

PERMEABILITY DETERMINATION

CTV V

Model Permeability

Static Modeling Permeability

Wireline log data acquired in the area include but are not limited to Spontaneous Potential (SP), natural gamma ray, borehole caliper, compressional sonic, resistivity as well as neutron porosity and bulk density.

Formation porosity is determined one of two ways: from bulk density using 2.65 grams per cubic centimeter (g/cc) matrix density as calibrated from core grain density and core porosity data, or from compressional sonic using 55.5 microseconds per foot ($\mu\text{sec}/\text{ft}$) matrix slowness and the Wyllie time-average equation Wyllie et al., 1956. See **Table 1** for the Wyllie compaction factors estimated in each zone.

Volume of clay is determined by SP and is calibrated to core data. Log-derived permeability is determined by applying a core-based transform that utilizes capillary pressure porosity and permeability along with clay values from XRD or FTIR. Core data from two wells with 13 data points was used to develop a permeability transform(**Figure 1.**). An example of the transform from core data is illustrated in **Figure 2.**

Figure 3. shows porosity and permeability histograms for both the Upper Injection Zone and the Lower Injection Zone. Porosity is derived from open-hole well log analysis and permeability is a function of porosity and clay volume. **Figure 4.** shows the distribution of permeability and porosity using Sequential Gaussian simulation (kriging) for the upper injection zone and Gaussian Random Function simulation for the lower injection zone within the static model

TABLES

Table 1. Sonic porosity equations by zone

Zones	Sonic Porosity Equation	Wyllie Compaction Factor
	Wyllie	1.3
	Wyllie	1.2
	Wyllie	1.0

FIGURES

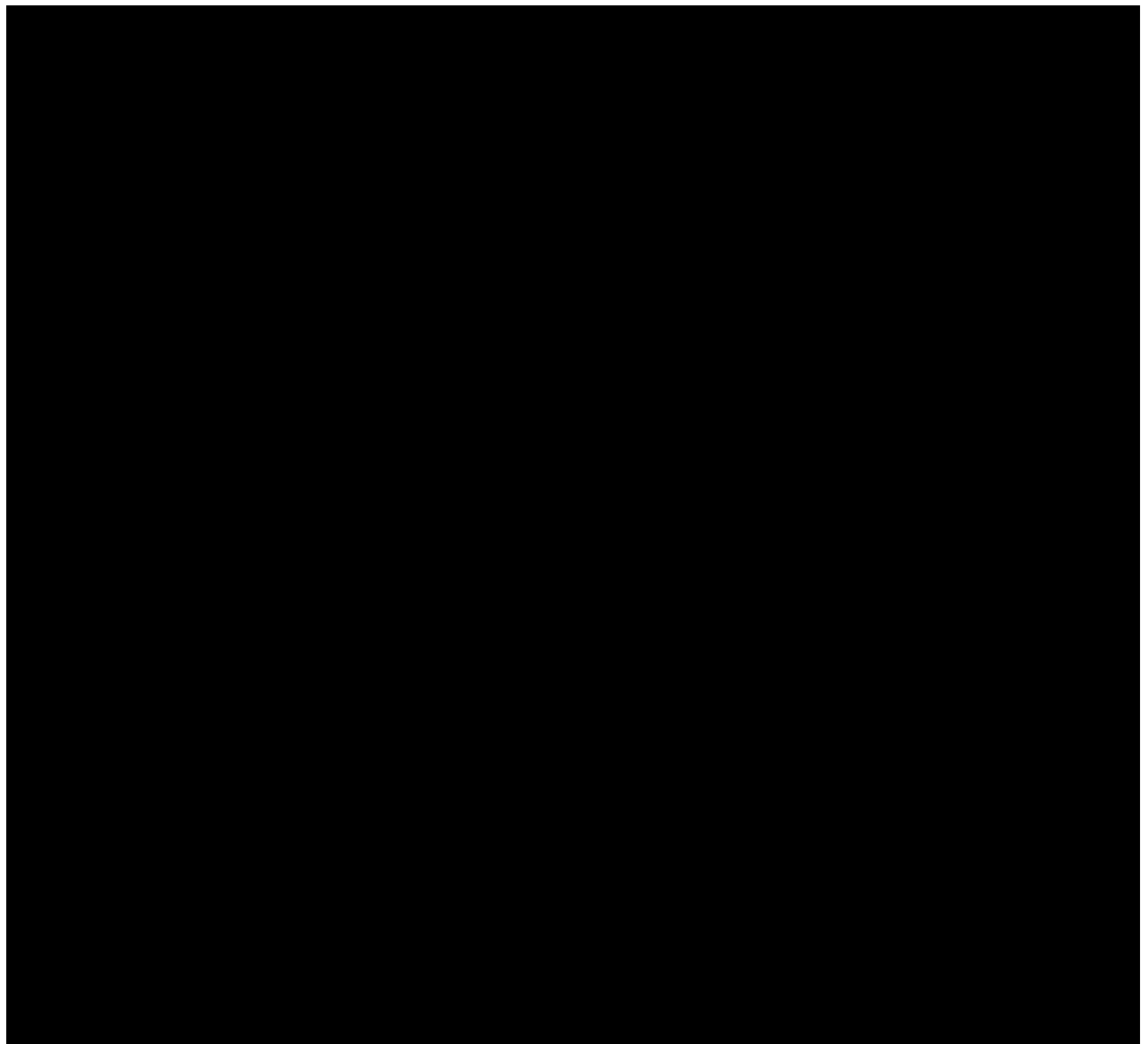


Figure 1: Location of wells with core data used for permeability transform.

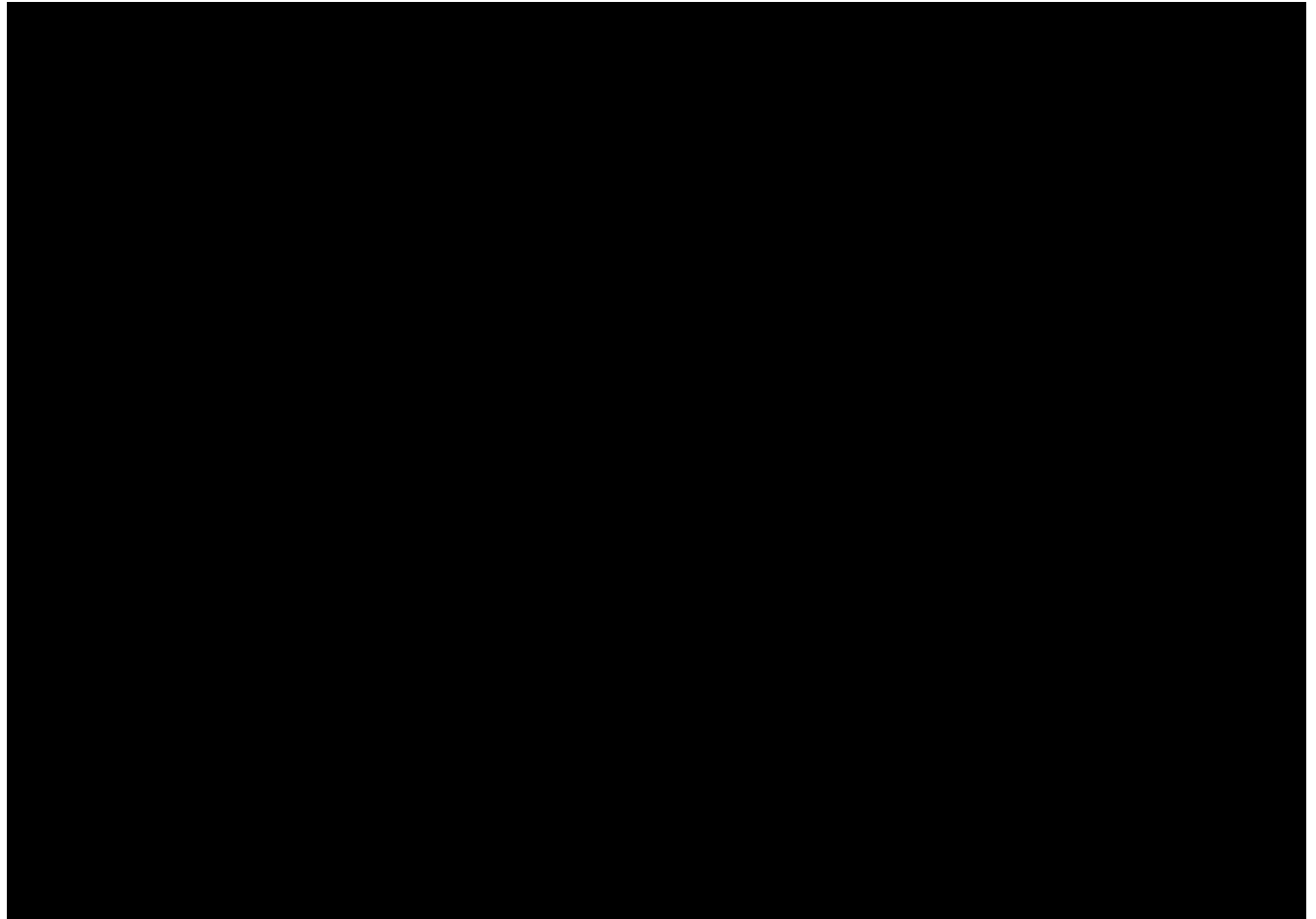


Figure 2: Permeability transform for [REDACTED] zones

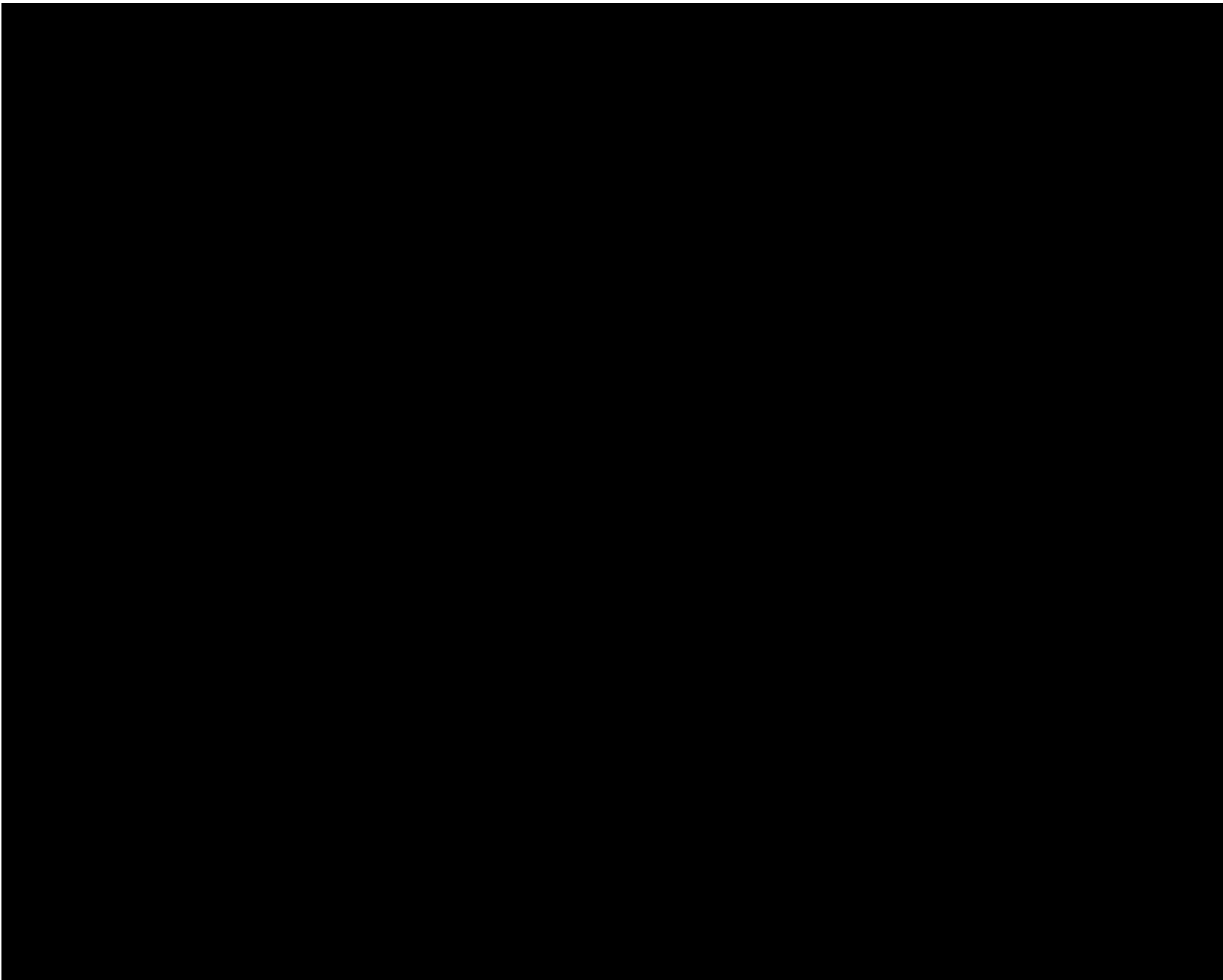


Figure 3. Upper and Lower Injection Zone porosity and permeability distribution used in the static model.

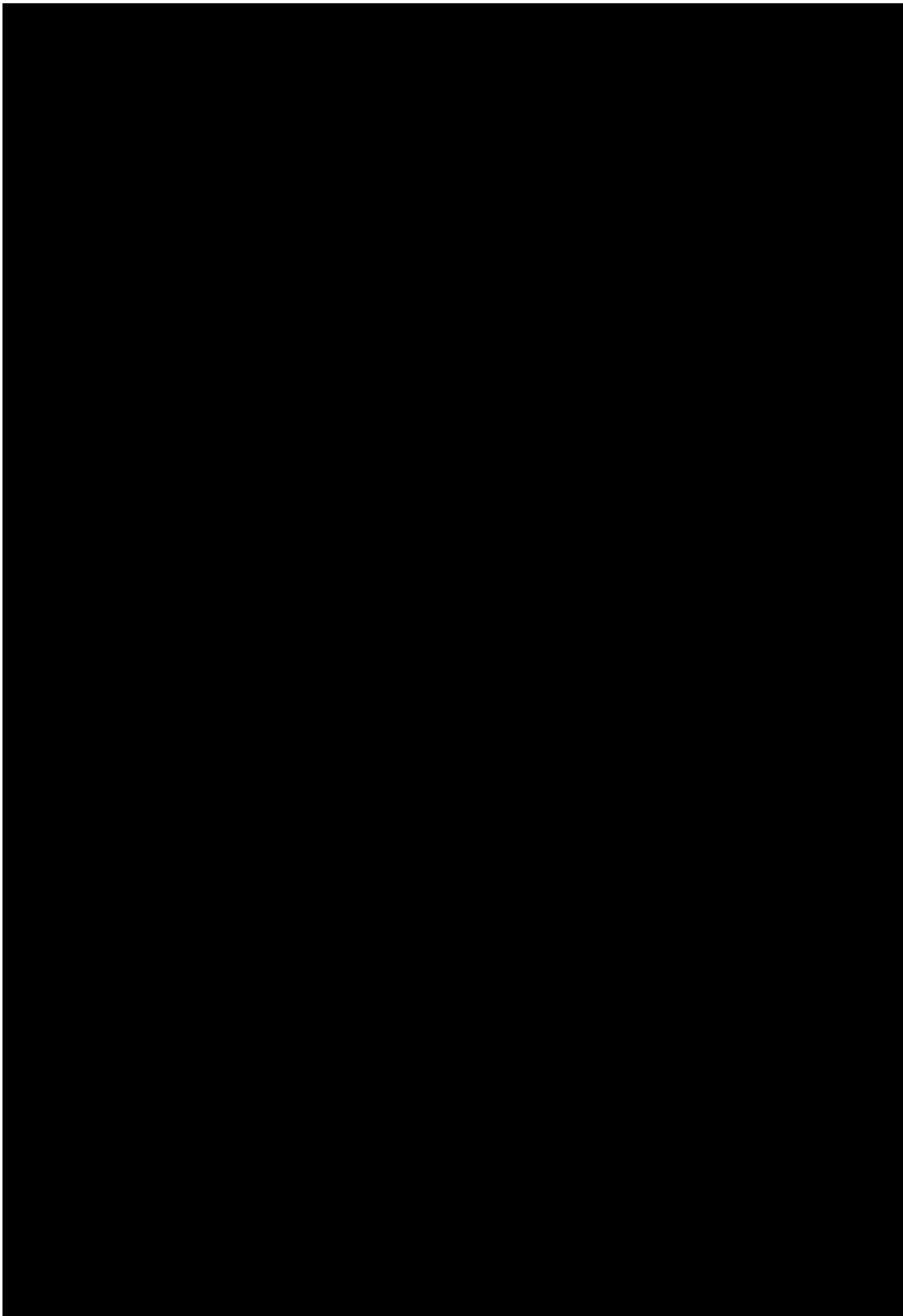


Figure 4. Sections through the static grid showing the distribution of porosity and permeability in the reservoir.