Search Continues for Liquid Gold

Investigations into the potential of the Table Mountain Group (TMG) aquifer – cited as one of the richest untapped water resources in the country, have reached an advanced stage.* The Water Wheel *takes an in-depth look at this multimillion Rand project, searching for possible solutions to the Western Cape's continuing water woes.

The fractured rock groundwater systems of the TMG constitute a vast aquifer system, extending from just north of Nieuwoudtville southwards to Cape Agulhas and eastwards to Port Elizabeth. The full volume of the aquifer rocks in this whole region comprises a staggering 100 000 km^3.

The groundwater intersections or pathways in the aquifer are commonly at depths of greater than 100 m below ground. The recharge to the TMG aquifer is believed to be in the range of 7% to 23% of mean annual precipitation (i.e. snow, rainfall and mist).

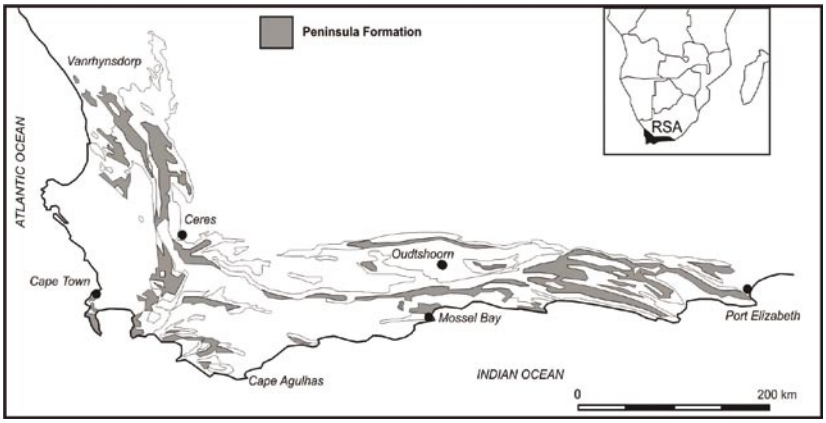
Groundwater from this aquifer is said to be among the purest in the country as regards electrical conductivity and total dissolved solids. However, the pH is as low as 5, which is very acidic and therefore corrosive. This means that, should bulk water supply from the TMG aquifer ever be considered, some form of treatment will have to be included to ensure that the water is of potable standard and to minimise damage to water distribution infrastructure.

UNEXPLOITED POTENTIAL

The proposal to investigate groundwater in the TMG aquifer as a potential source for bulk water supply for agricultural and urban use has been discussed since the early 1970s. The possibility of large-scale groundwater supply to the Cape Metropolitan Area (CMA) from the Cape Flats and West Coast aquifers was evaluated during the Western

THE FOUR MAIN PHASES OF THE TMG AQUIFER FEASIBILITY STUDY & PILOT PROJECT:

- **Inception Phase (2002)**: During this phase the Terms of Reference were finalised.
- **Preliminary Phase (2002-2004)**: In this phase, the study focused on the selection of the most favourable targets areas and sites for exploration boreholes and potential wellfields, after having considered all relevant factors, e.g. hydrogeological criteria, environmental impacts, and infrastructure requirements, among others.
- **Exploratory phase (2005-2007)**: Currently underway, this phase is intended to verify the predicted hydrogeological characteristics and to refine the siting of the target wellfields.
- **Pilot Borehole Phase (2007-2009)**: During this final phase a number of boreholes will be drilled to develop one or more wellfields with a target yield of three to five million cubic metres a year.



The Table Mountain Group Aquifer.

Cape Systems Analysis (WCSA) in the early 1990s.

Although mentioned in the WCSA, the TMG Aquifer was not evaluated in much detail. In the mid-1990s, Umvoto Africa's detailed study of the TMG Aquifer in the catchment of the Olifants River for the Department of Water Affairs & Forestry showed that there would also be opportunity for developing the TMG Aquifer to supply the Western Cape Supply System, which serves the municipalities of Cape Town, Stellenbosch, Paarl and Wellington, as well as towns on the West Coast and in the Swartland area. Irrigators along the Berg and Eerste rivers, and irrigators and urban users in the Riviersonderend catchment also receive water from the system. However, groundwater extraction from this system is still only a fraction of overall water supply.

The CMA Bulk Water Supply Study (2001), which investigated various water supply and water demand management options at reconnaissance level, again highlighted the potential of the TMG aquifer to augment water supplies to the area. Among others the study concluded that the TMG aquifer has the potential of yielding high volumes of good quality water; the overall cost of developing and operating wellfields in the aquifer compares favourably with other water supply schemes; and that it is important to study this potential at fully feasibility level. This led to the rollout of the TMG Aquifer Feasibility Study and Pilot Project, which started in 2002.

PHASED APPROACH

The present study is investigating the potential of the TMG aquifer situated between Tulbagh and Kleinmond or the so-called Peninsula Formation. The TMG Aquifer Alliance (TMGAA), comprising Ninham Shand, Umvoto and KBR, have been appointed to undertake this investigation.

According to TMGAA project manager Alan Shelly, the study involves four main phases, two of which (the Inception and Preliminary phases) have already been completed. The project team is about to start the Exploratory Drilling Phase (the third phase). This phase will entail the detailed siting of exploration boreholes, followed by the exploration drilling and associated environmental management activities. The outcome of this phase will be the verification of the hydrogeological predictions made in the Preliminary Phase and refining the location of the potential target wellfields.

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Drilling will be undertaken at various depths, possibly up to 1 000 m. The initial emphasis in an exploration drilling programme is obtaining core

samples of the fractured rock aquifer to undertake careful logging of the rock types and fracture sets intersected, and to undertake various laboratory tests on the rock materials.

The Exploratory Phase is preceded by an application to the provincial Department of Environmental Affairs & Development Planning (DEA&DP) to obtain a Record of Decision (ROD) for proceeding with the drilling of the exploration boreholes. At the time of writing, the ROD had been issued and the project team was awaiting any appeals before exploring the properties of the groundwater via exploratory drilling from 26 potential sites along the aquifer.

PROTECTING THE ENVIRONMENT

At this stage the potential impact on vegetation, including the Western Cape's unique fynbos biome, as a result of groundwater exploration in the Peninsula Formation is largely unknown. For this reason, the TMG Aquifer study is also informed by a parallel investigated, commissioned by the Water Research Commission, into the ecological and environmental impacts of large-scale groundwater development in the TMG aquifer system. The investigation is being conducted by a team led by the CSIR.

The public has been part of the process from the start. The engagement of the public from an early stage of the project has proved to be important and valuable, says Shelly. As such, a Key Stakeholder Forum comprising more than 20 relevant organisations has been established. It convenes every six months or so.

Moreover, a process of public communications and participation was initiated towards the end of the Preliminary Phase. A public website (www.tmg-aquifer.co.za) has also been developed. "The public generally support the approach to the study, which is a precautionary one in that it evaluates all potential factors (i.e. technical, environmental, societal etc.) that could influence the viability of the project," notes Shelly.

Once the Exploratory Phase has been completed in 2007, the findings of the investigation will be submitted to the City of Cape Town's Mayoral Committee for a decision on whether or not to proceed with the last (pilot) phase. In parallel, a submission will be made to DEA&DP for approval for the pilot phase activities. If approved, this phase will involve the development of pilot-scale groundwater abstraction (i.e. 3 to 5 Mm^3/a), including the necessary environmental management.

"Praise has to go to the City for Cape Town for initiating and funding this project and taking a leading management role. This study plays a significant role in the pro-active long-term planning of water supply to the Western Cape, by filling the scientific gaps in the complexity of the structural geology, to gain a better understanding of possible environmental impacts, to pro-actively set up monitoring frameworks, and so forth, in order to ultimately be able to make an informed decision on the viability and acceptability of the TMG aquifer as a potential resource," concludes Shelly.

***Left**: The Exploratory Drilling Phase (the third phase) will entail the detailed siting of exploration boreholes, followed by the exploration drilling and associated environmental management activities.*
***Right**: The fractured rock groundwater systems of the TMG constitute a vast aquifer system, extending from just north of Nieuwoudtville southwards to Cape Agulhas and eastwards to Port Elizabeth.*