



## GEOPHYSICS AS A VERITABLE TOOL IN RECONNAISSANCE STUDIES FOR DEVELOPMENT OF URBAN SETTLEMENTS

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### Abstract

*Geophysical Methods have been applied as tools in solving many earth problems. The earth properties measured has made it a veritable tool of reconnaissance/investigation in many parts of the world including urban planning with very high need of good foundation structure and groundwater for its development and future sustenance. This investigation was carried out in Abuja which is underlain mainly by the Gneiss – Migmatite complex. The geophysical method adopted is the electrical resistivity utilizing the Vertical Electrical Sounding (VES) technique. VES was conducted at 25 stations along 5 traverses. The quantitative interpretation through partial curve matching and computer aided 1-D forward modelling with the WingLink software revealed a sequence of four major geo-electric layers which are the topsoil, weathered layer, fresh basement and fractured basement. The topsoil range in resistivity from 102 to 2400  $\Omega m$  while the weathered layer resistivity ranges from 32 – 500  $\Omega m$ . The high resistivity of the topsoil in places is an indication of its lateritization which is good for construction foundation/materials in addition to the thin overburden in the area especially in the northern portion of the area. A fractured basement trend is observed in the N-S direction beneath points B1, F, I and O in the area which is believed to be interconnected with the strip of thick weathered layer in the southern flank of the study area to a depth of about 20 m. This could be indicative of a good groundwater zone in the area considering the shallow water table observed around the study area. Information obtained from this study indicates the area can be divided into two sections with relative uniformity thereby allowing for adequate cost effective planning of geotechnical explorations [FJPAS 1(1) 2016].*

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### 1.0 Introduction

Two important factors to be considered in every settlement include shelter and water. Consequently, input from geotechnical engineers and hydro-geologists is very essential for planning of urban settlements. Both professions are concerned with study of materials beneath the surface of the Earth Crust with particular interest in stratification of the subsurface.

Interest of the geotechnical engineer, on one hand, hinges on the stratification of the subsurface vis-à-vis the engineering strength and behavior of materials constituting each strata while that of the hydro-geologist on the other-hand, borders on the stratification vis-à-vis the potential of each strata to act as an aquifer unit.

However, considering the cost, time and energy implication of drilling through the earth in order to ascertain its stratification, the use of a non-invasive, yet accurate method for reconnaissance is required. Thus, application of the Direct Current (D.C.) electrical resistivity method of geophysical prospecting is suggested. Various studies have shown that geophysical methods especially the electrical methods are very useful for pre and post construction investigation [7], [3], [4], [2].

Conductivity/Resistivity is a distinguishing property of rock types particularly in basement complex terrains where remarkable contrast exists in the resistivity of fresh crystalline rocks and the overburden materials. Thus, using the D.C. electrical resistivity method of geophysical prospecting,