# POINT / COUNTERPOINT:

# Nevada Groundwater Transfer: Do We Know Enough to Decide?

*In 2004, the Southern Nevada Water Authority (SNWA)—the agency responsible for the region's water supply management, treatment, and transmission—initiated plans to export unused groundwater from Clark, Lincoln, and White Pine counties for which it has water rights applications. Some people are concerned about what adverse effects such development might have on the water table. Before construction begins, the Nevada State Engineer must determine how much water should be permitted and the Bureau of Land Management must complete a comprehensive environmental analysis of the project. The Nevada State Engineer has not yet announced hearing dates. The project is expected to take approximately 10 years to complete.*

Southwest Hydrology *solicited two different viewpoints on the review, monitoring, and permitting process, presented below.*

## *POINT: Proceed Carefully: Much Still Remains Unknown*

***Tom Myers, Ph.D.** – Hydrologic consultant*

In the arid West, groundwater is the only source of water for growth beyond what meager surface water sources provide. As Nevada's apportionment from the Colorado River becomes fully utilized, water purveyors for southern Nevada now look to at least 18 basins in northern and eastern Nevada for additional water to support the rapid growth prevailing in Las Vegas.

The hydrogeology of SNWA's proposed development area is very complex and not well studied. A carbonate aquifer system underlies much of the area, but many of the valleys are topographically closed and contain a valley fill aquifer. Interbasin flow occurs primarily through carbonate rocks such that discharges in one basin may depend on recharge in another. The connection between carbonate and valley fill aquifers is variable and poorly understood. For these reasons, a conservative approach to analyzing developmental impacts is essential.

The Nevada State Engineer administers water rights by allocating up to the perennial yield in any given basin, accounting for interbasin flow and discharge to water resources such as springs, streams, and wetlands. He must protect existing water rights and the public interest. For large projects based on limited data, the State Engineer often requires a monitoring and mitigation (M&M) plan to protect valued water resources.

### *Identify Key Resources*

The first step of an M&M plan is to determine which resources require protection. These could be nearby water rights, springs that support endangered species, such as the Ash Meadows complex near Death Valley, or wetlands that support biodiversity, such as the shallow lakes in Spring Valley.

Most model predictions show that significant impacts to water resources may take decades to centuries to manifest. But the carbonate aquifer has very transmissive zones that probably are not adequately considered by the existing models, therefore the time estimates could be wrong by orders of magnitude (Winograd and Thordarson, 1975). Monitoring must be designed to detect those errors.

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## *COUNTERPOINT: Concerns Unwarranted: Sufficient Data Exist to Permit Pumping*

***Andrew Burns** and **Jeff Johnson** – Southern Nevada Water Authority*

Many concerns voiced by rural residents and environmental activists about adverse effects to the water table are based on the presumption that groundwater withdrawals by the SNWA are both inherently harmful and irrevocable. This premise is simply untrue. Two of the most commonly voiced theories are that 1) no new recharge enters the carbonate aquifer system—often referred to as the "ancient water" theory; and 2) localized drawdown associated with groundwater pumping will expand indefinitely and unimpeded from the wellhead. Scientific data and explanations including the occurrence of natural recharge, geochemical evidence, and the complex hydrogeologic framework that forms the Basin and Range Province, which overlays the project basins, have done little to assuage stakeholders' concerns.

### *Monitoring is Key*

SNWA believes a comprehensive monitoring program is the key to sustainable groundwater development. While a tremendous amount of evidence exists that a large volume of groundwater can be safely withdrawn, the only way to ensure that senior water-rights holders and sensitive environmental resources are protected is by closely monitoring hydrologic conditions while groundwater pumping occurs.

### *The State Engineer's Role*

The Nevada State Engineer has wide latitude and broad authority in terms of imposing terms and conditions. These may range from a comprehensive groundwater-monitoring program to a combination of permanent rights and rights conditioned on effects from pumping over time.

SNWA's most recent experience with the Nevada State Engineer involved applications to change the agency's points-of-diversion of existing permits in the Three Lakes and Tikaboo South valleys northwest of Las Vegas. The principal issues in the hearing related to potential effects of pumping on senior water-rights holders and natural resources in the vicinity. The Nevada State Engineer will protect water-rights holders by determining if unreasonable lowering of the water table occurs and imposing measures to

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### *Establish Warning Systems*

Therefore, the second step is to determine which parameters would provide adequate warning of impending damage to a resource and where; these should be monitored. Managers must recognize that drawdown cones continue to expand after the stress ceases and the deficit caused by the stress is replenished. Monitoring water levels or discharge at a protected spring is insufficient because monitoring will merely document the degradation.

Water level is the most frequently monitored parameter. But in complex regions with multiple geologic layers, stress effects propagate through the layers at different rates, therefore wells must monitor multiple levels. The monitoring point should be based on the fastest rate that a drawdown cone could expand so that mitigation can actually prevent degradation.

Flux may be the most important, but difficult, parameter to measure directly, therefore a system of multilevel monitoring wells located to measure changes in gradient and transmissivity may be necessary to provide adequate advance warning of impacts. Such a system also would provide data for improved model calibration, thereby refining predictions about the timing and extent of potential impacts.

Hydrologically defensible monitoring can be designed; the hard part is mitigation. Often the only way to protect a water resource is to stop or substantially decrease pumping before it is harmed. However, once a certificated water right has been established and supplies drinking water to thousands of people, the pressure to maintain that source of water, even if spring flow appears threatened, is likely to be considerable. Attempts to replace an impacted resource by artificial recharge

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*Concerns Unwarranted, continued*

ensure their water rights are protected. This determination can accurately be made only through the implementation of a monitoring program. Thus, SNWA worked with the National Park Service, Fish and Wildlife Service, Bureau of Land Management, Department of Energy, and Air Force to design a comprehensive monitoring program to quantify the effects of groundwater pumping in the area and protect senior water rights.

The same process will hold true for the basins of east-central Nevada. SNWA views this groundwater not as a short-term solution to be extracted at any cost, but rather as a renewable resource that will help protect Southern Nevada's residents and the entire state's economy. Therefore, the agency is receptive to provisions that ensure its withdrawals are sustainable.

### *The Data Are Extensive and Reliable*

For nearly half a century, scientists have been analyzing Nevada's aquifers and groundwater flow systems. The Nevada Division of Water Resources, the U.S. Geological Survey, and even the Department of Defense have dedicated extensive resources to understanding the nature and capacity of Nevada's groundwater systems. Scores of hydrological and geophysical studies, along with hundreds of thousands of hydrologic data points, have served as the basis for many permits issued by the Nevada State Engineer in this region.

This information has been used for decades by the State Engineer to respond to applications for water diversions in the area. Moreover, SNWA, in conjunction with USGS, has been furthering the studies of these basins to help refine our knowledge base and provide the information necessary for the Nevada State Engineer to act upon these and other applications.

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*Southern Nevada Water Authority plans to draw upon the basins of east-central Nevada for a new water supply.*

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or other means are rarely successful because using local water exacerbates the problem. Therefore, mitigation also requires that alternative water sources be available to the water users.

### *Conservative Approach Warranted*

Regarding the proposed groundwater transfer, the best decision may be to minimize the risk by granting only those water rights for which a high degree of certainty exists that their use will not impact springs and wetlands. Because recharge estimates are among the most uncertain of any parameters in the basins targeted for development, acceptable risk reduction may mean that only a few tenths of the currently projected perennial yield should be allocated initially. Long-term monitoring—on the order of multiple decades—may be required to ensure that the water right can safely and sustainably be increased in the future.

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## *Reference*

*Winograd, I.J. and W. Thordarson, 1975. Hydrogeologic and hydrochemical framework, south-central Great Basin, Nevada-California, with special reference to the Nevada Test Site. Hydrology of Nuclear Test Sites, Geological Survey Professional Paper 712-C. U.S. Geological Survey, Washington D.C.*

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Further, as previously indicated, the Nevada State Engineer's authority over groundwater does not end when a permit is issued. His primary interest is the responsible, sustainable use of Nevada's groundwater supplies, which is in the best interest of Southern Nevada as well.

The assertion that information about the regional carbonate aquifer is not sufficient to allow carefully controlled, monitored withdrawals is a ploy intended to create a Catch-22. The idea behind this tactic is that water should not be permitted because there is not enough hydrologic information, while the absence of pumping precludes the gathering of such data.

An ongoing groundwater-monitoring program will answer the questions that form the core of anxiety about this project. That program can only be implemented once the SNWA begins withdrawing water from the system—water that the Nevada State Engineer has ample evidence exists.

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constituents, which include environmental tracers, such as stable isotopes of water and tritium/helium age-dating, and low-level concentrations of volatile organic compounds. The other half are being sampled for the basic constituents as well as an expanded schedule of constituents, including field parameters (pH, electrical conductance, dissolved oxygen, alkalinity, and temperature), major ions, trace elements, pesticides, and emerging contaminants.

The program aims to have online data reports available by basin, posted on the SWRCB Geotracker data management system website within four months of completion of sampling. Interpretive reports are expected to be available nine months following the data reports.

## *Bumps in the Road*

The GAMA program has been somewhat challenged since its inception. Sseveral groundwater management agencies have cited a lack of coordination that has led to some miscommunication, misunderstanding, frustration, and lack of cooperation. The issue of collecting data at the part-per-trillion level also has raised concerns: What do the data mean in terms of future groundwater quality, human and ecologic risk, public perception and uncertainty, and districts' potential liability for serving water with these extremely low levels of constituents? Another concern is interpretion of these low-level groundwater analytical data, which are not representative and are much lower than drinking water maximum contaminant levels. One groundwater management agency believes the low-level data are being mischaracterized and sensationalized in the reporting, leading to concerns about how and by whom these data will be interpreted and used.

Although California has made considerable progress with its groundwater data programs in the last few years, the road ahead is long, especially regarding the coordination of state, local, and federal programs. Even with the GAMA program, multiple agencies still collect and manage their own data according to different standards. Given the importance of this public and private resource on the state economy and public health, Californians will need to keep forging ahead to implement a comprehensive statewide groundwater monitoring program that provides adequate and accessible information on both groundwater quality and quantity and involves all stakeholders in order to achieve a sustainable resource for future generations.

*Visit the SWRCB GAMA website at www.swrcb.ca.gov/gama/. Contact Tim Parker at tparker@grac.org.*

## *References*

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