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Integrated geophysical and geochemical assessment of polluted zone by sewage effluent in University of Ibadan campus southwestern Nigeria

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This study arose from observation made on continuous discharge of sewage effluent into an agricultural training farm, University of Ibadan which is used for cultivation of vegetables and cereals, thus posing threat to human health. It aims in delineating sewage polluted zones and possible pathway into the groundwater network. The study area is underlain by banded gneisses. Ten resistivity Wenner profiles and thirty (30) VES stations were established and data analyzed using RES2DINV and WinResist algorithms respectively. Seven trial pits were dug; twenty-three (23) soil samples and seven groundwater samples were taken. The soil and water samples were analyzed using Inductively Coupled Plasma-Emission Spectroscopy and Atomic Absorption Spectrophotometric respectively. 2D inverted section depicts the top soil and clay unit. Resistivity in the top soil (36-70 Ω m) showed a decrease of 57% to 78% while the clayey unit (6-18 Ωm) showed a decrease of 63% to 88% relative to the control units. Decrease in resistivity within the top soil and clay unit suggests the presence of pollutants. VES-derived geoelectric section recorded three varying lithologies, with a decrease in resistivity of the top soil (22-58 Ωm) and the clay unit (6-15 Ωm) compared with the reference lithologies having 233 Ωm and 34 Ωm, respectively; the fractured sections in some parts of the bedrock could serve as a conduit for the seepage of the pollutants into the groundwater system. Water analysis shows that the concentration of Fe, Pb and Cd exceeded the WHO (2006) drinking-water quality guideline. Soil correlation analysis indicates 92.9% of the elements have the same source of supply. Enrichment factor and geo-accumulation analyses classified the concentrations of Cu, Cd, Fe, Pb, Zn, Sr, Ba, Mn, Ni and La to be enriched and contributed to the pollution. Combined geophysical-geochemical techniques have helped in mapping out polluted zones around the farm.

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