Back To The Future With Brackish Groundwater:

Developing A Valuable Texas Resource

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Texas Desal 2017

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INTERPRETATION OF ELECTRIC LOGS IN FRESH WATER WELLS IN UNCONSOLIDATED FORMATIONS

by

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ABSTRACT

Evaluations of wells drilled for fresh water present special problems in log analysis. In such analyses the problem is not to distinguish between two types of fluid, as in the evaluation of oil prospects, but to determine the quality and quantity of water that may be obtained from various strata.

In oil field interpretation R_w determination through SP analysis is usually satisfactory. There, the interrelations between concentration, activity, and resistivity are well established because NaCl is the dominant salt in solution. However, in fresh water other ions become important and the NaCl interrelationship does not apply. The SP is used for determination of fresh water quality, but firm empirical data for the locale are required.

Measurements of resistivity provide the means for determining relative productivities of fresh water sands. Unconsolidated sands generally exhibit uniformly high porosities; however, a surface conductance effect in fresh water sands causes the formation resistivity factor to vary with both R_w and grain size. Because permeability is related to grain size, resistivity values indicate relative productivity.

INTRODUCTION

Volumes have been written on the interpretation of electric logs in the search for oil and gas. But little has been published on interpretations of logs run in wells drilled for fresh water. The search for suitable sources of fresh water is important – – and continues to grow in importance each year. Needed are better methods of exploration and evaluation of water resources. The many electric logs that have been run offer an important source of data for exploration. And logs recorded in water wells can be used for evaluation of the fresh water sands.

However, interpretation methods developed by the petroleum industry do not directly apply for water wells. In general, effects due to the interstitial water itself – – its ionic make-up and the fact that its resistivity is about two orders of magnitude higher than that of oil field connate waters – – require a change in some concepts.

Furthermore, the water well industry is interested in evaluation of parameters different from those most important in oil wells. The hydrologist and water well engineer want

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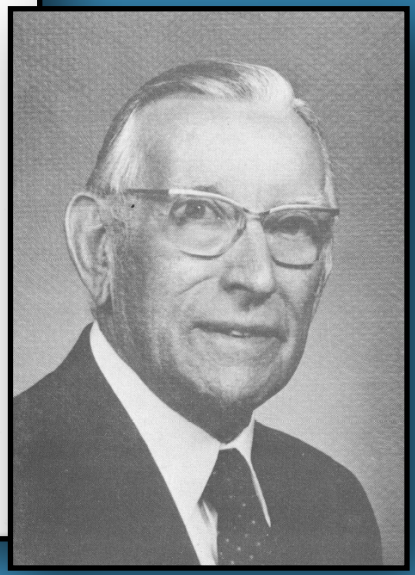

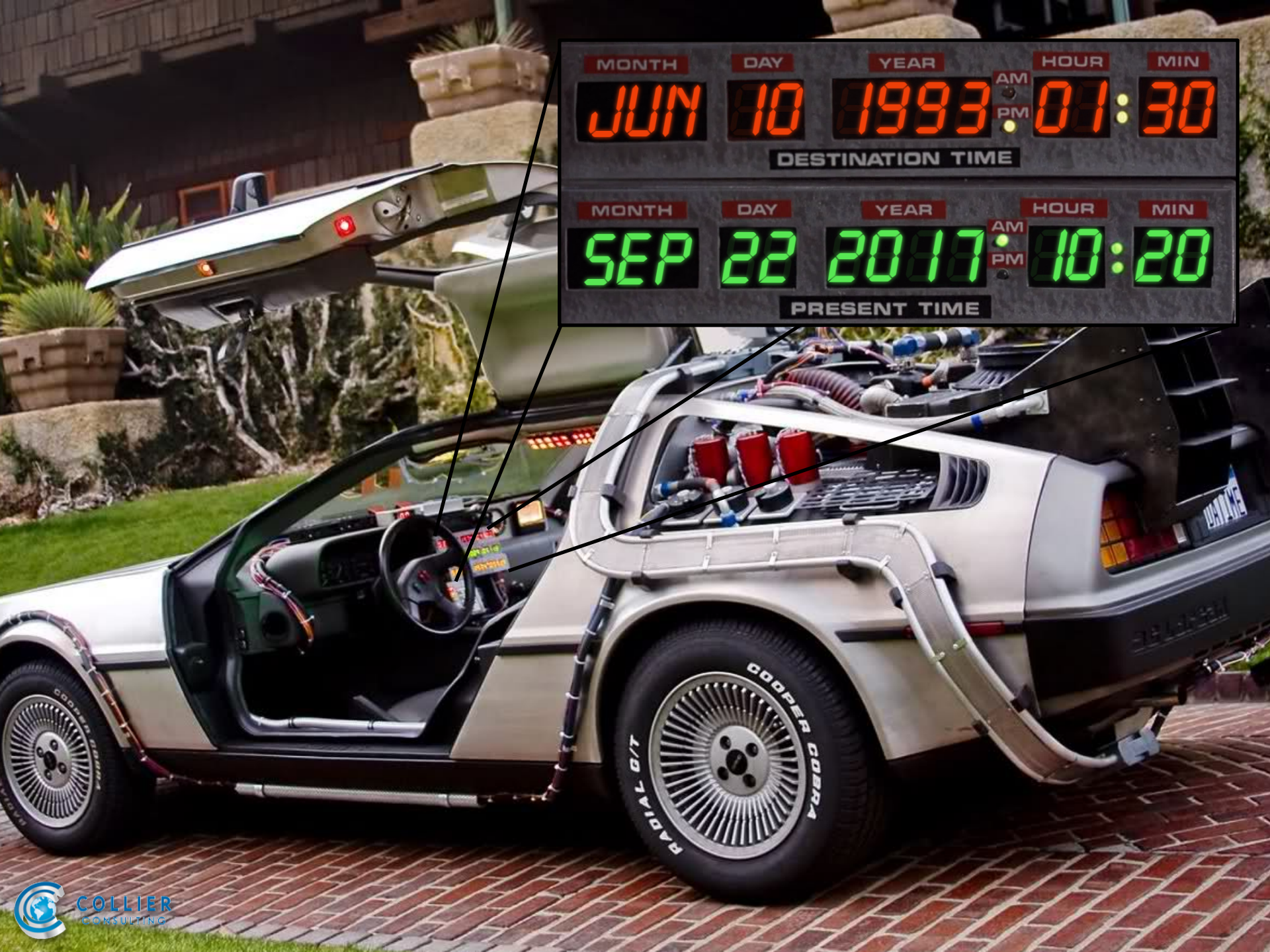
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Borehole Geophysical Techniques for Determining the Water Quality and Reservoir Parameters of Fresh and Saline Water Aquifers in Texas

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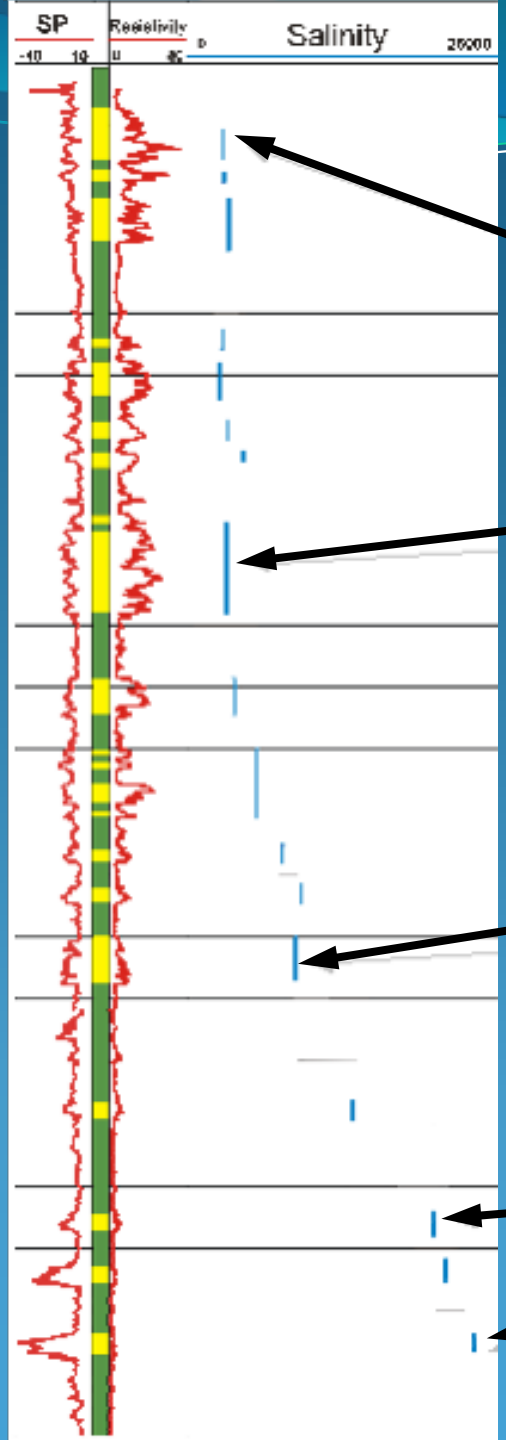
Calculated TDS Values (mg/L)



500’

1,000’

1,500’

2,000’

700

1,000

3,000

10,000

20,000

= Shale

= Sand

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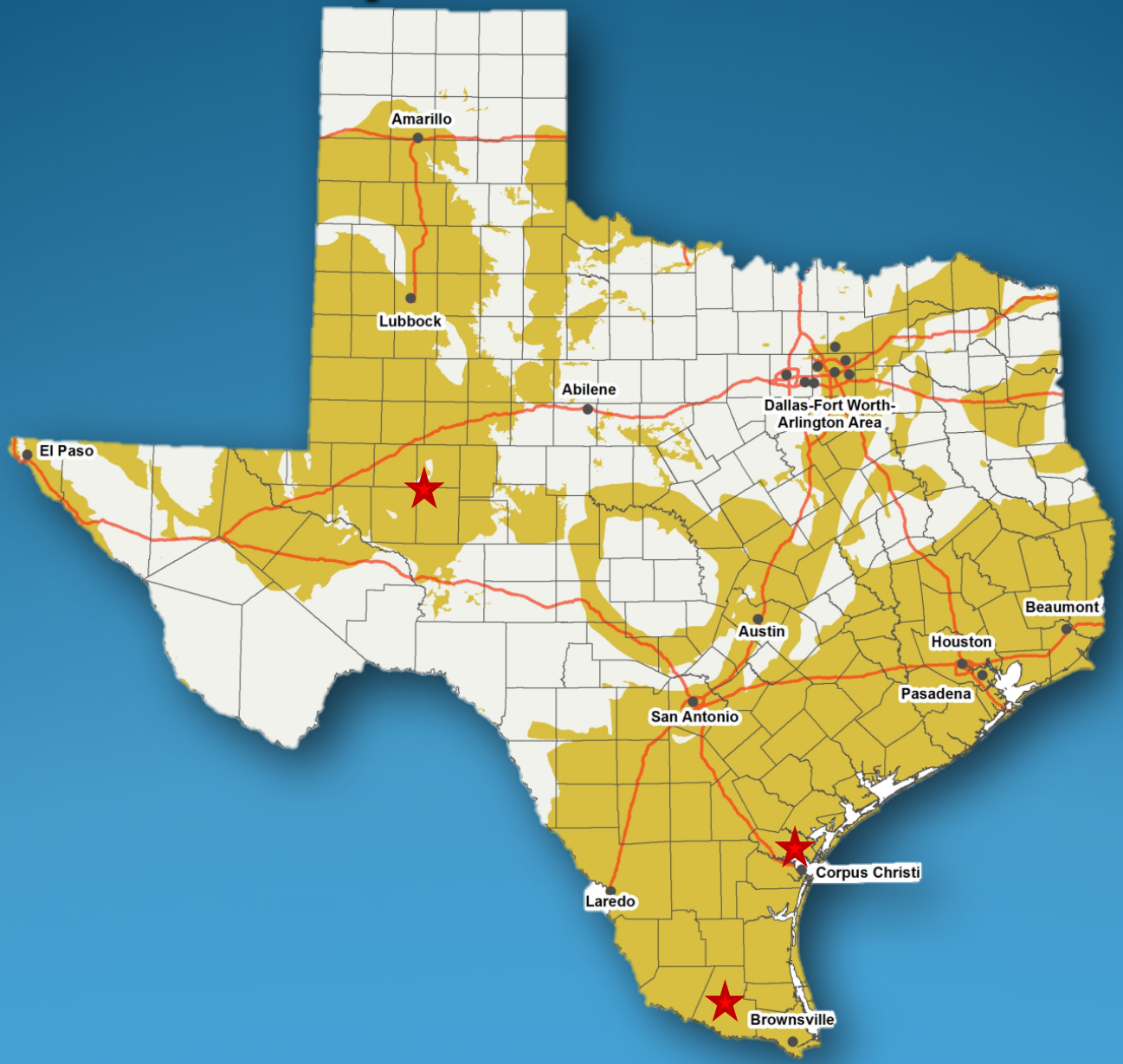
Brackish Aquifers – Case Studies



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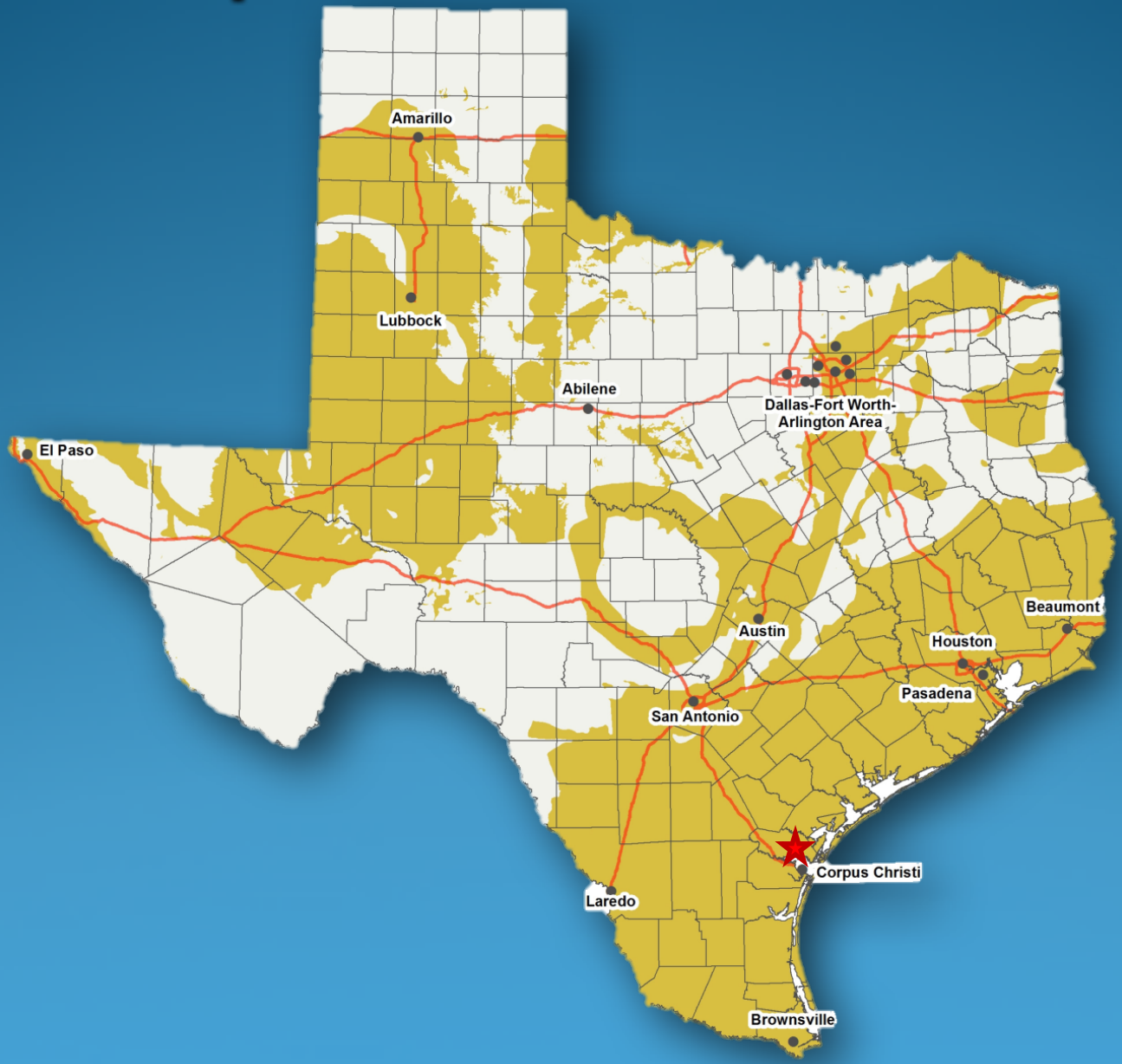
Brackish Aquifers – San Patricio County



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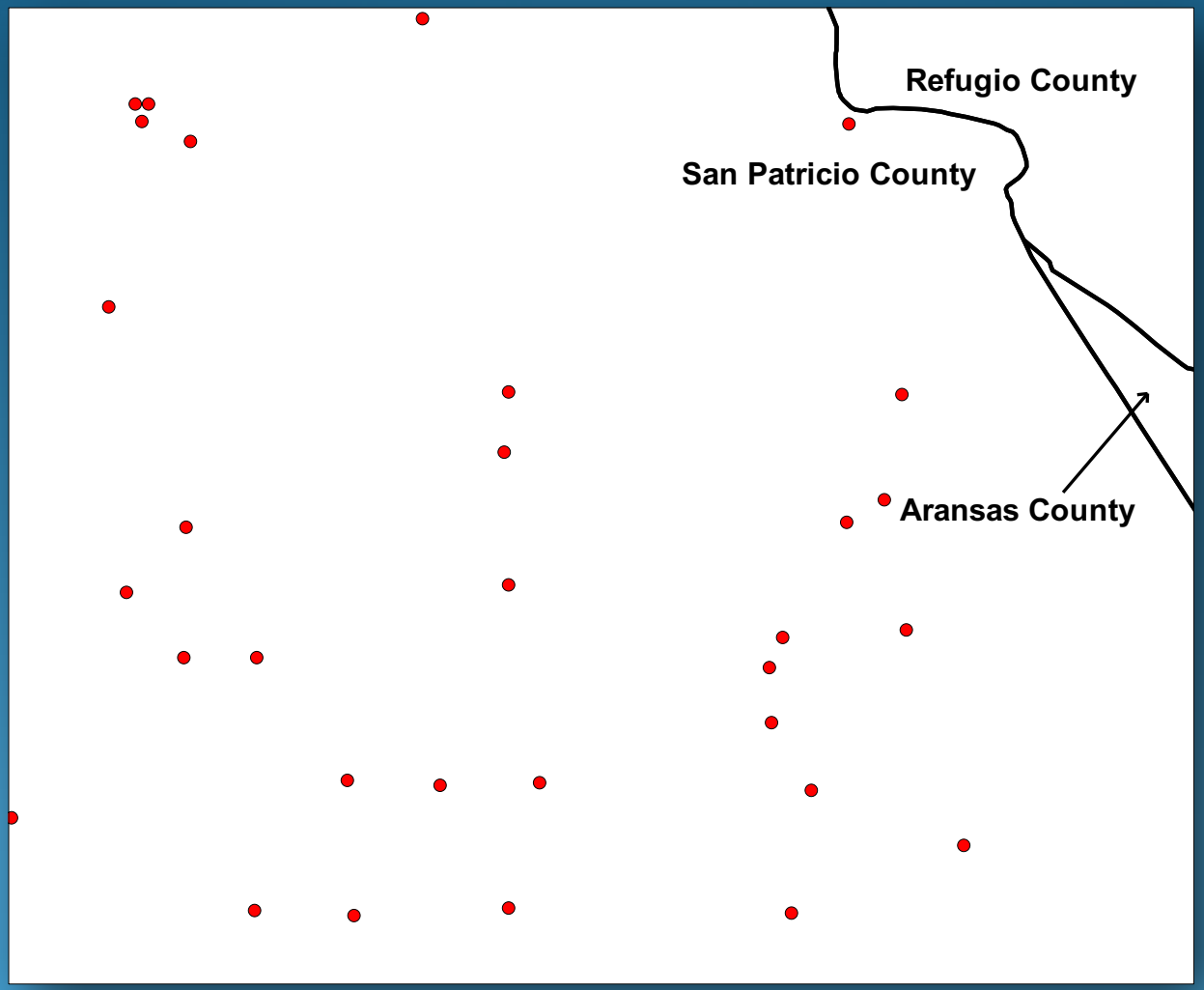
Located Water Wells



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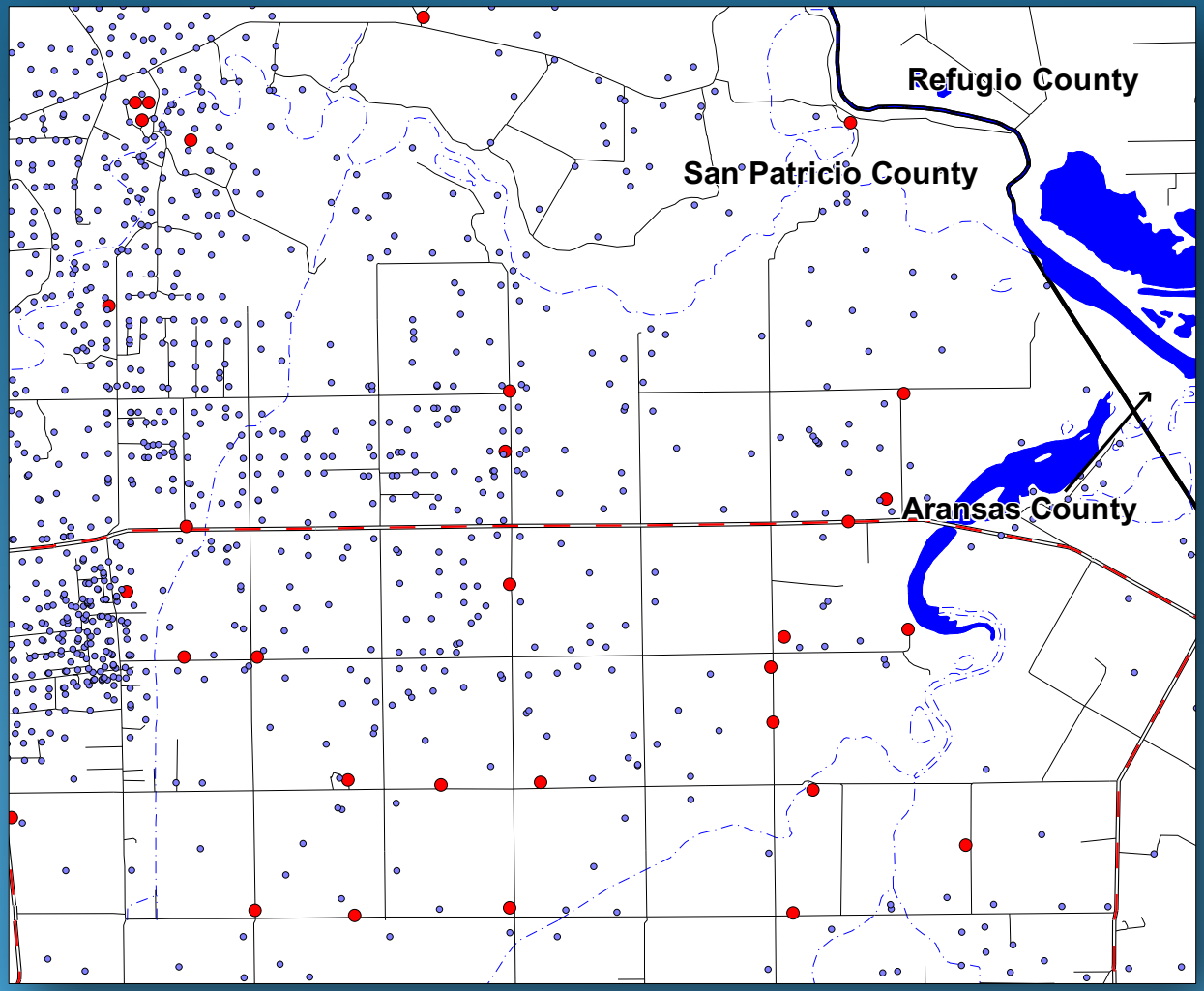
Borehole Geophysical Logs from Petroleum Tests



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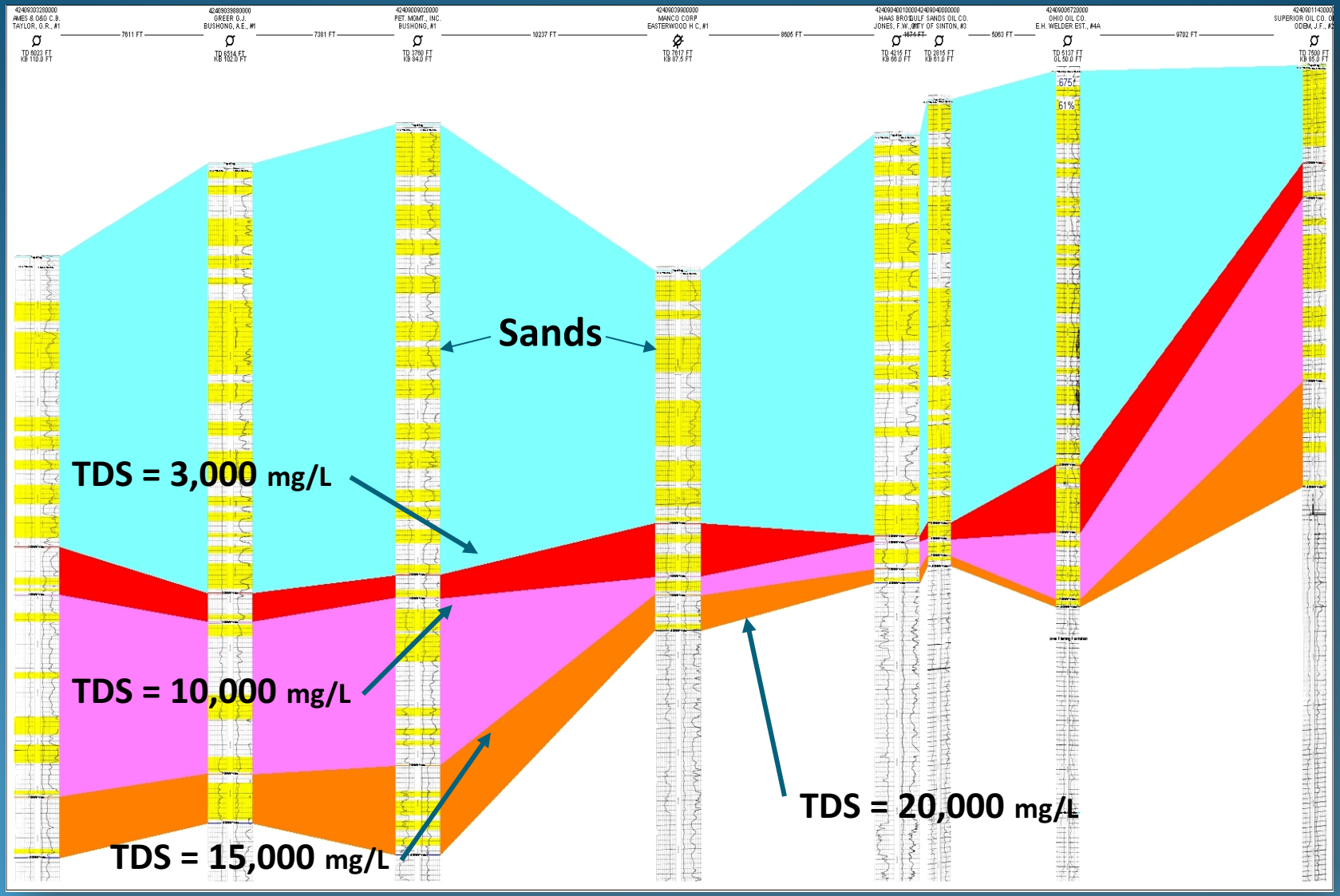
Depth

0’

500’

1000’

1500’



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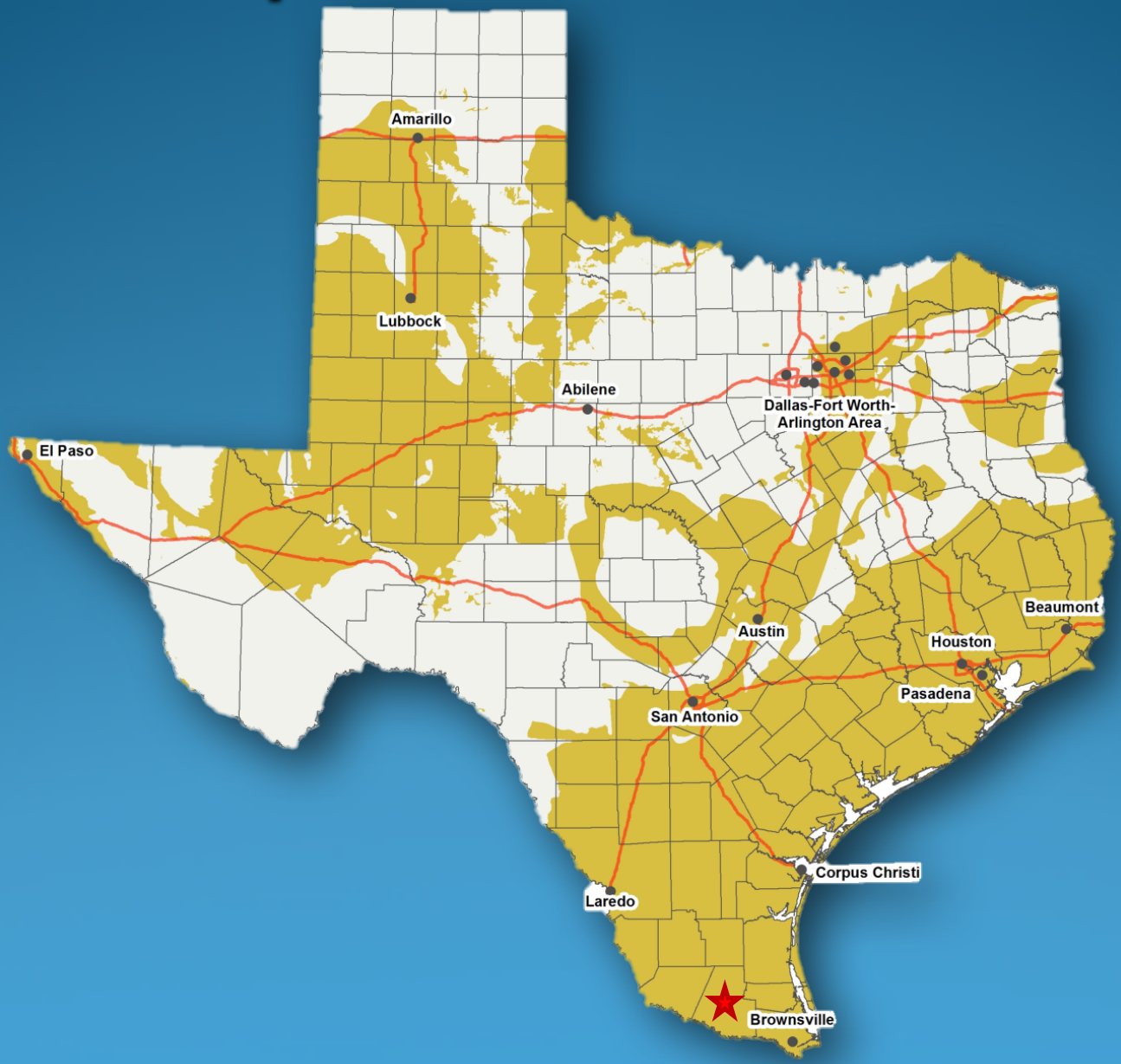
Brackish Aquifers – Lower Rio Grande



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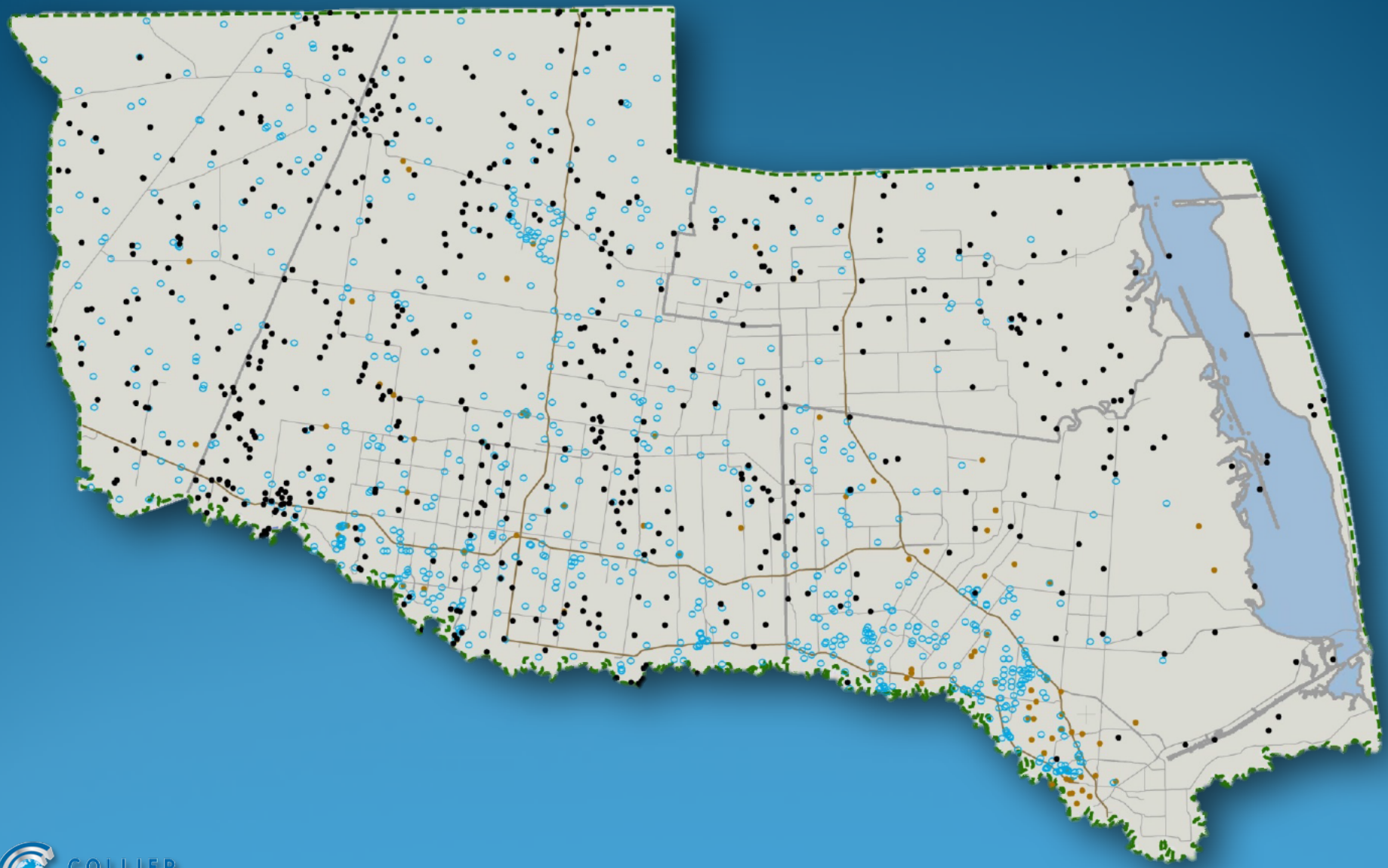
Borehole Geophysical Log Coverage



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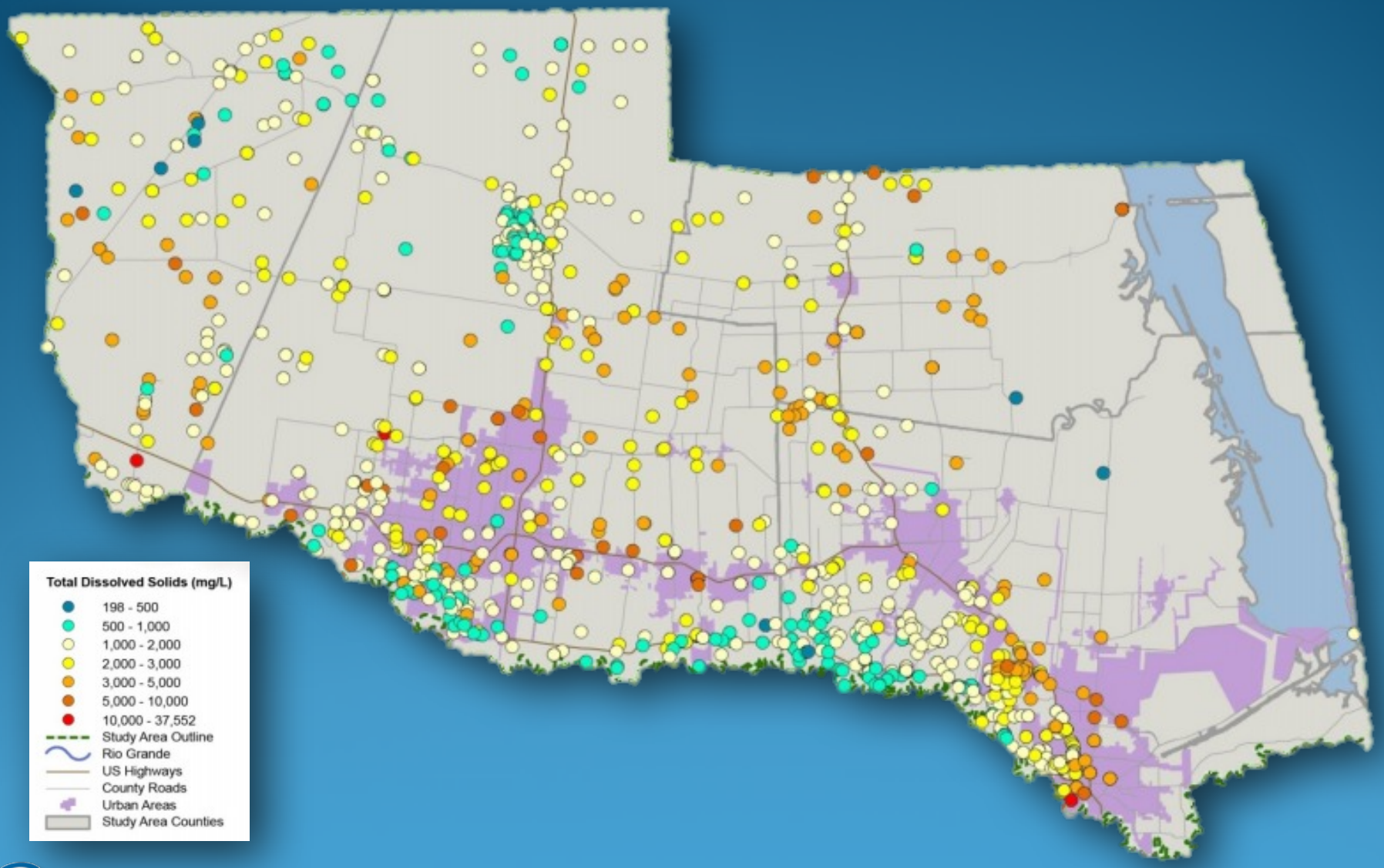
Well Water Salinity



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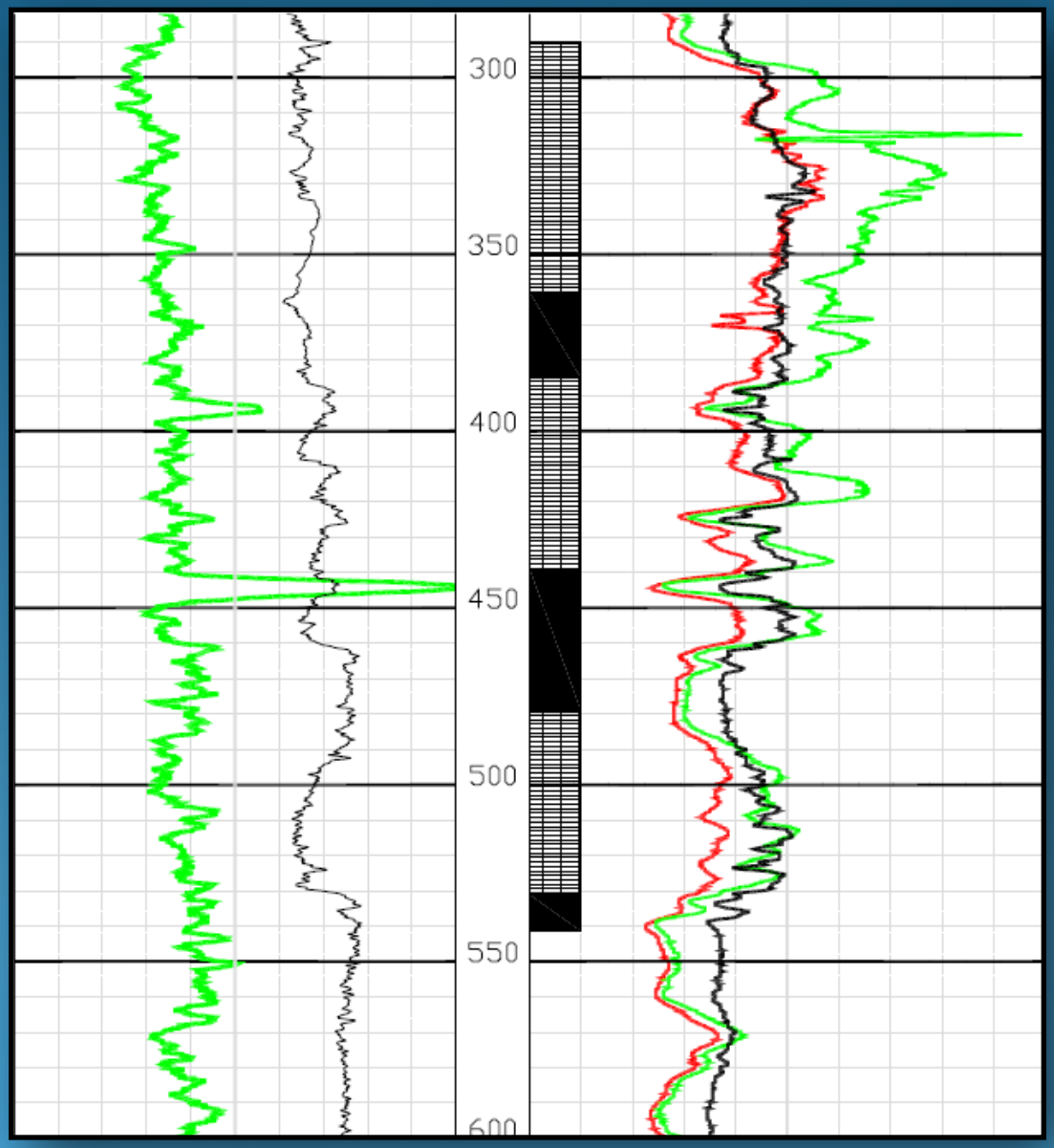
Existing Brackish Groundwater Well



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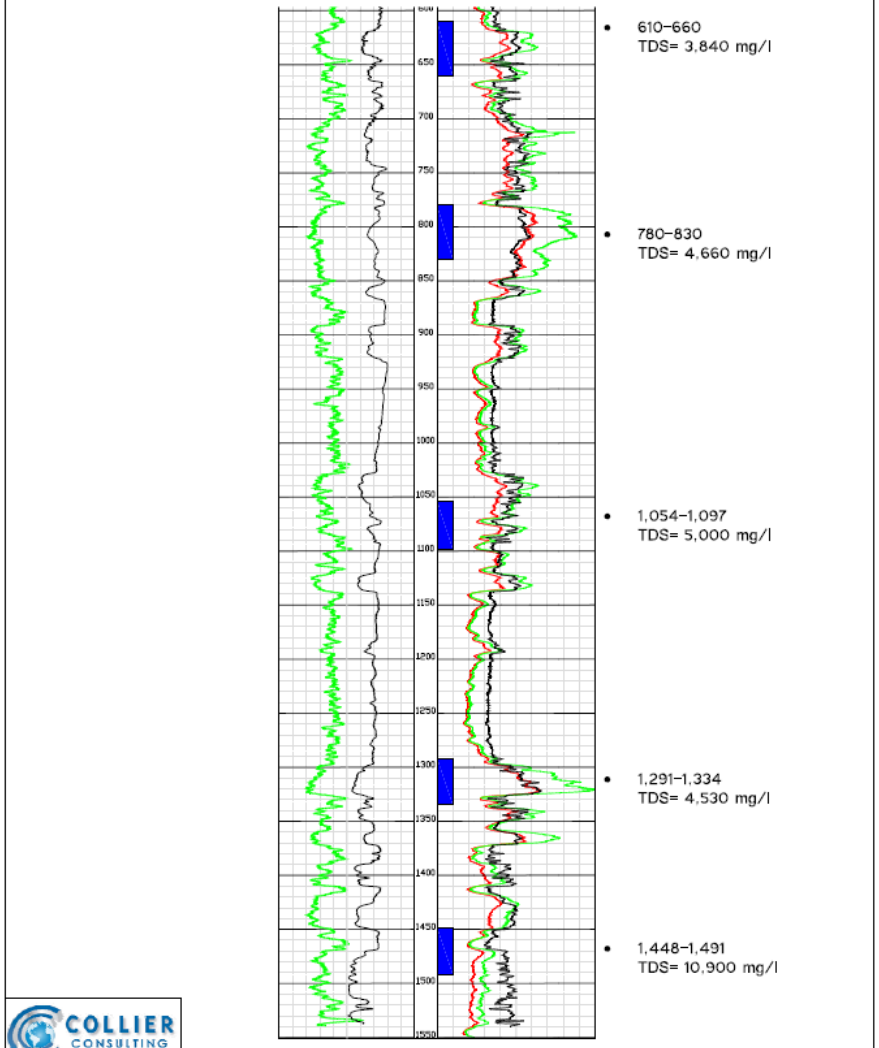
Discrete Interval Testing Results



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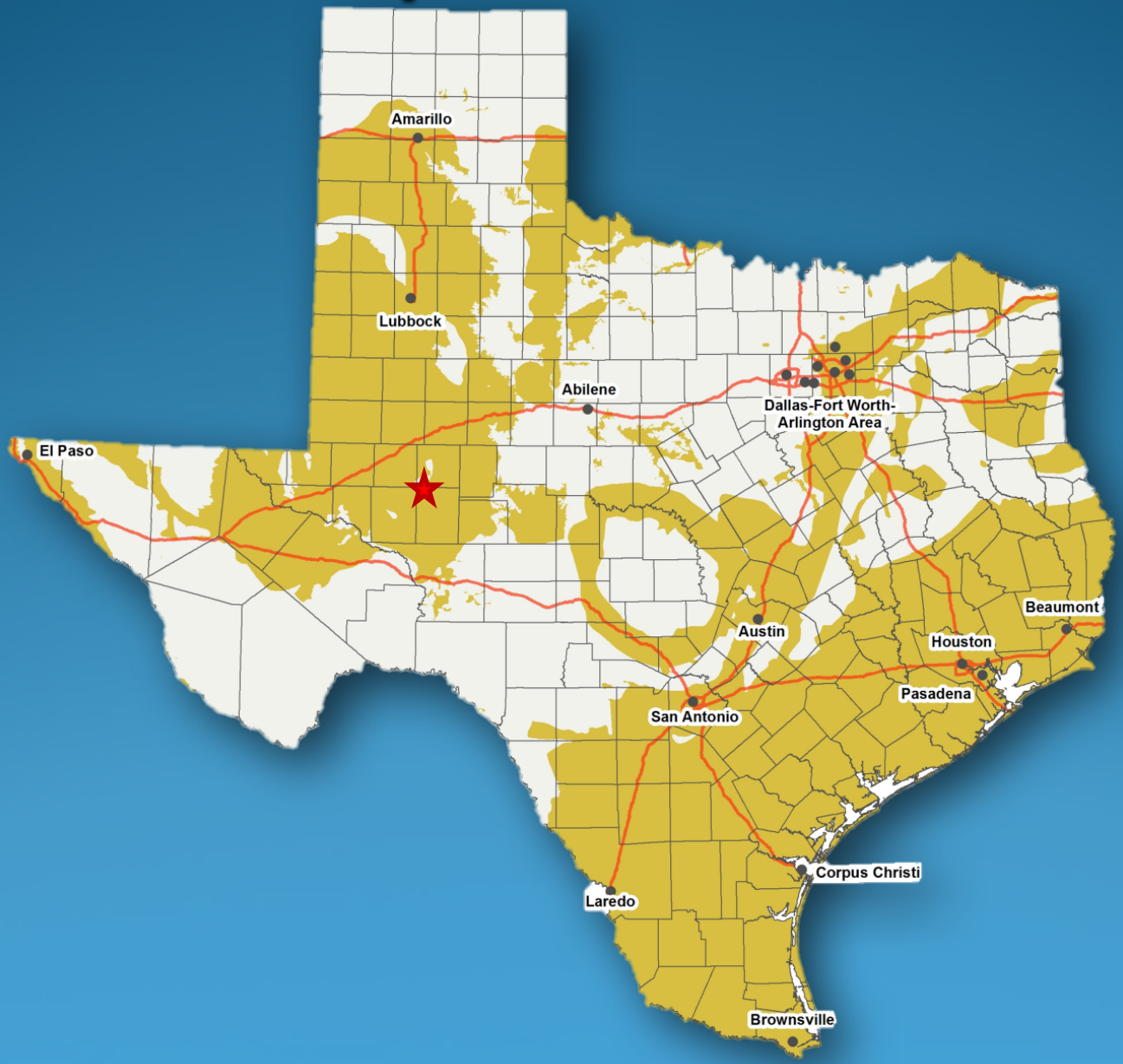
Brackish Aquifers – West Texas



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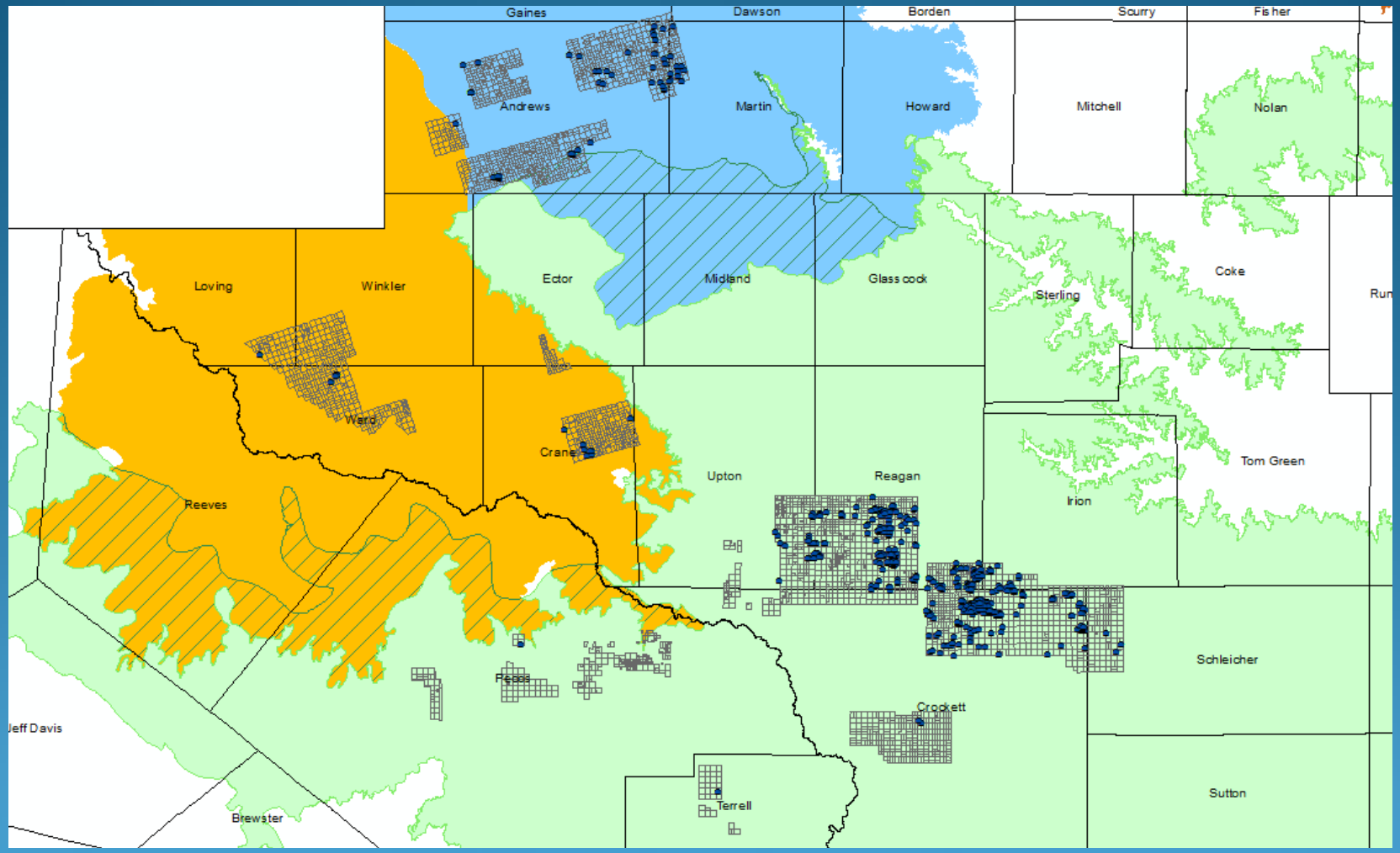
West Texas Surface Aquifers



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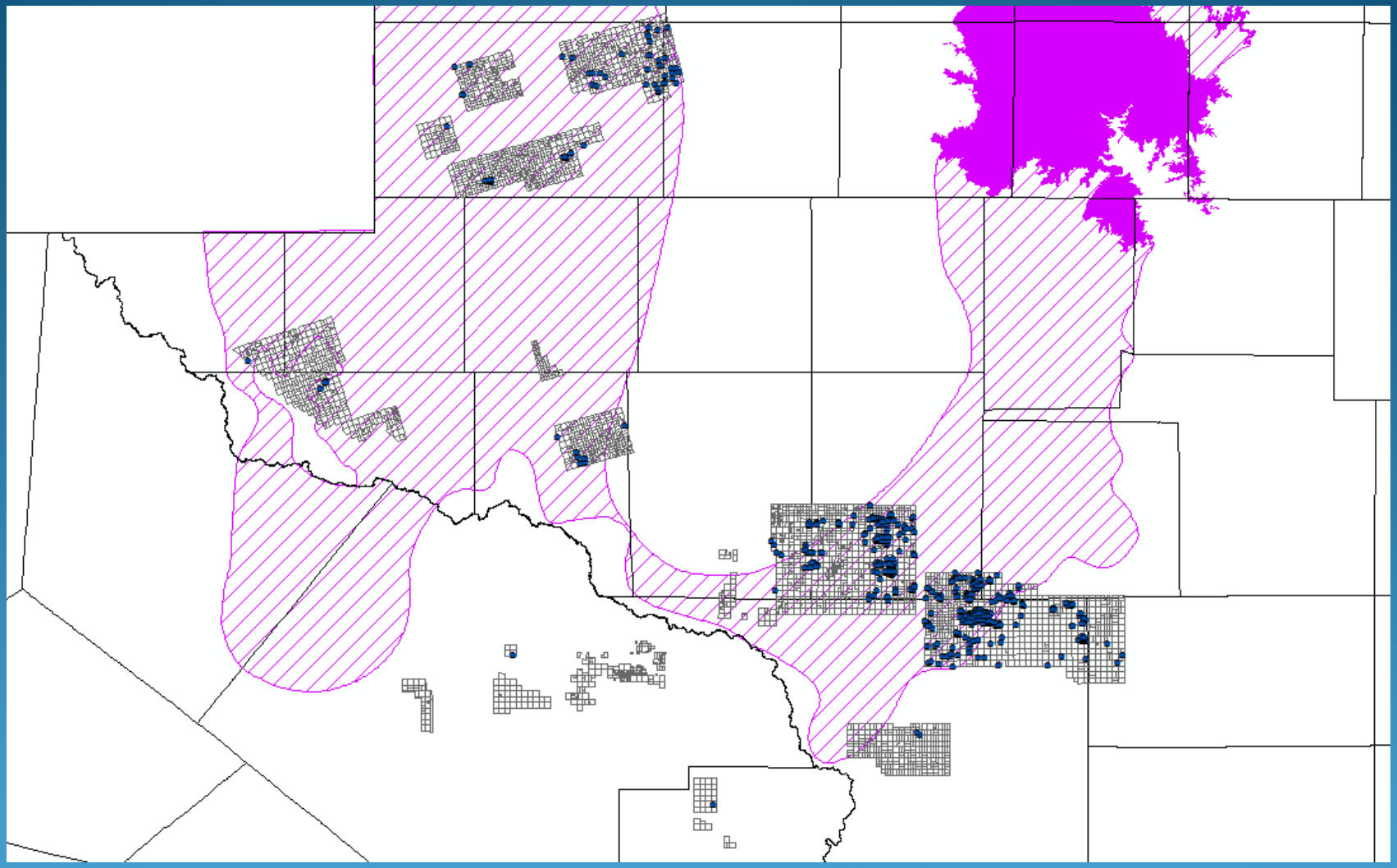
Dockum Aquifer



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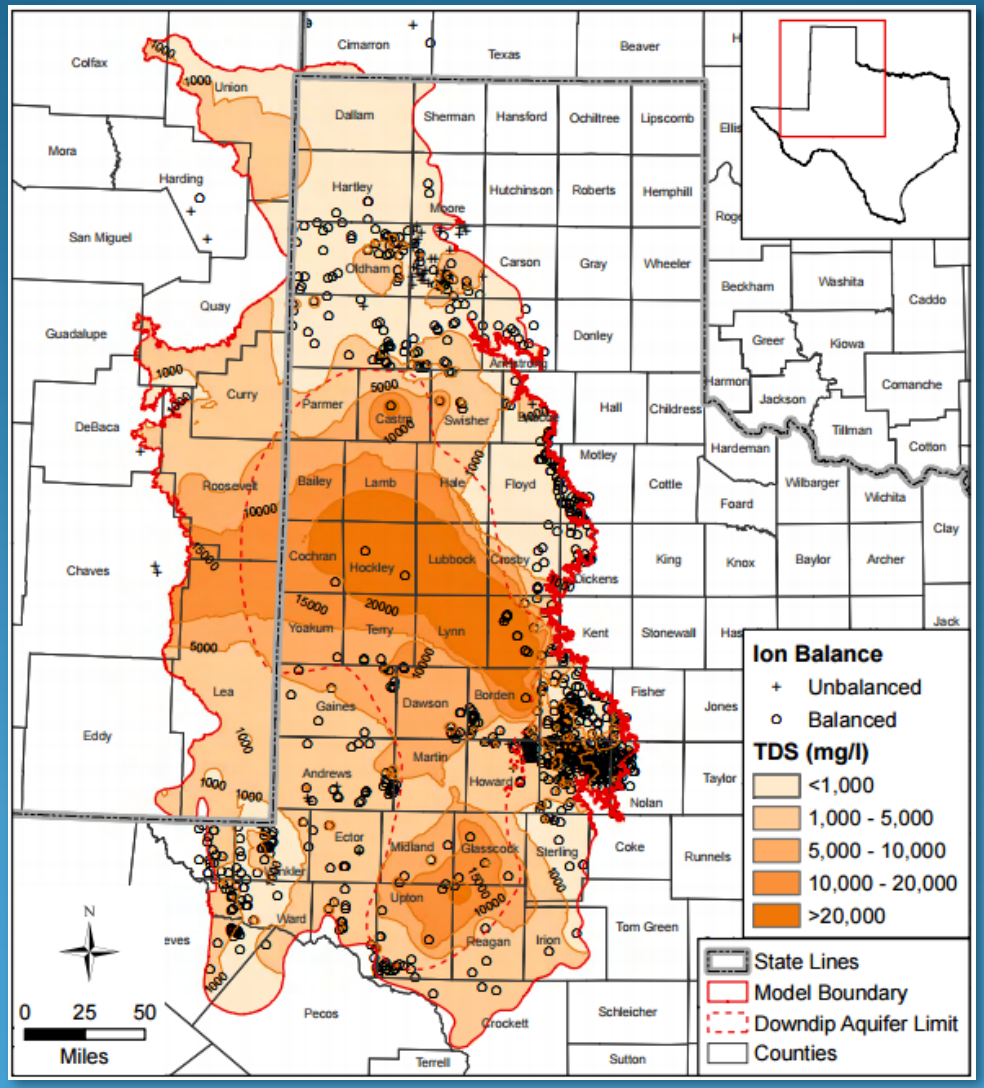
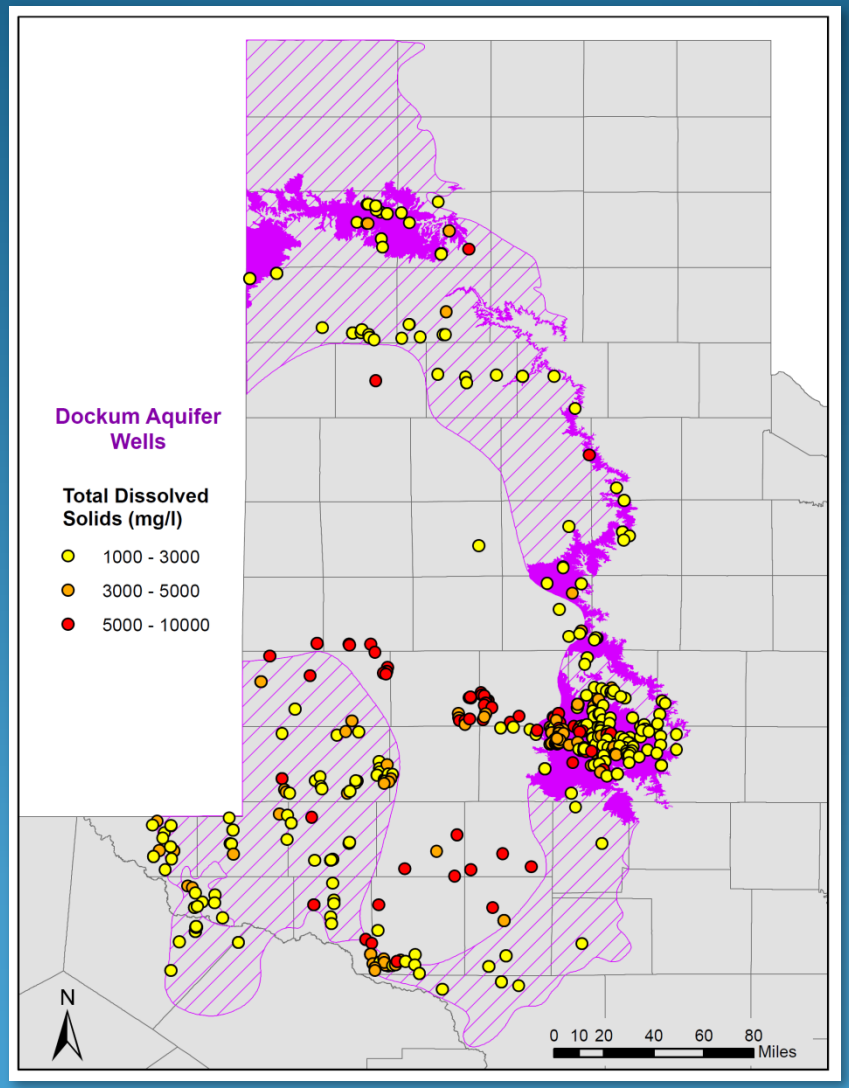
Dockum Total Dissolved Solids



Dockum Brackish Wells



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TWDB Database

QUESTIONS

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