

**Aquifer Storage and Recovery**  
Status of Current Projects

**A Report to the 76<sup>th</sup> Legislature**

of

**The State of Texas**

by the

**Texas Water Development Board**



January 1, 1999

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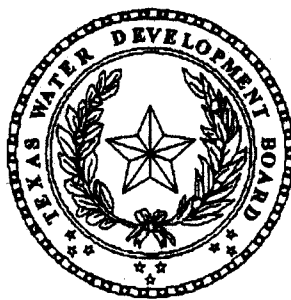
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## Introduction

The practice of storing state (surface) water in subsurface reservoirs was first authorized in Texas by the 74<sup>th</sup> Legislature through the passage of House Bill (H.B.) 1989. The Texas Water Development Board (TWDB) was charged with providing funding for pilot project feasibility investigations of Aquifer Storage and Recovery (ASR) in Texas. TWDB was further directed to prepare a biannual report to the Legislature including progress of authorized pilot projects, other investigations and recommendations.

The 75<sup>th</sup> Legislature mandated widespread change in Texas water planning, through the passage of Senate Bill (S.B.) 1. Previous restrictions on the locations and aquifers for which pilot project feasibility investigations could be authorized in Section 11.153(a) 1-4 were removed. A restriction on the issuance of operation permits for projects before June 1999 in Section 11.153(d) was also removed. Although grant funding for feasibility projects was not re-authorized, TWDB has maintained the management of grant contracts for on-going projects. ASR was one of the water management strategies offered for possible evaluation regional water planning groups under S.B. 1.

The TWDB was charged in Texas Water Code § 11.155(c), to provide a report on the status of ASR each odd numbered year. This report is intended to fulfill that mandate.

## History of ASR Investigations in Texas

In the early 1970s, using a process similar to ASR, several communities in the Southern High Plains used well fields to store excess water purchased on a basis of fixed cost independent of delivered volumes. Additionally, transfers of groundwater from a distant to a centrally located well field were made in West Texas. Since 1995, various investigations have been underway in Texas to evaluate the feasibility of applying ASR technology on a pilot project level. TWDB has provided grant funding and technical assistance for ASR investigations in Brownsville, Laredo and San Antonio. Additional preliminary feasibility investigations have been conducted independent of TWDB funding in the Cities of Austin, Leander and El Paso. The City of Pflugerville is scheduled to begin a similar, locally funded, investigation in early 1999.

The City of Kerrville currently owns the only ASR project which has progressed to permitted operational status. The City of El Paso operates a project, which injects re-use water treated to drinking water standards, in a manner similar to ASR.

## Definition of ASR

In Texas, ASR is defined by regulation, as the discreet storage in a subsurface reservoir and later recovery of state (surface) water, treated to drinking water standards. A "bubble" of stored water is created around the injection well bore and maintains a separate chemical identity from the native water. ASR technology is well suited to application in areas where the peak season of water availability differs from the peak season of water supply demand. ASR projects may utilize either potable or non-potable aquifers for storage reservoirs.

The concept of ASR projects differs from that of aquifer recharge projects. Aquifer recharge projects are designed, in part, to replace water extracted from an aquifer. Surface water that is available due to above normal precipitation is typically used for aquifer recharge. The recharged water co-mingles with native groundwater and increases general water availability. ASR projects use subsurface reservoirs as temporary storage depots with little or no co-mingling of waters.

## Capture of Stored Water

In Texas, where the withdrawal of groundwater is not regulated outside of groundwater conservation districts, much discussion has been given to the potential for unauthorized capture of water from an ASR project. While the capture of stored water is theoretically possible, in actual practice capturing water from ASR storage would be very difficult. Because ASR requires only a very limited area to store significant volumes of water, any potential effort to capture would need to be located virtually within sight of the injection well head. A point of high volume discharge would likely have to be located within ¼ mile of a storage site to pose any potential for interference. With such a small radius of control required to protect stored supplies, protection can easily be achieved through ownership of sufficient property around the stored water, by agreements entered into by the project operators or ordinance authority to control the installation of new wells. Where an ASR project stores water in a non-potable aquifer, the poor quality of the native water provides a strong additional disincentive to attempts at capturing stored water because the native water quality is too low for the intended use.

In a case where an ASR project may store water in a potable aquifer, the potential for interference from other groundwater users in most cases will be negligible. The effect of pumping in nearby well(s) may cause the stored ASR "bubble" to move away from the injection well. Because both the native and stored water are of potable quality, there is no need for an account of whether the project is producing native or stored water. In this case, the project may be operated in a manner in which similar volumes are withdrawn as were injected. The project may only experience slightly increased operational costs, due to a greater pumping depth caused by the adjacent production.

## ASR Applications

ASR may serve to store water for drought supply storage, as an adjunct supply for meeting seasonal daily peak demand, increasing the efficiency of water treatment plants or postponing plant expansion. ASR can store equivalent volumes of water more economically than surface reservoirs and can also avoid the associated environmental impact and evaporation loss. In-stream water quality, flow volume and the quality of supply can be managed, through selective diversion of water for ASR storage.

An investigation is required to determine the chemical compatibility of the sediments or rocks composing the subsurface reservoir, the native groundwater and the water to be stored. Upon assurance of chemical compatibility, water may be stored underground with high efficiency of recovery, at relatively low cost. When properly injected into the aquifer, the stored water will not move significantly and will retain water quality even if stored in a non-potable aquifer.

## Investigation Structure

ASR feasibility investigations funded by TWDB are conducted in three phases. The first phase consists of an existing data review to make a preliminary assessment of project feasibility. If warranted, the second phase consists of a field investigation to gather site-specific data to more definitely assess feasibility. Finally, a third phase typically consists of the design and construction of a prototype injection well. TWDB funding has only been extended for the Phases I and II level investigations in order to avoid application of research grant funding for capital infrastructure development.

## Status of TWDB Funded ASR Investigations

**Brownsville Public Utility Board:** The Phase I and II investigations were completed in 1996 and resulted in a favorable assessment of the economic and technical feasibility of an ASR application. To date, the project is awaiting authorization by Brownsville P.U.B. to move into the Phase III prototype injection well design and construction.

**City of Laredo:** The Phase I and II investigations were completed in 1998 and resulted in favorable assessment of economic and technical feasibility. Investigation findings identified a potential for aquifer plugging and indicated that more wells than originally anticipated may be required to store the volume of water needed to meet demands. The City of Laredo is currently investigating the potential for developing groundwater supplies in conjunction with any future development of an ASR application.

**San Antonio Water System/Bexar Metropolitan Water District:** The Phase I investigation was completed in 1998 with the favorable identification of six potential zones for further investigation. Due to budget constraints, the Phase II investigation will be limited to investigating the two most promising zones. Currently, the progress of investigation has been slowed while administrative and philosophical issues are resolved between the regional partners. TWDB has extended the completion deadline for this project through December 31, 1999 and it is anticipated that the investigation will be underway in early 1999.

## Additional Interest in ASR

Interest in ASR applications has extended beyond the areas where TWDB has funded feasibility investigations. The City of Austin and the City of Leander with the Lower Colorado River Authority (LCRA) have both completed Phase I investigations with favorable results. The Leander/LCRA project is scheduled to move ahead directly into Phase III in 1999. The City of Pflugerville is anticipated to begin a Phase I investigation in early 1999.

The multiplicity of potential ASR applications in close proximity offers the potential for incorporation of the various applications into a regional management system. San Antonio Water System (SAWS) is pursuing the potential for investigating the applicability of ASR outside of Bexar County with additional regional entities. Additional interest in ASR has been expressed in nearly all regions of the State.

## Legislative Proposals

ASR was incorporated among the topics to be considered by the Regional Water Planning Groups created by S.B.1. Therefore, no further legislative proposals are forthcoming.