GEOPHYSICAL INVESTIGATION REPORT

PROJECT: PRIVATE WATER SCHEME

LOCATION: BEHIND MECHANIC VILLAGE, MYPA ROAD, BOSSO. NIGER STATE

N09^{O} 38' 44.2''

E006^{o} 31' 51.1''

LINE BEARING: 200^{o}/020^{o}

ELEVATION: 269M

CLIENT: MR. PASCAL DAVID

CONTRACTOR: GEOKERITH SERVICES

08136658871

DATE: 18TH **NOVEMBER, 2020.**

Please, study this report before embarking on drilling.

SUMMARY OF GEOPHYSICAL INVESTIGATION

A.GENERAL INFORMATION

CLIENT: MR. PASCAL DAVID

LOCATION: BEHIND MECHANIC VILLAGE, MYPA ROAD, BOSSO

PROJECT: PRIVATE WATER SCHEME

STATE: NIGER STATE

ELEVATION: 269M

DATE: 18TH NOVEMBER, 2020.

EXISTING WATER SCHEME/ BOREHOLE

Well /Borehole	Depth (M)	SWL (M)	DWL (M)	REMARK
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B. LOCAL GEOLOGY

The area is underlined by basement formation, a moderate relief and basically consisting of granite schist exposed rock fragment was observed on the surface.

C. FIELD OPERATION

i. Geological and hydro geological mapping
ii. Frequency of the earth electromagnetism.

D. RECOMMENDATIONS

Drilling Method: Rotary/Air Drilling System

Drill Point: POINT 1.5

Depth of Drilling: 180m, maximum of 240m

Sign:……

Geophysicist

1.0 GENERAL INTRODUCTION

Site selection for ground water development involves considerable hydrogeological and hydrogeophysical studies. It is in view of this a detailed site investigation for ground water development was carried out at the property of Mr. Pascal David, behind mechanical village, Mypa School road, Bosso, Niger State on 18th November, 2020. The aim of this is to locate a feasible site for drilling a productive borehole that would be of economic importance as well as to delineate the aquifer layer parameter viz, weathered zone, fissure zone and depth to bedrock.

Using PQWT TC300, the survey team mobilized to site on 18th November, 2020 and conducted the survey employing the principle of natural electric field method. Surface geological survey and reconnaissance survey were employed to guide the final choice of a productive borehole site for drilling. Field work was conducted and a tentative drill point was located while data were sent for further computer interpretation and analysis.

1.1 RECONNAISSANCE SURVEY

Preliminary reconnaissance survey of the area was first carried out before actual geophysical survey data collection. This involves taking of altitude reading, global positioning system coordinates, observation of landscape, drainage pattern and tentative assessment of ground water potential of the area. Based on the reconnaissance survey, actual geophysical survey was concentrated on selected locations.

Reconnaissance survey reveals that the study area is not connected to utility water scheme hence no existing water scheme. Other alternative means of water has been the use of water vendors and water harvesting. This project is expected to augment

water supply to the property during the dry season. Outcrop observed is expected to be weathered and fractured at depth.

2.0 HYDROGEOLOGY

The basement complex underlying the surveyed site comprises migmatities granites, quartzite e.t.c. which in their unaltered state is regarded as acquicludes and of no hydro geological importance. Deformation and weathering has given these rocks unit secondary porosity, hence, regarded as aquifer. Two aquifer units are associated.

a. Unconfined within unconsolidated materials or the residual regolith
b. Confined exist within fractured Sandstone formations, aquifer units are at different locations and geophysical survey is necessary to delineate the best zone for groundwater development.

3.0 GEOPHYSICAL INVESTIGATION

One of the most relevant geophysical survey methods for groundwater prospecting is the electrical methods. At present the use of natural electrical field method in exploring underground water; the basic principle of natural electric field is through observation of the natural field existence. This is based on the electrical difference of natural earth electromagnetic field (frequency 0-30kHz). The several different frequencies of electromagnetic field, changes in the study of the underground field to solve geologic problem of an alternating current of geophysical exploration method.

The field of the natural electric field is the geomagnetic field (radio emission field or AC current field). The field distribution in the ground is far from the field source and can be regarded as a plane wave whose distribution is approximately

perpendicular to the ground. The change of the field is subject to Maxwell equation set.

$$\rho s = \frac{1}{5f}\left(\frac{Ex}{Hy}\right)^2 ------1$$

ps -------- AC current

f----------Operating frequency

Hy----------Magnetic field component

Ex----------Electric field component

According to the attenuation characteristic of the plane electromagnetic wave propagating in the formation, the depth of the electromagnetic wave in the medium is:

$$\delta = 503.3\rho f ----2$$

δ is the penetration depth.

From the above, the penetration depth of electromagnetic wave, frequency and resistivity. When the frequency is constant the higher the resistivity, the greater the penetration depth. When the resistivity is constant the lower the frequency the greater the penetration depth. Therefore, by changing the operating frequency can achieve the purpose of changing the depth. Because the magnetic field component is basically stable in the small area of the consent area. It can be regarded as a constant, so the quantitative relationship between the electric field component and the resistivity can be used to judge the high and low resistance characteristic of the geologic body. The instrument measures the frequency of the earth electromagnetism.

3.1 FIELD PROCEDURE FOR PROFILING SURVEY DATA COLLECTION AND MAPPING

Field procedure involved driving into the earth two potential electrodes (MN) into the subsurface and measuring the potential difference through the potential electrodes. PQWT TC300 detector device with all the accessories were used for the entire survey.

The natural electric field geophysical instrument is mainly used in the principle of natural field frequency selection method, is use of ground electromagnetic field as a work place source to the underground rock, ore resistivity and the maximum depth penetration was **300m on 270º/090º** bearing.

3.2 INTERPRETATION

Preliminary interpretation and analysis of map and curve requires geologic knowledge; water and mud exhibit low resistivity while rocks and cave exhibit medium and high resistivity respectively. From the map, horizontal is the measured point while the vertical is the detect depth. Several curves shapes are generated but the “V” shape and the inverted are the most significant in the curve interpretation and color code analysis which are generated automatically by the measuring instrument hence actual drill point can be establish.

3.3 QUANTITATIVE AND QUALITATIVE INTERPRETATION

The interpreted curve and mapping results are shown on table 1 with their geo-electric models. Quantitatively the curves gave 3-4 layer within the spread limit of MN =10m. The contour lines are parallel to each other.

N09º 38’ 44.2’’ E006º 31’ 51.1’’ Elev. 269m N/S. BEHIND MECHANIC VILLAGE, OFF MYPA SCHOOL, BOSSO. PASCAL DAVID

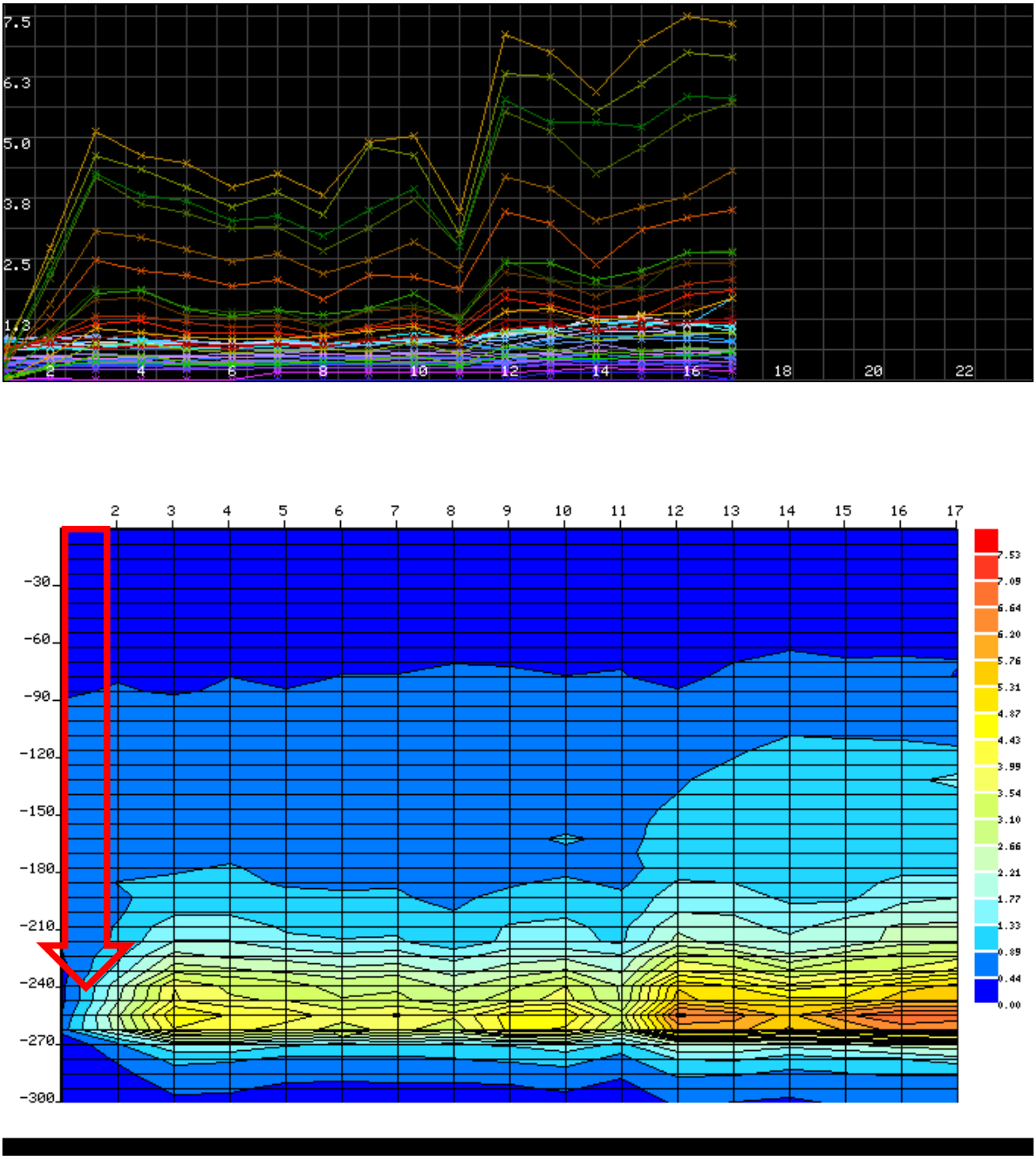

Figure 1.1: Graph and 2-D profile section of subsurface showing designated point of drilling on point 1.5

4.0 **DISCUSSION OF RESULT**

The curves give a “V” shape at horizontal measurement of point 1.5 while the contour map gives a vertical depth of 180m maximum of 240m. The basement rock is expected from 4m and it is expected to be competent at 30m. The blue stands for low resistivity (water/mud or in crack/fractures). The yellow stands for rocks with middle resistivity while the red stand for high resistivity signifies dry cave/rocks. The weathered and fractured basement aquifer units are expected to contain water in basement rock.

From the geological information and field data taken, it is safe to surmise the surveyed point 1.5 to yield appreciable amount of water from *Low* to *Fair* yield.

4.1 RECOMMENDATION

Recommendation was based on the result of careful analysis and interpretation of curve graph and generated color coded map.

- Recommended point for drilling is point 1.5
- Expected depth of drilling is about 180m, maximum of 240m.
- Borehole should be cased and screened to the bottom.
- Borehole should be grouted long enough to avoid contamination from surface run-off.

Drilling and maintenance should be done by competent contractor or personnel.

NOTE: This study(investigation) in its entirety is subject to other external factors like climate change, global warming and other environmental conditions which are not available to the geologist at the time the survey was conducted and as such the geologist is not liable to such changes as external factors that later occurs. This study cannot extensively quantify the yield. Point of termination of borehole shall be at the discretion of the site geologist/driller.

4.2 CONCLUSION

The above recommendation should be strictly followed for optimum results. It should be noted that surface geophysical investigation is an indirect method of studying the subsurface hence there is Possibility of having slight changes. We are highly delighted to be associated with Mr. Pascal David in the area of ground water development.

Best of luck Management