Groundwater Protection

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Involving community members in a hydrocensus

the dwaf
DEPARTMENT OF WATER AFFAIRS AND FORESTRY

NORAD
DIREKTORATET FOR UTVIKLINGSSAMARBEID
NORWEGIAN AGENCY FOR DEVELOPMENT COOPERATION

TOOLKIT for WATER SERVICES: Number 3.1

This document is for use by Water Services Authorities, service providers and Catchment Management Agencies in order to provide guidelines for conducting a site-specific hydrocensus (e.g. under project-based assessments in terms of the Groundwater Protocol, Version II).

Groundwater Protection - Involving Community Members in a Hydrocensus

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Foreword

Toolkit for Water Services

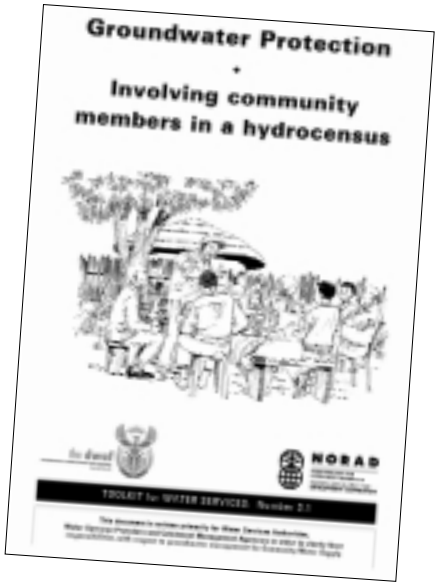
Groundwater has historically been given limited attention, and is not perceived as an important water resource, in South Africa. This is reflected in statistics showing that only 13 % of the nation's total water supply originate from groundwater. Because of the highly distributed nature of the water demand in rural and informal peri-urban settlements, regional schemes are, in most instances, not economically feasible. And because of decreasing available river and spring flows during low flow and drought periods, as well as wide-spread problems of surface water pollution in rural areas, groundwater will be the most feasible option for a large part of the new water demand.

The NORAD-Assisted Programme for the Sustainable Development of Groundwater Sources under the Community Water and Sanitation Programme in South Africa was managed by the Department of Water Affairs and Forestry (DWAF) between 2000 and 2004. The Programme undertook a series of inter-related projects aimed at enhancing capacity of water services authorities and DWAF to promote and implement sustainable rural water supply schemes based on groundwater resources and appropriate technologies.

Page 2 has a full list of the Programme outputs. The formats for these range from documents to software programmes and an internet portal, to reference sites where communities have implemented appropriate technologies. For more information on the "package" of Programme outputs contact your nearest DWAF Regional Office or Head Office in Pretoria.

It is our sincere hope that this Programme will contribute to the body of work that exists to enable more appropriate use and management of groundwater in South Africa.

Involving Community Members in a Hydrocensus
is Number 3.1 in the Toolkit for Water Services.
This document is for use by Water Services Authorities, service providers and Catchment Management Agencies in order to provide guidelines for conducting a site-specific hydrocensus (e.g. under project-based assessments in terms of the Groundwater Protection, Version II).



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Acronyms

CBO	Community-Based Organisation
CMA	Catchment Management Agency
CWSS	Community Water Supply and Sanitation
DPLG	Department of Provincial and Local Government
DWAF	Department of Water Affairs and Forestry
O&M	Operation and Maintenance
SABS	South African Bureau of Standards
SANS	South African National Standards
SSA	Support Services Agent
WMA	Water Management Area
WRM	Water Resource Management
WSA	Water Services Authority
WSDP	Water Services Development Plan
WSP	Water Services Provider
WSDP	Water Services Provision Contract
WUA	Water User Association

Introduction

Why does groundwater matter?

'The important role that groundwater plays in the health of many communities cannot be overstated. It is expected that groundwater sources will increasingly be the only source of additional water for the development of communities, particularly in the more remote areas. However the quality and quantity of these resources are constantly under threat from the activities of human existence and development. It is therefore of vital importance that adequate measures are taken to preserve our valuable groundwater resources.' (***Groundwater Protection Protocol***, 2003: DWAF)

Purpose of this Guide

This Guide is part of a series that explains how and why groundwater resources need to be protected and managed effectively in the rural context.

It aims to provide development project planners and implementers and all those who are entrusted with conducting a hydrocensus at community level, with an overview of how to conduct a hydrocensus with meaningful community participation. In most cases, the hydrocensus will be led by a technical official from the relevant municipality.

This guide also aims to assist officials or service providers to gather information, with community involvement, on water features, water supply sources and sources of potential water pollution in a particular site or area, a task that forms part of a *'Project-Based Assessment of Groundwater and Contamination Risk: Collection of Existing Threats to Groundwater Quality*', as required by DWAF's **Groundwater Protection Protocol** (Item 1 of the Stage 2 Task List). It is applicable to a hydrocensus in the rural context.

A Hydrocensus

Why do a hydrocensus?

We know that most development initiatives, including improved water and sanitation services, have the potential to be detrimental to the quality and / or quantity of groundwater resources. Water is a scarce and strategic resource in South Africa. This means that it is important to make an assessment of the possible impact of any development initiative on water resources in the area, before approving the initiative.

For example, where public health improvements are anticipated through the provision of on-site sanitation facilities, these benefits may be completely undermined if the sanitation facilities impact negatively on water quality. So it is critical that the costs and benefits are considered in a long- term and holistic manner. This can be done through a hydrocensus. A practical approach based on sound theoretical considerations should help ensure that rural communities are provided with basic water and sanitation services in a safe, environmentally sustainable and cost-effective manner.

What is a hydrocensus?

'Hydrocensus' literally means, 'water census'. A hydrocensus is a task that involves gathering information on water features, water supply sources and sources of potential water pollution in a particular site or area. The outputs of a hydrocensus should include a map that summarises and simplifies information on available water sources and potential polluting activities. A community-based hydrocensus is conducted in conjunction with local community members, and contains components such as a sanitary surveillance investigation, a community-based water audit and a mapping exercise.

A hydrocensus aims to:

- Identify details of water-related features (e.g. storm water channels, erosion gullies, weirs, diversion embankments), and disused or abandoned boreholes and wells.
- Identify features where water could collect in rainy periods (quarries, borrow pits, seasonal puddles, etc.).
- Identify potential sources of contamination (latrines, waste disposal sites, animal kraals, defecation sites, animal watering points, soak-away pits and drains, etc.).
- Identify visible features and symptoms (e.g. borehole casing rusted away at the surface, presence of algal blooms in stagnant water) that indicate the potential for water contamination.
- Identify water sources and, where possible, indicate the flow rate and the quality of each water source.

Together with this information, a map of the community area is drawn that depicts these features together with indications of distances, topography and slope. The community map should show major observable features such as roads, pathways, fences, houses, pit latrines and landmark objects such as large rocks, lone trees, large poles, etc.

The hydrocensus should be followed by a technical water audit, which involves deriving more detailed physical and chemical characteristics of each water source.

Why involve community members in a hydrocensus?

While government institutions are legislatively responsible for managing and protecting groundwater, it is the users of water resources who, in fact, manage most human impacts on groundwater at the local neighbourhood level. Local communities also have far better knowledge of local water resources, local practices that may contaminate groundwater, and the rules for water use in their communities. This makes the participation of community members in a hydrocensus crucial to the accuracy and efficiency of the process.

Community participation in the hydrocensus has a number of advantages, including:

- Improved accuracy of the information collected including social, environmental and cultural issues and impacts.
- Improved awareness of groundwater contamination at community level.
- Enhanced knowledge, skills and capacity of community members, including a better understanding of groundwater management and protection.
- Increased potential for locally generated corrective actions, where groundwater is or could be polluted.
- Improved credibility of the information collected.
- Increased energy and creativity to address groundwater related problems.
- Debunking of myths that result in practices that contaminate groundwater.
- Improved efficiency and effectiveness of the hydrocensus.
- The combination of technical expertise and local knowledge, which is essential to the success of a hydrocensus.
- Technical experts are exposed to the value of facilitating community input to water related projects and activities.

When is a hydrocensus required?

When decisions on development options are required, existing and historical data often do not provide adequate information on:

- The distribution of water sources.
- The water quality and flow variations.
- Activities that may impact on water quality.

A hydrocensus can provide valuable input whenever a decision is required on the location and design of an activity that has the potential to impact a water source. Among the activities considered most likely to impact water resources in rural areas are:

- On-site sanitation facilities (e.g. pit latrines, septic tanks, etc.) and defecation sites.
- Waste disposal.
- Concentrated manure and urine in animal kraals, at animal watering points or in manure storage sites.
- Animal dipping tanks that leak, or where dipping fluid is disposed of in an uncontrolled manner.
- Graveyards and sites used for the burial of animal carcasses.
- Informal workshops or fuel storage facilities.
- Sites used for the storage of poisons, like pesticides and herbicides.
- Greywater (sullage) disposal and uncontrolled run off.

Background information on many of these activities and guidelines on the proper location of such activities is presented in the Groundwater protection suite of documents Toolkit for Water Services, Numbers 3.4.1 to 3.4.7).

Information gathered during a hydrocensus is useful for:

(i) Planning development in a rural community that is reliant on groundwater abstraction points for water supply.
(ii) Planning new groundwater abstraction points for an existing rural community.
(iii) Planning development in a rural community that is reliant on abstraction from a nearby surface water source for water supply.
(iv) Planning a new surface water abstraction for an existing rural community.
(v) Assessing an existing situation (e.g. animal kraals and pit latrines in the vicinity of an existing or disused groundwater abstraction point (borehole).
(vi) Planning alternative or back-up water supplies where the current ones become unsustainable or contaminated.

Considerations for groundwater source suitability:

(i) Can it provide a sustainable supply of drinking water of acceptable quality (to S.A.B.S 241:1999) that meets the community's standards in terms of health, taste, odour, colour, etc?

(ii) If some level of treatment is required (e.g. disinfection), will this be able to be carried out reliably so that the health of the community is safeguarded?

(iii) Will the source be upslope from the community and possible polluting activities? (Being upslope helps promote cleaner and more cost-effective gravity-fed flow distribution systems.)

(iv) Will it be affordable to develop, operate and maintain?

A hydrocensus should be undertaken around all water sources that can be, have been or are currently utilised by the community, within a two kilometre radius.

How community members can be involved

While there are specific benefits to involving local community members in a hydrocensus in their communities, all development projects should facilitate community participation and information sharing. This includes water supply, sanitation, agriculture, health and hygiene education, school programmes, etc.

In addition to participating in a hydrocensus and other groundwater development activities, community members can participate by being involved in:

- Compiling landscape maps.
- Assessing potential threats to groundwater quality.
- Evaluating and choosing sanitation options.
- Monitoring adherence to water resource protection measures, together with the Departments of Health and of Water Affairs and Forestry, on an ongoing basis.

Community participation is considered essential for any local development, and in the context of groundwater protection, for creating an awareness of the importance of protecting groundwater resources, and in establishing a programme of ongoing sanitary surveillance of potential health risks within the settlements. It is clearly essential that the community participate in the selection of the most appropriate waste and sanitation options for their community that will ensure the protection of the environment and safeguard the health of the community.

The community will be able to contribute their knowledge of the area, local water management practices, past experiences, factors affecting success or failure of past water projects, and so on, and should be involved in any planning for new developments. Community mapping is a useful way of capturing community knowledge and understanding, while at the same time educating members of the community on the vulnerability of water resources.

Undertaking a Hydrocensus

Steps to undertaking a community-based hydrocensus

The steps to be followed when doing a hydrocensus are included as part of a water audit and risk assessment procedure in the Groundwater Protocol (DWAF, 2003).
The overall components of a hydrocensus are to:

- Assess groundwater as a potential for water supply in the area (see Table 1).
- Assess existing contamination threats to groundwater (see Table 2).
- Compile a map or model.

The procedure for carrying out the community-based hydrocensus may be divided into four steps as follows:

STEP 1 - Preparation / Setting the scene

One of the main benefits of involving community members in a hydrocensus is that the information collected is richer, more comprehensive and more readily internalised and acted on at the local level. In order to achieve these benefits, effective preparation must be done at community level.

Effective preparation involves:

- Identifying the relevant stakeholders.
- Obtaining permission and acceptance of the approach to be used.
- Preparing relevant materials that are visual and accessible to people with lo literacy.

It is important that the process towards identifying the relevant stakeholders involves discussions with both municipal representatives and local representatives.
Local representatives could include village water, sanitation or health committees, traditional authorities, women's groups, and so on. The groupings will differ from village to village and area to area.

Discussions with these groupings should include:

- Discussion of the potential benefits of community members' involvement.
- A clear description of the purpose and activities involved in a hydrocensus.
- Agreement on the approach to be taken (how the hydrocensus will be done).
- Agreement on who will undertake which activities (roles and responsibilities).

In order to maximise participation from community members, an enabling environment must be created. Most participants will only feel free to contribute and participate when they are not afraid of:

- embarrassment
- ridicule
- reprisal
- causing conflict
- revealing personal information.

Hints and tips for creating an enabling environment for participation:

- Acknowledge and appreciate the inputs and contributions from all participants.
- Respect local dynamics and preferences.
- Really listen to what participants are saying.
- Provide support and information when needed.
- Make sure that everyone's views are heard. One way of doing this is to encourage the group to discuss their responses between themselves first, and then report their collective position or response. This avoids a dialogue between the facilitator and the most dominant participant or elected spokesperson.
- Set the tone from the start by saying that this process works best when everyone is involved and given space to participate. All participants are equal.
- Given that women are often hindered from participating in mixed groups, separate men and women into different groups. This also applies if there are people in authoritative and subordinate positions, or where there are people from different class or educational backgrounds in the same group. Remember to support the quieter participants.
- Make the process fun and engaging. A community-based hydrocensus is directly relevant to the lives of community members, relatively easy to do, and requires active involvement from a range of people. One idea is to get children involved as part of a school project.
- Keep the amount of writing to a minimum. Writing excludes anyone with low literacy. This is one of the reasons that coming prepared with visual pictures of groundwater pollutants as you see in this Guide, will stimulate participation. If the group feels they need to keep a record in writing, then designate someone to take notes.

STEP 2 - Identifying all Water Sources and Pollution Threats

This will usually include the following:

- Undertaking a 'walk-about' through the village or area to identify all aspects of the census. This may need to be split between two or more groups to cover larger villages and / or more distant water sources that are relevant. (See Table 2.)
- Discussing the current and future relevance of each feature.

Table 1: Assessing the groundwater potential of an area (from Groundwater Protocol, 2nd Edition)

1. Collect background information on:
Hydrogeological environment
Soil types
Groundwater exploitation
Aerial photos
Classification of aquifers
Water resource assessments
2. Compile landscape map(s) indicating:
Village or community boundary *
Boreholes, wells and springs *
Depth to water table *
Soil types and depth to rock *
High surface drainage areas (e.g. steep impermeable slopes, erosion gulleys, storm water drains, drainage ditches) *
Dykes, fractures and faults *
Geological profile
Major and minor aquifers
Regions of deep weathering
Groundwater flow direction

Note: tasks that end with * indicate where members of the community can contribute

Table 2: Contamination threats and water audit

3. Collect information on existing threats to groundwater quality:
Existing toilets, including unimproved pit latrines, all types of improved on-site latrines, and any off-site sanitation systems including waterborne sanitation *
Solid waste dumpsites, including household waste pits *
Greywater disposal practices (often disposed of in the garden or in a pit in the yard) *
Animal kraals or feedlots where livestock is kept within confined spaces *
Livestock dipping tanks *
Graveyards or burial sites *
Small industries, especially motor vehicle repairs, food stalls and shops, and small manufacturing enterprises *
Poorly constructed and disused boreholes or wells where surface water is able to flow into the borehole / well or infiltrate soils next to the borehole / well *
Pits and quarries *
4. Carry out a water audit (community-based):
Identify normal run off paths during high rainfall incidents *
Identify all current water supplies and estimate current usage *
Identify traditional sources that may still be utilised in times of need *
Identify other water sources not utilised by the community, but that may be utilised by downstream users *
Identify wastewater disposal points *
Estimate wastewater quantities
Find average rainfall figures *

Note: tasks that end with * indicate where members of the community can contribute

STEP 3 - Community Mapping

This should be done by the group of community members, and should be done 'from scratch' without the use of existing government type maps. All inputs should be made by the community members. A map may either be drawn on a large sheet of paper, or modelled on the ground. Overall guidance should be provided to ensure that all components are included and that features can be recognised and pinpointed. The exercise of map compilation by the community members will be valuable for further community member involvement in development planning.

The community map should include important physical features like fences, roads, and paths. It should also indicate the location of water sources (both failed and in-use sources). Examples of water sources are streams, dams, springs, wells, and boreholes. Activities that could potentially pollute water resources should also be indicated. Examples are:

- Housing, schools, clinics and business premises.
- Bush or veldt toilet (defecation) sites, toilet facilities and washing areas.
- Kraals, animal dipping tanks and fuel / chemical stores.
- Household rubbish and dipping tank waste disposal / burning sites.
- Burial grounds.

In addition to the physical representation of features on the map or model, a brief description of each feature and its relevance should be included.

Community Mapping

Purpose:

- To capture a range of local water features from the perspective of local residents.
- To facilitate joint planning for protecting local water resources.

Time:

One to three hours depending on the complexity of the map required and the complexity of the village and its water features.

Materials required:

Whatever is available - newsprint, marker pens, buttons, small stones, beads, beans, material, etc.

Instructions:

Make a map of your community. You can do this anyway you like. Here are some materials to start with, and you can add any other materials you'd like to use.
Your map needs to include:

- Roads, paths, fences.
- Water sources (both failed and in-use sources, e.g. streams, dams, springs, wells, and boreholes).
- Activities that could pollute water resources such as bush or veldt toilet (defecation) sites, toilet facilities and washing areas; kraals, animal dipping tanks and fuel / chemical stores; household rubbish and dipping tank waste disposal / burning sites; and burial grounds.
- Houses, schools, clinics and business premises.

From here, the facilitator could ask the group to take an imaginary group of visitors on a tour of the village and use this as a basis to facilitate a discussion of problems encountered with water resources and strategies or actions to address these.

STEP 4 - Compiling the Hydrocensus Report

The report should include all the aspects identified during steps 1 to 3 of the hydrocensus. All information gathered during the hydrocensus and included in the final report should be verified through a process by which community members are able to make corrections to the findings of the hydrocensus, before it is finalised. Once the hydrocensus has been finalised, its outcomes should be communicated and made available to all members of the community.

The following measures should be taken to protect the water resource:

1 All measures with the potential to pollute the water source should be sited outside the recommended setback distance area of a surface water source, borehole, well or spring. Such activities include household, bush or veldt toilets, animal kraals, animal dipping tanks, household rubbish or waste disposal / burning sites, and bural sites.

2 All wells, boreholes and springs should be developed with key protection measures aimed at preventing contaminated surface water (including rainfall run off) from reaching the water source. Failed or abandoned water sources must be backfilled and sealed.

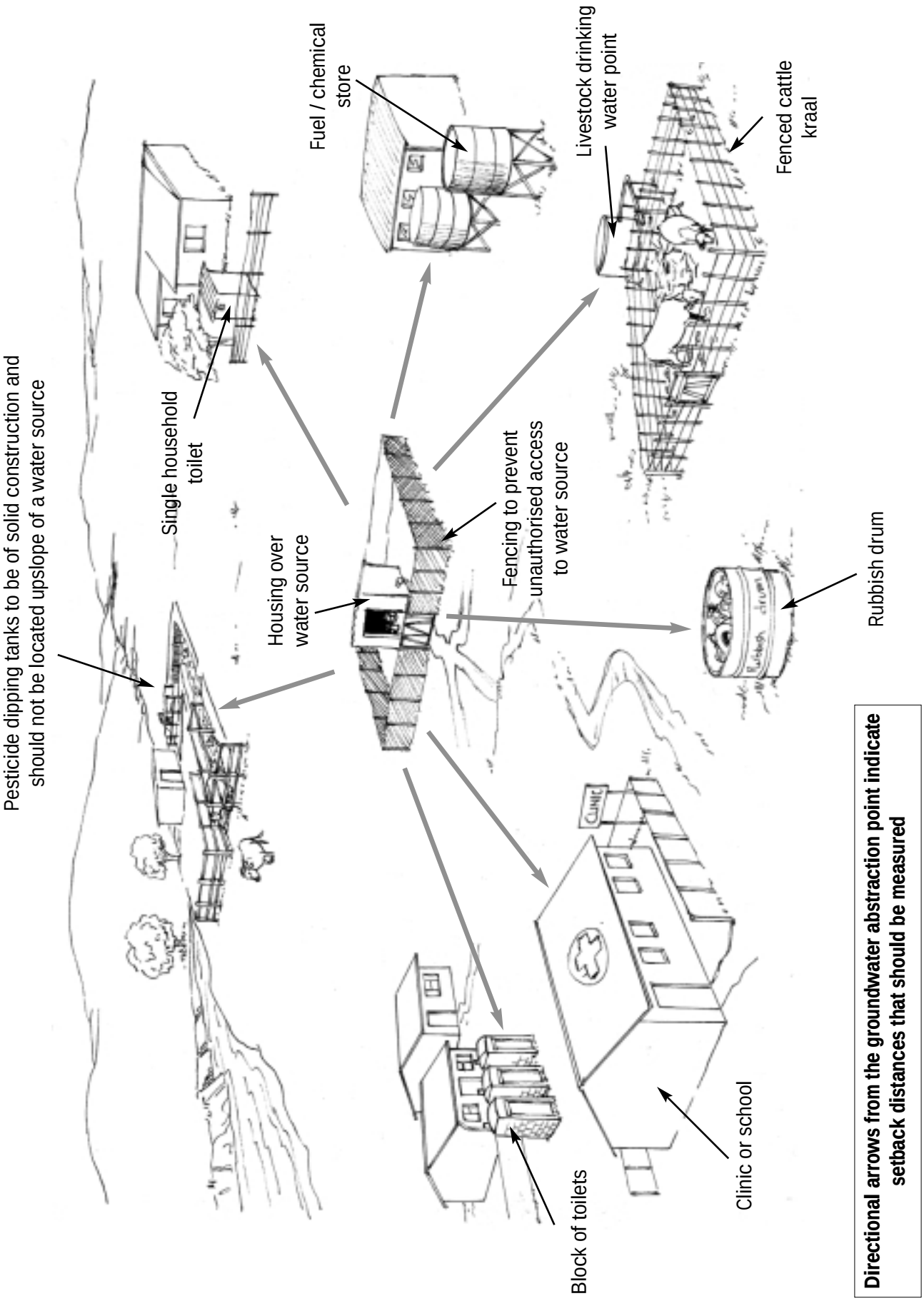
3 The area around the water source should be fenced to keep animals and unauthorised people from the immediate environs of the water source.

4 The water source quality should be analysed against the minimum standards, and undergo regular water quality monitoring by the Water Services Authority (WSA). Water treatment (at minimum, disinfection) should be considered as a further measure to protect community health, where there is any possibility of contamination of the water, whether at source or prior to being used in the home.

5 Community members and their leaders, the WSA, and any Water Services Provider (WSP) appointed by the WSA must agree at an early stage on who will be responsible for maintaining the measures in points 1 to 3 above, after implementation.

Item 4 (above) helps to ensure that the goundwater resource will not be compromised in the event that any one of the protective measures in the list of items 1 to 3, fails.

Figure showing examples of setback distances that should be measured



Directional arrows from the groundwater abstraction point indicate setback distances that should be measured

References and additional reading

Handbook for Village Water Supply Operators. Unified Local Government Service ULGS Botswana /Swedish Institute for Public Admin. SIPU 1990.

PHAST step-by-step guide: a participatory approach for the control of diarrhoeal disease (1998). WHO/EOS/88.3 (for participatory tools such as community mapping)

South Africa: Department of Water Affairs and Forestry (2003). *A protocol to manage the potential of groundwater contamination from on-site sanitation*, 2nd edition. Department of Water Affairs and Forestry. Pretoria

South African Bureau of Standards *Drinking Water Specification SABS 241:1999*.