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## Geoelectric Sounding for the Determination of Aquifer Transmissivity in Parts of Bayelsa State, South South Nigeria

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### ABSTRACT

The application of geophysical methods in combination with pumping tests provides a cost-effective and efficient alternative to estimate aquifer parameters. In this study, nineteen Schlumberger vertical electrical soundings (VES) were occupied in parts of Bayelsa State using a maximum current electrode separation ranging between 300 - 400 m with the aim of estimating the transmissivity of the alluvial aquifer in areas where no pumping test has been carried out. Four of the soundings were carried out near existing boreholes in which pumping test had been carried out. The VES data obtained was interpreted, and layer parameters such as true resistivities and thickness were determined. The geoelectric parameters were used to generate the Dar Zarrouk parameters. Correlating the Dar Zarrouk parameter (e.g longitudinal unit conductance) with transmissivity derived from pumping test data, a constant was found which translate longitudinal unit conductance to transmissivity in a hydrogeological setting where effective porosity is the primary control on resistivity and hydraulic conductivity. Transmissivity determined from the pumping test data range between 1634.0 - 5292.0 m<sup>2</sup>/day while transmissivity values estimated from the longitudinal unit conductance (L<sub>c</sub>) range between 721 - 8991 m<sup>2</sup>/day. The transmissivity estimated from the pumping test (T<sub>p</sub>) data and transmissivity estimated from the longitudinal conductance (L<sub>c</sub>) on comparison show excellent correlation (R<sup>2</sup> = 0.92). The high transmissivity values agree with the geology of the Benin Formation (Coastal Plain sands) consisting of fine-medium-coarse sands. The results give a useful first approximation of the transmissivity and could be used to site exploratory boreholes.

### KEYWORDS

Aquifer; Longitudinal Conductance; Transmissivity; Dar Zarrouk Parameters; Geoelectric Parameters; Yenagoa

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