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An online, peer-reviewed journal
published in cooperation with the
Texas Water Resources Institute

Texas Water Journal

Volume 12 Number 1 | 2021

Texas Water Journal

Volume 12, Number 1
2021
ISSN 2160-5319

texaswaterjournal.org

THE TEXAS WATER JOURNAL is an online, peer-reviewed journal devoted to the timely consideration of Texas water resources management, research, and policy issues. The journal provides in-depth analysis of Texas water resources management and policies from a multidisciplinary perspective that integrates science, engineering, law, planning, and other disciplines. It also provides updates on key state legislation and policy changes by Texas administrative agencies.

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Texas Water Resources Institute
Texas Water Journal
Volume 12, Number 1, December 22, 2021
Pages 202-204

Comment on "Exploring Groundwater Recoverability in Texas: Maximum Economically Recoverable Storage," published in the Texas Water Journal (2020) 11(1):152-171, by Justin C. Thompson, Charles W. Kreitler, and Michael H. Young

Robert E. Mace[1]*

Editor-in-Chief's Note: The Texas Water Journal accepted a request by Robert E. Mace, Executive Director and Chief Water Policy Officer at The Meadows Center for Water and the Environment, to share his thoughts on the article, Exploring Groundwater Recoverability in Texas: Maximum Economically Recoverable Storage," published in the Texas Water Journal (2020) 11(1):152-171, by Justin C. Thompson, Charles W. Kreitler, and Michael H. Young. The opinion expressed in this commentary is the opinion of the individual author and not the opinion of the Texas Water Journal or the Texas Water Resources Institute.

Keywords: groundwater availability, groundwater recoverability, pumping costs, total estimated recoverable storage, TERS, maximum economically recoverable storage, MERS

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Received 16 April 2021, Accepted 26 August 2021, Published online 22 December 2021.

Citation: Mace RE. 2021. Comment on "Exploring Groundwater Recoverability in Texas: Maximum Economically Recoverable Storage," published in the Texas Water Journal (2020) 11(1):152-171, by Justin C. Thompson, Charles W. Kreitler, and Michael H. Young. Texas Water Journal. 12(1):202-204. Available from: https://doi.org/10.21423/twj.v12i1.7136.

Terms used in paper

Acronym/Initialism	Descriptive Name
TERS	total estimated recoverable storage
TWDB	Texas Water Development Board

I applaud Thompson et al. (2021) for investigating the economic limitations of total estimated recoverable storage (TERS). While the concept of TERS may make practical sense when mining an unconfined aquifer such as the Ogallala, it does not make practical sense in many confined aquifers due to issues of hydraulics and, as the paper analyzes, economics.

Unfortunately, the definition of groundwater availability the authors used in the paper is incorrect. This incorrect definition does not impact the results of the study, but the confusion over the definition is important enough to discuss and clarify for the record. Many fierce policy discussions occur across Texas on desired future conditions, modeled available groundwater, total estimated recoverable groundwater, and groundwater availability, so a correct technical definition is critical.

The term "groundwater availability" is not defined in statute, but it has been used as a concept since Texas published its first water plan in 1961 (TBWE 1961). Initially, state agencies estimated groundwater availability with assumptions on what management goals could or should be. In other words, state agencies recognized that there was a policy component to groundwater availability. When Senate Bill 1 (75th Legislature [1997]) moved planning decisions from the Texas Water Development Board (TWDB) to the newly created regional water planning groups, so went planning decisions on groundwater availability. After conflicts arose between the groundwater availability amounts developed and used by regional water planning groups and those developed and used by groundwater conservation districts, who regulate the resource, the Texas Legislature assigned groundwater availability decisions solely to groundwater conservation districts working collectively in groundwater management areas through House Bill 1763 (79th Legislature [2005]), which is where those decisions remain today.

Thompson et al. (2021) quote TWDB (2016, p. 61) as defining availability as "…the maximum volume of raw water that could be withdrawn annually from each source (such as a reservoir or aquifer). Availability does not account for whether the supply is connected to or legally authorized for use by a specific water user group." [emphasis added by Thompson et al. (2021)]. Later, Thompson et al. (2021) state that "…[modeled available groundwater] volumes derived from [desired future conditions] do not strictly adhere to the definition of availability given by the plan," noting that the plan defines modeled available groundwater numbers as the (annual) volume that is "legally authorized for use." Later, they state that "the total storage component of TERS is the state's closest approximation of groundwater availability…" This is not correct.

I believe that the misinterpretation of the emphasized sentence in the previous paragraph is what confused Thompson et al. (2021). That sentence is intended to contrast water supplies for a water user group (based on existing infrastructure and an existing permit to use the water) with water availability (which is not necessarily constrained by existing infrastructure or existing permits but is constrained by policy, law, and the physical ability to produce water). This is explained a few pages later in the 2017 state water plan (TWDB 2016, p. 65), where the plan states that "groundwater availability is estimated through a combination of policy decisions, made primarily by groundwater conservation districts, and the ability of an aquifer to transmit water to wells." The plan then goes on to describe how groundwater availability is determined, namely through policy decisions encompassed by the desired future condition and the number that estimates how much water is available for use, the modeled available groundwater.

Mace et al. (2008), which Thompson et al. (2021) reference, also discusses how managed (now modeled) available groundwater is the groundwater availability that is used by groundwater conservation districts and regional water planning groups based on the policy decisions encompassed by the desired future condition. Even in areas without groundwater conservation districts, regional water planning groups may not include existing and planned-for use that exceeds the modeled available groundwater amount.

As mentioned by Thompson et al. (2021), TERS is one of the nine factors that groundwater conservation districts must consider when establishing their desired future conditions. In other words, TERS informs decisions on groundwater availability but does not define them. For example, TERS is relevant for much of the Ogallala Aquifer, where districts plan for the depletion of the saturated zone (50% of water left in storage after 50 years), and irrelevant for the Barton Springs Segment of the Edwards Aquifer, where the aquifer is managed sustainably to maintain springflow. In fact, and in practice, groundwater availability is equal to the modeled available groundwater amount.

Thompson et al. (2021) note that they were unaware of any rationale in the public record for why TWDB used 25% and 75% to represent the limits of TERS. Because I was working at TWDB at the time and was involved in discussions and decisions related to TERS, I can add some background, at least based on my files and perspective.

House Bill 1763 (79th Legislature [2005]) not only introduced the terms desired future condition and managed (now modeled) available groundwater, but it also introduced the term "total aquifer storage," defined as "the total calculated volume of groundwater that an aquifer is capable of producing." Although introduced, the Legislature did not assign anyone to calculate total aquifer storage or assign it to be used for anything.

In early 2009, toward the end of the first round of districts defining desired future conditions and TWDB staff providing managed (now modeled) available groundwater numbers, the board members requested briefings at their public meetings on the results of staff calculations of managed available groundwater (Mace and Ridgeway 2009). Mace and Ridgeway (2009) presented managed available groundwater numbers in the context of total groundwater supplies (groundwater availability) in the 2007 state water plan, existing groundwater supplies in the plan, existing groundwater supplies plus groundwater strategies in the plan, and groundwater use estimates. Later that year, the board requested that staff include an estimate of groundwater in storage (for example, Hutchison 2009). Staff included an estimate of the total amount of water in storage as well as an estimate of recharge or some approximation of sustainable yield.

TERS, TWDB's role in calculating it, and groundwater conservation districts' role in considering it arrived with the passage of Senate Bill 660 (82nd Legislature [2011]). The bill did not define the term, leaving TWDB to define it.

As Thompson et al. (2021) note, TWDB's definition of TERS did not consider the economics, although we considered it. However, considering economics opened up a number of policy questions. Economic for who? At what level? At what time? Thompson et al. (2021) used an irrigator in the central Carrizo-Wilcox Aquifer in their analysis; however, farmers generally need inexpensive water to compete in the marketplace. A city can afford to pay a great deal more for water for municipal, institutional, and industrial needs. But what is the most that a city is willing to pay for water? And at what point in the future? And wouldn't stakeholders need to be involved in assessing economic viability? Furthermore, Senate Bill 660 did not have a fiscal note, so whatever TWDB did, it had to be done with existing resources.

Ultimately, TWDB staff, with board approval, returned to the plain English interpretation of the phrase "total estimated recoverable storage" and set economics, as well as other technical issues, aside. That led staff to calculate TERS the way it is presently calculated with the 25% to 75% range and the disclaimer as expressions of the general uncertainty of this number.

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