# 9. DATA MANAGEMENT AND ARCHIVING

In the absence of direct functional relationships between hydrology and ecological functioning, the Reserve determination process is heavily reliant upon expert judgement. It is also a process that is likely to continue to develop in the future, as well as one that will involve an increasing number of participants. It is therefore essential that the best use is made of past experience when undertaking Reserve determinations in the future and to achieve that goal requires establishing procedures for effective data management and archiving. There are several clear reasons to justify the need for Reserve process and data archiving:

- To be able to return to past determinations for checking and updating.
- To ensure that information is not lost during a long-term (> 1 year) determination.
- To ensure consistent dissemination of information between different groups involved in the Reserve process (DWAF Head Office, Regional Offices, Consultants, etc.).
- To be able to make use of past determinations to assist in future determinations in the same region. To use past determinations as training material for new participants in the process.
- To use past determinations to test new developments in the methodology.

There is a wide variety of information that is involved in Reserve determinations that varies from text type explanations, decisions and motivations, through time series data of Streamlow, to hydraulic cross-section data and tabulated results. The following list of examples indicates that developing a suitable method for storing such information is therefore not a simple and straightforward task:

- Hydrological time series data (historical, natural, present day and various Reserve scenarios) in monthly and daily formats
- Channel cross-section data tables
- Riparian vegetation and geomorphological cross-section data
- Hydraulic parameter data tables
- Pictures of IFR sites
- Stressor-Response relationships
- BBM tables of depths, flows and durations for several ecological categories
- Assurance tables of Reserve flows
- Present state scores for different ecological parameters
- DRIFT database information
- Site selection decisions
- Stakeholder decisions
- Maps of IFR sites, river channels, resource units, gauging stations, quaternary catchments, reservoirs and abstraction or return flow points, etc.
- Specialist starter document information

In terms of the numerical data (Streamlow, cross-sections, hydraulics, sediment, recommended flows, etc.) the most appropriate method for storage and archiving is one that also serves as an access source for any models or analysis programs that are likely to need the data. One example is the SPATSIM (Spatial and Time Series Information Modelling) software that is under development at the Institute for Water Research (IWR), Rhodes University. This system makes use of 'shape' files for storing spatial data

(points, polygons and lines) and database tables for storing other data (single values, text, tabular data, time series and graphic). These data are then linked through a set of data dictionaries that allow efficient data retrieval through the spatial interface. The software includes a number of built-in data management, analysis and display routines, as well as providing a link to additional software that can be developed and operated outside the main program. Many of the hydrological data tools involved in Reserve determinations have already been linked to SPATSIM, while others are in the process of being linked through various Water Research Commission projects. Several research groups are contributing to the developments including the IWR, IWRE, Water Systems Research Programme (University of the Witwatersrand), Southern Waters and the Freshwater Research Unit (University of Cape Town) and Ninham Shand.

It is the intention of the IWR and the WRC to start to make SPATSIM available for wider distribution and use during 2001. While there will be no purchase price, it is likely that some license costs will be involved (the package uses some software that requires application development license costs to be paid) and there will inevitably be costs associated with training that will probably have to be covered by the potential users.

This type of approach appears to offer some useful solutions and has the advantage of linking the data storage requirements with the data processing requirements for some components of the Reserve. However, there are still a number of outstanding issues that would need to be resolved:

- Which organisation should be the custodian of the main national database of information (presumably the RDM Office of DWAF)?
- How do various Reserve determination participants extract information from the database and what are the recommended procedures for archiving data after a new determination has been completed?
- How should the non-numeric (reports) data be stored and linked to the numeric information?
- How should other information that is in a fixed format (determined by the specific model or process that uses it or generates it) be linked? This issue relates to some existing methods that have established formats, such as WRYM and the databases associated with DRIFT.

One of the important considerations about data management and archiving is that the terminology and general procedures (not necessarily the specific methods) should remain relatively fixed once they have been established. If this does not happen then a large part of the archived information will lose its value or become confusing, particularly to new participants in the process. Specific reference has been made to this issue as there have been a number of changes to both terminology and accepted procedures in the recent past. It would be an advantage if this could now be stabilised without stifling future developments and improvements to the process and methodology.

The overall conclusion to this section of the manual is that some of the data management and archiving issues could be resolved quite quickly. However, there are others that require inputs from within DWAF, as well as a relatively wide range of Reserve determination specialists.