EDAL DRILLING COMPANY LTD.

35[A] Clewry's Lane, off Main Motor Road, Congo Cross, Freetown, Sierra Leone

GEOPHYSICAL SURVEY REPORT
REF NO. 4
(2 JALLOH LANE-KUNTORLON)

SUBMITTED TO:
CONCERN WORLDWIDE-SL

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1. INTRODUCTION

In other to improve the water supply for Jalloh Lane and it's environs, Concern Worldwide-SL contracted **EDAL** Drilling Company, to explore the possibility of getting ground water in this area. As part of our operations, we therefore carry out a Hydrogeological and Geophysical investigations in sitting the borehole position in the project area.

These studies among others provided enough data and information used in assessing the possibility of striking groundwater in the project area. This report 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 Complex is formed mainly by basaltic magmatism and outcrops can be found in the west as a result of younger igneous intrusions and erosion. 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. Most of these formations are obscured and overlain by hard compacted laterites and some sedimentary materials.

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

3. FIELD WORK

The field work was divided into two phases;

- Reconnaissance Survey; and
- Geophysical Survey

3.1 Reconnaissance Survey

The aim of the reconnaissance survey was to select suitable area (s) for geophysical survey, considering the geological/Hydrogeological, environmental and other physical conditions.

The reconnaissance survey included the following:

3.1.1 Geomorphological Survey of the Area

This describes the landscape and other physical features on the project area. The project area is on high-ground with an elevation of about 77m above sea level. There were no in-situ outcrops in the immediate surroundings. Out crops can only be seen from a distance. The Geomorphology of the area suggested high ground water potentials.

3.1.2 Geological survey to determine the formation of the area and to identify possible hydrogeological features

The project area is overlain by hard compacted laterites which were derived from underlain weathered bedrock.

There was a hand dug well of 15m deep at about 14m from the selected area (but get dried up during the dry season). This suggested a water bearing formation at a near surface and thus there is a high potential of groundwater.

3.2 Geophysical Survey

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

3.2.1 Selection of Traverse Line

The traverse line was selected on the basis of geomorphologic and physical features as well as Hydrogeological features of the area. There was no visible strike direction of the geologic formation of the area due to weathering and surface erosion. Selected point for the Vertical Electrical Sounding (VES) was marked with a peg for identification.

3.2.2 Selection of VES points

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

3.2.3 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.

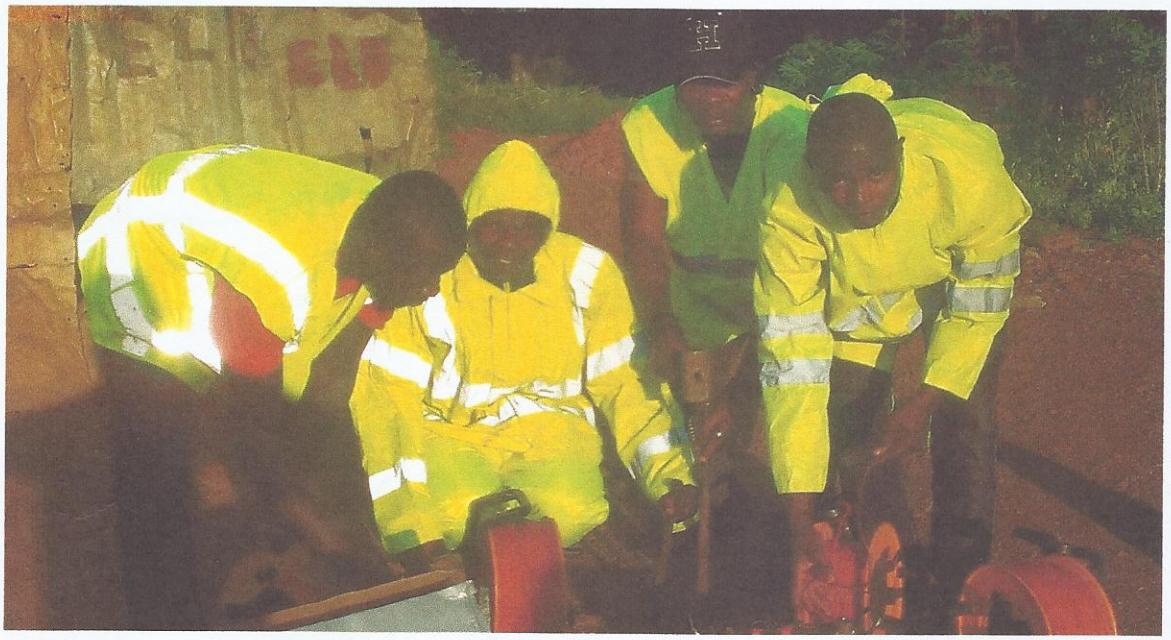
4. DATA ANALYSIS AND INTERPRETATION

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

4.1 Table 1: Schlumberger Array VES Data

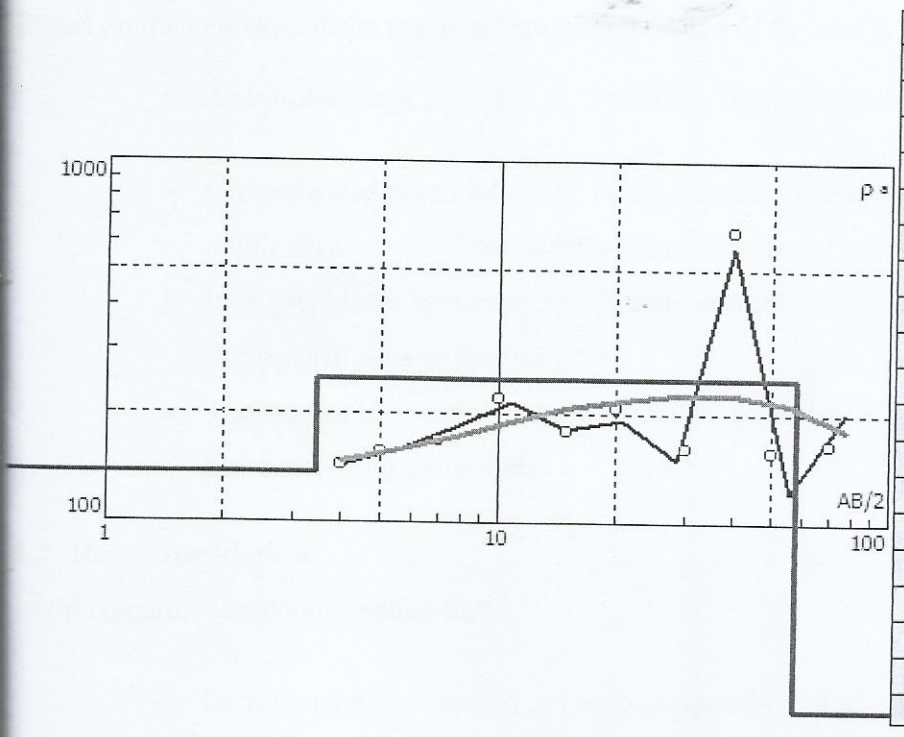
Client: **Concern Worldwide-SL**			Community: **2 Jalloh Lane-Kuntorlon**
Project: **Geophysical Survey**			Sounding Number: 1
District: **Western Area**			GPS Coordinate East: **0700988**
Date: 14th September,2015			GPS Coordinate North: **0935386**
Field Operator: Kemoh Alie Bayoh			Elevation: **77m**
Schlumberger Array VES Field Data			
No.	**AB/2**	**MN**	**Apparent Resistivity (ohm-m)**
1	4	0.8	144.01
2	5	0.8	156.06
3	7	0.8	168.32
4	10	1.5	220.47
5	15	1.5	179.21
6	20	1.5	206.33
7	30	1.5	160.70
8	40	7.6	639.70
9	50	7.6	156.10
10	70	7.6	164.05
11	80	14	8739.37

Photo showing Geophysical team at work



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

Model 1. Schlumberger Array VES Curve and Model.



N	ρ	h	d	Alt
1	137	3.43	3.43	-3.434
2	247	54.5	58	-57.97
3	7.11			

4.2: Table 2: Selection of Promising Points from VES Data

No.	LAYER	THICKNESS (m)	DEPTH (m)	APPARENT RESISTIVITY (Ohm-m)	POSSIBLE WATER ZONES (M)	RANKING	MAX DRILLING DEPTH (M)
1	1 2 3	3.43 54.5 -	3.43 58 -	137 247 7.11	15-30 50-70	High	80

It can be deduced from the VES data above that the maximum drilling depth should be 80m to cut through the first and second promising zones of 15-30m and 50-70m respectively to ensure reliable productivity. However this depth may be exceed based on other sub-surface conditions.

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Based on the analyses of the result in line with the aims of the study, the drawn conclusions are;

- The project area is within the Freetown Basic Complex.
- Groundwater potential could be high within the two promising zones as shown above at depth between 15- 30m and 50-70m respectively as indicated from the resistivity values.
- It is premature however, to estimate quantities/volume which could only be determined during drilling and pumping test.
- The borehole location was selected in accordance with both national and international borehole siting guidelines.

5.2 Recommendation

In this regard, it is recommended that;

- Drilling could be carried out at the selected point to confirm the existence of groundwater.
- The maximum drilling depth should be 80m to cut across the first and second promising zone of 15- 30m and 50-70m respectively to ensure reliable productivity. However, the supervisor may exceed this depth based on the field conditions.
- Both physico- chemical and bacteriological tests should be carried out on the borehole water samples from the completed well.
- Borehole must be constructed using the correct and standard materials such as standard uPVC screens and plain casings, well sorted gravels etc. for water quality and high yield.

REPORT SUBMITTED BY:

.....Bayoh 01/10/15

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