An integrated geophysical investigation involving 2-D Wenner profiling, Very Low Frequency Electromagnetic Method (VLF-EM) and Vertical Electrical Sounding (VES) was conducted around Aule area in Akure the capital city of Ondo State: Southwestern Nigeria. Also hydro chemical analysis was carried out on five water samples: two from deep wells (Borehole) and others from shallow wells (hand – dug wells).

The result of the study showed that the groundwater had been contaminated by hydrocarbon arising from leaky underground storage tanks in a filling station within the area. The hydrocarbon contaminant plumes are characterised by relatively high resistivity values (> 200 ohm-meters) and were delineated to a depth of above 10m. Hydro chemical results showed that the total acidity, major ions (Na⁺, K⁺, Cl⁻, Mg²⁺, Ca²⁺, NO₃⁻); Total Dissolved Solids (TDS) and electrical conductivity show anomalous values beyond WHO standards. Therefore, the contaminant plume has migrated to a significant depth thus posing serious threat to the groundwater system and the inhabitants of the area.

Keywords: Wenner profiling, Very Low Frequency Electromagnetic Method (VLF-EM), Vertical Electrical Sounding (VES), hydrocarbon contaminant, Aule, Akure.