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Evaluation of Groundwater Potential and Aquifer Protective Capacity of Overburden Units in Paiko, North-Central Nigeria Using Integrated Hydrogeophysical Survey

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A study on the evaluation of the groundwater potential of Paiko area, North-Central Nigeria was conducted with the aim of determining the most suitable areas for siting of boreholes. The area is underlain by rocks of the basement complex comprising of migmatites, gneisses and granites. To this end, hydrogeologic mapping with integrated geophysical method employing Very Low Frequency Electromagnetics (VLF-EM) and Radial Vertical Electrical Sounding (RVES) methods have been utilised. Nine VLF-EM traverses with a separation of 100 m coupled with a station interval of 10 m in the E-W direction were adopted for the VLF-EM survey. Twenty-Seven RVES stations were occupied along the established traverses. Interpreted VLF-EM results reveal fractures trending principally in the NW-SE direction. Fracture anisotropy trends delineated from RVES survey also trend predominantly NW-SE. These trends correspond to the principal joint direction orientation from the field. Delineated geoelectric units from interpreted RVES survey are made up of clay, weathered and fractured rocks on top of the fresh basement rock and are characterised by 3 - 6 layer curve types. Prominent VLF-EM anomalies which are attributable to relatively thick unconsolidated weathered mantle at the north-western portion of the area holds more promise in terms of groundwater prospect. However, these weathered overburden areas show weak to poor protective capacity rating. Hence, drilling depths should target a minimum of 80 m for optimum yields and high quality groundwater supply.

Keywords: *Groundwater, Radial Vertical Electrical Sounding (RVES), Very Low Frequency Electromagnetics (VLF-EM), Aquifer protective capacity.*