

Geoelectrical Resistivity Delineation of Groundwater Contamination Risks Caused by Acid Mine Drainage: a Case History of Okpara Coal Mine, Enugu, Southeastern Nigeria

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The project is integrating geophysical and hydrogeochemical approach in aquifer contamination studies over an area of about 85.6 km². A geoelectrical resistivity survey conducted in the area around Okpara coal mine, Enugu, southeastern Nigeria will evaluate groundwater contamination risks associated with the acid mine drainage. Hydrogeochemical parameters in the mine vicinity have shown elevated concentrations of Fe, Total Dissolved Solids and SO₄ at low pH values with majority of analysed water samples constituting acid low metal content. Schlumberger Vertical Electrical Soundings were undertaken at nineteen stations to determine, in more detail the dimension of the contaminant plume as well as the local stratigraphy. Azimuthal Resistivity Soundings at two locations were conducted to predict the direction of the contaminant migration as encountered geologic formations are highly fractured. Borehole information confirmed by generated geophysical models shows four distinct lithologies: sandstone: shale, sandy shale and coal seam. Controlled by the local topography, the depth to water table is between 5 – 10 m. The vulnerability of the aquifer was closely related to the resistivity values of the leachate plumes using empirical models that correlate geoelectrically-important hydrochemical parameters. The resistivity data, vertical cross sections and contour maps generated from these data will help map the contaminant plume, which will be delineated as an area of low interpreted resistivities.