

# From Wetland to Waste Land

## – Human Activities Threaten Gauteng Treasure



Terence McCarthy

***Stretching over 25 km, the Klip River wetland, south of Johannesburg, has proven one of Gauteng's most valuable natural assets through its ability to treat heavily polluted water. However, parts of the wetland have been severely degraded over the last few years, threatening the existence of this aqua-treasure. Lani van Vuuren reports.***

Even during Johannesburg's early years, when prospectors gathered from all over the world on the dusty outcrops of the Witwatersrand to share in its metal and mineral riches, the importance of the Klip River wetland could not be denied. Its underlying groundwater resources provided the first reliable water supply to the growing towns of the Witwatersrand gold field. It was only when the Vaal Barrage was completed in 1923 that groundwater became a less important source of supply to the towns of the Witwatersrand.

In the early days the Klip River was also a significant agricultural area,

with parts of the wetland being drained and irrigation canals and diagonal drains criss-crossing the wetland area. However, it is for its latest function that the wetland is most treasured, namely, for its ability to treat the polluted waters arising from the western section of the Witwatersrand urban-industrial-mining complex.

### **NATURAL WASTEWATER TREATMENT SYSTEM**

Prof Terence McCarthy of the School of Geosciences at the University of the Witwatersrand started his research on the Klip River wetland

five years ago. He reports that the wetland has been providing a water purifying function since the founding of Johannesburg.

The wetland receives water that has been contaminated by acid mine drainage, industrial sources and runoff from urban sources. Water from sewage treatment plants, which contain residual phosphates and nitrates also find their way into the wetland. "Polluted water arising from these sources has left clear symptoms in the chemistry of the wetland peat," explains Prof McCarthy. "Accumulated concentrations of metals such as copper, mercury, lead, nickel,

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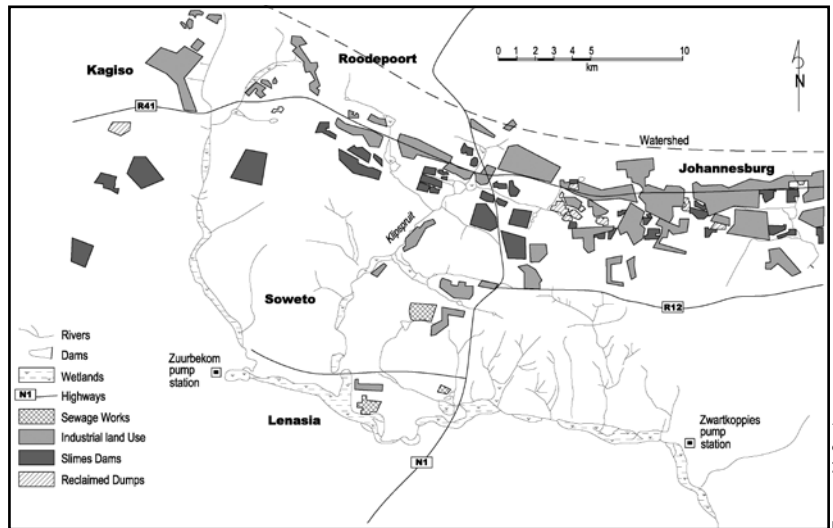
**AUTHORITIES TO HELP KLIP RIVER WETLAND**

A national multimillion Rand initiative to restore the Klip River wetland to its natural glory has kicked off following an announcement by Deputy Minister of Environmental Affairs & Tourism, Rejoice Mabudafhasi.

Speaking ahead of World Wetlands Day in Soweto in February, Mabudafhasi said the Klip River wetland had contributed indirectly to the South African economy and directly to the well-being of the country’s citizens. This was because of the wetland’s ability to trap pollutants and improve water quality coming out of catchments on the Witwatersrand that had been impacted by mining, industries and sewage treatment plants. The water purified by the wetland eventually finds its way to the Vaal River.

In the last few decades, however, the Klip River wetland has come under threat due to increased human activities. A multidisciplinary team was to be appointed under the leadership of Working for Wetlands to come up with a plan to rehabilitate the wetland. R2-million had already been secured from DEAT to initiate the process.

Mabudafhasi emphasised that it would require cooperation across government departments and tiers to ensure the success of the rehabilitation project. “It is only through such a combined approach that we can hope to tackle a problem of this magnitude, and it is our shared responsibility to bring the Klip River wetland back to health.”



Location of the Klip River wetland.

Terence McCarthy

zinc, as well as uranium, nitrogen and phosphate have been found in the wetland material.”

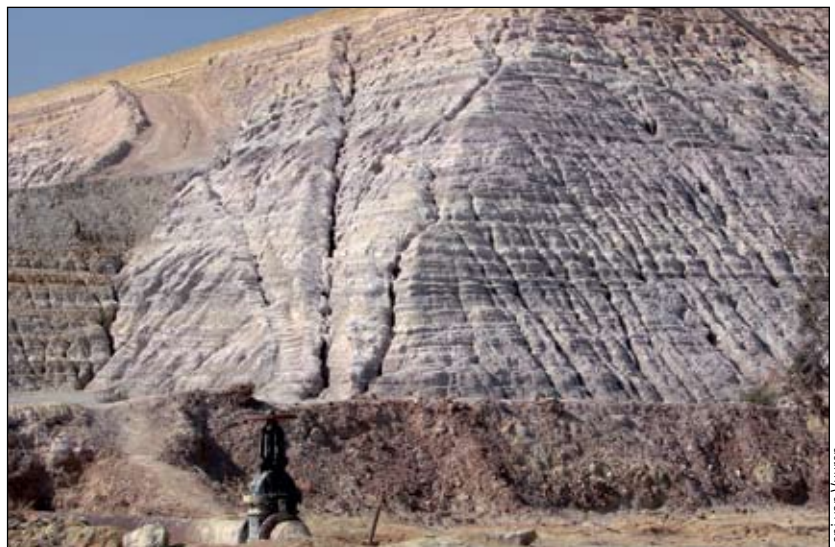
Interestingly, a student of Prof McCarthy, Jaco Venter, is currently undertaking an investigation into the extent of heavy metal accumulation in the wetland. The study should be completed later this year.

The purified water flowing out of the wetland eventually enters the Vaal River, one of the country’s largest rivers and a premier source of

water. “For this reason the Klip River wetland is possibly one of the most economically important wetlands in Africa,” maintains Prof McCarthy.

**RESOURCE UNDER THREAT**

Despite burgeoning growth and development in the area the upper reaches of the Klip River wetland, found near Lenasia, have remained in reasonable condition. Here a 500 m wide, reed-covered swamp can be found and, although some sections have



Lani van Vuuren

The Klip River wetland, south of Johannesburg, has played a significant water treatment function for more than a hundred years, cleaning up much of the pollution from mine dumps in the area.

been affected by peat mining and the heavy metal concentrations in the remaining peat are high, the vegetation does not appear to be adversely affected.

It is the lower reaches of the Klip River wetland that are of most concern. Aerial photographs show that this section of the wetland is in a state of near collapse. Prof McCarthy explains that the main problem is the steady increase in treated sewage water that the wetland has received since the 1960s.

The large volume of water has resulted in channelling along the former irrigation ditches dug to support agriculture during the early 1900s. "The channels have undergone major widening and incision. In places, bedrock barriers have been encountered during incision, resulting in several waterfalls and rapids along the modern river," notes Prof McCarthy.

The incising channels have also exploited some of the diagonal head drains and thus the new, widened channels migrate from one side of the wetland to the other. These diversions across the wetland have had the effect of capturing progressively more of the dispersed flow and focusing it into a widening, single channel, thus further promoting incision and channel widening.

The channels are still flanked by reed beds, but these appear to experience only limited inundation. This seriously compromises the wetland's ability to sequester pollutants. "The success of a wetland to purify water lies in the slow movement of water through the wetland," reports Prof McCarthy. "In the upper reaches where the reed bed is still functioning the flow velocity of the water is in the region of 0,03 m/s and the contact area between aquatic vegetation is very large. "However, in the canalised section, the flow velocity is in the region



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*Large volumes of water entering the wetland from nearby sewage treatment plants have resulted in deep incising channels.*



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*Drying up of the reed beds leads to the burning off of the peat layers, exposing the bedrock below.*

of 0,5 m/s. This means the residence time of the water has been reduced in this section of the wetland from days to hours. It is therefore likely that the downstream reed bed has virtually ceased to sequester pollutants."

### **FROM REED BED TO GRAVEL BED**

When the reed bed dries out, the peat starts to burn. The ash thus produced forms soil susceptible to erosion and several gullies have already formed in the lower reaches of the Klip River wetland. If this degradation is not halted, we could see the release of heavy metals, organic load and phosphates, which are bound in the peat into the Vaal River system over the coming years.

"If no immediate action is taken the lower Klip River and the Vaal downstream of its junction with the Klip will experience eutrophication problems similar to those experienced at the Hartbeespoort Dam. The wetland could be lost and replaced by a single channel, gravel-bed river, similar to the Jukskei to the north of Johannesburg," says Prof McCarthy.

It is believed that further degradation can be prevented by constructing a series of weirs to raise the water level back to what it used to be and to get the water back onto the floodplain and into the reeds that are left. Whichever action is taken, it is hoped that it will take place in the short term to prevent the complete disappearance of this strategic asset. 