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Exploring the Raft River Geothermal Area, Idaho, with the dc Resistivity Method

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A geoelectrical survey consisting of 269 bipole-dipole total field stations and 79 Schlumberger soundings was made as part of a study of the geothermal resources in the Raft River Valley, Idaho. The simple total field resistivity map depicted the following features: (1) the predominance of quasi-horizontal layering around the source bipole, (2) the existence of a low-resistivity layer over a major part of the survey area, and (3) the presence of a resistivity-high coincident with a gravity-high in the northwestern part of the survey area. Subsurface structures, faults, and lateral changes in resistivity were better delineated on a resistivity map normalized to the layering beneath the center of the current bipole. The maximum electrode spacing (AB/2) for the soundings ranged from 914 to 4880 m (3000 to 16,000 ft). All the sounding curves were processed and interpreted automatically, using an inversion computer program. Minor adjustments to some final interpretations were made using Dar Zarrouk curves. The interpretation indicated that up to 2 km of Cenozoic sediments underlie the valley including a low-resistivity layer (2 to 7 ohm-m), about 1 km thick.

A deep test well [drilled to a total depth of 1526 m (5007 ft)] confirmed the geoelectrically predicted depth of 1400 m (4600 ft) to a basement of a metamorphic rocks. Initial temperatures of about 147°C were recorded and hot water flowed at the rate of approximately 2300 liters/minute. In addition, the drilling results of five intermediate-depth (76–434 m) test holes were also in good agreement with the interpretations of the electrical data and confirmed the predicted depth to the top of a low-resistivity (2 to 7 ohm-m) layer which was identified as hydrothermally altered Pliocene sediments.