

## Overberg celebrates opening of new UF plant

Farmers in the Overberg are now assured of water of the highest quality following the official inauguration of the new ultrafiltration plant near Swellendam.

The 800 000 ℓ/day UF facility, designed and constructed by local firm Ikusasa Water, was erected at Overberg Water's Rùensveld Oos water purification plant. This plant treats highly coloured Cape brown water from the Theewaterskloof Dam for use by farmers and other rural users.

Overberg Water Chairman Joe Emeran, pictured with Ikusasa Water Chairman Andrew Theunissen, praised the staff of Overberg Water for their commitment to good governance. He said that it was only through public-private partnerships that South Africa can move forward and provide citizens with better services as it was within the private sector that funds were available for innovation research and development.

It is exactly with such a partnership that the UF facility came to be, noted Theunissen. Overberg Water and Ikusasa Water worked closely together for almost two years to optimise the treatment process. Extensive piloting work ensured that the final configuration selected would be the correct one. The facility is based on the most advanced local and international technology.



The UF plant was designed to operate in parallel and independently from the existing conventional treatment plant. Raw water is pumped directly from the river and divided between the UF plant and the conventional plant. The treated water from both plants is then blended into a single clear water reservoir. Backwash water from both plants is recycled to the feed of the conventional plant. The advantages achieved with this configuration were an 800 kℓ/day increase in total water production, improved water quality, reduction in water losses and a reduction in alum use.

Ikusasa Water is the first South African manufacturer of UF capillary membranes,

which it produces at its Somerset West facility under licence from the Water Research Commission and Stellenbosch University. The company also currently has a Memorandum of Understanding in place with the university to further advance the technology.

Overberg Water CEO Dries Potgieter expressed his satisfaction with the plant. "While most of the water supplied by our utility goes towards agricultural use this does not mean we can allow it to be of inferior quality. In fact, many of our clients supply overseas markets and have to comply with extremely stringent quality regulations. The quality of water used can have a huge impact on such

contracts. About 20% of the water goes towards domestic use."

The new UF treatment plant is highly automated, and can supply high-quality water regardless of the feed water quality. It is capable of removing particulate matter, colour, bacteria (such as cholera), viruses and parasitic microorganisms.

Apart from its smaller footprint the new UF facility at Rùensveld Oos also offers other advantages over conventional plants. It uses about a tenth of the coagulants as conventional plants to treat the high colour, high turbidity source water, thus offering lower running costs.

## Company says saving water can boost mine production

Recent testing on a South African platinum mine has shown that saving water through paste and thickened tailings technologies is not only good for the environment but can allow higher throughput and boost profitability.

Using a pilot plant at Anglo Platinum's Mogalakwena South concentrator facility in Limpopo province, engineers and scientists at SRK Consulting, together with engineering consultants Paterson & Cooke have developed a simple model for estimating overall water consumption on the mine – and how to improve it. The tests showed that substantial water

savings can be made by increasing the concentration of solids in the thickeners, especially when material density reaches 65% to 70% (conventionally, material reporting to tailings storage facilities will register densities of around 55%).

"For solid concentrations between 65% and 75% there is a rapid decrease in the release of free water," said SRK's principal geotechnical engineer, Johan Boshoff. "This results in a dramatic improvement in water consumption as pool size at the tailings facility – and hence evaporation and seepage losses – are reduced." One of the main constraints

to raising throughput in mining plants is the lack of enough potable water, noted Boshoff. "The water saved by implementing thickened tailings technology can allow plants to improve their throughput, and this is a key factor in determining the profitability of a mine".

There are other important benefits to be derived from recovering more water at the plant, rather than from tailings, for example, better structural stability of the tailings makes it safer and easier to access. This in turn allows rehabilitation of tailings dams to begin earlier – speeding up compliance with environmental

rehabilitation requirements. It reduces the danger of mine water seeping into groundwater resources, which has become a growing concern in South Africa's mining industry.

The technology related to water extraction in mineral processing plants is well-advanced in many countries where water is a highly valued resource and environmental regulations are very stringent. There is little doubt that SA is headed in this direction, said Boshoff. "Despite our concern about the lack of water in this country, the price is still too low to make users address the problem more assertively."

## Chrome smelter cleans up its act



The Tubatse Ferrochrome smelter is reducing its environmental footprint and helping to preserve water in Steel-poort River through its new wastewater treatment plant.

The plant, developed by Veolia Water Solutions & Technologies and KV3 Civil Engineers, treats all water outflow on the smelter site, including industrial stormwater, contaminated groundwater, treated sewage water and industrial effluent containing a high concentration of dissolved salts.

According to Frank Rosslee, Engineering Manager at Tubatse Ferrochrome, the true value of this plant lies in the fact that by treating the contaminated groundwater and other wastewater sources, a large volume of water is re-used, without releasing anything harmful into the surrounding environment. "The added environmental gain from the project is that the volume of water that the smelter needs to extract from the Steelpoort River is reduced," he notes.

The added advantage to the smelter is that its process water quality has improved considerably, which assists in enhancing the life expectancy of all its major process equipment. "Most components in the smelting process have to be water cooled and harsh water can cause damage due to corrosion, embrittlement, stress corrosion cracking, chemical deposition, fouling, organic growth and other negative effects of dry and saline

process water," Rosslee explains.

The plant has the capacity to treat 5 000 m<sup>3</sup>/day of water. According to Veolia Water Solutions & Technologies MD Gunter Rencken, the basic processes that the wastewater and groundwater are subjected to include adding ferrous chloride, removing silt and oil residue, clarification, ultrafiltration, reverse osmosis and a combination of thermal and solar evaporation.

### Water on the web

[www.fao.org/nr/water/infores/multimedia.html](http://www.fao.org/nr/water/infores/multimedia.html)

The FAO has a wonderful number of photographic galleries and short animations on the link between food production and water. The latter should be of specific interest to those wanting to get to improve their knowledge of the water sector.

[@vaal\\_dam](https://twitter.com/vaal_dam)

People can now follow the latest available information on the Vaal Dam on Facebook and Twitter. The Vaal is the first South African dam to have its own social media pages. This is an initiative of the Department of Water Affairs and CSIR.

[www.un.org/millenniumgoals/](http://www.un.org/millenniumgoals/)

There is less than five years left before the deadline of the Millennium Development Goals. This site offers information on countries' progress on the various goals around the world.

[www.unwater.org/worldwater-day/index.html](http://www.unwater.org/worldwater-day/index.html)

The World Water Day site offers feedback of all the World Water Day events held across the world, including South Africa.

## Space scientist takes award

Space scientist Andiswa Mlisa, a Director of Cape Town earth sciences consultancy Umvoto Africa, is the winner of the small business sector award, and runner-up overall, in this year's Technology for Women in Business (TWIB) awards.

TWIB is an initiative aimed



at enhancing the accessibility of science and technology to women in business, particularly in small, medium and macro enterprises (SMMEs). It is a national programme run under the auspices of the Department of Trade and Industry.

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## New from the WRC

### Report No: KV 257/10

*Impact study of the estuarine research and related activities funded by the WRC (C Breen; L Downsborough; D Roux & J Crafford)*

The purpose of this investigation was to assess how WRC funding and involvement in estuarine knowledge generation impacted the social environment, the economic environment and the health and welfare of the people of South Africa. It is intended that the outcome of this study will assist the WRC in planning its future involvement and research agenda regarding estuaries. Among others, the study found that the WRC has found strategic direction and has been the principal funder for estuaries research for at least 15 years. In addition, estuaries research supported by funding from the WRC has had a significant and positive effect nationally and locally on the management of estuaries.

### Report No: TT 429/10

*Water-related microbial disease guidelines Volume 3: How great is the problem? (health impact assessment)*

This guidelines document presents

the third in a five-volume series aimed at addressing the question of how best South Africans can protect themselves from water-related microbial disease. It provides a framework

of principles and guidelines for the assessment of health impacts, of water development projects such as water supply, sanitation and hygiene education, irrigation and dam construction.

### Report No: KV 249/10

*Development of a low cost LED-photodiode based spectrophotometer for continuous*

*on-line monitoring using optical flow cells (C Garcin; F Nicolls; B Randall; M Fraser; M Griffiths and S Harrison)*

This report describes the development of an LED-photodetector device for continuous on-line monitoring using optical flow cells as a low cost alternative to conventional spectrophotometry. Conventional spectrophotometers generally use tungsten or deuterium incandescent light sources, and have diffraction gratings, mirrors, filters and various other components that make up complex and expensive instruments. The development of light emitting diodes that emit at specific wavelengths in a narrow bandwidth offer several advantages for replacing the conventional technology: LEDs are robust, inexpensive, longer lasting, smaller, and stabilise within milliseconds.

### Report No: 1690/1/09

*Sensing as a tool for resource assessment towards the determination of the legal compliance of surface and groundwater use (LA Gibson; Z Münch; J Engelbrecht; N Petersen; and J Conrad)*

The overall objective of this project was to determine the usefulness and applicability of using remote sensing technologies as a tool for resource assessment towards the determination of the legal compliance of surface and groundwater use. This project focuses on the creation of new knowledge and being at the innovative edge of the topic. The study found that in the context of illegal water use, using remote sensing as a tool to quantify water storage may be appropriate in identifying water bodies and generating a fair estimate of volumes stored. The application of the water balance equation to the G10K catchment did not determine the level of legal compliance of water users to legislation. However, new methodologies, unused in South Africa, were applied to the study area with many challenges encountered. There is much hope that, as remote sensing technology develops and remotely sensed data becomes available at a higher spatial and temporal resolution, the full potential of these models

will be able to be fully tested and if proven accurate, could possibly be used operationally in the future.

### Report No: 1681/1/10

*Modelling the influence of vegetation, soil moisture and aerosols on early summer Southern African climate (M Tadross; I Oliveira; M Mdoka; F Tummon; G Maure; N MacKellar; N Brown; O Crespo; S Hachigota & B Hewitson)*

Little is currently known regarding global and regional controls of the early part of the rainfall season. An enhanced understanding of the controls of early-season rainfall characteristics are required to enable the design of new forecasting methodologies, which in turn may offer practical benefits to water managers and underserved members of the South African population, e.g. subsistence farmers. New forecasting methodologies will require knowledge of which antecedent conditions are important and be able to use this information to predict early-season rainfall, given likely non-linear interactions. This project focused on the links between early season (September-January) rainfall and local antecedent conditions of vegetation, soil moisture and atmospheric aerosols.

### Report No: 1562/1/10

*Methodological approach to assessing eco-hydrological responses to climate change in South Africa (RE Schulze; BC Hewitson; KR Barichev; M Tadross; RP Kunz & MJC Horan)*

The purpose of this project was to investigate effects of climate change on second order impacts, viz. ecological flow indicators and water temperature parameters, with particular focus on scientific techniques and methods. This was achieved by downscaling climate output from the ECHAMS/MPI-OM General Circulation Model (GCM) and then using the results as input data into the daily time-step ACRU hydrological model in order to simulate the impacts of climate change, as projected by this particular GCM, on the selected eco-hydrological indicators at a fine spatial scale.

### Report No: 1753/1/10

*Land-water linkages: Agent-based modelling of land use and its impact on water resources (YE Woyessal WE Welderufael & JDM Kinyua)*

Over the last few decades, numerous researchers have improved measurements of land-use change, the understanding of the causes of land-use change, and predictive models of land-use change, by a representation of much more complex, and sometimes intricate, processes of land use. In central South Africa, agriculture, mainly commercial farming, is the economic backbone of the community in the region. Small-scale farmers are currently being introduced to improved agricultural practices through improved surface water (rainwater) management. The hydrological balance of any river basin is directly and indirectly influenced by the spatial and temporal distribution of land-use and land-cover changes. The general aim of this project was to contribute to the understanding of the dynamics of human-environment interactions and decision-making processes for the sustainable use of land and water in the Modder River. More specifically, the project looked at the driving forces in land-use change; the influences of the spatial and temporal distribution of land-use and land-cover changes on the hydrological balance of the river basin; and analysing and modelling both the physical environment and the human dimension of the processes of land use change and its impact on water resources.

### Report No: TT 432/1/10

*'Going with the franchising flow' – An exploration of partnerships for the operation and maintenance of water services infrastructure (K Wall & O Iwe)*

The rapid rate of construction and commissioning of new water services infrastructure is severely challenging the public sector institutions in South Africa responsible for operating and managing this infrastructure. Innovative approaches are required. There is an alternative institutional model that is suited more for the ongoing operation and maintenance





of water services systems than for investment in new infrastructure and, importantly, that is friendly to small business and local economic development. This

alternative is the franchising partnership. A WRC scoping study completed in 2005 found that franchising partnerships could alleviate and address many challenges in the management of water services. At the same time, franchising would support the development of local microenterprises and broad-based black economic empowerment, all within the public sector delivery environment. The objective of a second study commissioned by the WRC, and now completed, was to identify the scope for franchising partnerships for the operation and maintenance of selected water services infrastructure, to establish the viability of franchising partnerships, and to make a case for outsourcing to franchises to be considered by water services institutions. This report forms part of a series of seven reports. The other reports are not available in hard copy, but can be downloaded directly from the WRC website.

#### Report No: 1747/1/10

*Multidisciplinary analysis of hydroclimatic variability at catchment scale (M Rouault; N Fauchereau; B Pohl; P Penven; Y Richard; CIR Reason; CGS Pegram; N Phillippon, G Siedler & A Murgia)*

The MAHYVA project, Multidisciplinary Analysis of Hydroclimatic Variability at the Catchment Scale, was a project that involved climatologists, meteorologists, oceanographers and hydrologists from southern Africa and Europe. The goal was to document, understand and build capacity in analysing the impact of

climate variability on rainfall, streamflow and vegetation at the catchment scale. Because of the important role of the ocean on southern African rainfall, oceanography was an important component of the project.

While more information was needed on how the main modes of variability interact with South African climate, there was also a strong need to improve our knowledge on how large-scale climate variations impact on smaller hydrological scales. Consequently, the MAHYVA project aimed at building variability to hydrological parameters at the catchment scale, which included refining both the spatial and temporal scales of investigations.

#### Report No: KV 259/10

*Evaluating the potential contribution of episodic toxicity data to environmental water quality management in South Africa (AK Gordon; SK Mantel & WJ Muller)*

The approach of this project was to undertake a desktop literature review with the aim of addressing questions around the quality and quantity of episodic toxicity data available in the aquatic environmental water quality literature; the philosophical and practical constraints limiting their inclusion in environment water quality management procedures and guidelines in South Africa; and to investigate how these data could be incorporated into the current development of a risk-based approach to deriving water quality guidelines for aquatic ecosystems, and the continued refinement of the Direct Estimation of Ecological Effect Potential (DEEEP), a direct toxicity assessment method developed by the Department of Water Affairs.

#### Report No: KV 250/10

*Development of an immobilised fixed film system for sulphide oxidation in passive mine-water treatment (PD Rose; J Gilfillan; N Rein & D Render)*

The work reported in this study was undertaken to evaluate, at the pre-feasibility level, the proposition, based on observations by researchers at the Rhodes

University Environmental Biotechnology Research Unit (EBRU) over several years, that the immobilised sulphide oxidising fixed film system may be considered for the treatment of sulphide containing wastewaters. The passive treatment application was targeted in these studies where sulphide removal presents a severe technological bottleneck in the development of these treatment systems. A consultancy project was undertaken to consolidate and confirm work undertaken at EBRU on sulphide oxidising fixed film systems and to investigate the intellectual property position on which further investment in the process may be considered.

#### Report No: TT 476/10

*An investigation into the water infrastructure development financial allocation pathways in municipalities (B Hollingworth; P Koch; S Chimuti & D Malzbender)*

The water services sector has a number of attributes that determines its financing. Firstly, there are many decision-makers within the water services sector. Secondly, there are many sources of finance, and thirdly, financial and human capacity within the sector varies considerably. Because of the many institutions involved in all the processes, a complete picture of financing in the sector has not emerged. In order to analyse finances in the water services sector, this research project, following a well-known concept from business management, has postulated a 'value chain'. This envisages the adding of value through a number of sequential functions (or phases), as the technical and institutional arrangements change to match the challenges

of each function. This also allows the examination of each function to determine the contribution of the institutions that lead it to overall efficiency and effectiveness. What is important in the context of regulated markets and prices is that 'value', 'cost' and 'price' are not equivalent. The purpose of this analysis is, on one level, to guide policy formulation in the water services and municipal sectors and on another level, to assist all decision-makers to be better informed in making financial decisions concerning matters such as financial grant allocations, tariffing, capital expenditure, operations and maintenance expenditure.

#### Report No: TT 461/10

*Eutrophication research impact assessment (Frost & Sullivan)*

The WRC has been extensively involved in eutrophication research since its inception. The aim of this project

was to map the full extent of domestic water quality research funded and published by the WRC since 1984; to outline the application of the research and products in South Africa; to determine the impact of the research and products; and to relate the outcomes/impacts of the developed products to a

common measure such as 'Rand value of research product impact'. The study showed that, overall, WRC research on eutrophication has made positive steps towards improving all aspects of South African society. Consistent research, supported by the targeted application by industry of the results and more efforts to increase public awareness, will do a great deal towards eradicating the problem of eutrophication and ensuring a safer, more sustainable future for people, animals and ecosystems alike.



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