WATER WELL DRILLING AND EXPLORATION COMPANY LTD

STREET: KWAMADULE,

WARD: HANDENI VIJIJIN,

DISTRICT: HANDENI.

TANGA - REGION

HYDROGEOLOGICAL/GEOPHYSICAL SURVEY REPORT OF ONE BOREHOLE.

Oct 15, 2024,

CLIENT: Mr, JACOB MBAPA RORKIMA.

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EXECUTIVE SUMMARY

This report gives an overview of the groundwater exploration work for borehole drilling on earmarked site in Kwamadule in Handeni vijijin district, Tanga Region.

The groundwater exploration involved hydrogeological, geological and morphological appraisals. Finally, geophysical measurements were conducted involving both magnetic and resistivity surveys, the two methods were done in order to identify geological structures and study of the subsurface conditions.

The results show that the drilling depth varies from *200m- 220m* depending on the geological formation results. However, so long the surveyed area is large it is anticipated to strike water in medium depths.

ACKNOWLEDGEMENT

The office wishes to express her sincerely appreciations to Mr, Jacob Mbapa Rorkima **(**Client) for a trust shown by assigning this valuable task.

1.0 INTRODUCTION

On behalf to Mr, Jacob M, Rorkima **(**client**)** wants to provide a permanent water source at his area purposely for domestic uses.

The main objectives being to access the groundwater potential at area and locates drilling sites also comments on aquifer conditions and depths to potential aquifers.

This report constitutes the findings of the groundwater survey work, which was conducted on 14 of Oct 2024.

2.0 LOCATION AND ACCESSIBILITY

Kwamadule is located at Handeni vijijin district area in Handeni city. Accessibility to the surveyed area is almost throughout the year.

3.0 PHYSIOGRAPHY

The scenario of study area is almost hills; the drainage pattern of the study areas and its immediate vicinity is towards South, water flows from North to South. Generally, the drainage pattern at the study area is toward south.

4.0 CLIMATE AND WEATHER

In general, Tanga features are favourable climate with relatively warm temperatures throughout the year. While average highs are somewhat consistent throughout the year, average lows dip to $13^{O}C$ in July. Tanga averages 570mm of precipitation per year, the bulk of which occurs during its wet season between November and April. The remainder of the year comprises the city's dry season.

5.0 **GEOLOGY**.

The study area is dominated by granites of Pre-Cambrian age. The granite is therefore anticipated to comprise the bedrock of the investigated area. The granitic rock is expected to be overlained by a sequence of weathered and fractured rock mantle.

6.0 HYDROLOGY AND HYDROGEOLOGY

Deeply weathered granites and gneisses provide a good potential for encountering portable groundwater within the project area. Medium to deep water wells are expected to tape the deep seated weathered granitic gneiss aquifers. Although lineaments are not strongly displayed, fractured rock basement, which can be aquiferous may be encountered at some localities.

7.0 INVESTIGATION METHODS.

During the survey, three methods were applied for the determination of the possible areas (sites) for the drilling and construction of the water well and for marking of the surveyed points.

7.1 Reconnaissance Survey

This included the study of the existing maps and physical visit of the area. Before embarking on the detailed geophysical investigation, the survey team, with the guidance of Mr. **SIRIWA** in order to view, assesses physical environment

structures and features of hydrological interest to identify the prospective areas where the survey is to be directed.

7.2 Survey Work

7.2.1 Fresh Result 2 Systems

Long Range and Geophysical Water Detector were applied in this survey. The method enables to obtain the possibility of very accurate and depth water type selected whether fresh, salty or very salty.

8.0 DISCUSSION AND RECOMMENDATIONS.

Table 1: Interpreted data

LOCATION	POINT	LINE	LINE STATUS	WATER DENSITY (%)	WATER SALINITY (PPM)	DEPTH(M)
POINT 1	**1**	**A**	Fresh water			
		B	Fresh water	**80**	**3999**	**200m**
		C	Fresh water			
		D	Fresh water			
		E	Fresh water			
		F	Fresh water			
	2	**A**	Fresh water			
		B	Fresh water	**75**	**4000**	**220m**
		C	Fresh water			
		D	Fresh water			
		E	Fresh water			
		F	Fresh water			

Table 2: Site Recommended for Water Well Drilling

S/N	POINT	RANK	WELL DEPTH (M)	G.P.S		ELEVATION (M)
				NORTHING	EASTING	
1	1	1	200	9333491	0802419	1094
	2	2	220	9333455	0802454	1095

The sites should be drilled to the range of the recommended depths and as to the manner as described in sections 7.2 through 7.5 of this report.

***It is important to note that the survey method applied does not give the quantity of water to be encountered. These parameters have to be determined after proper completion of bore hole drilling.**

8.2. Borehole Drilling

8.2.1 Exploratory Drilling

Drilling of recommended site should start with an exploratory hole or test hole of small diameter of 7”᾽ (125mm) to the recommended depth. A brief exploratory aquifer capacity test should be done in order to estimate and assess the aquifer productivity.

If an exploratory hole has provided sufficient water to suffice the required productivity and water quality and qualified for development into production, drilling and construction shall proceed as in 7.2.2 below.

8.2.2. Production Borehole Drilling and Construction.

The exploratory hole shall be rimmed (enlarged) to a diameter of 10 inch (250 mm). If the technical conditions at site are adverse and make it difficult to complete the borehole with 2
50mm diameter, telescopic drilling can be allowed to complete the borehole with 7 inch (200mm) diameter to the recommended depth. The minimum drilling diameter however, is recommended to less than 8 inch (200 mm) for the production borehole.

Since it is expected that a motorise pump (preferably a submersible pump) will be used for pumping water to a raised storage tank, from which the whole residential premises will get its supply, installation of Upvc filter pipes of diameter of 5 inch (130mm) is recommended. Upon consent of the client's consultant at site, five inch (125 mm) Upvc filter pipes may be applied if the 7 inch (200 mm) drilling diameter is applied. Borehole completion with inch (140) diameter filter casings is highly preferred, since it presents more room for accommodating bigger sizes of pumps, and for borehole cleaning in the future, shall the need arises.

Proper gravel packing, backfilling and sanitary seals must be placed at appropriate zones and depths during filter pipes installation, for borehole completion to the ground level.

It is also worth to mention here that the upper shallow seated aquifers can have a significant contribution to the productivity of boreholes and should therefore not be neglect ed, except for cases where they pose pollution risks to the lower deep aquifers. Where a high drilling pressure and rate are applied, and productivity of the borehole is assessed to be insufficient, ample time should be provided to allow for water recovery, and a blow test be conducted, before condemning the borehole as dry and abandoning it.

Though the maximum drilling depths indicated for borehole form the basis for the client on preparing the contract document (especially the Bill of Quantities), it should be taken as suggestive. Sometimes, studying and analysis of the lithological samples from the borehole, or other technical conditions at site may demand terminating the drilling before or continuing the drilling further deeper than the recommended depth. It will be the duty of the drilling supervis or or the client's consultant at site to provide proper advice and directives to the contractor on this aspect.

8.3. Well Development and Aquifer Capacity Testing

To realize optimum well productivity, proper well development should be done. Well development enhances productivity by removing fine sands, silt and cuttings; and therefore increasing permeability by opening the aquifer fractures and pores. At least six hours of surging and flushing is recommended.

8.4. Well Capping and Protection

If the water well will be drilled before the pump is procured, the client is advised to direct the drilling contractor to provide a proper protection on the production borehole. This can be done by installing either a metallic pipe or constructing a concrete stand, with the top of the production borehole covered and sealed. Installation/construction of the protective capping is done after test pumping is completed. Experience shows that when a water well is left for a long time without be ing installed with a pump after drilling, it can lead to sabotage of the well by infilling it with stones, wood and other hard particle materials, perhaps on an attempt by curios youngsters; or even adult persons to counter prove if the borehole really contain water or not. It will be most appropriate therefore if the client makes arrangement to install the productive water borehole as soon as the drilling and construction is completed.

8.5. Water Quality Testing and Well Disinfection

It is advised to conduct preliminary water quality testing, especially on physico-chemical parameters during the exploratory/test drilling phase; prior to approving the respective site for further development. If the technical and financial capacity allows, bacteriological test can also be done during the exploratory drilling phase.

Water samples for quality testing can be collected during exploratory test pumping. Few physicochemical parameters during this phase (e.g. PH, EC, and TDS, turbidity, odour and taste) can suffice to enable the drilling supervisor to take appropriate preventive measures and decisions at site e.g. seal off the top saline horizons or disapproving the pilot hole for further development into a production borehole earlier; if the hazardous elements are impossible to eliminate or treat. After drilling and construction of the production well has been completed, a detailed physico-che mical and bacteriological water quality testing and analysis should be conducted, prior to commissioning the well for public utilization. If the results of the test fail to meet presently working National Standards, then water disinfection and/or treatment should be done to bring the condition to the allowable standards.

8.6. Water Wells Drilling and Construction Supervision

The client is advised to employ a consultant hydrogeologist or drilling supervisor to ensure that all activities are executed in compliance with the working regulations, standards and professional ethics. The supervisor at site should be knowledgeable in water wells drilling, construction, development and test pumping activities in order to provide proper supervision and advice to the drilling contractor. Apart from the aforementioned, his/her tasks also include providing technical

advice and decisions at site e.g. to alter some of the provided/recommended technical specifications if conditions (technical) at site demand so; as he may think and judge as technicall y necessary and beneficial to the client.
Thought the maximum drilling depth indicated for borehole form the basis for the client on preparing the contract document (especially the Bill of Quantities), it should be taken as suggestive. Sometimes, studying and analysis of the lithological samples from the borehole, or other technical conditions at site may demand terminating the drilling before or continuing the drilling further deeper than the recommended depth. It will be the duty of the drilling supervisor at site to provide proper advice and directives to the contractor on this aspect.

9.0 IDENTIFICATION OF THE RECOMMENDED SITES

- *P2 is recommended to be drilling with the depth of 80m to 220m as marked.*

9.1. Site Markings.

The site recommended for drilling and constructions had been bench marked.

9.2. Persons Who Know the

Mr, Masoud (Survyor).

Location of the Sites.

The recommended sites were shown and therefore are known to Handeni vijijin..
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10.0 DRILLING PERMIT

The Water Resources Management Act, 2009 (or Act No 11 of 2009) Section 54 requires any person who intends to drill a borehole to obtain a ground water permit (or drilling permit) from the Basin Water Board of the respective area before commencing any drilling activity.