

May newsletter

National Groundwater Strategy 2010

Newsletter #4: The Monitoring Of Groundwater Levels?

06/30/2010

What Do We Mean By “Groundwater Monitoring”?

Here are two paraphrased quotations drawn from Version 1 of the National Groundwater Strategy, currently under DWA internal review:

a) Monitoring for assessment, planning and management:

“A lack of reliable groundwater data makes it difficult to make accurate assessments of the availability and abstraction potential of groundwater. The reliability of groundwater data and information is very important for effective and sustainable groundwater management. Reliable data can only be achieved through continuous monitoring.”

Monitoring with the aim of tracking the resource for planning and strategic management purposes usually relies on dedicated monitoring boreholes equipped with data recorders. This data is fed into the National Groundwater Data Base (NGDB).

and;

b) Monitoring for sustainable operations:

“Failure of groundwater supply schemes is often blamed on the resource (i.e. the aquifer or the groundwater) rather than on the infrastructure (borehole, pump, pipes, valves etc) used to abstract the groundwater. It is common to hear that “the borehole dried up”, or “the groundwater ran out.”

In fact, failure of groundwater supply schemes is almost always either due to failure of infrastructure (e.g. a blocked borehole screen) or unsuitable pumping regimes (e.g. pumping at very high rates for short periods of time) that are related to a lack of monitoring. Monitoring for operational purposes is either by means of a ‘dipmeter’ or recorder within an operational borehole, or by means of a recorder on a monitoring borehole placed with a well-field - aimed at specifically capturing the condition of that well-field.

Why Monitor?

This newsletter is focused on the monitoring of water levels for the sustainable operation and management of individual boreholes or well-fields, as opposed to strategic monitoring. While the practical aspects of monitoring may be similar, the issues surrounding such monitoring are very different.

Tracking the level of water in a borehole indicates whether abstraction rates are exceeding recharge. The user knows whether the supply is running low – and this can be followed both for the season and to show long-term trends.

Monitoring also indicates whether there are problems with the function of the borehole, such as clogging. Most importantly too, monitoring helps the user in determining optimal rates of abstraction, which may be higher (or lower) than expected. A monitored borehole can be more efficiently, effectively and safely used.

There are a number of facets to monitoring for operations and maintenance:

- Monitoring of water levels
- Monitoring of water quality
- Monitoring of pumping rates
- Monitoring of electricity consumption
- Monitoring of water demand

When a borehole is drilled and water located, a pump-test is usually carried out. This indicates the strength or yield of the borehole (e.g. 2 litres/ sec) and, provided pumping is carried out well within the parameters of such yield (e.g. abstracting at 1 litre/ sec or for only 12 hours day), the borehole is expected to keep delivering forever. Too seldom is the actual water level monitored and too often failures are experienced.

South Africa has a national network of monitoring boreholes (see figure 1) and a National Groundwater Data Base (NGDB) but as noted in the NGS this is still inadequate for reliable; resource assessments – particularly when one gets down to quaternary catchment scale. What the country also clearly lacks, despite all the guidelines, is a culture of individual

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Progress with the National Groundwater Strategy

A draft version of the NGS has been completed and subjected to internal and DWA review. This draft is now being revised and is expected to be referred to public scrutiny by August 2010.

Additional stakeholder workshops and discussions are planned with both the Mining and Agricultural Sectors and the draft NGS will be used to elicit feedback from interested and affected Government Departments.

Useful References

DWAF, 2004. Toolkit for Water Services: Groundwater Monitoring or Pump Operators. No. 6.1, Department of Water Affairs, Pretoria.

DWAF, 2008. Guideline for the assessment, planning and management of groundwater resources in South Africa. Edition 1, Department of Water Affairs, Pretoria.

Your feedback

Your inputs on this topic, or any other aspect related to the future of Groundwater in South Africa, would be much appreciated.

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monitoring of groundwater. This needs to be fostered, and is an important target of the NGS.

The strategic objective could read:

To establish a culture of monitoring where the water level of every borehole is measured and recorded on a regular basis.

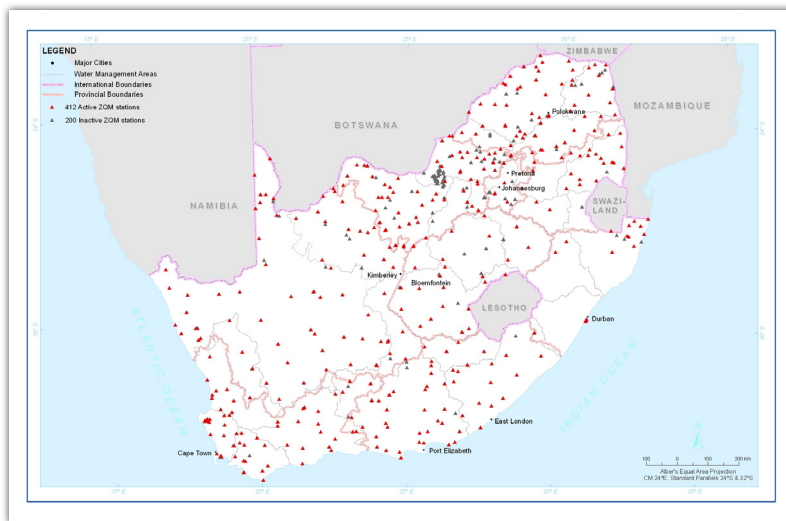


Figure 1 Groundwater quality monitoring stations (ZQM)

How To Monitor Groundwater Levels

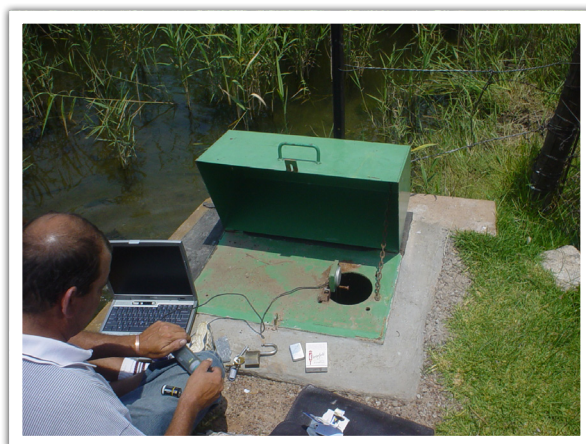
Monitoring is addressed in the “Guideline for the assessment, planning and management of groundwater resources in South Africa” (DWAF, March 2008) with the following advice:

“Ensure that the monitoring network installed during the implementation phase is sufficient to provide effective coverage and accurate measurements for management purposes. This includes abstraction well-fields and their monitoring boreholes, local and regional monitoring network, monitoring boreholes around individual facilities, such as sewage works, waste dumps, etc, and springs.

Monitoring should include (inter alia):

- Piezometer tubes to measure water levels in pumping holes; alternatively, install continuous water level monitoring equipment
- In-line flow meters for monitoring water abstraction from boreholes
- Borehole sampling to monitor quality of groundwater
- Spring flow measurements

It is an unfortunate fact that water level monitoring equipment is often not installed. Provided a piezo-meter tube has been fitted to the rising main it is possible to use a dipmeter to manually measure the distance to groundwater, and hence its level. But not even the piezo-meter tube comes as standard. Whilst it is possible to drill a hole in the baseplate at the collar of the borehole and to lower a dipmeter from here, this can easily get entangled in the pump or cables, resulting in an unfortunate mess.



Picture 1 Download data from data logger

What Are The Constraints To Monitoring Groundwater Levels?

It is commonly stated, and easy enough to demand, that “we must monitor”. In making such a demand it becomes the responsibility of authorities to make such monitoring a simple thing to do.

The advice in the DWA guideline makes monitoring seem easy – and so it should be. Either read a dipmeter inserted manually via the piezo-meter tube, or use a permanent recorder. The dipmeter is an extremely simple device, with an electrode lowered down the borehole on a electrical cable and distance to contact with water measured using an ammeter. Every borehole could and should have at least this minimalistic device.

Why then is there such a marked disregard for monitoring?

The following are all possible reasons:

1. There is no culture or interest in tracking and knowing the groundwater level
2. Keeping within pump test limits is assumed to be enough
3. Boreholes are not automatically equipped with a monitoring device as standard
4. Boreholes usually don't even have an inspection hole in the borehole cap, which would allow for the use of a dipmeter.
5. There is no requirement for this.
6. Equipment may be simple (as in the case of the dipmeter), but is not readily available on the market
7. There is no statutory requirement to monitor and record borehole water levels.

The Strategy

A number of steps are required in the building of a monitoring culture:

1. Imprint an understanding of the nature of the aquifer, and that the groundwater level must be maintained within sustainable levels to avoid failure.
2. Dam levels are commonly are published in the press and announced on television. This information should be supplemented by “state of the aquifer” reporting. For towns dependent on groundwater these groundwater levels should be published regularly and become part of the public psyche.
3. All boreholes should be equipped with inspection holes for the insertion of a dipmeter, with a fitted monitoring tube if necessary.
4. The monitoring of all boreholes used to supply water for domestic or commercial purposes should be mandatory, with records open to inspection. Managers must be trained as to safe levels, how to detect trends in both the short and long term, and how and when to reduce pumping loads (as with water restrictions from a surface water source) when records indicate.
5. Equipment – ranging from dipmeters to data loggers should be readily available from all suppliers of borehole equipment such as casing, pumps etc. The supply of appropriate monitoring equipment must be viewed as standard.

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