitted to the Office of the State Engineer of the State of Nevada, Spring Valley Exhibit 3050 June 2006.

Harris, Thomas R., Jeffrey E. Englin, Gary M. Vesperat, Manuel Lopez, George Ebai, Shawn W. Stoddard, Kevin House, Mike Sibley, and White Pine High School Sociology Class (1994) "White Pine County Comprehensive Tourism Master Plan" Report submitted to the Office of the State Engineer of the State of Nevada, Spring Valley Exhibit 3052 June 2006.

Kilkenny, Maureen and Mark Partridge (2009) "Export Sectors and Rural Development" *American Journal of Agricultural Economics* 91(4):910-929.

Marsh, John M. (1994) "Estimating Intertemporal Supply Response in the Fed Beef Market" *American Journal of Agricultural Economics* 76(3):444-453.

Marsh, John M. (1999) "The Effects of Breeding Stock Productivity on the U.S. Beef Cattle Cycle" *American Journal of Agricultural Economics* 81(2):335-346.

Mifflin, Martin D., S.E. Kao, John Keith, and C.F. Stringer (1992) "Draft Economic and Engineering Feasibility of Water Development and Importation to Clark County for the Las Vegas Valley Water District Water-Right Applications." Mifflin and Associates, Inc., Las Vegas, NV; pdf.

Mulligan, Gordon (1984) "Agglomeration and Central Place Theory: A Review of the Literature" *International Regional Science Review* 9(1):1-42.

Peseau, D., and Carter, G. (2011) "Future economic development potential of agriculture in White Pine and Lincoln Counties: Presentation to the Office of the Nevada State Engineer" Utility Resources, Inc.; SNWA Exhibit 103.

Rake, Launce (August 16, 2006) "A matter of survival: LV's growth will stop in 2013 without White Pine water, Mulroy says" *Las Vegas Sun* <http://www.lasvegassun.com/news/2006/aug/16/a-matter-of-survival/> accessed August 19, 2011.

Van Liew, W. P. (2006) "Preliminary Assessment of the Hydrology of Spring Valley and Snake Valley Hydrographic Areas." National Park Service, Water Resources Division, Fort Collins, CO.

Southern Nevada Water Authority (March 2011) "Clark, Lincoln, and White Pine Counties Groundwater Development Project Conceptual Plan of Development" [http://www.snwa.com/assets/pdf/wr\\_gdp\\_concept\\_plan\\_2011.pdf](http://www.snwa.com/assets/pdf/wr_gdp_concept_plan_2011.pdf)

Water Resources, State of Nevada Division of (accessed August 21, 2011) *Statutes and Regulations Governing the Division of Water Resources*, <http://water.nv.gov/home/statutoryauthority.cfm/statutoryauthority.cfm>