Geothermal Resources in Sedimentary Basins

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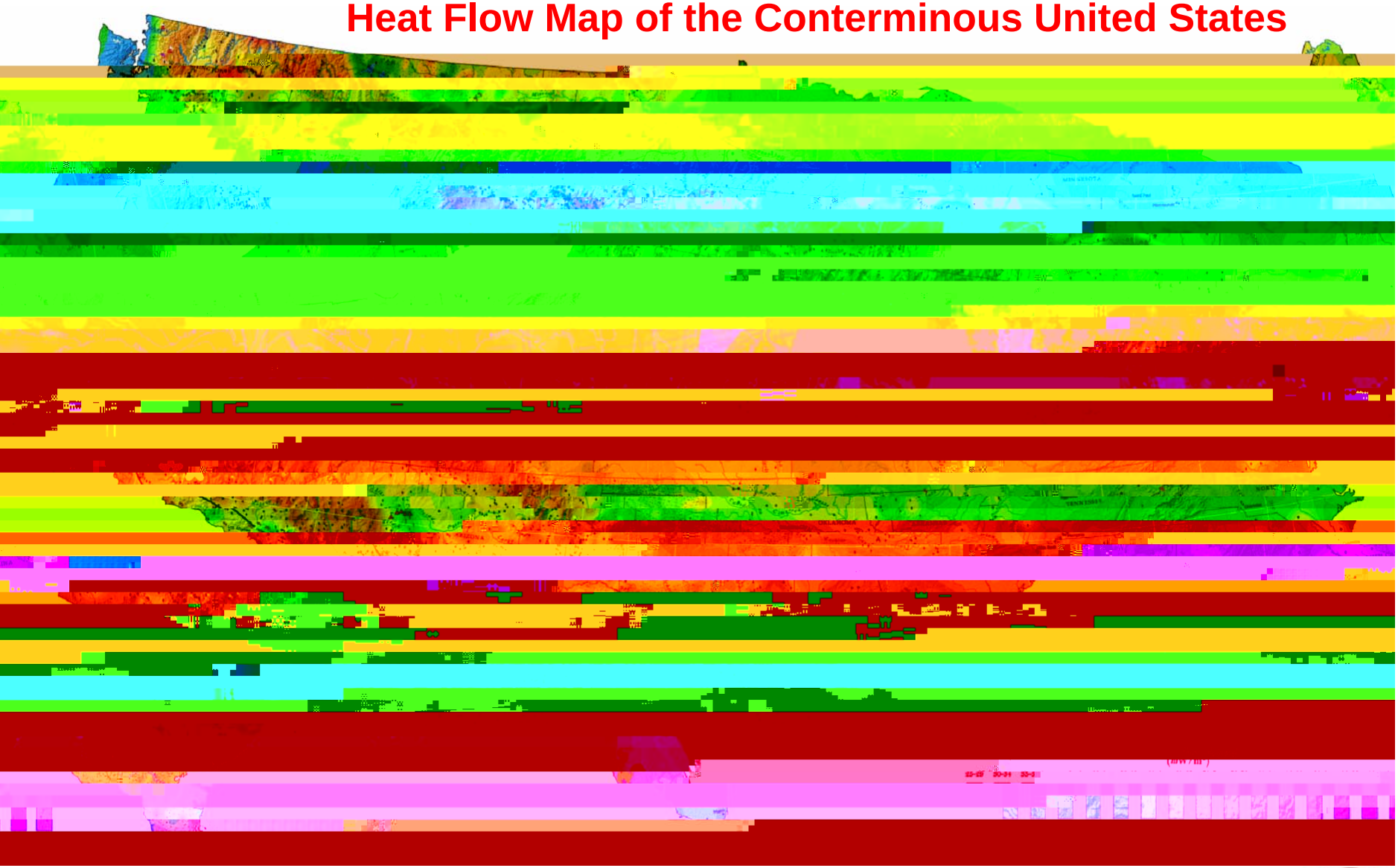
Heat Flow Map of the Conterminous United States



Subset of the Geothermal map of North America (Blackwell and Richards, 2004), current geothermal power plants are shown as white stars.

All data sites for US heat flow map including sites of wells with BHT data in the AAPG data base. BHT symbols are based on depth and temperature. The named wells are the BHT calibration points.

Heat flow and BHT sites

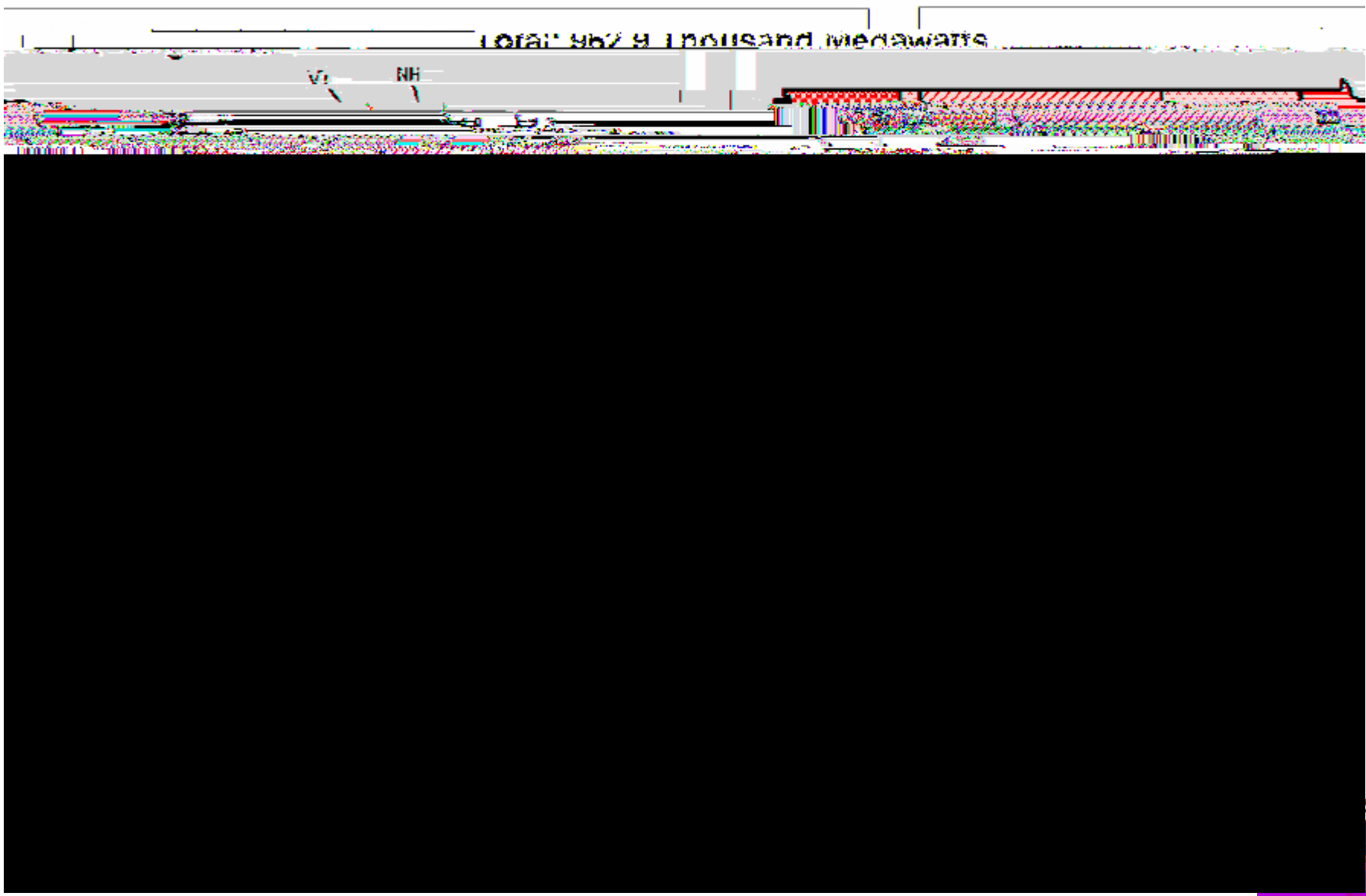
Scenarios for Development in Sedimentary Basins

Coproduced fluids
Geopressure fluids
Sedimentary EGS

These are briefly described, resource base discussed, and examples of development given for each category

The resource base for these 3 types of geothermal development is briefly summarized: HUGE!

U.S. Electric Power Industry, Existing Net Summer Capacity by State, 2004



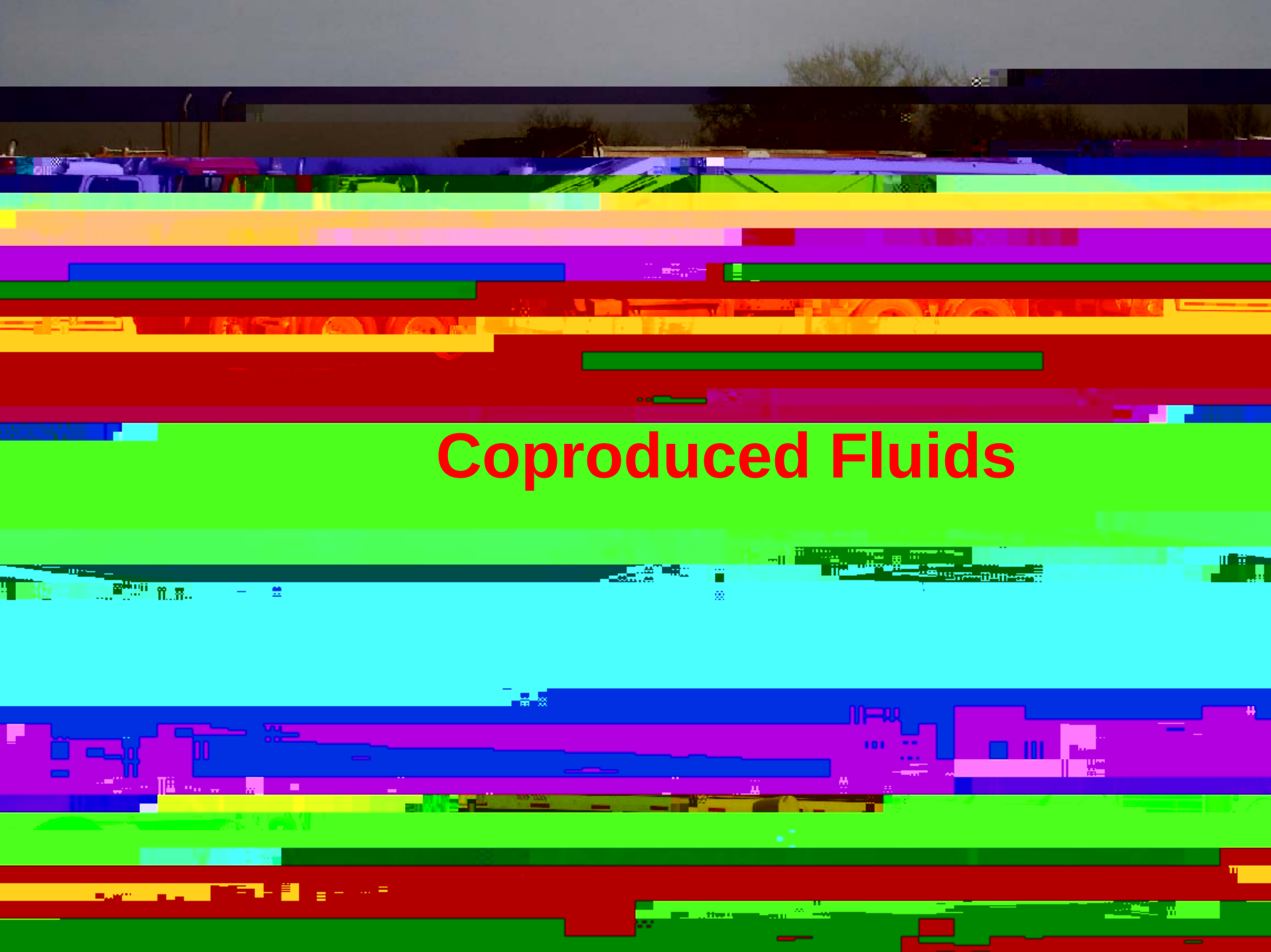
Geothermal Resource Base Summary, Conterminous US

Category	Thermal Energy	Methane	Total Energy
	ExoJoules (10		

The EGS resource base for Texas alone (at temperature above 150°C (300°F) and depths less than 7 km (23,000 ft)) is 255,000 EJ, or 4.1×10^8 MWsecs-20yrs.

If a recovery factor of 1% is used there is still 4.1×10^6 MWsec for 20 years available (the present installed electrical power capacity in Texas of 0.1×10^6 MWe).

The US Geological Survey has estimated the resource in the geopressured city in Texas of 0.1x10


Coproduced Fluids

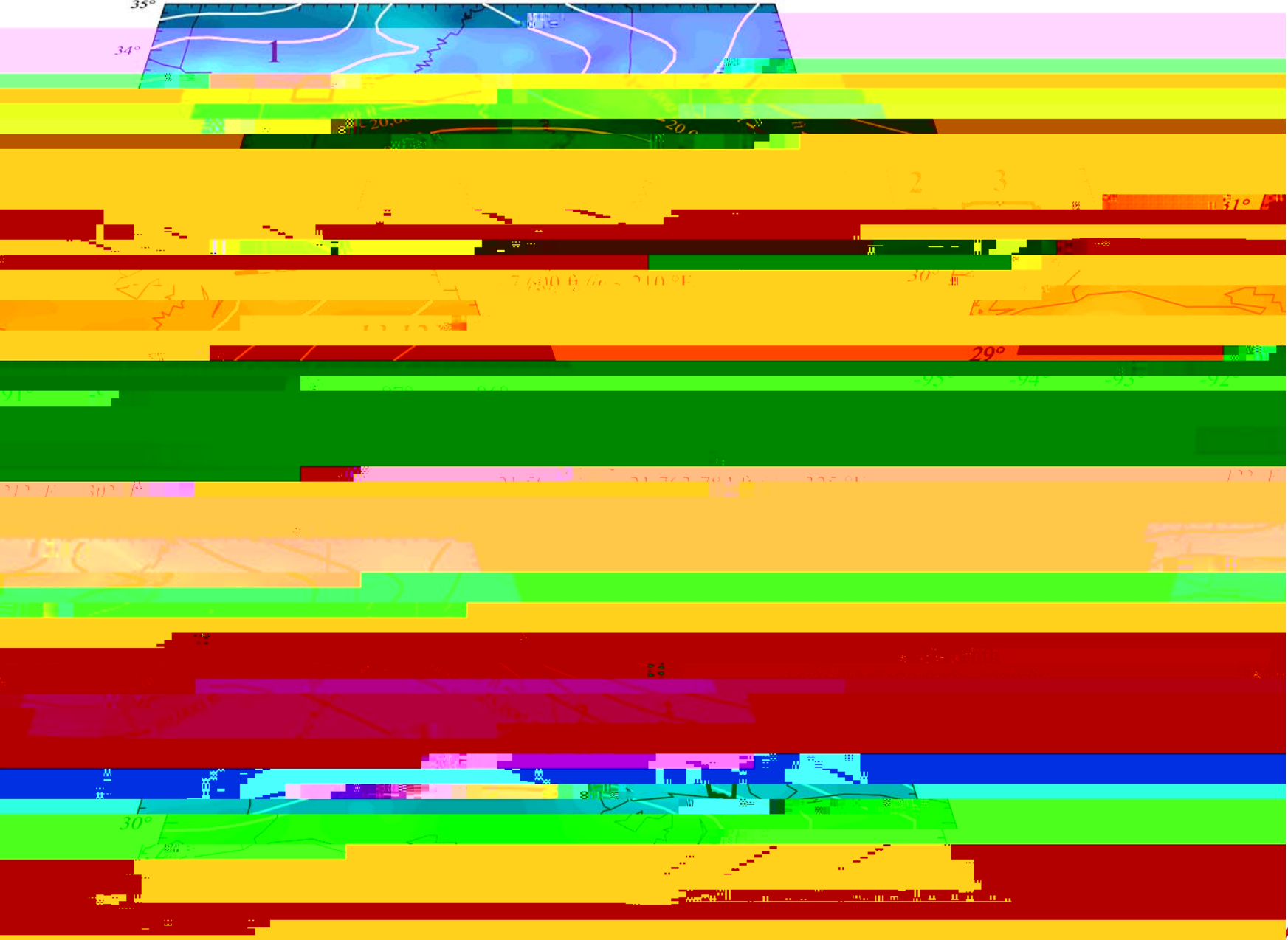

35°
34°
31°
30°
29°
30°

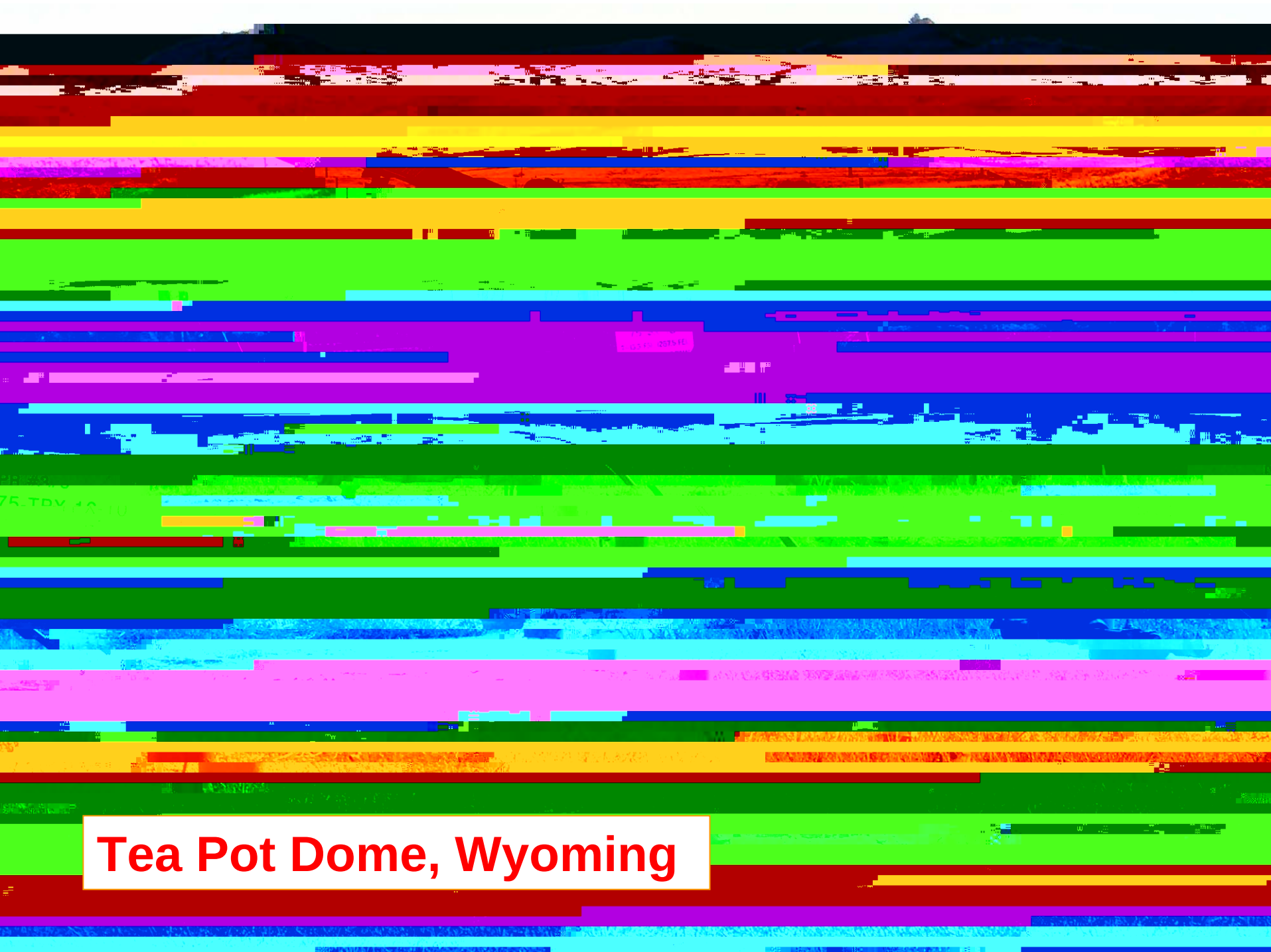
Table 1. Comparison of cost components for conventional hydrothermal development of a water-flood field.

Existing Water-Flood Field Conditions

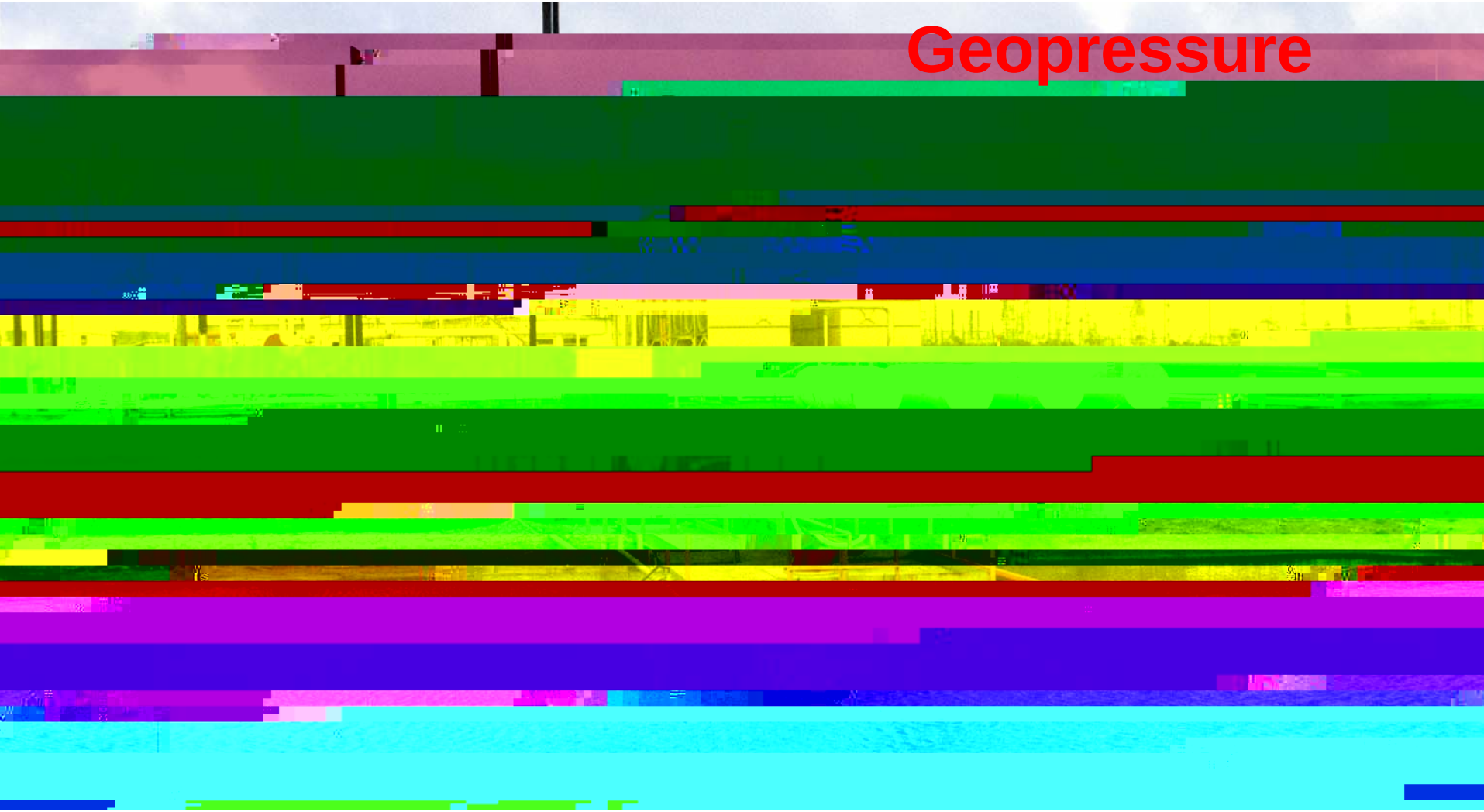
- Many wells with BHT's at over 225 °F at 15,000 ft or less
- Water produced from wells, stripped of hydrocarbons, and reinjected (paid for by disposer!)
- In-place infrastructure of power lines, roads, pipelines
- Possible continued stripping of gas and oil in otherwise non-economic wells

Direct Costs to Develop a Water-Flood Field

- Build power station
- Minor surface infrastructure upgrades (i.e., insulating collection pipes)

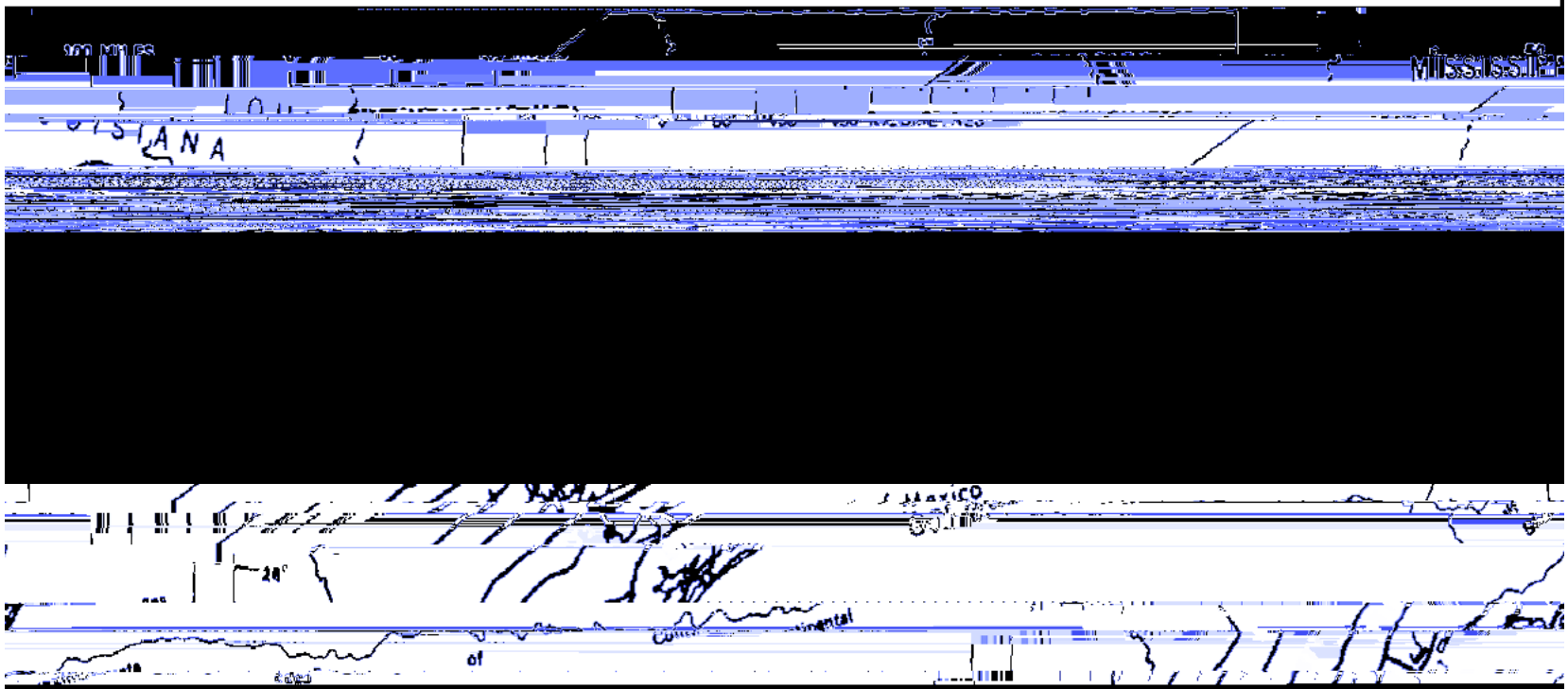

Tea Pot Dome, Wyoming

Geopressure



- Pleasant Bayou, Brazoria, Texas 1989-1990

Circular 725 - Geopressured Geothermal Resource Assessment Papadouplous et al. (1975)



Category	Thermal Energy 10^{18} Joules	Methane 10^{12} ft^3	Total Energy 10^{18} Joules
Geopressure			
Papadoulopous et al. (1975)	46,000	669	71,000
Wallace et al. (1979)	107,000	59	170,000

EGS - Sedimentary and Basement

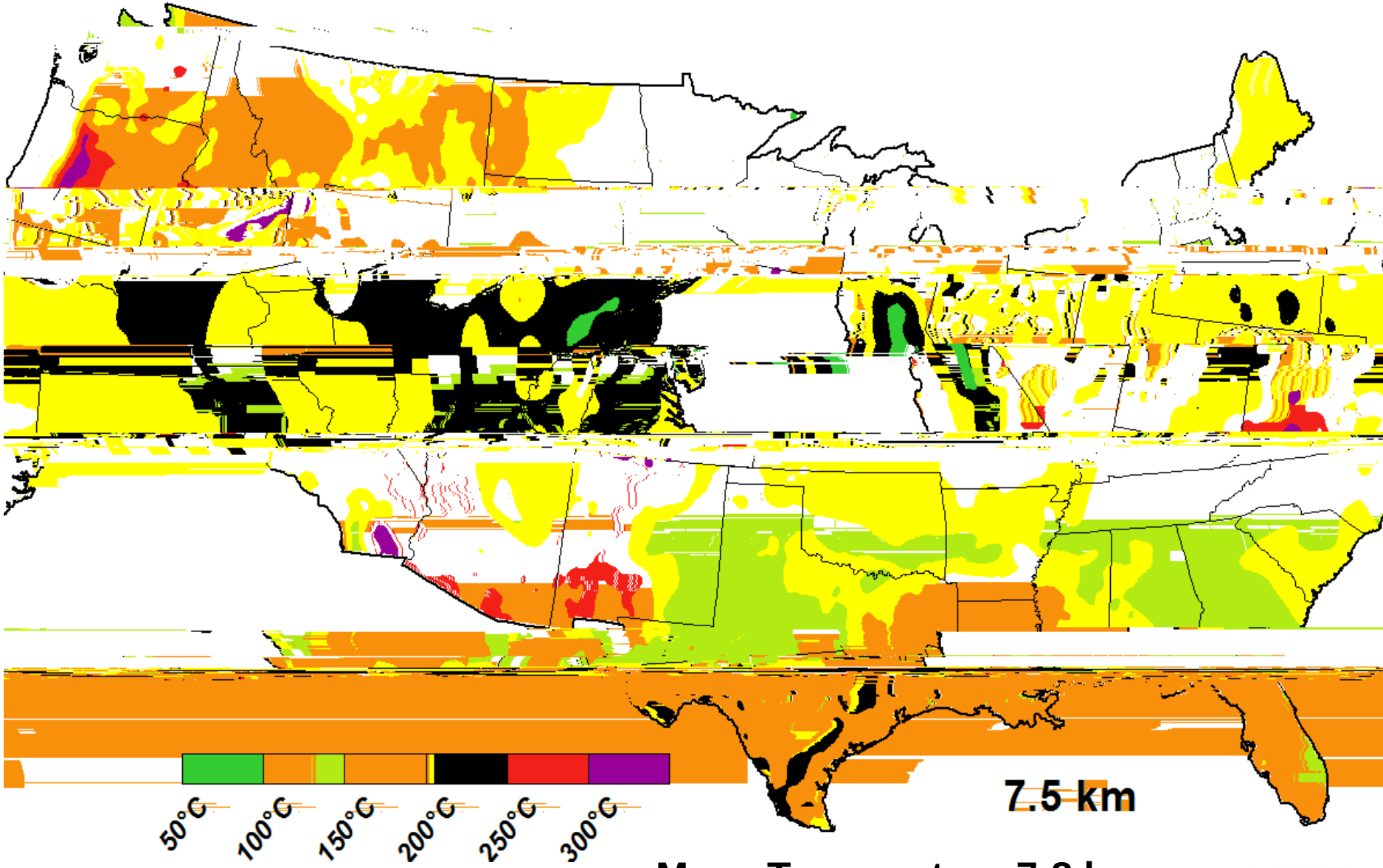
The EGS System

Introduction of water into rock of limited permeability (either tight sediment or basement) in a controlled fracture setting so that this water can be withdrawn in other wells for heat extraction.

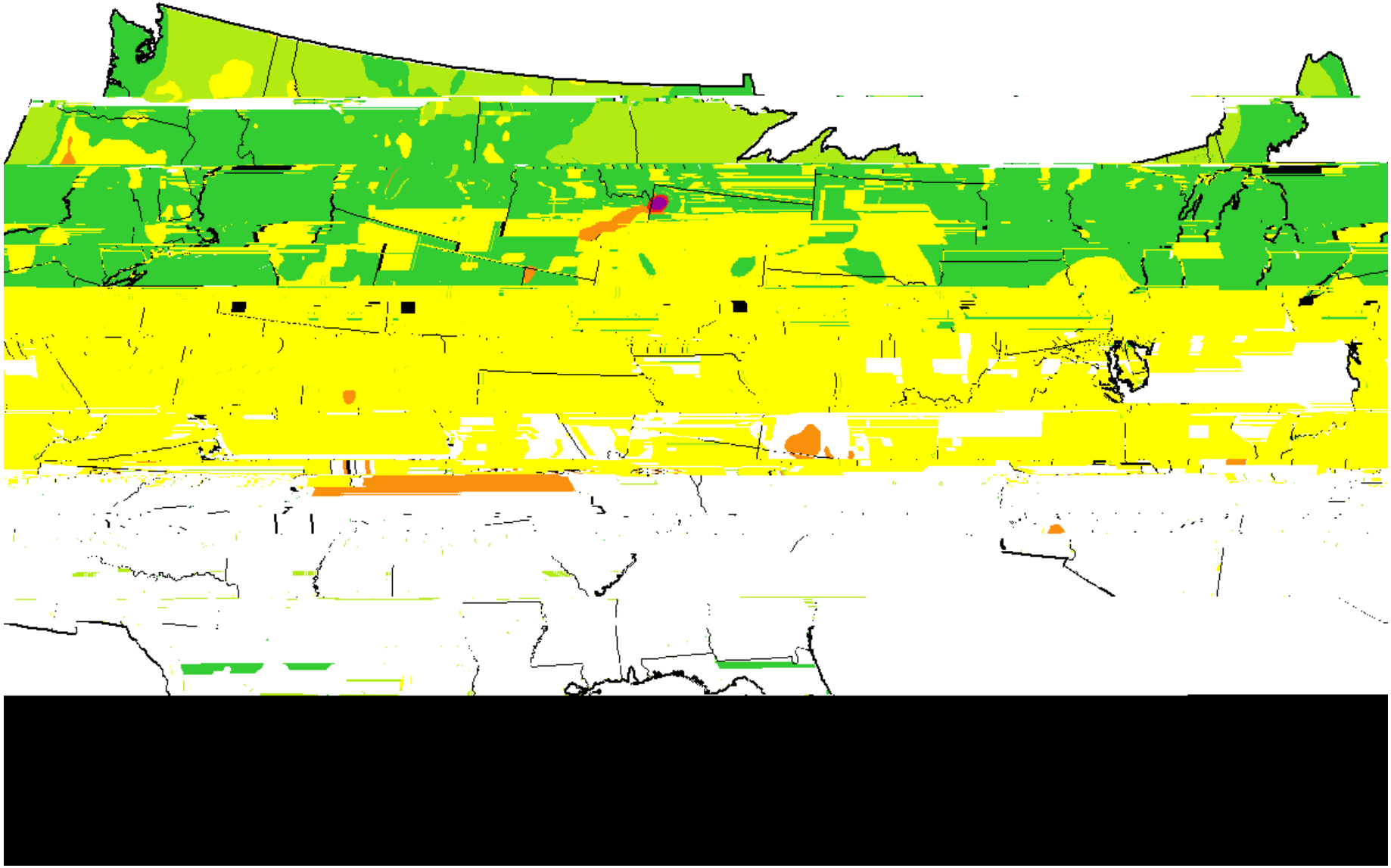
An area that is very favorable is in east Texas and northern Louisiana where the low permeability tight formations of the Jurassic with temperatures over 350 °F are being exploited as tight gas systems.

Example T-D Curves from east Texas and Louisiana

Example Cases: **Cooper Basin, Australia, Gross Schossberg Germany**

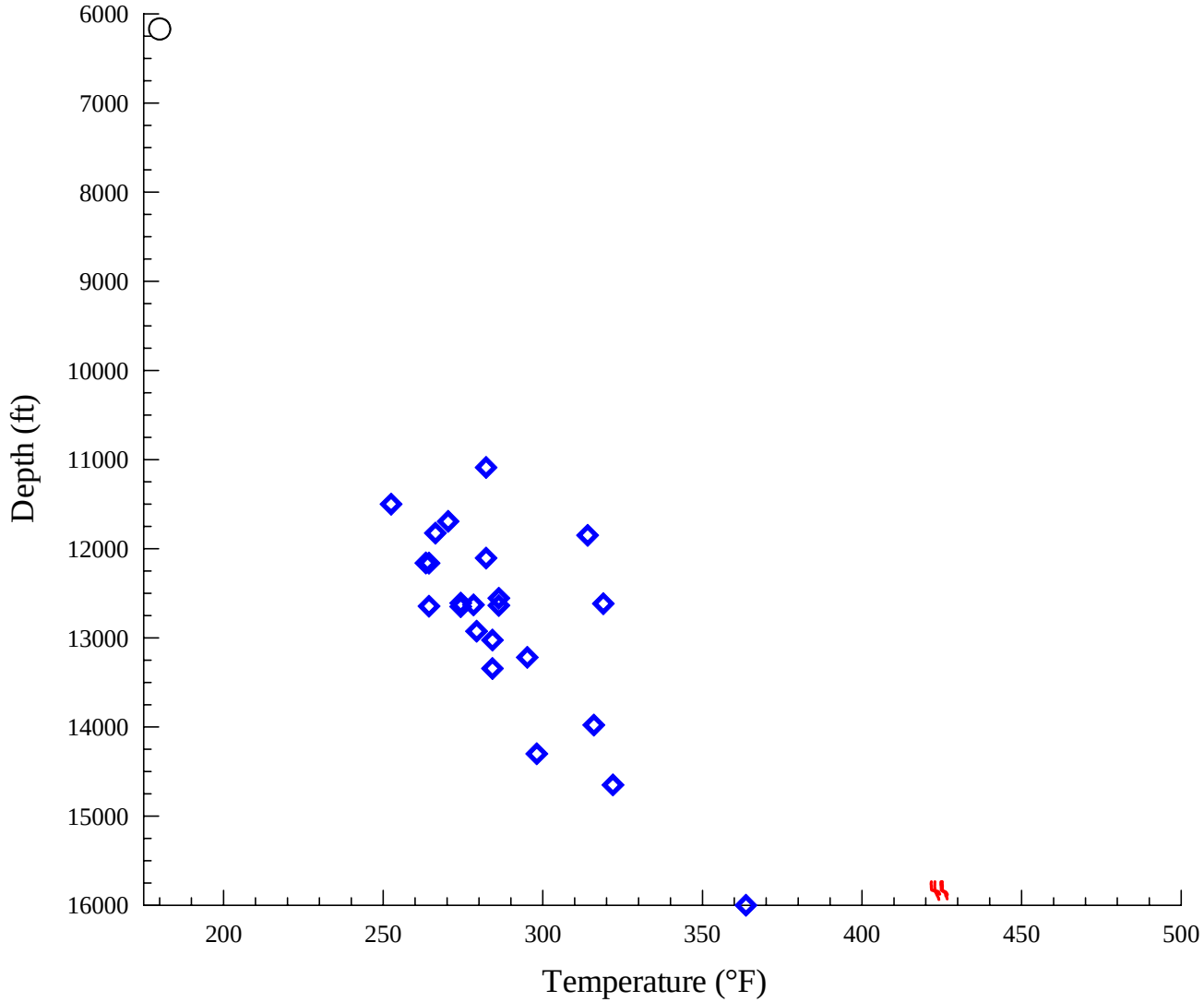


Mean Temperature 7-8 km
21,000 to 24,000 ft

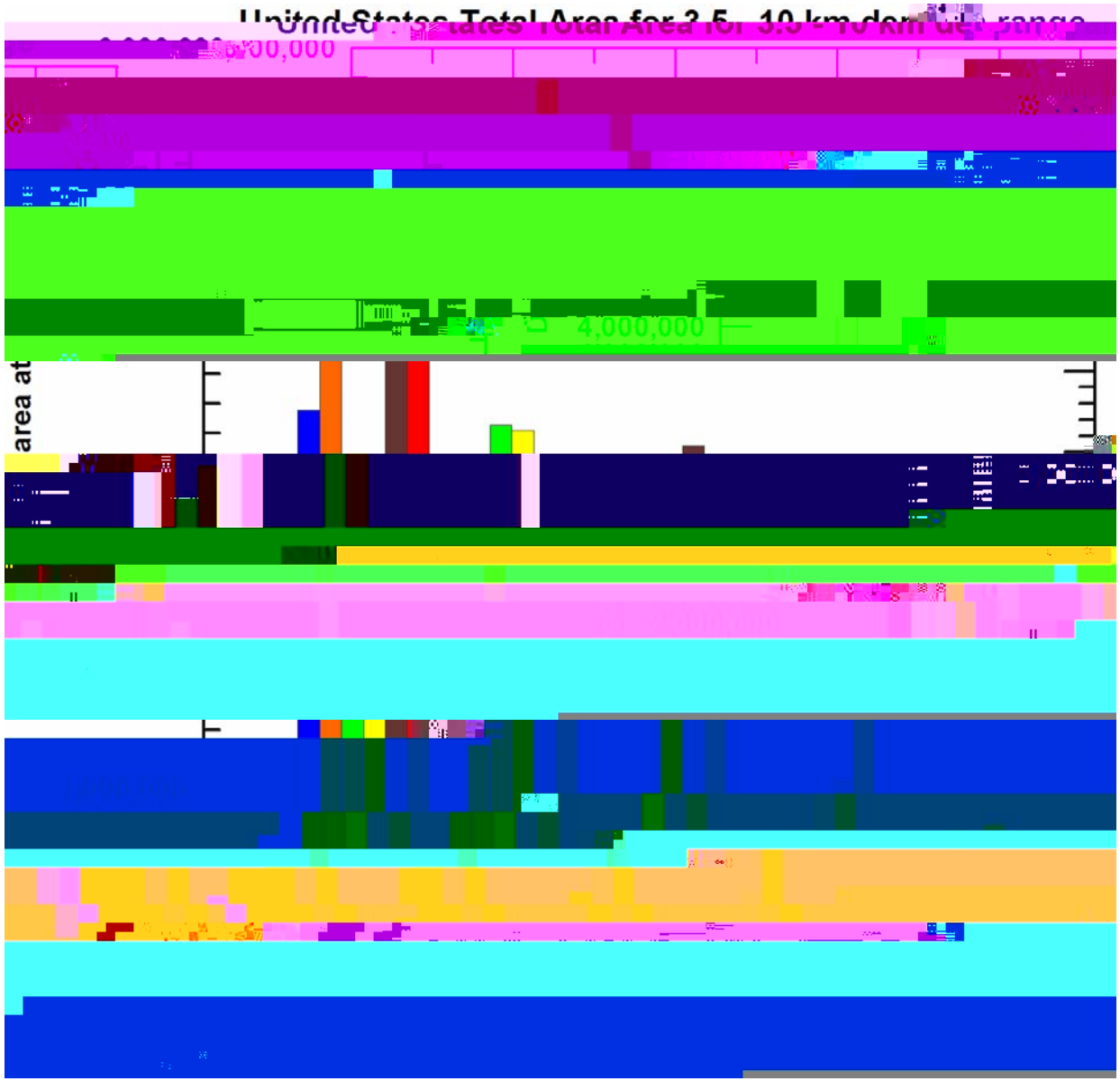


Mean Temperature 4-5 km

12,000 to 15,000 ft



Precision temperature log and BHT data for areas in the Texas and Louisiana. All three areas are situated in the high gradients areas paralleling the Gulf Coast. The existence of temperatures in excess of 250 °F by 9,000-12,000 ft suggest favorable conditions for future geothermal development.

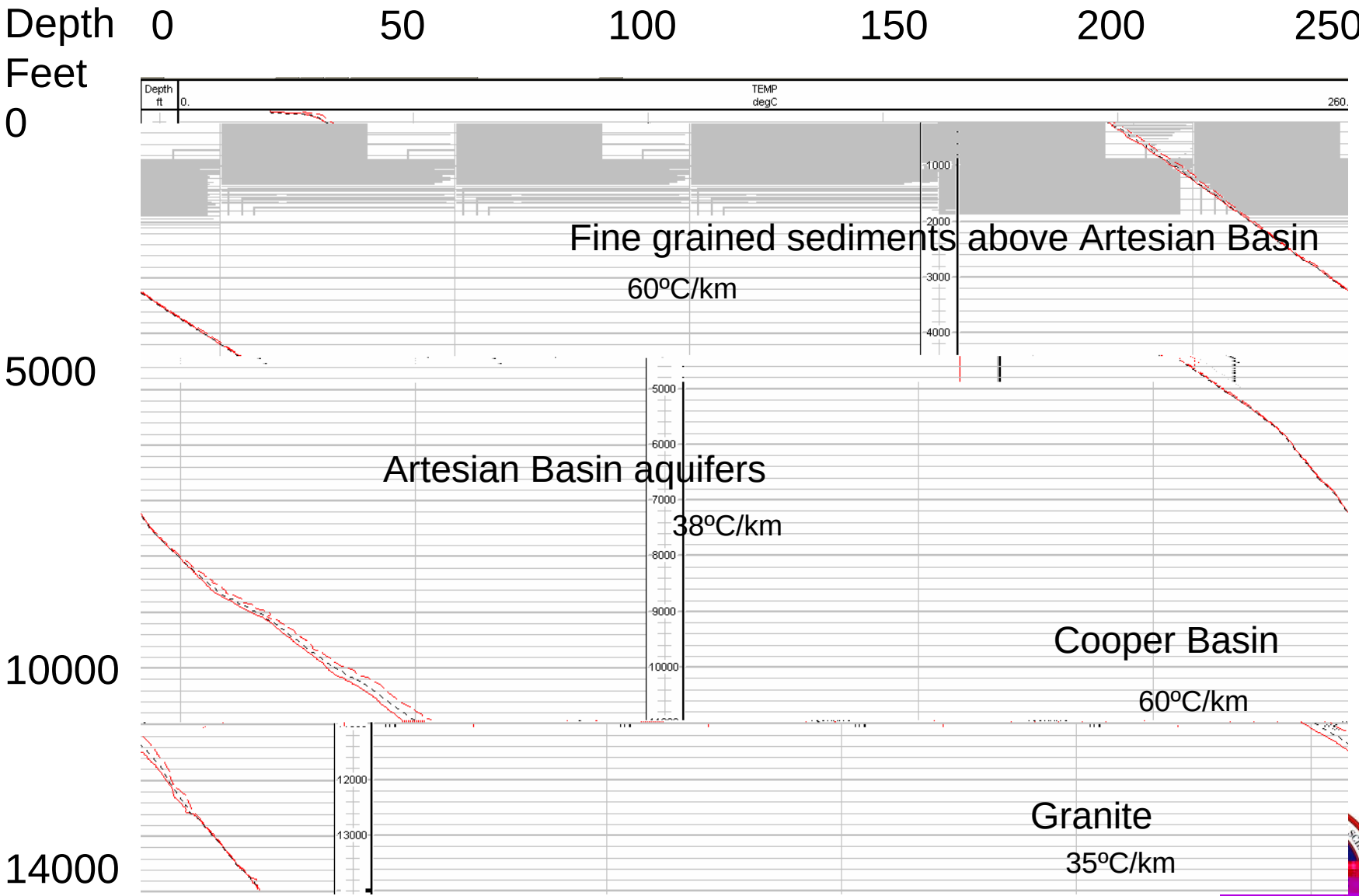


The most favorable EGS

Closing the NEMMCO Grid into a loop Provides benefits on national scale

Innamincka to:
Leigh Creek
= 380km,

Temperature (°C) in Habanero-1 Cooper Basin



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