EDAL DRILLING COMPANY LTD.

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

GEOPHYSICAL SURVEY REPORT
REF NO. 7
(LUMPA-MCHP)

SUBMITTED TO:
CONCERN WORLDWIDE-SIERRA LEONE

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1. INTRODUCTION

In a quest to improve the water supply for Lumpa community- Maternal and children Health Post, 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 between the Bullom sedimentary formation and the Freetown Basic complex.

The Bullom Group is comprised of unconsolidated to poorly consolidated sediments occupying the coastal plains of Sierra Leone. The deposits extend up to 50km inland and are found at heights up to 40m above present sea level (Culver and Williams; 1979). Although outcrops of Bullom Group are rare and generally poor, the available evidence suggest a lateral variable sequence of poorly consolidated, near horizontal, often iron-stained gravels, sands, clays with occasional intra-formation laterites.

The Freetown Complex on the other hand is formed mainly by basaltic magmatism and outcrops can be found in the west as a result of younger igneous intrusions and erosion. The Bullom Group is resting unconformably on the Freetown complex.

However, groundwater potential could be high within the upper sedimentary formation and at depth within fracture bed rock if properly located using appropriate sitting methods.

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

The project area is on a flat ground with an elevation of 34m above sea level. Sediments are mainly deposited by marine (water) agent. Fresh trees and hand dug wells can be located near project area; all suggesting groundwater presence.

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

The project area is composed of unconsolidated sandy-sediments derived from water deposition. This kind of lithology is water-bearing and thus holds a potential for 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

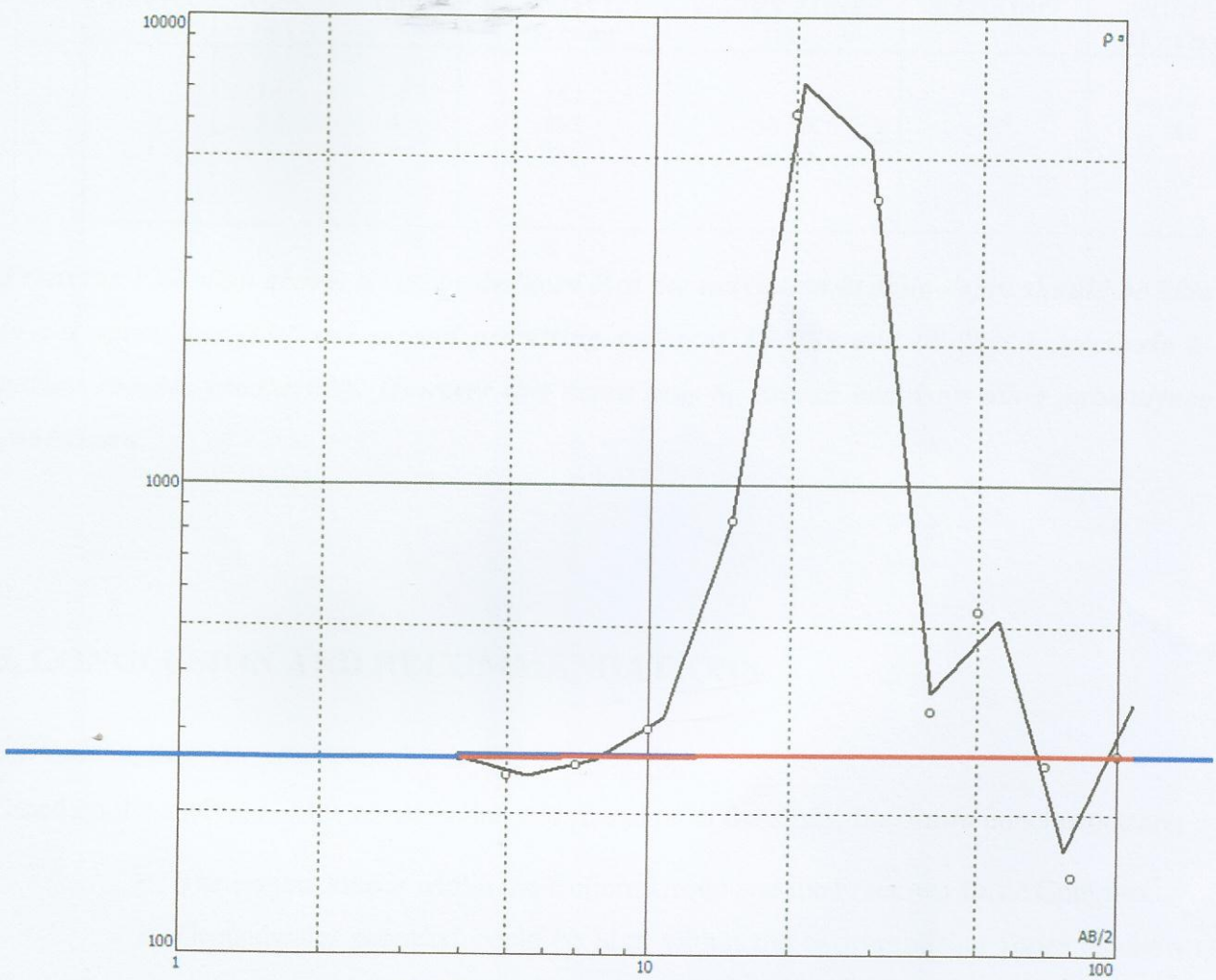
The Vertical Electrical Sounding (VES) data and the corresponding curve are presented below:

Table 1: Schlumberger Array VES Data

Client: **Concern Worldwide-SL**			Community: **Lumpa-MCHP**	
Project: **Geophysical Survey**			Sounding Number: **1**	
District: **Western Area Rural District**			GPS Coordinate East: **0714140**	
Date: **3rd November 2015**			GPS Coordinate North: **0921512**	
Field Operator: **Abdul Rahman Turay**			Elevation: **34m**	
Schlumberger Array VES Field Data				
No.	**AB/2**	**MN**	**Resistance (ohm)**	**Apparent Resistivity (ohm-m)**
1	4	0.8	4.2142	262.17
2	5	0.8	2.465	240.48
3	7	0.8	1.3126	251.78
4	10	1.5	1.4519	302.41
5	15	1.5	2.1948	835.29
6	20	1.5	7.4021	6193.25
7	30	1.5	2.1618	4072.88
8	40	7.6	0.50414	330.47
9	50	7.6	0.52473	539.2
10	70	7.6	0.1255	253.48
11	80	14	0.10289	146.65
12	100	14	0.11927	266.36

Model-1: Schlumberger Array VES Curve and Model

Apparent Resistivity Vs AB/2



N	1	2	3		
ρ	262	262	266		
h	1.6	2.4			
d	1.6	4			
Alt	-1.6	-4			

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	1.6 2.4 -	1.6 4 -	262 262 266	30-50 60-80	2rd	80

From the VES data above, it can be deduced that the maximum drilling depth should be 80m to cut across the first and second promising zones of 30-50m and 60-80m 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 Bullom Group and the Freetown Basic Complex.
- Groundwater potential could be high within the two promising zones as shown above at depth between 30-50m and 60-80m 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 30-50m and 60-80m 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 PVC screens and plain casings, well sorted gravels etc. for water quality and high yield.

REPORT SUBMITTED BY:

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