



## Development of awareness tools for groundwater protection

Mark Bannister, South Africa

INADEQUATE WATER AND sanitation is a major problem in many rural communities. This problem is often compounded by pollution of the available groundwater, surface water and rainwater sources. Sources of pollution may be natural or man made.

Examples of man made pollution which occur as a result of delivery are the possible incompatibility of technologies such as pit latrines and boreholes and the location of boreholes near dip tanks to ensure the community have reasonable access to water for the dips. Examples of man made pollution which occur as a result of the use of services are unhygienically maintained boreholes and tapstands surroundings, use of rivers for bathing, garment washing, cattle drinking troughs etc. Other forms of man made pollution occur as a result of local practices particularly where natural attenuation processes are reduced by subsurface conditions. As groundwater, which is adequate in quality and quantity, is critical in water service provision for the unserved, the majority of who are in the rural and peri – urban areas, it is important to put in place measures and procedures for efficient groundwater management. In order to do this, the South African and Norwegian governments initiated a groundwater management programme, a component of which is the development of community awareness tools for groundwater protection.

### Problem statement

The inadequacy of basic services and the relatively poor socio-economic environment of peri urban and rural areas predispose such communities to certain behaviour, which have the potential of introducing groundwater contamination pathways. This potential for contamination is further heightened by the lack of communication between the various stakeholders and role players involved in delivery of services such as water and sanitation in these areas. Incompatible technologies are used without putting in place risk reduction measures further heightening the environmental impact on groundwater in these areas. The location of a dip tank uphill and near a borehole, around which the community grows vegetables illustrates this lack of communication needed to meet communities' needs without jeopardizing their health. It would be useful to have awareness tools for the various stakeholders around groundwater protection during delivery of services. This project aims to identify the pathways that can cause man made contamination to groundwater, and create tools that can help to block those pathways by making people more aware of the contamination routes and the consequences thereof.

### Stage 1

#### Objectives

1. Identify and quantify local risk behaviour in relation to agriculture, domestic, hospital, human waste disposal and burial practices of the community.
2. Assess local boreholes for risk factors for localised contamination.
3. Quantify various types of household wastes produced in the community.

#### Process

As a first step towards the development of these tools, a survey was carried out at Thornhill in the Eastern Cape. Thornhill is made up of 3 villages namely Thornhill, Parkamisa and Zola, which are typical of rural villages everywhere in S.Africa. The houses are built in unplanned clusters and lack basic environmental health infrastructure such as potable water and good sanitation.

A cluster sampling method was used to select households for the study. Items of information sought using observational checklists, questionnaires and interviews include the identification and quantification of:

- Potential sources of localised groundwater contamination through boreholes and other groundwater sources
- Potential sources of widespread groundwater contamination from local practices in relation to agriculture, solid waste disposal, on- site sanitation and burial practices
- Physico – chemical and bacteriological parameters in some of the groundwater sources.

### Stage 2

#### Objectives

1. To formalise the different pathways that lead to contamination of groundwater.
2. To develop participatory awareness tools that can be used in communities.
3. To ensure that communities really understand the importance of healthy drinking water, and how to maintain that healthiness for a sustainable period of time, by protection of their groundwater.

#### Process

The information gathering process has now taken place, and we are presently in Stage 2 whereby workshops are

planned to develop the necessary tools that will block the pathways of contamination.

Tools such as PHAST (Participatory Health and Sanitation Training) is one particular tool that has already been implemented by Mvula Trust with great results in S.Africa. This is one particular participatory tool that can be developed further to include issues around groundwater protection.

The workshops will both identify existing tools and develop new tools that can best transfer the information to the communities. The newly developed tools will then be tested in the field - they will then be monitored and developed further to ensure they give the best results.

## Discussion

The results of the survey which aimed at identifying and quantifying point and diffuse sources of localised and widespread contamination to groundwater can be summarised in relation to onsite sanitation, solid waste disposal, agricultural and burial. Localized contamination is usually through pathways created by the poor design or construction of the groundwater supply whilst widespread contamination relates to the natural vulnerability of the aquifer to pollution.

Typical contamination pathways include:

### 1. On-site sanitation

On-site sanitation facilities in rural and low-income urban areas may be a significant source of micro biological and chemical contamination. This is due to the accumulation and retainment of faecal matter in one place, especially as the deposit of wastes is at some depth into the ground. Other factors that may influence extent of pollution include type of settlement, population density, and sanitation arrangements and sanitation behaviour.

In some cases, sealed pit latrines or urine diversion systems might be an option for provision of onsite sanitation to this area.

### 2. Solid Waste Disposal

Solid wastes might hold risk for groundwater contamination in the following ways:

- In communities with inadequate excretal disposal facilities, solid wastes are usually mixed with faeces therefore insanitary disposal methods might lead to microbial pollution of surface water and groundwater.
- Even where solid waste is not mixed with faeces, disposal methods which allow leaching, have the potential of increasing nutrient loads of chemicals such as nitrate and chloride especially where the subsurface conditions are conducive to lateral and vertical migrations.

### 3. Agriculture

Animal enclosures may significantly increase nitrate levels in:

- A localised manner, where the animals are confined in an enclosure.
- A widespread contamination of the aquifer where large numbers of animals roam, depositing faeces which can be washed into surface waters, ultimately polluting groundwater where the subsurface nature does not allow sufficient attenuation.
- Cattle dips can also contaminate an aquifer if not suitably located away from the source

### 4. Miscellaneous Sources

In the rural and the peri – urban areas, a relevant potential source of miscellaneous pollution is the practice of burying the dead within household yards. Pollution may be localised where a significant number of graves are situated uphill and close to a borehole.

## Conclusions and recommendations

Ground water is a valuable resource, which needs to be managed efficiently to ensure that it remains appropriate in quality and quantity for its intended use. It is particularly critical to do this in a water threatened country like South Africa, where many of its unserved populace live in scattered rural and peri-urban settlements. The efficient management of groundwater involves:

- The production of awareness tools/guidelines that are developed with an awareness of water needs, uses and patterns in these communities.
- A creation of awareness around groundwater use, protection, pollution and conservation to enable the community to make informed decisions and where necessary change groundwater related risk behaviour.
- It is necessary to develop materials not only for the community, but also the process of information dissemination, awareness tools and guideline development will also involve and engage developmental practitioners, Water Service Authorities and other Government departments.

## Reference

Final point and diffuse sources of contamination survey – Bolu Alebolu, Mvula Trust 2001.

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MARK BANNISTER, Mvula Trust, Program Manager,  
Pietersburg, South Africa.

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