

Insight From a Large-Scale ASR Project

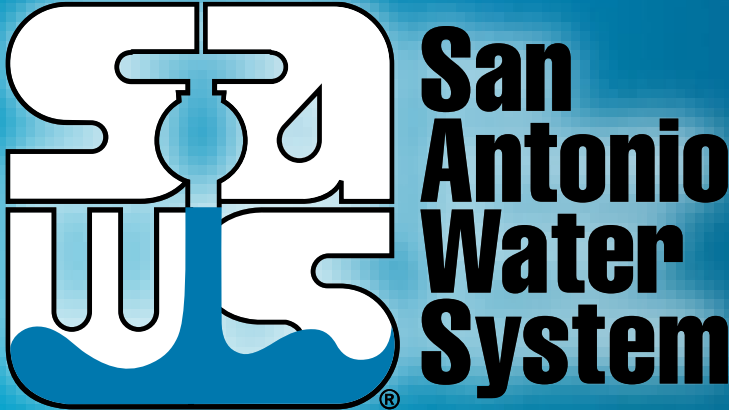
Gregg Eckhardt

Senior Analyst, Production and Treatment Operations

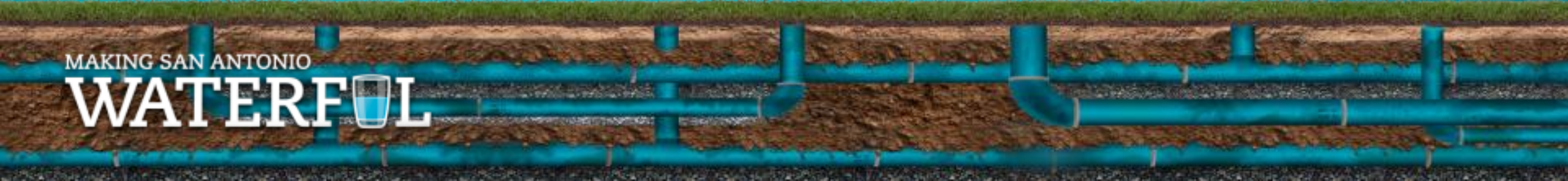
**Subsurface
Water Storage
Symposium 2024**



February 23, 2024



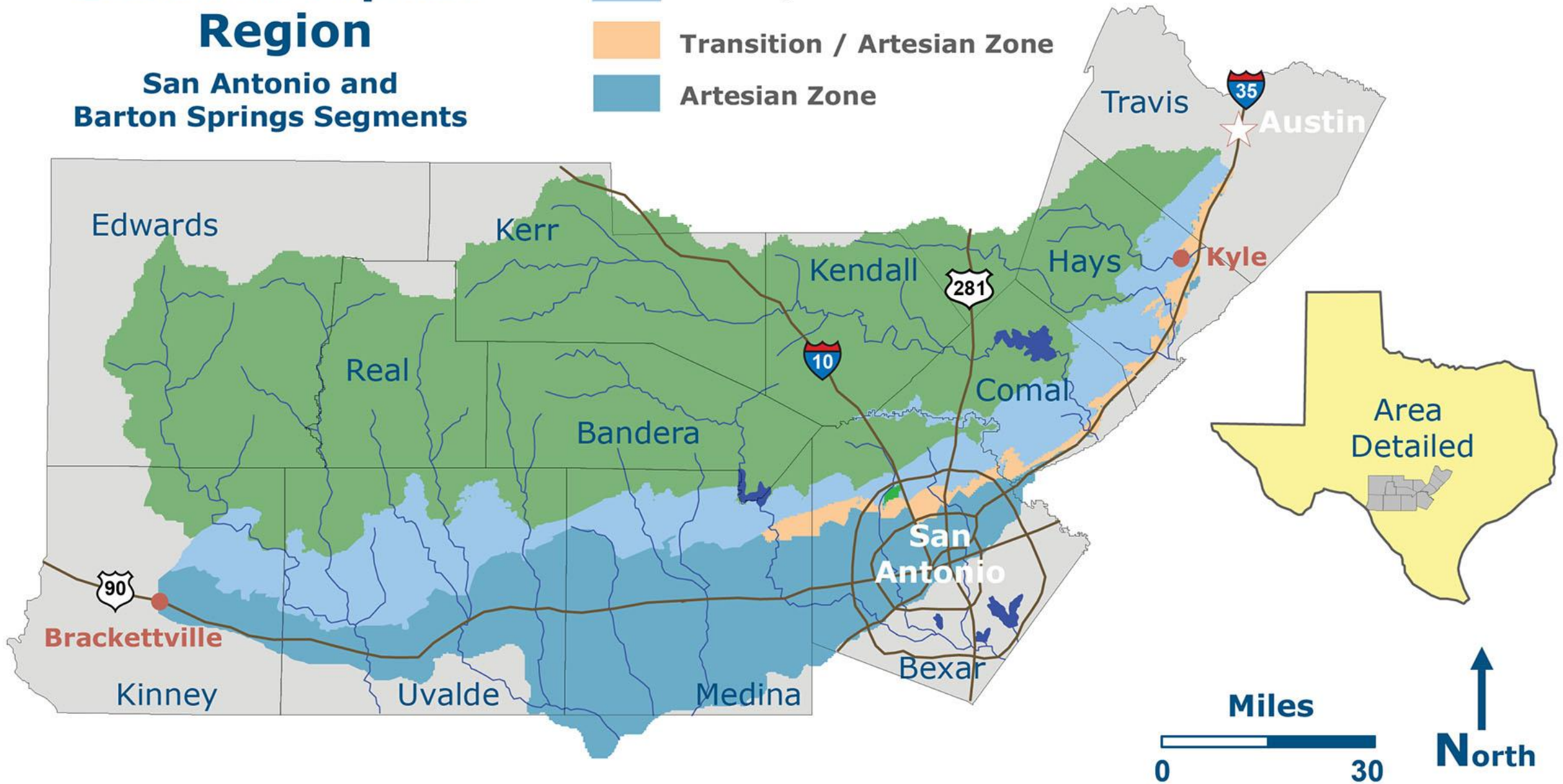
MAKING SAN ANTONIO
WATERFUL



The Edwards Aquifer Region

San Antonio and Barton Springs Segments

- Contributing Zone
- Recharge Zone
- Transition / Artesian Zone
- Artesian Zone









San Antonio Springs



Comal Springs

Stinky Falls





San Marcos Springs

San Antonio Express-News

Serving South Texas since 1865

SATURDAY, August 24, 1996

★ Final Edition 50c

Bunton orders pumping limits

City leaders react angrily, plan to file appeal Monday

By **KEN DILANIAN**
EXPRESS-NEWS STAFF WRITER

Flanked by local leaders at a dramatic City Hall news conference, Mayor Bill Thornton vowed Friday to appeal a federal judge's order that he decried as favoring animals over people.

"Today I think it's time we draw a line in the sand to fight for consideration of humans and human rights," Thornton said. "Quite frankly, the court is jacking us around."

Thornton's sentiments were echoed by a variety of city officials who protested an order by Senior U.S. District Judge Lucius D. Bun-

ton III that may require San Antonians to stop watering their lawns in an effort to save five federally protected species at Comal and San Marcos springs.

After years of warnings, threats and voluntary plans, Bunton finally imposed a legally binding court order in response to allegations from the non-profit Sierra Club that San Antonio's Edwards Aquifer water use is violating the Endangered Species Act.

Governments at all levels have failed to properly preserve the Edwards, Bunton wrote, and that failure is killing species in violation

■ See THORNTON/8A



“
Today I think it's time we draw a line in the sand to fight for consideration of humans and human rights. Quite frankly, the court is jacking us around.

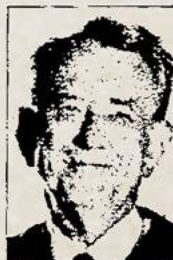
— Mayor Bill Thornton

”

“
The Edwards Aquifer region has finally reached the point where the aquifer is unable to provide for the needs of all those who depend upon it during dry years.

— Senior U.S. District Judge Lucius D. Bunton III

”



SAWS chief foresees ban on lawn watering by Oct. 1

By **JERRY NEEDHAM**
EXPRESS-NEWS STAFF WRITER

A federal judge ordered restrictions on pumping from the Edwards Aquifer by the city of San Antonio and other defendants Friday, in an endangered species lawsuit filed by the Sierra Club.

Mayor Bill Thornton and City Council members vowed an appeal.

The order by Senior U.S. District Judge Lucius D. Bunton III does not take effect until Oct. 1. Depending on how much rain falls by then, the San Antonio Water System and other large users of aquifer water could be limited to no



The water debate is about a lot more than blind critters.
Carlos Guerra/1B

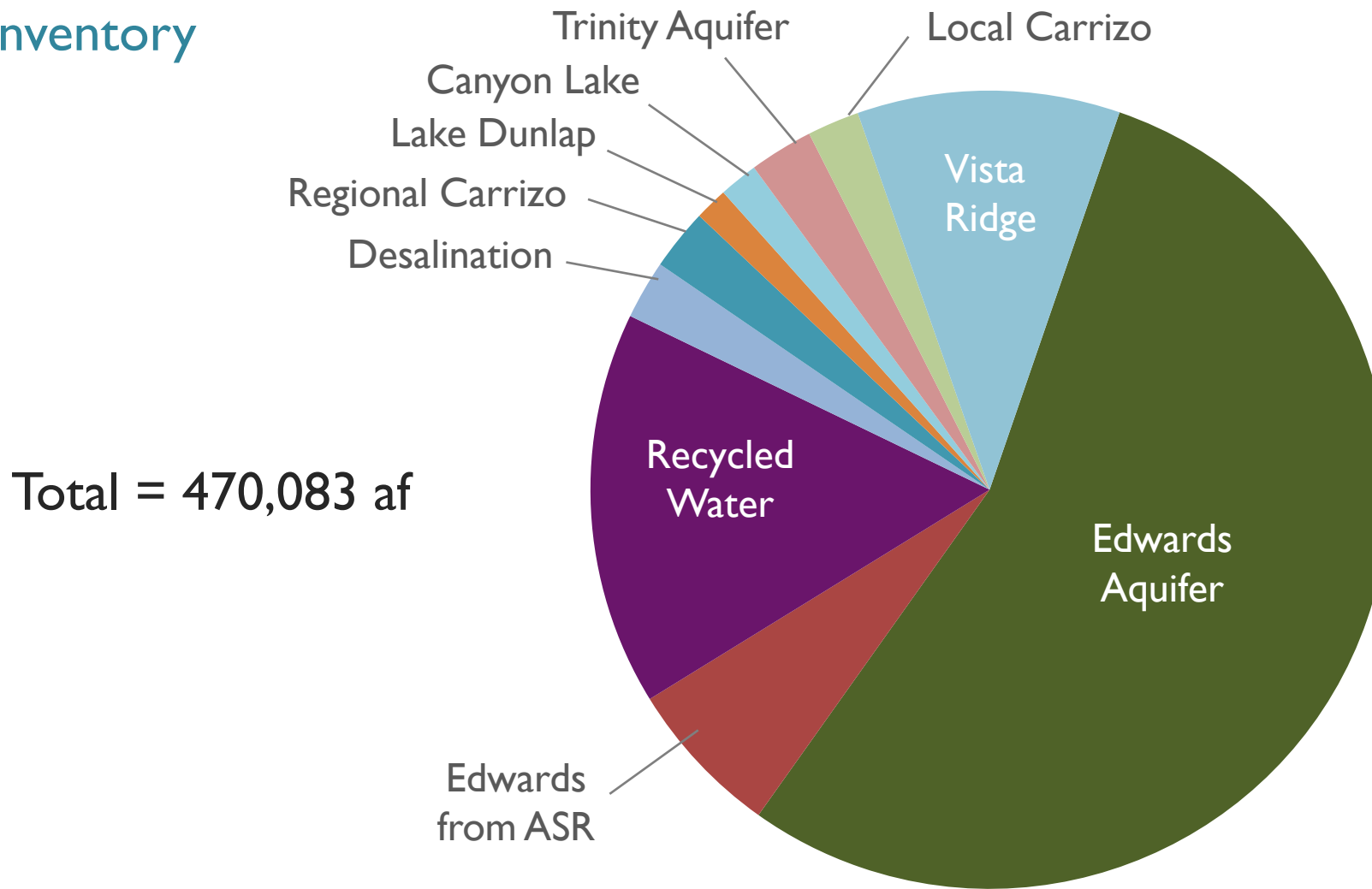
more than 1.2 times their winter average pumpage.

Joe Aceves, SAWS president, said that to meet that limit, the city probably would have to ban any outdoor water use by residen-

■ See FEDERAL/8A

Supply Diversification

2024 Supply Inventory



Insight From a Large-Scale ASR Project



H₂Oaks Center

one site, three sources



Carrizo well



Carrizo fresh water

ASR well



Edwards water in storage

Desal well



Lower Wilcox brackish water

Injection well



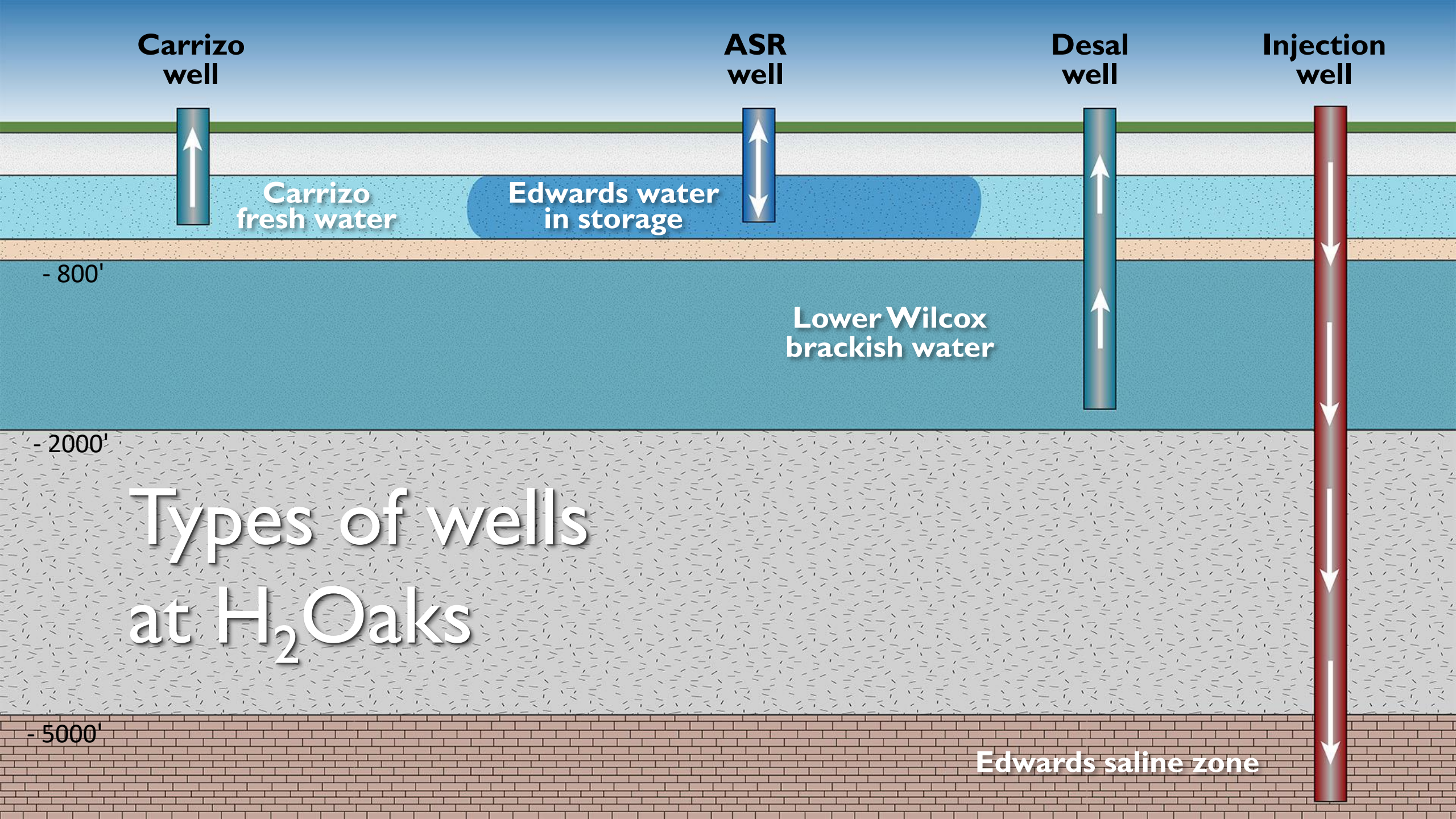
Edwards saline zone

- 800'

- 2000'

- 5000'

Types of wells at H₂Oaks



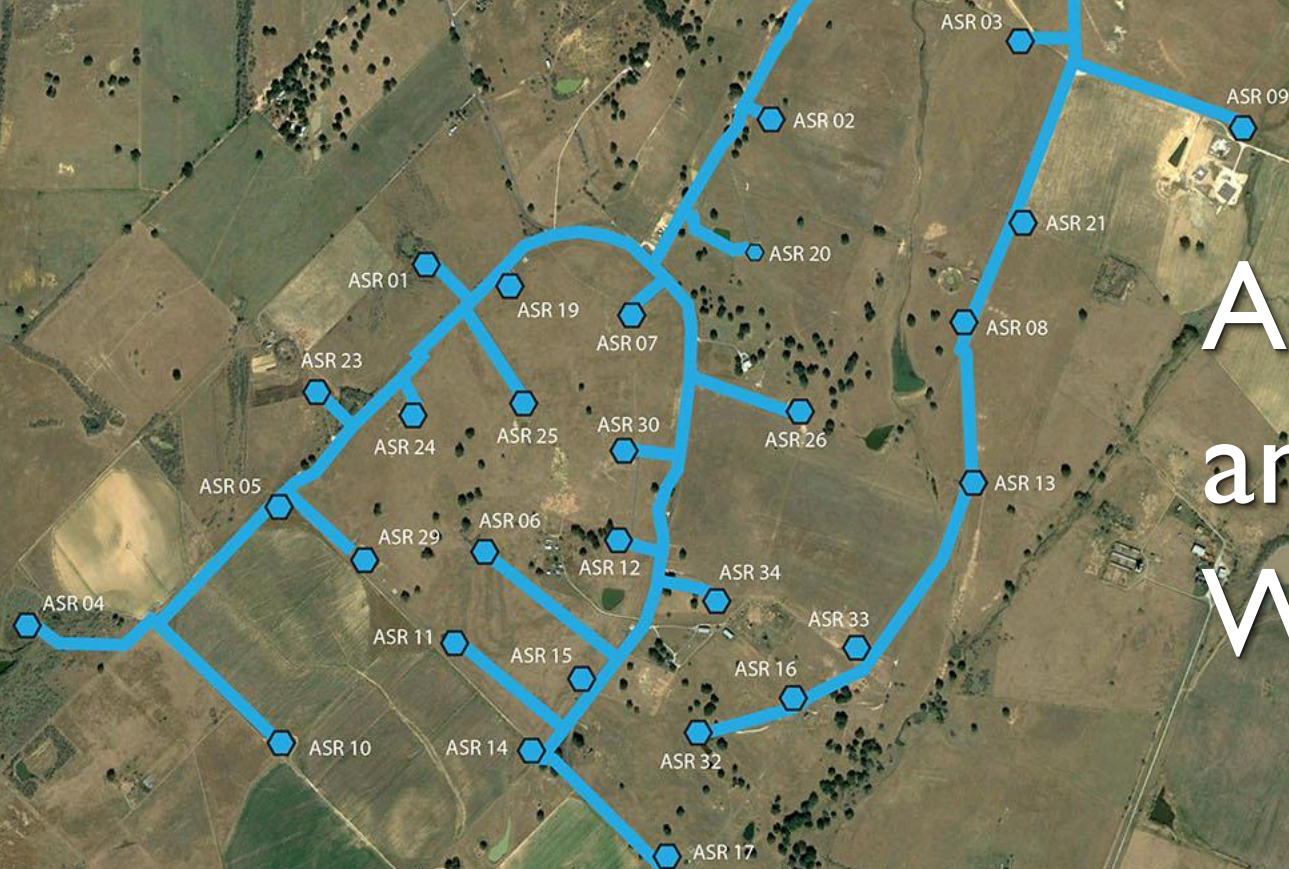


plant site

wellhead

Aquifer Storage and Recovery

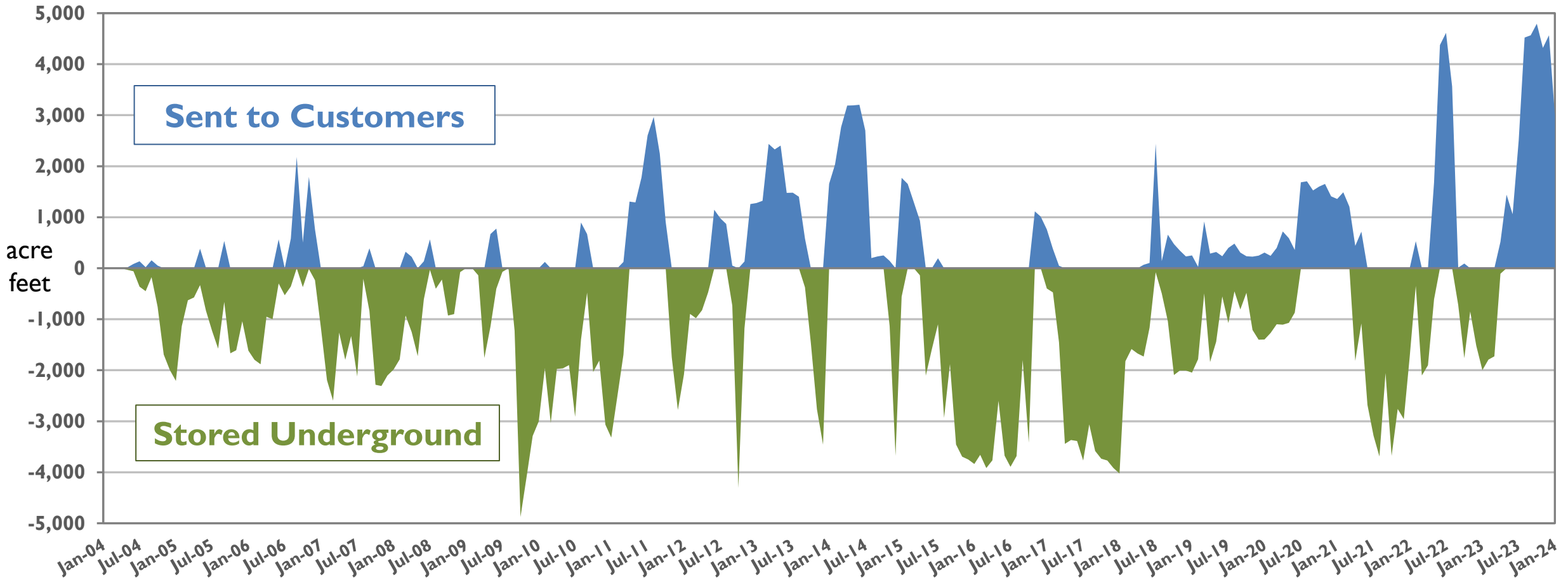
Aquifer Storage and Recovery Wells



aerial imagery date: 1/16/2017

ASR Production and Storage Volumes by Month

January 2004 to January 2024



Insight From a Large-Scale ASR Project

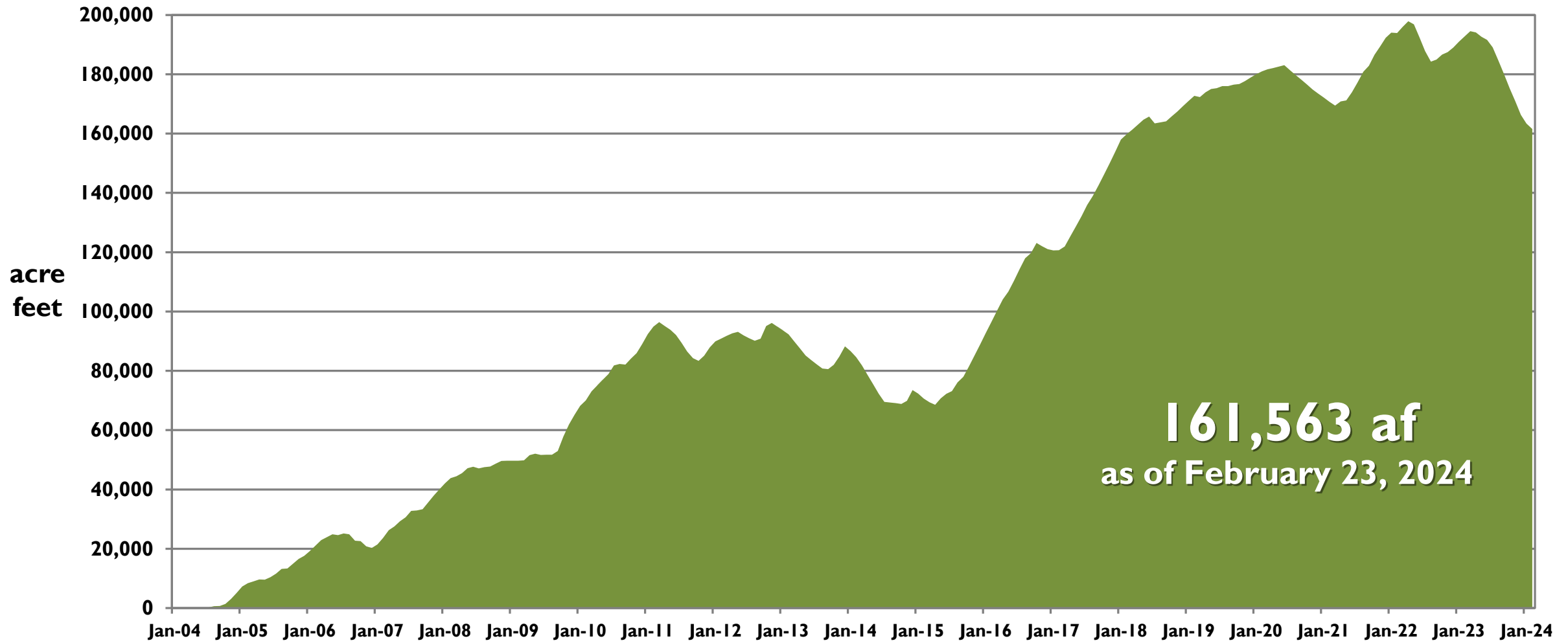


Unplanned Performance Test



Insight From a Large-Scale ASR Project

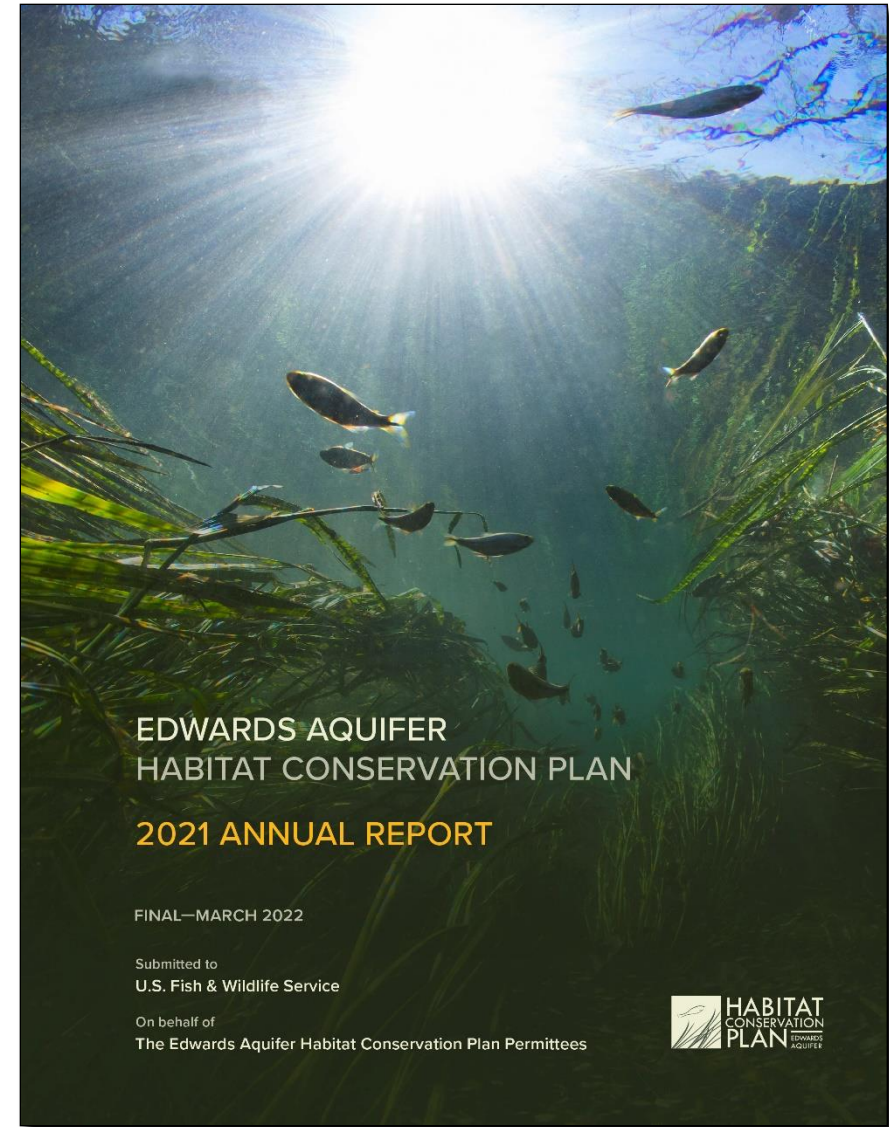
SAWS ASR Water In Storage



Insight From a Large-Scale ASR Project



Habitat Conservation Plan for Endangered Species Protection



Underground Injection Control Permit

Central Registry

The Customer Name displayed may be different than the Customer Name associated to the Additional IDs related to the customer. This name may be different due to ownership changes, legal name changes, or other administrative changes.

Detail of: **Underground Injection Control Permit 5R2100042**

For: **TWIN OAKS ASR FACILITY (RN104866454)**

No physical location description on file.

Permit Status: **ACTIVE**

Held by: **San Antonio Water System (CN600529069)** View 'Issued To' History

OWNER OPERATOR View Compliance History

Mailing Address: Not on file

Legal	Description	Start Date	End Date	Type	Status	Status Date
5R2100042	UIC PERMITS	10/09/2001		PERMIT	ACTIVE	10/09/2001

Tracking No.	Type	Value	Start Date	End Date
19383601	APPLICATION RECEIVED	NEW CLASS V AUTHORIZATION	09/14/2001	10/09/2001

Physical	Description	Start Date	Type	Status	Status Date
TWIN OAKS ASR FACILITY		10/09/2001	CLASS V	CONSTRUCTED	10/09/2001

Tracking No.	Type	Value	Start Date	End Date
9279528	NUMBER OF PERMITTED WELLS	34	10/09/2001	
9280064	WELL LATITUDE	29.13444	10/09/2001	
9280593	WELL LONGITUDE	-98.40250	10/09/2001	
9281275	INJECTION ZONE FORMATION	CARRIZO SAND	10/09/2001	
9281780	INJECTION ZONE TOP DEPTH	400	10/09/2001	
9282235	INJECTION ZONE BOTTOM DEPTH	780	10/09/2001	
9282746	INJECTION RATE REPORTED	60 MGD <60 PSI MAX	10/09/2001	
9283266	INJECTION FLUID	EDWARDS AQUIFER WATER	10/09/2001	

Quarterly Reporting

File: TO_DATA.ACDDR
 Report: WELLS 01-17 QUARTERLY SUMMARY

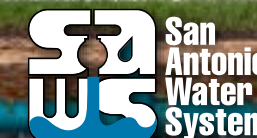


1/2/2024 11:02:56 AM
 Page 1 of 1

H2Oaks Aquifer Storage and Recovery
 Wells 01-17 Quarterly Summary

Selected date range is: 10/1/2023 to 12/31/2023

	ASR Well Number																
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
10 / 2023																	
Average Injection Rate (mgd):	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Injection Volume (mg):	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Number of Injection Days:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average Injection Pressure (psi):	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Recovery Volume (mg):	36.95	66.14	0.00	67.14	64.80	58.05	0.00	71.24	0.00	0.00	63.65	54.07	53.42	35.57	0.00	67.41	29.14
Number of Recovery Days:	14	31	0	31	31	31	0	31	0	0	31	31	28	25	0	31	18
11 / 2023																	
Average Injection Rate (mgd):	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Injection Volume (mg):	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Number of Injection Days:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average Injection Pressure (psi):	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Recovery Volume (mg):	0.00	61.84	0.00	65.40	63.18	6.10	0.00	69.89	12.85	0.00	61.86	50.21	23.72	0.00	0.00	67.42	53.81
Number of Recovery Days:	0	29	0	30	30	4	0	30	7	0	30	30	13	0	0	30	30
12 / 2023																	
Average Injection Rate (mgd):	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Injection Volume (mg):	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Number of Injection Days:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average Injection Pressure (psi):	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Recovery Volume (mg):	0.00	41.58	0.00	68.26	64.77	31.78	0.00	71.29	0.00	0.00	63.91	52.12	35.59	16.75	0.00	66.83	56.15
Number of Recovery Days:	0	20	0	31	31	19	0	31	0	0	31	31	19	12	0	31	31





ASR and Local Carrizo Wells



aerial imagery date: 1/16/2017



Carrizo Aquifer Treatment Facility



Desalination Membranes

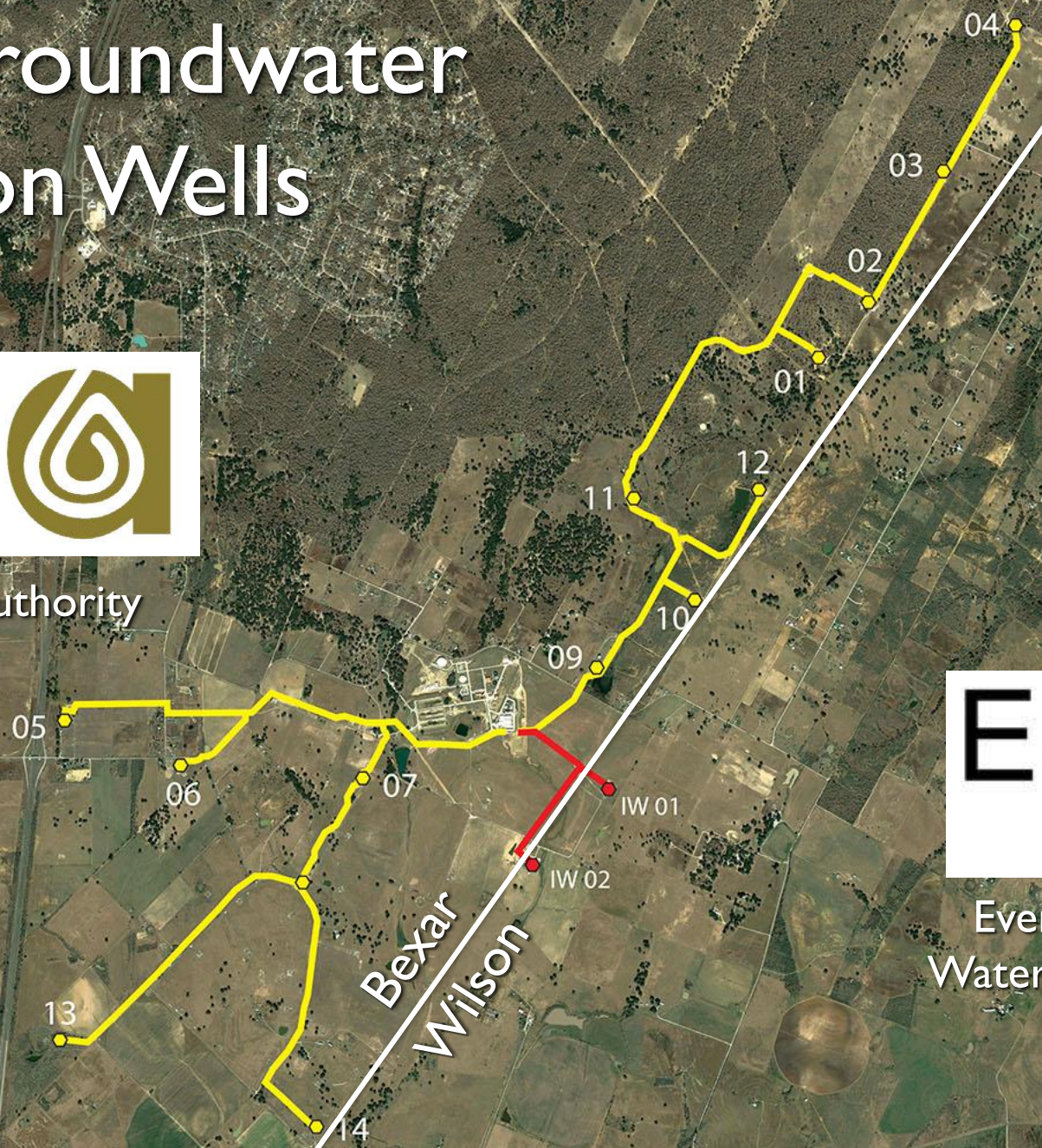
Brackish Groundwater Desalination Wells



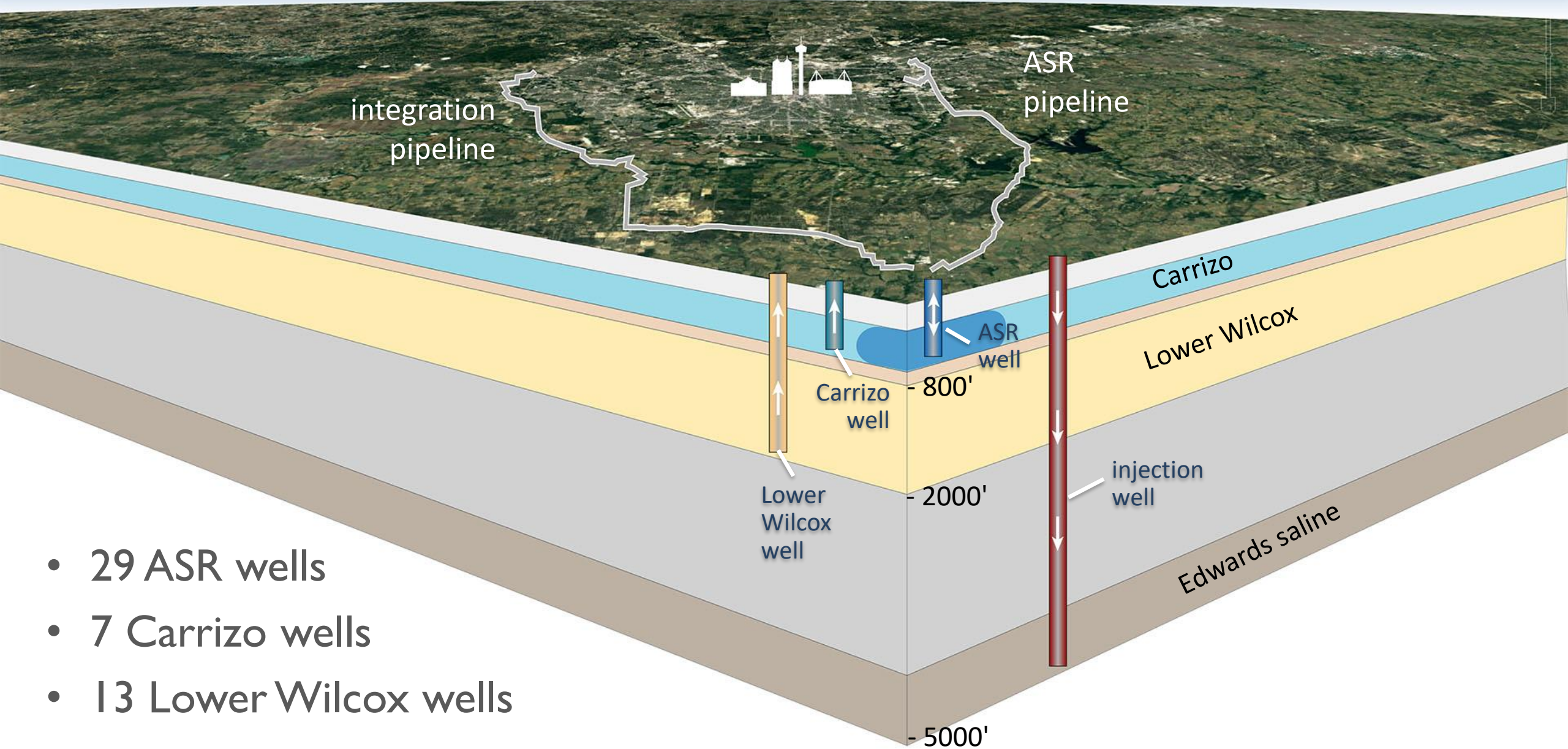
Edwards Aquifer Authority



Evergreen Underground
Water Conservation District

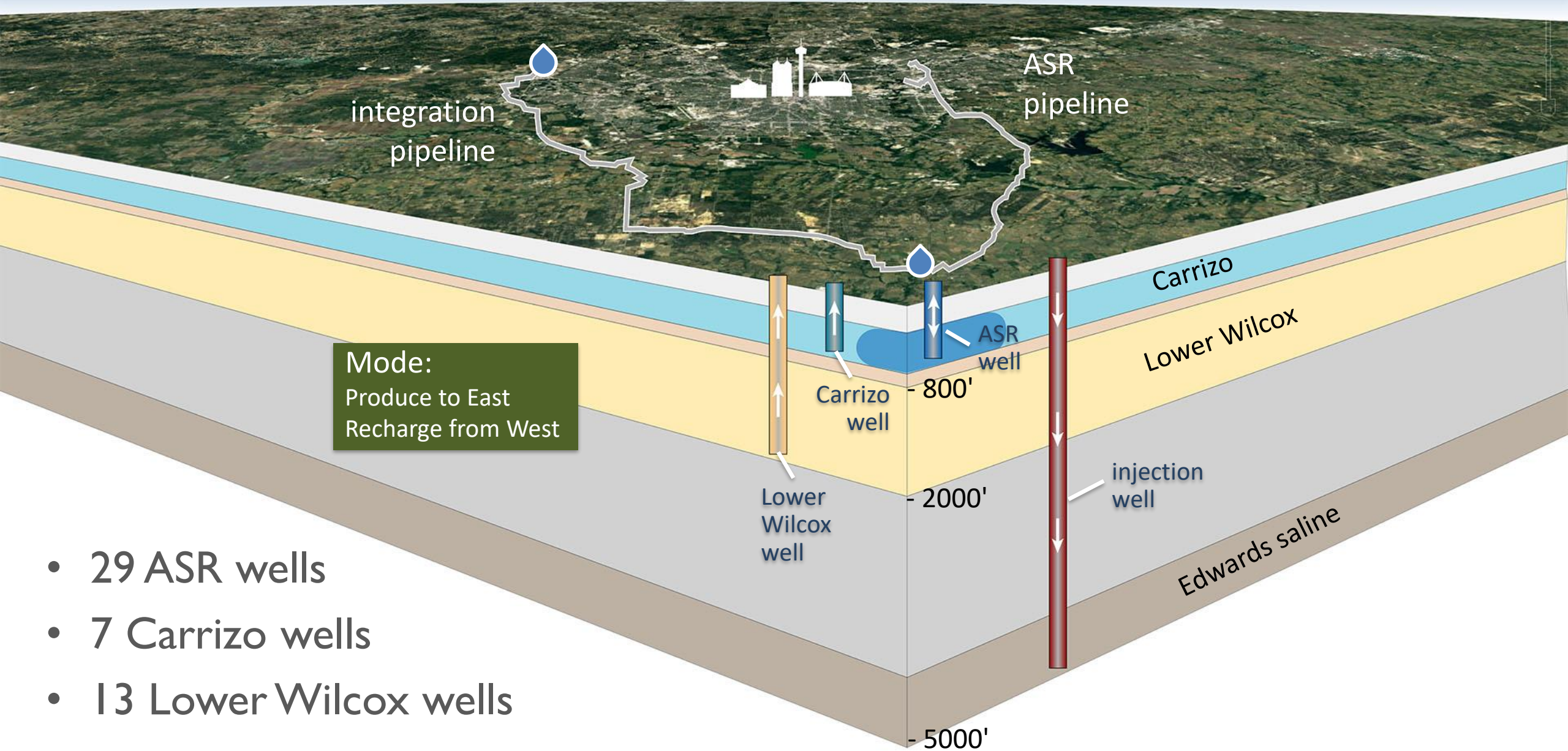


H₂Oaks Center



- 29 ASR wells
- 7 Carrizo wells
- 13 Lower Wilcox wells

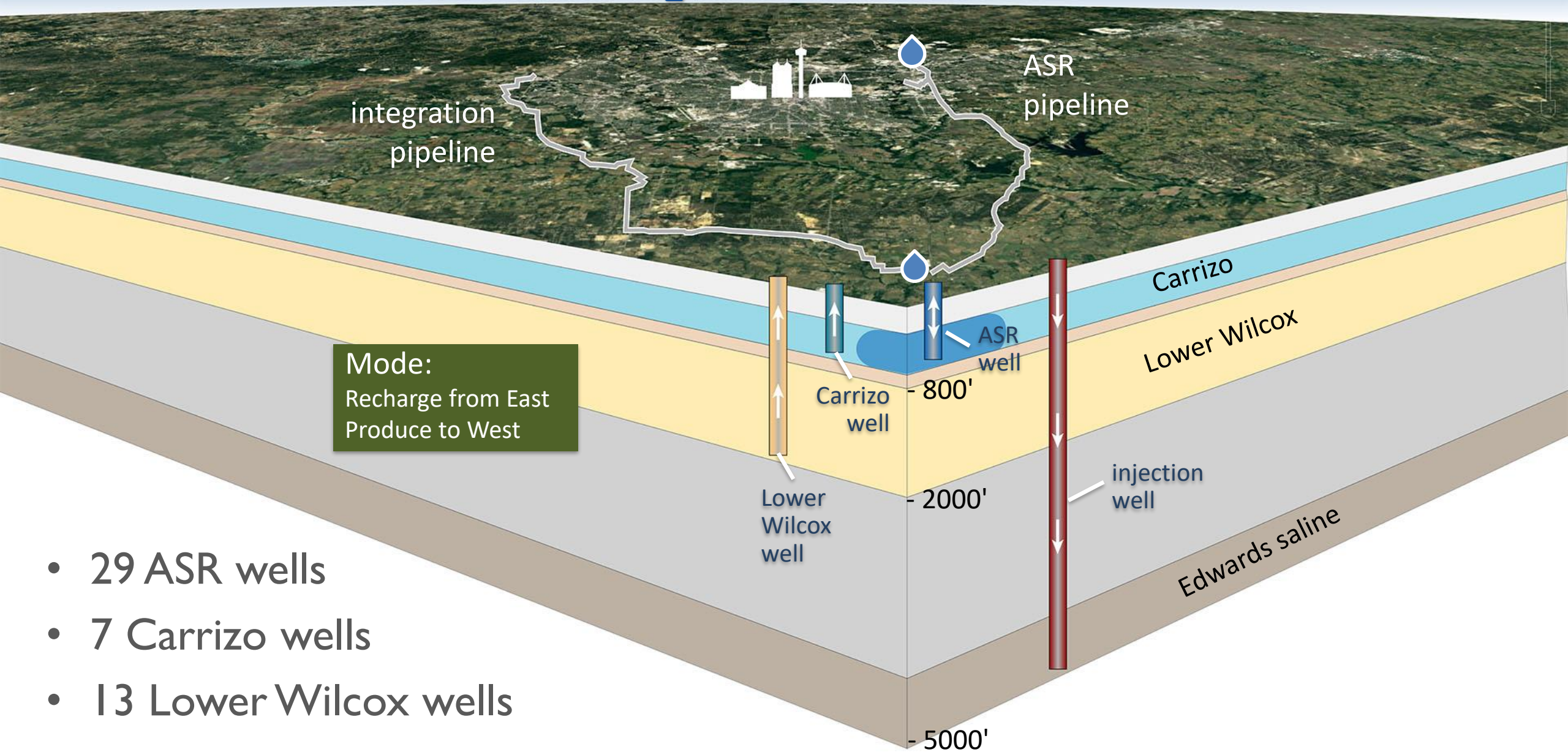
H₂Oaks Center



Mode:
Produce to East
Recharge from West

- 29 ASR wells
- 7 Carrizo wells
- 13 Lower Wilcox wells

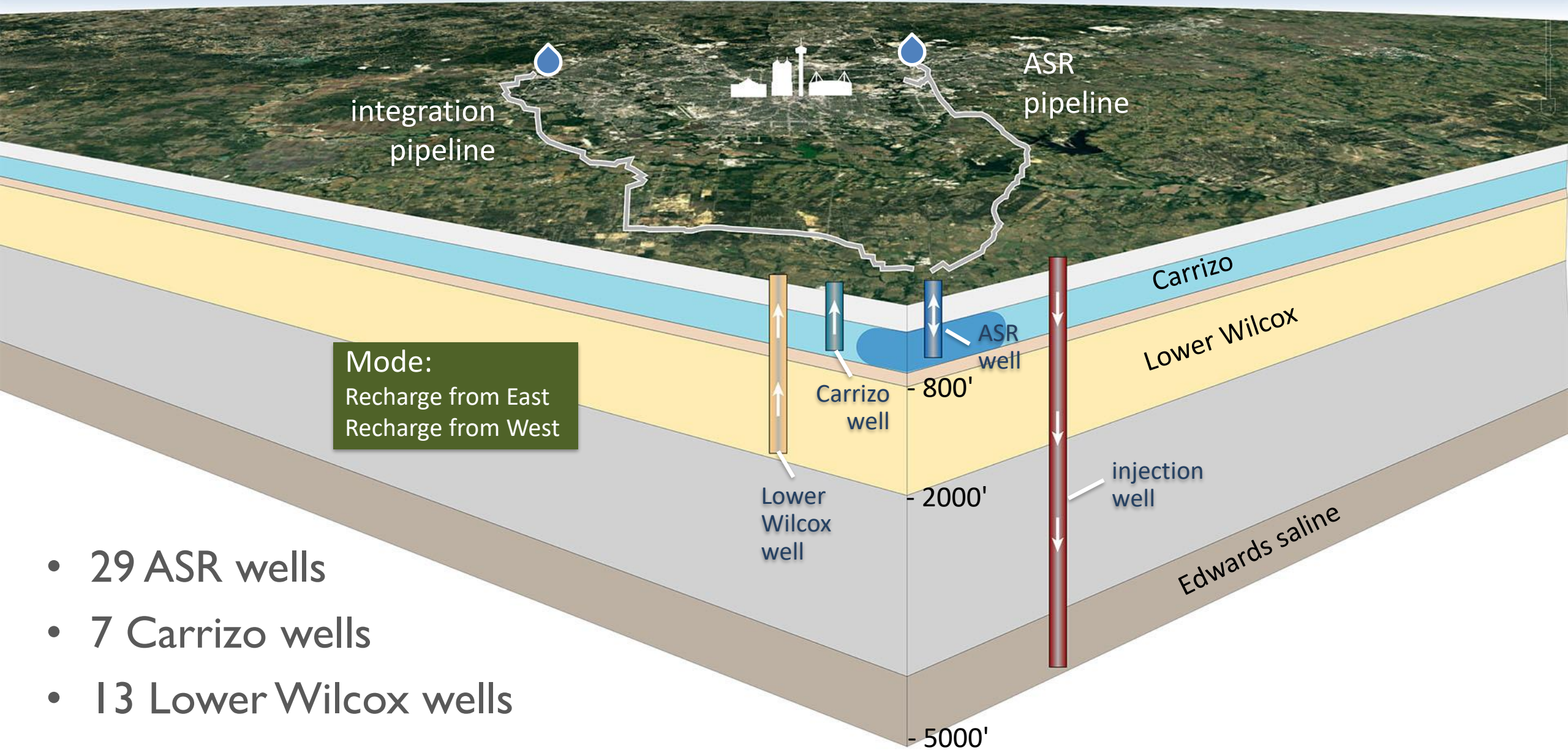
H₂Oaks Center



Mode:
Recharge from East
Produce to West

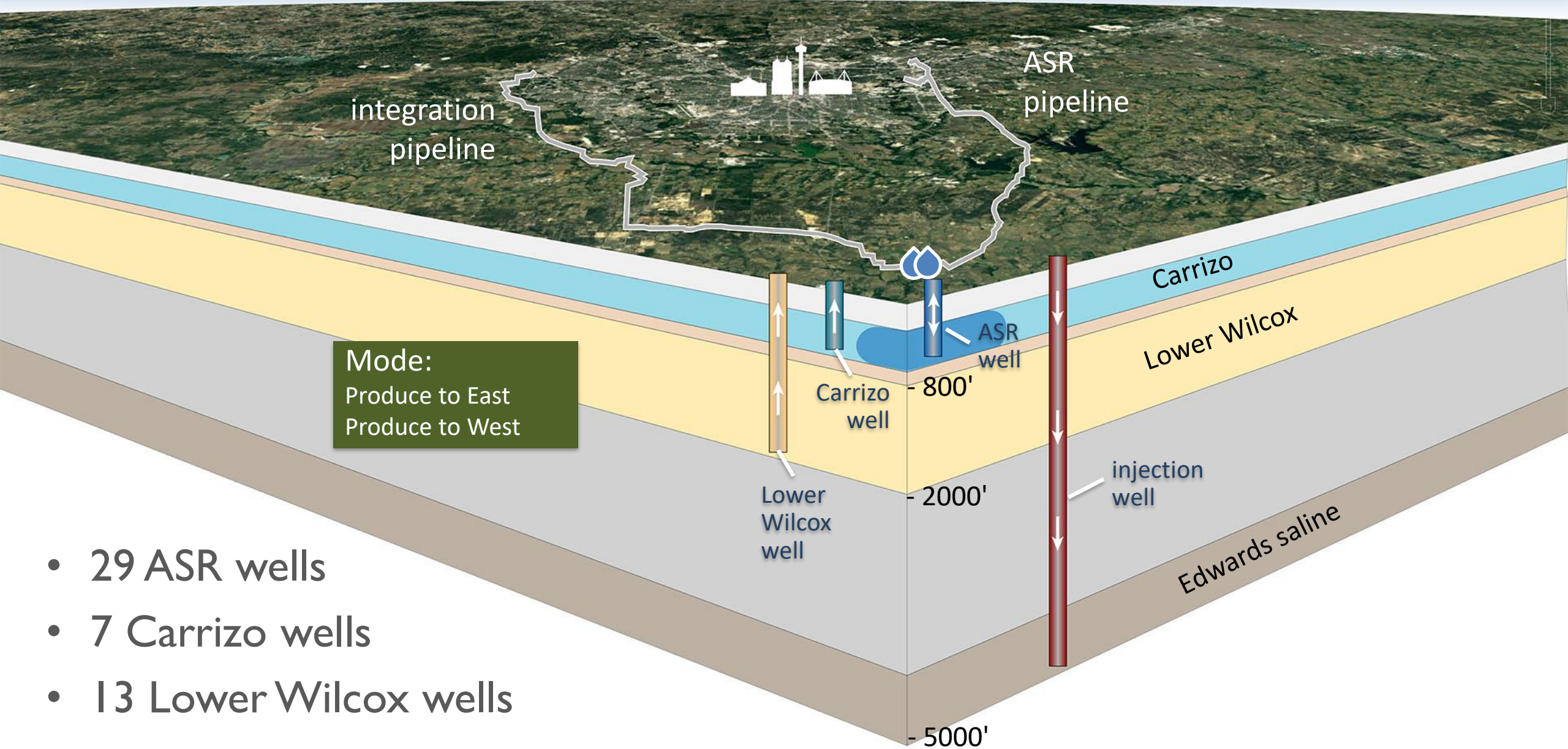
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H₂Oaks Center



- 29 ASR wells
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H₂Oaks Center



Mode:
Produce to East
Produce to West

- 29 ASR wells
- 7 Carrizo wells
- 13 Lower Wilcox wells

Changing Operational Plan

- Seasonal benefit
- Long-term storage
- Both seasonal benefit and long-term storage

Texas Blind Salamander



Fountain Darter



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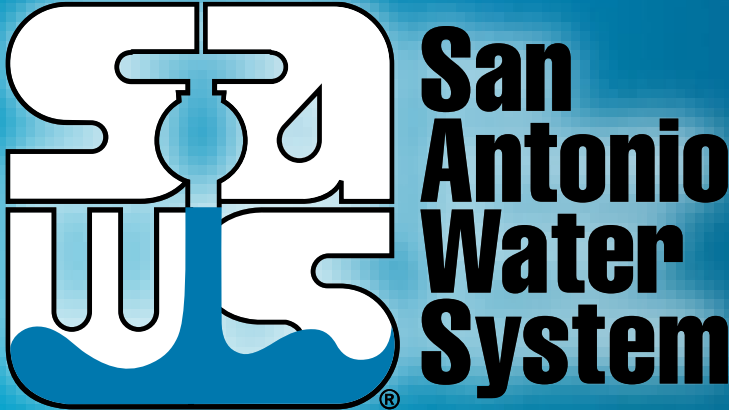
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