Brackish Groundwater Desalination in Texas

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Outline

Acquire Brackish Groundwater → Treat Brackish Groundwater (Desalination) → Treated Water Distribution

- Geological
- Legal/Regulatory

Brine Disposal
Outline

1. Acquire Brackish Groundwater
2. Treat Brackish Groundwater (Desalination)
3. Treated Water Distribution
4. Brine Disposal

Subcategories:
- Geological
- Legal/Regulatory
Outline

Acquire Brackish Groundwater

Geological

Legal/Regulatory

Treat Brackish Groundwater (Desalination)

Treated Water Distribution

Brine Disposal

Texas State Flag
Estimated Brackish Groundwater

Felder et al. (1965) Preliminary map of the conterminous United States showing depth to and quality of shallowest ground water containing more than 1,000 parts per million dissolved solids. Hydrologic Atlas 199.
Estimated Brackish Groundwater
Estimated Brackish Groundwater
4% Groundwater Withdrawn, High TDS

Vast Brackish Groundwater Resources in Texas

- 20 Most Populous Texas Cities
- Interstate Highways
- Brackish Aquifers*

*Regions underlain by one or more aquifers where Total Dissolved Solids (TDS) are between 1,000 and 10,000 milligrams per liter (mg/L)

Source: TWDB
Expanding, Multi-sector Use of Brackish Groundwater in Texas

Texas Desalination Plant Database.
Desalination Plants in Texas
Outline

Acquire Brackish Groundwater
  Geological
  Legal/Regulatory

Treat Brackish Groundwater (Desalination)

Treated Water Distribution
  Brine Disposal
Tensions on Texas Groundwater

GROUNDWATER \[\xrightarrow{\text{Rule of Capture}}\] Landowners
Tensions on Texas Groundwater

GCDs \(\xrightarrow{\text{Statutory Authority to Regulate}}\) GROUNDWATER \(\xrightarrow{\text{Rule of Capture}}\) Landowners
Tensions on Texas Groundwater

Federal Courts

State Courts

Legislature

GCDs

GROUNDWATER

Landowners

Statutory Authority to Regulate

Rule of Capture
Tensions on Texas Groundwater

Federal Courts

State Courts

Legislature

GCDs

GROUNDWATER

Landowners

Statutory Authority to Regulate

Rule of Capture

Environmental Flows

Potential Takings Liability
Map of TX Groundwater Conservation Districts

Legend
- Shale Plays
- GCDs

Data source: TWDB, USGS
## 9 Groundwater Conservation Districts have Brackish Rules

<table>
<thead>
<tr>
<th>GCD</th>
<th>Permit Length</th>
<th>Production Limit</th>
<th>Well Spacing</th>
<th>Reporting</th>
<th>Mechanical Well Tests</th>
<th>Brine Disposal Plan</th>
<th>Casing Requirements</th>
<th>Monitoring Wells</th>
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9 Groundwater Conservation Districts have Brackish Rules

Outline

Acquire Brackish Groundwater

Geological

Legal/Regulatory

Treat Brackish Groundwater (Desalination)

Treated Water Distribution

Brine Disposal
Brine Disposal Considers Cost and Environmental Impact

- Surface Water Body (Inland vs. Coastal)
- Evaporation Ponds
- Deep Well Disposal (El Paso)
- [Wastewater Treatment Plant]
- [Land Application]
Brine Disposal in Texas

Groundwater Plants Disposal (Designed Production)

- Evaporation Pond
- Land Application
- WWTP
- Other
- Surface Water Body
- Well Disposal
- Not Reported

Total: 53 MGD

Surface Water Plants Disposal (Designed Production)

- Evaporation Pond
- WWTP
- Other
- Surface Water Body

Total: 22 MGD

Disposal, as reported in the Texas Desalination Plant Database
Conclusion

- Brackish groundwater is prolific and a potentially game-changing resource in Texas
- Brackish groundwater can be used for mining and cooling with minimal treatment
- Desalination of brackish groundwater for public supply is steadily increasing
- Since legal framework is firmly entrenched and unlikely to change, creative solutions that work within the current framework to incentivize development of brackish groundwater resources are essential
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