

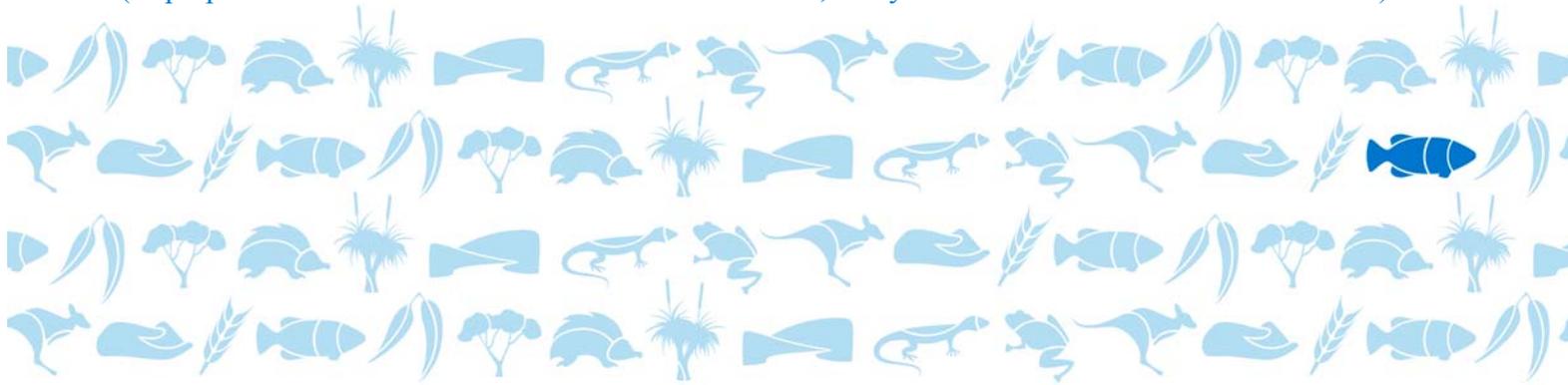
August 2007

South Australian Murray-Darling Basin Natural Resources Management Board

## INFORMATION PAPER 2

# ***THE CAPACITY OF THE GROUNDWATER RESOURCE TO MEET DEMAND***

(In preparation of the Water Allocation Plan for Peake, Roby and Sherlock Prescribed Wells Area)



**Government of South Australia**

South Australian Murray-Darling Basin  
Natural Resources Management Board



## INTRODUCTION

This paper, *Information Paper 2 'The Capacity of the Groundwater resources to meet Demand'* aims to introduce important concepts that will underpin setting limits to groundwater extraction. This paper follows *Information Paper 1 'Hydrogeology of the Peake, Roby and Sherlock Prescribed Wells Area'* which provided background information on hydrogeology of the area, describing the different aquifer systems, how these are recharged and how they function.

## DISCUSSION

### 1. Determining extraction limits

An assessment of the capacity of the groundwater resource to meet demand needs to take into account the following two issues:

- the impact of groundwater extraction on the groundwater resource; and
- the impact of extraction on all groundwater users. In the case of the Peake, Roby and Sherlock Prescribed Wells Area (PRS PWA), there are no identified environmental needs of the groundwater and consequently the impact on stock and domestic users becomes the main issue.

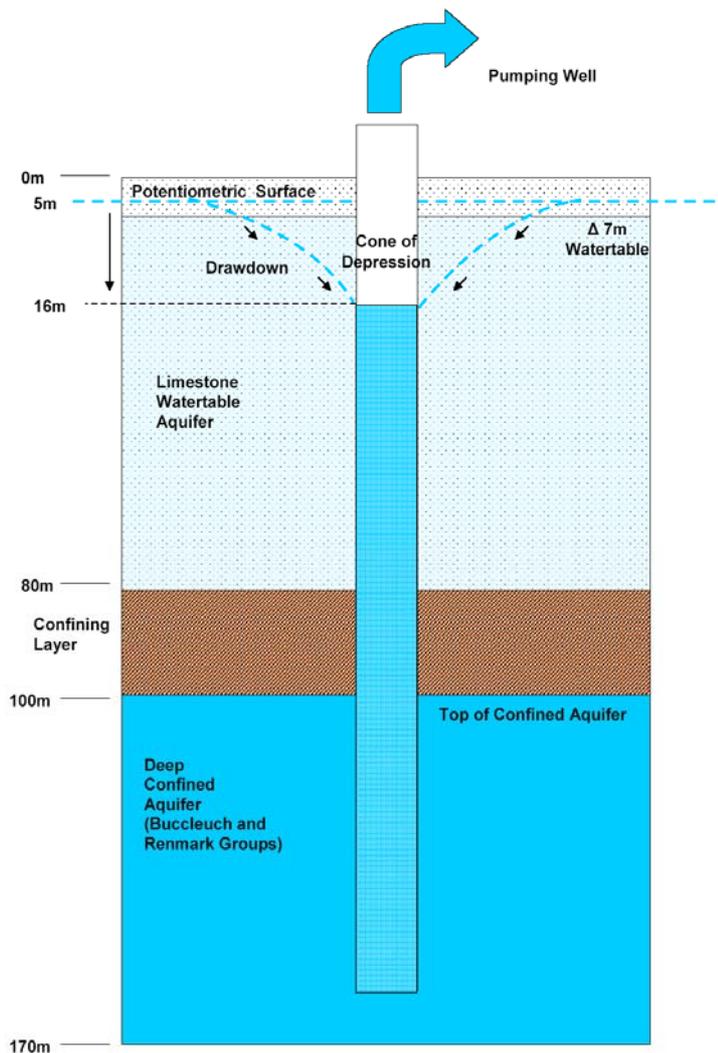
A groundwater resource has many users, environmental, social and economic. In order to manage the resource for current and future users it is important a balance is identified so that needs of all users are considered.

This is achieved by estimating an 'acceptable volume that can be extracted per year' or an 'extraction limit'. The estimation of the extraction limit will require some trade-off between the various users of the resource.

In the case of the PRS PWA, the additional groundwater extraction for irrigation has caused groundwater pressures to fall which has had an impact on the stock and domestic users.

The extraction limit will be an acceptable volume of extraction per year that is *acceptable* to irrigators and stock and domestic users, recognising that all groundwater extraction will have an impact on the groundwater system, especially in a confined aquifer.

## 2. Is there an unacceptable impact on the health of the groundwater resource?



**Fig 1 General Schematic of the Drawdown within the Confined Aquifer**

The groundwater pressures within the cone of depression, have not drawdown to below the top of the confined aquifer (**Fig 1**).

The current drawdown is relatively small when comparing it to the height of groundwater above the top of the confined aquifer. This indicates that the groundwater resource is *relatively* unaffected by current groundwater extraction.

There are some concerns regarding the potential for increasing salinity of groundwater due to extraction. The available monitoring data suggests this is unlikely to be due to leakage from the shallow aquifer (as shown in Fig 4 Information Paper 1).

However lateral migration of more saline groundwater, in the west, towards the eastern areas of lower salinity groundwater may occur. Further analysis is required to quantify this particular threat.

Overall, it is considered that the aquifer shows some resilience to the effects of current groundwater extraction.

However, extraction has impacted stock and domestic users by reducing groundwater pressures and stranding pump infrastructure.

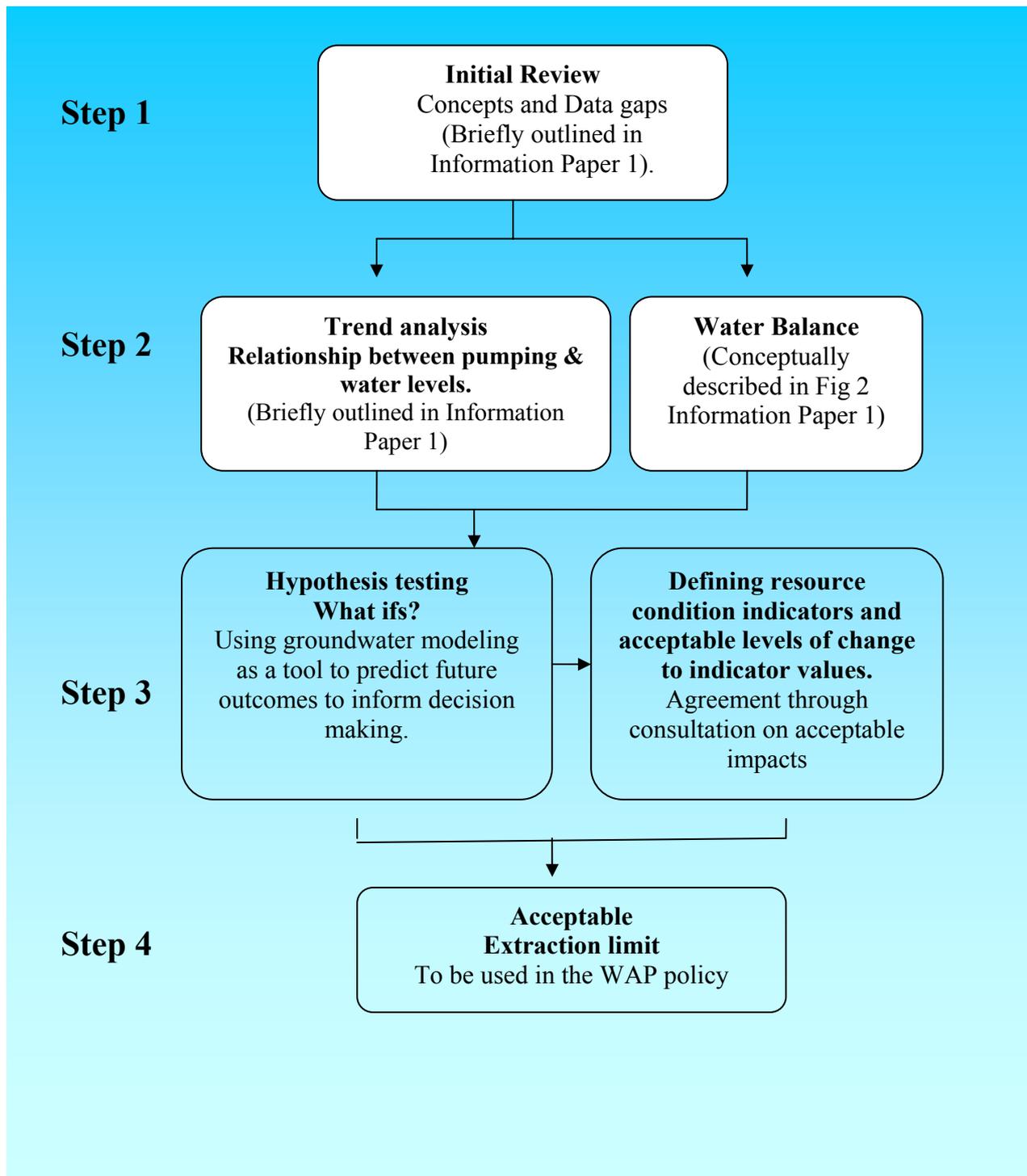
*The main questions for this water allocation plan are:*

*What is the:*

- *Acceptable quantity (volume) and rate (per year) of extraction for irrigation (which includes the associated social and economic development); and*
- *Acceptable level of impact on stock and domestic users?*

### 3. What process is used to determine the extraction limit?

Figure 2 outlines the process to quantify the acceptable extraction limit. The combination of scenario modelling and the definition of acceptable resource condition indicator values will enable quantification of the acceptable limit to groundwater extraction.



#### 4. What are resource condition indicators and acceptable values?

A *groundwater resource condition indicator* is a measurable groundwater parameter such as groundwater pressure, drawdown or groundwater salinity.

There is an *acceptable* level of change to selected indicators values that cannot be exceeded due to extraction of groundwater. For example, the resource condition indicator may be the long term drawdown (that is, maximum fall in groundwater pressures since 2002) and an example of the acceptable level of drawdown may be that which had occurred by March 2007.

The groundwater flow model can then be used to estimate the rate of groundwater extraction that can occur without the drawdown exceeding this acceptable value. Preliminary results of groundwater flow modeling will be used in the water allocation planning process. In this example, the extraction regime (rate and location of extraction) must be set so that groundwater pressures will not fall below the maximum drawdown observed between 2002 and 2007.

Other examples of resource condition indicators and acceptable values or change are:

- Groundwater salinity should not exceed X mg/L due to groundwater extraction.
- Groundwater pressures must recover to within X metres (or X%) of historic (pre - 2002) groundwater pressures.
- Seasonal drawdown should not to exceed the average drawdown observed in 2005/06 and 2006/07.

These are examples only and further discussion with stakeholders is required to develop a final set of indicators and acceptable values that can be used to quantify the extraction limit. It is likely that more than one indicator will be required.

There are some important principals involved in the definition of resource condition indicators and acceptable values. The resource condition indicators need to be spatially explicit. That is, they apply to a particular area or apply to a particular monitoring bore. For example, different drawdown limits may be set for different areas.

It is important that resource condition indicators and acceptable values are agreed to by stakeholders, for example not just irrigators and not just the stock and domestic users. The indicators and values must reflect a balance of economic development, protection of the resource and rights of stock and domestic users. Consideration also needs to be given to the issue of how to deal with the variability that will occur due to long term climate variability.

#### **RECOMMENDATION**

It is recommended that resource condition indicators and acceptable values be discussed and agreed and used as a basis for quantifying the agreed level of extraction. This will be the focus of a targeted workshop to be held in August 2007.