

The El Paso and San Antonio Desalination Projects: Lessons Learned and Problems Solved

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Texas Desal 2017 Austin, Texas

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Surface Water Plants Hueco Wells Mesilla Wells Desalination Plant



### **EPWU/Army Partnership Agreement**

- All facilities are constructed on Fort Bliss
- EPW leases land from the Army
- Army pays for all concentrate disposal studies and Environmental Impact Statement
- EPW conducts all planning, engineering, pilot plant work, design and construction
- All facilities owned and operated by EPW
- EPW sells water to Fort Bliss

### Kay Bailey Hutchison Desalination Plant

Opened in 2007 to deal with:
Drought
Emergency situations
Growth
Brackish water intrusion

### **Benefits of Desalination Plant**



- Reserves fresh water in Hueco Bolson for drought periods
- Prevents brackish water from encroaching on fresh water wells
- Increases fresh water production for El Paso by 25%









# Remote Concentrate Disposal Area

- Less costly and less environmental impact than evaporation ponds
- 3 injection wells
- Concentrate pipeline (22 mi)



### **Injection Well Construction**

- Class I Standards
- Well 1 (2004)
   3,777 ft deep
- Well 3 (2006)
   4,030 ft deep
- Well 2 (2007)
   3,720 ft deep







Adapted from Collins, E. W., and Raney, J. A., 2000, Geologic map of West Hueco Bolson, El Paso region, Texas: The University of Texas at Austin, Bureau of Economic Geology, Miscellaneous Map No. 40, 24-p. text, scale 1:100,000.







### **Regulatory Concepts**

- Safe Drinking Water Act (SDWA) prohibits injection which endangers an underground source of drinking water (USDW);
- Injection zone is considered a USDW because the TDS is < 10,000 mg/L;</li>
- Class V injection well authorization prohibited injecting water that did not meet primary drinking water standards;

# **Regulatory Concepts (Cont.)**

- The injection zone is brackish with a TDS > 8,000 mg/L and does not meet national and state primary drinking water standards for arsenic, gross alpha, nitrite, and radium;
- Membrane treatment would be required prior to use. It is not a source of drinking water;
- Required to dilute concentrate to primary drinking water standards;

## **Aquifer Exemption**

- Most viable option was an "Aquifer Exemption;"
- Aquifer Exemptions require modifications to State UIC Programs, including public notice and participation;
- Exemptions are granted by the State with concurrence from the EPA;
- Process includes submittal of application package to State for review. Once State reviews and approves, the request is sent to EPA for approval;

# **Aquifer Exemption (Cont.)**

- Aquifer exemption application package was submitted jointly to TCEQ and EPA in August 2008. Aerial extent of aquifer exemption request was based on a plume that would be generated from the injection of concentrate at a constant rate of 3 MGD for 50 years;
- Application demonstrated that:
  - Injection zone was not a source of drinking water for human consumption;
  - No water supply wells penetrate the aquifer;

# **Aquifer Exemption (Cont.)**

- Application also recognized:
  - Quality of injected fluids does not significantly affect existing water quality of the Exempt Aquifer;
  - No measurable quantity of groundwater was encountered until the exempt aquifer is reached at depths ranging from 2,222 to 2,890 feet; and
  - Upper and lower confining zones present.



## **Aquifer Exemption (Cont.)**

- TCEQ approved Aquifer Exemption in December 2011;
- EPA jointly approved the exemption in September 2012;
- Although the exemption was secured, the Class V authorization still required EPWU to dilute concentrate in order to meet primary drinking water standards;
- EPWU requested an amendment to the authorization from TCEQ in September 2012; and
- TCEQ issued amendment in August 2014.

## What Did the Approval Mean?

- No dilution and no waste of fresh water;
- Can inject up to 3,360 AF/Year of concentrate;
- Continual well maintenance and monitoring;
- Quarterly reporting of injection pressures, rates, volumes, and water (injectate) quality; and
- Pressure Fall-Off Testing and MITs as required to ensure integrity of wells.

## **Future Planning**

- Plant production to increase
- Continued to be used in drought relief and interruption of supply
- Additional capacity with 6<sup>th</sup> skid



### SAWS Brackish Desal Plant H2Oaks Grand Opening on January 27, 2017



### **SAWS Program Summary**

- ✓ H2Oaks Center located in southern Bexar County on SAWS ASR property
- ✓ Uses a brackish water underutilized resource nearby to San Antonio
- Takes advantage of State funding opportunities through Texas Water Development Board
- ✓ Three Phase Program

	Permeate	Finished Water
Phase I	10 MGD	12 MGD
Phase II	20 MGD	24 MGD
Phase III	25 MGD	30 MGD



### WHY BRACKISH? Diversification 2017 SAWS Supply Portfolio





Early Work for SAWS Brackish Desal Project

Feasibility Study 2005 - 2006

# ≻Test Wells2006 – 2008







	Carrizo Well ASR Well		
Carrizo Sand	FRESH WATER ZONE		
Upper Wilcox Clay	AQUITARD (BARRIER LAYER)		
Wilcox Sand	1,600 ft BRACKISH WATER ZONE	ction Well	
		Inje	
Navarro Clay	CONFINING ZONE	Brackish	
Anacacho Limestone			
Austin Chalk			
Eagle Ford Shale, Buda	a Limestone & Del Rio Clay	_	
	5,000 ft		

### **Program Design**

#### Phase 1

- ➢ 12 MGD or 13,440 AF/Y
- ➢ 12 Production Wells
  - Production Wells 1 thru 4 (2012)
  - ✓ Wells 5 thru 8 (2013)
  - ✓ Wells 9 thru 12 (2014-2016)

#### 2 Injection Wells

- ✓ (#1 2012)
- ✓ (#2 201<u>5)</u>
- Over 12 miles conveyance piping
- RO Treatment Plant



### **Production Wells**

- 12 Production wells
- Each about 1,600 feet deep
- Completed in Lower Wilcox Formation
- Production rate of 700 1,100 gpm
- TDS of 1,300 1,500 mg/L





#### **Difficulties with Production Well Construction**

#### Gravel Pack Installation

- ✓ Be methodical and take your time installing
- ✓ Try to match volume calculations from caliper log
- Sand Production, Turbidity and Silt Density Index





### SAWS modular skid mounted RO trains

#### Cartridge Sediment Filters



# **Class 1 Injection Well Permitting**



Injection wells authorized by TCEQ under an Underground Injection Control <u>General Permit</u> For Brackish Desal Concentrate Disposal

- 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, mechanical integrity, reservoir mechanics, formation testing program, well stimulation program, injection procedures, area of review, etc.);
- Big advantage is <u>Regulatory review time</u> is streamlined from a previous review time of about 13 months down to about 60 days.
- UIC General Permit issued for period of 10 years.

### **Injection Wells**

- 2 Class I Injection Wells
- Completed in Edwards
- Total Depth of 5,040 5,100 feet
- 800 feet open hole completion
- Concentrate is about 15,000 mg/L
- Native Edwards water salinity 90,000 mg/L TDS
- Injection volume is 1.1 MGD
- Injection rate of up to about 400 GPM each





#### **Construction Difficulties**

- Cementing Long String
  - ✓ Match Caliper volumes
  - ✓ Multistage cementing

### **For More Information Contact**

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