



GEOGULF2021

A U S T I N
October 27–29, 2021



Electrical Resistivity Imaging near Abandoned Steel Oil Wells: Five Case Studies, USA

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ABSTRACT

Abandoned wells may act as conduits for the contamination of groundwater by oil field brines and other pollutants. The steel casings of abandoned wells eventually develop leaks, which if not properly plugged, can allow pollutants to reach freshwater aquifers that supply drinking water. Resistivity surveys were conducted in the vicinity of five abandoned oil wells in order to characterize the near-surface geology and to determine the effects of the steel casings and potential leakage. The arrays consisted of dipole-dipole (DD) and inverse Schlumberger (SLB) arrays. The effects from steel cased wells can manifest as low resistivity anomalies in the vicinity of the casings, depending on proximity of the line to the well, well location along the line, and the specific array used. These features appear as vertical, circular, elliptical, and bell-like anomalies. However, in some instances with the SLB array, the data appear not to be affected by the presence of steel casings. This observation is significant because resistivity surveys utilizing the SLB array can provide reliable information on near-surface geology next to abandoned wells, and horizontal and vertical extension of brine impacted areas due to leaking abandoned oil wells. The DD array, on the other hand, is better at locating potentially hidden abandoned wells but interpreting subsurface structure or contamination with the array is more difficult.

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