

CALL FOR TENDERS

Lot 2

Reference Number: WHH_2018/20 BHs/UGA 1075/02

Siting, Drilling and Installation of Twenty (20) deep boreholes in Amuria District

Welthungerhilfe is an International NGO operating in Uganda and with its headquarter in Bonn, Germany. Welthungerhilfe received funding from Charity: Water for a WASH project in Katakwi / Amuria districts. Welthungerhilfe launches this Call for the drilling of twenty (20) deep boreholes in Amuria District under Lot 2

This tender is open to interested drilling companies and relevant NGOs in Uganda, with proven experience in deep borehole drilling. They must be registered and holders of a valid drilling permit of the Ministry of Water and Environment.

Besides, they must possess at least the following drilling equipment:

- ☐ Drilling rig trucks (preferred 4x4 driven);
- ☐ Appropriate compressor, as well on a trucks;
- ☐ Water tank truck.

Besides, they must assign:

- ☐ A Registered specialist to carry out the hydro-geological survey;
- ☐ A drilling engineer (supervisor), who must be on site during the entire drilling process.
- ☐ Adequate number of support staff to ensure service delivery

For the submission of offers, the annexed forms have to be filled out, duly signed and submitted in time by the applicants.

All offers, Signed, stamped and sealed and all pages numbered MUST be HAND DELIVERED to:

The Project Manager UGA1075
Deutsche Welthungerhilfe e.V.
Plot 2148 Lubbo Close, Muyenga Tank Hill Road.
Kampala, Uganda
PO Box 71223
Kampala Uganda
+256 776 266 828
Email:whhkatakwi@gmail.com

Not later than 2:00 pm on 10th August 2018.

Welthungerhilfe will not be responsible for bids delivered to a wrong address. Late bids shall be rejected.

All offers and documents arriving at another place and/or after that date and time, for whatever reason, will be rejected. Applicants will have to make sure themselves that their offers will arrive in time at the right place.

The documents to be submitted by the applicants are:

- ☐ The Submission form 1, with the list of supporting documents and the list of references;
- ☐ The Submission form 2 with the actual offer supported by corresponding BoQs.

SUBMISSION FORM 1

The Project Manager UGA1075
 Deutsche Welthungerhilfe e.V.
 Plot 2148 Lubbo Close, Muyenga Tank Hill Road.
 Kampala, Uganda
 PO Box 71223
 +256 776 266 828
 Email:whhkatakwi@gmail.com

Subject:

Call for the siting, drilling and installation of twenty (20) deep bore holes in Amuria District

Interested parties should provide detailed information on the following selection criteria:

A) Company Information/ Legal Status

A1: Full address (including contact person) and Contacts of the Bidder.

A2: Certified copy of Trading License (2017/2018)

A3: Registration/ incorporation certificates

A4: Valid Drilling Permit (2017/2018)

A5: Valid Income Tax Clearance Certificate (2016, 2017 & 2018).

A6: VAT registration certificate

A7: Registered Power of attorney for this project addressed to WELTHUNGERHILFE A8: An original letter of no objection from the bidder authorizing Welthungerhilfe to obtain more information from the bidder's banker(s).

B) Technical Capacity

The interested party is to list below details of all works of a similar nature carried out as Main Contractor over the last 3 years. The Values shall be in Uganda shillings.

Attach proofs of successful completion, recommendation letters.

(Use additional rows if necessary).

Project	Project Name	Name of Client & Address/Contact Person	Location (District, Sub-county, Parish) and Year of completion	Value of Contract (UGX)
Borehole Drilling				

C) Staff capacity

The interested party is to submit updated CVs, photos and photocopies of certificates of their key staff likely to be engaged in carrying out the works in Amuria,

- ☐ Registered Expert on hydro-geological survey
- ☐ Project engineer, Site Engineer, drilling supervisor and other crew members

D) Logistical Capacity

The interested party is to list below details of all construction plant, transport, tools and equipment intended for use in carrying out the works in Amuria if to be hired or already owned, year of manufacture, registration no., and capacity.

Attach logbook or updated leasing agreements.

(Use additional rows if necessary)

Type and Capacity	Owned or hired?	Proof (log book/ leasing agreement)	Year of manufacture	Registration Number
Rig Truck with mounted deep drilling facilities				
Truck with mounted compressor				
Water tank truck				
Etc.				

E) Financial Capacity

Attach most recent copy of

- ☐ Certified bank statement (**over the last 6 months**) and
- ☐ Certified audited financial report 2016, 2017& 2018

Submission Form 2

To: The Project Manager UGA1075
 Deutsche Welthungerhilfe e.V.
 Plot 2148 Lubbo Close, Muyenga Tank Hill Road.
 Kampala, Uganda
 PO Box 71223
 Kampala Uganda
 +256 776 266 828
 Email:whhkatakwi@gmail.com

Bid for: Siting, Drilling and Installation of Twenty (20) deep bore holes in Amuria District (Lot. 2)

1. I, the undersigned, authorized to sign bid for and on behalf of the below company hereby offers to execute, complete deliverables and remedy any defects in the whole works in conformity with the said document for:

Designation	Unit Cost (UGX)	Quantity	Total Cost (UGX)
(Extra) Deep borehole drilling as specified in annexes 3, 4, and 5 (As detailed in the Bill of Quantity attached)		20	

Total = Price of offer:

(in numbers): _____ UGX

(in words): _____ Uganda Shillings

2. We undertake if our bid is accepted as a responsive, to complete and deliver the whole work comprises in the contract within _____ days from the day of signature of the contract.
3. The defect liability period shall be 90 calendar days from the date of practical completion of the contract.
4. This offer is binding for a period of at least 16 weeks, starting from the deadline of the submittal of the offer unless previously withdrawn in writing to Welthungerhilfe e.V
5. We shall mobilize to start the work within _____ days from date of signing of the contract agreement.

Date, Place:

Yours sincerely:

Signature, stamp

Specific Technical Part

1. To be provided by the contractor:

- ☐ Hydro-geological survey for each bore hole;
- ☐ Information of the landowner of the exact proposed borehole site. This has to be done in time. No drilling can be done without the consent of the landowner. Welthungerhilfe will prepare the respective agreements.
- ☐ Transportation of all equipment, material and staff to the sites;
- ☐ Drilling works,
- ☐ Three-hour yield test in the bore hole, according to standard;
- ☐ Physio-chemical and bacteriological analysis of the water found in the bore hole by a certified laboratory;
- ☐ For bore holes with sufficient yield and water meeting WHO standards for drinking water only:
- ☐ Insertion of 5" PVC pipes into the borehole.
- ☐ Installation of hand pumps (complete) Brand: Certified **U2 or U3 pumps, stainless steel riser pipes and rods (original)**; if other brand is preferred, please indicate. Installation materials will be inspected upon delivery and substandard quality rejected.
- ☐ Report indicating the characteristics of the bore hole;
- ☐ Hand-over procedure with Welthungerhilfe.

2. The offered price includes:

- ☐ Siting;
- ☐ Transportation;
- ☐ Use of tools, machines and equipment;
- ☐ Material, such as water, fuel etc.;
- ☐ Any stores and storage costs;
- ☐ Laboratory costs and costs of reporting;
- ☐ Staff (hydro-geologist, supervising water and drilling engineer, technical drilling team, drivers, masons and other craftsmen, any casual labour; etc.);
- ☐ All staff cost such as salaries, allowances, medical treatments, etc.
- ☐ Equipment: Trucks, machines, compressor, drilling rig, tanks for water and fuel, equipment for hydro-geological survey, etc.
- ☐ Equipment and material for pump, apron: Pump complete with all accessories and spare part kit, cement, steel reinforcements, sand, aggregates and boulders, plus all auxiliary material such as timber for casting, nails etc.,
- ☐ Any taxes and charges. **Drilling works are no longer exempted from VAT. Welthungerhilfe will deduct 6% Withholding tax of the contractual amount and pay directly to the Uganda Revenue Authority on behalf of the contractor as required by law unless proof of exemption is provided!**

3. Payments

Very important:

1. Payments are done under the condition: No Water – No Pay.

That means: If the bore hole is dry, if the yield is below 500 litres/ hour (according to 3h pumping test), or if any content of the pumped water is not suitable for human consumption, or if any rates (nitrate, salt, etc.) are exceeding the rates according to Ugandan standards for drinking water, then the works undertaken to drill this bore hole will not be paid by Welthungerhilfe.

2. If the static water level is below 75m, then this borehole is considered to be dry.
3. In case of dry boreholes or boreholes with insufficient yield, the Contractor is free to drill another bore hole, based on a new hydrological survey, in a radius of 500m. Also, Welthungerhilfe is free to ask for the drilling of alternative site(s) within the same Sub-County. In this case, only the boreholes drilled and meeting the conditions of Points 1) and 2) will be paid. Any exceeding money, paid via advance payments to the contractor, has to be reimbursed immediately in such a case.

4. Location of the bore holes

The exact locations in the field will be shown to the Contractor by a representative of Welthungerhilfe. However, the bore holes will be located in the following sub counties:

District	Sub County
Amuria	Willa
	Abarilela

General items

- ☐ The execution of works has to be according to the technical specifications of this tender document and must respect the norms and standards valid in the Republic of Uganda. If national standards do not exist, relevant international standards or rules, namely those issued by UNHCR and UNICEF, will be applied.
- ☐ Welthungerhilfe will follow and supervise continuously and on daily basis the works, be it by the project manager, be it by his representatives on site. The remarks of Welthungerhilfe staff will have to be followed. No work will be expected to continue on site without the presence of the client's representative unless otherwise this is agreed upon
- ☐ Every modification of the contractual works or the time schedule must be confirmed in writing, in the form of contract annexes, amendments or modifications. Verbal arrangements are not valid.
- ☐ The contractual time schedule has to be followed. Occasional rain, bad weather, holidays etc. have to be taken into account when the Contractor sets up his time schedule. **The same applies to technical problems with the vehicles and/or drilling equipment. Such factors will not be accepted as reasons for delay.**
- ☐ The Contractor will respect the rules of security on site. He will be fully liable in case of accidents, damages etc. to his staff, workers and/or thirds parties. At night, the site must be protected as well.

TECHNICAL SPECIFICATIONS AND PROCEDURES FOR DRILLING AND CONSTRUCTION OF BOREHOLES WITH HANDPUMPS

1. NATURE OF CONTRACT

- 1.1 The Specifications are for the drilling of boreholes and equipping them with hand (India Mark II or III hand pumps with certified stainless steel rise pipes and rods) with adherence to the recent guidelines issued by the Ministry of Water and Environment on the use of pipes for rural water- correspondence ref No. ADM/107/01 dated 31/Nov/2016 and completion of all civil works involved.
- 1.2 Client would like to have a turnkey contract for the construction of Hand pump water facilities on drilled boreholes. For this the Contractor shall provide all labour, transport, plant, tools, equipment and materials and appurtenances, and shall perform all Works necessary to satisfactorily locate sites for drilling, construct and complete successfully drilled boreholes including lowering of borehole assembly with PVC casing and Screen and end cap, gravel pack at appropriate intervals and back fill, close near surface water table aquifer, cleaning and development of said boreholes, pump test for 3 hours, chlorinate borehole, install hand pump, construct apron with drainage and soak away pit and water quality testing (physical, chemical and biological) in accordance with this specification and to any further details as may be ordered by the Client.
- 1.3 The Contractor shall employ only competent workmen for the execution of the Works, and all such Works shall be performed under direct supervision of an expert water well driller/site supervisor.

2. CONTRACTOR'S DRILLING EQUIPMENT

- 2.1 The Contractor shall specify in the Schedule of Drilling Equipment, borehole development and other accessory equipment, its type and capacity that is to be used to undertake this work. Its capacity shall be sufficient to cope with the Works as stated in the Contract. It shall at all times be kept in full working order and good repair.
- 2.2 If the Client considers that the drilling equipment or any accessories in use on the site of the works is in any way unsuitable, inefficient or inadequate in capacity, the Client shall have the right to call upon the Contractor to put such equipment in good order within seven days or alternatively to remove such plant and replace it with additional plant or equipment which the Client considers necessary to meet the requirements of the Contract. In the event that this requirement of the Contract is not satisfied, the Client reserves the right to terminate the Contract immediately.
- 2.3 No extra payment shall be made for the Contractor's change of drilling equipment, labour or other equipment required to complete the Works specified, nor for any incidentals thereto, the cost being deemed to be included in the schedule of rates.

3. SITE SELECTION

- 3.1 The Contractor upon arrival in Amuria will meet a representative of

Welthungerhilfe or other concerned authorities (list to be provided by Welthungerhilfe) and inform about the drilling plans. The designated representative in consultation with target community will select socially acceptable location for drilling purpose (see 3.2 and 3.3 below). The Contractor shall receive from client the list of proposed locations. Contractor upon visiting these locations will determine the road conditions for accessibility of the drilling rig and other heavy equipment. The Contractor will receive from client a list of additional reserve locations by order of priority as replacements for any dry or unsuccessful boreholes. Any changes or alternative sites will be in consultation with Client and designated representatives.

3.2 Within each of the selected location, the driller in consultations with designated representative will select 2-3 sites that are socially acceptable to the communities.

The Contractor will be responsible for getting these socially selected sites checked by proper Geophysical / Geological and confirm the technical feasibility of drilling a successful borehole(s) for hand pump installation. In case the Contractor selects a site that is not one of those selected by the water committee, then he should discuss with the designated representative and explain the need for changes. If the water committee members are not satisfied by the change in location, then contractor should communicate to the Client.

3.3 The technical sitting team should ensure that the sites selected for the hand pump facility is preferably within the communities and in no case more than 500 meters from where at least 80% of people of that village / community live. The site should definitely not be in a place that gets flooded in the rainy season and should be away from the flood plain area of any streams or rivers in the locality. Special care must be taken to ensure that the sites chosen are at least 30 meters away from toilet pits or any other sources of pollution such as grave yard, stagnant pools of dirty water or animal pens.

3.4 The Contractor will technically select all sites, prepare a Drilling Work Plan and communicate it in writing to the Client with a **sketch map** showing the rig movement and their distances between the consecutive drilling sites and Gantt chart to show the completion plan for all works and report on the geophysical sitting with the interpretation and recommendations.

3.5 Sites selected will consider the rainy season and accessibility to heavy drilling rigs and support vehicles'. If the Contractor considers improvements are required for any reason to enable him carry out the Works, he shall make the improvements at his own expense. In the event that improvement is not feasible, and access is still not possible, then the contractor should notify in writing to the client and seek permission to replace the location from the reserve list.

3.6 At least two to three (2-3) sites shall be identified at each location, which shall constitute one single sitting payable under this contract. In case the Contractor fails to drill a successful borehole and moves to a new location, he shall make at least three (2-3) sitting for this new location before claiming payment as stipulated in the Bills of Quantities. The contractor will get paid only for sitting

successful boreholes.

3.7 The Contractor may move to a new location only after two unsuccessful boreholes in one location. Payment for sitting will be made on the basis of clause 3.6 above.

3.8 The Contractor shall observe all social norms of the community in the sites selected that adhere to the Ugandan laws. The client as well expects that the contractor shall treat its staff, workers and the local community in appropriate ways. Any infringement of the community social norms is subject to facing the arm of law.

4. BOREHOLE CONSTRUCTION

A typical borehole section is shown in annex: 7. Basic methods of drilling are indicated below as a basic guide, mostly to maintain a few key dimensional specifications.

Drilling Methods:

4.0.1. The preferred method of drilling in consolidated compact formations is rotary percussion with air and/or foam flush. Boreholes will be drilled with 8" then followed by 6 7/8-inch drill bits and reamed with a minimum diameter of 10 5/8 inches for sanitary protection or for lowering temporary casings.

4.0.2. In unconsolidated loose, unstable, collapsing formations, rotary with appropriate drilling stabilizer will be used. In such a case the drilling diameters will be telescopic starting with diameter large enough to lower temporary casing in upper collapsing formations and continue drilling with a final minimum diameter of 6 7/8-inch bit. If other chemical fluids or solids are used to arrest collapsing of formations, the Contractor has to use proper borehole development and cleaning methods to ensure the use of borehole water is safe for drinking purposes. The Contractor will use such fluids or solids with the agreement of the Client. Boreholes will be constructed with UPVC casing, screen and sand trap. The Contractor will decide appropriate lengths of

slotted screen in the aquifer intervals. All cost of using proper drilling fluids and solids is included in the rate per meter quoted. No additional payments will be made by client.

4.2 Borehole Depth:

4.2.1 Boreholes shall be drilled to such depths as to penetrate below the shallow water table aquifers and tap the first potential deeper aquifer or aquifers in confined/semi-confined conditions with a minimum discharge of 0.25 litres per second to sustain continuous pump testing for 6 hours to ensure reliable operation of hand pumps fitted on them. The depth to be drilled should be at least 75 metres and at least six (6) meters below the main aquifer to provide proper installation of a hand pump and to provide a sand trap of 3 meters. If the discharge is less than 0.25 litres/second, a decision to abandon the

borehole or continue to drill deeper will be at the discretion of the Contractor.

4.3. Borehole Diameter:

4.3.1. Boreholes will be drilled with telescopic diameters.

4.3.2. The first 6 meters from the surface will have concrete grouting for sanitary protection. For this, the borehole will be reamed to a minimum diameter of 9 or 10 5/8" inches and concrete grouting placed in the annular space between the casing and open borehole wall.

- 4.3.3. Borehole will be drilled with 8" then 6 7/8 inch (174.63mm) bit in the hard rock. The reaming diameter will be based on the type of temporary casing the contractor will use and not less than 9 inches to install Class 10 PVC casing of 140mm outside diameter for the total depth of the borehole¹.
- 4.3.4. The contractor must take into account the depths he has to drill and lower temporary casing to complete the drilling. This cost must be built in the quoted unit cost for drilling.
- 4.3.5. The client will not be responsible for any loss of temporary casing which the contractor is unable to pull out or lost due to snapping or breaking from the completed boreholes.
- 4.4. Screen:
 - 4.4.1 The Contractor will use proprietary; factory-made Class 10 UPVC slotted screens, the slot size and screen length depending on the aquifer materials and aquifer thickness. The Contractor will take sole responsibility of designing the well assembly and placing screen and casing at appropriate depths to match the positioning of the aquifer(s).
 - 4.4.2 Slotted screens should be of DIN 4925/8061 or equivalent approved by international standards and have the following dimensional specifications: U-PVC casing pipe, Class 10, drinking water standards, nontoxic and in standard lengths of three (3) meters, Nominal diameter of 125mm, OD 140mm, flush jointed, male female trapezoidal threads, slot width 0.75 mm and not more than 1mm, and open area as percentage of internal surface area 9.26% per linear meter. Depending on the aquifer, the Contractor may choose an appropriate slot width other than 0.75mm.
- 4.5 Casing Pipe and Sand Trap:
 - 4.5.1 Casing pipe should be of DIN 4925/8061 or equivalent approved by international standards, and have the following dimensional specifications: U-PVC Class 10, drinking water standards, nontoxic and in standard lengths of three (3) meters in length, Nominal diameter 125mm, outer diameter 140mm, WT 7.5mm, for installation down to 90 meters, flush jointed for internal and external diameter, male /female trapezoidal threads and in lengths of 3 meters.
 - 4.5.2 The boreholes will be fully cased to bottom. The threads both male and female are properly cleaned with a clean brush and cloth before they are joined. If the pipes used are with bell and socket, these are cleaned using fluids and cemented with recommended solvent cement by the manufacturers of the casing pipes and screen. Wait for recommended time for the joint to set firmly before lowering into the borehole.
 - 4.5.3 The Contractor will take all necessary precautions during the transportation and storage of casing pipes from their warehouse to drilling sites to prevent

¹ Note: Drill bit sizes more than those indicated are also acceptable to accommodate the drill bits which the Contractor's rig is equipped with or of which the Contractor may have in stocks.

distortions, ending or deformation of the pipe that could result in eccentricity along the length of the pipe.

- 4.5.4 A maximum of 3meter length of sand trap will be part of the well design when boreholes are cased to the bottom. The sand trap will be from UPVC casing pipe with specifications described above, fitted to the end of last screen and bottom end with an end-cap. The end cap is glued with appropriate solvent cement or solutions as recommended by the UPVC manufacturer. Note that the joint sections are properly cleaned with cleaning fluids and recommended time given for the joint to set firmly before lowering into the borehole.

4.6 Gravel Packing and Grouting:

- 4.6.1 The annular space between the casing and borehole wall is filled with filter packing materials in the screen intervals and back filling materials. The gravel packing mixture to be used depends on the sieve analysis results and the slot size of the screen. The contractor will do the sieve analysis and then determine the gravel pack materials. Gravel packing material will be stored in a way so as to avoid contamination or rain washing finer materials. Iron and Calcareous grains will not be included in the gravel pack materials.
- 4.6.2 The contractor will be required to sieve and wash gravels if found to be supplied not to the required size and dirty.
- 4.6.3 Gravel packing is carried out as continuous feed operations done usually by two people filling uniformly around the circumference of the pipe. It is advisable to add some water with a pipe so that the gravel flows down. If the gravel gets inside the temporary casing, the casing is slowly pulled out and gentle well development is done to allow gravel to settles properly to a height of 3 meters above the top of the screen interval or the targeted water bearing formation. More gravel is added with development if the gravel settles down.
- 4.6.4 Backfilling and grouting is done when the Minimum acceptable yield of 0.25 litres/second is confirmed by development. The borehole cuttings or clayey soils are back filled up to 6 meters below the ground surface.
- 4.6.5 The grouting is done with a concrete mix in the ratio of 1:2:3 of cement sand and gravel respectively. The gravel size should be not more than 6mm. Insert a 3meter Steel casing of 6 inches' diameter on to the PVC casing, both protruding above ground level by at least 60cm to facilitate installation of Bush Pump Type B (see manual for details).

5. BOREHOLE DEVELOPMENT:

- 5.1. On completion of drilling, the Contractor will choose a suitable and appropriate borehole development method. The borehole shall be developed for a period of at least two hours in order to obtain a maximum yield of water that is free of suspended matter. Developing shall be carried out by airlift pumping and surging, jetting and block surging, or other techniques the contractor feels is more appropriate and efficient to suit the casing, hydro-geological and drilling conditions prevailing in that borehole. All boreholes shall be presented for testing free of any bridging or obstruction to the total depth. The Contractor should provide the equipment required for verticality testing as described in Directorate of Water Development regulations.

Developing will be for a minimum period of 2 hours.

6. PUMPING AND RECOVERY TEST:

- 6.1. A pumping test is required on a routine basis for each borehole. The Contractor will estimate the discharge from the air lifting rates or blow test during borehole development. Based on the estimated discharge, the Contractor will certify the borehole as either "successful" or "lost". For successful boreholes for hand pumps, the Contractor will undertake a seven-hour pump testing of which the first one hour is a three step draw down test. The discharges for the step drawdown test will be fixed by the contractor based on the well development results. High yielding boreholes, with a discharge of more than 1 litre/second may be pump tested for 72 hours. The 72 hours' pump test is conducted if the borehole is intended for a motorised pump. After conducting the step drawdown tests the borehole should be allowed to recover almost to the original static water level (1 hour) before the constant yield test is undertaken continuously for 4 hours at the chosen/predetermined rate.
- 6.2. The first step could be minimum acceptable discharge of 0.25 litres/ sec. The second step will be at an estimated discharge from blow test (during the well development) and the third step will be 50 to 75% more than the estimated discharge from blow test. As a thumb rule the range of the three steps could be 0.5 litres/Sec or above depending of development results, 0.75 litres /Sec and 0.25 litres/Sec. and each step for 20 minutes (total 1 Hours) the continuous test of 4 hours will be carried out at a discharge at which the dynamic water level will stabilize. Annex 9 and 10 show the formats for recording pump test data. If the discharge is below 0.25 litres/second or dynamic water level is below 45meters then the borehole will be regarded as "Lost".
- 6.3. Recovery test will be for one hour or such time when the three is at least recovery of 80% of the static water level noted at the start of the pump test. The pump test data and the results of pump test is presented in the standard form attached (Annex- 8).
- 6.4. The Contractor shall have on site a 900 V-notch weir, preceded by a tank with baffles, for the measurement of flows. Small flows (less than 0.25 litres/second) can be measured by timing the filling of a vessel of known volume. The Contractor shall also have on site an operating electric dip meter, calibrated in centimetres, and with visual/audible indicator of when the water level is reached.
- 6.5. Readings of flow and water level shall be taken at the intervals defined on the test pumping form. For accurate measurement, an electrical/ sonic water level indicator with graduated tape for taking water level readings should be utilized. Recovery readings shall be taken for a minimum of 1 hour, during which period pumping equipment shall not be removed from the borehole.

7. WATER QUALITY TESTING:

- 7.1. The contractor shall, make sampling and quality analysis of water from every borehole.
- 7.2. The water quality test should be conducted at a competent testing laboratory that is authorized by the client.
- 7.3. The parameters to be tested are given in table below and standards will be according to WHO guidelines for drinking water quality.
- 7.4. Water samples for chemical analysis should be collected at the end of the test pumping process and analysed at the approved laboratory at the earliest possible time to facilitate timely handing over of the borehole for use by the community.
- 7.5. Thus the pump handle should only be fitted after acceptable chemical analysis results. Samples for biological testing will be collected later in suitable batches so as to meet the time limit of 48 hours between collecting and analysis in the Laboratory.
- 8.0 Pump installations (Riser pipes and connecting rods)
- 8.1 All the sources will be installed using stainless steel pipes and stainless steel connecting rods materials to ensure compliance with UNBS standards
- 8.2 32mm or 1 1/4" stainless steel pipes in 3m length with O ring and welded seamless sockets in AISI 304. 1pc Nipple adapter stainless steel AISI 316; or equivalent

Table 1: showing parameters to be tested

Biological	Physical	Chemical
Coliforms	Colour	Arsenic
E. Coliforms	Odour	Fluoride
	Taste	Manganese
	Turbidity	Total Dissolved Solids
	PH value	Copper
	Electric Conductivity	Nitrate
		Sulphate
		Chloride
		Bi-Carbonate
		Magnesium
		Calcium
		Total Suspended Solids
		Alkalinity: Total as CaCO ₃
		Hardness: Total as CaCO ₃

9 SAMPLING AND DRILL TIME LOGS:

Representative samples of the strata intersected shall be collected every one meter or less depending on the change of geological formation. For collection, the Contractor shall cease drilling, circulate all cuttings to the surface, resume drilling and collect the cuttings then brought to the surface. The Contractor shall take every possible precaution to guard against sample contamination due to poor circulation, bore hole erosion, or caving. Cutting samples shall be bagged, labelled with borehole depth at

time of collection, and stored in a position where they will not be contaminated by site conditions or drilling operations. The Contractor shall supply strong, transparent indelible labels as required. The driller in-charge will also record the drill time logs/penetration rate of each rod or at every three-meter interval. A sample of Litho logical log with drill time log is shown in Annex - 8

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sample bags and indelible labels as required. The driller in-charge will also record the drill time logs/penetration rate of each rod or at every three-meter interval. A sample of Litho logical log with drill time log is shown in Annex - 8

10 CHLORINATION AFTER BOREHOLE COMPLETION:

Each successful borehole must be chlorinated following completion drilling operations. The Contractor will decide on the concentration of chlorine based on the volume of water in the borehole.

11 PROTECTION:

Each successful borehole must be chlorinated following completion drilling operations. The Contractor will decide on the concentration of chlorine based on the volume of water in the borehole.

After successful completion of drilling, casing and testing head-works will be constructed in line with the guidelines given in the Head-work Manual which forms part of the documentation of this contract.

12 ABANDONMENT.

- 12.1 The Client shall have the right at any time during the progress of the Works to order the abandonment of the borehole. The Contractor shall thereupon remove the drilling rig, withdraw any casing and screen and salvage all such materials as the Client shall direct, and shall fill and leave the borehole to the satisfaction of the Client. In such case all works done and materials used will be paid by client.

13 "LOST" (UNSUCCESSFUL) BOREHOLES:

"Lost" boreholes are either "dry" boreholes or "uncompleted" boreholes.

14 DRY BOREHOLES:

Dry boreholes are defined as:

- 14.1 A borehole having no water bearing zones/aquifers
- 14.2 A Borehole that has insufficient discharge (less than 0.25
- 14.3 litres/second) for 6 hours of continuous pumping test
- 14.4 A borehole with stabilized Dynamic Water Level of more than 45 meters at minimum acceptable discharge of 0.25 litres/second
- 14.5 A borehole that has failed verticality test (see section 8)
- 14.6 Hand pump facility is unable to provide discharge of 0.25 litres per second. The hand pump installed on such borehole is unable to sustain continuous use by the communities throughout the day.

² This situation may arise with time within the Guarantee period because of one or more constructional defects such as ruptured / cracked casing, sections of boreholes collapsed, heavy silting closing the screen, screen choked; lowering the discharge, or poor sitting of borehole with no potential sustainable aquifers, drilling up to insufficient depths to tap potential sustainable aquifer. In the above case the Contractor shall either improve the discharge by appropriate well development methods or if the dynamic water level is less than 40m, lower the pump inlet with additional riser pipes and connecting rods. In the case of any remedial works not being effective the Contractor shall drill a new borehole at an alternative site mutually agreed with the Water Committee and the Contractor. If, after investigations, the Contractor feels that there are no possibilities of drilling a successful borehole in the village/ community, then the Contractor can move to a new location. This should, however, be after two failed attempts to drill the borehole in the same location. If the contractor is unable to remove the defects, abandoned due to any other reason then the borehole is classified as "Dry" and contractor has to refund the

14.2 UNCOMPLETED BOREHOLES:

14.2.1 For any reasons, contractor is unable to continue drilling and complete the construction of borehole then this borehole is deemed to be an “uncompleted borehole.”

14.3 In case of “uncompleted” boreholes, no payment shall be made for that borehole either for drilling or materials that cannot be salvaged and the rig's unproductive time spent. If the Contractor chooses to deviate from standard procedure and the agreed method of drilling, and wishes to adopt any other procedure or techniques that involves any additional cost and time required it will be done so entirely at the Contractor's own risk and cost.

15 TEST OF ACCEPTABILITY AND REPORTS:

15.1 Subject to meeting the requirements of the maintenance period, the borehole shall be accepted for payment on presentation of the following reports at schedules shown in the table below and sample of the formats given in the annexes:

NAME	DESCRIPTION	FREQUENCY
1. Sketch Map showing the drilling plan. See annex-1	A table showing the location, name, borehole number, and distances in kilometres from the last drilling location along with a sketch map showing the above information and sequence in which the drilling will progress i.e. route of movement of the rig. (see Annex -1).	Once, before the starting of drilling operations.
2. Results of Geophysical surveys	A table showing the location by District and Wards, borehole number, GPS co-ordinates, and geophysical results of surveys showing geology type, type of resistivity g curve with the thickness of interpreted layers and their thickness, recommended depth to be drilled. (see Annex -2 for sample format)	Once after the completion of geophysical survey. Submitted to client before drilling commences and also as part of final report.
	Detailed report on resistivity surveys on each borehole with i) sketch map showing the locations of three sites investigated, ii) data collection sheet for Vertical al Sounding(VES); iii) VES curves with interpretation on a log-log paper showing with thickness and resistivity and recommendations for drilling. (A sample report will be provided)	Once - One report for each district. To be submitted along with the invoices for final payment.

payment made by the client for that borehole.

<p>3. Strata log, penetration rate</p> <p>Log and location of main strikes.</p> <p>(see Annex-8)</p>	<p>An accurate record of strata passed through and the depths at which strata were intercepted; progressive measured (V-notch) airlifted yields after reaching water.; An accurate record of the penetration rates achieved in minutes for each meter drilled, together with type, size and grade of bit.</p>	<p>Recorded daily as drilling progress.</p> <p>Submitted to client with invoices for payment.</p>
	<p>An accurate record of time spent each day on different phases of drilling, to include rig down time, with causes.</p>	
	<p>A record of depth at which the water zones were struck during the drilling. This information can be combined with strata log and penetration log.</p>	
<p>4. Pumping Test data (see annex 9) and recovery test results.</p> <p>(See annex 10)</p>	<p>A detail report on the pump test, including the data of draw down with time and recover test, specific yield and draw down, recommendations on hand pump installation.</p>	<p>Once, recorded during pump test</p> <p>Submitted to client with invoices for payment.</p>
<p>5. Construction log</p> <p>(See Annex-7)</p>	<p>An accurate record and a figure showing the details of well construction- position of all casing, slotted casing, sand trap, end cap placed in the borehole, their quantities, hand pump installation- position of cylinder, number of connecting rods and riser pipes.</p>	<p>Recorded for each borehole after completing borehole construction.</p> <p>Submitted to client with invoices for payment.</p>
<p>6. Invoice for works done.</p>	<p>Invoices in same form in which rate schedule were quoted for each borehole and a summary sheet of all</p>	<p>Once after completion of 10 boreholes.</p>

	invoices.	
7. Certificate of Completion	A certificate of Completion & acceptance of hand pump facility constructed from Client staff.	Once after the inspection of hand pump facility by Client staff and Submitted to client with the invoices.

15.2 The Contractor is expected to submit three (3) spiral-bound copies of the **above reports and a summary in the beginning for each instalment of payment.**

16 ADHERENCE TO SOCIAL NORMS

Through all processes of the borehole drilling, the supplier shall adhere to all social norms in line with the Ugandan laws.

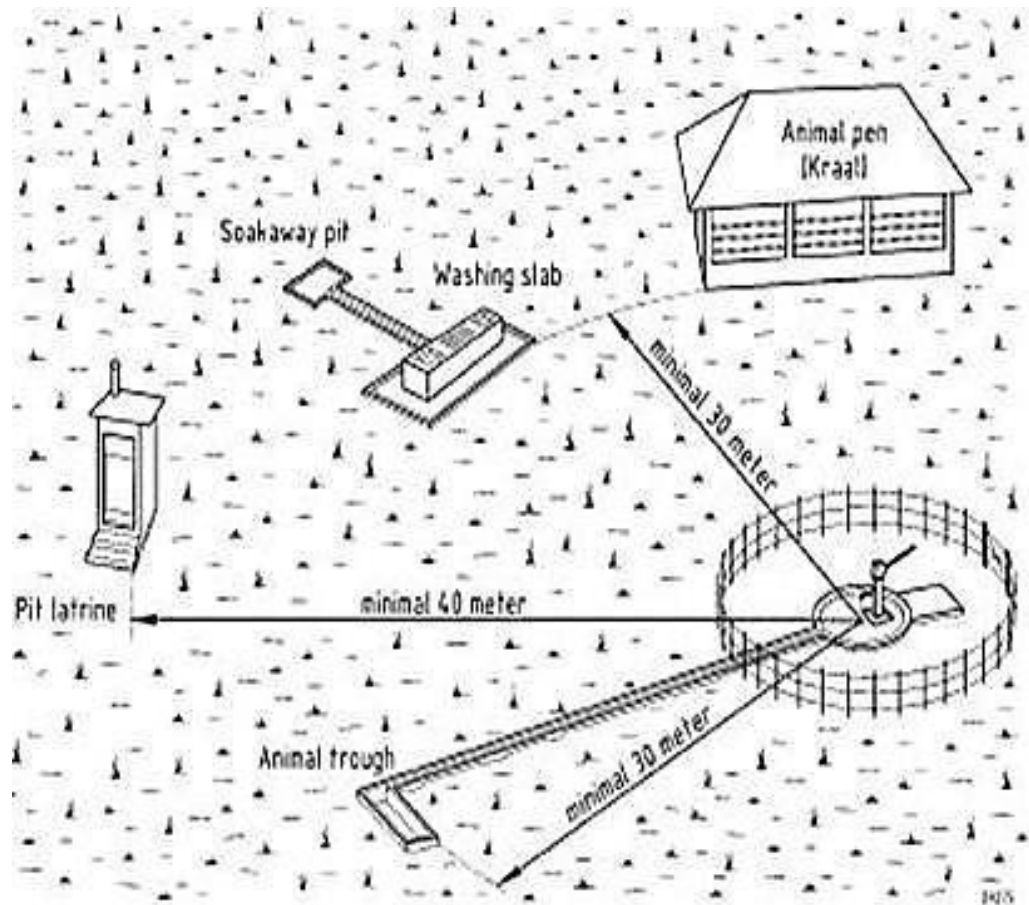
ANNEX -1

Table showing Locations for drilling of Boreholes with Distances Between locations in Amuria District

No.	Location Details	GPS Coordinates		Dist. In Kilometres from BH No. last drilling site
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Annex-2

Figure showing the distances from sources of pollution to be observed for site selection for constructing a water point.



Annex -3

No	Description of Activity	Months	2018																							
			Weeks				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
			Responsible																							
1	Initial road survey determining for rigs Mobility of reading GPS Distances.	Contractor																								
2	Technical verification of sites(Geophysical surveys)																									
3	Borehole Drilling Work																									
4	Pumping Test																									
5	Pump Installation.																									
6	spillway Apron, and soak-away construction																									
7	Cleaning the site and handing over.																									

2.2 M

1.9 M

45 cm

15 cm

Top soil

15 cm

cement concrete mix 1 : 2 : 4

Overburden: Clay Dry unconsolidated formation

PVC head casing ø : 6"

Depth 50m - 100m

Aquifer: Weathered gneiss Layer of sand Fractured bedrock

PVC plain casing ø : 5", Class 10

PVC screen casing ø : 5", Class 10

PVC decantation casing ø : 5"

Dry formation: Bedrock (gneiss) Clay

Foundation aggregate

BRC wired mesh

Concrete

ground level

slope 1 : 50

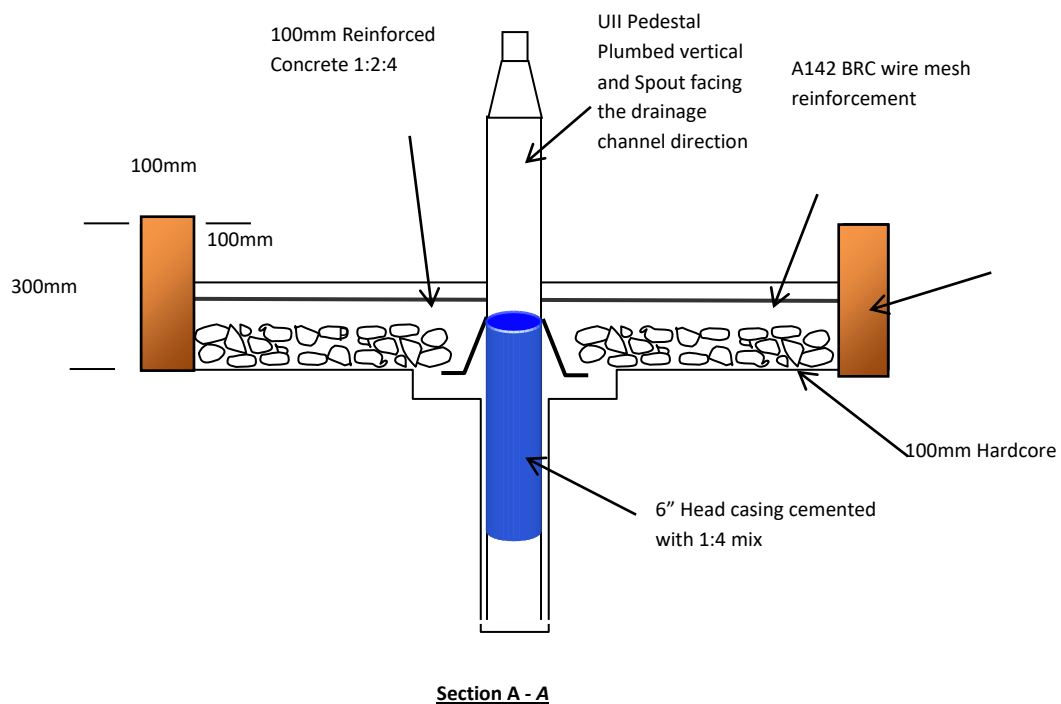
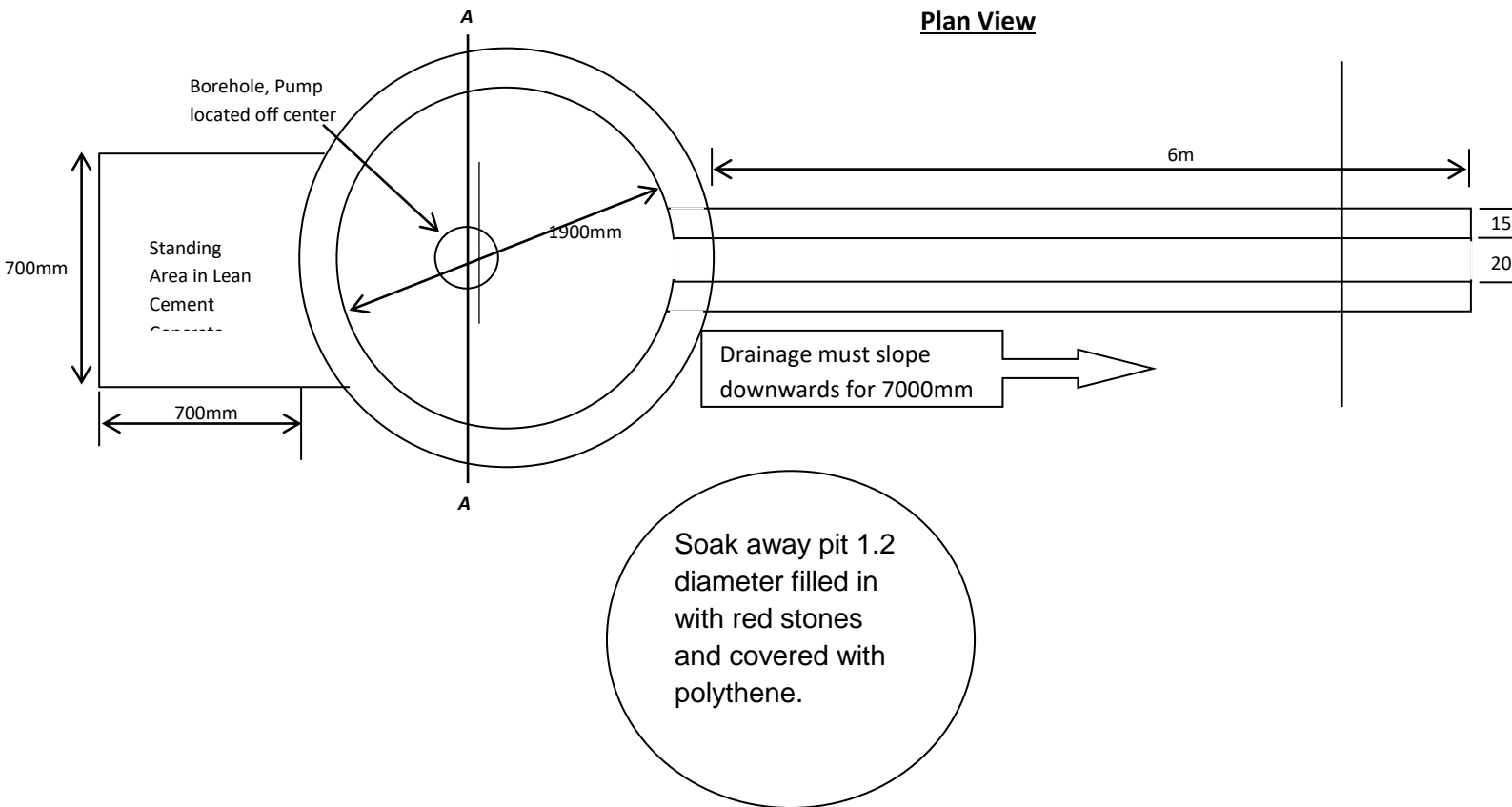
60 cm

Gravel pack

Bottom plug

27

Borehole slab Annex- 5



Annex-6

Litho log and drill time log with water strike zones

Litho log and drill time log with water strike zones

Drilling Company: _____

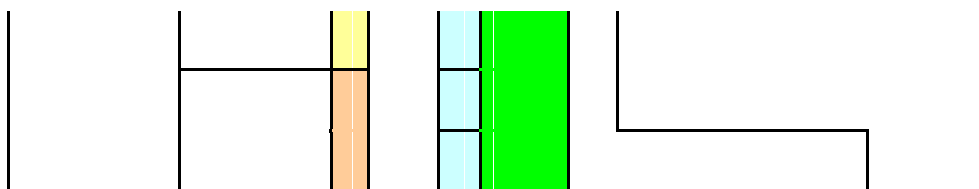
District		Borehole Number	
----------	--	-----------------	--

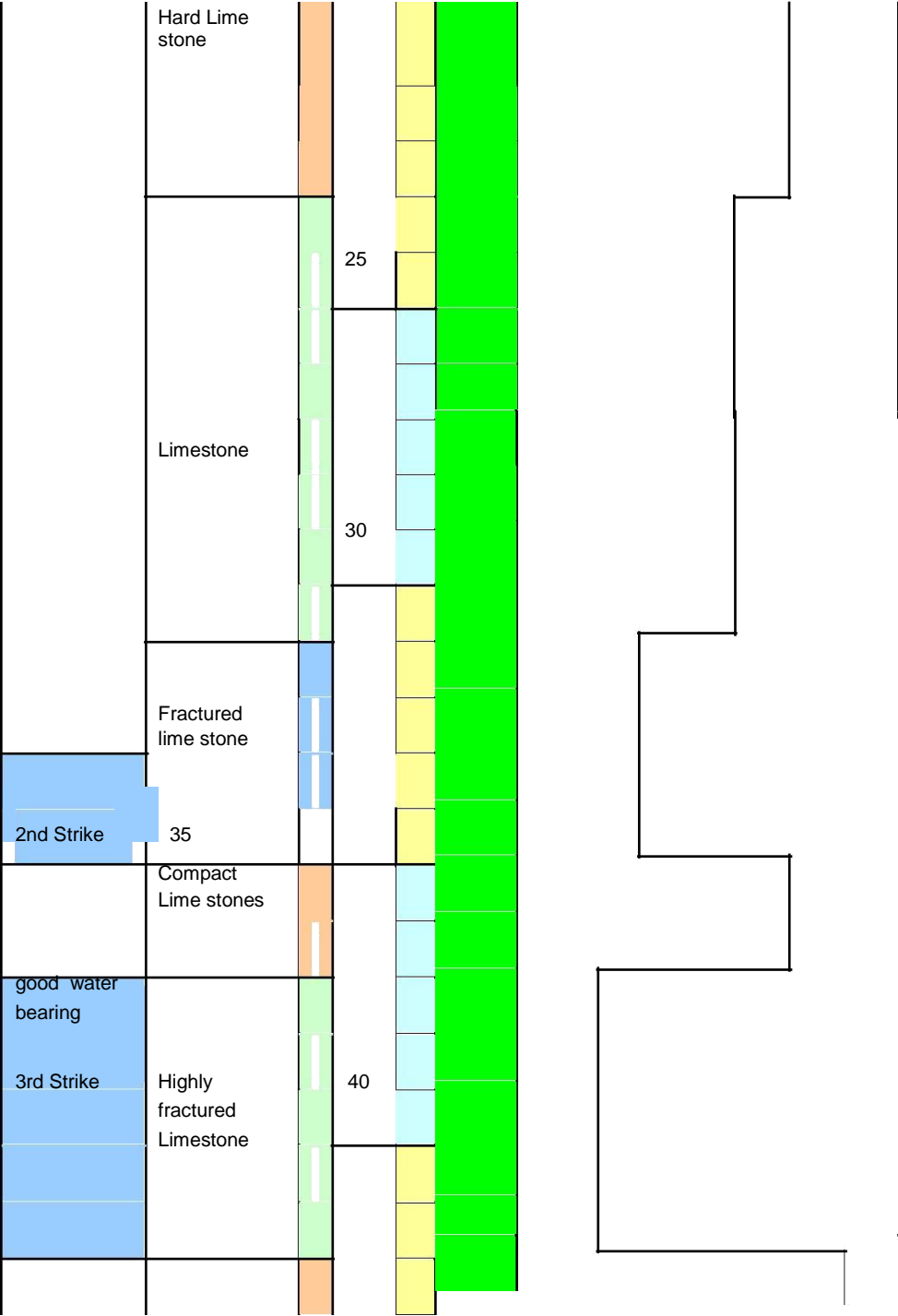
Borehole Number	
------------------------	--

Location		Date :	
----------	--	--------	--

Date :	
--------	--

Water strikes	Litho-logical Log		Depth in Meters	BORE HOLE	Drill Time Log								
	Ground Surface				Minutes / per meter drilled								
			0			2	4	6	8	10	12	14	16
	Loose soil		5										
	Weathered Lime stone		10										
1st Strike Little water													
	Marls		15										
			20										





Annex-7 PUMP TEST - STEP DRAW DOWN TEST REPORT

STEP 1 :	Discharge set at (Liters/Second):		0.25
TIME ELAPSED (In Minutes)	DEPTH TO WATER LEVEL (Meters)	DRAWDOWN (In meters)	REMARKS
0			
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
15			
20			
TIME ELAPSED (In Minutes)	DEPTH TO WATER LEVEL (Meters)	DRAWDOWN (In meters)	REMARKS
0			
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
15			

STEP 3 :	Discharge set at (Litres/Second):		
TIME ELAPSED (In Minutes)	DEPTH TO WATER LEVEL (Meters)	DRAWDOWN (In meters)	REMARKS
(20 MINUTES)			
0			
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
15			
20			
Pump Supervisor	Drilling Supervisor		Drilling Manager

Annex 8

Table showing locations and results of vertical electrical sounding (VES)															
Village		BH No.	GPS coordinates				Geology	Curve type	Resistivity in ohm meters			Thickness of layers on ohm meters			Depth to drill (in Meters)
No.	Name		S lat.		E Long.		Type		P1	P2	P3				
1.XXX															
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
Sub-Total in (1)															
Average drilling depth in meters															

Annex-7 -Continued

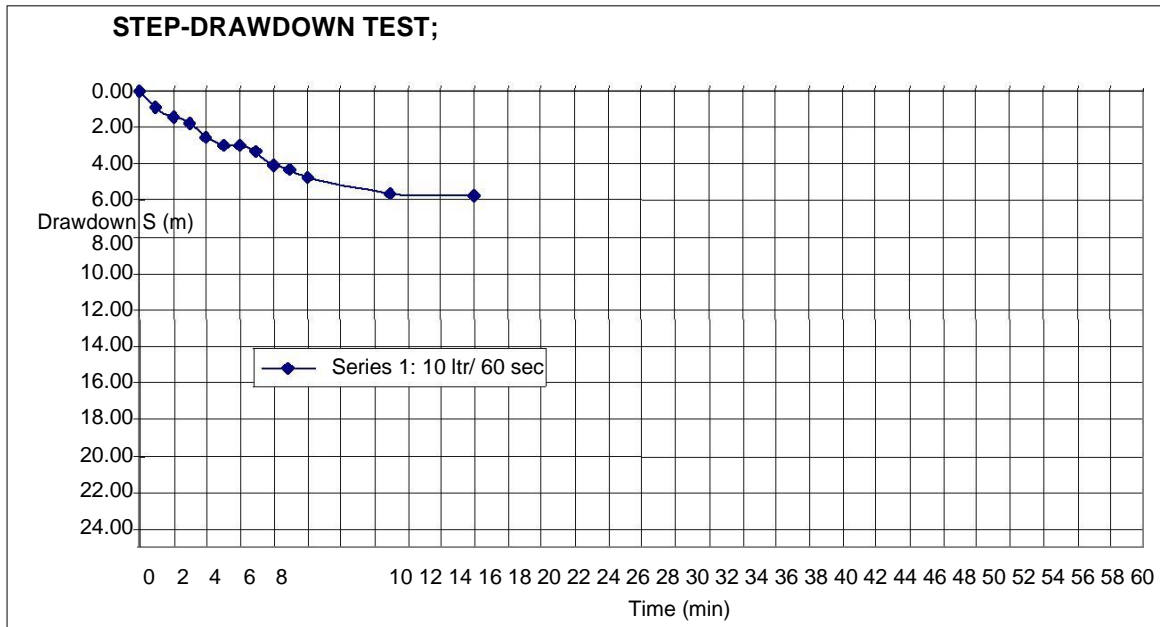
PUMP TEST - 3 HOURS AQUIFER TEST				
Name of Source:		District: LL	Date:	
S.NO	TIME ELAPSED IN MINUTES	DRAWDOWN (METERS)	YIELD (LTR / SEC)	REMARKS
1	0			
2	1			
3	2			
4	3			
5	4			
6	5			
7	6			
8	7			
9	8			
10	9			
11	10			
12	15			
13	20			
14	25			
15	30			
16	35			
17	40			
18	50			
19	60			
20	70			
21	80			
22	90			
23	105			

24	120			
25	135			
26	150			
27	165			
28	180			
<div> <i>Pump Supervisor</i> <i>Drilling Supervisor</i> <i>Drilling Manager</i> </div>				

Annex-7 -Continued

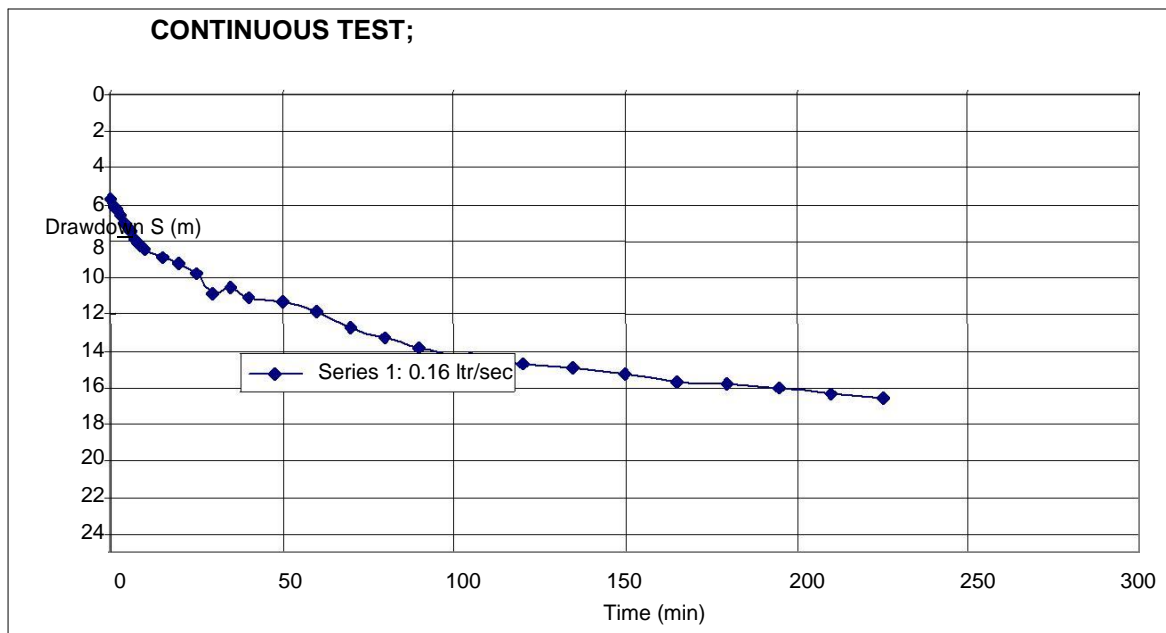
Draw Down Curves

Step Draw down



Draw Down Curves

Continuous at Fixed Discharge



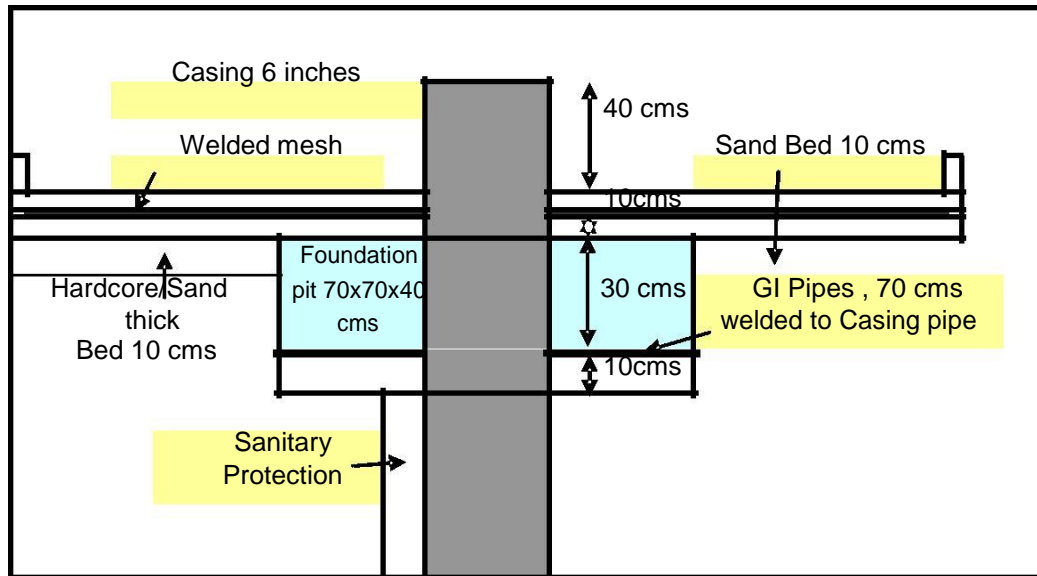
Annex- 8

PUMP TEST - RECOVERY TEST

Name of school:			District:	Date:
S.NO	TIME ELAPSED IN MINUTES	DRAWDOWN (METERS)	YIELD (LTR / SEC)	REMARKS
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				

25				
26				
27				
28				
29				
30				
<div> <div><i>Pump Supervisor</i></div> <div><i>Drilling Supervisor</i></div> <div><i>Drilling Manager</i></div> </div>				

APRON CONSTRUCTION FOR INSTALLING BUSH HAND PUMP



Installation of Hand pump will be based on the Manual for Installation of Bush Pump Type B. Below are some additional hints.

1. Level the ground surface.
2. Look around the hand pump and find the direction of natural drainage. The apron drainage should merge with the natural drainage.
3. Dig foundation pit for hand pump 70 x70x 40 centimetres around the casing pipe.
4. Cut 3 pieces of reinforcement steel and weld about 30 centimetres below the ground surface.
5. Mix concrete in ratio 1: 2: 3 (cement: sand: Gravel 20mm) and fill the foundation pit. Ensure that casing is vertical. Make sure the concrete is well compacted and all air bubbles removed.
6. Draw a circle one-meter radius or place the mould with the casing pipe slightly off centre on the ground. Dig 10 centimetres below the ground surface and fill with sand. Compact the sand.
7. Assemble the Apron mould including the drainage mould and foot stand piece. Apply old used oil or diesel to the inner part of the mould. This allows the mould to be released easily and not crack the apron casted or getting the mould stuck to the apron. Place apron mould and ensure that the drainage for the mould is along the spout and in the direction of natural drainage. The drainage mould with one end closed should be at the end of the drainage
8. Mix concrete Cement: sand: Gravel (20 mm) and pour about 5 cms. Compact the concrete as it is filled. Use a metal rod to ensure that all air bubbles are removed.
9. Make enough open area in the centre to place welded mesh through the casing / Hand pump is already installed. Continue filling the concrete into the mould.
10. Fill the annular space between the inner and outer meld.

11. Similarly fill the drainage mould. Allow the concrete to dry for 3-4 hours before removing the mould. Gently tap the outer mould to release the mould from concrete apron.
12. Do a rough polishing of the apron surface Sprinkle some cement and water if needed to make the surface little smooth. Work well on the drainage sections and the ridge along the Apron.
13. Make several ridges with sand or soil inside the apron. Fill them with water for curing. There should be standing water for 7 days. Apron that is not cured will crack or will soon develop pot holes. In 7-8 days, concrete will get 80% of its strength.
14. Install the pump after 7 days.
15. Pump several times until the water is clear and there is no fine sand or materials.
16. Properly installed hand pumps should fill a 20 litres bucket in 20- 25 full strokes. If it takes more than 30 strokes, then something is wrong with the installation of hand pump. The full stroke of the pump should be ideally 21-23 cms.
17. **Installation**
 1. Installation of U2 deep well hand pump super structure incl. pedestal, water tank, pump head and reinforced concrete platform (concrete mix 1:2:4) and 6m long drainage channel.
 2. Installation of 1¼" stainless steel riser pipes (in 3m lengths).
 3. Installation of stainless steel connecting rods (in 3m lengths).
 4. Installation of U2 Cylinder unit complete.
 5. Construction of complete 1.5m deep soak pit