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Electrical Investiagtion of Ground Water Pollution in Dumpsites at Awka, Anambra State

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Abstract:- The purpose of the study was to investigate the ground water pollution in dumpsites. It was an experimental study. Samples were randomly collected from dumpsites at recognized location. In March, 2019, duplicate samples were also collected from each of the sampling stations. The samples were kept in sterile containers. The containers were labeled accordingly. At the occurrence of precipitation, samples containing rainy weather were collected in a sterile sample bottle. The samples were carried from the sites to the laboratory in an ice box which contained packs of frozen ice. The Wenner array together with Campus tiger model resistivity was used to measure the six electrical resistivity imaging lines. The range of the electrode is between 5 to 35m with a station interval of 5m. The programme RES2DIN was used to invert the apparent resistivity data in order to get true two dimensional resistivity distribution in the surface. This was followed by the plotting and construction of the topographic map of the area at 5m elevation interval. The findings of the study indicated that the refuse dumpsite has a pattern of resistivity variations on the surface. The resistivity values were carried by solid wastes, leachate and underlying weathered profile resulting in ground water pollution. Among others, it was recommended that law enforcement agents in the state should ensure that market and domestic wastes are not dumped indiscriminately.

Keywords:- *Electrical Investigation, Dumpsite, Ground Water, Pollution.*

I. INTRODUCTION

Dumping of wastes on land has generated a lot of concerns over the years on the adverse effects of the wastes on both surface and groundwater population. In this regard, researchers on groundwater electrical investigation seem to have shifted the emphasis on the problems or challenges posed by the refuse dumps to considering quality of the groundwater (Oladunjoye, Olayinka and Amidu 2011). This problem seemed to be worsened by the increase in industries and urbanization. According to Ogbonna, Chindah and Ubani (2012), the springing up of different industries and the drift from rural areas to the urban centers have led to the generation of wastes which have negative impacts on human health through the pollution of the groundwater.

All over the world, the contamination of groundwater is a serious challenge especially now that most cities are faced with the problem of managing their wastes. In most cities in Nigeria, for instance, the process of collecting domestic and industrial generated wastes are very poor. There is inadequate waste disposal equipment. Wastes are also dumped indiscriminately on the streets and canals. On some occasions, dumping sites are created without considering the human residents or inhabitants. The presence of the refuse dumps determines the quality of groundwater in the area (Rizwan & Guardeep 2010). The environment is largely polluted by dumpsites. The wastes currently are not properly managed and there is no effective means of ensuring that people living around the dumpsites are safe in terms pollution.

Soluble chemicals being generated by the decayed wastes continue to pollute the groundwater (Andrea, Vagner, Giulliana, Lazaro & Heraldo, 2012). It is therefore imperative to embark on electrical investigation in order to ascertain extent of pollution of the groundwater in the dumpsites. This became necessary considering the practices of people especially in Awka.

In Awka, Anambra state, there seemed to be influx of people as a result of urbanization. This increase in human population and commercial practices has led to a large generation of domestic and industrial wastes which posed serious health challenge to the human population (Onyido, Okolo, Obiukwu & Amadi 2009). This became more worrisome when estimated 88,000 tons of wastes were generated domestically in 2018 (Umar, Aziz & Yusoff, 2010). In the area of the study, refuse or wastes are dumped at convenient locations. Figure 1 in the appendix shows the geological map of Awka metropolis.

II. RESEARCH METHOD

- *Collection of samples:*

Samples were randomly collected from dumpsites at recognized location. In March, 2019, duplicate samples were also collected from each of the sampling stations. The samples were kept in sterile containers. The containers were labeled accordingly. At the occurrence of precipitation, samples containing rainy weather were collected in a sterile sample bottle. The samples were carried from the sites to the laboratory in an ice box which contained packs of frozen ice.

The Wenner array together with Campus tiger model resistivity was used to measure the six electrical resistivity imaging lines. The range of the electrode is between 5 to 35m with a station interval of 5m. Figures 2; 3; 4; 5 and 6 located in the appendix showed the different dumpsites in Awka metropolis. The numbering of the traverses was based on the order they were conducted, T1-T8. These are shown in figure 3 (a-d) in the appendix. Some traverses (1, 2, 3 and 4) were conducted on the dumpsite while some (5 and 6) were on the down slope of the dumpsite. The remaining two (7 and 8) served as the control and measured about 300m.

III. INVERSION AND ANALYSIS OF DATA

The programme RES2DIN was used to invert the apparent resistivity data in order to get true two dimensional resistivity distribution in the surface. This was followed by the plotting and construction of the topographic map of the area at 5m elevation interval. These are shown on fig. 4(a-b) and 6(a-b)

IV. DISCUSSION OF FINDINGS

The findings of the study indicated that the refuse dumpsite has a pattern of resistivity variations on the surface. The resistivity values were carried by solid wastes, leachate and underlying weathered profile. The resistivity values for the traverses collected from the control site were higher than those collected from the dumpsite. The finding of this study is analytically important.

The findings of the study demonstrated how effective electrical resistivity is in identifying a resistive element in a medium with low resistivity or identifying a resistive element in a medium with high resistivity. The findings indicated that leachate generated in the dumpsite penetrates the surface area and spreads laterally. This migration of leachate is a major cause of pollution around the dumpsites.

The findings of this study are in line with Micheala, Odolib, Chukwura and bend (2018) that leachate generated from refuse dumps polluted groundwater in the area of their study. Similarly, Alsaibi, Mogheir and Afifi (2011) found that electrical resistivity is effective in identifying any resistive element in whether high or low resistivity medium. Furthermore, Ehirim and Ofor (2011) found that aquifer close to a solid landfill site constituted surface pollutant in a coastal area in Port Harcourt, Nigeria.

V. CONCLUSION

Electrical resistivity is capable of identifying variations in resistivity around refuse dumpsites. The electrical investigation of ground water pollution identified leachate and weathered profile at the dumpsites. The leachate migrated into the surface and inside the soil thereby polluting the groundwater around the refuse dumpsites in Awka metropolis.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations were made:

- The Anambra state government should put in place necessary mechanisms to manage wastes in the area.
- The state legislature should come up with effective laws to check indiscriminate dump of refuse in the state.
- Industries in the state should be properly supervised by relevant authorities to avoid indiscriminate dumping of refuse by the industries
- Law enforcement agents in the state should ensure that market and domestic wastes are not dumped indiscriminately.
- Health and sanitation workers should educate people in the state on the dangers of drinking contaminated water.

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Fig 1:- Dumpsite at Agu Awka

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Fig 2:- Dumpsite at Umueze behind community primary school

Fig 3:- Dumpsite at Eke Awka

Fig 4:- Dumpsite at Emma Nnaemeka Street Awka

Fig 5:- Dumpsite at Amawbia

Fig 6:- Dumpsite at Umubelu Awka

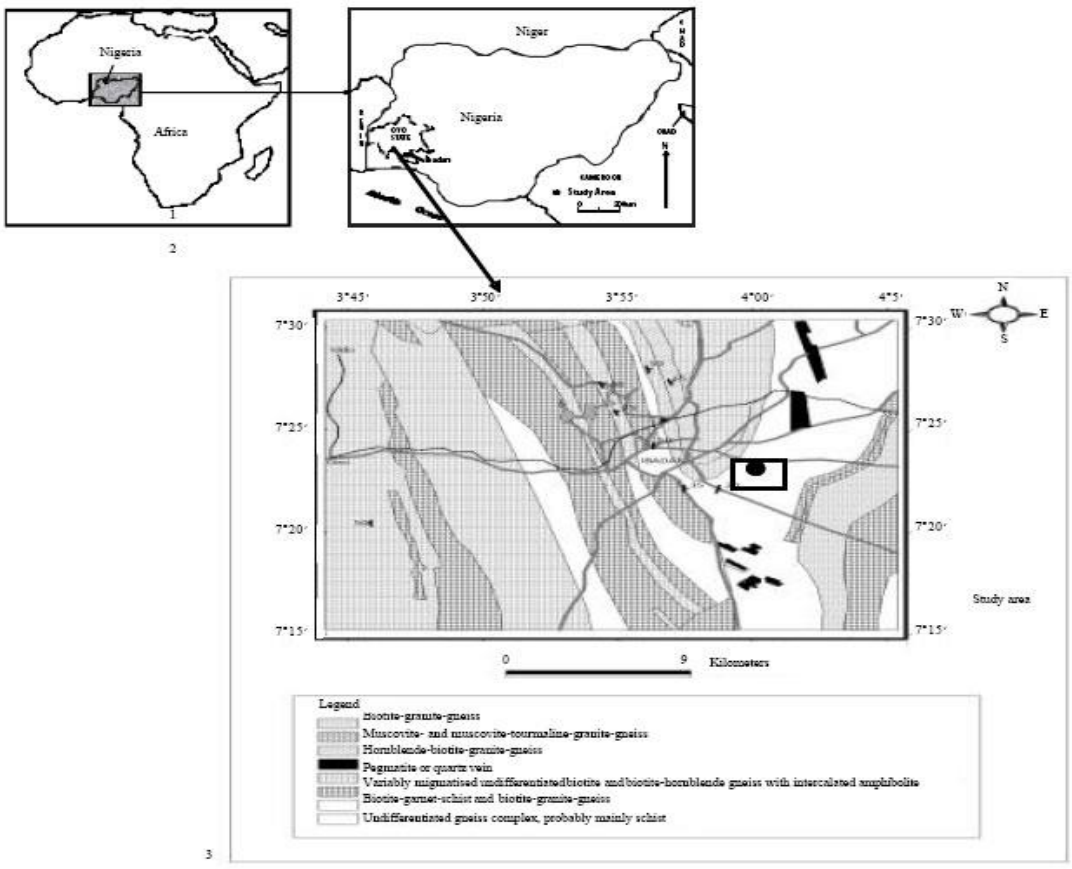

Fig 1:- Geological map of Awka metropolis, southeastern Nigeria, showing location of the study area

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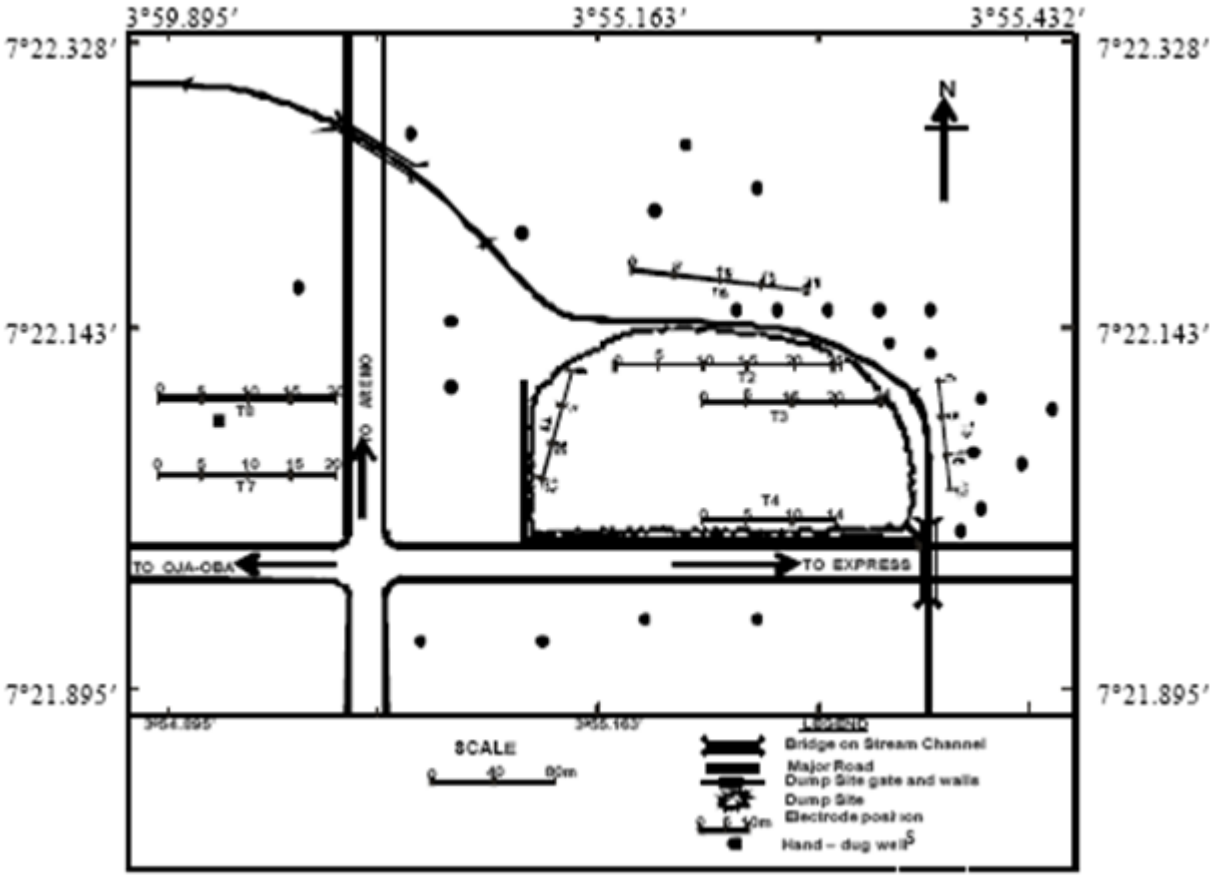

Fig 2:- Survey plan of the study area showing outline of the r