



# Aquifer Storage and Recovery

Aquifer storage and recovery (commonly referred to ASR) is the storage of water in a suitable aquifer through a well during times when water is available, and the recovery of water from the same aquifer during times when it is needed. This method, along with spreading basins and vadose zone injection wells, is termed managed aquifer recharge and is a process to artificially transfer water to the subsurface.

Aquifer storage and recovery is a well-established technology to enhance the management of water resources. There are approximately 133 aquifer storage and recovery systems in the United States and three currently operating in Texas.

## History in Texas

In Texas, studies and applications of aquifer storage and recovery started in the late 1940s, when the U.S. Geological Survey and its partners evaluated aquifer response to induced recharge and recovery using wells in the El Paso and Amarillo areas.

From the early 1960s to 1990s, aquifer storage and recovery was used by the Colorado River Municipal Water District, a group of towns on the High Plains, and the City of Midland.

In 1995, the 74th Texas Legislature passed House Bill 1989, authorizing the Texas Water Development Board (TWDB) to fund aquifer storage and recovery feasibility studies. As a result, \$877,000 helped fund studies for the Brownsville Public Utilities Board, the City of Laredo, the Sabine River Authority, and the San Antonio Water System. The San Antonio Water System's feasibility study laid the foundation for the Twin Oaks Aquifer Storage and Recovery facility.

In 1987, the TWDB also provided a \$100,000 grant to the Upper Guadalupe River Authority to study the feasibility of aquifer storage and recovery. Completed in 1992, the study led to the construction of the current facility operated by the City of Kerrville.

## Assessing Aquifer Storage and Recovery in Texas

In 2009, the TWDB funded a \$102,000 study to assess the status of aquifer storage and recovery in the state and to determine the reasons for this well-established water management solution not being used more in Texas. The study provided insight into the opinions of water purveyors in the state on aquifer storage and recovery and included recommendations for implementing the strategy.

The primary concerns of the utilities that were surveyed included:

- The ability to recover stored water
- The quality of recovered water
- The cost-effectiveness of aquifer storage and recovery compared to other solutions
- The potential for others to access the stored water

Recommendations to more successfully implement aquifer storage and recovery in the state included:

- Technical evaluations
- Regulation assessments
- Educational outreach

## Benefits and Challenges

### Benefits

- No evaporation losses
- Does not require inundation of land
- No loss in storage capacity due to sedimentation

### Challenges

- Limited by geology
- Need for high level of water treatment
- Potential losses of stored water
- Lack of detailed information on costs and cost-effectiveness of the technology for certain uses

## Current Facilities

Three aquifer storage and recovery facilities, serving the cities of El Paso, Kerrville, and San Antonio, operate in Texas today.

The El Paso Water Utilities facility began operating in 1985. It injects reclaimed wastewater from the Fred Hervey Reclamation Plant into the Hueco Bolson Aquifer, where it moderates local water-level declines. Since its inception, the facility has injected more than 70,000 acre-feet of treated water into the aquifer. The injected water is recovered by production wells located approximately one-half mile from the injection sites. The system initially consisted of 10 wells but has since been reduced to two as the utility increasingly employs spreading basins to transfer water to the aquifer. Because injection and recovery are not from the same well, this system is considered a hybrid aquifer storage and recovery system.

The City of Kerrville's facility came online with its first well in 1998 and expanded with a second well in 2002. The system uses treated water from the Guadalupe River for storage in the Trinity Aquifer. Presently, the system has 2,100 acre-feet in storage. Up to 2.65 million gallons per day of water can be recovered to supply the City when diversions from the river are curtailed. The City considers the system to be highly beneficial and is planning to further expand its capacity.

The system serving San Antonio is called the Twin Oaks Aquifer Storage and Recovery facility. It began operating in 2004 and was expanded in 2009. Source water from the Edwards Aquifer is transported 42 miles to the aquifer storage and recovery facility and stored in the Carrizo Aquifer. With 29 aquifer storage and recovery wells, 60 million gallons per day of recovery and treatment capacity, and 73,000 acre-feet of storage, the Twin Oaks facility is the second largest aquifer storage and recovery system in the United States. The system's primary function is to supply San Antonio with water when pumping from the Edwards Aquifer is curtailed because of low water levels or spring flows.

## State Water Plan

In the 2012 State Water Plan, six regional water planning groups included aquifer storage and recovery as a recommended water management strategy. In total, the regional water planning groups have projected aquifer storage and recovery to create an estimated 80,869 acre-feet of new water per year by 2060, accounting for almost one percent of all recommended water management strategies.

## More Information

To learn more about the TWDB's aquifer storage and recovery activities, please visit: [www.twdb.texas.gov/innovativewater/asr/index.asp](http://www.twdb.texas.gov/innovativewater/asr/index.asp)

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