A Consideration of Arguments Against Including "Drought of Record" in Desired Future Condition Modeling for Groundwater Management Area 9

Prepared by

Preserve Our Water, Inc.

www.preserveourwater.org
pow@hughes.net

July, 2008

A Consideration of Arguments Against Including "Drought of Record" in Desired Future Condition Modeling for Groundwater Management Area 9

Context

The Groundwater Conservation Districts (Districts) of Groundwater Management Area 9 (GMA 9) have undertaken several aquifer modeling exercises with the Texas Water Development Board over the course of the past year. These modeling efforts support establishing a "Desired Future Condition" (DFC) for the Trinity aquifer. The DFC is a measurable statement that will guide future allocation of groundwater. The computer models produce information about the performance of the aquifer, the impact on springs, rivers and creeks, and establish the amount of water that can be pumped from the aquifer in achieving the DFC. That DFC and the data provided by the model will define the amount of water in those aquifers available for use over a 50-year planning horizon.

However, the modeling definitions submitted by GMA 9 lack what many technically qualified observers and informed citizens believe to be a critical factor. Specifically, the modeling exercises do not include an evaluation of how a "drought of record" period affects the predicted future water level in the Trinity Aquifer. The term "drought of record" refers to the severe and lengthy period in the early 1950s during which much of the US southwest suffered from far-below-average rainfall.

This discussion will examine each of several arguments elected officials and staff of the Districts in GMA 9 offer against including "drought of record" in the modeling exercises.

Engineering to the Exception

One rationale advanced for excluding a "drought of record" rainfall period in the modeling reflects a well-established engineering principle. That principle holds that a system should not be engineered to "extreme" or "exceptional" conditions. Failure to adhere to this principle results in an "over-engineered" system which usually results in unnecessary cost or inconvenience or both. It is clear that the drought of the 1950s was the most extreme experienced within this region in the past 100 years.

However, if a longer period is examined, does this drought continue to stand out as exceptionally extreme? The science of paleoclimatology answers this question with a resounding "No." Although the "instrumental" era of climate and weather studies (carefully measured and recorded weather events like rainfall) in this area date back only to the latter 19th century, other sources can be relied on to gain an understanding of earlier climate conditions. With a period of 300 – 400 years as the reference, the drought of the 1950s emerges as a predictably regular occurrence. Rainfall conditions on par with that event occurred two or more times in each of the preceding centuries. Using tree-ring analysis and other estimates of rainfall, scientists have extended the understanding of climate even further back; almost 2,000 years. Those data reveal an even more disturbing picture. Droughts of far greater severity and duration have occurred repeatedly in this region over that time frame. When examined from a broader historical perspective, our "drought of record" is neither exceptional nor extreme.

Another question engineers must ask when assessing the conditions for which a system should be designed is, "What is the impact of system failure?" The extremity of conditions suitable to guide the engineering of a refrigerator, for example, is significantly less stringent – due to the consequences of failure – than the conditions chosen for guiding the engineering of a car. A car is subject to less stringent design criteria than an airplane which in turn is subject to less stringent criteria than the Space Shuttle. In the case of water planning, it is important for planners to bear in mind the human, public health, and economic and environmental implications of their planning. Such consideration should lead the prudent planner to a high standard of rigor.

On closer examination, the engineering based rationale for excluding a drought of record rainfall period in the GMA 9 modeling effort is less than convincing as another drought of equal or greater severity is highly probable.

Drought Management Plans to the Rescue

Each of the Districts have, or are finalizing, Drought Management Plans. These Plans specify what measures will be taken during droughts, including both voluntary and mandatory reductions in water use. During the drought of the 1950s, no such Plans existed as Districts did not come into existence until well after that event. Some District officials have argued that it is unnecessary to model the results of such a drought since implementation of those Drought Management Plans will serve to mitigate the impact of the drought.

While it is reasonable to expect that well-designed, publicized and enforced Drought Management Plans may stretch the available water over a longer period, this argument suffers from a serious shortcoming. Calibrating a Drought Management Plan to the effects of a drought absent data regarding those effects is a highly unreliable undertaking.

A cursory examination of the Drought Management Plans in place across GMA 9 will highlight this problem. The conservation provisions and triggering conditions vary significantly among the Districts. Some Plans have no objective trigger points based on aquifer conditions, rainfall patterns, independent drought indices, or the like. Others use various combinations of such indicators. In some Districts voluntary conservation measures take effect with the arrival of summer, while others have voluntary programs through the harshest of drought conditions. The water conservation goals, typically expressed in percent of reduction in use, for the at each drought level also varies as do the number of levels of drought condition defined in the plans.

Given such diversity in Plans across the area that is served, primarily, by the Trinity aquifer it is clear they cannot have been based on a shared set of facts. The District official who feels their Drought Management Plans can serve to protect the citizens when such a drought occurs must be asked, "How do you know?" Absent an estimate of the effect of such a drought, given current and projected demand levels, how can a GCD official know how much water must be conserved, when such conservation should start, and who may suffer regardless of such measures? A simple modeling exercise that includes "drought of record" conditions will address these concerns.

"We tried, but it didn't work"

The first model specification executed for GMA 9 included a drought of record period. That modeling attempt failed or, as the modeling technicians say, "failed to converge." Some GMA 9 officials and staff point to this occurrence and claim it as demonstration of a technical inability to include such an event in the model used for the Trinity Aquifer. This claim ignores two important facts.

In 2001, work on the current state water plan was underway. The planning area known as Region K, which includes a portion of GMA 9, based its groundwater modeling on a target of maintaining 90% of the spring flow recorded during the drought of record in any subsequent drought of equal severity. The current water budgets of two Districts in GMA 9, Hays/Trinity and Blanco-Pedernales, result from the successful modeling of this specification by the Texas Water Development Board (TWDB).

The second objection to this argument is that the specification executed by the TWDB on behalf of GMA 9 was not a faithful replica of specifications previously executed for Region K. For reasons never explained, the specification was subtly, but very critically, different. It called for maintaining 90% of *normal* spring flow (rather than the much reduced level experienced during drought of record) under drought of record conditions. It is hardly a surprise that the effort ended in failure.

In addition, Ms Cindy Ridgeway, Modeling Team Leader for the TWDB reports that the majority of Groundwater Management Areas responsible for karst aquifers, like the Trinity, are including a "drought of record" period in their DFC modeling requests

This argument fails for a lack of any factual basis and is inconsistent with the methodology employed by similar Groundwater Management Areas.

"We don't want to know"

The most uncomfortable argument, but in some ways the most understandable, is that we simply do not want to know. This argument assumes that the demand for Trinity groundwater has grown so great since the 1950s that many dire consequences of a drought of similar or greater severity are already unavoidable. Providing graphic evidence of the severity of that impact appears to raise fears because of the potential for disruptive economic and political consequences of that knowledge.

Appendix A provides a summary of the changes in population within the GMA 9 counties since the 1950 census. As the table in that appendix depicts, the growth in population, and hence demand for water, has grown well over 3 fold in the past 55 years.

While this concern is understandable, particularly from the perspective of an elected official, it is clearly not a sound basis for avoiding the facts.

Conclusion

All of the various TWDB modeling requests, either in progress or pending, call for an increase in allowable pumping from the Trinity aquifer. One of those pumping scenarios is likely to emerge as favored by the GMA 9 panel. Absent new, far better substantiated arguments against doing so, it is clear that modeling the impact of a drought of record period must be completed before final submission for approval by the TWDB of a Desired Future Condition for the Trinity aquifer. A failure to take that step poses an unknown risk to all those who currently rely on this aquifer for life and livelihood. It also extends an unsupported assurance to the tens of thousands who would come to rely on that water as a result of raising the permissible pumping levels.

APPENDIX A

TABLE 1: GMA 9 COUNTY[1] POPULATION COMPARISON: 1950 – 2005

County	1950	2005
Bandera	4,410	19,988
Blanco	3,780	9,110
Comal	16,357	96,018
Hays	17,840	124,432
Kendall	5,423	28,607
Kerr	14,022	46,496
Medina	17,013	43,027

[1] Due to the very small portions of Travis and Bexar Counties served by the Trinity they have been excluded from this table.