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Managed Aquifer Recharge (MAR) for the Management of Stormwater on the Cape Flats, Cape Town

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Abstract : The city of Cape Town in South Africa, has shown consistent economic and population growth in the last few decades and that growth is expected to continue to increase into the future. These projected economic and population growth rates are set to place additional pressure on the city's already strained water supply system. Thus, given Cape Town's water scarcity, increasing water demands and stressed water supply system, coupled with global awareness around the issues of sustainable development, environmental protection and climate change, alternative water management strategies are required to ensure water is sustainably managed. Water Sensitive Urban Design (WSUD) is an approach to sustainable urban water management that attempts to assign a resource value to all forms of water in the urban context, viz. stormwater, wastewater, potable water and groundwater. WSUD employs a wide range of strategies to improve the sustainable management of urban water such as the water reuse, developing alternative available supply sources, sustainable stormwater management and enhancing the aesthetic and recreational value of urban water. Managed Aquifer Recharge (MAR) is one WSUD strategy which has proven to be a successful reuse strategy in a number of places around the world. MAR is the process where an aquifer is intentionally or artificially recharged, which provides a valuable means of water storage while enhancing the aquifers supply potential. This paper investigates the feasibility of implementing MAR in the sandy, unconfined Cape Flats Aquifer (CFA) in Cape Town. The main objective of the study is to assess if MAR is a viable strategy for stormwater management on the Cape Flats, aiding the prevention or mitigation of the seasonal flooding that occurs on the Cape Flats, while also improving the supply potential of the aquifer. This involves the infiltration of stormwater into the CFA during the wet winter months and in turn, abstracting from the CFA during the dry summer months for fit-for-purpose uses in order to optimise the recharge and storage capacity of the CFA. The fully-integrated MIKE SHE model is used in this study to simulate both surface water and groundwater hydrology. This modelling approach enables the testing of various potential recharge and abstraction scenarios required for implementation of MAR on the Cape Flats. Further MIKE SHE scenario analysis under projected future climate scenarios provides insight into the performance of MAR as a stormwater management strategy under climate change conditions. The scenario analysis using an integrated model such as MIKE SHE is a valuable tool for evaluating the feasibility of the MAR as a stormwater management strategy and its potential to contribute towards improving Cape Town's water security into the future.

Keywords : managed aquifer recharge, stormwater management, cape flats aquifer, MIKE SHE
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