EDAL DRILLING COMPANY LTD.

GEOPHYSICAL SURVEY REPORT

SUBMITTED TO:

TEAM AND TEAM INTERNATIONAL

35[A] Clewry's Lane, off Main Motor Road, Congo Cross, Freetown, Sierra Leone
Cell Numbers: 076 601 550 / 076 204 816 Phone No. 230745 Email: edalltd@gmail.com

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1. INTRODUCTION

To explore the possibility of developing groundwater through borehole drilling and as a prerequisite for drilling, Team and Team International therefore contracted EDAL Drilling Company to conduct Hydrogeological/ Geophysical survey to locate the borehole position with possible groundwater potential at the proposed site.
These studies among others, provided enough data and information used in assessing the possibility of striking groundwater in the project area.
This report therefore documents the work carried out during the investigations at the site.

2. BACKGROUND / GEOLOGY OF PROJECT AREA

The project area lies within the Freetown Basic Complex.
The Freetown Basic Complex outcrop in the west as a result of younger igneous intrusions and it is predominantly of basaltic magmatism. The Freetown Complex is a layered gabbroic anorthosite intrusion, emplaced gneisses and schist of the Kasila group. It forms part of the Peninsula and Banana Island.
It is thought to have been formed due to multiple injections of magma that occurred intermittently.

Therefore, groundwater potential of the Freetown Basic Complex is found within weathered and fractured zones of these igneous (crystalline) rocks.
However, groundwater quality and quantity could be high if properly located through the appropriate hydrogeological/geophysical investigations.

3. FIELD WORK

The field exercise was carried out together with Team and Team International representative to select target area (s) for geophysical survey. The activities included the following:

- Geomorphological survey of the area
- Geological survey to determine the formation of the area and to identify possible hydrogeological features
- Demarcation of area for traverse lines for geophysical survey.
- Location of GPS coordinates

3.1. Selection of Traverse Line

The traverse line was selected based on the geomorphology, physical structures as well as the hydrogeological features of the area. There was no visible strike direction of the geological formation of the area due to weathering and engineering activities.

3.2 Geophysical Survey

The Geophysical survey consisted mainly of Electrical Resistivity i.e. Vertical Electrical Sounding (VES) using ABEM SAS 1000 Resistivity meter.

3.2.1 Selection of VES points

The Vertical Electrical Sounding (VES) point was selected based on the site location and geological features.

3.2.2 Vertical Electrical Sounding (VES)

Vertical Electrical Sounding (VES) was carried out with the aim of determining the formation resistivities and the depth to bedrock, as well as finding the possibility of obtaining fractures at depth.
The Schlumberger electrode configuration and the required procedures were used for the VES. Selected point for drilling was marked with a peg for identification.

4. DATA ANALYSIS AND INTERPRETATION

The Vertical Electrical Sounding (VES) data and the corresponding curve are presented below:

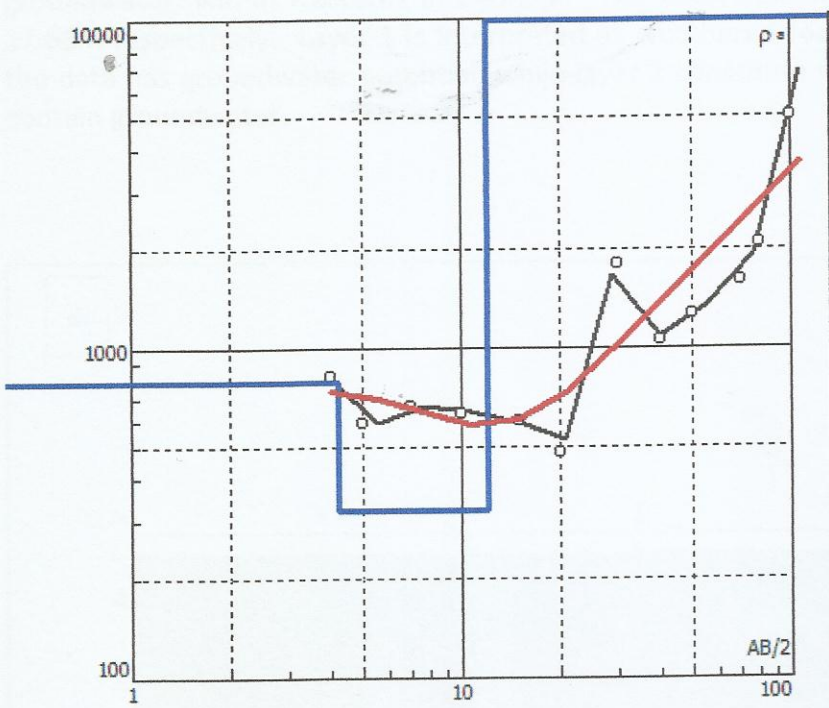
Table 1: Schlumberger Array VES Data

Client: **Team and Team International**	Community: **Kuntolon**
Project: **Borehole Siting (Geophysical Survey)**	Sounding Number: **1**
District: **Western Area**	GPS Coordinate East: **0710584**
Date: **23rd April, 2014**	GPS Coordinate North: **0939708**
Field Operator: **Morlai Kanu**	Elevation: 103m

Schlumberger Array VES Field Data

No.	AB/2	MN	Resistance (ohm)	Apparent Resistivity (ohm-m)
1	4	0.8	13.1400	817.46
2	5	0.8	6.1118	596.26
3	7	0.8	3.4779	667.13
4	10	1.5	3.0600	637.36
5	15	1.5	1.5847	603.10
6	20	1.5	0.5746	480.76
7	30	1.5	0.9573	1800
8	40	7.6	1.6033	1050
9	50	7.6	1.2376	1271
10	70	7.6	0.7926	1600
11	80	14	1.4569	2076
12	100	14	2.2572	5040

The VES data is first presented in the form of a table (as shown above) from which a graph of Apparent Resistivity (ρ_a) Vs half the Current Electrode Spacing (AB/2) is plotted.



N	ρ	h	d	Alt
1	818	4.25	4.25	-4.254
2	322	7.68	11.9	-11.93
3	329803			

Figure 1. Schlumberger Array VES Curve and Model

The data shows a two-layer subsurface in which $\rho_1 < \rho_2$. The unusually low apparent resistivity registered at some points in layer 2 is indicative of the presence of pore electrolyte, possibly groundwater, within fractures in bedrock. The equivalent layer thicknesses are 4.25m and 11.68m respectively. Layer 1 is interpreted as weathered rock (Regolith) which, according to the data has groundwater potential; while layer 2 constitute fractured bedrock that also likely contain groundwater.

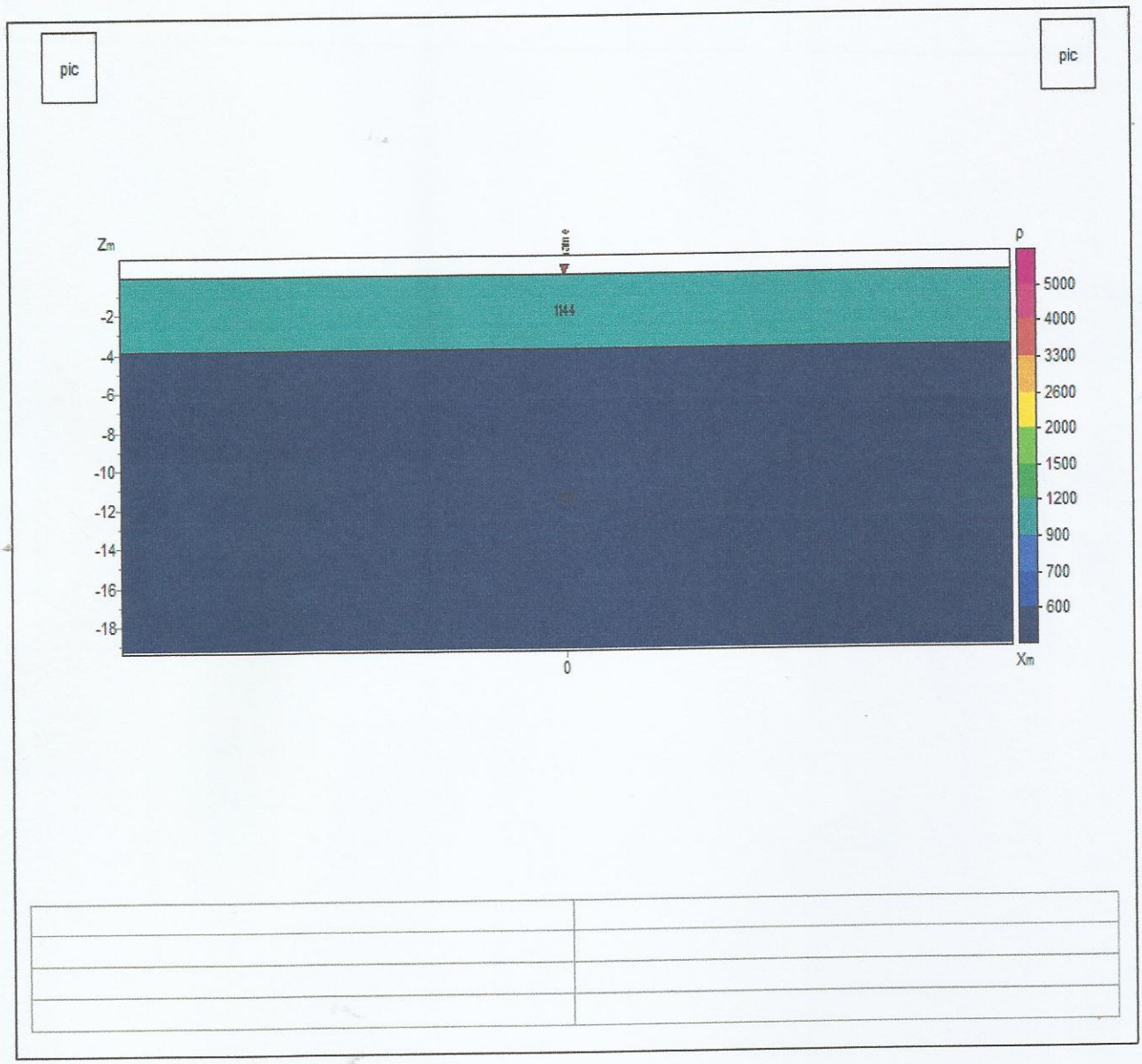


Figure 2. Pseudo - section Showing Apparent Resistivities and Layer Thicknesses

Table 2: Selected Promising Points from VES Data

No.	VES POINT	LAYER	THICKNESS (m)	DEPTH (m)	APPARENT RESISTIVITY (Ohm-m)	POSSIBLE WATER ZONES (M)	RANKING	MAX DRILLING DEPTH (M)
1	A	1 2 3	4.25 7.68	4.25 11.68	818 322 3298	15-30 40-65	1st	80

5.0 CONCLUSIONS AND RECOMMENDATIONS

Conclusion

Based on the analyses of the result, and in line with the aims of the study, the conclusions are as follows:

- The project area lies within the Freetown Basic Complex lithological formation.
- Groundwater potential (i.e. quality and quantity) could be high at depth within weathered zones and fractured bedrocks.
- The potential water zones are found between 15 - 30m and 40 -65m respectively as indicated from the resistivity values.
- It is premature, however, to estimate quantities, which could only be determined during test drilling and test pumping.
- The borehole location was selected in accordance with both national and international borehole siting guidelines.

Recommendation

In this regard, it is recommended that;

- Drilling should be carried out at the selected point to confirm the existence of groundwater.
- The borehole must be constructed using the correct and standard materials such as standard PVC screens and plain casings, well sorted gravels etc. for water quality and high yield.
- The maximum drilling depth should be 80m to cut across the two promising zones of 15m - 30m and 40m - 65m respectively for sustainable productivity and high yield of the borehole.
- Both physico-chemical and bacteriological test should be carried out on the borehole water sample after completion.

REPORT SUBMITTED BY:

24/04/15

Morlai Kanu
Geologist/ Field Operator
Cell: +232 76 950 032