



Courtesy WIN-SA

***The world-renowned Kruger National Park (KNP) is famed for its fauna and flora but, in some circles at least, it is now also grabbing attention for something that is far from the thoughts and peering eyes of tourists – wastewater treatment. Article by Petro Kotzé.***

Considered by many to be Africa's most iconic game reserve, the KNP has received accolades for its green treatment of some of what's left behind by the thousands of people that streams through the park gates every year – sewage. While they missed out on the Department of Water Affairs' esteemed Green Drop certification during the last round of assessments, the park is being upheld as a best-practice example in terms of its wastewater treatment methods.

According to Dr Marlene van der Merwe Botha, specialist of wastewater management for Water Group Holdings, who manages the Green Drop project, "the KNP will probably be the first oxidation pond system that will attain Green Drop status."

Though it is something that few spare a second thought to, the topic is one that the park's general manager of technical services, Blake Schraader, feels quite passionate about. The park operates a total of 13 wastewater treatment plants with a design capacity of approximately 365 million litres per year, to cater for the roundabout 1.5 million tourists that enter the park per year (about 4 000 per day) and the 2200 permanent staff members. The Skukuza system alone treats between 240 000 and 320 000 litres of sewage per day.

## KRUGER'S GREEN TECHNOLOGIES

In line with the area that they operate in, Schraader and his team are serious about choosing technologies that have the least amount of impact on the environment, and curb the negative impact of people on the environment. "It is very important for us to promote the use of sustainable green and natural systems," he says.

While municipalities in cities often use activated sludge systems, requiring lots of energy the Kruger

technical management believes in natural systems and try to use as little as possible energy. All the systems here comprise of a combination of three processes, explains Schraader, anaerobic digesters, oxidation ponds and artificial wetlands. They run treatment plants of various sizes, catering for places as large as Skukuza to picnic sites such as Tshokwane and far-flung ranger posts.

Depending on the size, plants range from simple septic tanks with soak-aways, to systems that entail anaerobic digesters, oxidation ponds and artificial wetlands or different combinations of the three processes. The systems are configured differently depending on needs, but they all mostly rely on Mother Nature to do the job.

In the anaerobic digester, organic material is broken down by bacteria in the absence of air, while the wastewater is further treated in an oxidation pond through the interaction of sunlight, oxygen and bacteria. Water is then polished further as it flows through the artificial wetland or so-called reed beds.

The ponds only need to be desludged every seven to ten years, says Schraader. The removed sludge is dried and mixed with soil to rehabilitate gravel pits with. Alternatively, the sludge is buried, but they make sure that there is no possibility of any contamination of groundwater aquifers.

Water for human consumption is abstracted from the park's rivers, and that's exactly where it goes back to afterwards. "All our systems are licensed," says Schraader, "and that means we need to adhere to a certain quality of the outflow."

While they need to comply with the general limit as set by the Department of Water and Sanitation, and always meet it, they strive to meet the special limit, a benchmark of more stringent quality parameters. Except for the legal requirements they have to adhere to, an ecological disaster would also have international repercussions in a place like Kruger.

"The system has been fine-tuned through the years and every year we continue monitoring the system performance and plan for upgrades where required," says Schraader. They stringently monitor the quality of effluent before and after every stage of the process, so they know where to tweak if there are problems. Integral to this success is knowing each element of your system, and its capacity, inside and out.

"Keep on refining," advises Schraader. "You have to implement, monitor, measure the quality of the

outcome, and then make certain adjustments." At the Shingwedzi rest camp, for example, the system entailed a septic tank and a reed bed, but one of the reed beds will now be converted into an oxidation pond before the last reed bed. In Skukuza they only have an oxidation pond and reed beds, but they are planning to add a anaerobic digester before the oxidation pond. "When your quality gets close to your limit, look at where your system is under pressure, and make changes."

## AIMING FOR THE GREEN DROP

In 2010, the team started working towards Green Drop certification. The programme evaluates the best practice management, compliance and performance of wastewater systems and rewards excellence according to a set of criteria.

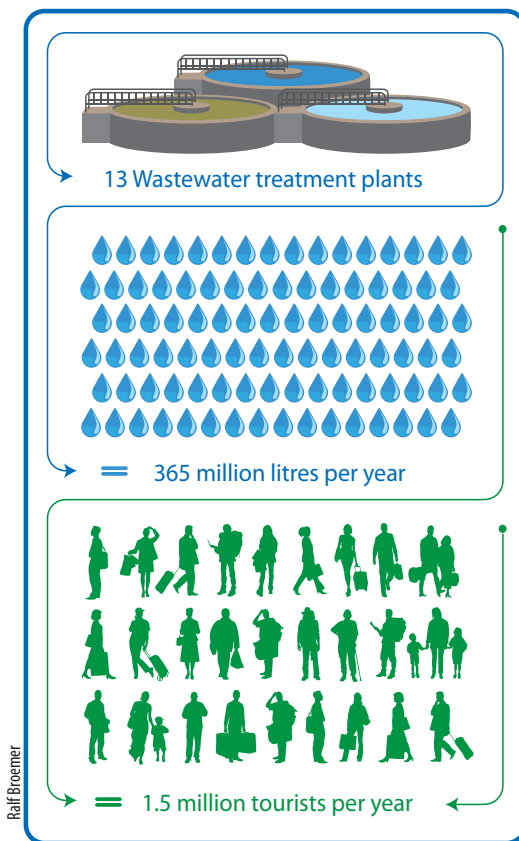
The 2013 Green Drop report is still to be published, but the park has already been informed of the results. While the Kruger systems and final effluent quality are of exceptional standard, they could not meet all the criteria, mostly due to their unique circumstances that include the remoteness of waste-water plants, the wastewater treatment processes applied and relative small scale of the plants. For a small sewage plant in Tshokwane for example, explains Schraader, they cannot have a ring-fenced budget or a dedicated operator on site. "When the Green Drop criteria were designed they had larger municipal water treatment plants in mind," he says. "We don't need to comply to all those criteria because our plants are relatively small and are natural systems that do not require direct process control."

However, their innovative work was recognised when they were selected to present their methods, as 'best-practice' in small wastewater treatment plants, at the recent Water Institute of Southern Africa conference. The park is also the topic of a recent WIN-SA lesson series, which aims to capture the innovative work of people tackling service delivery challenges on the road

*Blake Schraader, General Manager Technical Services of the Kruger National Park.*



Courtesy WIN-SA



to Green Drop status. The series focuses on “sparks of excellence” in South Africa, as identified by the Water Research Commission and the Water Information Network of South Africa (WIN-SA).

According to van der Merwe Botha, what makes Kruger unique is that their systems are incredibly well designed, making use of anaerobic systems and reed bed systems to attain effluent of a very high standard.

There is a general perception that you cannot reach Green Drop status with oxidation ponds, she

says. “This is a perception that we need to manage because, even though oxidation ponds are not technologically advanced, it is possible to attain effluent of a high standard with them.” However, they are disregarded because they are often not managed right, and then the perception is created that they do not do a sufficient job, she says. People overlook the benefits such as low maintenance and operational costs.

But, all is not lost for Kruger National Park’s road to Green Drop certification. According to van der Merwe Botha, they are adding bigger initiative for oxidation systems in the next round of Green Drop assessment, as well as slight relief of effluent quality standards for green systems. These changes will enable Kruger, and other Small Wastewater Treatment Plants that use oxidation ponds to attain Green Drop certification.

## TAKING THE GREEN BEYOND KRUGER

There is not just the hope, but huge potential for small municipalities to implement systems similar to Kruger’s, says van der Merwe Botha. In particularly smaller municipalities that have space available to construct the ponds. Kruger set a benchmark that can be attained by other as well, she says.

She says they would broadly have to keep three things in mind. Firstly, the oxidation system’s design needs to be very good. Secondly, you must not allow your system to sludge up. Thirdly, they must understand that an oxidation pond is not just a waste pond, but a system that must be properly managed, monitored and maintained.

However, it will not necessarily be clear sailing ahead. “Technical skills are a challenge,” she says



The reedbed at Punda Maria.

Petro Kötze

and adds that it is integral that the correct people are appointed. You must appoint the right people, she stresses, and if you don't have them, you must put your existing staff in contact with people like Schraader. "You need to have committed staff and somebody who is dedicated to make it work," adds Schraader. A sewage treatment works is something that most people don't want to visit so you need to have the right, passionate and knowledgeable person to manage it.

While many may have the theoretical knowledge to job, they short in practical know-how. "So, maybe we have to look at stationing them on sites like Kruger's for a month or two to learn," says van der Merwe Botha. Schraader agrees that it is "definitely possible" for systems similar to theirs to be implemented in other places beyond the boundaries of Kruger. But using "appropriate technology" is integral, he stresses.

"We have some form of control over the quality of the discharge that we treat, and it's very different than what you find in Johannesburg," he notes. "Discharge from all operators in Kruger, like restaurants, has to adhere to certain standards. Up to 99% of all of the effluent that they treat is domestic. The systems that we use are natural, and in our environment it works very well. I would not say that the same system would work as well for a place like Johannesburg with heavy industries.

However, Schraader adds that it can be an alternative to conventional purification plants for small wastewater treatment plants with a capacity of less than two mega litres.

## GREEN DROP AND BEYOND

It is little surprise that Schraader reports that they will "definitely" tackle the challenge again during the next Green Drop assessment, which starts in September. "One of our aspirations is to get the Green Drop certification, and we will get it." This will also make them the first South African National Park to carry the coveted status. But their future objectives do not stop there.

In the next ten years, the number of visitors to Kruger may double, particularly since two safari lodges are planned for the park. The technical management team must thus provide for increased volumes of wastewater per day.

## NO PLACE LIKE KRUGER

Managing wastewater plants in the Kruger National Park brings about challenges that many local municipalities would never have to deal with. When the park started closing artificial waterholes as part of an attempt to reinstate natural migration patterns, the elephants did not initially change their ways at a similar pace. They broke through the fences around the water and wastewater plants to get to the ponds and wetlands, causing millions of rands of damage. Crocodiles and hippos followed. In Punda Maria, the elephants broke through the fence and fed on the reeds in the artificial wetland, completely destroying the reed bed and damaging the oxidation ponds.

Other challenges include duck weed that grow on the surface of ponds and depleted oxygen, which operators remove manually, and floods. A number of existing rest camps are situation on the banks of major rivers.

**Source:** *Water Information Network Lesson series – Kruger National Park chooses green technology to achieve a Green Drop.*



Dirine van Rensburg

Furthermore, they want to take in interns and work with education institutions to research pond systems and alternative technologies that cater for green options, re-use and value adding. They also want to continue to reach out and share knowledge and experience with private game reserves, municipalities and mines.

The Kruger technical management team is also upping the benchmark for another area that falls under their broad range of responsibilities – drinking water. While they are waiting for the next round of Green Drop assessments to start, they have applied for Blue Drop status. This process is currently on the go. □