

Texas Water Development Board ASR & AR Program Overview & Update

James A. Golab, Ph.D., P.G.

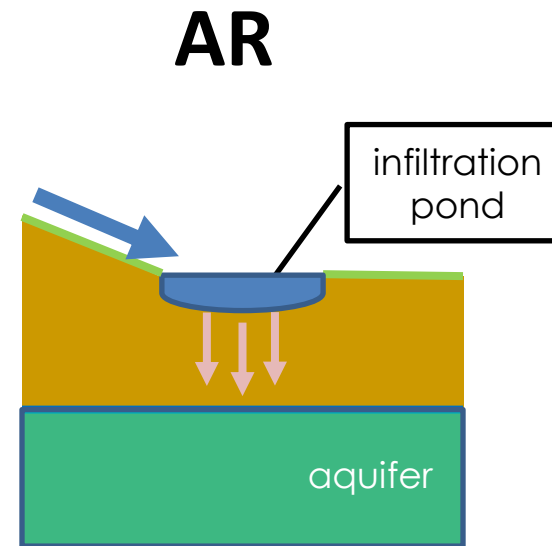
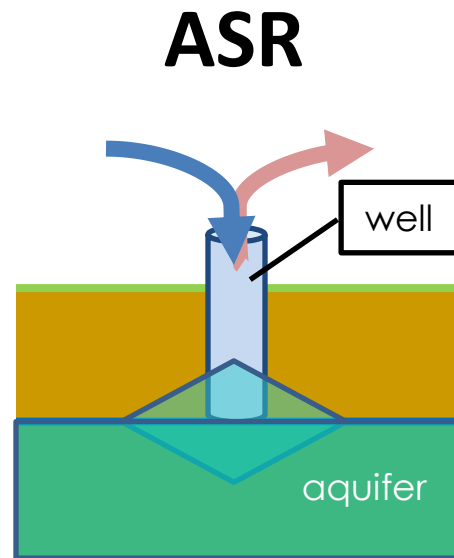
November 02, 2023
Texas Water Conservation Association Fall Conference
San Antonio, Texas

TWDB ASR Program

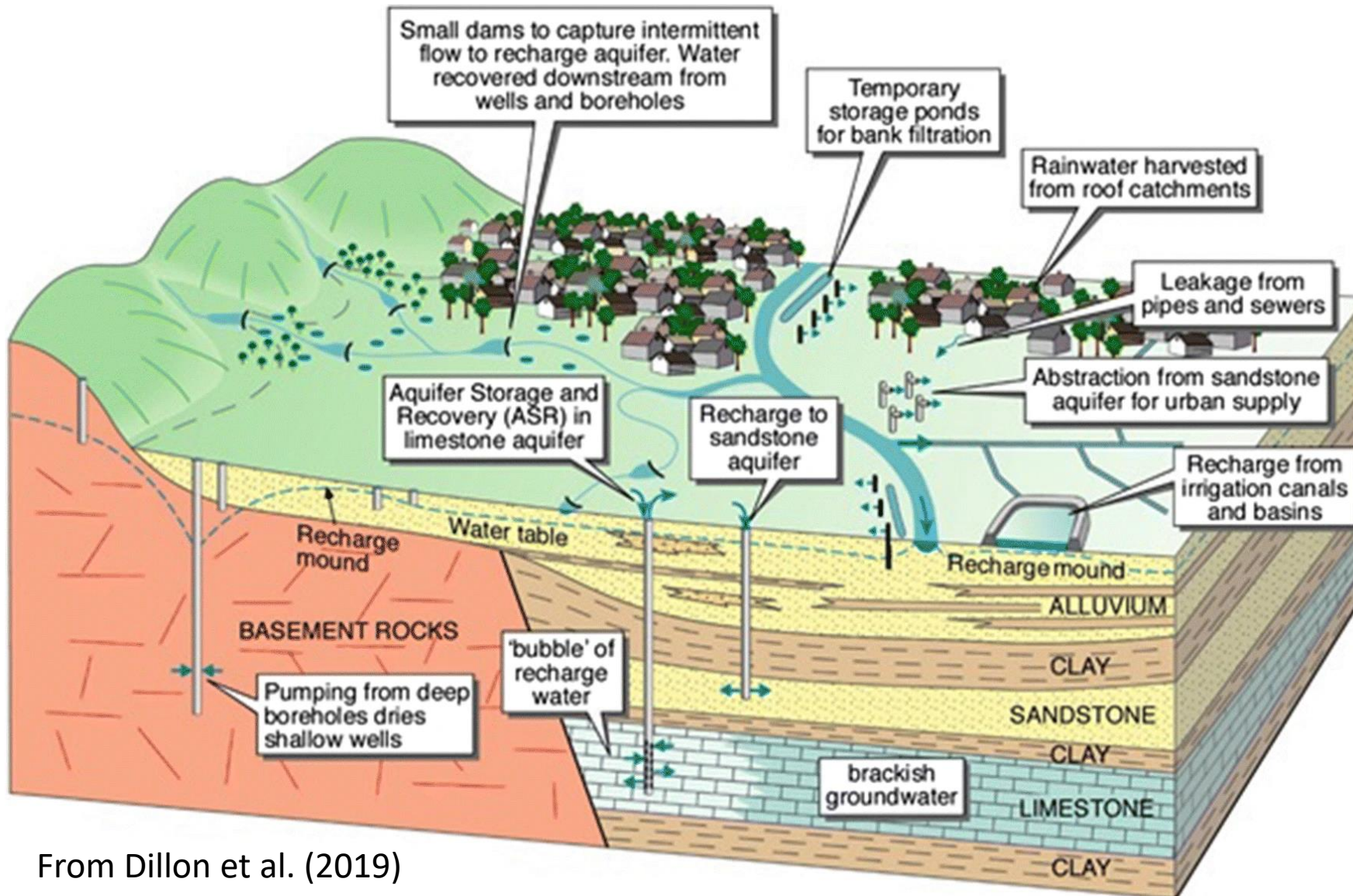
- Water Science and Conservation Office
 - Conservation and Innovative Water Technologies Division
- Resources, scope, and staffing wax and wane with mandates
- Currently 2 staff and 1 vacancy

What is ASR and AR?

- **Aquifer storage & recovery (ASR)** is using a well to inject water into an aquifer for the purpose of subsequent recovery and beneficial use
- **Aquifer Recharge, (AR)** is the controlled recharge of an aquifer at the surface through various methods such as infiltration basins.



What is needed for an ASR project?



From Dillon et al. (2019)

Needs

- Municipal
- Industrial
- Agricultural
- Environmental

Excess water*

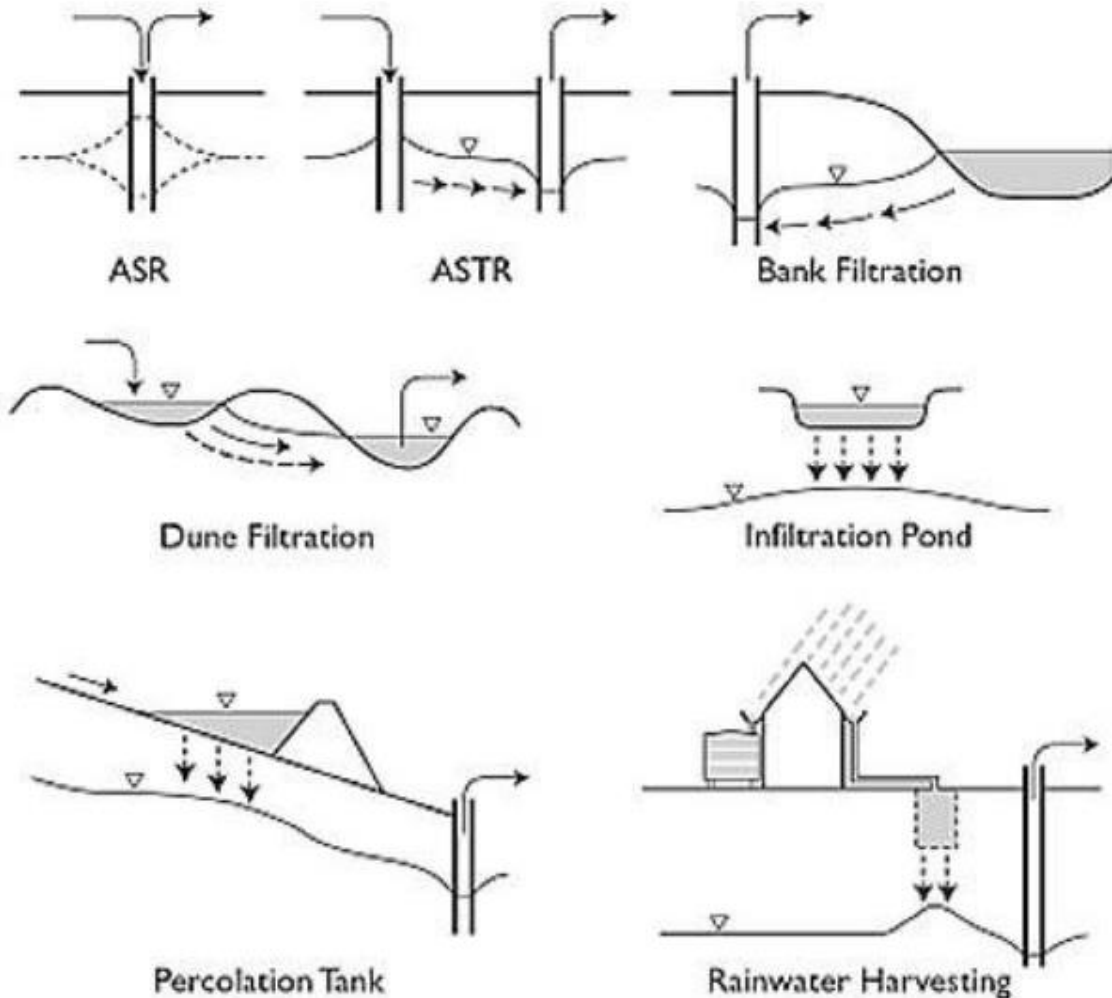
- Surface Water
- Reclaimed Water
- Groundwater

Hydrogeologic characteristics*

- Storage
- Recharge
- Recoverability

*Compatible water quality

What is needed for an AR project?

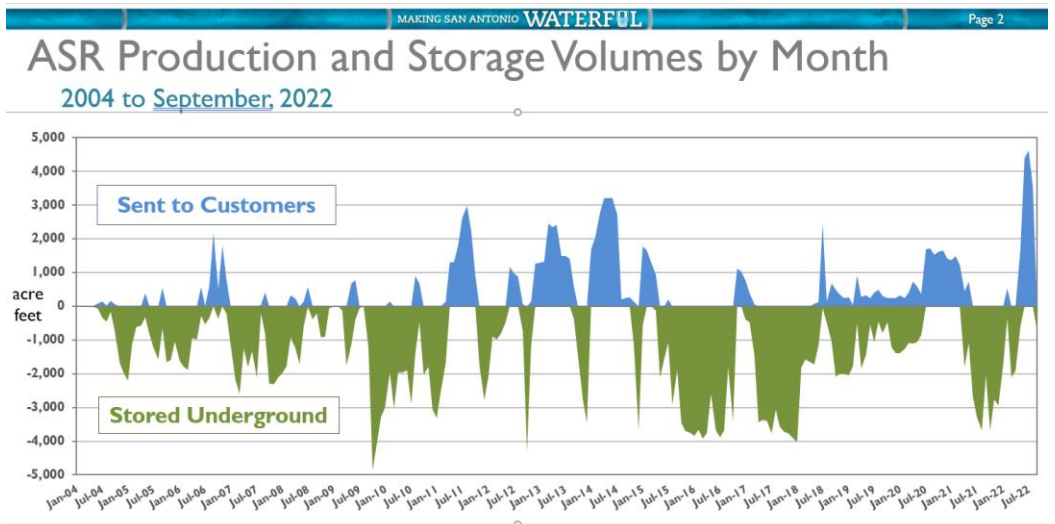
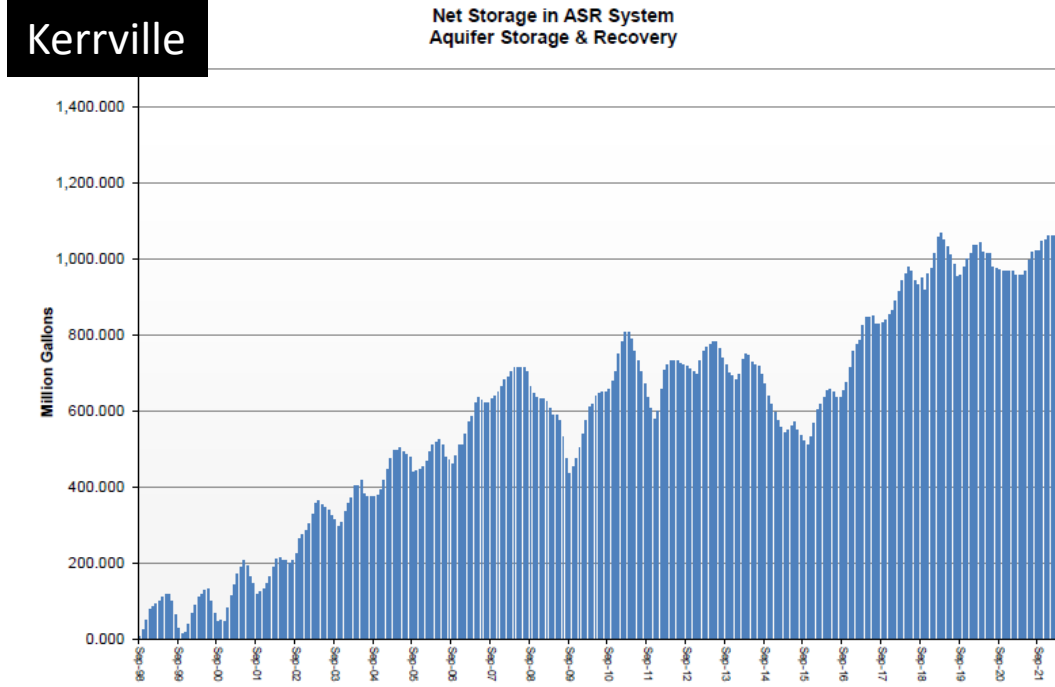


- Spreading methods
 - Infiltrations ponds or basins
 - Flooding
 - Ditch or furrow development
 - Irrigation
- Induced bank infiltration
- Channel modification or diversion
 - Recharge dams
 - Sand dams
 - Channel spreading
- Runoff harvesting
 - Barriers
 - Trenches
- Reclaimed water reuse
 - Treatment effluent
 - Wastewater

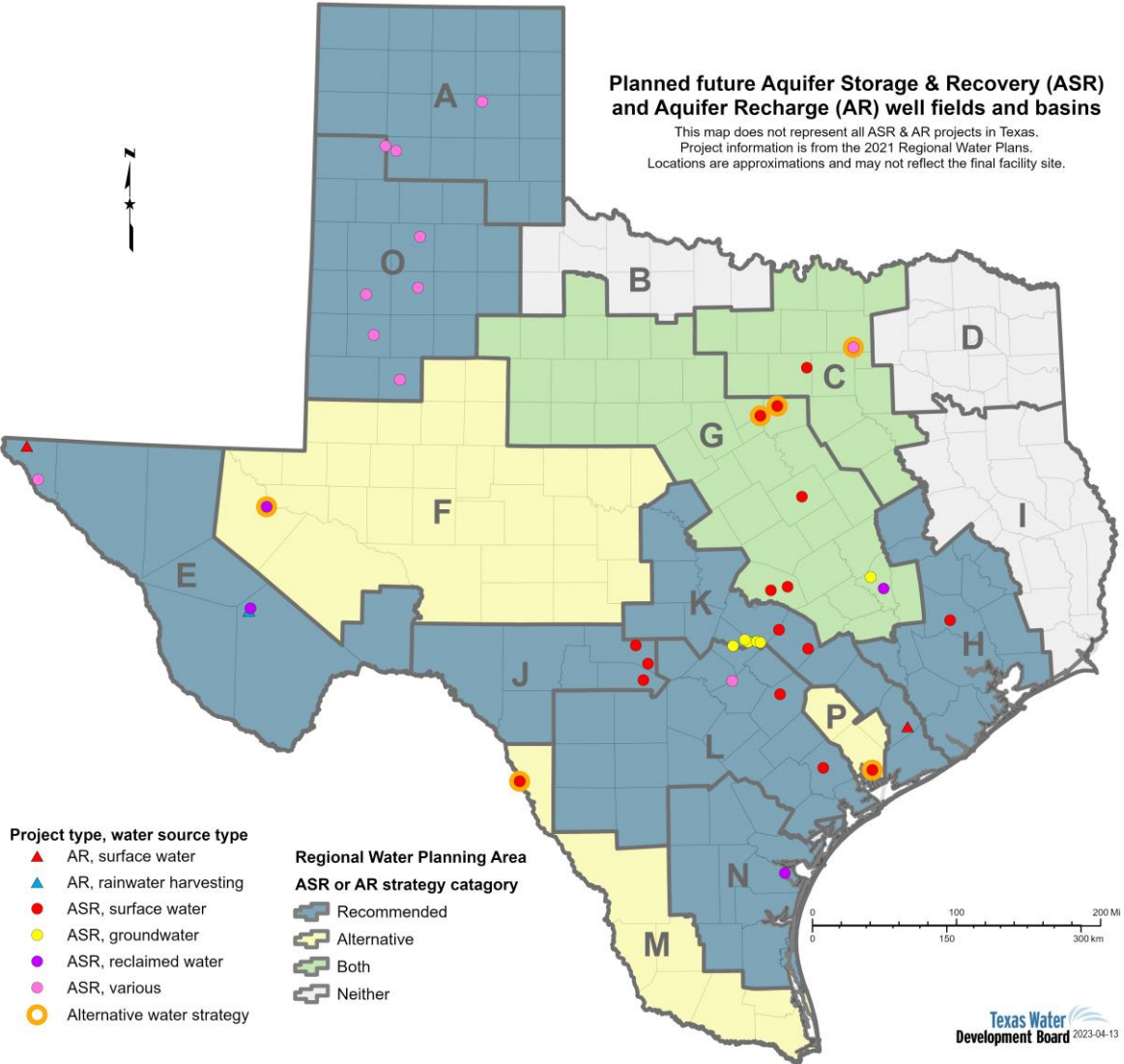
Most common MAR techniques (Gale and Dillon 2005) ASR: Aquifer Storage and Recovery; ASTR: Aquifer Storage Transfer and Recovery

Existing ASR and AR in Texas

- 7 operational (3 ASR, 4 AR)
- 5 are pilot testing, 4 have authorizations
- Scales vary greatly
- Existing supply is difficult to estimate for many of the facilities
- Kerrville
 - ~3,000 acre-feet stored (March 2022)
- San Antonio,
 - ~186,000 acre-feet stored (October 2022)



Future ASR and AR in Texas



88th Texas Legislature (2023)

- SB 28 - New water supply for Texas fund
- SB 2379 - ASR in eastern Williamson County

State Water Plan (2022)

- 10 of 16 regional water planning groups
- 193,000 acre-feet per year in 2070, 3% of the total
- 37 ASR well fields, 3 AR surface infiltration facilities
- \$2.7B total capital costs, \$18.5M median capital cost per project, \$39-\$1,330/acre-foot


Hurdles

- Available source water
- Regulations
- Economics
- Public perception and expectations

2000-2011, contracted reports

- 2002 – Groundwater banking report for water plans
- 2010 – Stormwater potential for water plans
- 2011 – Assessment of ASR in Texas



Identification of Geographic Areas in Texas Suitable for Groundwater Banking


Prepared for  **Texas Water Development Board**
Austin, Texas

Kenneth Calhoun
T. Neil Blandford
Mark D. Ankeny

Bridget R. Scanlon
Robert C. Reedy
Bureau of Economic Geology

December 31, 2002



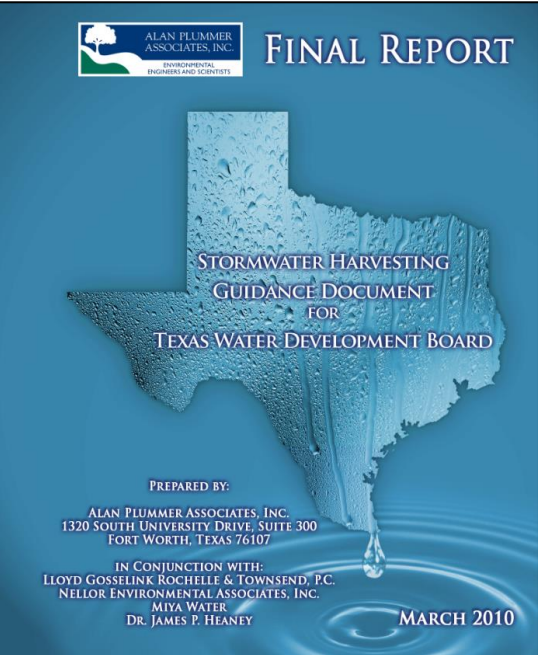
 **FINAL REPORT**

**STORMWATER HARVESTING
GUIDANCE DOCUMENT
FOR
TEXAS WATER DEVELOPMENT BOARD**

PREPARED BY:
ALAN PLUMMER ASSOCIATES, INC.
1320 SOUTH UNIVERSITY DRIVE, SUITE 300
FORT WORTH, TEXAS 76107

IN CONJUNCTION WITH:
LLOYD GOSSELINK ROCHELLE & TOWNSEND, P.C.
NELLOR ENVIRONMENTAL ASSOCIATES, INC.
MIYA WATER
DR. JAMES P. HEANEY

MARCH 2010



An Assessment of Aquifer Storage and Recovery in Texas



Report

by
Malcolm Pirnie, Inc
ASR Systems, LLC
Jackson, Sjoberg, McCarthy & Wilson, LLP

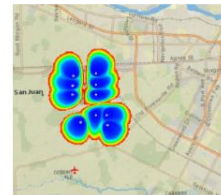
In Cooperation with
El Paso Water Utilities Board
City of Kerrville, Texas
San Antonio Water System

2013-2018 grants

- 2015: House Bill 1, Rider 25
 - \$1M Grant
 - Corpus Christi ASR Feasibility
 - New Braunfels ASR Demonstration
 - Victoria ASR Demonstration

Corpus Christi Aquifer Storage and Recovery Feasibility Project
TWDB Contract No. 1600011956
Prepared for: Texas Water Development Board
Prepared by: HDR Engineering Inc., INTERA Inc, Geochemical Solutions LLC, and Wellspec
Project Partners: Corpus Christi Aquifer Storage and Recovery Conservation District and City of Corpus Christi

August 2019



Victoria County Groundwater Conservation District

Victoria Aquifer Storage and Recovery Demonstration Project

TWDB Contract No. 1600011958

By Arcadis U.S., Inc., ASR Systems LLC

June 2019

RECEIVED
JUN 27 2019
TWDB CONTRACTS

FINAL



New Braunfels Utilities: Aquifer Storage and Recovery Demonstration Project
TWDB Contract No. 1600011957
By Arcadis U.S., Inc., ASR Systems LLC, INTERA Incorporated

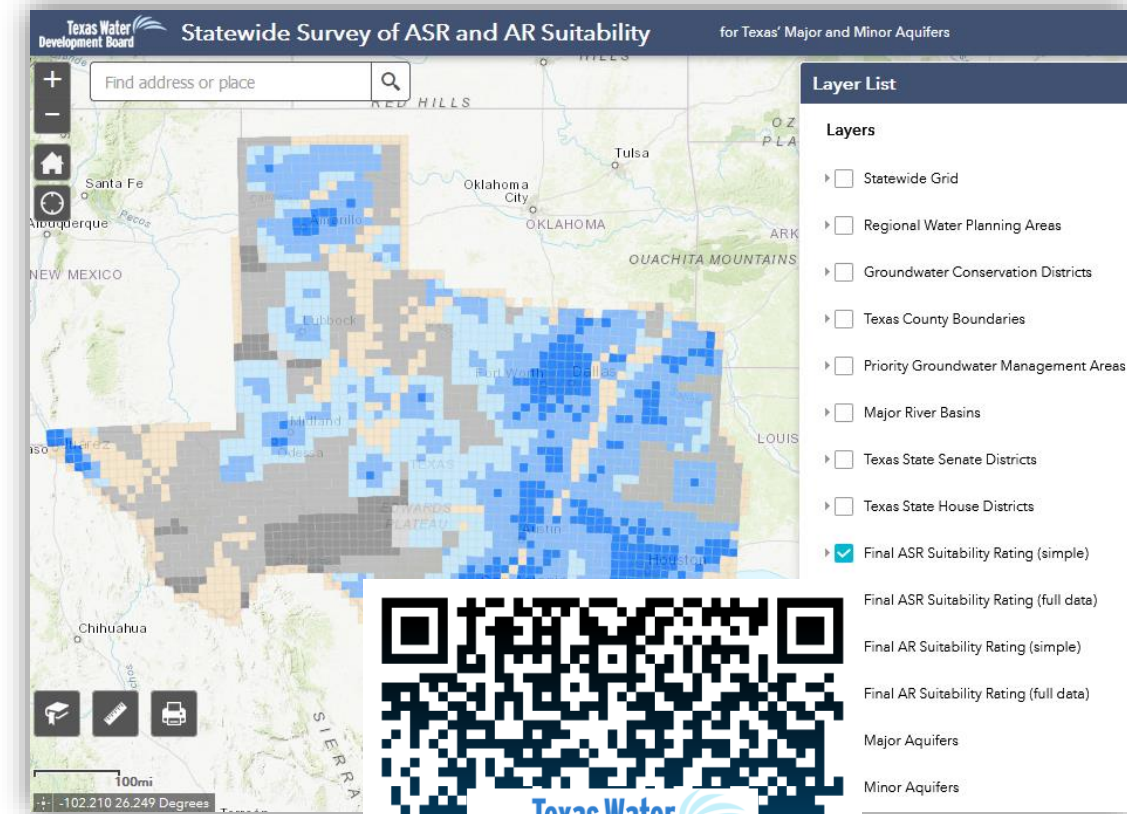
March 2019

FINAL



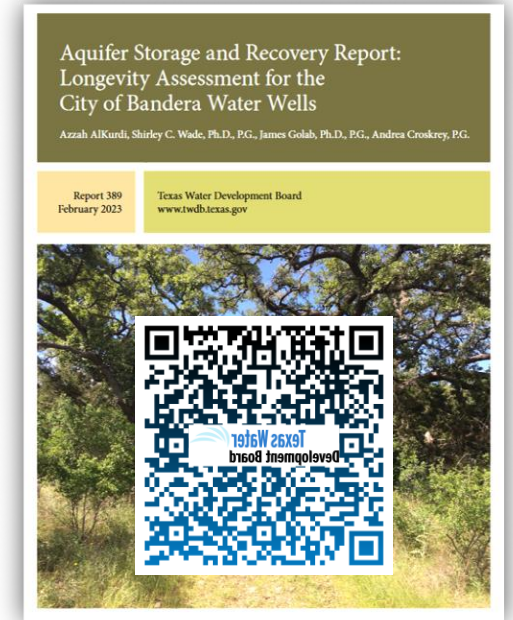
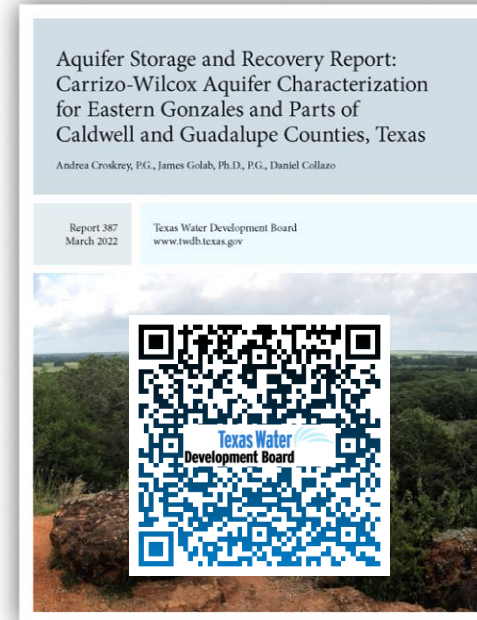
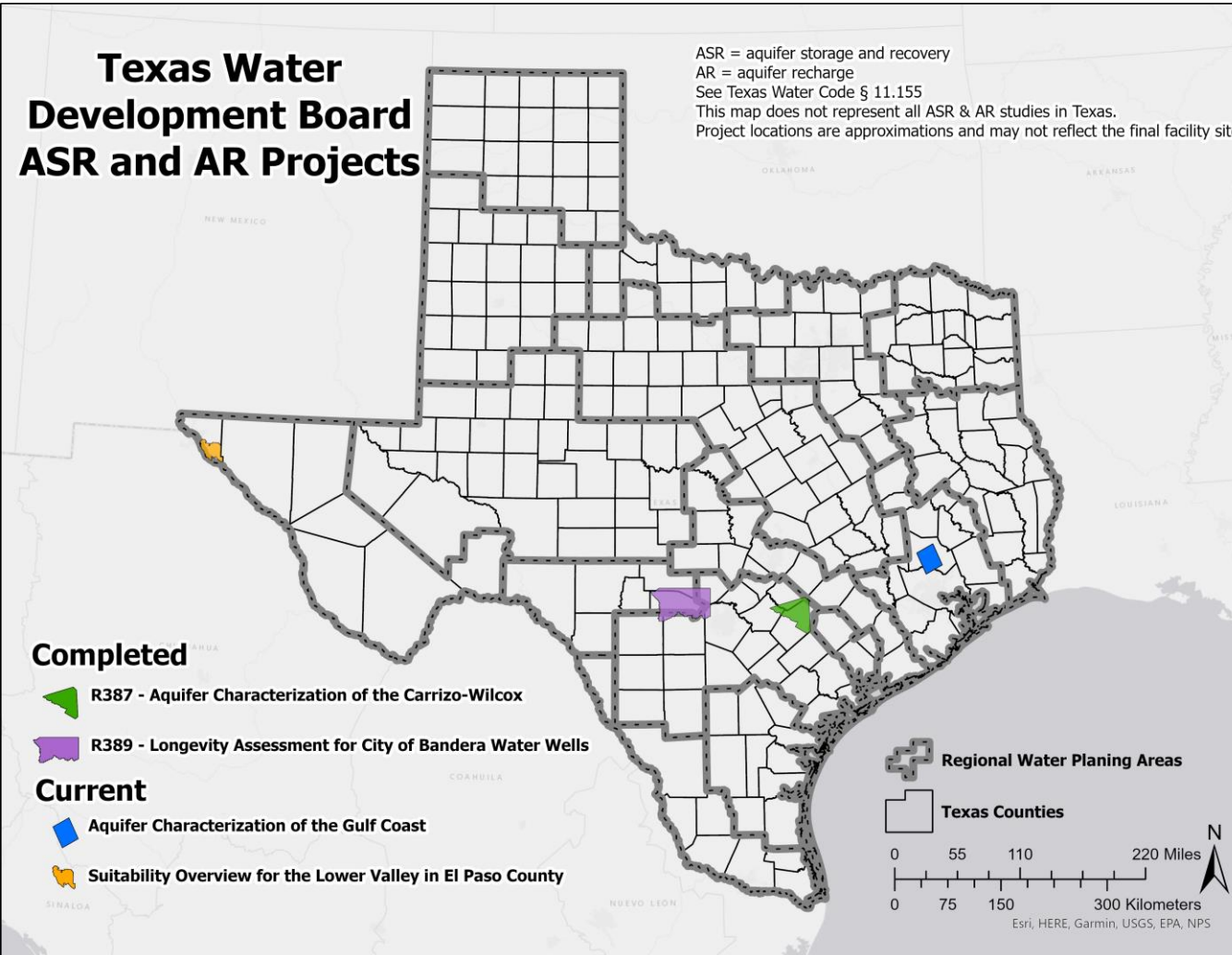
2019-2020, staff +survey

- 2019: House Bill 721
 - 3 full time positions
 - Funding for a survey of ASR or AR suitability
- 2020: *Statewide survey of aquifer suitability for ASR or AR projects in Texas*

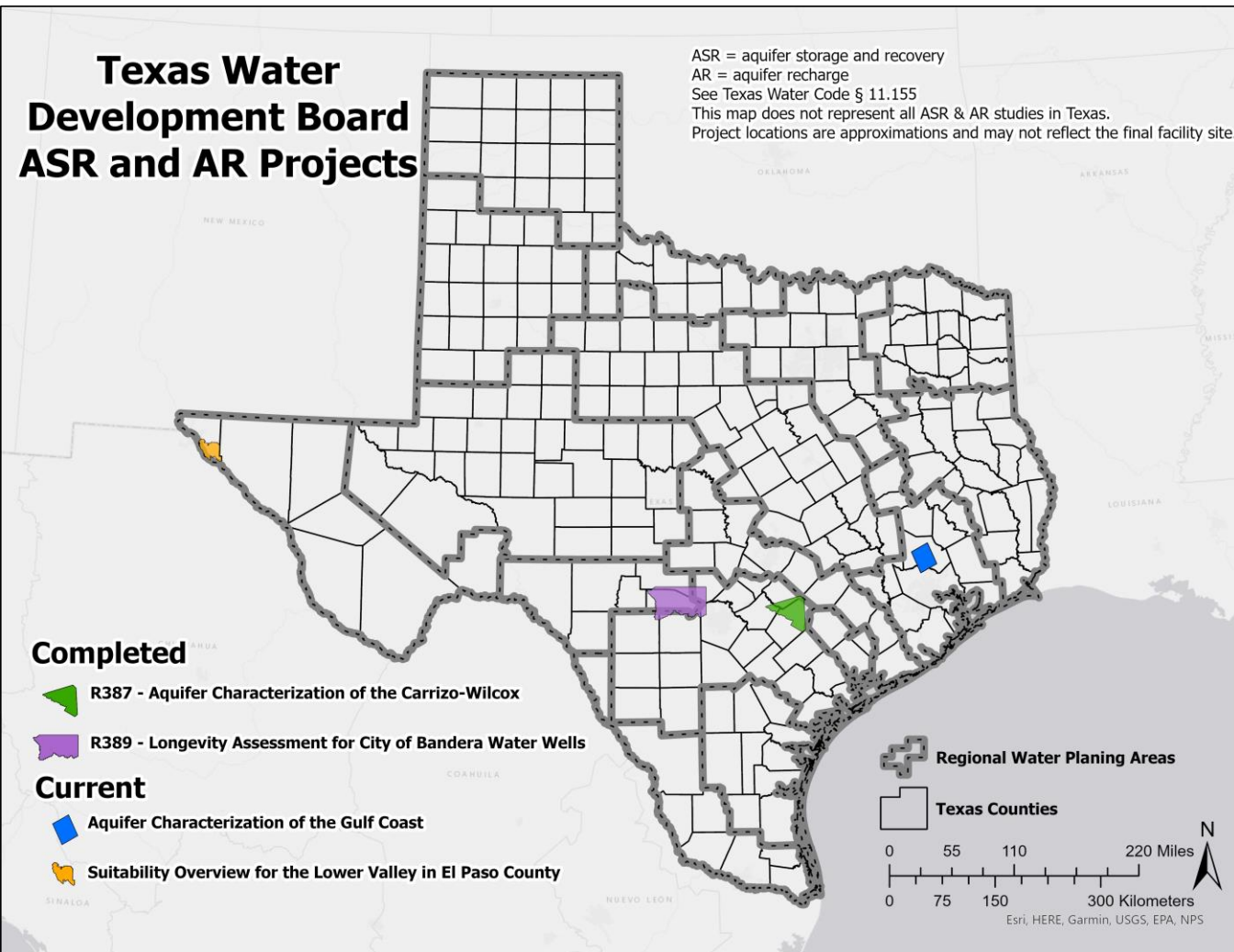


2020 to present

- Completed:
Report 387 & Report 389



2020 to present, continued



- Lower Valley Water District
 - Hueco aquifer in El Paso County
 - Analysis complete, writing
- San Jacinto River Authority
 - Gulf Coast aquifer mostly in Montgomery County
 - On hold for position backfill
- Summary of Edwards and Trinity aquifer MAR in Texas

Goals, Mandate, & Plans

Goals

- Disseminate information through public education
- Consolidate and map all available study materials
- Facilitate the application of best practices among entities considering aquifer storage and recovery

Mandate

- Texas Water Code §11.155
- Conduct ASR or AR studies
- Work with and report the results to water planners, engineers, government officials, and other appropriate interested persons that may be investigating the development of ASR and AR projects within Texas.

Plans

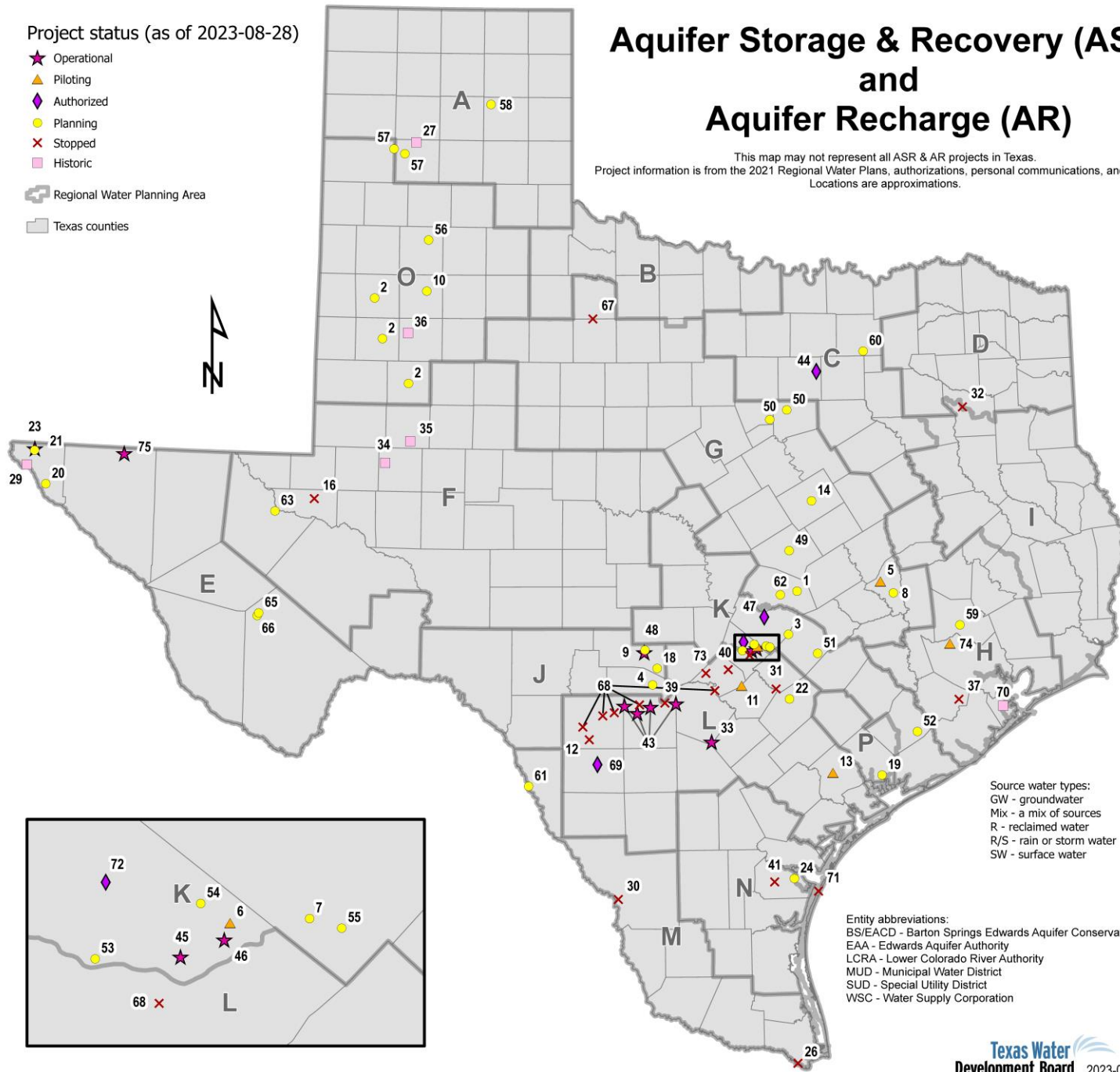
- Known MAR planning in TX:
 - 9 authorized or pilot testing
 - 35 in various planning stages
- MAR accounts for over 2.5% of planned new water supplies by 2070 (2022 State Water Plan)

Project status (as of 2023-08-28)

- ★ Operational
- ▲ Piloting
- ◆ Authorized
- Planning
- ✕ Stopped
- ◻ Historic
- Regional Water Planning Area
- Texas counties

Aquifer Storage & Recovery (ASR) and Aquifer Recharge (AR)

This map may not represent all ASR & AR projects in Texas. Project information is from the 2021 Regional Water Plans, authorizations, personal communications, and research. Locations are approximations.



Source water types:
 GW - groundwater
 Mix - a mix of sources
 R - reclaimed water
 R/S - rain or storm water
 SW - surface water

Entity abbreviations:
 BS/EACD - Barton Springs Edwards Aquifer Conservation District
 EAA - Edwards Aquifer Authority
 LCRA - Lower Colorado River Authority
 MUD - Municipal Water District
 SUD - Special Utility District
 WSC - Water Supply Corporation

Map ID	ASR or AR	Source type	Status	Project description label
1	ASR	SW	Planning	Brazos River Authority - Lake Granger
2	ASR	Mix	Planning	Canadian River Municipal Authority, southern cities
3	ASR	SW	Planning	City of Austin
4	ASR	SW	Planning	City of Bandera
5	ASR	GW	Piloting	City of Bryan
6	ASR	GW	Piloting	City of Buda
7	ASR	GW	Planning	Saline Edwards Aquifer
8	ASR	R	Planning	City of College Station
9	ASR	SW	Planning	City of Kerrville, expansion
10	ASR	Mix	Planning	City of Lubbock
11	ASR	Mix	Piloting	City of New Braunfels
12	ASR	GW	Stopped	City of Uvalde
13	ASR	SW	Piloting	City of Victoria
14	ASR	SW	Planning	McLennan County (City of Waco)
16	ASR	SW	Stopped	Colorado River Municipal Water District
18	ASR	SW	Planning	Eastern Kerr County Regional Water Supply Project
19	ASR	SW	Planning	Lavaca Navidad River Authority (alternative)
20	ASR	Mix	Planning	Lower Valley Water District
21	AR	SW	Planning	El Paso Water Utilities, Rio Grande recharge
22	ASR	SW	Planning	Guadalupe-Blanco River Authority (Mid-basin)
23	AR	R	Operational	El Paso Water Utilities, reuse recharge
24	ASR	R	Planning	City of Corpus Christi
26	ASR	SW	Stopped	Brownsville Public Utilities Board
27	ASR	GW	Historic	City of Amarillo, 1954 to 1955 test
29	ASR	SW	Historic	City of El Paso, 1940-1950s test
30	ASR	SW	Stopped	City of Laredo
31	ASR	SW	Stopped	Luling Water Treatment Plant (alternative)
32	ASR	SW	Stopped	Sabine River Authority
33	ASR	GW	Operational	San Antonio Water System
34	ASR	GW	Historic	City of Midland, 1970s
35	ASR	SW	Historic	Colorado River Municipal Water District, 1963 to 1970
36	ASR	SW	Historic	High Plains, 1970s to 1980s
37	ASR	SW	Stopped	Missouri City
39	ASR	SW	Stopped	Medina Lake Firm Up
40	ASR	SW	Stopped	Canyon Reservoir, upstream
41	ASR	SW	Stopped	Robstown-Driscoll Regional Facility
43	AR	SW	Operational	EAA recharge enhancement dams
44	ASR	SW	Authorized	Tarrant Regional Water District
45	ASR	GW	Operational	Ruby Ranch Water Supply Corporation
46	AR	SW	Operational	Onion Creek recharge structures
47	AR	R/S	Authorized	Residential rainwater harvesting
48	ASR	SW	Operational	City of Kerrville
49	ASR	SW	Planning	Bell County
50	ASR	SW	Planning	Johnson County SUD and Acton MUD (alternative)
51	ASR	SW	Planning	LCRA ASR Carrizo-Wilcox
52	AR	SW	Planning	LCRA Enhanced Recharge
53	ASR	GW	Planning	BS/EACD, Hays County Other
54	ASR	GW	Planning	BS/EACD, Hays
55	ASR	GW	Planning	BS/EACD, Creedmoor-Maha WSC
56	ASR	Mix	Planning	City of Plainview
57	ASR	Mix	Planning	City of Amarillo
58	ASR	Mix	Planning	City of Pampa
59	ASR	SW	Planning	San Jacinto River Authority
60	ASR	Mix	Planning	North Texas Municipal Water District (alternative)
61	ASR	SW	Planning	City of Eagle Pass (alternative)
62	ASR	SW	Planning	Brazos River Authority - Lake Georgetown
63	ASR	R	Planning	City of Pecos (alternative)
65	ASR	R	Planning	City of Alpine, wastewater treatment facility
66	AR	R/S	Planning	City of Alpine, rainwater harvesting
67	AR	SW	Stopped	Seymour Aquifer, Haskell and Knox counties
68	AR	SW	Stopped	Edwards Aquifer, proposed recharge dams
69	AR	SW	Authorized	Wintergarden Groundwater Conservation District
70	ASR	SW	Historic	Texas City, 2005 to 2016
71	ASR	SW	Stopped	Padre Island pump station
72	AR	R/S	Authorized	Driftwood Municipal Management District
73	AR	GW	Stopped	Canyon Lake Water Supply Corporation
74	AR	R/S	Piloting	Harris County infiltration basin
75	AR	R/S	Operational	Dell City flood dams

TWDB ASR &AR Program

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Stay connected:

