EDAL DRILLING COMPANY LTD.

BOREHOLE SITTING REPORT (II) FOR HASTINGS EBOLA TREATMENT CENTER

PREPARED BY:

EDAL DRILLING COMPANY
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SUBMITTED TO:

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1. INTRODUCTION

Due to the cancellation of one of the first surveyed points in the project area, a second resistivity survey was conducted on the 10th November, 2014 to explore the possibility of getting groundwater. This report will therefore contain information similar to the previous one since it is within the same area; but with different data and analysis.

These studies, among others, provided enough data and information used in assessing the possibility of striking groundwater in the project area.

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 50k inland and are found at heights up to 40m above present sea level (Culver and Williams, 1979). Although outcrop of the 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- formational laterites.

The Freetown Basic Complex on the other hand 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.

The Bullom Group is resting unconformably on the Freetown Complex.

3. FIELD WORK

3.1 Reconnaissance Survey

The aim of the reconnaissance survey was to select target areas for geophysical survey. The field reconnaissance survey took place on 27TH October, 2014 and the activities that were carried out involved:

- Geomorphologic 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

3.1.1 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 the ongoing construction at the site.
Selected point for the Vertical Electrical Sounding (VES) was marked with a peg for identification.

3.2 Geophysical Survey

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

4. DATA ANALYSIS AND INTERPRETATION

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

Table 1: Selection of 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	B	1 2 3	7.12 10.6 -	7.12 17.7 -	835 25.1 29769	40-70 80-100	2nd	100

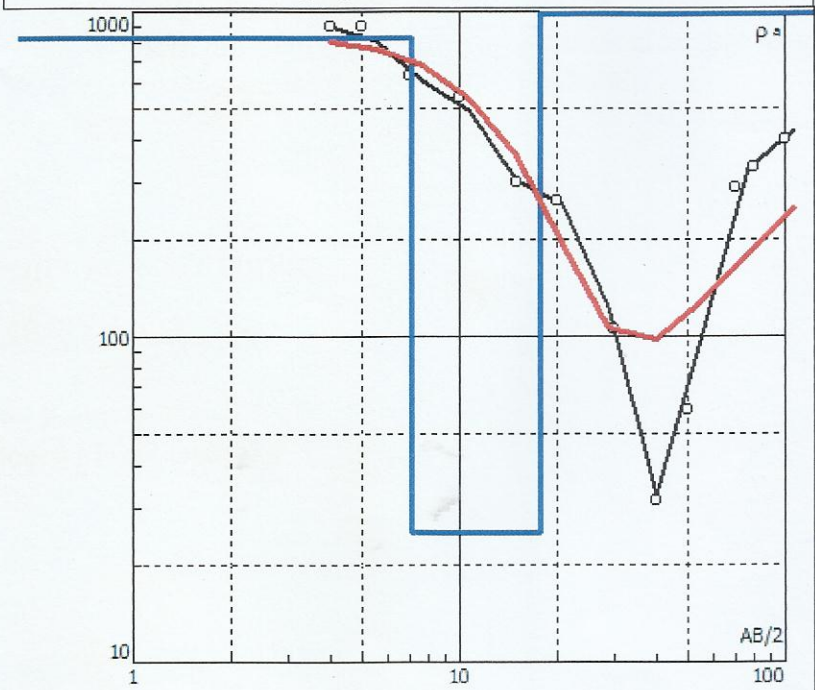
Figure 1. Schlumberger Array VES Data and Corresponding Curve and Model

Client: **Mr. Mohamed Hijazi**	Community: **Hastings**
Project: **Borehole Sitting/Drilling**	Sounding Number: **2**
District: **Western Area**	GPS Coordinate East: **0705824**
Date: **10th November, 2014**	GPS Coordinate North: **0927849**
Field Operator: **Morlai Kanu**	Elevation: **51m**

Schlumberger Array VES Field Data

No.	AB/2	MN	Resistance (ohm)	Apparent Resistivity (ohm-m)
1	4	0.8	14.523	903.5
2	5	0.8	9.2075	898.3
3	7	0.8	3.3218	637.2
4	10	0.8	1.3551	541.6
5	15	1.5	0.7852	298.8
6	20	1.5	0.3130	261.9
7	30	1.5	0.0562	105.9
8	40	1.5	0.0094	31.5
9	50	7.6	0.0575	59.1
10	70	7.6	0.1414	258.6
11	80	14	0.2333	332.5
12	100	14	0.1811	404.4

Schlumgerger Array– VES Curve



Model Parameters

N	ρ	h	d	Alt
1	835	7.12	7.12	-7.117
2	25.1	10.6	17.7	-17.67
3	29769			

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 lies between the Bullom Sedimentary formation and the Freetown Basic Complex.
- Because of the location of the project area, the sedimentary formation of the Bullom Group is probably underlain by the Freetown Igneous Complex.
- Groundwater potential could be high if found within the sedimentary formation especially at depth between 40 to 70m. On the other hand, the potential could as well be high at depth greater than 80m, probably within a fractured bed rock as indicated from the resistivity values.
- It is also worth to note that clay as a sedimentary material has very low resistivity values. As such, the low resistivity values from 40 to 70m holds high water potentials but it could as well be clay formation with no water potential.

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 100m to cut across the first and second promising zone of 40 to 60 and 80-100m respectively to ensure reliable productivity. However, the supervisor may exceed this depth based on the field conditions.
- Both physico- chemical and bacteriological test should be carried out on the borehole water samples from the completed well.

REPORT SUBMITTED BY:

.....13/11/14

Morlai Kanu
Geologist / Field Operator

6. Problems encountered
   (With accessibility, formations, equipment and community, etc)
7. Suggestion for improvement
   (On supervision, documentation, durations, etc.)
8. Borehole Completion Records,
   (Original Drilling and test pumping logs bound separately from the report)

9. Any other information that the Contractor may deem important or necessary
10. Two hard copies of this report one in soft copy on the Borehole Completion Records should be submitted to the Supervisor

17) Acceptance of the borehole

The well shall only be accepted by the engineer upon satisfactory completion of all drilling operations, installation of casings and screens, development works and test pumping.

18) Platform Construction

The Contractor shall construct concrete platform for each successful borehole carrying out the following activities in order

19) Submersible pump installation

The Client shall supply and install a suitable Solar Powered submersible pump with all accessories. All parts to be installed shall be tested first before installation. The supervisor shall approve the material to be installed.

Other Conditions

i) **Loss of equipment**

Any equipment lost down a borehole must be removed or the borehole will be considered a failed borehole. In such an event a replacement borehole will have to be constructed and tested at the contractor's expense.

ii) **Lost /abandoned Borehole**

Should any incident to the plant, behaviour of the ground, jamming of the tools or casing, or any other cause prevent the satisfactory completion of the works, a borehole shall be deemed lost and no payment shall be made for that borehole or for any materials (used or not recovered) or time spent.

In the event of a lost borehole, the contractor shall permanently seal the bore and construct a borehole immediately adjacent to the lost borehole or at any site indicated by the engineer. The option of declaring any bore lost shall rest with the contractor, and is subject to the approval of the engineer.

An abandoned borehole shall be treated as follows: