DIAGENESIS
Borehole and Mining Service
RC 2388654

REPORT OF GEOPHYSICAL SURVEY FOR GROUNDWATER EXPLORATION

CLIENT:
OAK RURAL HEALTH ORGANIZATION.

LOCATION:
KORUKORU , ALONG IGBO OLOYIN, AKINYELE LOCAL GOVERNMENT IBADAN.

CONSULTANT:
DIAGENESIS BOREHOLES AND MINING SERVICES.
BN(2388654)

NO 3 WINJOBI CLOSE AROMETA ELEYELE, IBADAN OYO STATE.

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FEBRUARY, 2021.

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INTRODUCTION

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HYDRO-GEOPHYSICAL SURVEY FOR PRODUCTIVE BOREHOLE CONSTRUCTION AT KORUKORU VILLAGE,ALONG IGBO-OLOYIN AKINYELE LOCAL GOVERNMENT BY OAK HEALTH ORGANISATION.

Sir/Ma,

Further to your instruction to find a suitable location for water borehole, we have carried out an adequate hydro geophysical survey to facilitate an optimal site selection and a favourable condition at your site premises. A major determinant of the performance quotient of any borehole is its location.

Consequently, prior to any drilling operation, the entire focus area will have to be comprehensively evaluated in order to select the best possible point for drilling.

The aim of the survey is;

1. Deciphering the electrical sub-surface stratification of the project area.
2. Determining the hydro-geological layering of the area, potential and variation in water bearing capacity across the area.

The site work was carried out on the 15th of February, 2021. The result of the investigation and recommendation are presented in this report.

The value presented in this report are not absolute, they are to serve as a guide in the course of constructing the borehole.

Yours faithfully,

1.0 EXECUTIVE SUMMARY

An electrical resistivity survey was carried out within the premises with view to appraise the groundwater potential in the area, method of tapping groundwater without any adverse effects. The surveys include a lateral horizontal profiling and vertical electrical depth sounding.

A **70m depth** is recommended to be drilled on the **VES** point 1. The yield of the hole is expected to be **FAIR YIELD** due to the nature of the underlain formations and the nature of the curve type **(HK)** and little fractures cut cross. The driller should make sure that the hole is properly cased with PVC screened casings and seat conveniently on the basement rock for clean drinkable water.

1.1 SITE LOCATION AND DESCRIPTION

The study area falls within the South-West Nigeria. There are little exposures found along the river channel. Geologically, the study area is known to be under laid with massive crystalline rock in their older pursuits.

2.0 GEOLOGY AND HYDROLOGY

The area on which the report is being presented lies within the South-West of Nigeria Precambrian basement complex. The geological survey map suggests that the basement complex in this area comprises migmatite-gnesis, quartizite and granite. The area of investigation falls within the basement complex of South-Western Nigeria.

The assemblage of rocks consist of Gnesis, granite gnesis, schist and gabbros in their modifications, Both massive and low lying outcrop of these rocks could be seen around the road cuttings, and streams while some are highly weathered due to their exposure to agent of denudation, the above materials may be permeable when fractured or weathered and consequently when below water table forms an aquifer.

3.0 SCOPES OF THE WORK.

The first phases of these investigations involve geological and hydro-geological surveys of the area while the second phases involve the geo-electrical investigation proper.

The geo-electrical investigations consist of lateral electrical profiling and vertical electrical depth sounding.

- Lateral exploration profiling – a series of measurements of resistivity are made with a constant electrode spacing, moving the whole of the electrode arrangements consecutively to a number of points. Thus the lateral variation of resistivity of the ground can be measured. The resistivity of the ground can be measured. The resistivity obtained is used to pick the VES point on the surface.
- Vertical exploration depth sounding – a series of measurements of resistivity are made by increasing the electrode spacing in successive steps about a fixed point.

The results of the investigation are presented as appendixes to this report.

It should however be pointed out that the electrical resistivity survey simply identifies physical structures (like fracture layer) within a rock body but does not guarantee the occurrence of water in it as it could be filled with ore body for example (like electrical conductive materials)

Nonetheless, the electrical resistivity method has an excellent track record when it comes to finding useful quantities of water in hard rock.

It should also be stated here that the quality of water depends solely on the rock materials in which the water interact with over the years.

A geologist is therefore not liable to either the quality and/or the quantity of the ground water obtained in a site as they are absolutely a function of nature.

4.0 INTERPRETATION AND RESULTS

The ability of a rock unit to conduct electrical current depends primarily on three factors;

- The amount of opens spaces between particles.
- The degree of interconnection between open spaces.
- The volume and conductivity of the water in the pore spaces.

The presence of water in its chemical character is the principal controls on the flow of the electric current because most rock particles offer high resistance to electric flow. Thus, resistivity decreases as porosity, hydraulic conductivity, water content and water salinity increases. There are two approaches in interpreting the resistivity data;

- Qualitative
- Quantitative

In qualitative interpretation, the potential zone is found out by studying the nature of the field curve. In quantitative interpretation, there are again two approaches; *indirect method in direct method, the theoretically computed master curve are used to find out layer parameters by curve matching technique where as in direct method, computer are employed to find out the layer parameters.

During the field survey, the apparent resistivity obtained for different electrode spacing is recorded. These apparent resistivity are plotted against current electrode spacing as double log graph sheets having 62.5 modulus to get the field curves and are interpreted from curve matching technique and iterating inversion method (earth layered method)

5.0 DATA INTERPRETATION

VES1 display **HK** type curves. The quantitative partial curve matching method was first adopted. This was followed by the use of Computer software to improve the quality of the interpretations are as shown in fig1&2.

RESULT DISSCUSSIONS FOR THE VES POINT 1

Depth (m)	Resistivity (ohm-m)	Inferred Lithology
00.00-00.80	79.00	Top Soil
00.81-02.20	52.30	Sandy Clayey Soil
02.21-11.90	259.20	Weathered Basement
>11.90	91.10	Fractured Basement

RESULT DISSCUSSIONS FOR THE VES POINT 2

Depth (m)	Resistivity (ohm-m)	Inferred Lithology
00.00-00.40	86.10	Top Soil
00.41-12.70	50.90	Sandy Clayey Soil
>12.70	112.70	Fractured/Weathered Basement

6.0 RECOMMENDATION

In view of the above analysis and index, the location (Ves) in my own opinion has requisite hydrogeological features for a **FAIR AQUIFEROUS POTENTIAL**.**VES POINT 1**, is recommended to be drilled to a depth of **70m** and an estimated overburden of about **25-30m (IT MAY REQUIRE CASE DOWN BECAUSE OF LOOSE FORMATION),** Hence the driller should make sure the HOLE IS CASE VERY WELL and seat conveniently on the basement rock to encourage clean drinkable water. In addition appropriate grouting and gravel packing should be adopted.

NOTE; (1) GEOPHYSICAL SURVEY IS A GUIDE.

(2) THE YIELD OF A HOLE IS INDEPENDENT OF DEPTH.

APPENDIX.

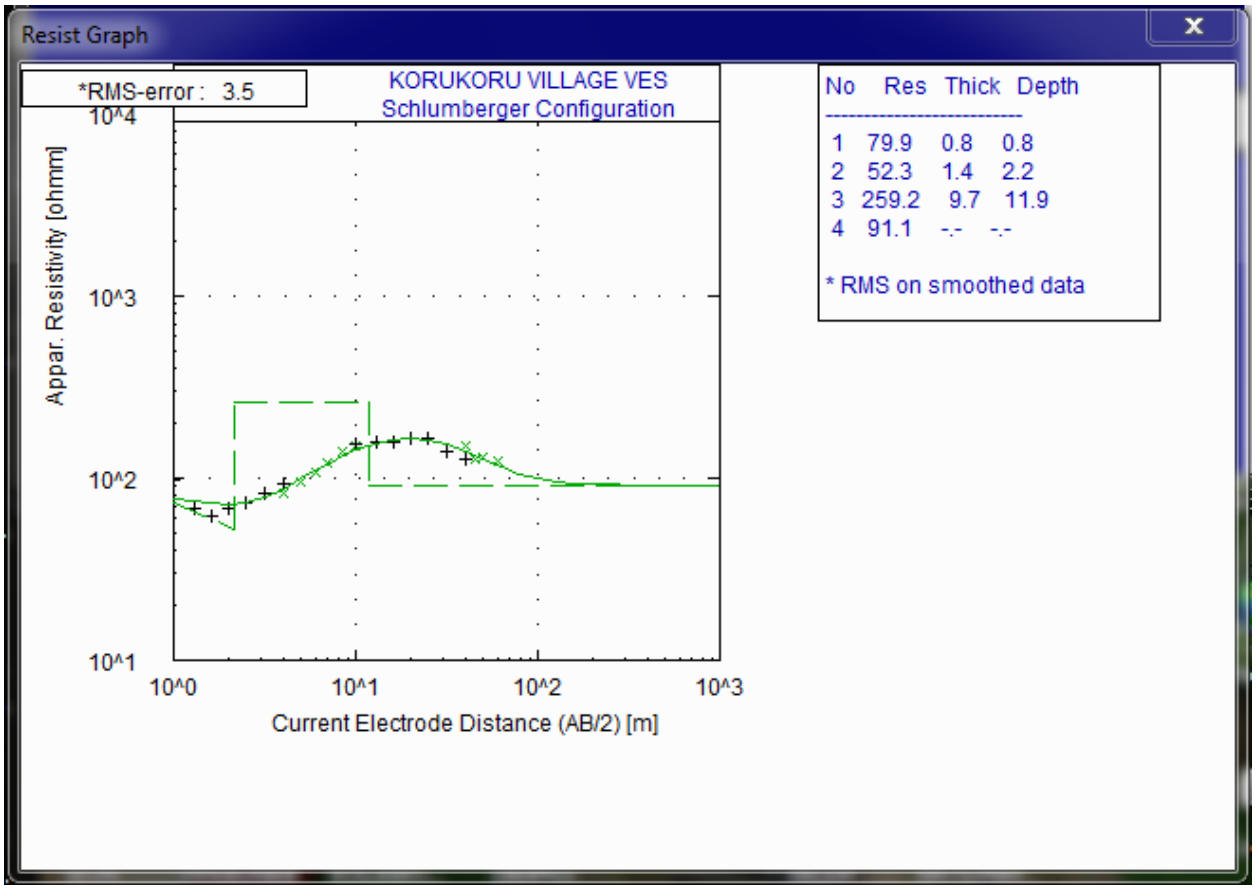
DATA AS ACQUIRED DURING THE PROFILLING

No.	Observed Resistance in Ohms	MP
1	4.69	15
2	4.47	18
3	4.32	21
4	4.44	24
5	4.79	27
6	4.89	30
7	4.08	33
8	4.07	36
9	4.08	39
10	4.09	42

a= inter-electrode spacing =10m

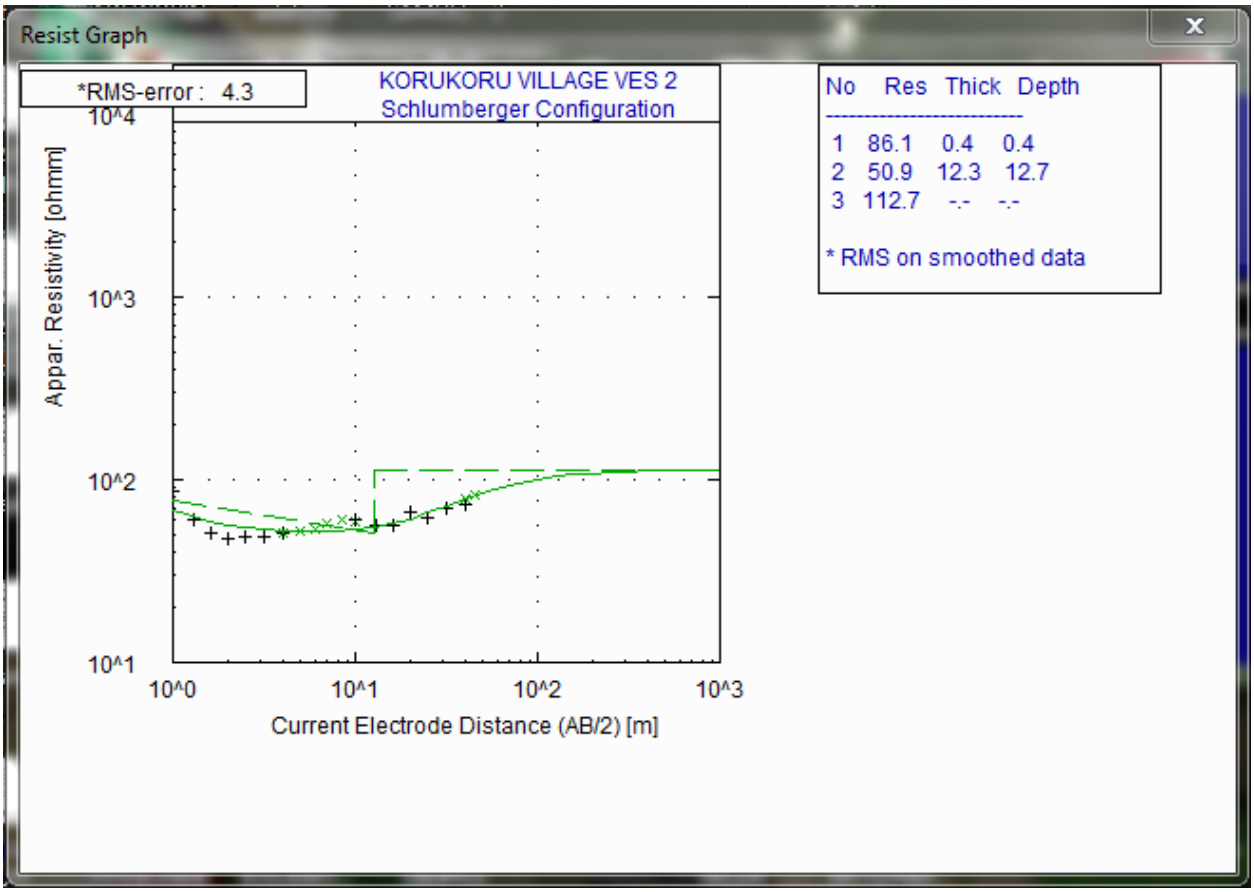
d= distance between current electrodes

VES 1



THE GRAPH OF APPARENT RESISTIVITY AGAINST CURRENT ELECTRODES SPACING. (VES)

VES 2



THE GRAPH OF APPARENT RESISTIVITY AGAINST CURRENT ELECTRODES SPACING. (VES

KORUKORU VILLAGE VES 1

Schlumberger Array

AB/2	RES
1.0000	97.8210
1.3000	67.7030
1.6000	61.5880
2.0000	67.5224
2.5000	73.0170
3.2000	82.6816
4.0000	93.9700
4.0000	82.3230
5.0000	96.1430
6.0000	107.8950
7.0000	121.2300
8.5000	141.4008
10.0000	151.1430
10.0000	155.4670
13.0000	158.1140
16.0000	156.8500
20.0000	165.6540
25.0000	166.9640
32.0000	141.2610
40.0000	127.6640
40.0000	151.5028
45.0000	125.8690
50.0000	131.6480
60.0000	123.6920
70.0000	119.5460

KORUKORU VILLAGE VES 2

Schlumberger Array

AB/2	RES
1.0000	86.2450
1.3000	60.7490
1.6000	50.7410
2.0000	47.5090
2.5000	48.9140
3.2000	48.9696
4.0000	51.6240
4.0000	51.3770
5.0000	51.7580
6.0000	53.8880
7.0000	56.9800
8.5000	59.8460
10.0000	59.6260
10.0000	59.9830
13.0000	56.7889
16.0000	56.6332
20.0000	67.2520
25.0000	61.4490
32.0000	69.9870
40.0000	73.7650
40.0000	78.9098
45.0000	82.8790