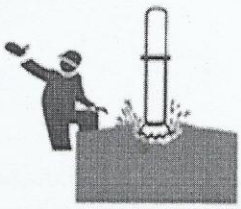

EDAL DRILLING COMPANY LTD.

GEOPHYSICAL SURVEY REPORT

MIRO FORESTRY YONI MILE 91

SUBMITED TO:

MIRO FORESTRY YONI MILE 91

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1. Introduction

Geological, Hydrogeological and Geophysical survey are carried out in specific location to delineate the aquifer potential of the site in questions. As in the case of our project area, the survey conducted gave a vivid assurance of the possibility of ground water potential within the surveyed area.

2. Geology of the Project Area

The geology of the project area falls within the confines of the Kasila belt of metamorphic rocks, which run from northwest through Southwest of Sierra Leone to Liberia. The Kasila group is a high grade metamorphic belt with rocks trending in the NNW direction. It comprises a highgrade series of granulites, consisting of garnet, hypersthene and hornblende gneisses, quartzites and associated migmatites. In Sierra Leone, this group bounds the main part of the West African craton on its west and southwestern margin. Where the Kasila Group is eroded, significant secondary deposition of titanium minerals (Rutile and Zircon) have been formed. Weathering of this Group has also deposited bauxite.

3. Field Work

3.1 Reconnaissance survey

The aim of the reconnaissance survey was to select suitable area for geophysical survey considering the geological, hydrogeological, environmental and other physical condition. The reconnaissance survey includes the following:

3.1.1. Geomorphological survey of the project area

- This includes the topography and other physical features. The project area is relatively elevated to a height of 80m to 84m above current sea level with minor depression or reducing environment which is highly water lodge throughout the season. Thus the geomorphology of the site indicates high ground water potential.
- However, there was a functioning borehole within the environ of the project area which is a good indicator of ground water potential.
- Also the trees within the surrounding of the area project area were fresh like the ever green leaves; this was an indicator to certify their intake of water directly from a more or less shallow water source. Note that trees/ plants are essential component of the hydrogeological cycle.

3.1.2. Selection of Traverse Line for geophysical Survey

- The traverse line for resistivity survey was selected on the basis of the geomorphology, geological and the hydrogeological features as well as the location of the project area. There was no visible outcrop found within the area in question, thus the strike direction of the rocks could not be measured. The absence of visible outcrop could be due to the action of intense weathering of rocks by agents of denudation and/or other activities.
- Point for the Vertical Electrical Sounding (VES) was selected based on the location of the project area and on the land space provided by the client. Also environmental factors like septic tank, waste dump and sucker ways of deadly chemicals were taken into consideration. Thus the location and point selected were void of all hazards that make ground water unfit for drinking.

3.2. Geophysical survey

The geophysical survey considered mainly the Electrical Resistivity of the various layer of the earth covered with depth upon inducing it with electrical probe i.e. Vertical Electrical Sounding (VES) using the ABEM SAS 1000 Terrameter system.

3.2.1. Vertical Electrical Sounding (VES)

Vertical Electrical Sounding (VES) was carried out with varying electrode spacing by schlumbenger electrode model to determining the formation resistivity and the depth of bedrock. Thus layers with relatively lower resistivity were inferred higher conductivity which is encouraging for ground water

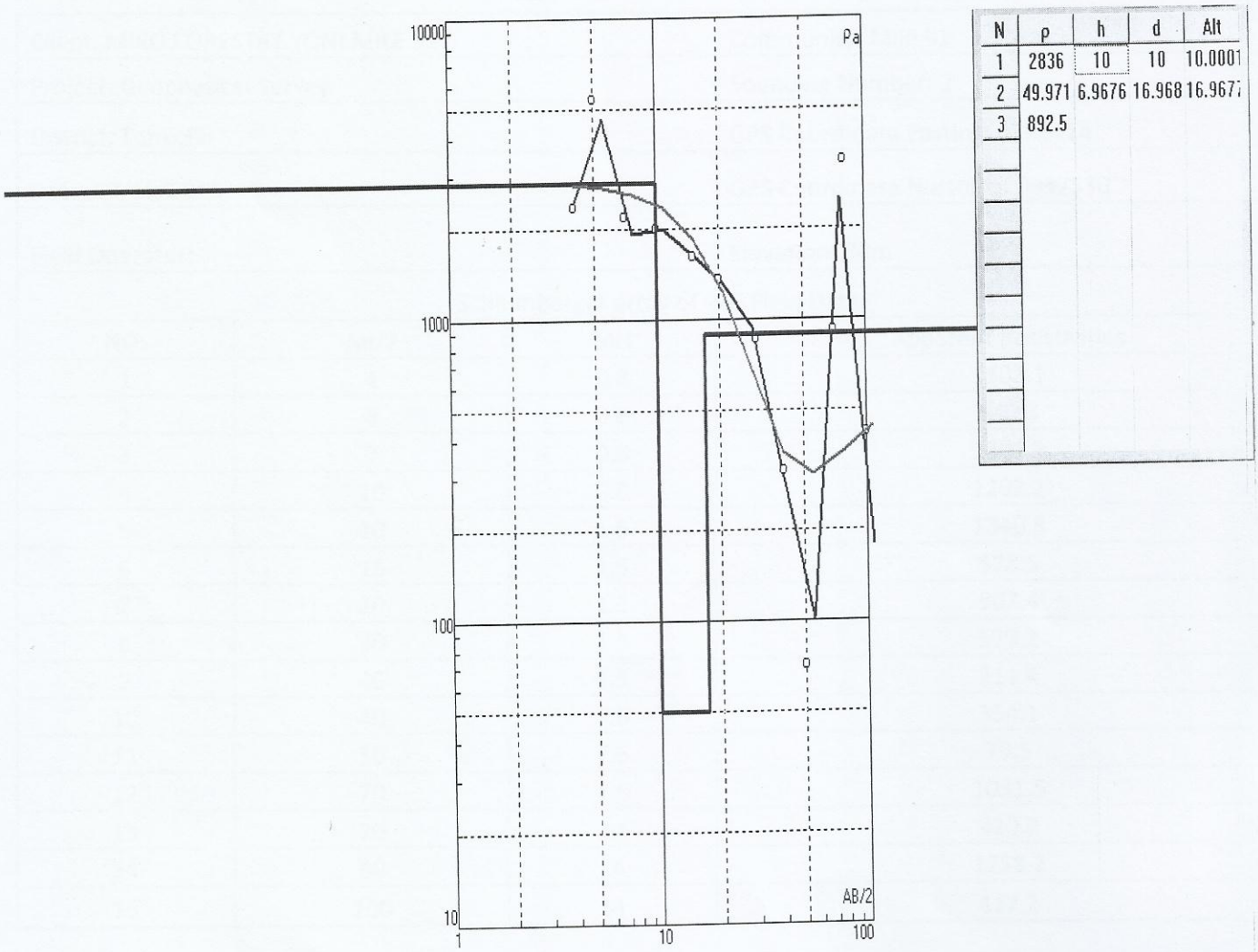
potential. This is because water serve as conductive fluid for electrical impulses therefore layers with water records a very low resistivity. The schlumberger electrode configuration and the required procedures were used for the (VES) at the two proposed points

4.0. Data Analysis and Interpretation

Table 1: Schlumberger Array of VES

Client: MIRO FORESTRY YONI MILE 91			Community: Mile 91
Project: Geophysical Survey			Sounding Number: 1
District: Tonkolili			GPS Coordinate Easting's: 0796450
Date: 13/10/2016			GPS Coordinate Northings: 0937328
Field Operator:			Elevation: 84m
Schlumberger Array of VES Field Data			
NO:	AB/2	MN	Apparent Resistivities
1	4	0.4	1403.1
2	5	0.4	3240.3
3	7	0.4	1301.8
4	10	0.4	1202.2
5	10	0.75	1340.8
6	15	0.75	1078.5
7	20	0.75	907.4
8	30	0.75	577.2
9	40	0.75	211.4
10	40	3.8	354.1
11	50	3.8	79.5
12	70	3.8	1031.5
13	70	7	920.7
14	80	7	3358.2
15	100	7	417.2

Figure 1 Schlumberger Array of VES Curve

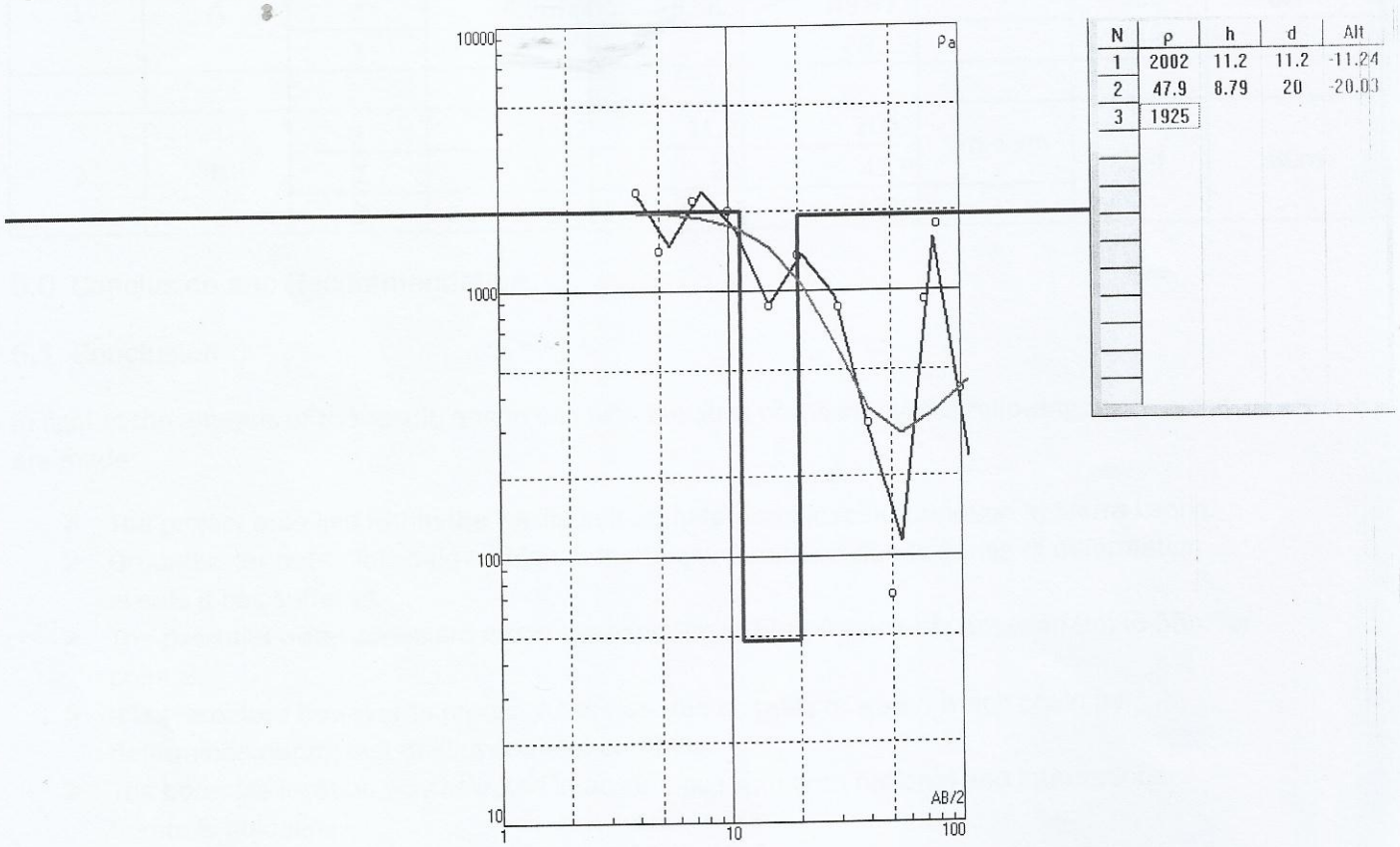


From our graph p_1, p_2 , p_3 are the average Apparent Resistivities of the layers encounter during the geophysical survey. Note: There was a drastic drop of the average apparent Resistivity of layer-2 which indicating it conductive nature. This means we may encounter our first strike of groundwater coming down to that layer due to the wet period between 8m to 18m and continue through to 55m for a sustainable yield.

Table: 2 Schlumberger Array of VES

Client: MIRO FORESTRY YONI MILE 91			Community: Mile 91
Project: Geophysical Survey			Sounding Number: 2
District: Tonkolili			GPS Coordinate Easting: 0796414
Date: 13/10/2016			GPS Coordinate Northing: 0937530
Field Operator:			Elevation: 80m
Schlumberger array of VES Field Data			
NO:	AB/2	MN	Apparent Resistivities
1	4	0.8	1403.1
2	5	0.8	840.3
3	7	0.8	1301.8
4	10	0.8	1202.2
5	10	1.5	1340.8
6	15	1.5	578.5
7	20	1.5	907.4
8	30	1.5	577.2
9	40	1.5	211.4
10	40	7.6	354.1
11	50	7.6	79.5
12	70	7.6	1031.5
13	70	14	920.7
14	80	14	1758.2
15	100	14	417.2

Figure: 2 Schlumberger Array of VES Curve



N	ρ	h	d	Alt
1	2002	11.2	11.2	-11.24
2	47.9	8.79	20	-20.03
3	1925			

From our graph p_a, p_b , p_c are the average Apparent Resistivities of the layers encounter during the geophysical survey. Note: There was a drastic drop of the average apparent Resistivity of layer-2 which was indicating it conductive nature. This means we may encounter our first strike of groundwater coming down to that layer due to the wet period between 9m to 18m and continue through to 55m for sustainable yield.

Table: 3 List of VES point in order of Preference

NO:	VES POINT	LAYER	THICKNESS (m)	DEPTH (m)	APPARENT RESISTIVITY (oh-m)	POSSIBLE WATER ZONES(M)	RANKS	MAX DRILLING DEPTH (m)
1	A	1	10	10	2836	8m-55	1st	80m
		2	6.9676	16.968	49.971			
		3			892.5			
2	B	1	11.2	11.2	2002	9m-55m	2nd	80m
		2	8.79	20	47.9			
		3			1925			

5.0. Conclusion and Recommendation

5.1. Conclusion

In light of the analysis of the result, and in line with the aims of the study, the following conclusions are made:

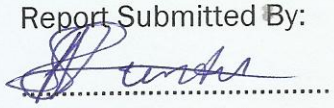
- The project area lies within the Kasila belt of metamorphic rock formation in Sierra Leone.
- Groundwater potential could be high in the Kasila formation due to series of deformation events it has suffered.
- The potential water zones are found between 8m to 55m for point A; between 9m to 55m for point B.
- It is premature however to predict / estimate the quantity of water, which could be determined during test drilling and test pumping.
- The borehole location was selected in accordance with both national and international borehole guidelines.

5.2. Recommendation

In this regard, it will be good to follow this recommendation:

- Drilling should be carried out at the selected point (.i.e. A and B) in order of preference to confirm the existence of groundwater
- The borehole should be constructed using the correct and standard material such as standard screen and plain uPVC casing, well sorted gravels for water quality and high yield etc.
- The maximum drilling depth should be 70m for both point A and B for sustainable yield.
- Both physco-chemical and bacteriology test should be carried out on the borehole water sample after completion for water quality analysis.

Report Submitted By:



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