

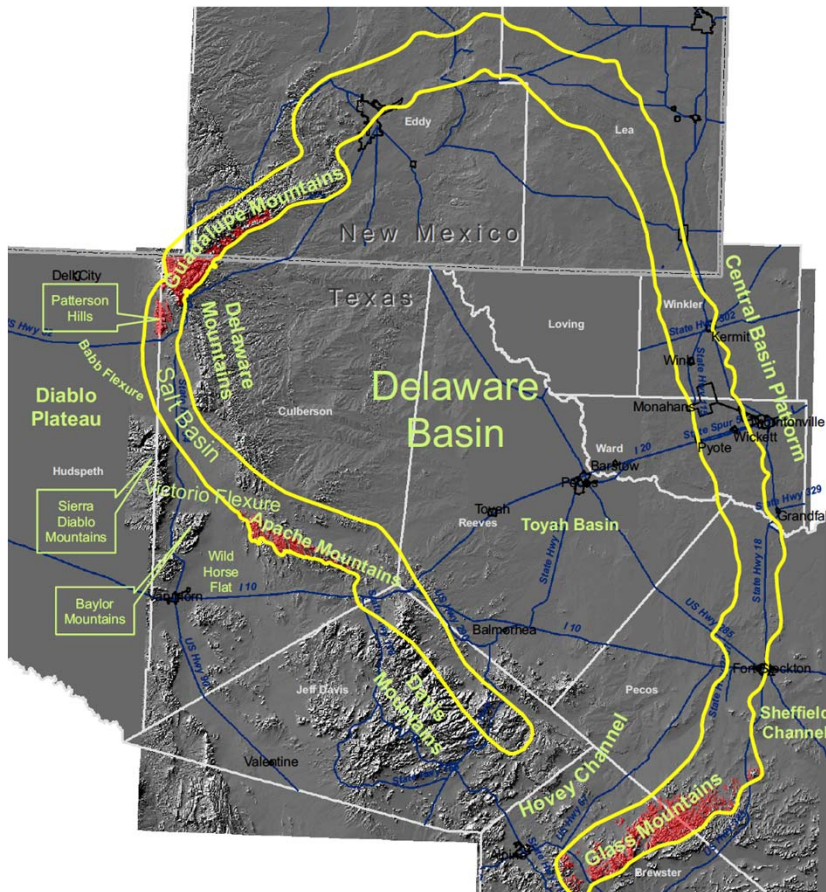


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## **Capitan Reef Treatment Overview**

# Capitan Reef Aquifer

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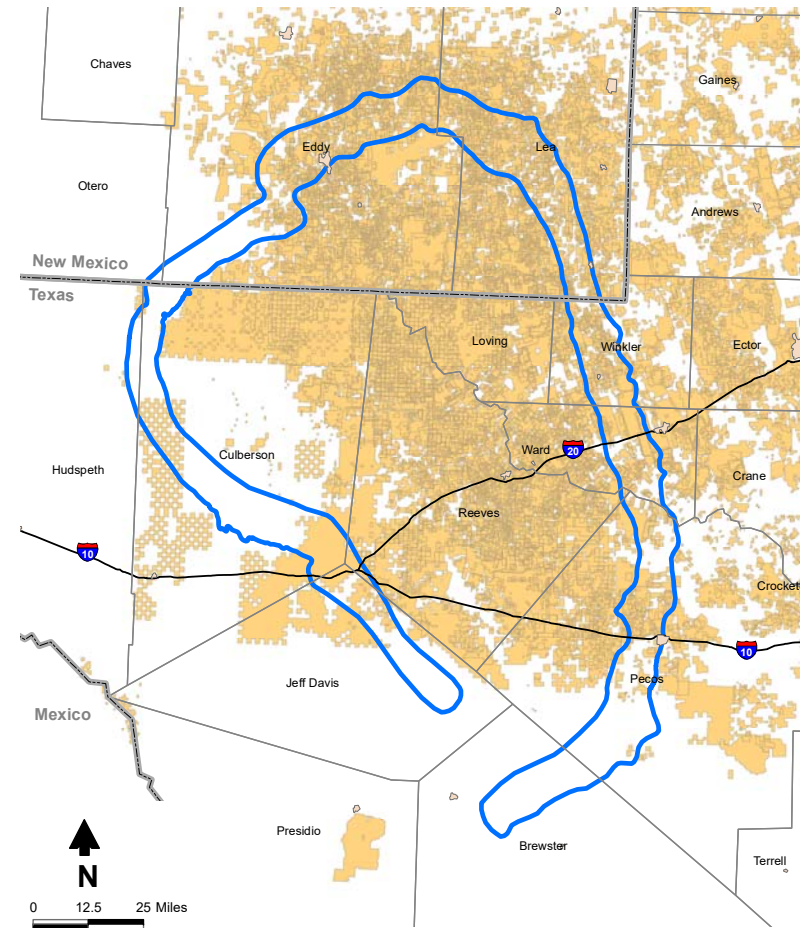
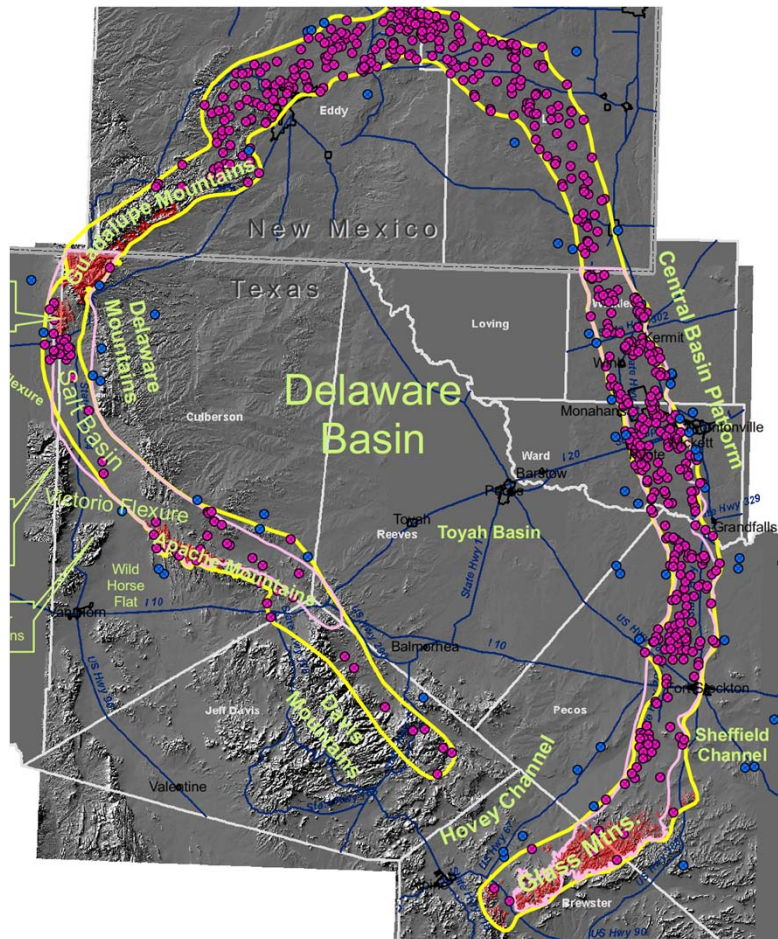
## Capitan Reef Complex Aquifer

- Strategic Water Source for all Delaware Basin Operators
- Horse-Shoe around most of currently leased horizontal well acreage
- 3,500 – 4,500 Vertical Depth Aquifer
- Slightly Brackish
- Just above Bone Spring
- Primary Concerns:
  - H<sub>2</sub>S Aqueous
  - Calcium Sulfate
  - Calcium Carbonate



# Capitan Reef – Data Sets & Operators

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# Capitan Reef Aquifer Pro's & Con's

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## Pro's

- Prolific: 22,000 square miles in far west Texas and southeastern New Mexico
  - Portions of Winkler, Loving, Ward, Pecos, Reeves, Jeff Davis, Culberson, Brewster, Hudspeth in TX; Eddy, Lea in NM
- No water right permits required in NM! No appropriation process! Not contested
  - Only requires a notice to drill
- Economy of Scale: wells can produce 500 GPM, upwards of 1,500 GPM!
  - Santa Rosa wells in NM average 75-100 GPM

## Con's

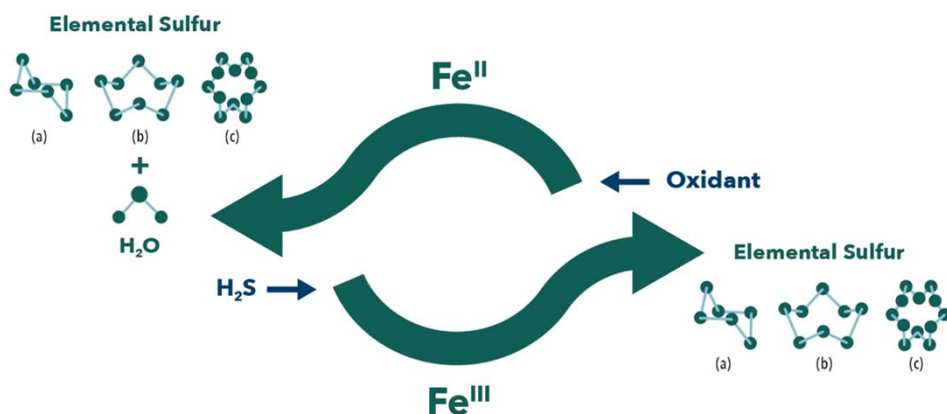
- More expensive well (at least 4,000 ft depth)
- High water variability
- H<sub>2</sub>S & Sulfates always present





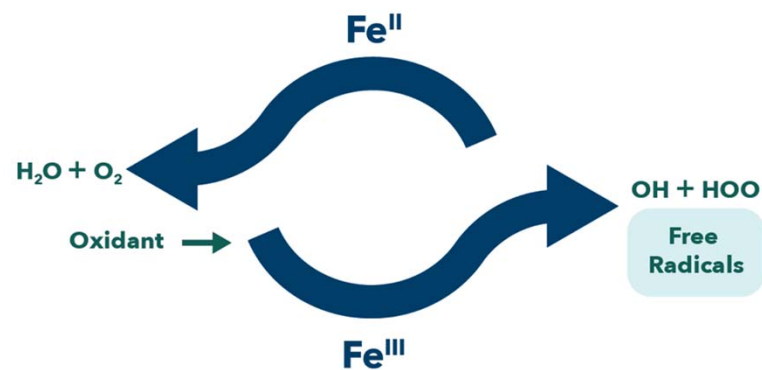
“Talon Reagent” chemistry is catalyzed by a Stabilized Oxidant.  
Based on dosage ratios and water composition, reaction follows two oxidant pathways.

## Sulfide to Sulfur Redox



Class I – Sulfide ( $\text{H}_2\text{S}$ )

## Modified Fenton's Reagent

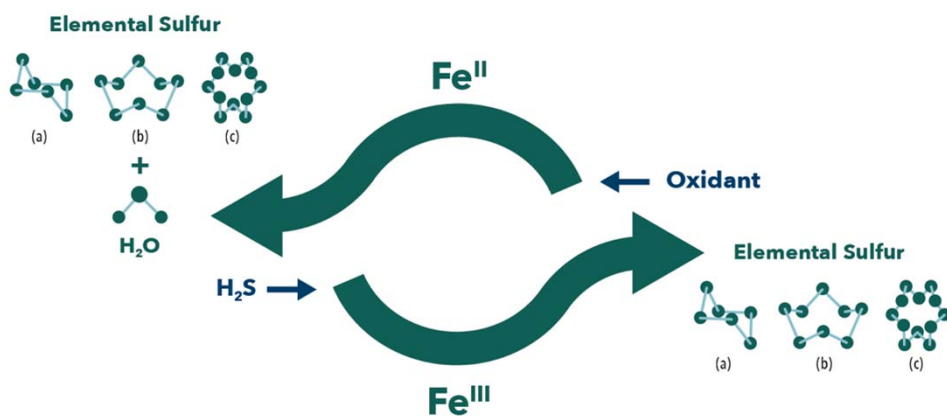


Class II – Phenol, Cyanide, Amine  
Class III – BTEX, MtBE, PCE, TCE, FOG



“Talon Reagent” chemistry is catalyzed by a Stabilized Oxidant.  
Based on dosage ratios and water composition, reaction follows two oxidant pathways.

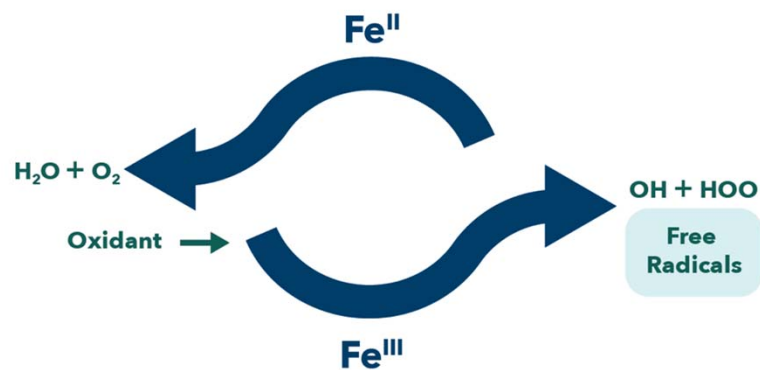
## Sulfide to Sulfur Redox



*Preferential Reaction with  $\text{H}_2\text{S}$  present.*

Class I – Sulfide ( $\text{H}_2\text{S}$ )

## Modified Fenton's Reagent



*Hydroxyl Radical formation at pH 6.3 to 8.3.*

Class II – Phenol, Cyanide, Amine  
Class III – BTEX, MtBE, PCE, TCE, FOG



# Field Trial – Capitan Reef

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## Water Characteristics

- Over 120 PPM H<sub>2</sub>S Aqueous
- Chlorides: 10,000 mg/L
- Low Iron Content
- Calcium & Sulfates Present

## Site Design

- Treatment Requirement: 0 PPM H<sub>2</sub>S
- Flow Rate: 27 BBL / Minute
- Application: Quills & Static Mixers
- Settling: Floc & Drop

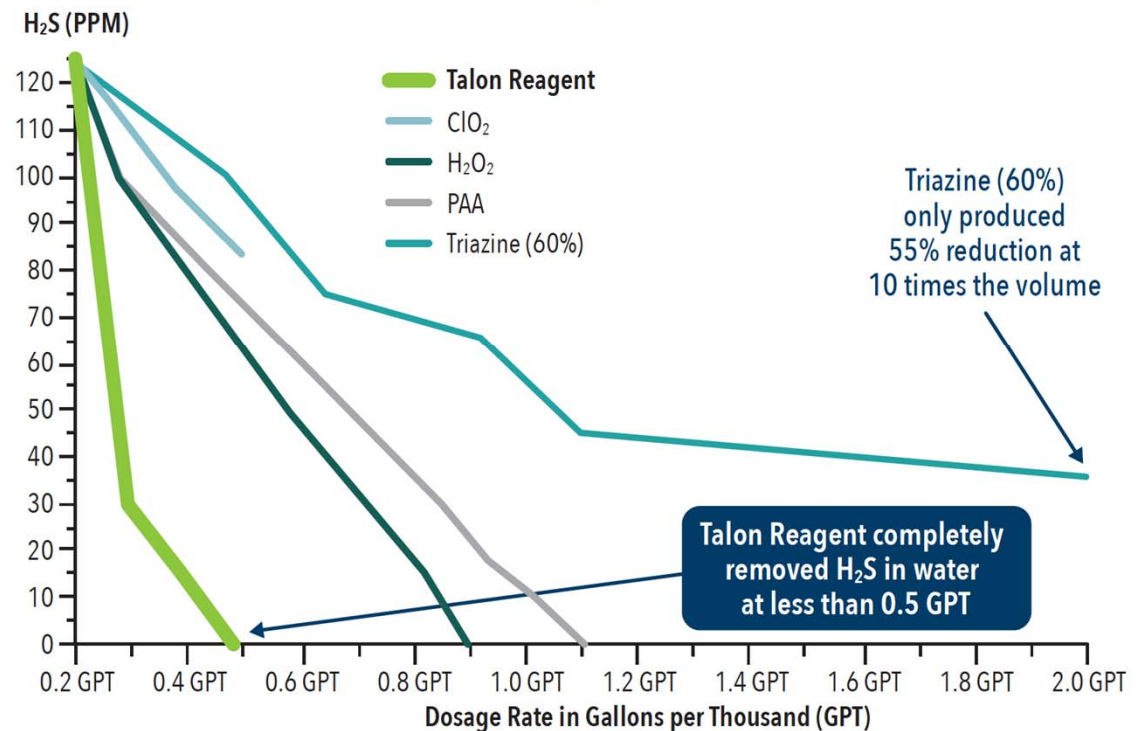


## Case Study – Capitan Reef

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A brackish aquifer well contained 120 PPM  $\text{H}_2\text{S}$  aqueous. A large U.S. operator planned to use the water for stimulation, but could not treat the water effectively enough to meet safety standards. The operator tried numerous solutions, including Chlorine Dioxide, 60% Triazine,  $\text{H}_2\text{O}_2$ , and PAA. Streamline's Talon Reagent System performed 3x better than the nearest competing solution, reducing  $\text{H}_2\text{S}$  to 0 PPM in the effluent, and saving the customer money.

### $\text{H}_2\text{S}$ Treatment in Brackish Aquifer Well





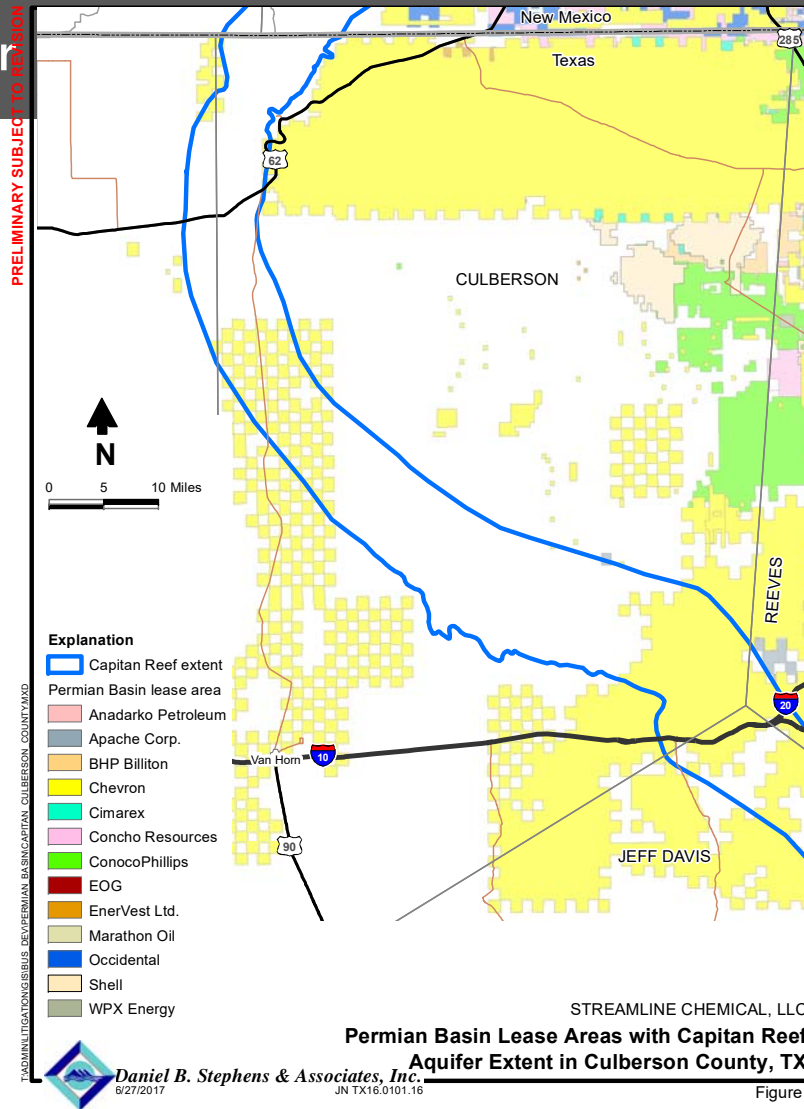


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**Backup Slides**

# Capitan Reef Aquifer

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# Capitan Reef Aquifer

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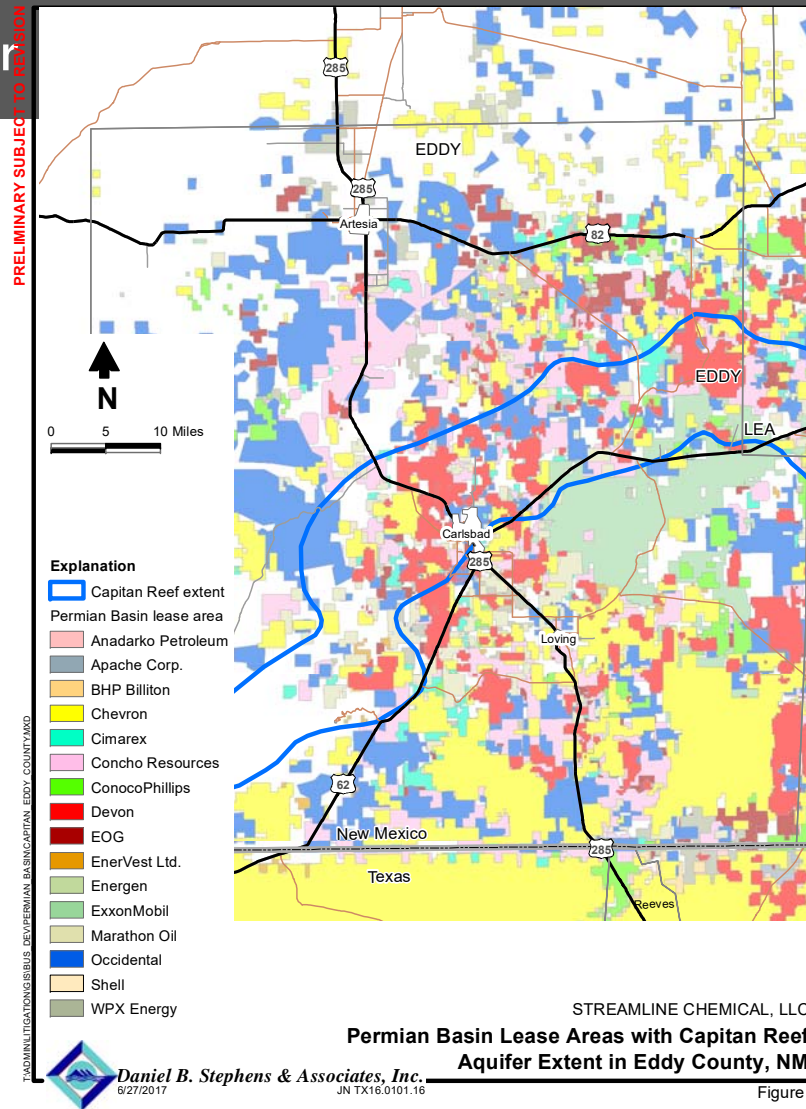
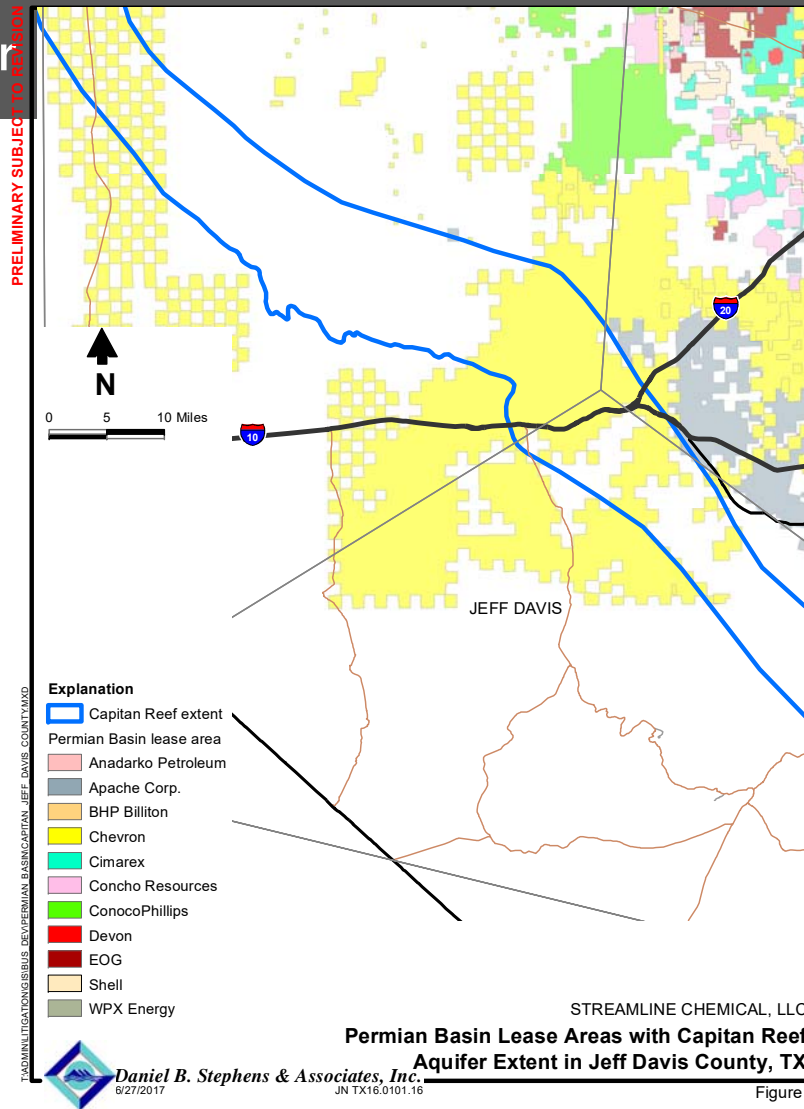


Figure 3



# Capitan Reef Aquifer

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# Capitan Reef Aquifer

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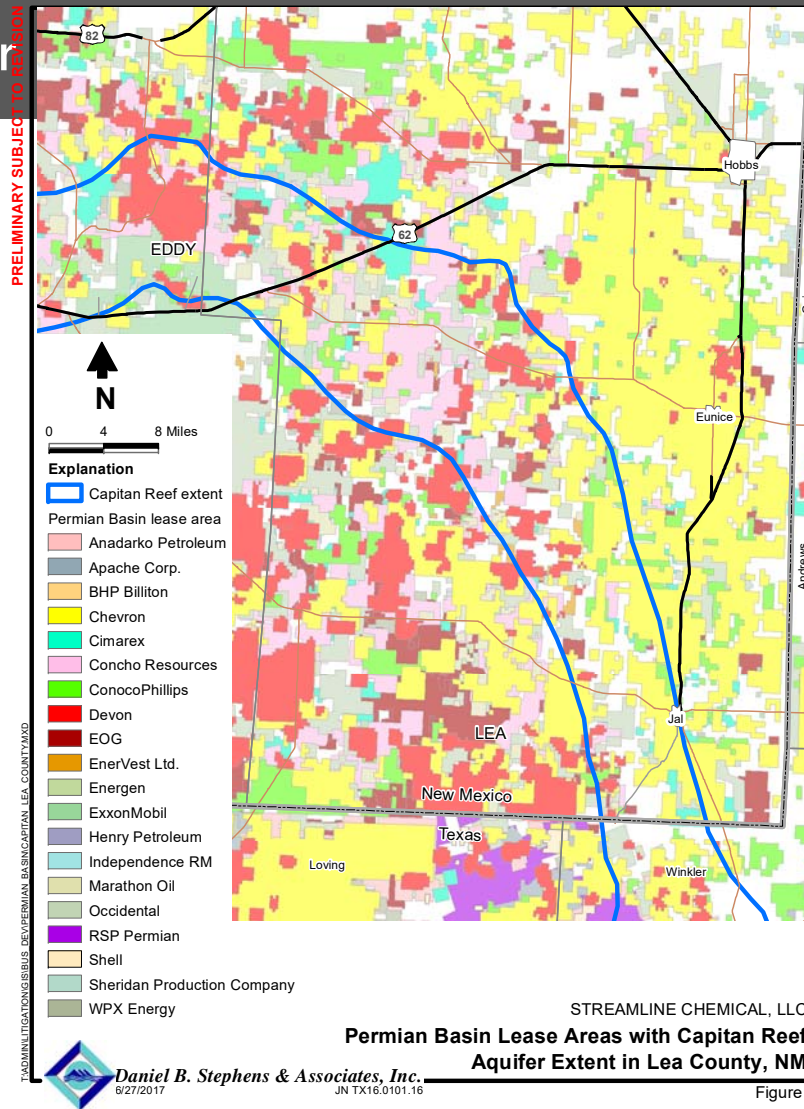
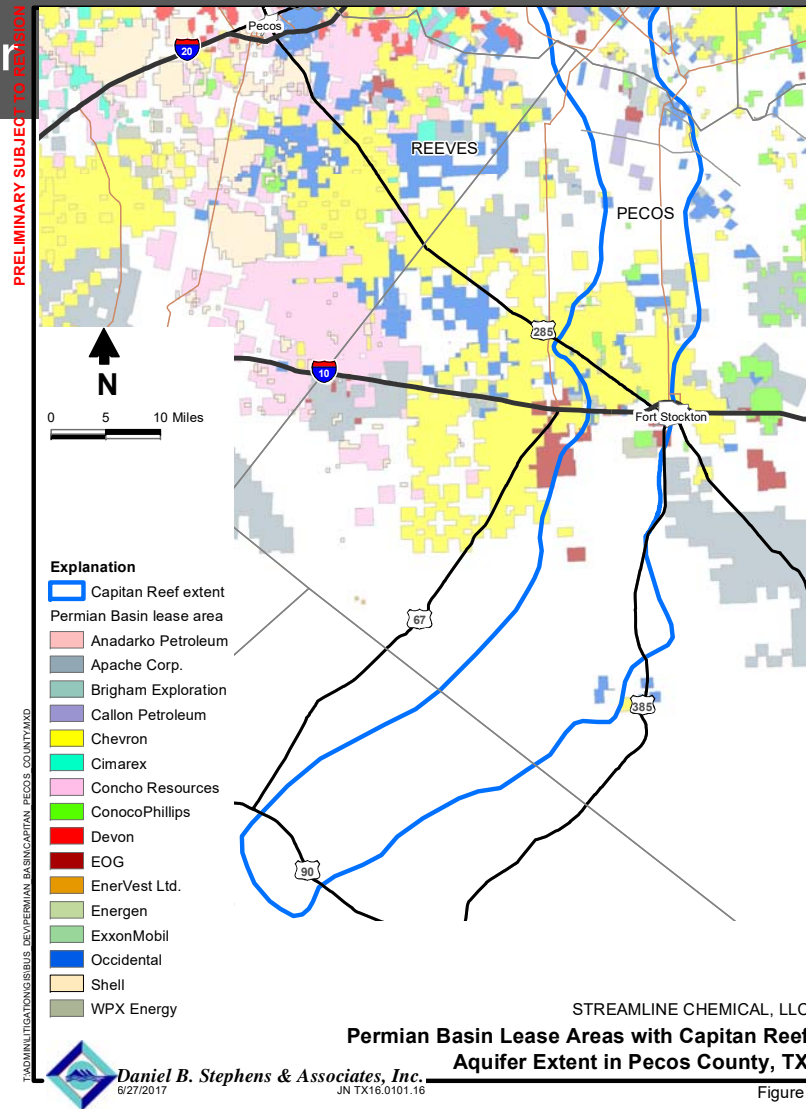


Figure 2



# Capitan Reef Aquifer

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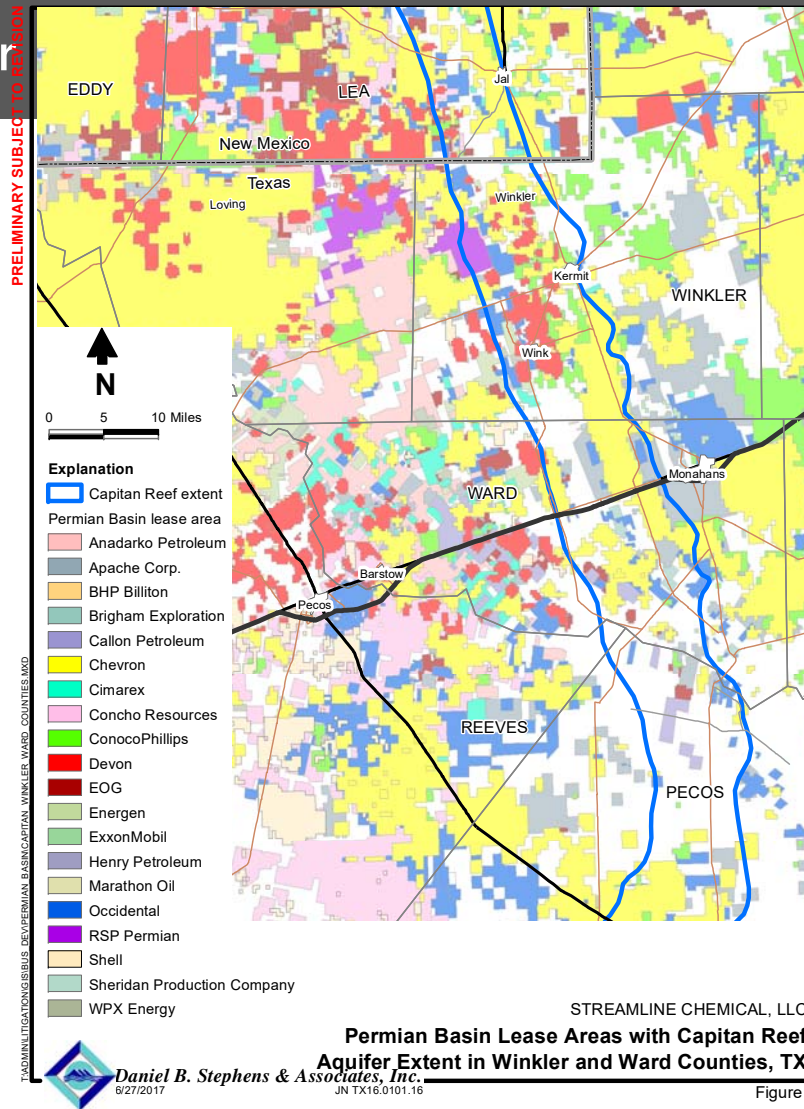


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# Capitan Reef Aquifer

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## Case Study – Storage Tanks

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A central distribution facility contained high levels of H<sub>2</sub>S in storage tanks, causing Health, Safety, and Regulatory concerns for a South Texas operator. Prior to treatment, headspace H<sub>2</sub>S levels reached 140 PPM. The Talon Reagent System rapidly reduced H<sub>2</sub>S concentrations in the sour water influent, bringing aqueous H<sub>2</sub>S levels to 0 PPM. Tank headspace H<sub>2</sub>S levels dropped to below 2 PPM as treated water flowed in at 600 BBL/day. The cost-effective treatment program allowed the operator to reduce risk and responsibly manage produced water.

### H<sub>2</sub>S Treatment in Produced Water Tanks

