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Steve Rossi

City of Phoenix Water Services Department

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DROUGHT AND GROWTH CONSIDERATIONS IN LONG RANGE MUNICIPAL WATER RESOURCE PLANNING

Steve Rossi, Principal Water Resources Planner, City of Phoenix Water Services Department
200 W. Washington 9th Floor, Phoenix, AZ 85003 602-495-3669, 602-495-5542;
srossi@qwest.net

In 1951, following a decade of “unprecedented development” in the City of Phoenix, a report addressing future water production and transmission facilities projected that the City’s population would reach 420,000 by the year 2000. Almost fifty years later, the U.S. Census for 2000 established Phoenix’s population at 1.3 million – a threefold increase over that seemingly robust 1951 projection.

Uncertainty regarding the rate of population growth is but one of many challenges inherent in assessing future municipal water needs. An effective water resource plan must consider not only the traditional “consensus opinion” of what is likely to happen over time, but a range of alternative scenarios which could occur. Strategic planning approaches which consider a variety of future conditions become particularly important in an era of over-allocated watersheds, stringent environmental regulations, water quality concerns, litigation and tough competition for supplies.

The Phoenix Water Resources Plan is typically updated every five years to reflect current water demand projections and water supply conditions. Prior plans have concluded that Phoenix’s historic and anticipated water supplies were sufficient to meet the long term needs of current customers and a significant level of growth. Though the City maintains a well-diversified portfolio of water supplies, surface water from a variety of sources is utilized to meet over 90 percent of customer demands in a “normal” year. The region’s recent experience with relatively deep and lengthy drought conditions in its major source watersheds has underscored the need to further assess Phoenix’s vulnerability to worsening conditions. In addition, Phoenix’s growth patterns - and thus water demand - may be significantly affected by unanticipated economic or demographic trends.

A key objective of Phoenix’s most recent plan is to better understand these potential conditions, and to determine the optimal level of water supply and infrastructure redundancy to mitigate drought-related surface water shortages. In embarking on this exercise, several questions were raised. These questions helped provide insights and direction that will ultimately reduce the risk associated with future conditions. Examples of the questions addressed in the City’s evaluation are:

1. Is the past 100 years of record an appropriate indicator of future droughts (both length and severity) or should potentially deeper and longer-term drought be considered (as reflected in tree ring analyses covering several centuries)?
2. How soon will shortages on the Colorado River be encountered and how severe are these shortages likely to be?
3. How will Colorado River and Salt/Verde River shortages affect the surface water supplies allocated to Phoenix?
4. What is the likelihood of drought on both major surface water systems at the same time?
5. To what degree can available groundwater mitigate drought?
6. Considering costs and relative probabilities, what is an optimal level of water supply and infrastructure redundancy needed to avoid adverse consequences to residents, businesses and the local economy?
7. What mechanisms are most appropriate for recovering these costs?
8. How could higher density development in Central Phoenix and elsewhere affect water demands?
9. How will changes in the commercial/industrial makeup of the local economy affect water demands?
10. How much further can customers conserve without adversely impacting lifestyle, the economy, and the overall “quality of life” in the community?
11. Under what conditions is it appropriate for the City enact mandatory customer water use reductions?

Though many of these questions, and several others, were difficult to address, the process of seeking out the answers provided valuable insights in our long-range planning effort. The evaluation process included the identification of key variables, developing and running scenarios through models which are spatially and seasonally sensitive, and developing water supply and demand strategies based on the outcomes. The updated plan concludes that Phoenix’s portfolio of current and future supplies is capable of handling a wide variety of growth and drought conditions. However, significant infrastructure-related capital expenditures will be necessary to accommodate growth and to better “drought-proof” the portfolio.

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