

Preliminary Evaluations
of
Brackish Groundwater
for
Region L Water Management Strategies

Prepared for
South Central Texas
Regional Water Planning Group

Prepared by



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May 1, 2008

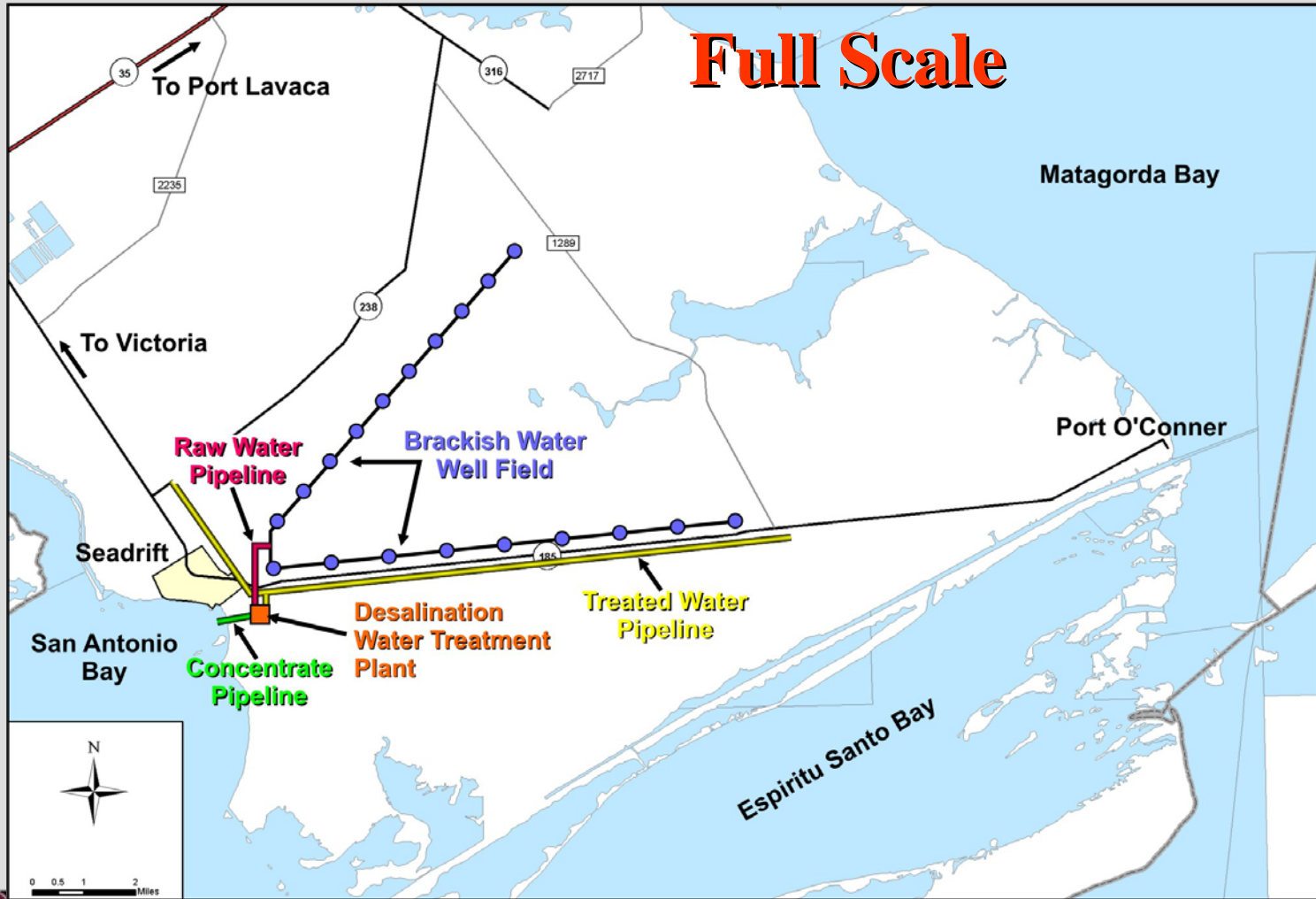
Areas of Interest & Aquifers

Area	Source of Brackish GW
<ul style="list-style-type: none">Southern Calhoun County	<ul style="list-style-type: none">Gulf Coast Aquifer
<ul style="list-style-type: none">Woodsboro-Refugio	<ul style="list-style-type: none">Gulf Coast Aquifer
<ul style="list-style-type: none">Bexar County (SAWS)	<ul style="list-style-type: none">Wilcox AquiferEdwards Aquifer

Southern Calhoun County (SCC)

- Setting
 - Preliminary Study by GBRA shows large residential developments are planned between Seadrift and Port O'Connor
 - Full Scale Development
 - Population: ~36,000
 - Avg Water Demand (new utilities): 5,287 acft/yr
 - Peak Day Water Demand: 11.8 MGD
 - Half Scale Development
 - Quarter Scale Development

Southern Calhoun Co Water Strategy



SCC Features of Water Strategy

Full Scale

- Capacity
 - Avg Annual: 5,287 acft
 - Avg Annual: 4.72 MGD
 - Peak Day: 11.8 MGD
 - Peak Well Field: 15.26 MGD
- Wells
 - Number: 19
 - Yield: 700 gpm
 - Depth: 300 ft
 - Spacing: 1.0 mi
- Brackish GW
 - Cl: ~1,600 mg/L
 - TDS: ~4,000 mg/L
- Treatment
 - Reverse Osmosis
 - 88% to Desal
 - 75% Recovery
 - 12% Blended
- Treated Water (mg/L)
 - Cl: ~200
 - TDS: ~500
- Concentrate Disposal
 - Peak Rate: 3.46 MGD
 - TDS Concentration: ~10,000 mg/L
 - Location: San Antonio Bay

Southern Calhoun Co Estimated Costs

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Cost Category	Full Scale	Half Scale	Quarter Scale
Capital	\$40,849,000	\$24,716,000	\$14,899,000
Project	\$58,096,000	\$35,247,000	\$21,322,000
Annual	\$8,417,000	\$4,820,000	\$2,740,000
Yield (acft)	5,287	2,644	1,322
Per acft	\$1,592	\$1,823	\$2,073
Per 1,000 gal	\$4.88	\$5.59	\$6.36



SCC Implementation Issues

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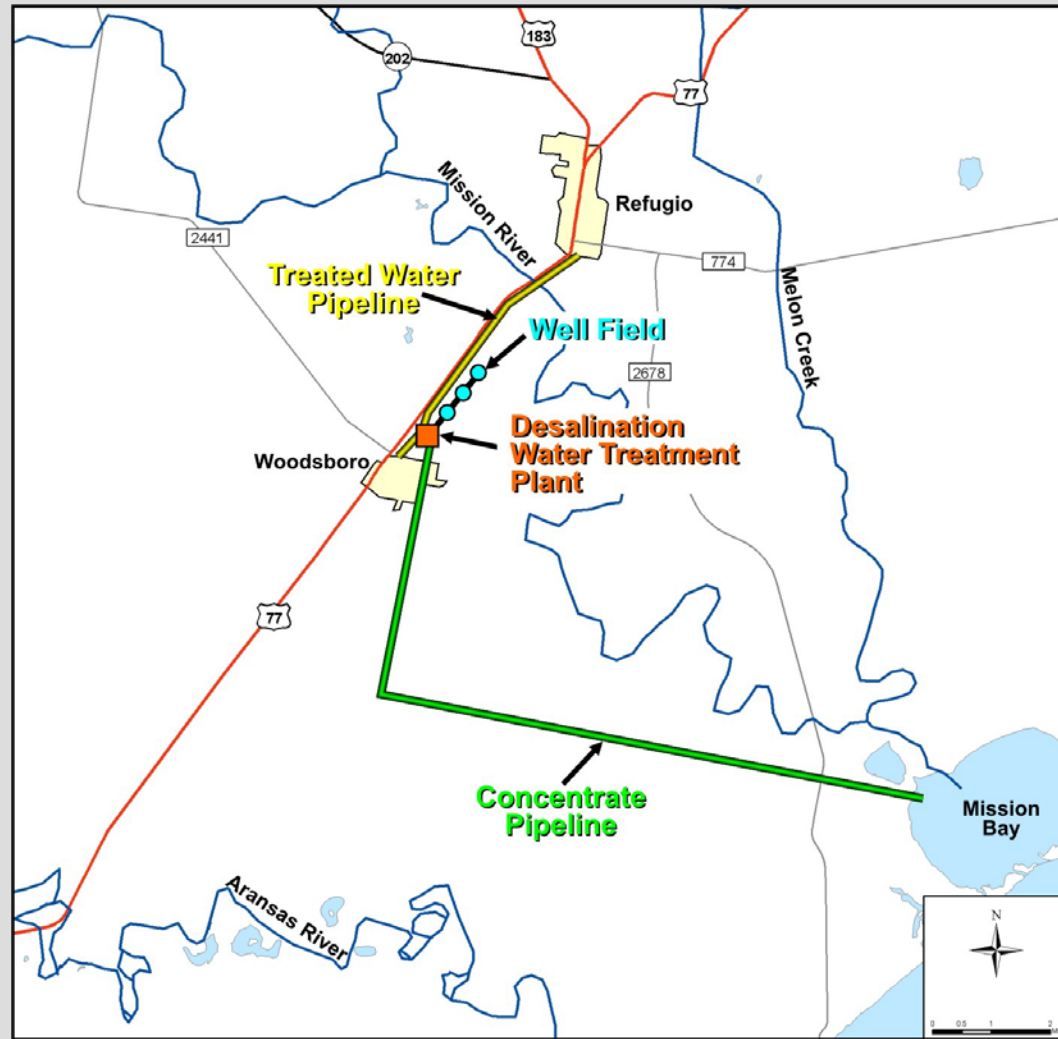
- Permitting of Concentrate Discharge to San Antonio Bay
- Verification of Gulf Coast Aquifer Water Yield and Availability
- Purchase or Lease of Property for Well Field

Woodsboro-Refugio (W-R) Water Strategy

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- Setting
 - Woodsboro
 - Water Quality issues
 - Replacement of existing water system
 - Refugio
 - System considered to be adequate for current demand
 - Growth in demands would be provided by Water Strategy
 - Average Daily Water Demand (2060)
 - Woodsboro: 0.22 MGD
 - Refugio (growth only): 0.20 MGD
 - Woodsboro and Refugio (growth only): 470 acft/yr

Woodsboro-Refugio Water Strategy



W-R Features of Water Strategy

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- Capacity
 - Avg Annual: 470 acft
 - Avg Annual: 0.42 MGD
 - Peak Day: 0.85 MGD
 - Well Field: 0.96 MGD
- Wells
 - Number: 3
 - Yield: 400 gpm
 - Depth: 600 ft
 - Spacing: 0.5 mi
- Brackish GW (mg/L)
 - Cl: 300-500
 - TDS: 900-1,400
- Treatment
 - Reverse Osmosis
 - 50% to Desalination
 - 80% Recovery
 - 50% Blended
- Treated Water (mg/L)
 - Cl: ~200
 - TDS: ~500
- Concentrate Disposal
 - Peak Rate: 0.11 MGD
 - TDS: ~7,500 mg/L
 - Location: Mission Bay

Woodsboro-Refugio Estimated Costs

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- Total Capital Cost: \$ 6,403,000
- Total Project Cost: \$ 10,238,000
- Total Annual Cost: \$ 1,094,000
- Project Yield (acft/yr): 470
- Annual Cost of Water:
 - Per Acft \$ 2,325
 - Per 1,000 gallons \$ 7.13



W-R Implementation Issues

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- Permitting of Concentrate Discharge to Mission Bay
- Purchase or Lease of Property for Well Field

SAWS-Local Wilcox Water Strategy

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- **Setting**

- SAWS

- Advancing research and plans to develop a brackish water supply from the Wilcox Aquifer

- Well Field

- Southern Bexar, Northern Atascosa, and Western Wilson Counties

- Water Treatment Plant

- South Bexar County

- Delivery Points

- Northwest San Antonio Pump Stations

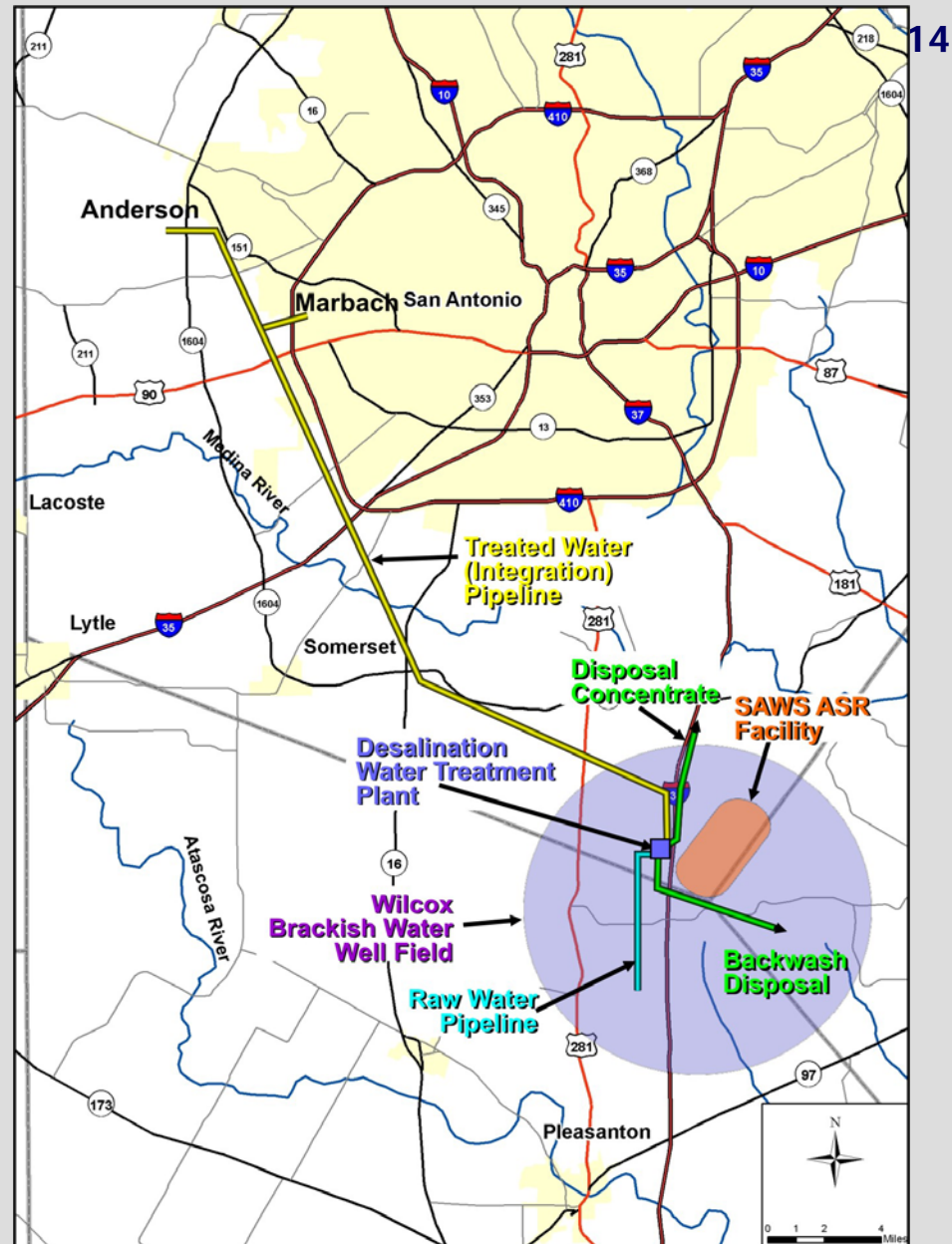
- Concentrate Disposal

- Depleted Oil and Gas Field

- Capacity

- 28,000 acft/yr (25 MGD)

SAWS-Local Wilcox Water Strategy



SAWS-Local Wilcox Features of Water Strategy

- Capacity
 - Avg Annual: 28,000 acft
 - Avg Annual: 25.0 MGD
 - Peak Day: 25.0 MGD
 - Well Field: 29.0 MGD
- Wells
 - Number: 27
 - Yield: 750-1,000 gpm
 - Depth: 1,500-3,000 ft
 - Spacing: ~0.5 mi
- Brackish GW (mg/L)
 - TDS: 1,300-1,500
- Treatment
 - Reverse Osmosis
 - 70% to Desalination
 - 75% Recovery
 - 30% Blended
- Treated Water (mg/L)
 - TDS: 450-500
- Concentrate Disposal
 - Rate: 4.0 MGD
 - TDS: ~7,500 mg/L
 - Location: Depleted Oil and Gas Field

SAWS-Local Wilcox Estimated Costs

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SAWS Estimates

- Total Capital Cost: \$ 197,223,000
- Total Project Cost: \$ 299,233,000
- Total Annual Cost: \$ 38,499,000
- Project Yield (acft/yr): 28,000
- Annual Cost of Water:
 - Per Acft \$ 1,375
 - Per 1,000 gallons \$ 4.22

Region L Review

- SAWS estimate seem to be about 10% too low, mostly due to:
 - Integration Pipeline
 - Number of Wells



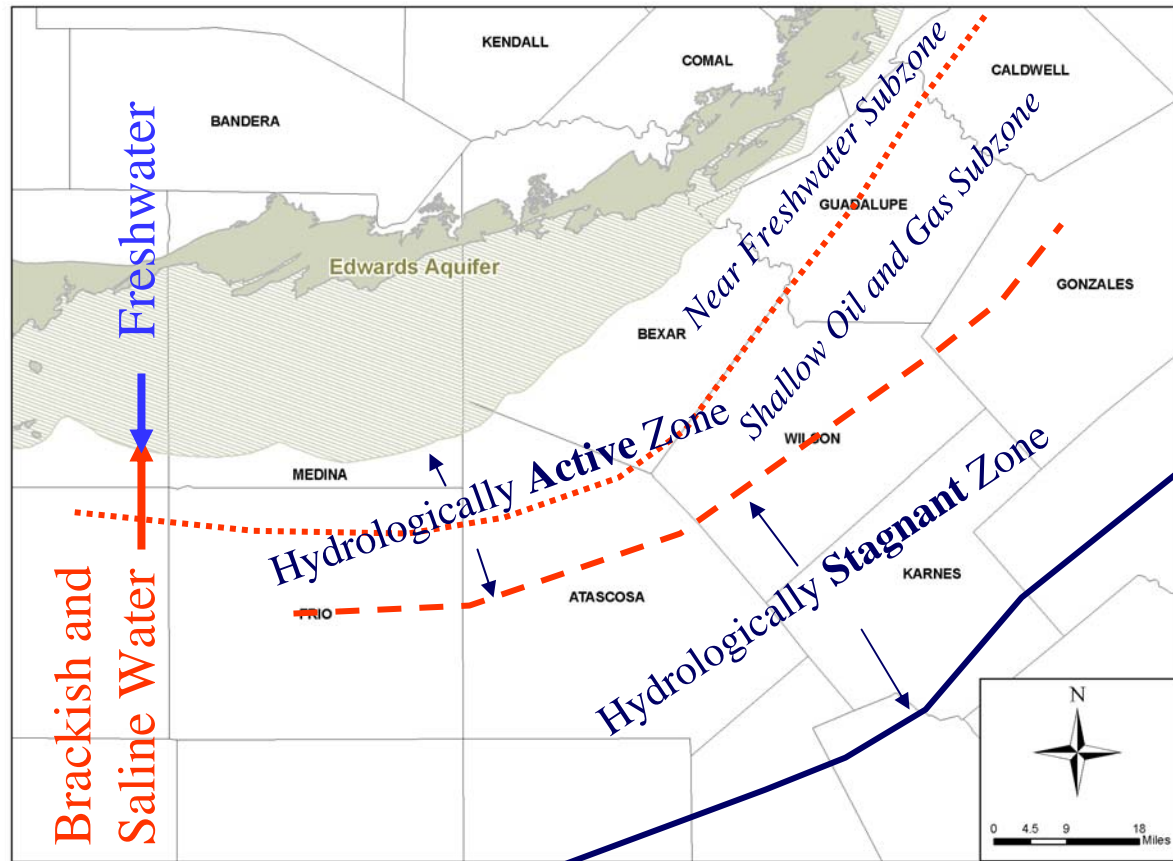
SAWS-Local Wilcox Implementation Issues

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- Verification of Wilcox Aquifer Water Yield and Water Quality Characteristics
- Potential Adverse Impact on other Aquifers
- Permitting of Concentrate Discharge to Depleted Oil and Gas Field
- Permitting Wells with Local Groundwater District
- Purchase or Lease of Property for Well Field

Brackish Edwards Water Strategy

- Saline Zones of Edwards



Modified from Groshen and Buszka (1997)

Brackish Edwards Water Strategy

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- **Setting**

- SAWS

- Advancing research to better characterize the potential of brackish water in the Edwards for public water supply

- Well Field

- Southern Bexar County

- Water Treatment Plant

- Southern Bexar County

- Delivery Point

- SAWS Twin Oaks Water Treatment Plant
 - ASR
 - East Side Pipeline to Artesia Pump Station

- Concentrate Disposal

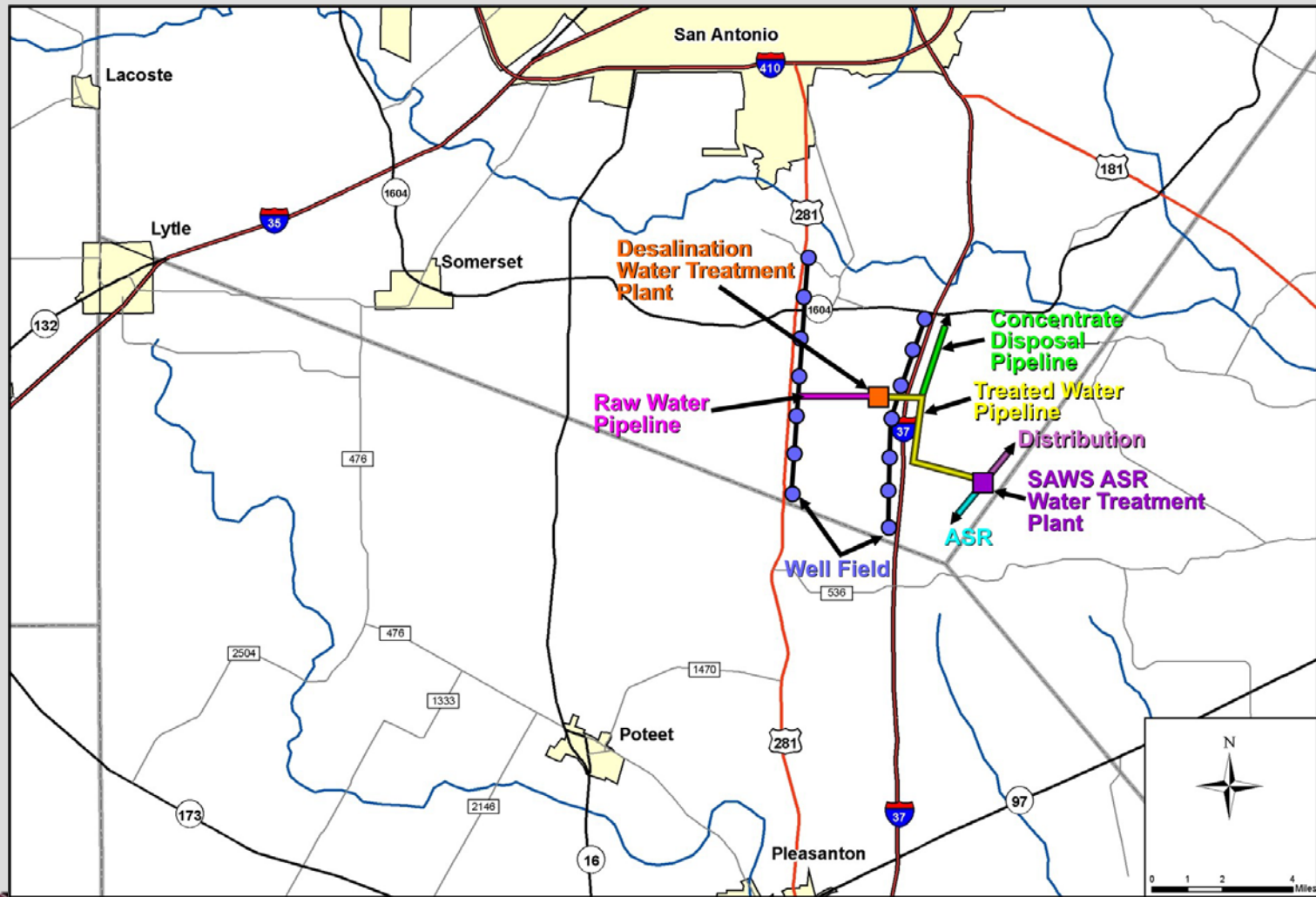
- Depleted Oil and Gas Field

- Capacity

- 18,000 acft/yr (16 MGD)



Brackish Edwards Water Strategy



Brackish Edwards Features of Strategy

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- Capacity
 - Avg Annual: 18,000 acft
 - Avg Annual: 16.0 MGD
 - Peak Day: 16.0 MGD
 - Well Field: 20.0 MGD
- Wells
 - Number: 14
 - Yield: 800-1,200 gpm
 - Depth: 4,500-5,000 ft
 - Spacing: ~1.0 mi
- Brackish GW
 - TDS: 4,500 mg/L
 - Temperature: 98°F
- Treatment
 - Reverse Osmosis
 - 90% to Desal
 - 75% Recovery
 - 10% Blended
- Treated Water (mg/L)
 - TDS: 450-500
- Concentrate Disposal
 - Rate: 4.0 MGD
 - TDS Concentration: ~18,000 mg/L
 - Location: Depleted Oil and Gas Field



Temperature: 98°F

Brackish Edwards Estimated Costs

- Total Capital Cost: \$ 93,136,000
- Total Project Cost: \$ 136,981,000
- Total Annual Cost: \$ 17,028,000
- Project Yield (acft/yr): 17,924
- Annual Cost of Water:
 - Per Acft \$ 950
 - Per 1,000 gallons \$ 2.92

Brackish Edwards Implementation Issues

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- Safety Issues Associated with the Potential Production of Hydrogen Sulfide with Raw Water
- Verification of Water Yielding and Water Quality Characteristics
- Analysis of Potential Depletion of Freshwater from Edwards
- Permitting of Concentrate Discharge to Depleted Oil and Gas Field
- Permitting with Local Groundwater District and/or Edwards Aquifer Authority
- Purchase or Lease of Property for Well Field

Summary

STRATEGY	YIELD (ACFT/YR)	UNIT COST (acft/yr)	REMARKS
Southern Calhoun County (Full Scale)	5,287	\$ 1,592	Water delivered to master meters at front of developments
Southern Calhoun County (Half Scale)	2,644	\$ 1,823	
Southern Calhoun County (Quarter Scale)	1,322	\$ 2,073	
Woodsboro- Refugio	470	\$ 2,325	Water delivered to existing city water distribution systems
SAWS-Local Wilcox	28,000	\$ 1,375	Water delivered to distribution centers in northwest San Antonio
Edwards Brackish	18,000	\$950	Water delivered to SAWS Twin Oaks WTP



Brackish GW Desalination Strategies

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Comments and Questions