

# In support of water-resource planning – highlighting key management issues using DRIFT: A case study

C Brown<sup>1\*</sup>, C Pemberton<sup>1</sup>, A Birkhead<sup>2</sup>, A Bok<sup>3</sup>, C Boucher<sup>4</sup>, E Dollar<sup>5</sup>, W Harding<sup>6</sup>,  
W Kamish<sup>7</sup>, J King<sup>1</sup>, B Paxton<sup>8</sup> and S Ractliffe<sup>8</sup>

<sup>1</sup> Southern Waters Ecological Research and Consulting, Zoology Department, University of Cape Town, PO Box 12414, Cape Town 8010, South Africa

<sup>2</sup> Streamflow Solutions, PO Box 889, Gonubie 5256, South Africa

<sup>3</sup> Anton Bok Aquatic Consultants, 5 Young Lane, Mill Park, Port Elizabeth 6001, South Africa

<sup>4</sup> Botany Department, University of Stellenbosch, Private Bag X1, Matieland 7602, South Africa

<sup>5</sup> ESJ Dollar Consulting, 40 Susan Crescent, Langeberg Heights 7570, South Africa

<sup>6</sup> DH Environmental Consulting, PO Box 5429, Helderberg 7135, South Africa

<sup>7</sup> Ninham Shand, PO Box 1347, Cape Town 8000, South Africa

<sup>8</sup> Freshwater Research Unit, Zoology Department, University of Cape Town, Private Bag, Rondebosch 7700, South Africa

## Abstract

The DRIFT (downstream response to imposed flow transformation) methodology was applied as part of a comprehensive Reserve determination study on the Olifants-Doring River, Western Cape, South Africa. DRIFT was used to provide flow scenarios, and descriptive summaries of their consequences in terms of the condition of the river ecosystem, for examination and comparison by decision makers, managers and users. The methods used and results obtained in that study are presented and discussed in the light of the study constraints of time and money, the lack of historical data, and the urgent need to provide clear, easily-understandable information on the consequences for the river ecosystem of various tradeoffs characteristic of water resource developments. The results indicated that abstracting during high flows in winter and river restoration work can have positive ecological and agricultural returns.

**Keywords:** environmental water requirements; Ecological Reserve; DRIFT; scenarios; river condition; tradeoffs

## Introduction

The South African National Water Act (NWA; No. 36 of 1998) is founded on the principle that National Government has overall responsibility for, and authority over, water-resource management for the benefit of the public without seriously affecting the functioning of the natural environment, i.e., sustainable utilisation of the resource. In order to achieve this objective, Chapter 3 of the NWA provides for the protection of water resources through the Ecological Reserve (NWA, 1998).

The Department of Water Affairs and Forestry (DWA) Directorate: Resource Directed Measures (D:RDM) is tasked with the responsibility of ensuring that the Reserve requirements, which have priority over other uses in terms of the NWA, are determined before licence applications are processed, particularly in stressed catchments. The Reserve refers to both the Ecological Reserve and the Basic Human Needs Reserve. The Olifants/Doring River catchment is deemed to be one such system and a comprehensive determination of the Reserve was therefore commissioned in 2003, and Southern Waters Ecological Research and Consulting were appointed to lead the technical aspects of the study.

The study as a whole encompassed separate flow determinations for the river, the estuary and the groundwater systems (Brown et al., 2003). This paper concentrates on the river system and outlines the approach used and results obtained, using

one of the study sites (Site 1) as an example. The results of the study are intended to support water-allocation planning, in accordance with the requirements of the NWA and the National Water Resource Strategy (DWA, 2002).

The process for determining the Ecological Reserve for river ecosystems is stipulated by DWA (DWA, 1999) and comprises eight steps:

- Step 1. Initiate the study
- Step 2. Define the resource units
- Step 3. Ecoclassification
- Step 4. Quantify ecological water requirement scenarios
- Step 5. Ecological consequences of flow scenarios
- Step 6. Decision-making process
- Step 7. Ecological RQOs
- Step 8. Operationalising the Reserve.

Step 1 is essentially an internal DWA process, where the applicability and limitations of different levels of Reserve determination are evaluated and a level appropriate to the study river decided on. The level chosen dictates, *inter alia*, the duration of the study, the disciplines represented, the intensity and frequency of data collection and the method used. In the case of the Olifants-Doring study, a comprehensive level of determination was decided on, which provided for a two-year study period and, for the river component, a team of specialists representing six disciplines, namely: hydrology, hydraulics, geomorphology, water quality, botany, macroinvertebrate ecology and fish ecology.

Step 2 involves the division of the study catchment into representative ecosystems, e.g., rivers, wetlands, estuaries or groundwater, and representative reaches within each of the ecosystems identified. For the Olifants-Doring study, this process

\* To whom all correspondence should be addressed.

☎ +27 21 4653135; fax: +27 21 4653901;

e-mail: [cbrown@southernwaters.co.za](mailto:cbrown@southernwaters.co.za)

Received 26 July 2005; accepted in revised form 19 December 2005.