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Assessment and design of a treatment process for the potable reuse of wastewater in Gaborone, Botswana

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DECLARATION

I declare that this research report is my own unaided work. It is being submitted for the degree of Master of Science in Engineering to the University of Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination to any other University.

……..
John Wilson

…….day of …… year…….

ABSTRACT

Gaborone, Botswana is currently exploring the option of direct potable reuse of wastewater to augment its drinking water supply. A feasibility study has already been undertaken assessing this option and has concluded that direct potable reuse is feasible. Based on this report and an assessment of the possible options for reuse, an alternative design has been developed integrating all levels of wastewater treatment.

The design integrates the different levels of wastewater treatment compared to the existing proposed design and is based the following points:

- Reuse will commence once the influent flows to the sewage treatment works reach 65 000 m^3/day, expected to be in 2012
- The future expansion of the sewage plant will provide two separate treatment process trains, the existing conventional activated sludge (CAS), and a new Membrane Biological Reactor (MBR).
- CAS will treat waste generated from the water reclamation plant, whilst MBR treats screened raw sewage and provides disinfected feed water to the plant
- The reclamation plant is comprised of 6 unit processes; cartridge filtration, nanofiltration, reverse osmosis, UV disinfection, stabilisation, and chlorination.
- Final product water will be blended with conventionally treated surface waters from the Gaborone water works, with a maximum 35% of the blended water being reclaimed.

The report concludes that this design is more cost effective resulting in an approximate saving of 15% on the overall costs over an 11-year period.

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