

# Design Requirements for Commercial Sedimentary Geothermal Projects

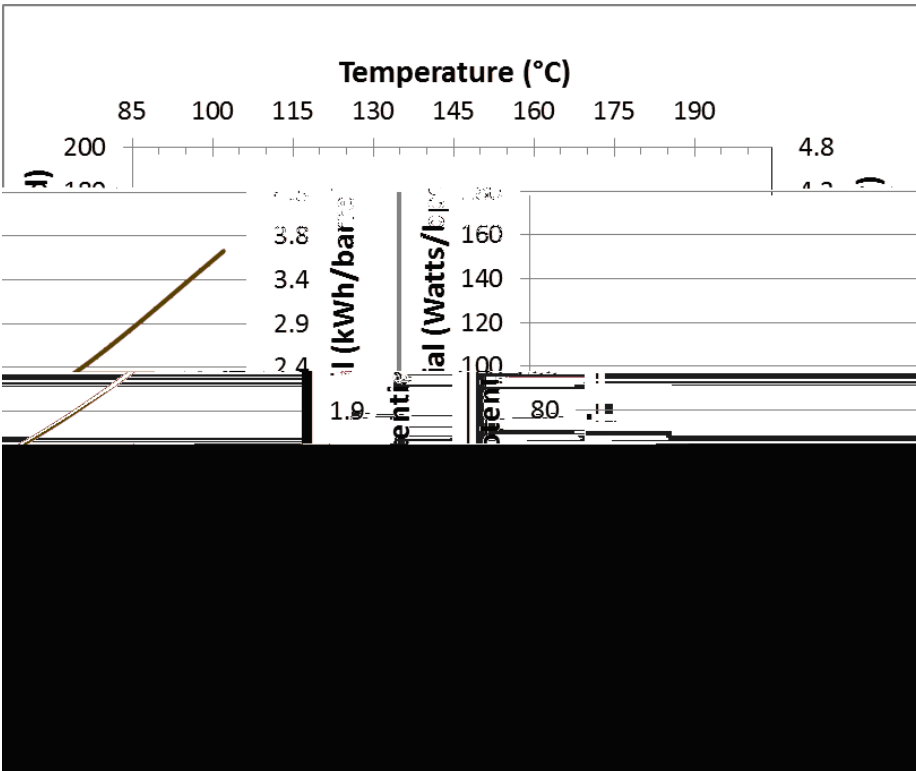
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April 25-26, 2016

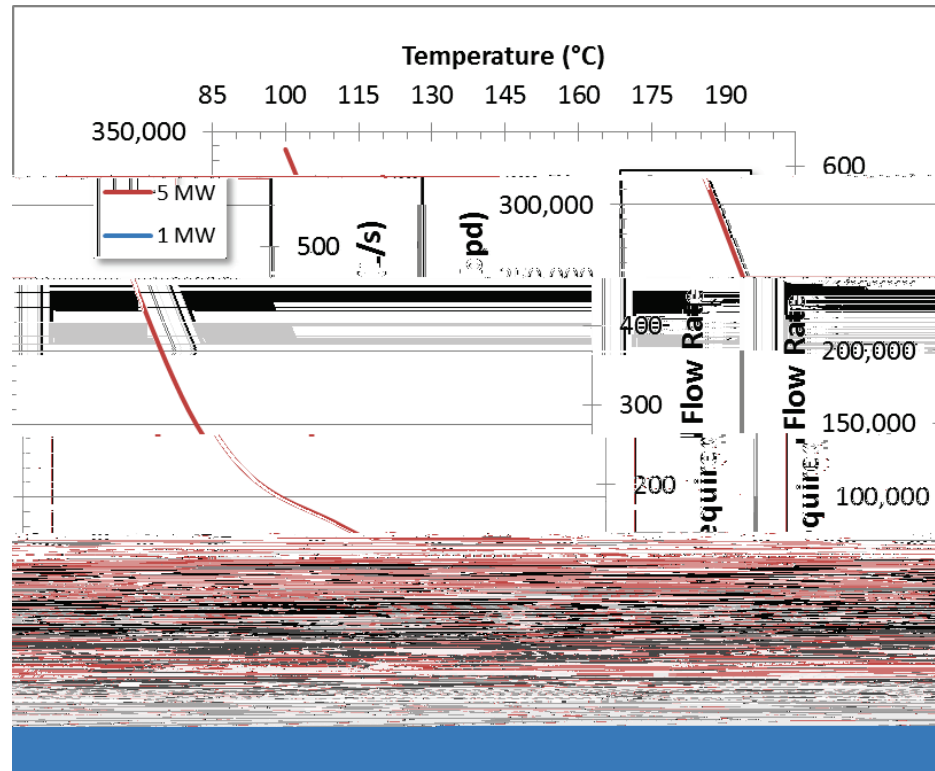
# Geothermal vs. Petroleum – a Comparison

Petroleum		Geothermal
	Temperature	
	Flow Rates	<i>average</i>

# Temperature is important, but is not enough...



Electricity Generation vs. Temperature



Flow Rate Requirements vs. Temperature

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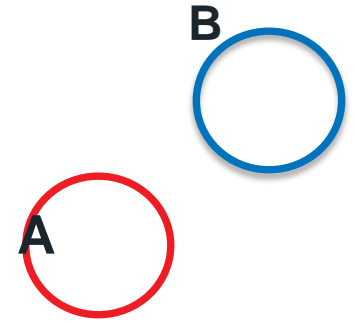
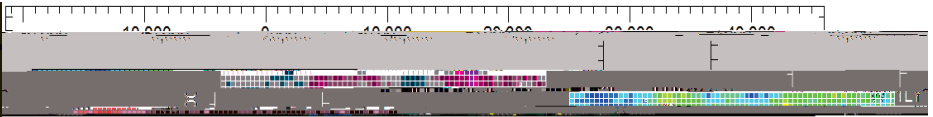
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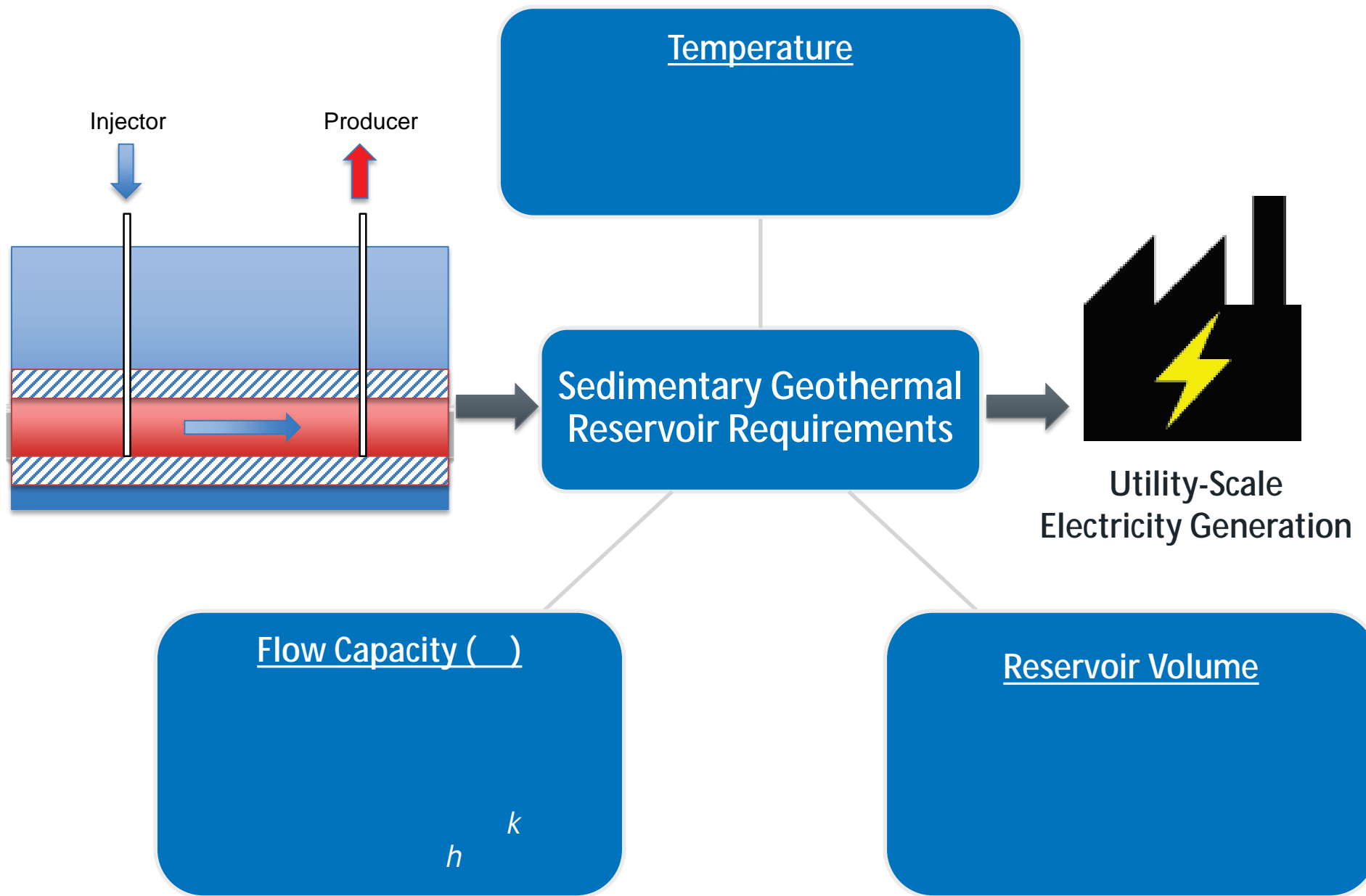
$$k \phi \quad k \phi$$

- Area B is selected due to its higher porosity (hir.1() pe16.7e)-.6(dmT0.30540 r



Temperature Distribution





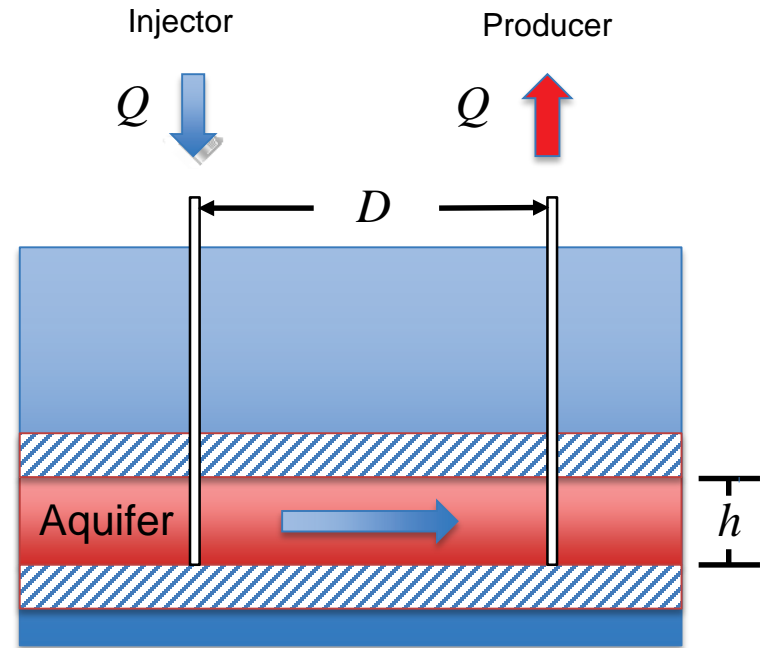
# Sedimentary Geothermal Doublet – Analytic Model

- Time for **thermal breakthrough** at production well (Gringarten, 1979)

$$\Delta t = \left[ \phi + (1 - \phi) \frac{\rho_r C_{p r}}{\rho_w C_{p w}} \right] \frac{\pi D h}{Q}$$

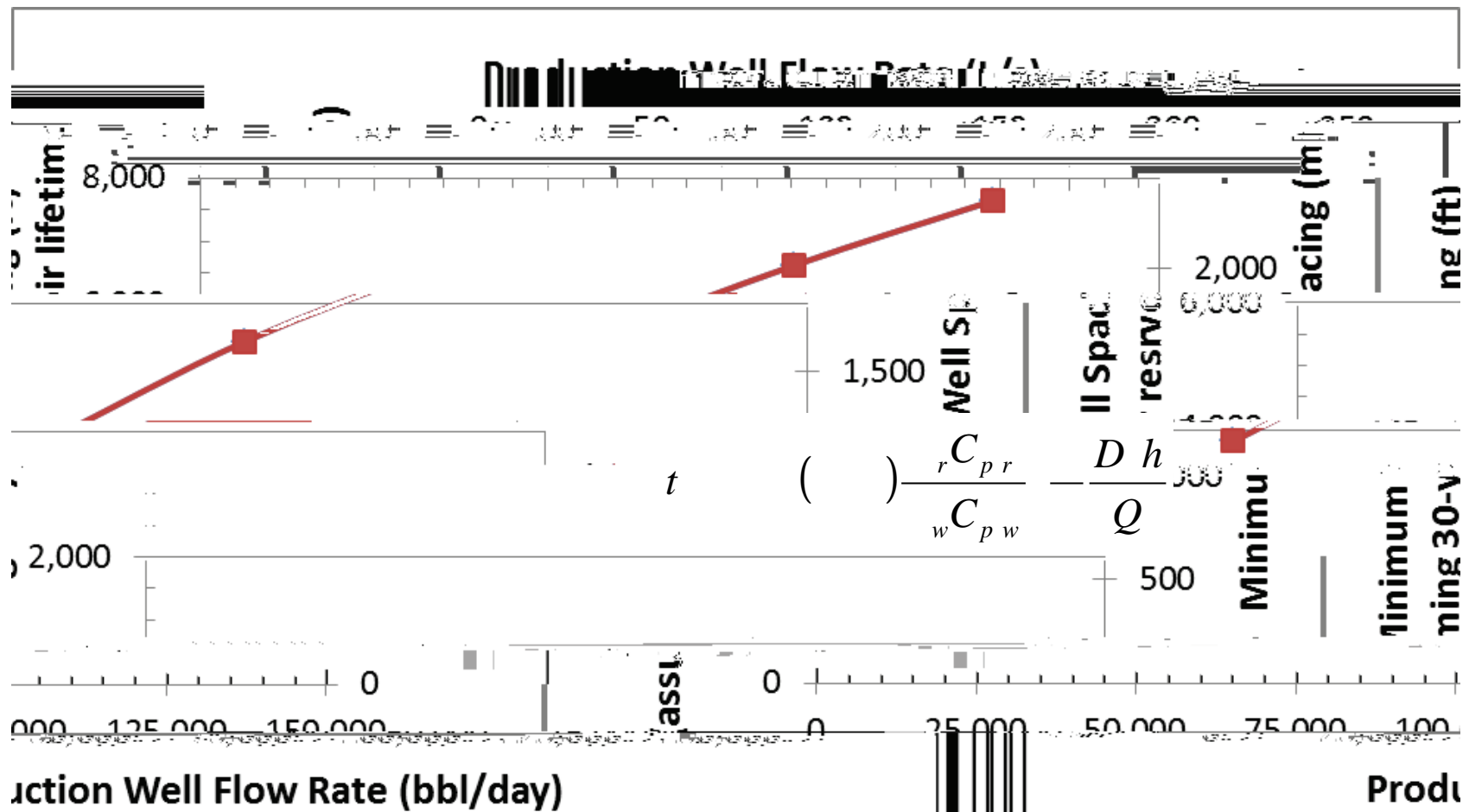
- Pressure difference** between injection and production wells (Gringarten, 1979; Muskat, 1939)

$$\Delta P = \frac{\mu Q}{k h} \left( \frac{D}{r_w} \right)$$



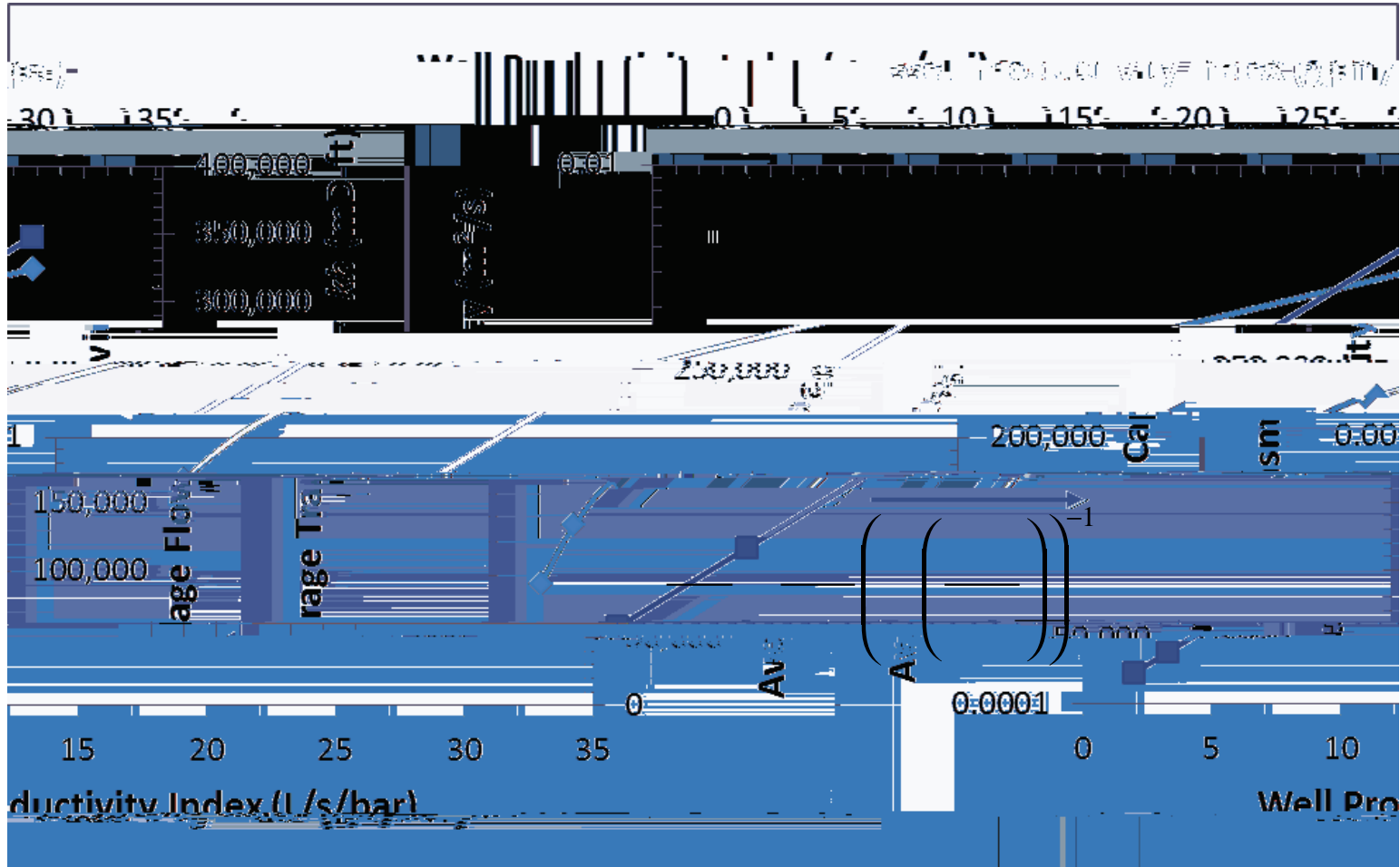
Parameter	Value
$\phi$	0.15

# Reservoir Lifetime and Well Spacing



- Well spacing on the order of 4,000-6,000 ft (1-2 km)

# Well Productivity



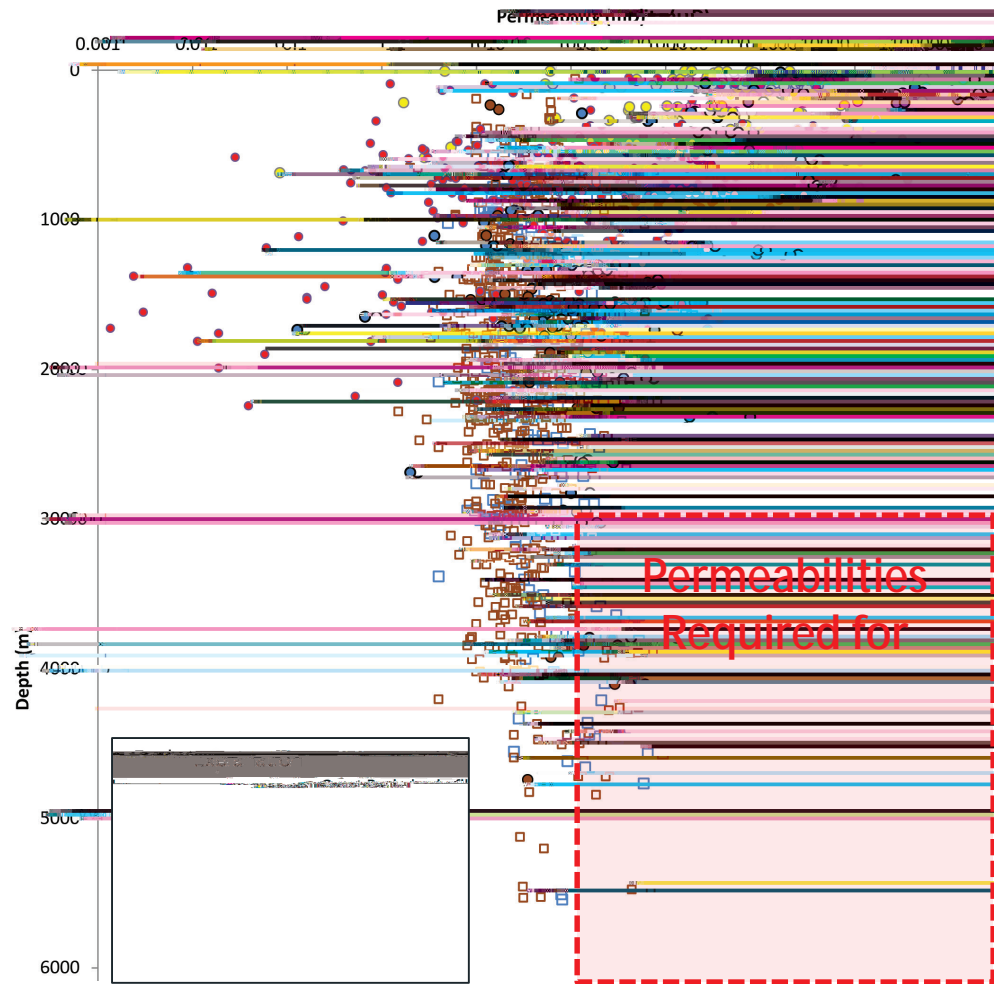
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hundreds to thousands of mD

reservoir permeabilities of



# Sedimentary Geothermal Doublet – Analytic Model



# Can Reservoir Performance Be Improved?



- Studied impact of well-configurations on well productivity
- Found that use of horizontal wells and fracturing can increase well productivity by factor of 3-5



# Questions?

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Contact Info:

# Citations

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- *Geothermal Resources Council Transactions*

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- *Geothermal Resources Council Transactions*
- *Optimization of Well Configuration for a Sedimentary Enhanced Geothermal Reservoir.*

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