

Borehole Drilling – Planning, Contracting & Management

A UNICEF Toolkit



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Toolkit Orientation Table

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Module 2	Procurement Considerations for Borehole Drilling Works <ul style="list-style-type: none"> ■ Defines procurement process and responsibilities ■ Provides guidance for risk management ■ Compares two solicitation methods: ITB and RFPS ■ Highlights key considerations during the pre-contractual, contracting and contract administration phases including the evaluation of technical and financial proposals and the payment schedule
Module 3	Borehole Siting and Drilling Supervision Consultancy <ul style="list-style-type: none"> ■ Provides template of Terms of Reference which includes: <ul style="list-style-type: none"> ▪ Description of the assignment ▪ Supervisor's checklist ▪ Deliverables and reporting requirements ▪ Suggested Bill of Quantities for the consultancy services ▪ Completion certificate templates ■ Includes template for UNICEF Agreement for Borehole Siting and Drilling Supervision Consultancy Services
Module 4	Terms of Reference for Borehole Drilling Works and Pump Supply and Installation <ul style="list-style-type: none"> ■ Includes overview of how to select and specify handpumps and assure their quality ■ Provides templates for: <ul style="list-style-type: none"> ▪ Terms of Reference for Borehole Drilling Construction and Development of the Borehole ▪ Terms of Reference for the Supply and Installation of Pumps ■ Provides Technical Specifications for the borehole and a suggested format for the borehole completion record
Module 5	UNICEF Request for Proposal for Services for Borehole Drilling Works <ul style="list-style-type: none"> ■ Follows the UNICEF frame of Request for Proposal for Services in VISION and advises on options and elements ■ Includes template Bill of Quantities for borehole drilling works

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Foreword

While UNICEF has been funding and implementing borehole drilling projects in numerous countries and contexts for many years, until now there have been no official guidelines within the organization specifically targeting both programme and supply staff involved in such complex projects. Feedback from country offices, as well as the general drive to bring uniformity, professionalism and standardization in practices, made the necessity of this work obvious. This Toolkit is the result of intensive work requiring seamless collaboration between various departments of UNICEF (e.g. Programme Division, Supply Division and country offices) and with external experts (Skat Foundation). Its purpose is to act a key reference that will guide staff throughout the different steps of planning, contracting and managing borehole drilling projects. It is the hope of the writers that it will increase the quality, efficiency and effectiveness of drilling programmes and clarify areas where specific expertise is required.

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Borehole Drilling – Planning, Contracting & Management

Introduction to the Toolkit

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Abbreviations and Acronyms

“	Inches
μS/cm	micro Siemens/cm
BAFO	Best and Final Offer
BoQ	Bill of Quantities
CFM	cubic foot per minute
cm	centimetre
CP	Contractual Provisions
CRC	Contract Review Committee
CRT	Constant Rate Test
DIN	German Institute for Standardization
DTH	down-the-hole
EM	electromagnetic
GPS	Global Positioning System
GTC	General Terms and Conditions
ISO	International Organization for Standardization
IT	Information Technology
ITB	Invitation to Bid
ITBS	Invitation to Bid for Services
kg	kilogram
km	kilometre
L	litre
LM	linear metre
LS	lump sum
LTA	Long Term Agreement
m	metre
m ²	square metre
m ³	cubic metre
mm	millimetre
MPa	megapascals
NGO	Non-Governmental Organisation
no.	Number
NTU	Nephelometric Turbidity Unity
PDI	Pre-Delivery Inspection
PPM	parts per million
PVC	polyvinyl chloride
QA	Quality Assurance
Q&A	Questions and Answers
RFP	Request for Proposal
RFPS	Request for Proposal for Services
RFQ	Request for Quotations
RWSN	Rural Water Supply Network
Toolkit	UNICEF Toolkit for Borehole Procurement and Construction
TIP	Technology Information Packages
ToR	Terms of Reference
uPVC	unplasticized polyvinyl chloride
VES	Vertical Electrical Sounding
VISION	Virtual Integrated System of Information (IT system used by UNICEF)
VLOM	Village Level Operation and Maintenance
WASH	Water, Sanitation and Hygiene

Definitions

Adjudicator	The Adjudicator is the person appointed jointly by the Client and the Contractor to resolve disputes in the first instance.
Authorised Representative	The Authorised Representative is any person, whether an officer of the client, or employee of the Designated Supervising Agency, authorized by the Client in writing to carry out inspection or supervision of the Works. The term includes the Project Authority but can also include other representatives with written authority.
Assignment	The assignment refers to the specified task or work that has been assigned to the consultant to undertake, as set out in the Contract Documents.
Bidder	The Bidder is one who makes an offer to the Client to execute or supply certain works, commodities, or services at a given price. In some documents, the bidder is referred to as an <i>offerer</i> or a <i>proposer</i> .
Bill of Quantities	Bill of Quantities means the priced and completed Bill of Quantities forming part of the Bid.
Client	<p>The Client is the organization or agency that is contracting out the borehole construction. The client can be</p> <ul style="list-style-type: none"> ■ UNICEF — In the case of boreholes that are directly contracted by UNICEF, the Client is the UNICEF Country Office ■ Government or NGO — In cases where UNICEF supports National Government or an NGO to contract boreholes, the National Government or NGO is the client
Community	The Community is the primary stakeholder, the end user of the borehole and the final owner. Community members should be included in the entire borehole procurement process, particularly in the siting and design so that the borehole can meet their needs and acceptance.
Completion date	Completion Date is the date of completion of the Works as certified by the Engineer.
Confidential Bill of Quantities	The Confidential Bill of Quantities is a reflection of a fair and reasonable price for the construction work, as determined by a professional (including labour, equipment, materials and a reasonable value for overheads and profit). It can also be referred to as the Engineer's Estimate.
Consultant	The consultant is a person or company that has been engaged or whose bid has been accepted by UNICEF by the client to carry out services such as the design of the project, borehole siting, drilling supervision and final inspection of the works.
Consultant's Representative	The Consultant's Representative is the person authorised by the Consultant to make decisions on the Consultant's behalf for any one site or part of the Works. In the case of a borehole drilling project, the Consultant's Representative will usually be the Supervisor.
Contract	In the context of UN procurement, a contract is a written, legally binding agreement between the organization and a supplier which establishes the terms and conditions, including the rights and obligations of the organization and the supplier. A contract may take many different forms, e.g. agreement, purchase order, memorandum of understanding, letters of assist.

Contractor	Any party to a procurement contract with the organization. A contractor may take various forms, including an individual person, a company (whether privately or publicly held), a partnership or a government agency.
Bid	A bid is an offer submitted in response to an invitation to tender or an offer in response to an electronic auction. The bid is evaluated against the set of criteria that are described in the invitation to tender.
Contract Price	The Contract Price is the price stated in the Letter of Award and is adjusted in accordance with the provisions of the Contract.
Days	Days are calendar days; months are calendar months.
Defect	A defect is any of the works not completed in accordance with the Contract.
Defects Correction Period	The Defects Correction Period is the amount of time that the contractor has to correct any defects in the construction.
Defects liability	Defects liability is the period during which the Drilling Contractor is responsible for repairing or rectifying defects that appear in the Works. The period is named in the Contract and calculated from the Completion Date.
Designated Representative	The Designated Representative is the UNICEF officer designated as representing UNICEF in the contract.
Designated Siting and Supervising Agency	The Designated Siting and Supervising Agency is the consultancy agency engaged by the Client to carry out supervision during the whole life of the project and assist in the contracting procedure and the day-to-day supervision and inspection of the Works.
Delivery Date	Delivery Date is the time the work as defined in the contract is completed at the location(s) indicated for delivery.
District Local Government	The District Local Government is the local government authority. It usually has the responsibility of planning and post-construction monitoring of water facilities and may be involved in monitoring the construction work.
Drawings	Drawings of the Works, as included in this Contract, and any additional and modified drawings issued by (or on behalf of) UNICEF in accordance with this Contract.
Drilling Contractor	The Drilling Contractor is a private company or NGO engaged in the drilling of boreholes. It is the responsibility of the Drilling Contractor to drill the borehole as specified in the contract.
Engineer's Estimate	Engineer's Estimate – a reflection of a fair and reasonable price for the construction work, as determined by a professional (including labour, equipment, materials and a reasonable value for overheads and profit). In UNICEF, this is referred to as the <i>Confidential Bill of Quantities</i> .
Equipment	The Contractor's apparatus, machinery and vehicles used in the execution of the Works.
Final completion certificate	The final completion certificate is issued at the end of the defects liability period provided that there are no defects.

Filter pack	Filter pack is the permeable material that is placed to fill the annular space around the screen and prevent the formation from collapsing onto the screen, as well as filter fine materials from entering the well. A filter pack is used if a well cannot be developed naturally. A filter pack is thicker than a <i>formation stabiliser</i> and needs to be at least 50 to 100mm thick to be effective.
Formation stabiliser	Formation stabiliser is the permeable material that is placed to fill the annular space around the screen and prevent the formation from collapsing onto the screen. A formation stabiliser is used if a well can be <i>developed</i> naturally.
Gravel pack	Gravel pack is the permeable material that is placed around the screen of drilled water well. It is a generic term that refers to both the <i>formation stabiliser</i> and filter pack.
Handover of site	The handover of site is a responsibility transfer work process, giving of care, custody and control of the project to the owner at its final stage, after installation is completed, inspected and tested. The handover includes the completed boreholes, the pumps installed and project documents as specified in the contract.
Handpump	A handpump is an apparatus or machine for raising water by means of a piston, plunger, or washers in a pipe powered using human energy from the hands, arms, or feet.
Handpump Standardisation	Handpump Standardisation is the formal or informal mechanism that governs the types of community handpumps used within a particular country, sometimes including handpump standards. In Mozambique and Madagascar standardisations also include self-supply, household or low-cost (as opposed to community) handpump models.
Handpump Standards	Handpump Standards are design standards for a specific handpump. For public domain pumps the standards can either be specified in a standardisation policy (e.g. Ghana, Nigeria, Uganda and Zimbabwe) or held by a third party such as RWSN. For private domain pumps the standards are held by the private organisations.
Handpump installation team	The Handpump installation team is responsible for the construction and installation of handpumps. The team may be part of the Drilling Contractor's team or a separate organization.
Hydrogeologist	The Hydrogeologist is either a professional consultancy of groundwater specialists or an individual consultant responsible for borehole siting, design, supervision and monitoring.
Initiating unit	The initiating unit is the section within UNICEF requesting the fulfilment of the work to be done.
Inspection	The term inspection refers to the activity of checking products or facilities. An inspection can be an official visit to the works in order to verify that all specifications have been adhered to and that the works are in their proper condition, or measuring, examining, testing or gauging one or more characteristics of a product or service, and comparing the results with specified requirements in order to establish whether conformity is achieved for each characteristic.

Intended Completion Date	The Intended Completion Date is the date on which it is intended that the Contractor shall complete the works. The intended Completion Date may be revised only by the Engineer by issuing an extension of time or an acceleration order.
Offerer	See bidder .
Private Domain	Private Domain refers to product designs held by a private manufacturer protected by patents and/or royalty rights (e.g. Kardia, Vergnet pumps.).
Project Authority	The Project Authority is the individual who shall be responsible for the day-to-day liaison and management of the Agreement. (Note: there will be one Project Authority nominated by UNICEF, who need not be a UNICEF staff member, and one nominated by the consultant.)
Proposer	See bidder .
Pump caretaker	The pump caretaker is responsible for both the regular and routine maintenance and repair of the handpump. They should be trained on the installation, repairs and maintenance of the particular pumps on a project.
Public Domain	Public Domain refers to product designs not protected by patents or royalty rights. Anyone can copy or manufacture the product (e.g. India Mark II and Afridev pumps.).
Laws	Laws are all national legislation, statutes, ordinances and other laws and regulations of any legally constituted public authority.
Material	Materials are products that are used in a particular activity. In the case of this toolkit, materials refer to the consumables used during water well drilling construction and borehole completion such as the casing and screen, filter pack and cement.
Monitoring	Monitoring is the periodic oversight of the implementation of an activity. Monitoring seeks to establish the extent to which work proceeds according to plan and includes recording of progress. Note that monitoring is not the same as supervision.
Quality	Quality means degree of excellence, e.g. the totality of features and characteristics of a borehole and handpump that display their ability to satisfy stated and implied needs.
Quality Control	Quality Control is used for checking a product for its quality against a set of standards or specifications
Site or Sites	The place or places where the Works are to be executed and any other place defined as such in the Drawings and Contract Documents.
Specifications	The Technical Specifications of the Works included in this Contract and any modifications or additions approved by UNICEF.
Sub-contractor	A sub-contractor is any person or company that has been named and sub-contracted by the Consultant of the Supplier with the consent of UNICEF to carry out a specified part of the assignment or works as set out in the contract.
Substantial completion certificate	The Substantial Completion Certificate is issued to the drilling contractor once the borehole is finished and the pumping test is successful. If handpump supply and installation is included in the drilling contract, this must also be completed for the certificate to be issued.

Supervision	Supervision is the action or process of watching and directing what someone does or how something is done. In the case of the toolkit, supervision includes the process of watching and directing the drilling, pad construction and installation of pumps and record keeping, as well as other coordination and reporting tasks. See also supervisor.
Supervisor	The Supervisor is the on-site representative of the Client on the drill site. The Supervisor may either be UNICEF staff or authorised by the Consultant to act as his/her representative on site. The supervisor ensures that the Drilling Contractor adheres to the technical specification, makes all the required measurements, keeps all records accurately and ensures that health and safety procedures are adhered to. The Supervisor gives instructions to the drilling contractor as required for the completion and handing over of the borehole, and ensures that all data and information is collected. The Supervisor may be a hydrogeologist, an engineer, or a technician, and should have been trained in drilling supervision.
Supplier(s)	Suppliers are persons or entities that entered into a Contract directly with the Contractor to supply materials and equipment fabricated specifically for the Works. A supplier can also be known as a vendor.
Toolkit	The Toolkit refers to the publication entitled <i>Borehole Drilling –Planning, Contracting & Management: A UNICEF Toolkit</i> .
Tender	Tender is a generic term for bids, quotations and proposals, received from a Supplier in response to Solicitation Documents.
Works	Works refers to the specified tasks required by the Contract Documents.
Vendor	A vendor is a bidder, a prospective, registered or actual supplier, contractor or a provider of goods, services and/or works to UNICEF. Vendors include private or public companies, whether parent, holding, subsidiary, affiliate, consortium members, or partnership, a government agency or a non-government organization. A vendor can also be known as a supplier. A vendor is considered registered by UNICEF when entered in Vendor Master in VISION.
Village Level Operation and Maintenance (VLOM)	Village Level Operation and Maintenance (VLOM) is the unofficial classification of handpumps that are maintainable at the village level Handpumps specifically classified as VLOM include the Afridev and the Tara.
VISION	VISION is the Virtual Integrated System of Information, which is the Information Technology –IT system used by UNICEF

Background to the Toolkit

In the last half a century, UNICEF has supported National Governments in the provision of water supply in rural and remote places through the drilling of boreholes and supply of ancillary equipment. Over those years, various procurement methods and technical specifications have been used on borehole projects in different countries. Sometimes there is uncertainty about accepted practices and standards. As UNICEF continues to provide support and promotes professionalism in borehole drilling, it is also committed to improving the cost effectiveness of its work in rural communities.

Borehole Drilling – Planning, Contracting & Management: A UNICEF Toolkit (subsequently referred to as the Toolkit) has been developed to bring uniformity to practices and to guide UNICEF staff involved in borehole procurement and the supply of equipment, as well as contracting consultancy services for borehole siting and supervision.

Clarifying responsibilities for (i) borehole siting, (ii) supervision and (iii) the supply and installation of the pump is a vital part of drilling project management. Once the responsibilities have been established, it is essential that all procurement and contract documents clearly specify who is responsible for what, and that there are no contradictions between contracts. In clarifying responsibilities, national policies and practices should be considered. Any differences in approach with what is set out in this Toolkit should be discussed with the government. Once responsibilities have been clarified, efforts are required to ensure that all stakeholders (i.e. community representatives, pump mechanics/pump minters, local government, national government, NGO partners, drilling contractors and consultants) are properly briefed as to what everyone is expected to do. Note that the training of pump mechanics/menders is generally not included in a drilling contract.

The document is based on a review of good practices within UNICEF, lessons from previous projects, the principles in the RWSN [Code of Practice for Cost Effective Boreholes](#)¹ and advice in the [UNICEF Guidance Note on Professional Water Well Drilling](#)² (Box 1). In the case of fast tracking required to deal with emergencies, the tender process can be executed according to the [Exceptions to Competitive Bidding in the Supply Manual Guidance](#)³.

¹ RWSN (2010) **Code of Practice for Cost-effective Boreholes**, Rural Water Supply Network, Available from <http://www.rural-water-supply.net/en/resources/details/128>

² UNICEF/Skat Foundation (2016) **Professional Water Well Drilling: A UNICEF Guidance Note**, UNICEF and Skat Foundation, available from <http://skat.ch/book/professional-water-well-drilling/> and UNICEF et Skat Foundation (2018) **Forage d'eau: vers la professionnalisation d'un secteur: Note d'orientation de l'UNICEF**, UNICEF et Skat Foundation, Available from <http://skat.ch/book/forage-deau-vers-la-professionnalisation-dun-secteur/>

³ See Chapter 6: PROCUREMENT OF SUPPLIES, EQUIPMENT AND SERVICES Section 3: Solicitation Process; 4.0 EXCEPTIONS TO COMPETITIVE BIDDING, available from <https://intranet.unicef.org/Policies/DHR.nsf/6203f70108ece1f685256720005e2bfe/4449c9e5ec472029c1257e62004647e6?OpenDocument>.

What is the Toolkit for?

This **Toolkit** is a support to the “**Project design, implementation and monitoring**” hexagon of the **UNICEF Guidance Note on Professional Water Well Drilling**² (Figure 1).

The **Toolkit** guides both UNICEF programme and supply staff through the life of a project. It follows a logical sequence on UNICEF procurement practices and provides recommendations on processes (Invitation to Bid [ITB] versus Request for Proposal for Services [RFPs]), evaluation criteria, contract provisions, generic bill of quantities, terms of reference and contractual approaches to seek technical services for siting of boreholes, borehole construction and supervision of construction works.

The **Toolkit** should enable readers to identify risks, forecast challenges and follow a strategy to address them. The **Toolkit** is mindful of the fact that technical specifications and all documentation relating to procurement and installation of boreholes and pumps are to be prepared on an impartial basis so as to promote competitive tendering. There should be no over-specification, and quantities should be as realistic as possible.

Box 1 UNICEF Guidance Note on Professional Water Well Drilling

The guidance note is structured around six broad areas of engagement for UNICEF country offices, as illustrated in the figure (right):

The engagement proposed for each area is summarized as follows:

- The **institutional framework** matters – promote initiatives to improve national (or state) policies, regulation, standards and procedures of borehole drilling, including clarification of roles and responsibilities.
- **Groundwater information** is essential – value groundwater data and ensure that drilling records are collected, quality assured and collated. This data, together with information generated from it, should be made readily available to help future borehole siting and design as well as groundwater resources management.
- **Capacity** is fundamental – raise the skills and knowledge of groundwater development and encourage the availability of suitable equipment in the country.
- **Project design, implementation and monitoring** needs to be thorough – improve the design, implementation and monitoring specific borehole drilling or rehabilitation projects, and ensure that documentation of the process and results is readily available.
- **Dialogue & awareness** is crucial – foster dialogue between government agencies (including regulators), drilling contractors and consultants, NGOs, development partners and civil society. Encourage and support efforts that raise awareness of decision-makers and the public about groundwater potential, management and its exploitation.
- **Investment is indispensable** – invest adequate financial resources to improve and sustain professional groundwater development.



Toolkit Formatting

The **Toolkit** provides flexibility so that it can fit the circumstances of a particular project. It should be noted that national laws, standards and codes are to be adhered to, unless otherwise specified. Possibilities for modification to some clauses to suit particular situations are shown with notes are shown in [***bold italics highlighted in grey***]. Advice and key elements (such as relevant principles) to take into consideration are highlighted in blue text boxes throughout the document (e.g. Box X).

Box X Sample box containing advice and key elements that should be taken into consideration

When commencing with an Invitation to Bid, UNICEF procurement.....

Toolkit Modules

The **Toolkit** comprises five modules which follow the logical sequence of a project's life. Modules are interconnected, and it is advisable to initially read them in order to become familiar with the whole process. Subsequently, depending on the information sought, they can be consulted separately for specific guidance.

Module 1 – Principles for Planning, Contracting and the Management of Borehole Drilling Projects — sets out the responsibilities for key stakeholders and presents eight principles for the planning, contracting and management of borehole drilling projects. These principles are applicable to all borehole projects in which UNICEF is involved, either directly as the contracting Client or in support of the National Government or other agencies. The principles are to be used to develop appropriate contracts for borehole projects and are applicable to all boreholes fitted with handpumps⁴. The principles aid decision-making and streamline the procurement process.

Module 2 – Procurement Considerations for Borehole Drilling Works – highlights key aspects to be considered in the procurement process for borehole drilling construction. It should help UNICEF programme and supply staff in the country offices to work together in the project planning, procurement and contract management. The module defines the roles and responsibilities of UNICEF Programme and Supply staff at each stage of the procurement process as well as guidance on risk management. It specifically provides key information for the pre-contractual and contracting phases, including advice for pre-qualification of drilling contractors and a list of the key contract documents. Module 2 provides a clear comparison of the two solicitation methods likely to be used in borehole projects – ITB (invitation to bid) and RFPS (request for proposal for services) and advice on which one to use. Guidance on evaluating the technical and financial proposals is given, including suggested criteria for the evaluation assessment. The payment schedule is described in detail.

Module 3 – Borehole Siting and Drilling Supervision Consultancy provides guidance and advice for the preparation of an agreement for borehole siting and supervision consultancy. The module includes a template for the Terms of Reference (ToR), a UNICEF standard structure of Agreement and templates for other key documents that should be annexed to the contract. Note that the Terms of Reference and Agreement assume that UNICEF is the Client, i.e. that borehole construction, as well as the siting and supervision, is directly contracted by the UNICEF Country Office.

Module 4 –Terms of Reference for Borehole Drilling Works and Pump Supply and Installation provides an overview of contract options, and guidance and advice for the preparation of ToRs for (i) borehole drilling works

⁴ Concerning the pumps to be installed, recommendations throughout the toolkit have specifically been formulated for handpumps.

and (ii) Pump Supply and Installation. These two ToRs define the scope of work and set out the responsibilities of the Drilling Contractor, pump supplier and other stakeholders. Each ToR forms the basis for the preparation of the technical and financial proposals by the bidders, and subsequently becomes an integral part of the contract. The module is structured according to the UNICEF standard structure of ToR, in the form of templates that can be modified to suit local requirements.

Module 5 – Request for Proposal for Services (RFPS) provides guidance on how to customize the RFPS in VISION for the procurement of borehole drilling works. With Terms of Reference (ToR) developed, the RFPS process needs to define the framework of the solicitation and future collaboration with the supplier(s). The contract(s) that will be granted to the successful supplier(s) is (are) extracted from VISION.

Although much of the guidance in the toolkit is for boreholes that are procured and contracted by UNICEF directly, the guidance should also be useful for Governments and NGOs. However, Government will have to adhere to public procurement procedures, and other agencies will use other Information Technology (IT) systems for generating key documents.