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

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7 ABSTRACT

8 Upper Cross River Hydrogeological Basin lies within latitudes  $6^{\circ} 02'N$  to  $6^{\circ} 24'N$  and longitudes  $8^{\circ}$   
9  $00'E$  to  $8^{\circ} 16'E$ , and is generally underlain by shales of Asu River group of Albian age. The area has  
10 Histories of intensive mineralization which influenced groundwater system, resulting to occurrence of  
11 different water types. This study determines the various water types via evaluation of major ion  
12 concentration from representative water samples collected across the area. Twenty (20) water samples  
13 were *analyzed* using Spectrophotometer of HACH DR/2010 series, and results showed that groundwater  
14 in the area is generally hard and polluted with TDS in some places. Statistical inspection was performed  
15 on the results using aqua-chem, and it delineated five hydro-chemical facies, namely: Ca-Mg-Cl-SO<sub>4</sub>,  
16 Ca-Mg-HCO<sub>3</sub>-Cl-SO<sub>4</sub>, Ca-Mg-HCO<sub>3</sub>, Na-K-HCO<sub>3</sub> and Na-K-Cl-SO<sub>4</sub>; all lie between slight acidic and  
17 weak alkaline water. These chemical facies (water types) diffused from non-point sources in urban area  
18 and point source from south of Abakaliki town. The dispersion of the *facies* plumes is possibly  
19 controlled by advection process through structural weak zones such as fractures. Hydraulic heads  
20 determined from hand-dug wells indicate local potentiometric surfaces, hence, showed local  
21 groundwater flow system which is possibly controlled by the underlying low permeable aquicludes  
22 formed by shales. The protective capacity of the aquitards was somewhat reduced by the permeating  
23 fractures which exposed the aquifers to polluting effects of mineralized water-types.

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

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