COMPLETION REPORT FOR FULL REHABILITATION THREE DEEP BOREHOLES INSTALLED WITH HAND PUMPS IN COMMUNITIES OF KAKOOGE CENTRAL, KIRIBAIRYA LANDING SITE AND NSOKO ALL IN BUYENDE SUBCOUNTY, BUYENDE DISTRICT.

The project was contracted to Reddys borehole and technical services Ltd.

INTRODUCTIONS

According to the agreement reached between Foundrising Community Development and Reddys borehole and Technical services Ltd, Borehole flushing, Pump testing and Installation of three (03) boreholes has been successfully done in Buyende District. The works commenced in Buyende by 15th June, 2021 with the mobilization of Materials, Drilling Rigs, equipments and tools to site. Borehole flushing started on 19th June 2021 to 09th June 2021, Test pumping started 21st June 2021 to 23rd June 2021 and Installation was completed on 24th June 2021.

The table below shows the location of boreholes.

S/N	District	Sub County	Parish	Village
1.	Buyende	Namusita	Kakooge	Kakooge
2.	Buyende	Buyende	Kiribairya	Kiribairya
3.	Buyende	Namusita	Mango	Nsoko

Borehole flushing/Cleaning

Photo showing borehole flushing in Nsonko, Kakooge and Kiribairya Villages in Buyende District

Boreholes are resistant to many forms of natural and manmade disasters.

Although the components above ground may be damaged, the narrow opening at the top of the borehole often prevents contamination of the water Source or damage to the pump components below ground. The main exception to this is damage caused by earthquakes, which can be greater below ground than what can be seen on the surface. This technical note sets out the actions required to repair and rehabilitate a borehole after any disaster.

Step 1: **Assess the damage •**

Meet with community leaders and ask them which hand pumps serve each section of the community. Obtain any available records of the drilling of the borehole and the installation of the hand pump, particularly concerning the materials used for lining the borehole, its overall depth and the depth to the screen. Select the hand pumps that are most commonly used as a source of drinking-water, provided a plentiful supply before the emergency and are likely to be easiest to repair.

Step 2: Repair the borehole and hand pump.

1. Flush the sediment from the borehole. There are a number of ways of doing this but the simplest method is jetting. Other methods are possible but require specialist skills and equipment.

2. Check the top of the borehole casing for damage. If it is bent or twisted it will not be possible to install the pump correctly. You may have to cut away the damaged portion of the casing and weld a new piece into place.

3. Repair any damage to the pump and riser pipe. Take the opportunity to replace worn parts.

4. Re-assemble the pump and reinstall the borehole components.

Step 3: Disinfect and re-commission the borehole and hand pump. Following rehabilitation, the borehole and all components must be disinfected to ensure a clean water supply. Operate the hand pump for about an hour to remove any groundwater contamination caused by the disaster or the jetting process. The most common method of disinfection is chlorination. The chlorine compound most commonly used is high-strength calcium hypochlorite (HSCH) in powder or granular form which contains 60 to 80% available chlorine. Sodium hypochlorite in liquid bleach form is also used but this

only contains about 5% available chlorine outlines a method for disinfecting a borehole using HSCH cleaning and rehabilitating the borehole.

PUMPING TEST/ PUMP RECOMMENDATION WITH SAFE YIELD

Development of ground water resources without adequate pumping test data is a speculative operation which may have unforeseen consequences.

Pumping tests are usually carried out to obtain data which can help to access and determine the ability of a borehole to yield water, predict its performance, determine the hydraulic properties of the water bearing layers which yield water to the borehole and also provides a good opportunity to obtain information on water quality and selection of suitable pumping equipment.

The above photos shows borehole pump testing and borehole installation in Buyende District.

When water is pumped from a well, the level of water in the well is dropped, creating a drawdown or head loss and setting up a localized hydraulic gradient which causes water to flow to the well from the surrounding aquifer. A cone of depression of the potentiometric surface is thus formed around the well and the shape and manner of the expansion of this cone depends on the pumping rate and the hydraulic parameters of the aquifer.

As in any well, under non- pumping condition the level at which the water resides in the well is known as the STATIC WATER LEVEL (SWL). When pumping starts, the water level will drop to a new level known as the pumping water level or DYNAMIC WATER LEVEL (DWL) and this level is the function of the pumping rate. The difference between the static and the pumping water level is referred to as the DRAWDOWN (S). Various terms relating to well performance as defined above are shown in Fig 1 below.

Thus, based on objectives, a test programme is designed to cover the following;

a) A 3hrs constant discharge pumping test/water level measurements.

b) Recovery level measurement, for as long as the well recovers.

c) Discharge measurement (yield)

d) Sampling for water quality tests

The following equipments are used to conduct the pumping test:

a) A 3 HP Grunfos submersible pump complete with starter panel and cable suitable for the test.

b) Water level indicator (dip meter). 2 nos, each for tested and observation well.

c) A digital stop-watch for timings.

d) A Flow meter for reading the discharge.

HAND PUMP INSTALLATION

Of all the three (03) boreholes, all were installed with stainless steel pipes and rods, all the three (03) boreholes were installed successfully and the community people are already using it. They are also advised to be very careful in handling the borehole so that serves them for long period of time.

Table 5 Summary of casting and installation results.

S/N	District	Sub County	Parish	Village	Pump Installation depth (m)	No. of pipes installed
1.	Buyende	Namusita	Kakooge	Kakooge	24m	8 pipes
2.	Buyende	Buyende	Kiribairya	Kiribairya	21m	7 pipes
3.	Buyende	Namusita	Mango	Nsoko	21m	7 pipes


The above photo showing stainless steel pipes and also during Installation in Buyende District

WATER QUALITY ANALYSIS

One of the main objectives of any supply project is to provide the community with water of a good quality, which should be colorless odorless and pleasant to test at the end of the test pumping, a water sample was collected by the contractor for analysis of Physio-chemical parameters for the water of each of the 03 boreholes. Water quality analysis was done at Ministry of Water and Environment Central Laboratory-Entebbe, Kampala. The results of the water quality analysis are presented in Annex 3

From the analyzed samples, it's indicated that all the samples showed satisfactory Physio-chemical characteristics although apparent color and total suspended solids were slightly higher than national permissible standards for portable water. These two parameters are however not disease causing but may have some impact on source water bearing rocks in the area rather than a construction problem as all efforts were analysis certificates the water is fit for both domestic and livestock usage.

SLAB AND BOREHOLE COVER


The above photos shows apron casting at Kakooge village in Buyende District.

The construction of the concrete slab and placement of permanent borehole top flanged cover was delayed till the completion of the yield test exercise. This was to avoid breaking of the concrete slab by the Rig if the yield test had to be done after the emplacement of the slab.
Each borehole was provided with a thick and reinforced concrete slab measuring 2.8 × 3.0m.
The concrete slabs are about 800mm above ground level.
Also on the well heads are welded steel flanges base and cover which are secured by bolts and nuts.

The above photo shows the apron construction in Kakooge

WELL HEAD PIPE CONNECTIONS


The above photos shows the apron casting, pump testing and a completed borehole.

The well head and the pedestal were painted with alluminium and later two coats of non toxic with water-colour paint were applied to the well head work. The hand pumps were secured with padlocks and the keys given to the water works staff.

S/N	District	Sub County	Parish	Village	Pump testing yield (m3/hr)	Static water level (mbgl)	Dynamic water level (mbgl)
1.	Buyende	Namusita	Kakooge	Kakooge	2.0m3/hr	16.20m	19.04m
2.	Buyende	Buyende	Kiribairya	Kiribairya	1.10m3/hr	3.30m	13.55m
3.	Buyende	Namusita	Mango	Nsoko	1.53m3/hr	12.84m	18.05m

BOREHOLE SERVICING

Existing boreholes were developed by removing pump and the riser pipes, airlifting of the wells until water is clean and sand free and changing of all necessary components and restoring of the boreholes to functional condition.

The above photos showing some of the completed boreholes for Foundrising Community Development in Buyende

CHALLENGES FACED

During this project, we faced the following challenges;

- Flushing tools almost got stuck in one site due to over silting of the borehole
- There was flooding in some compound next to Kakooge Central Borehole but we managed to re-channel the water.
- Shifting between sites was somehow difficult due to the bad feeder roads
- Lack of reagent to do chemical analysis in some districts labs

CONCLUSION AND RECOMMENDATION

The borehole flushing and rehabilitation works was completed with proper cleaning operation and well design.

Maximum proportion of the water bearing formations (aquifers) are penetrated and utilized to obtain the maximum yield from the water wells.

Sealing and grouting of the top loose sediments in the borehole including concrete well head construction are carried out in order to protect the borehole from intrusion of contaminated surface water or any other foreign materials.

For permanent pump installation for use, pump specification is recommended based on the yield drawdown characteristics at section, minimum 10m under pumping test data.

Though the boreholes are properly developed and cleaned during construction and testing operation, servicing of the boreholes within a certain period of interval, at least once in two years is essential. This helps to remove undesirable materials that could be deposited on the screens of the borehole through time and eventually decreases the in-flow of water in to the borehole after long- term use or unused.

The objection of this contract was to investigate possibilities of getting safe groundwater and also supervise the construction of the water sources at various selected locations. Detailed investigations were carried out at selected location and borehole flushing was carried out at potential location, while the location had sufficient water for communal use. The following activities/ observations have been;

- The water quality is within range for the drinking water for human consumption'
- Communities were requested through their water committees to report any damages to the water facility and misuse habits.
- Communities were sensitized on good hygiene and good sanitation practices so as to improve their health.
- The community members were also sensitized to keep the SOPs and follow the guidelines from the Ministry of Health by washing their hands regularly, putting on their face mask and keeping social distance to avoid the spread of Corona Virus.

ATTACHMENTS

Borehole flushing data

Test pumping data

Installation data

Water quality certificate of analysis

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Borehole flushing data

Test pumping data

Installation data

Water quality certificate of analysis

REDDY'S BOREHOLE
& TECHNICAL SERVICES LTD

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Email: rbtsltd.ug@gmail.com, Web: www.reddys.co.ug

BOREHOLE FLUSHING/BLOWING RECORD SHEET

General Information

GPS Coordinates (N/E)	
Source Name	**Kakooge Central**
Village	**Kakooge Central**
Parish	**Kakooge**
Sub-county	**Buyende**
County	**Budiope West**
District	**Buyende**

Borehole Data

Funder before rehabilitation	**Rhonda Snyder**
Year of initial construction or last rehabilitation	**24/02/1993**
Borehole No. DWD	**WDD6038**
Casing Type	**PVC**
Casing diameter (mm)	**152**
Date of blowing	**19/06/2021**
Static water level before flushing (mbgl)	**14.40m**
Depth before Flushing (mbgl)	**65.15m**
Depth After flushing (mbgl)	**65.75m**
Flushing Duration (Hr.)	**1:00hr**
Recovered Depth (mbgl	**0.60m**
Status of water on flushing	**Clear**

Flushing Technician (Name/Sign) ..... **(Contractor)**

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BOREHOLE FLUSHING/BLOWING RECORD SHEET

General Information

GPS Coordinates (N/E)	
Source Name	**Kiribairya landing site**
Village	**Kiribairya**
Parish	**Kiribairya**
Sub-county	**Buyende**
County	**Budiope West**
District	**Buyende**

Borehole Data

Funder before rehabilitation	**Foundrising community Development**
Year of initial construction or last rehabilitation	
Borehole No. DWD	
Casing Type	**PVC**
Casing diameter (mm)	**152**
Date of blowing	**19/06/2021**
Static water level before flushing (mbgl	**2.32m**
Depth before Flushing (mbgl)	**37.50m**
Depth After flushing (mbgl	**50.84m**
Flushing Duration (Hr.)	**2:00hrs**
Recovered Depth (mbgl	**13.34m**
Status of water on flushing	**Clear**

Flushing Technician (Name/Sign) ..... **(Contractor)**

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BOREHOLE FLUSHING/BLOWING RECORD SHEET

General Information

GPS Coordinates (N/E)	
Source Name	**Nsonko**
Village	**Nsonko**
Parish	**Mango**
Sub-county	**Buyende**
County	**Budiope West**
District	**Buyende**

Borehole Data

Funder before rehabilitation	**Foundrising community Development**
Year of initial construction or last rehabilitation	**24/02/1993**
Borehole No. DWD	**WDD 6038**
Casing Type	**PVC**
Casing diameter (mm)	**152**
Date of blowing	**19/06/2021**
Static water level before flushing (mbgl	**14.40m**
Depth before Flushing (mbgl)	**65.15m**
Depth After flushing (mbgl	**65.75m**
Flushing Duration (Hr.)	**1:00hrs**
Recovered Depth (mbgl	**0.60m**
Status of water on flushing	**Clear**

Flushing Technician (Name/Sign) ..... **(Contractor)**

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PUMP TESTING LOG

REDD'YS BOREHOLE
& TECHNICAL SERVICES LTD

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Kampala, Uganda
Tell: 0709234234/0776234234
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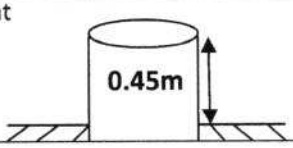
Location	**Kakooge**	DWD	
Village	**Kakooge**	Client	**Foundrising community development**
Parish	**Kakooge**	X-coordinates	
Sub county	**Namusita**	Y-coordinates	
County	**Buyende**	Altitude (m)	
District	**Buyende**	Drillers yield	**2.0m3/hr**
Date start	**22/06/2021**	Depth of pump	**70m**
Date end	**22/06/2021**	Sketch of measuring point	
Duration of Pump Test (m)	**180 minutes**		
Static water level (m)	**16.20m**		
Dynamic water level (m)	**19.04m**		

Type of test. **Constant pumping**

Time	Time since start of pump (min)	Water level (m) bmp	Draw down (m)	Discharge Q(m^3/hr)	Remarks
	0	16.12	0.00		
	1	16.91	0.79		
	2	17.00	0.88		
	3	17.10	0.98		
	4	17.23	1.11	1.80m3	34 sec water micars
	5	17.28	1.16		flow
	6	17.32	1.20		
	7	17.38	1.26		
	8	17.43	1.31		
	9	17.47	1.35		
	10	17.53	1.41		
	12	17.60	1.48	1.80m3	34 sec water salty
	14	17.68	1.56		
	16	17.71	1.59		
	18	17.77	1.65		
	20	17.85	1.73		
	25	17.88	1.70		
	30	17.94	1.82		
	35	17.99	1.87	1.80m3	34 sec water clears
	40	18.12	2.00		
	45	18.19	2.07		
	50	18.24	2.12		
	55	18.27	2.15		
	60	18.30	2.18		
	70	18.36	2.24	1.80m3	34 sec clear water
	80	18.39	2.27		discharge
	90	18.40	2.34		
	100	18.55	2.43		
	120	18.64	2.52		
	140	18.77	2.65	1.80m3	34 sec water clear
	160	18.89	2.77		sample collected
	180	19.04	2.92		

Type of test. **Recovery**

Time	Time since start of pump (min)	Water level (m) bmp	Draw down (m)	Discharge Q(m^3/hr)	Remarks
	0	19.04	0.00		
	1	18.20	0.84		Percentage recovery
	2	17.40	1.64		95%
	3	17.10	1.94		
	4	16.89	2.95		
	5	16.57	2.47		
	6	16.26	2.78		
	7				
	8				
	9				
	10				
	12				
	14				
	16				
	18				
	20				
	25				
	30				
	35				
	40				
	45				
	50				
	55				
	60				
	70				
	80				
	90				
	100				
	120				
	140				
	160				
	180				

Supervisor name ..... **Signature** .....

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PUMP TESTING LOG

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Kawempe, Kalerwe-Tula Road
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Tell: 0709234234/0776234234
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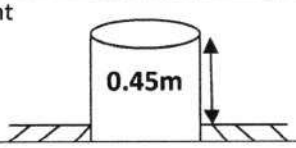
Location	**Kiribaurya**	DWD	
Village	**Kiribaurya**	Client	**Foundrising community development**
Parish	**Kiribaurya**	X-coordinates	
Sub county	**Buyende**	Y-coordinates	
County	**Buyende**	Altitude (m)	
District	**Buyende**	Drillers yield	**1.10m3/hr**
Date start	**23/06/2021**	Depth of pump	**30m**
Date end	**23/06/2021**	Sketch of measuring point	
Duration of Pump Test (m)	**180 minutes**		
Static water level (m)	**3.30m**		
Dynamic water level (m)	**13.55m**		

Type of test. **Constant pumping**

Time	Time since start of pump (min)	Water level (m) bmp	Draw down (m)	Discharge Q(m^3/hr)	Remarks
	0	3.15	0.00		
	1	5.80	2.65		
	2	6.07	2.92		
	3	6.14	2.99		
	4	6.20	3.05	1.09m3	56 seconds
	5	6.27	3.12		
	6	6.87	3.72		
	7	7.54	4.39		
	8	7.89	4.74		
	9	8.26	5.11		
	10	8.43	5.28		
	12	9.03	5.88	1.09m3	56 seconds
	14	9.44	6.29		
	16	9.88	6.73		
	18	10.22	7.07		
	20	10.56	7.41		
	25	10.97	7.82		
	30	11.41	8.26	1.09m3	56 seconds
	35	11.52	8.37		
	40	11.70	8.55		
	45	11.89	8.74		
	50	12.02	8.87		
	55	12.10	8.95		
	60	12.21	9.06		
	70	12.29	9.14	1.09m3	56 seconds
	80	12.35	9.20		
	90	12.40	9.25		
	100	12.59	9.44		
	120	12.70	9.55		
	140	12.93	9.78		
	160	13.20	10.05	1.09m3	56 seconds
	180	13.55	10.40		

Type of test. **Recovery**

Time	Time since start of pump (min)	Water level (m) bmp	Draw dow n (m)	Discharge Q(m^3/hr)	Remarks
	0	13.55	0.00		
	1	12.94	0.61		
	2	11.81	1.74		
	3	10.94	2.64		
	4	10.27	3.28		
	5	9.50	4.05		Percentage recovery
	6	8.80	4.75		94%
	7	8.34	5.21		
	8	7.85	5.70		
	9	7.40	6.15		
	10	7.04	6.51		
	12	6.52	7.03		
	14	6.08	7.47		
	16	5.66	7.89		
	18	5.40	8.15		
	20	5.17	8.38		
	25	4.46	9.09		
	30	4.21	9.34		
	35	3.93	9.62		
	40	3.74	9.81		
	45				
	50				
	55				
	60				
	70				
	80				
	90				
	100				
	120				
	140				
	160				
	180				

Supervisor name DEZ115 ..... **Signature**.....

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PUMP TESTING LOG

REDD'YS BOREHOLE
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Tell: 0709234234/0776234234
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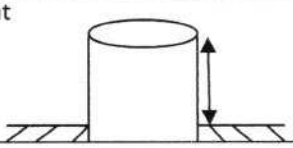
Location	**Nsonko**	DWD	
Village	**Nsonko**	Client	**Foundrising community development**
Parish	**Mango**	X-coordinates	
Sub county	**Namusita**	Y-coordinates	
County	**Buyende**	Altitude (m)	
District	**Buyende**	Drillers yield	
Date start	**21/06/2021**	Depth of pump	
Date end	**21/06/2021**	Sketch of measuring point	
Duration of Pump Test (m)	**180 minutes**		
Static water level (m)	**12.84m**		
Dynamic water level (m)	**18.05m**		

Type of test.....

Time	Time since start of pump (min)	Water level (m) bmp	Draw down (m)	Discharge Q(m^3/hr)	Remarks
	0	12.43	0.00		
	1	14.30	1.85		
	2	14.50	2.05		
	3	14.70	2.25		
	4	14.68	2.23	1.53m3	40 sec water tirbide flow
	5	14.79	2.34		
	6	14.87	2.42		
	7	15.00	2.55		
	8	15.22	2.77		
	9	15.37	2.92		
	10	15.53	3.10		
	12	15.67	3.22	1.53m3	40 sec water slightly clear
	14	15.83	3.38		
	16	16.30	3.85		
	18	16.45	4.00		
	20	16.57	4.12		
	25	16.70	4.25		
	30	16.78	4.33	1.53m3	40 sec water clear
	35	16.86	4.41		
	40	16.94	4.49		
	45	17.10	4.65		
	50	17.25	4.80		
	55	17.39	4.94		
	60	17.48	5.03		
	70	17.66	5.21	1.53m3	40 sec clear water
	80	17.74	5.29		
	90	17.78	5.33		
	100	17.85	5.40		
	120	17.88	5.43		
	140	17.93	5.48		
	160	17.98	5.53	1.53m3	40 sec clear water
	180	18.05	5.60		

Type of test.....

Time	Time since start of pump (min)	Water level (m) bmp	Draw down (m)	Discharge Q(m^3/hr)	Remarks
	0	18.05	0.00		
	1	14.20	3.85		
	2	13.56	4.49		Percentage recovery
	3	13.43	4.62		91%
	4	13.37	4.68		
	5	13.14	4.91		
	6	13.03	5.02		
	7	12.94	5.11		
	8				
	9				
	10				
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	140				
	160				
	180				

Supervisor name ..... **Signature** .....

REDDY'S BOREHOLE & TECHNICAL SERVICES LTD. P. O. BOX 10940, KAMPALA

INSTALLATION REPORT

REDD'YS BOREHOLE
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Kawempe, Kalerwe-Tula Road
Kampala, Uganda
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Location	**Kakooge**	DWD	
Village	**Kakooge**	Client	**Fundraising Community Development**
Parish	**Kakooge**	X-coordinates	
Sub county	**Namusita**	Y-coordinates	
County	**Buyende**	Altitude (m)	
District	**Buyende**	Date of installation	**24/06/2021**

Static water level	**16.20m**
Dynamic water level	**19.04m**
Type of pump installed	**U2 Stainless steel**
Pump installation depth	**24m**
Number of Pipes Installed	**8 pipes**
Riser pipe size	**1 ¼"**
Riser pipe material	**Stainless steel**
Pump rod diameter	**1/4 "**
Pump rod material	**Stainless steel**
Yield	**1.80m3/hr**

Supervisor name: ..... **Signature:** .....

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REDD'YS BOREHOLE
& TECHNICAL SERVICES LTD

Kawempe, Kalerwe-Tula Road
Kampala, Uganda
Tell: 0709234234/0776234234
Email: rbtsltd.ug@gmail.com

Location	**Kiribairya**	DWD	
Village	**Kiribairya**	Client	**Fundraising Community Development**
Parish	**Kiribairya**	X-coordinates	
Sub county	**Buyende**	Y-coordinates	
County	**Buyende**	Altitude (m)	
District	**Buyende**	Date of installation	**24/06/2021**

Static water level	**3.30m**
Dynamic water level	**13.55m**
Type of pump installed	**U2 Stainless steel**
Pump installation depth	**24m**
Number of Pipes Installed	**8 pipes**
Riser pipe size	**1 ¼"**
Riser pipe material	**Stainless steel**
Pump rod diameter	**1/4 "**
Pump rod material	**Stainless steel**
Yield	**1.09m3/hr**

Supervisor name: ..... **Signature:** .....

REDDY'S BOREHOLE & TECHNICAL SERVICES LTD. P. O. BOX 10940, KAMPALA

INSTALLATION REPORT

REDD'YS BOREHOLE
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Kawempe, Kalerwe-Tula Road
Kampala, Uganda
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Location	**Nsoko**	DWD	
Village	**Nsoko**	Client	
Parish	**Nsoko**	X-coordinates	
Sub county	**Mango**	Y-coordinates	
County	**Buyende**	Altitude (m)	
District	**Buyende**	Date of installation	**24/06/2021**

Static water level	**12.84m**
Dynamic water level	**18.05m**
Type of pump installed	**U2 stainless steel**
Pump installation depth	**21m**
Number of Pipes Installed	**7 pipes**
Riser pipe size	**1 ¼"**
Riser pipe material	**Stainless steel**
Pump rod diameter	**1/4"**
Pump rod material	**Stainless steel**
Yield	**1.53m3/hr**

Supervisor name: DENIS ..... **Signature:** .....

REDDY'S BOREHOLE & TECHNICAL SERVICES LTD. P. O. BOX 10940, KAMPALA

Republic of Uganda

MINISTRY OF WATER AND ENVIRONMENT
NATIONAL WATER QUALITY REFERENCE LABORATORY - ENTEBBE

Certificate of Analysis

Client Name : Reddys Borehole and Technical Services Limited C/o Fundraising Community Development
Client Address : Kawempe, Kampala
Sample type & Location : GroundWater from kakooge Borehole, Buyende District
Date received : 29th June 2021
Analysis Completion date : 12th July 2021
Sampled by : Client

TEST RESULTS

Source Name	Units	Kakooge Borehole	Drinking water standards (DEAS12:2018 Maximum permisible for Natural potable Water)
Village		Kakooge	
Sub county		Namusita	
District		Buyende	
Lab Identifier code		E48256	
Turbidity (NTU)	NTU	0.99	25
Colour	PtCo		50
pH	units	6.9	5.5-9.5
Electrical Conductivity	µS/cm	3310	2500
Total disolved solids	mg/l	2317	1500
Total Hardness as CaCO3	mg/l	1160	600
Calcium hardness as CaCO3	mg/l	674	600
Magnesium hardness as CaCO3	mg/l	486	600
Calcium	mg/l	270	150
Magnesium	mg/l	117	100
Sodium	mg/l	375	200
Potasium	mg/l	7.1	50
Total Alkalinity	mg/l	470	_
Bicarbonates	mg/l	573	_
Fluoride	mg/l	1.21	1.5
Sulphates	mg/l	200	400
Chlorides	mg/l	655	250
Nitrates as N	mg/l	8.50	10
Nitrites as N	mg/l	<0.001	0.9
Ammonium as N	mg/l	0.15	0.5
Phosphates as P	mg/l	0.53	0.7
Total Iron	mg/l	0.21	0.5

Notes;

- Samples are analyzed on as received basis.
- The client does bear sampling responsibility as to the representative characters of the sample delivered. Results are therefore based on the sample delivered and analyzed.
- mg/l-stands for milligrams per liter

Checked by

LABORATORY MANAGER
NWQRL 12 JUL 2021 NWQRL
NATIONAL WATER QUALITY REFERENCE LABORATORY -ENTEBBE

Water Quality Management Department
Directorate of Water Resources Management
Waterquality.laboratory@mwe.go.ug
P.O Box 19, Entebbe
Tel: 041-321342

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Issued by

PRINCIPAL ANALYST LABORATORIES
12 JUL 2021
NATIONAL WATER QUALITY REFERENCE LABORATORY – ENTEBBE
Sign:.....

Republic of Uganda

MINISTRY OF WATER AND ENVIRONMENT
NATIONAL WATER QUALITY REFERENCE LABORATORY - ENTEBBE

Certificate of Analysis

Client Name : Reddys Borehole and Technical Services Limited C/o Fundraising Community Development
Client Address : Kawempe, Kampala
Sample type & Location : GroundWater from kiribairya Borehole, Buyende District
Date received : 29th June 2021
Analysis Completion date : 12th July 2021
Sampled by : Client

TEST RESULTS

Source Name	Units	Kiribairya Borehole	Drinking water standards (DEAS12:2018 Maximum permisible for Natural potable Water)
Village		Kiribairya	
Sub county		Buyende	
District		Buyende	
Lab Identifier code		E48255	
Turbidity (NTU)	NTU	1.6	25
Colour	PtCo		50
pH	units	7.1	5.5-9.5
Electrical Conductivity	µS/cm	4940	2500
Total disolved solids	mg/l	3458	1500
Total Hardness as CaCO3	mg/l	810	600
Calcium hardness as CaCO3	mg/l	382	600
Magnesium hardness as CaCO3	mg/l	425	600
Calcium	mg/l	153	150
Magnesium	mg/l	102	100
Sodium	mg/l	1000	200
Potasium	mg/l	6	50
Total Alkalinity	mg/l	1000	_
Bicarbonates	mg/l	1220	_
Fluoride	mg/l	2.43	1.5
Sulphates	mg/l	315	400
Chlorides	mg/l	540	250
Nitrates as N	mg/l	12.00	10
Nitrites as N	mg/l	0.01	0.9
Ammonium as N	mg/l	0.02	0.5
Phosphates as P	mg/l	0.18	0.7
Total Iron	mg/l	0.16	0.5

Notes;

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Certificate of Analysis

Client Name : Reddys Borehole and Technical Services Limited C/o Fundraising Community Development
Client Address : Kawempe, Kampala
Sample type & Location : GroundWater from Nsoko Borehole, Buyende District
Date received : 29th June 2021
Analysis Completion date : 12th July 2021
Sampled by : Client

TEST RESULTS

Source Name	Units	Nsoko Borehole	Drinking water standards (DEAS12:2018 Maximum permisible for Natural potable Water)
Village		Nsoko	
Sub county		Namusita	
District		Buyende	
Lab Identifier code		E48254	
Turbidity (NTU)	NTU	1.1	25
Colour	PtCo		50
pH	units	6.7	5.5-9.5
Electrical Conductivity	µS/cm	370	2500
Total disolved solids	mg/l	259	1500
Total Hardness as CaCO3	mg/l	121	600
Calcium hardness as CaCO3	mg/l	68	600
Magnesium hardness as CaCO3	mg/l	53	600
Calcium	mg/l	27	150
Magnesium	mg/l	13	100
Sodium	mg/l	30	200
Potasium	mg/l	3.5	50
Total Alkalinity	mg/l	160	-
Bicarbonates	mg/l	195	-
Fluoride	mg/l	0.54	1.5
Sulphates	mg/l	12	400
Chlorides	mg/l	9.6	250
Nitrates as N	mg/l	1.87	10
Nitrites as N	mg/l	<0.001	0.9
Ammonium as N	mg/l	0.03	0.5
Phosphates as P	mg/l	0.38	0.7
Total Iron	mg/l	0.13	0.5

Notes;

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- mg/l-stands for milligrams per liter

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