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Analysis of Hydrogeochemical Facies in Groundwater of Upper Part of Cross River Basin, Southeastern Nigeria

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ABSTRACT

Upper Cross River Hydrogeological Basin lies within latitudes 6^0 02^1N to 6^0 24^1N and longitudes 8^0 00^1E to 8^0 16^1E, and is generally underlain by shales of Asu River group of Albian age. The area has Histories of intensive mineralization which influenced groundwater system, resulting to occurrence of different water types. This study determines the various water types via evaluation of major ion concentration from representative water samples collected across the area. Twenty (20) water samples were *analyzed* using Spectrophotometer of HACH DR/2010 series, and results showed that groundwater in the area is generally hard and polluted with TDS in some places. Statistical inspection was performed on the results using aqua-chem, and it delineated five hydro-chemical facies, namely: Ca-Mg-Cl-$S0_4$, Ca-Mg-HCO_3-Cl-SO_4, Ca-Mg-HCO_3, Na-K-HCO_3 and Na-K-Cl-SO_4; all lie between slight acidic and weak alkaline water. These chemical facies (water types) diffused from non-point sources in urban area and point source from south of Abakaliki town. The dispersion of the *facies* plumes is possibly controlled by advection process through structural weak zones such as fractures. Hydraulic heads determined from hand-dug wells indicate local potentiometric surfaces, hence, showed local groundwater flow system which is possibly controlled by the underlying low permeable aquicludes formed by shales. The protective capacity of the aquitards was somewhat reduced by the permeating fractures which exposed the aquifers to polluting effects of mineralized water-types.

KEY WORDS: Pollution, Groundwater, *Hydrochemical Facies,* Asu River, shale, Aquifer.