

---

This item was submitted to [Loughborough's Research Repository](#) by the author.  
Items in Figshare are protected by copyright, with all rights reserved, unless otherwise indicated.

## Development of a family wells programme in Maputaland

PLEASE CITE THE PUBLISHED VERSION

PUBLISHER

© WEDC, Loughborough University

VERSION

VoR (Version of Record)

PUBLISHER STATEMENT

This work is made available according to the conditions of the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0) licence. Full details of this licence are available at: <https://creativecommons.org/licenses/by-nc-nd/4.0/>

LICENCE

CC BY-NC-ND 4.0

REPOSITORY RECORD

Deverill, Paul, and Stephen R. Nash. 2019. "Development of a Family Wells Programme in Maputaland". figshare. <https://hdl.handle.net/2134/29256>.



## Development of a family wells programme in Maputaland

Paul Deverill and Stephen Nash, South Africa

THERE HAS BEEN considerable activity implementing community water supplies throughout South Africa over the course of the last 4 years. There is also a growing realisation amongst the many implementing agencies responsible that many water supply projects may not be sustainable.

Piped water supplies have a particularly poor record of sustainability in Maputaland, the region of South Africa which forms the coastal plain of northern KwaZulu Natal (Figure 1). It extends from the north of Lake St Lucia up to the Mozambique Border. To the West lie the Ubombo Mountains, to the East is the Indian Ocean. The area is flat and sandy with grassveld and swamp, with a mean annual rainfall of 750 mm. The rural population of about 120,000 people is Zulu, the majority living in widely scattered kraals often several hundred metres apart. Maputaland has seen very little infra structural development, although recently work has started on the first tar road to cross the area (Broughton, 1996).

The Maputaland coastal plain is made up of fine, wind blown sand and alluvial clays deposited over tens of thousands of years. With a relatively high rainfall and the proximity of the Ubombo mountains to the West, the sands form an extensive shallow aquifer with the water table between 10 and 20 m deep. Traditionally people take water from pans, lakes and shallow pits sunk a few metres into clay. The former government also provided a number of

open wells and boreholes equipped with hand pumps, although without effective maintenance most of these are now defunct.

The potential of the area for protected shallow wells as an alternative to piped water supplies was recognised by the Mvula Trust working in conjunction with Partners in Development cc, a small private company, and resulted in a three year pilot programme.

### The family well concept

Family wells rather than community wells were favoured for a number of reasons. In particular, the highly dispersed settlement pattern would have necessitated a great many community wells, and it was envisaged that there would be many institutional problems associated with ownership and maintenance. The family well concept had a good record in Zimbabwe, although unlike there, there was no local well sinking culture in Maputaland, presumably due to the intrinsic difficulties of sinking wells in fine sand.

Altogether, over 100 dug wells were completed in three of the 7 tribal areas by five local teams. A system was developed in which the householder would apply for a well and pay a small deposit @ 75 or \$ 12) that was used to establish the level of the local water table with the help of a small augur. Once the balance of R 225 (\$ 37) was paid, materials were dropped off on site and the well completed in two stages, the first being to make up to thirty reinforced cement mortar rings. After curing these were used to line the well during its excavation. Smaller rings were used to telescope down beneath the water table. The wells were finished with a slab, lid and windlass. After completion, each well was handed over to the owner, who would also receive information on how to keep it clean.

The personal contribution amounts to 8 per cent of the cost of a typical well, in line with the Mvula Trust policy of the time.

### Problems with dug wells

A number of problems were encountered. It proved very difficult keep the well rings aligned if the depth of the well exceeded 7 - 8 metres, even if these were wired together. It was also difficult to sink the small rings more than about 1m below the water table, as a plastic mixture of sand and water would flow underneath the bottom ring into the well as fast as it could be excavated. To the South of the project area, the wells tended to tap shallow lenses of water overlying thick clay. This reduced their reliability, with

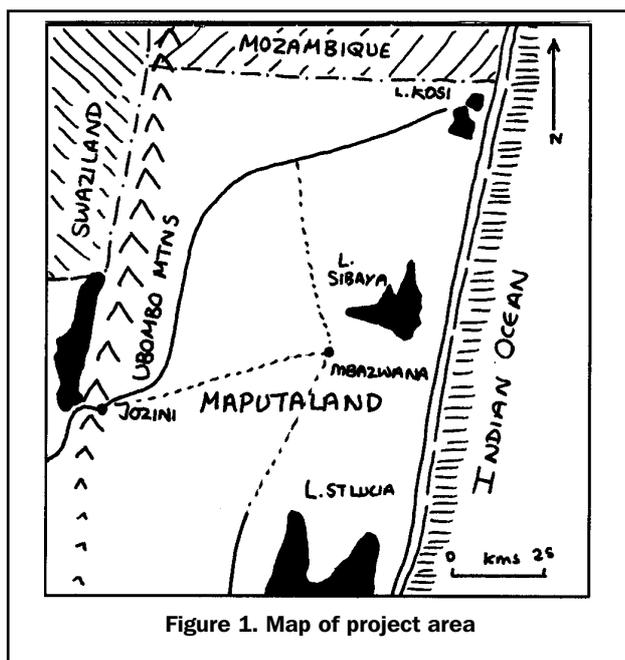


Figure 1. Map of project area

over 40 per cent drying up towards the end of the dry winter. It was also very difficult for local project committees to manage the logistics of wells; construction often used over 25 sacks of cement. Ring wells proved expensive and time consuming to build, typically costing R 4,000 and taking 2 to 3 weeks to complete. Finally, it was difficult to keep the water in the well clean. Faecal coliform concentrations of over 250 per 100 ml proved common.

**Tube wells**

Faced with all these difficulties it was clear that an alternative technology was urgently needed. Hand augured tube wells had proved successful in many parts of Africa (Morgan, 1990) and had even been tried to the north of the project area some 15 years earlier, although the majority of these had silted up. After some initial investigations, auguring equipment was purchased from Zimbabwe and used to sink a number of experimental tube wells. To prevent fines entering the tube well, a single layer of geo-textile cloth was wrapped around the 125 mm PVC slotted pipe, based on an idea from a vegetable garden project in Niger. This was

lowered into the augured hole, before being sunk a further 4 metres below the water table by bailing sand and water from inside the pipe.

Altogether, 14 experimental tube wells were sunk in this way, fitted with a very simple bucket pump (a length of galvanised steel tube fitted with a simple foot valve at one end) developed from a commercial design available in Zimbabwe.

A series of stepped pump tests on a single tube well was used to measure the performance of the filter cloth and establish if it was clogging with fines. The results of each test were plotted on a graph of specific draw-down vs flow rate. The percentage change in specific draw down, was calculated for each test (Table 1). This is a simple measure of the proportion of energy lost across the screen and filter as the flow rate is increased. Any clogging over time would be indicated by an increasingly negative percentage over time.

The figures in Table 1 indicate that the filter losses have remained relatively constant over 7 months of heavy use as a community tube well. There is no physical sign of clogging. This particular tube well is still in use today, supplying water to more than 15 families.

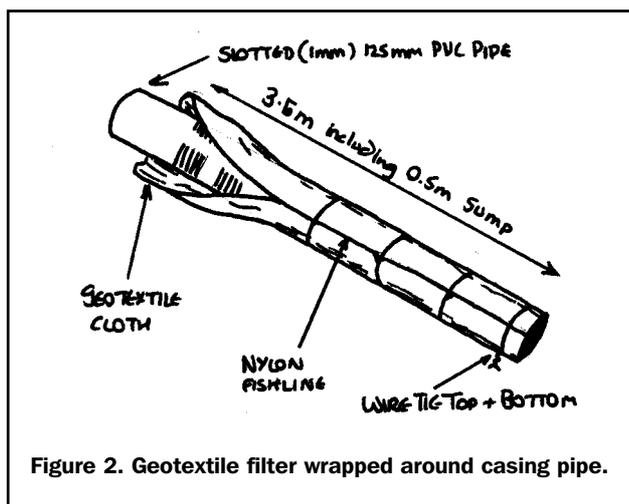


Figure 2. Geotextile filter wrapped around casing pipe.

**Advantages of tube wells over wells**

Tube Wells have proved more appropriate for several reasons. They have been sunk to over 20 metres even through clay, penetrating the water table by up to 5 metres. This can be done in less than half the time needed for a well and costs a third less. The equipment used can easily be transported in a three quarter tonne pick-up truck, whilst the material requirement is much reduced, for example, only 2 sacks of cement are needed. All this facilitates the local management of a tube well project. With a small internal volume and the flushing action of the bucket pump, the tube wells are inherently self cleaning, averaging less than three faecal coliform per 100 ml for a community water supply (Deverill, 1999).

At the time of writing there are three tube well teams in action, including an all women team and a mixed sex team. The personal contribution has been raised to R 500 (\$82 or 23 per cent of the capital cost), which can be shared by two

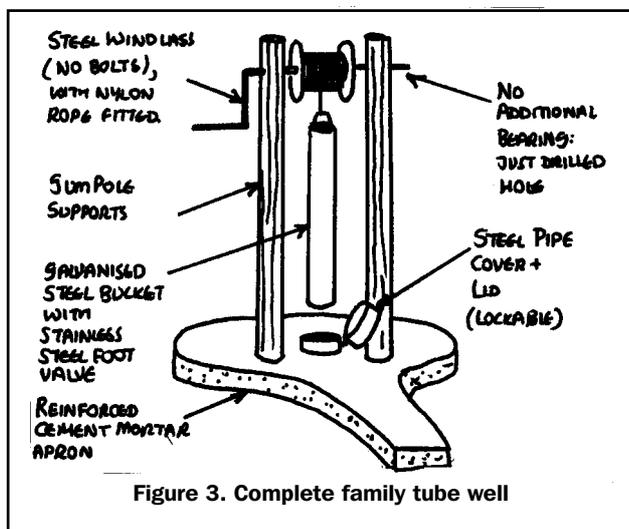


Figure 3. Complete family tube well

Test No	Month	Change in Specific Drawdown
1	May '98	4.4%
2	Jul '98	-2.8%
3	Nov '98	-2.5%
4	Jan '99	2.2%

or three families. The capital cost which averages R 250 per person is less than one third that of most reticulated supplies completed in South Africa in recent years, which in any case only provide a public stand pipe rather than a family water supply. So far, the tube wells are proving very reliable and problems are easily resolved at household or community level. The design has evolved to become as simple as possible to the extent that routine maintenance consists of periodically replacing a piece of wire that acts as a split pin on the bucket valve.

### Outstanding issues

A training system for tube well owners has been developed which involves local communicators informing householders about the use and maintenance of their tube well. This training could be extended to include broader issues of hygiene, although most households still lack an adequate toilet. It is therefore planned to modify a number of participatory tools developed for a local sanitation project for use with small groups of individuals applying for a tube well. The process will be facilitated by the communicator with the help of the local community health worker.

A key technical problem is the depth of the water table in the south of the project area, which in some places exceeds 20 metres and is often associated with a hard clay. This may rule out hand augured tube wells. Although it is hoped to further improve the auguring equipment, it may prove necessary to develop a low cost mechanised rotary drill. Alternatively, if the water table is too deep for hand augured wells, rain water harvesting can be promoted.

Even though the tube well technology is easier to implement than ring wells, there is a continuous need to develop the capacity of local and programme staff to manage the programme. A job card, which also serves as a quality check and hand over form, has been introduced to assist this process. This is very similar to one developed for the domestic sanitation project mentioned earlier. In a remote

area of South Africa, however, such development takes a great deal of time.

Finally, persuading local government to adopt this affordable approach to water supplies has been difficult. Many influential individuals regard piped water supplied by taps as a political right in the new South Africa, even if is not a practical option in most areas. Challenging this way of thinking is a long process, but one best tackled by practical demonstration. One of these individuals has recently paid for and received his own tube well.

### Acknowledgement

I would like to thank Naphthal Kunene, Esau Gumede and Dorothy Zikhali of the Ubombo Family Wells Programme for their efforts and perseverance, without which the work behind this paper would not have been achieved.

### References

- BROUGHTON, A. and STILL, D. Study of Southern Maputaland Water Supply to Dispersed Rural Settlements, Partners in Development, 1996.  
DEVERILL, P and Nash S. Ubombo Family Wells Research Programme, Final Report, Partners in Development, 1999.  
MORGAN, P. Rural Water Supplies and Sanitation, 1990, Macmillan. ISBN 0333-48569-6.

---

PAUL DEVERILL, Programme Manager, Partners in Development Maputaland, PO Box 198, Mbazwana 3974 KwaZulu Natal.

STEPHEN NASH, Project Engineer, Partners in Development Maputaland, PO Box 198, Mbazwana 3974 KwaZulu Natal.

---