



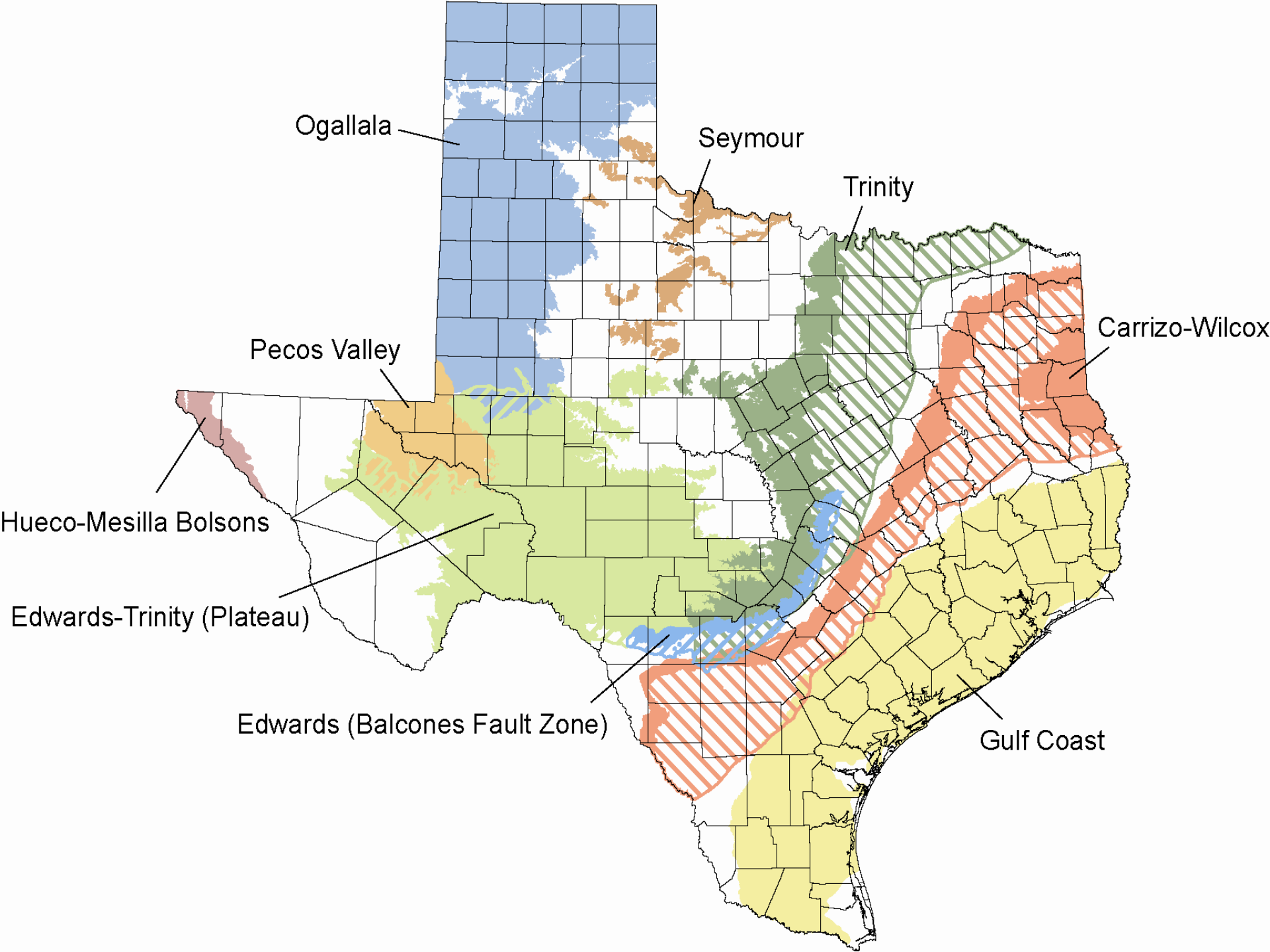
San Antonio Water System

Brackish Groundwater Desalination and the Use of Deep Well Injection for Concentrate Disposal

March 3, 2017

Multi-State Salinity Coalition
Las Vegas, Nevada

Brad Cross
LBG-Guyton Associates



SAWS Program Summary

- H2Oaks Center located in southern Bexar County on SAWS ASR property
- Grand Opening on January 27, 2017
- Uses an underutilized brackish water resource
- Takes advantage of State funding opportunities
- Three Phase Program





H2Oaks
CENTER

The Dallas Water System





Why Utilize Brackish Water?

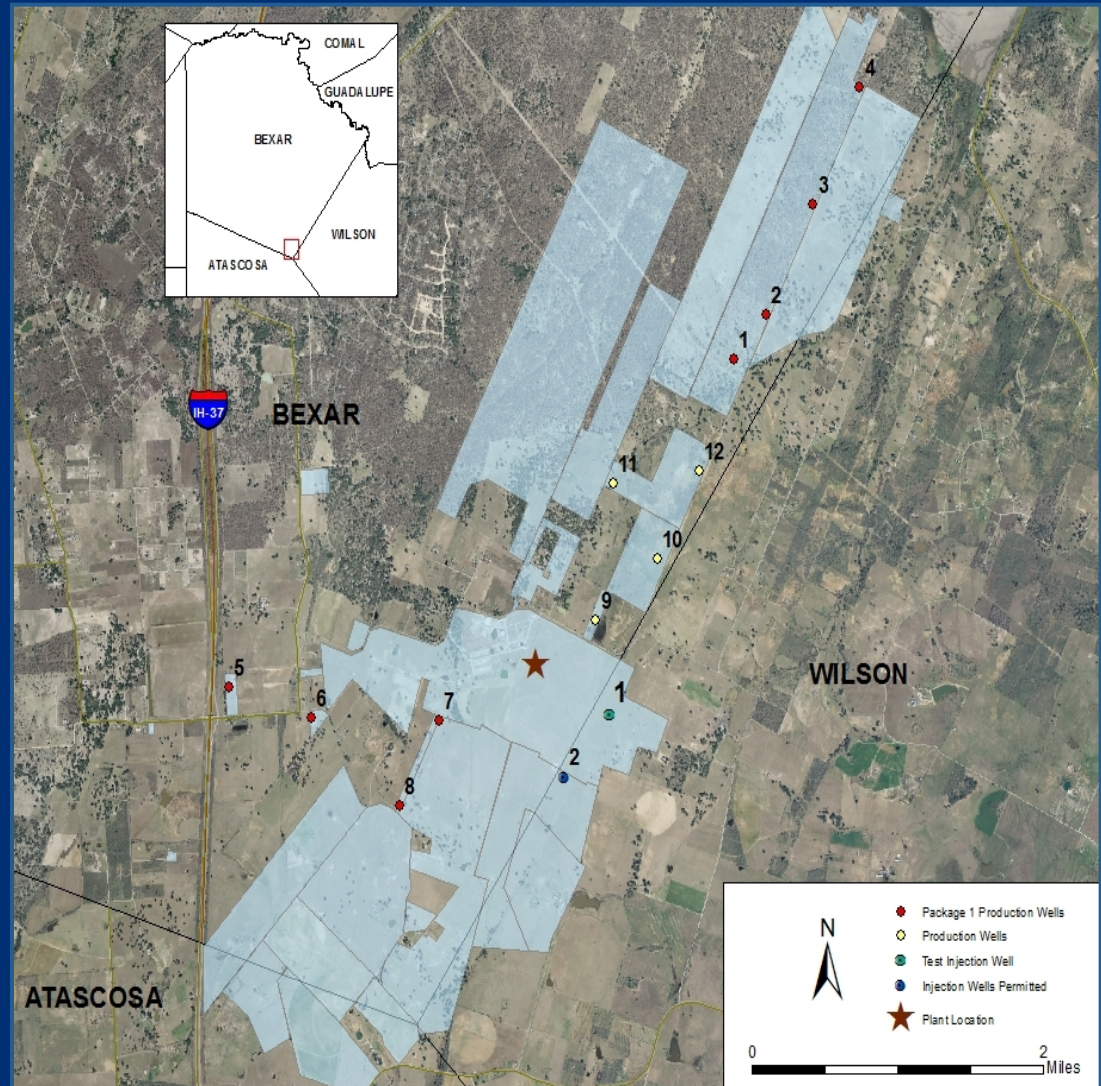
Alternative Resource

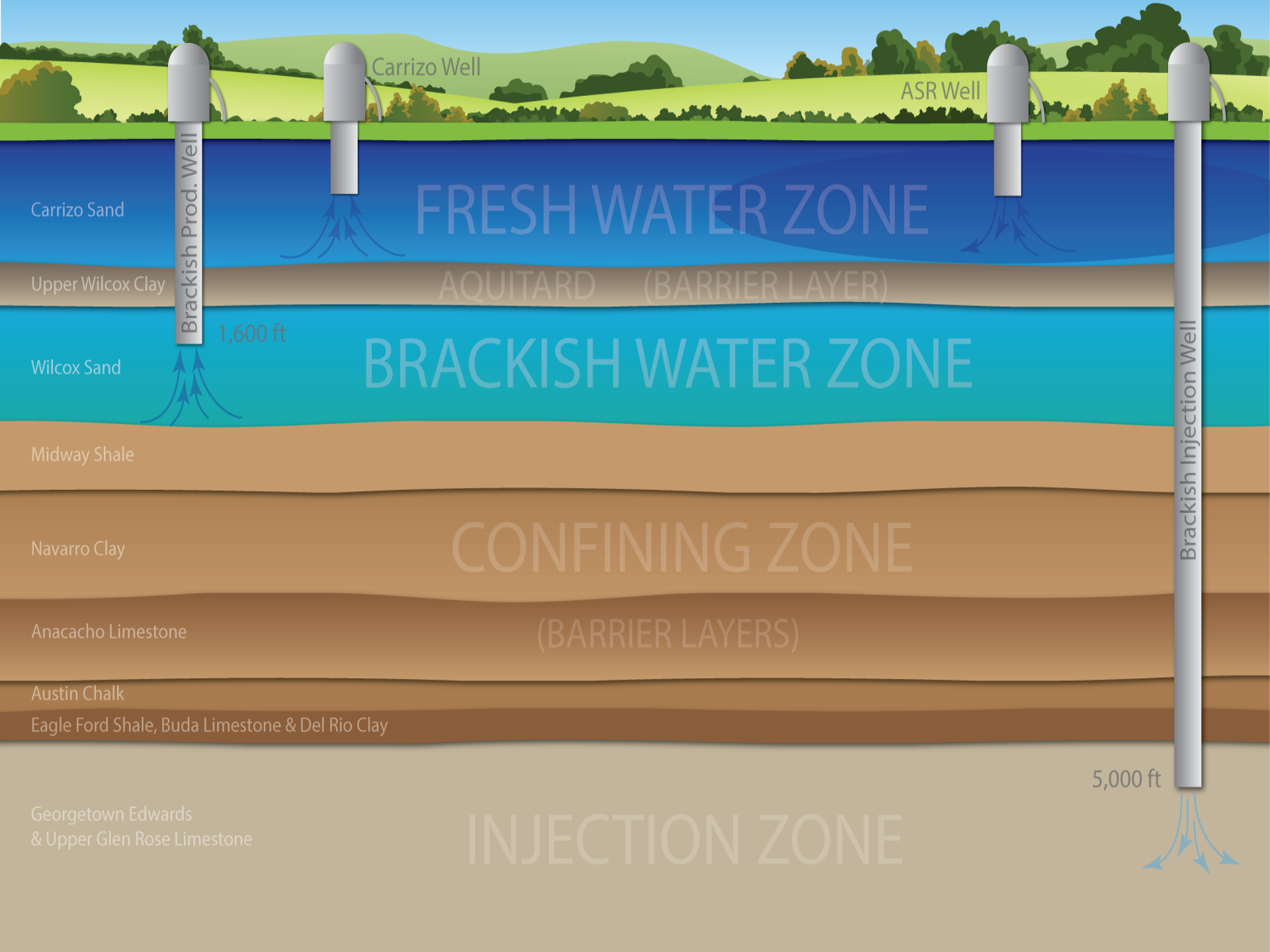
- Resource (Wilcox Aquifer) close to San Antonio making it cost effective
- Underutilized resource
- Depth of approximately 1,500 feet
- Large volumes of brackish water

Program Design

Phase 1

- 12 MGD or 13,440 AF/Y
- 12 Production Wells
- 2 Injection Wells
- 12 miles conveyance piping
- RO Treatment Plant





Carrizo Well

ASR Well

Carrizo Sand

FRESH WATER ZONE

Upper Wilcox Clay

AQUITARD (BARRIER LAYER)

Wilcox Sand

1,600 ft

BRACKISH WATER ZONE

Midway Shale

Navarro Clay

CONFINING ZONE

Anacacho Limestone

(BARRIER LAYERS)

Austin Chalk

Eagle Ford Shale, Buda Limestone & Del Rio Clay

Georgetown Edwards
& Upper Glen Rose Limestone

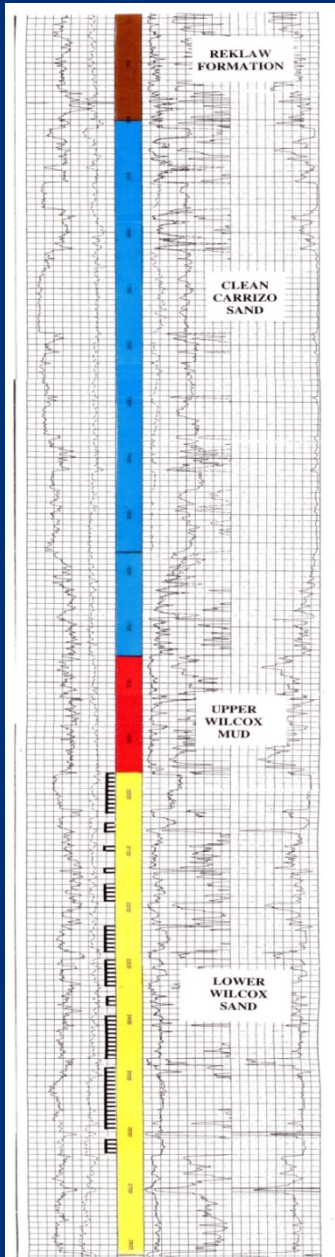
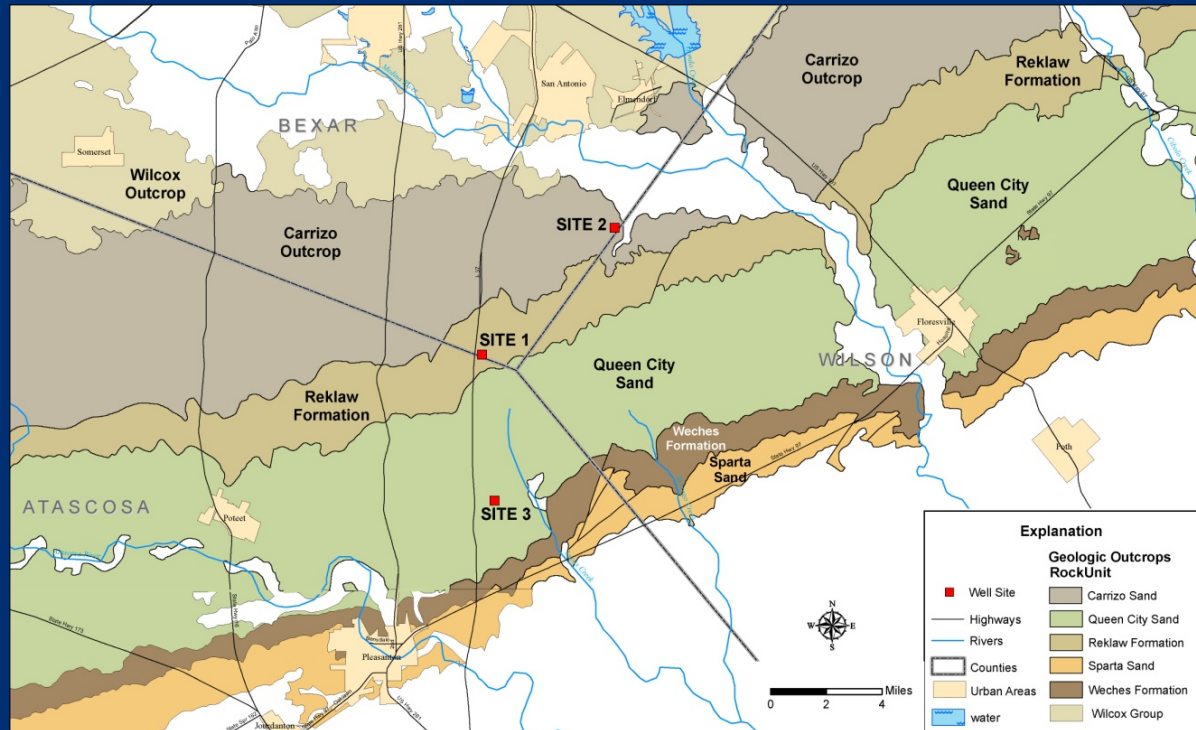
INJECTION ZONE

Brackish Injection Well

5,000 ft

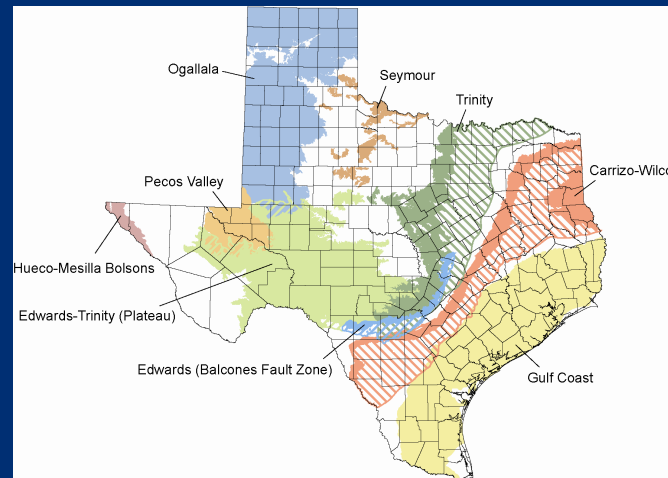
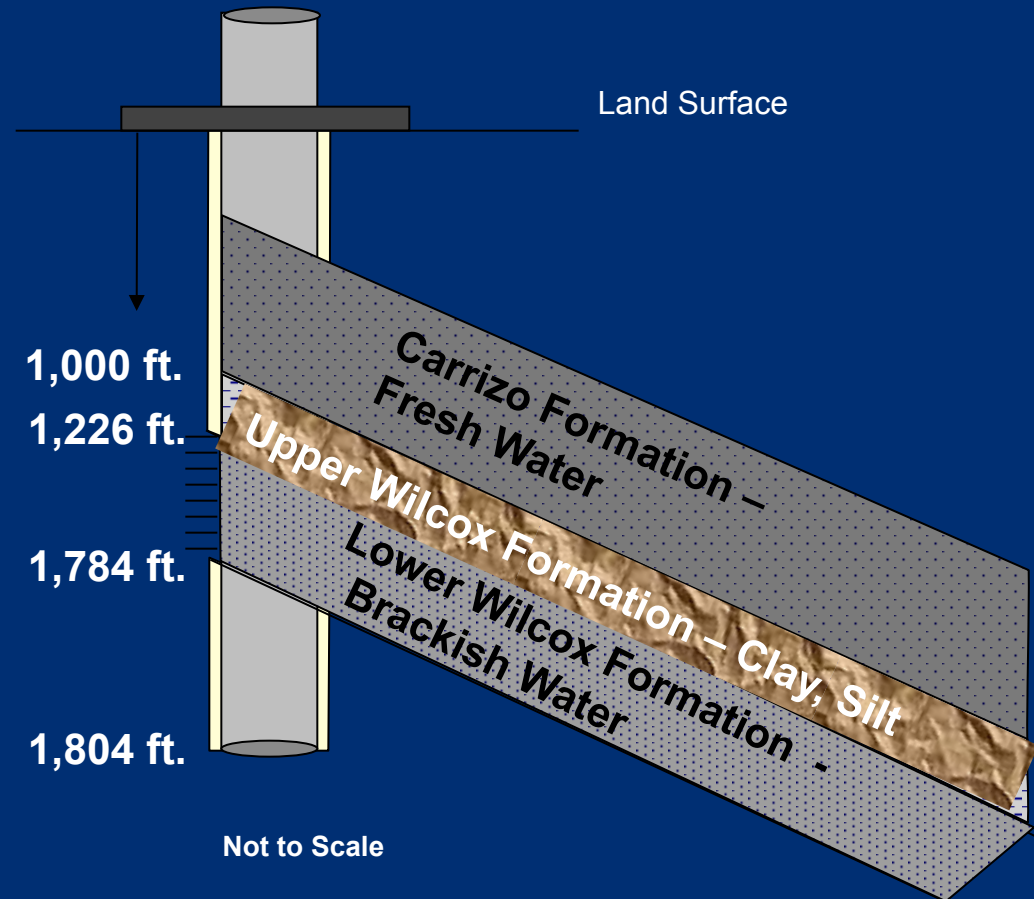
Feasibility Study March 2006

Test Wells Aug 2006 - May 2008



General Geology

- Wilcox Formation is deep and gets deeper toward the coast
- Upper Wilcox aquitard isolates the freshwater Carrizo Aquifer from the brackish Wilcox
- 300 to 400 feet of producible Sand in the lower Wilcox
- Wilcox Formation has Sodium Sulfate/Chloride type chemistry with a TDS of 1,300 – 1,500 mg/L



Production Wells

- 12 Production wells
- Completed in Lower Wilcox Formation
- Production rate of 800 – 1,000 gpm
- TDS of 1,300 -- 1,500 mg/L

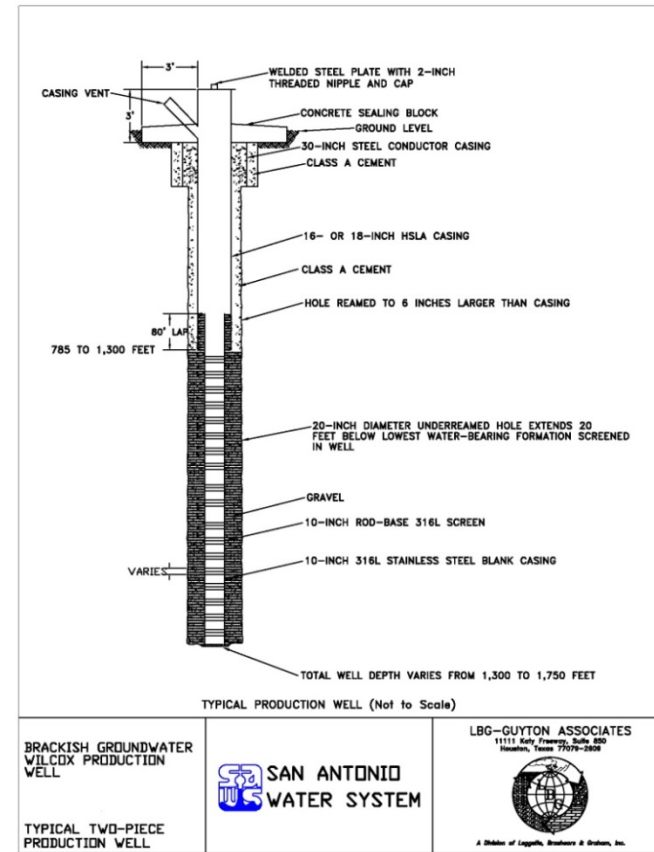
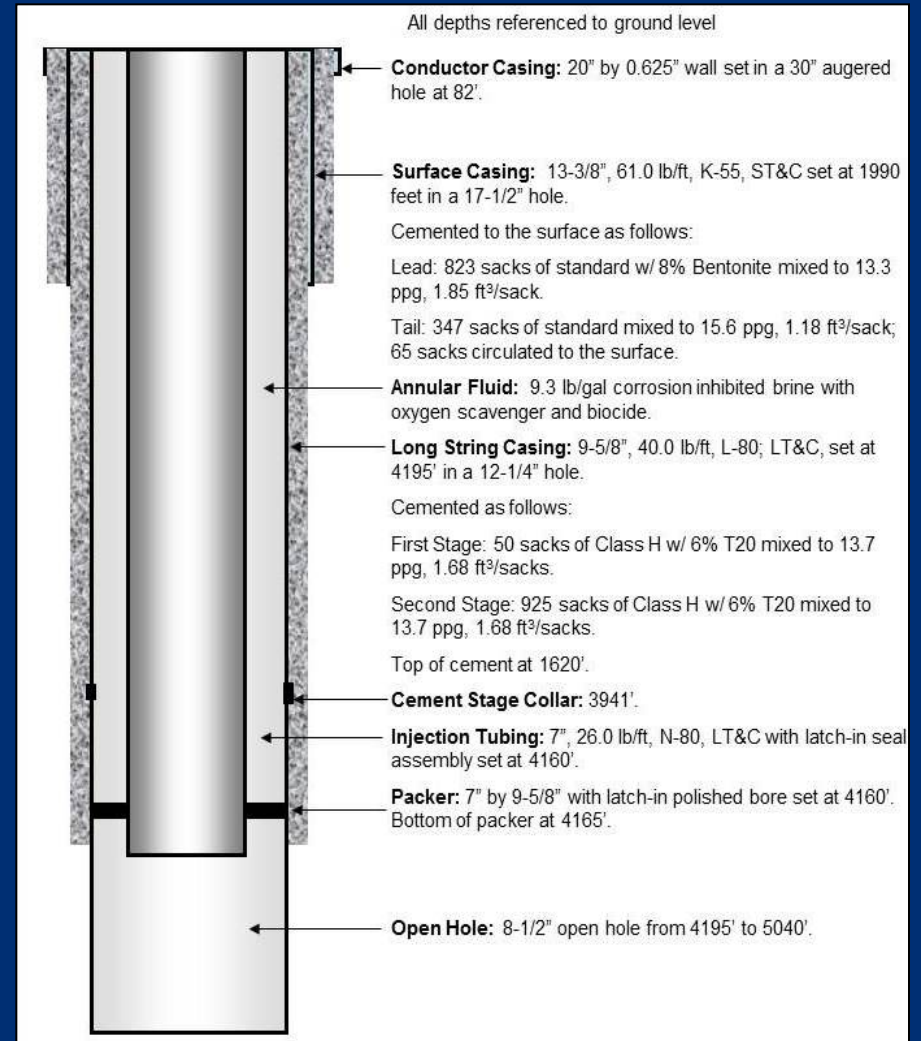


Figure 3

Injection Wells

- 2 Class I Injection Wells
- Completed in Edwards & Upper Glen Rose Limestones
- Total Depth of 5,040 – 5,100 feet
- 800 feet open hole completion
- Native Edwards water salinity – 90,000 mg/L TDS
- Concentrate is 15,000 mg/L
- Injection volume is 1.1 MGD
- Injection rate of 764 GPM between the two wells





Injection Well Permitting

Injection wells authorized by Texas Commission on Environmental Quality under an Underground Injection Control General Permit.

- Worked closely with regulatory staff;
- Filed Notice of Intent & financial assurance;
- Developed technical report (geological description, maps, x-sections, identification of USDWs, construction details and procedures, reservoir mechanics, formation testing program, well stimulation program, injection procedures, area of review, etc.);
- Worked closely with public;
- Regulatory review time minimal;
- UIC General Permit issued for period of 10 years.

For More Information Contact

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