EXECUTIVE SUMMARY

Since promulgation of the National Water Act and the need to set aside water for aquatic ecosystems, it has emerged that surface - groundwater interaction is poorly understood and even more difficult to quantify. A research project was consequently undertaken to develop a prototype tool to:

- identify rivers in South Africa dependent on groundwater for sustaining baseflow, and
- develop methods and models to quantify the groundwater contribution to baseflow.

A prototype model was developed in a modular fashion to accommodate inclusion of results of parallel research being undertaken by the Department of Water Affairs and Forestry and the Water Research Commission. Using data sets generated during the Groundwater Assessment Phase II project, the Pitman model was modified to facilitate the quantification of the groundwater contribution to baseflow. This entailed consideration of recharge, groundwater discharge to streamflow and abstraction.

The revised Pitman model was then included in the SPATSIM software and tested in a number of quaternary catchments across South Africa. The model was calibrated against existing WR90 simulated monthly time series data. In general terms, the revised algorithms appeared to generate results that were intuitively realistic as well as replicate hydrographs produced using the original Pitman model while taking into account groundwater factors. Some problems were encountered in dolomitic catchments, but these are thought to be the result of the modeling approach used by WR90 and not the result of problems with the modified Pitman model.

Based on the calibration and testing of the revised Pitman model in 17 quaternary catchments, guidelines were developed for estimating the groundwater parameters used in the model. Incorporation of the modified Pitman model into the SPATSIM software has provided hydrologists with a useful tool to quantify surface - groundwater interaction at a catchment scale. Proper training in the use of the software is required yield reliable results.