

The sustainability of indirect wastewater recycling at Atlantis, South Africa

Dr. Gideon Tredoux, CSIR, Principal Hydrogeochemist, Stellenbosch, South Africa

Coauthors: R Bishop, A Oosterhof, et al.

ABSTRACT

Managed aquifer recharge (MAR) using infiltration basins forms an integral part of the Atlantis Water Resource Management Scheme, which is situated on the semi-arid West Coast of South Africa, 50 km north of Cape Town. The water supply, consisting of natural and artificially recharged water, obtained from the local, unconsolidated coastal aquifer was intended as a temporary measure. However, due to the limited water resources in the region it is still the main source of potable water supplying in excess of 6 Mm³/a per annum to the town with over 240 000 residents and an industrial sector of 140 factories.

The system design allowed for all wastewater and urban stormwater runoff to be captured for recharge and recycling. In 1986 water quality considerations dictated that the system be redesigned such that industrial effluent is treated separately and only tertiary treated domestic wastewater is recycled. Treated wastewater is also reused for landscape irrigation. Modifications to the stormwater collection system separated out saline runoff from the noxious trade area and contaminated runoff from industries such as the foundry and diesel engine factory for disposal. Conversion of the last stormwater retention basin into an artificial reed bed also allows for filtering and sedimentation before the water reaches the recharge basin. The introduction of a second infiltration basin and separation of the high quality peak flow stormwater runoff from the higher salinity baseflow component further improves recharge water quality in critical parts of the aquifer.

The initial operation of the system introduced a large quantity of dissolved and particulate organic material into the infiltration basins, a significant proportion of which is still present in the subsurface. Iron clogging of boreholes is a widespread phenomenon of the production well fields, both in areas within and outside the influence of the infiltration basins. However, the MAR practice may be contributing to the problem. Redesign of the basins for alternative wetting and drying should alleviate both problems but the effect is only expected to become noticeable in the well field after a year or more. The closure of a waste disposal site in the town area was also directed at protecting the water resource and it is expected that the plume emanating from the area will become insignificant long before it reaches the well field area.

The paper investigates various aspects of the longer-term recharge of treated wastewater and urban runoff using "indicator" determinands while considering the varying quality of water recharged over more than two decades. It discusses the range of innovative measures taken to

improve the sustainability of the system and the effects thereof against the background of the need to make maximum use of the limited water resources in the region.