A Free Market Solution to Groundwater Allocation in Texas:

A Critical Assessment of the House Natural Resources Committee Interim Report on Groundwater

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I. Introduction:

Groundwater management in Texas is profoundly influenced by the existing property rights system. In Texas, property rights to groundwater are governed by the common law rule of capture. Under this law, a landowner has the right to pump an unlimited quantity of water from any aquifer underlying his property. The landowner, however, has no right to the water until it is withdrawn from the ground. Further the landowner has no right to protect against interference or aquifer depletion by other water users.

In short, the rule of capture makes it extremely difficult for landowners to conserve and manage their groundwater assets. Essentially, the only way they can protect their claim is by pumping the water. Unfortunately, the rule has created a race to the pumphouse. Landowners must try to out-pump each other in order to ensure that they get their fair share. The result, however, has been devastating to the state's groundwater aquifers.

Yet, few policy reforms focus on the inherent limitations of Texas' groundwater rights system and inability of landowners to protect their

water claims. Today, the public policy trend focuses on strict regulatory controls over groundwater resources rather than addressing the shortcomings of the existing property rights structure.

Typically these regulations are designed to restrict water use and are almost always imposed with little consideration of efficiency. They also impose limitations on the transferability of water, preventing it from moving to higher valued uses. The main objective of these regulations is not to ensure that water is allocated efficiently, but to ensure that the aquifer is not depleted. While an amiable public policy goal, regulations protect groundwater resources at the expense of property rights.

Regulations are not the only way to protect groundwater. Texas has an opportunity to address groundwater management problems by rethinking and revising the rule of capture. Texas adopted the rule of capture when groundwater was plentiful and its subterranean movement was beyond the understanding of judges and other decision makers. Modern hydrology, however, enables us to create accurate models of groundwater aquifers. With this knowledge comes the ability to define property rights in groundwater.

The race to the pumphouse created by the rule of capture can become a thing of the past. This paper sets forth a proposal for addressing groundwater allocation challenges in Texas through stronger private property rights and water markets. The first section of the paper examines the recent House Natural Resources Committee interim report on groundwater management. That report failed to examine property right approaches and focused primarily on centralized planning and regulatory solutions. As a result of that oversight, the remaining two sections of this paper outline a method for establishing private property rights to groundwater and for establishing market allocation systems.

II. A Critical Assessment of the House Natural Resources Committee Interim Report on Groundwater:

Water policy has come a long way in the last ten years. In that time there has been a significant shift toward water markets. Throughout the western United States, water policy discussions are far more pro-market than ever before. Unfortunately, the House Natural Resources Committee interim report on groundwater failed to examine property rights and market-based management alternatives. In fact, Texas stands to lose significant ground and move away from more rational market oriented policies if the legislature acts upon several recommendations included in the report.

The most troubling of these are the recommendations to establish groundwater conservation districts and to grant the districts "powers and authority necessary to enable them to adequately manage groundwater resources." In addition, the report recommends that the districts be given extensive tax, spend, and right-of-condemnation authority. In order to establish a permitting process of wells, developing comprehensive management plans, and adopt the necessary rules to implement those plans.

While in principle this may sound like an appealing public policy approach, one of the problems with water management districts is that they tend to rely on regulatory command-and-control fixes rather than addressing the more important issue of groundwater rights and the rule of capture.

Senate Bill 1 of the 75th Legislature recognized the importance of water supply to individual citizens, cities and counties, agriculture, and industry. The backers of the bill also believed that an appropriate balance between private property rights and the rights of surrounding landowners could be achieved through groundwater management districts. The recommendations in the current interim report, however, failed to find that balance. In essence, the recommendations would give water management districts broad discretion and authority over property rights for both land and water.

Finally, the report makes an extremely weak recommendation of "wait and see" on water marketing, water exports and groundwater rights in general. This recommendation must be strengthened and given higher prioritization by the legislature. In fact, the state of Texas could make significant advances toward improving groundwater management by simply establishing private, transferable rights to groundwater that can be enforced both at the pumphouse as well as in the aquifer.

Water marketing and groundwater rights should be brought to the forefront of legislative priorities long before the establishment of groundwater management districts. Establishing secure and transferable private property rights to groundwater could minimize many of the challenges that are trying to be addressed through these districts.

III. Establishing Property Rights to Groundwater:

Strong property rights make for good markets. The big hurdle to establishing strong groundwater rights is resistance to changing the status quo use and control of groundwater (Anderson and Snyder 1997, 17.1). Individuals who are now pumping from an aquifer are not likely to voluntarily reduce their rate of extraction. Nor are bureaucratic agencies likely to give up authority they may have over allocation. Getting all parties to agree to a private property rights market regime requires demonstrating how market forces can increase water availability through improved allocation and describing the government institutions necessary to facilitate these improvements. Creating well-defined, enforceable, and transferable rights to groundwater is essential to establishing water market allocation regimes that will address groundwater depletion concerns.

Defining Groundwater Rights

One of the first steps the state should undertake is to quantify rights to groundwater. This act in itself will reduce extraction simply because the groundwater will have a tangible and defendable value to individual users. Currently, this is not the case under the rule of

capture. The only way to realize the value of the water is to capture it before other overlying landowners.

As landowners compare aquifer levels and pumping costs under a private property rights regime with experiences under the rule of capture, they will realize a new, more conservative behavior. With certainty that an individual's water claim will remain in the aquifer until needed, (Anderson and Snyder 1997, 173) groundwater levels should begin to rise and pumping costs decline.

Texas has already taken a step toward defining groundwater rights. In 1993, Texas Senate Bill 1477, established a mechanism for defining groundwater rights in the Edwards Aquifer. While it had some limitations and problems, the bill established a process that could be used for defining groundwater rights throughout the rest of the state.

Monitoring and Enforcing Groundwater Rights

Effective groundwater markets require monitoring and enforcement of water rights. Active monitoring and enforcement help to minimize conflicts over competing needs as well as discourage illegal water use. In addition, as water markets become more active, the potential for third party damages to other water right holders increases. However, a system of recording titles, enforcing of water rights, and facilitating transactions could help to minimize these conflicts. Groundwater management districts could play an important role in providing these types of services. Rather than giving districts regulatory authority over water allocation, a more appropriate function for the districts would be to assist with monitoring and enforcing rights as well as reviewing and facilitating water rights transactions.

Transferability of Groundwater Rights

Groundwater rights must be fully transferable and tradable to all types of uses. Placing restrictions on the transferability of these rights will impede the efficiency and effectiveness of water markets.

One of the shortcomings of the 1993 Senate Bill 1477 is that while it provided for water sales and leases, it placed restrictions on the amount of water that could be transferred from agricultural uses. These types of restrictions can skew market prices and result in significant economic losses. The bill guaranteed that the agricultural water share would be a proportion of historic use and a minimum of two acre-feet per acre. In addition, the bill restricted permanent transfer of agricultural water rights and limited off-farm water leasing so that one acre-foot per acre of water must be retained for irrigation. These guarantees come at the expenses of other water uses.

A recent study by Texas A& M University estimates that such restrictions could cost the businesses, cities, and people of the Edwards Aquifer region as much as $0.3 to $3 million annually (McCarl et al.1999, 1265). In addition, the study found that restrictions on permanent sales and leasing could cause price differentials between uses by as much as $70 per acre foot for leases and $875 for permanent sales (McCarl *et al.* 1999, 1266).

IV. Groundwater Market Approaches:

Texas policy makers have a choice in how they can deal with groundwater allocation. One option is to proceed with the groundwater management district proposal that will lead to command-and-control regulations specifying how much each landowner can pump and allowing little possibility for exchanges among groundwater users. Fortunately, in other parts of the western United States the regulatory approach is being discarded for property right market regimes that take advantage of time-and-place specific information regarding the highest and best use of the resource. Several states have made huge strides toward free market approaches to groundwater management.

- Oklahoma has passed legislation calling for measurement of groundwater basins and assignment of transferable groundwater rights.

- Numerous groundwater basins throughout California are asking courts to adjudicate and quantify groundwater rights and to permit transfers.

A market organizes economic activity using price to communicate commodity values across diverse participants with competing interests. In order for groundwater markets to function properly, certain conditions must be met.

1. An adjudication of groundwater rights must occur regardless of what market regime is chosen.
2. The market must be inclusive of all potential buyers and sellers regardless of their use or needs. Excluding participants will ultimately affect the market price.
3. A system of rights that will provide security for allocations held in the aquifer and facilitate trading at the lowest possible cost must be selected.
4. An enforcement and monitoring system must be established.
5. The regulatory review process to prevent third-party impairment must be prudent and expeditious.

A variety of allocation systems have been developed for groundwater markets. These proposals give special consideration to the unique hydrological and legal aspects of groundwater aquifers. Well-defined, enforceable, and tradable property rights are fundamental to each of the proposals discussed. Yield-stock rights, unitization, and proportional rights are three of the more well-developed groundwater market regimes.

While differing in structure and approach, the objectives of each of these market regimes are similar in that they:

- account for the current and future value of groundwater resources;

- allow individual landowners and pumpers to act independently while being held accountable for any third party damages imposed on other water right holders;
- improve allocation efficiency among alternative uses by allowing water to be traded, benefitting both buyers and sellers and minimizing government regulations;
- achieve both ecological and economic efficiency; and
- enable water users to better deal with risk in relation to natural variations in water availability through contracting.

Yield-Stock Rights

This approach attempts to maximize the net present value by taking into account the current and future value of the groundwater storage or stock (Smith 1977, 7-10). Individual water users in the aquifer are given property rights for a share of the groundwater. Each right has two components; one providing a claim to a percentage of the annual recharge into the aquifer, and the other to a percentage of the aquifer's storage or stock. The initial allocation of the water rights I a claim based on an individual's historic water use during a specific time period.

The flow and stock components provide a way of accounting for water use. Water usage is monitored throughout the water season, and at the end of each year adjustments are made to each user's account by subtracting the amount pumped and adding the appropriate share of an aggregated recharge. Violations for pumping water in excess of the amount owned are handled with fines or sanctions on a water user's claim to recharge in subsequent years. This type of accounting system has been in place since 1978 in the Genevois Basin, which underlies the border between France and Switzerland (Anderson and Snyder 1997).

A main advantage of a market based on yield and stock rights is that it allows water users more opportunity to manage risk. Contracting among water owners offers a way for people risk-averse to trade with those willing to accept more risk. Those who are more risk-averse can acquire additional stock rights from other water users as a contingency against water shortages associated with random and seasonal fluctuations in the aquifer's recharge rates.

Unitization

Unitization is an alternative means of achieving efficiency in the face of pumping costs and well interference. Unitization is an approach used to develop oil and natural gas deposits that lie in subterranean reservoirs similar to groundwater. It provides an opportunity to manage an aquifer as if it were owned by a single entity. If an aquifer were managed by a single owner, that individual would extract at a rate that maximizes the groundwater's net present value.

When overlying owners unitize a reservoir, they agree to develop the reservoir as a whole and divide the costs and profits proportionally. This arrangement enables them to obtain the most efficient production from the field by carefully spacing wells and applying a

reservoir-specified rate of extraction. By drilling the optimal number of wells in strategic locations over the reservoir, pumping costs and extraction rates can be optimized.

In addition, extraction can be controlled and adjusted in response to market conditions. Monitoring and enforcement costs are reduced because the resource is recovered from a few, closely controlled wells. In short, cooperative unit production from a reservoir eliminates the perverse rush to drill, with its attendant excessive costs and reduction in eventual recovery (Murray and Cross 1992, 1116). Faced with inefficient development caused by excessive pumping under the rule of capture, some oil and natural gas producing states have required unitization. As a result of a compulsory unitization statute for oil and gas reservoirs, Louisiana's oil and gas wells are, on average, one-third more productive than those in Texas, where unitization is not required (Murray and Cross 1992, 1150).

Unitization, coupled with quantified, transferable groundwater rights, could allow for efficient development of groundwater aquifers (Anderson and Snyder 1997, 177). By drilling and utilizing an optimal number of wells, pumping costs as well as monitoring and enforcement costs could be reduced. Well interference problems could conceivably become nonexistent. While the reduction in the number of wells would require transportation of pumped water to the land on which it is used, this cost would be weighed against the elimination of pumping externalities as well as increased opportunities for users on the periphery of the basin to utilize their rights where reduction of the aquifer's perimeter would otherwise prohibit it. Moreover, transportation costs might be minimized by use of the existing surface water infrastructure of irrigation districts, ditch companies, municipal facilities, and federal water projects.

The transaction costs of a cooperative agreement for development of an aquifer may be a limiting factor for implementing unitization, particularly where the number of water users is large. Groundwater management districts, however, could play a role in facilitating cooperation and coordination among the water users.

Proportional Rights

Two economists at the Environmental Defense (formerly the Environmental Defense Fund), Benjamin Vaughan and Peter Emerson (1996), offer an alternative water market approach for the Edwards Aquifer. Their approach could be applied to other groundwater aquifers in the state. In recent years, overpumping of the aquifer has dropped water levels, threatening to dry up several large springs that provide critical habitat to several endangered plants and animals. To address these problems, Vaughan and Emerson develop a market with groundwater rights that are based on a proportion of the aquifer's annual safe yield. The principal objective of this proposal is to ensure that the aquifer maintains a minimum level.

The basic structure of this market is as follows:

1. An adjudication of all rights, whether the water is used for agricultural, municipal, industrial, domestic, or environmental purposes must occur.

2. Each year the yield would be announced to determine the amount of water each right holder is allowed to extract. That amount would be a proportion of the yields.
3. Water rights would be allocated according to a priority date system. Water rights would be divided into classes according to their priority date. In dry years, water usage by junior water rights would be limited or curtailed until the needs of senior water rights were met.
4. Water users are able to make up any shortfalls by purchasing rights from other users.

V. Conclusion

Approaches to groundwater management have traditionally begun with regulatory controls because policy analysts have incorrectly assumed that the definition, enforcement, and transferability of groundwater rights are not feasible. Unfortunately, the recent interim report to the House Natural Resource Committee makes that same mistake. Rather than placing tighter restrictions on property rights through groundwater management district, the report should have examined ways to reform groundwater rights that enhance individual decision making and ownership while protecting groundwater resources.

Addressing groundwater problems in Texas should be accomplished by improving property rights, not by adding additional layers of bureaucracy. Establishing secure and transferable rights to groundwater is an essential first step.

Texas is just one of many states dealing with growing water scarcity and decline groundwater resources. One option is to proceed with command-and-control regulations that specify how much each water user receives. The problem with this approach is that politics determine who has access to this vital resource. Water and politics simply don't mix.

Property rights and water markets offering the best hope among all other options for efficiently and equitably allocating this precious resource to its most highly valued uses. Any other solution ultimately results in a political race to the pumphouse. And we do not have to look very far in Texas to see the damage of mixing water and politics.

VI. References

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