

**Independent  
Assessment of  
Jurisdictional  
Reports on the  
Environmental  
Achievements  
of the COAG  
Water Reforms**

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Technical Report 6/2001

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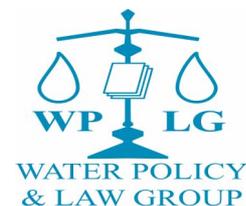


# Independent Assessment of Jurisdictional Reports on the Environmental Achievements of the COAG Water Reforms

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Technical Report 6/2001



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# 1. INTRODUCTION

## 1.1 Background to study

Driven by the broad agenda of the National Competition Policy and particularly the Council of Australian Governments' (COAG's) Water Reform agenda, Australia's water industry has undergone dramatic reform. The extent of reform is highlighted by the introduction of new or amended water legislation in all States and Territories.

The need for reform was motivated by the recognition that most of Australia's water resources were heavily committed and degraded. The reforms focused on the need to arrest further environmental degradation while providing for an efficient and sustainable water industry.

During 1999 the Cooperative Research Centre for Freshwater Ecology (CRCFE) prepared a report on the likely ecological outcomes of COAG's Water Reforms (Cullen et al. 2000)<sup>1</sup>. The report considered the question of whether the reforms were likely to lead to beneficial environmental outcomes, and focused in particular on the issue of allocations for the environment. The report recognised that reforms had taken longer than was originally envisaged and much was still to be implemented, although considerable energy and resources had been applied and substantial progress achieved. Nearly two years on, it is timely to revisit the ecological outcomes of the COAG Water Reform agenda.

This report, commissioned by Environment Australia (EA) and the National Competition Council (NCC), provides an independent assessment of the environmental achievements of the State and Territory Governments in implementing key requirements of the Water Reform agenda. This assessment has as its focus several key environmental aspects of water management including:

- ecological sustainability of new schemes;
- ecological sustainability of allocations for the environment;
- ecological sustainability of water trading;
- suitability of monitoring programs to address ecological impacts of water management;
- implementation of the National Water Quality Management Strategy; and
- scientific aspects of Integrated Catchment Management (ICM).

The assessment framework was developed in consultation with EA and was developed from the NCC's Third Tranche Assessment Framework<sup>2</sup> (Chapter 8: Water), which requires jurisdictions to demonstrate that beneficial environmental outcomes, or significant 'on-ground' performance, have been generated by the reforms. Many other water reform elements are raised in the Third Tranche Assessment Framework, including pricing and cost recovery and institutional arrangements. However, those reform issues are beyond the scope of this assessment.

The assessments included in this report are based on the Third Tranche Assessment Reports (Chapter 8: Water) prepared by the jurisdictions and submitted to the National Competition Council.

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<sup>1</sup> Cullen P., Whittington J. & Fraser G. (2000). *Likely Ecological Outcomes of the COAG Water Reforms*. CRC for Freshwater Ecology.

<sup>2</sup> NCC (2001) *NCP — Third Tranche Assessment Framework*. National Competition Council.

## 1.2 Assessment methodology

### 1.2.1 Assessment Criteria and Descriptors

The CRCFE developed the following list of Assessment Criteria and Descriptors (Table 1.1), in consultation with EA, to guide the assessment of the environmental achievements of the COAG Water Reforms. It addresses key ecological issues raised in the NCC Third Tranche Assessment Framework (Chapter 8: Water). It is our belief that the criteria and descriptors provide a transparent and consistent means of assessing jurisdictional performance in implementing particular environmental aspects of the Water Reform agenda.

Under direction from EA, we have relied on the NCC Third Tranche Assessment Framework to structure our appraisal. Hence, we have noted, but not considered, the contention by some jurisdictions that the reform obligations covered in the NCC framework expand the boundaries of the 1994 COAG Water Reform Framework.

**Table 1.1. List of Assessment Criteria and Descriptors developed by CRCFE to provide a framework for assessing the performance of jurisdictions in implementing key water reforms. Relevant NCC Third Tranche clauses are noted.**

<p>1. Ecological sustainability of new schemes or extensions to existing schemes:</p> <ul style="list-style-type: none"> <li>• Are assessments independent and based on best scientific practice?</li> <li>• Are assessments made prior to commencing the scheme or extensions to the scheme?</li> <li>• Are potential impacts on streamflow, riparian and floodplain condition taken into account in the planning and approval process?</li> <li>• Is the scale of the ecological assessment commensurate with the scale of the development — does the assessment extend downstream?</li> <li>• Are suitable mechanisms in place for monitoring impacts on the environment of new schemes or extensions to existing schemes?</li> </ul> <p>Relevant Clauses from the NCC Third Tranche Assessment Framework: <i>Clauses 3d(iii), 4f.</i></p>
<p>2. Ecological sustainability of allocation of water rights and allocations for the environment, with particular scrutiny of stressed or over-allocated systems:</p> <ul style="list-style-type: none"> <li>• Are allocations consistent with the <i>National Principles for the Provision of Water for Ecosystems</i> (ARMCANZ and ANZECC, 1996)?</li> <li>• Is the process consistent with the stressed systems identified in the Second Tranche report?</li> <li>• Is the process for establishing environmental allocations documented and implemented?</li> <li>• How appropriate are the methods for assessing the environment's water needs?</li> <li>• Is there a scientific process for identifying environmental flows?</li> <li>• Does the framework provide an appropriate balance between the environment and other users?</li> <li>• Is the framework likely to maintain, enhance or restore river health?</li> <li>• Does the system of environmental water allocations recognise the whole water cycle?</li> <li>• In relation to the magnitude of the task, have jurisdictions made substantial progress towards providing allocations for stressed and other rivers?</li> <li>• Will allocations be reviewed after five years?</li> </ul> <p>Relevant Clauses from the NCC Third Tranche Assessment Framework: <i>Clauses 4a,b,c,e.</i></p>

**Table 1.1 continued**

<p>3. Ecological sustainability of water trading:</p> <ul style="list-style-type: none"> <li>• How are the ecological and hydrological constraints of catchments assessed and are they considered?</li> <li>• Are ecological constraints considered when determining cross-border trading?</li> <li>• Are there suitable mechanisms in place for monitoring the environmental outcomes of water trading?</li> </ul> <p>Relevant Clauses from the NCC Third Tranche Assessment Framework: <i>Clauses 5a,c.</i></p>
<p>4. Suitability of assessment programs to address ecological impacts of water management:</p> <ul style="list-style-type: none"> <li>• Are there State-wide programs for assessing river health?</li> <li>• Where rivers cross borders, is the assessment framework consistent and coordinated between States?</li> <li>• Is there a formal process for adaptive management?</li> <li>• Are the monitoring programs and State-wide assessments underpinned by the best available scientific knowledge?</li> </ul> <p>Relevant Clause from the NCC Third Tranche Assessment Framework: <i>Clause 4d.</i></p>
<p>5. Scientific and technical aspects on issues pertaining to water quality:</p> <ul style="list-style-type: none"> <li>• Is water quality assessment by the States linked to land use planning and management?</li> <li>• Have environmental values and associated water quality guidelines or objectives been set?</li> <li>• Are State-wide water quality monitoring programs in place?</li> <li>• Are the programs spatially and temporally adequate?</li> <li>• Are there established State-wide assessment procedures for interpreting water quality data?</li> </ul> <p>Relevant Clause from the NCC Third Tranche Assessment Framework: <i>Clause 8b.</i></p>
<p>6. Scientific and technical aspects on issues pertaining to Integrated Catchment Management (ICM):</p> <ul style="list-style-type: none"> <li>• Does the ICM framework provide suitable protection of rivers having high environmental value?</li> <li>• Does the ICM approach use the best available scientific and technical information?</li> </ul> <p>Relevant Clauses from the NCC Third Tranche Assessment Framework: <i>Clauses 6a,b, 8c.</i></p>

### **1.2.2 Approach to assessment**

There were three components to this assessment:

- The jurisdictional reports to the NCC's Third Tranche Assessment were assessed using the criteria described in Table 1.1 above. The key findings of this assessment are summarised in Chapter 2.
- An assessment of the legal regulatory and institutional frameworks supporting the ecological outcomes of the water reforms, written by Associate Professor Jennifer McKay, Director of the Water Policy and Law Group, University of South Australia, is provided in Chapter 3.
- The detailed assessments of the individual jurisdiction submissions are presented in Chapter 4. As part of the process, advice was also sought from the following panel regarding on-ground activities in each jurisdiction: Dr Peter Davies, Peter Cottingham, Dr Terry Hillman, George Begg, Dr Jenny Davis and A/Prof George Ganf. Errors and omissions are, however, the responsibility of the authors.



## 2. NATIONAL OVERVIEW AND RECOMMENDATIONS FOR PROGRESS

### 2.1 Expected progress

Based on the criteria and descriptors outlined in Table 1.1 the CRCFE has developed a list of activities and outcomes that we consider to represent appropriate progress in meeting the jurisdictions' environmental commitments to water reform. This list reflects the NCC's Assessment Framework which seeks evidence that water reforms are generating 'real benefits' to the environment. The NCC categories are shown in italics; the CRCFE list of indicators of achievement are shown for each one. These indicators have been used to assess the achievements of each jurisdiction.

#### 2.1.1 *Ecological sustainability of new schemes*

- Jurisdictions should be able to provide evidence that assessments of ecological sustainability are made prior to the commencement of works and that the assessment is both independent and based on best scientific practice.
- Where new schemes have not occurred since the implementation of the water reforms, jurisdictions should have processes in place for assessment.
- Assessments of ecological sustainability for new or enlarged schemes must consider the potential impacts on hydrology, biota, water quality and habitat (in-channel, riparian zone and the floodplain).
- Assessment should be commensurate with the scale of the development and ensure that downstream impacts are considered, even when those impacts may occur in other jurisdictions.
- If permission is granted for the development of a new or enlarged scheme then appropriate programs should be in place to measure the environmental impacts of these works. The assessment program should provide appropriate information to give clear direction for improved management if necessary.

#### 2.1.2 *Ecological sustainability of allocations for the environment*

- Stressed or over-allocated systems should be defined and all river systems in each jurisdiction should be assessed against these criteria.
- Allocations of water for the environment should have commenced, particularly in stressed and over-allocated river systems.
- The conceptual framework within which allocations for the environment are made should be consistent with the *National Principles for the Provision of Water for Ecosystems* (ARMCANZ and ANZECC 1996)<sup>3</sup>.
- Methods for the assessment of water for the environment should be based on sound scientific knowledge recognising the whole water cycle — including interactions between groundwater and surface waters, overland flows, wetlands and estuaries.

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<sup>3</sup> ARMCANZ and ANZECC (1996). *National Principles for the Provision of Water for Ecosystems*. Sustainable Land and Water Resources Management Committee Subcommittee on Water Resources, Occasional Paper SWR No. 3. Agriculture and Resource Management Council of Australia and New Zealand, and Australian and New Zealand Environment and Conservation Council.

- Programs should be in place for assessing the ecological outcomes of environmental allocations. At a minimum, this requires that assessment programs suitable for monitoring the ecological outcomes of water management are now in place.
- Monitoring programs have to be appropriately scaled (spatially and temporally) to measure ecological outcomes of these allocations.
- Allocations for the environment should be reviewed after five years, with processes in place for the review to inform and, if appropriate, alter future allocations and river management.

### ***2.1.3 Ecological sustainability of water trading***

- Clear environmental guidelines for water trading should now be in place.
- Environmental guidelines should include a clear statement of the methods for determining the hydrological and ecological constraints of the source and destination of the water trade.
- Environmental guidelines should provide an unambiguous description of the environmental opportunities of water trading, with mechanisms to ensure they occur.
- The ecological impacts of water trading should be monitored and assessed and a process should be in place which allows the results of this assessment to be used to improve the efficiency and ecological sustainability of water-trading guidelines.

### ***2.1.4 Suitability of monitoring programs for addressing ecological impacts of water management***

- Each jurisdiction should now have a clear and documented assessment of the ecological condition of *all* of its water resources.
- Adequate programs should now be in place to assess the ecological outcomes of water and catchment management.
- Specific programs for assessing the ecological outcomes of environmental allocations need not be undertaken across the whole jurisdiction, but should at least be undertaken for representative rivers (i.e. river systems that have similar hydrology, ecology and environmental allocations).
- Where river systems cross State boundaries, jurisdictional assessment programs must be compatible, and ideally should be integrated.
- To provide a comprehensive assessment of ecological condition and the drivers of this, such programs should assess hydrology, habitat, water quality and biota.

### ***2.1.5 Implementation of the National Water Quality Management Strategy***

- There should be evidence of a State-wide approach to water quality management that adopts the scientific framework outlined in the *Australian Water Quality Guidelines for Fresh and Marine Waters* (ANZECC 1992)<sup>4</sup>.

### ***2.1.6 Scientific aspects of Integrated Catchment Management (ICM)***

- ICM should be underpinned by sound scientific and technical knowledge. This is particularly of concern for community- and stakeholder-driven decision making — groups that under

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<sup>4</sup> ANZECC (1992). *Australian Water Quality Guidelines for Fresh and Marine Waters*. National Water Quality Management Strategy. Australian and New Zealand Environment and Conservation Council.

normal circumstances would have limited access to this knowledge and that are generally not easily able to make informed judgements about what is ‘best available knowledge’.

## 2.2 Summary of progress to date

Across Australia, significant progress has been made in the area of legislative reform designed to improve the ecological outcomes of water management. New or amended legislation is essentially in place in all jurisdictions. The big challenge now is to continue (and in some cases begin) implementation of this reform and to demonstrate outcomes of these actions.

Progress in allocating water for the environment in an adaptive management framework is less than satisfactory in a number of jurisdictions. Most jurisdictions have not been able to provide evidence of ecological outcomes of delivering water for the environment for a number of reasons, including:

- slow and sometimes absent progress in implementation of key reform programs;
- poorly developed tools for demonstrating ecological outcomes;
- long time lags between implementation and measurable outcomes; and
- under-funded or non-existent programs for assessing ecological outcomes.

This report provides an overview of jurisdictional progress, using our description of expected progress (section 2.1) as a benchmark. Only the information contained in the jurisdictional submissions to the NCC’s Third Tranche Assessment has been used in developing this overview. We acknowledge that there may be additional programs and actions undertaken by the States and Territories that are not discussed in their submissions to the NCC.

**For a number of jurisdictions, the reports contained insufficient information to allow us to make a fully informed assessment against some criteria. In our opinion, the lack of detailed reporting requirements in the NCC’s Third Tranche Assessment Framework has contributed to this situation. For future assessments we recommend that the NCC’s Assessment Framework should provide clear advice on reporting requirements.**

## 2.3 Ecological sustainability of new schemes or extensions to schemes

Jurisdictions should be able to provide evidence that assessments of ecological sustainability are made prior to the commencement of works for new schemes and that the assessment is both independent and based on best scientific practice. While it is acknowledged that there may not have been new schemes to assess since the implementation of water reforms, the processes for assessment should be in place.

**On the whole, legislation supports the requirement for appropriate ecological assessment of new schemes. However, jurisdictional submissions provided insufficient evidence for appraising the adequacy of these assessments.**

At a minimum, jurisdictions should in future provide details on:

- who makes the assessment;
- the knowledge base used to make the assessment;
- the methods used to make the assessment;
- any review (e.g. peer review, inter-agency review, etc.) of the assessment; and
- on-going assessment of the impacts of the scheme.

### **2.3.1 Development of farm dams**

Because of their small size and the false perception that they have little environmental impact, farm dams have in the past fallen outside the provisions and regulations of water resources, planning, and environmental protection Acts. However, some jurisdictions (e.g. Victoria and NSW) now recognise their cumulative impact on catchment hydrology and ecology, and are implementing procedures and policies for assessing and regulating farm dam developments.

**The remaining jurisdictions should review their approaches to considering the cumulative impacts of farm dams on stream health when granting development approval for new dams.**

### **2.3.2 Ecologically sustainable yields**

The recent Australian Water Resources Assessment (NLWRA 2000)<sup>5</sup> provides information on the derivation and distribution of *sustainable yields* for rivers. Sustainable yield is defined as:

The limit on potentially divertible surface water that is allowed to be delivered from a resource after taking account of environmental values and making provision for environmental water needs.

Each jurisdiction has used different methods (and sometimes multiple methods — e.g. Victoria) for calculating this value. Sometimes ‘sustainable yield’ was simply calculated as current (capped) diversions, e.g. for Victoria, SA and NSW rivers in the Murray-Darling Basin. In these and other instances the environmental needs were ‘guesstimates’. For example, the NT Government estimated the environmental flow requirement to be 80% of flow in the humid zone and 95% of flow in the arid zone while the Tasmanian Government estimated 30% of annual flow to be sufficient to maintain good habitat (with higher and lower percentages for summer and winter flows).

Because of the potential impact on management of the ‘sustainable yield’ concept, serious attention needs to be given to ensuring that a scientifically robust assessment of environmental flow allocations is made before this type of sustainable yield data is used for management purposes.

**We have serious concerns with the way ‘sustainable yield’ has been developed without consideration of environmental needs or river health, and do not believe this material presented in the National Land & Water Resources Audit provides an adequate basis for decision making.**

### **2.3.3 In-stream extractive activities**

Extraction of sand and gravel from the bed and banks of rivers is still widely allowed across Australia. There are likely to be few situations where the habitat disruption caused by this type of extractive activity is ecologically sustainable. A notable exception would be the restoration of in-stream habitat by extraction of sand accumulated in rivers with catchments degraded by clearing.

**All river bed extractive activities should undergo a detailed environmental assessment process prior to commencement.**

Similar restrictions should be placed on the removal of large woody debris from rivers (fallen trees and logs).

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<sup>5</sup> NLWRA (2000). *Australian Water Resources Assessment 2000. Surface water and groundwater — availability and quality*. National Land & Water Resources Audit.

## 2.4 Ecological sustainability of allocations for the environment

### 2.4.1 *Development of a national approach*

Each jurisdiction has independently developed its own approaches for assessing and providing environmental allocations.

**Most jurisdictions, apart from NT, have made significant progress in developing scientifically robust approaches for determining environmental flow allocations.**

Assessing the environment's water requirements is a difficult area scientifically, and the wide range of approaches taken also reflects the ambiguous direction from the scientific community on this issue. The need for a coordinated national approach was expressed previously in *Progress in Implementation of the COAG Water Reform Framework (1999) Report to COAG (High Level Steering Group on Water) — Part 2 Jurisdiction Reports*, where it was noted that the

... most difficult and pressing need to achieve the COAG water reforms is a national approach and methodologies for the determination of environmental flows.

A national approach has not been forthcoming and therefore jurisdictions have had to develop individual approaches. This prolonged development phase has contributed to the slow implementation of programs.

**The development of approaches for assessing environmental allocations would have benefited significantly from strong and informed national leadership. Unfortunately this did not occur and consequently the Commonwealth missed an opportunity to set the agenda for delivery of environmental flows and is partially responsible for the generally slow implementation nationally.**

A national forum, comparing and contrasting the different approaches taken by the jurisdictions for the assessment of allocations for the environment, would be useful. Involvement of national organisations such as EA, appropriate CRCs, CSIRO and agencies involved with water management is recommended. The outcomes of the forum need to be effectively coordinated and disseminated. There is a role for a national council of experts to facilitate this.

### 2.4.2 *Delivery of environmental allocations*

There has been quite varied progress by jurisdictions in delivering allocations for the environment.

**No jurisdiction has provided environmental water allocations for all of its river systems. While most jurisdictions have made some progress (NSW, VIC, WA, QLD, ACT, SA), considerably more needs to be done; for example, the unregulated systems of NSW, more than half the rivers of QLD, the River Murray in all States, significant parts of VIC and SA, and all of TAS and NT.**

### 2.4.3 *Need for accountability and transparency*

There remains a need for greater transparency in the assessment process developed in most jurisdictions. Well-detailed methods, published and available to all interested parties, are needed so that individual judgements and critiques of the process can be undertaken.

**The transparent methodologies and approaches used by Queensland and NSW are commended; further progress in this area by other jurisdictions is encouraged.**

#### **2.4.4 Five year review**

We recommend that allocations for the environment be reviewed after five years. Five years provides some certainty to consumptive users but recognises the limited knowledge base upon which environmental allocations have been made. Most jurisdictions have opted for five-year reviews (except WA — at least every seven years; and NT — not defined). Also, while there will be five-year reviews in NSW and Queensland, there is less scope for altered management until the tenth-year review.

Granting volumetric entitlements for greater than five years reduces jurisdictional capacity to increase allocations for the environment if a review recommends so. In this context it remains to be seen how the five-yearly review of allocations proposed in NSW will be incorporated into altered management practices when entitlements have been granted for ten years.

**For future assessments, increases in environmental allocations for stressed rivers (either purchased or acquired) should be a major performance criterion.**

#### **2.4.5 Integrated monitoring of ground- and surface-water flows**

WA, SA, VIC and NSW are relatively advanced in their consideration of groundwater systems. However, further attention and guidance needs to be given to this area at a national level.

Methods for the assessment of water for the environment should be based on sound scientific knowledge and should recognise the whole water cycle — including interactions between groundwater and surface waters, overland flows and wetlands and estuaries. In particular, a previous assessment of the ecological outcomes of water reforms (Cullen et al. 2000)<sup>6</sup> stated that:

Generally there appears to be poor integration of the management of groundwater systems and surface water systems despite their acknowledged interconnectedness.

There is little knowledge available on the contribution of groundwater to river flows in individual river valleys and this lack of knowledge is reflected in most jurisdictional submissions. States have not invested sufficiently to provide this information.

There are growing concerns about the poor quality of hydrological data in Australia. For example, the Australian River Condition report undertaken as part of the National Land & Water Resources Audit has found that only 30% of Australia's river length has sufficient surface hydrological data to allow assessment of river hydrological condition.

**There is a critical need for improved stream flow gauging, and progress by the jurisdictions in the monitoring and modelling of groundwaters and surface waters is urgently required.**

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<sup>6</sup> Cullen P., Whittington J. & Fraser G. (2000). *Likely Ecological Outcomes of the COAG Water Reforms*. CRC for Freshwater Ecology.

#### **2.4.6 Overland flows**

River systems relatively unimpacted by water resource development in ephemeral arid-zone and dry tropical systems remain vulnerable to floodplain and riparian developments. Overland flows are critical to the ecological functioning of these systems. Further consideration needs to be given to protecting these systems from inappropriate floodplain and riparian development, particularly in QLD, WA, SA and NT. At the time of the Second Tranche Assessment, Cullen et al. (2000) stated that:

... there is considerable difficulty in defining channels and therefore floodplains, in some of Australia's lowland rivers. This has led to uncontrolled harvesting of floodwaters in several jurisdictions with unknown but potentially serious ecological consequences.

This issue is now widely recognised and for the most part is being addressed.

**However, in some jurisdictions what appears to be ecologically unsustainable development of levees and off-channel storages has continued since the Second Tranche Assessment. This situation should be addressed as a matter of priority.**

#### **2.4.7 Barriers to fish passage**

Barriers to fish (and other biota) will significantly reduce the effectiveness of environmental flows. While there is no doubt that the issue of in-stream barriers to fish movement is well recognised by Australia's river managers, the allocation of funds to support fish passage construction projects lags behind community expectations of fish population rehabilitation.

**Recent funding announcements by the Murray-Darling Basin Ministerial Council in this area are a welcome development and similar State- and Federally-funded initiatives are recommended in other catchments.**

### **2.5 Assessment of the ecological sustainability of water trading**

COAG recognises water trade within strict environmental constraints as a mechanism for improving efficiency within the irrigation industry by encouraging water use that achieves its highest value. It must be recognised, however, that individual water trades have an impact at both the source and the destination, and can simultaneously produce net positive, negative or neutral environmental outcomes.

Some environmental benefits may accrue when water use moves from degraded lands to areas more suited to ecologically sustainable irrigation (e.g. areas with appropriate soil types, drainage, etc.). However, care must be taken not to deliver 'on land' environmental benefits at the expense of further degrading the 'in-stream' environment through inappropriate flow management.

These potential environmental benefits will not necessarily accrue unless there are strict environmental guidelines in place. It is critical that adequate processes are in place to ensure that the environment is not worse off because of water trading, and, further, that opportunities to improve environmental outcomes through water trading are actively pursued.

**The jurisdictional reports provide few examples of adequate progress in the development of trading rules. Notable exceptions are certain districts within Victoria and the MDBIC Interstate Trade Pilot Scheme.**

### **2.5.1 Level of intrastate water trade**

The maturity of the water markets varies across jurisdictions. Water trading in some form has been established for some years in NSW, Victoria and South Australia, particularly within irrigation regions, and more recently between irrigation regions. There has been some water trading in Tasmania in the last water year. Water trade has occurred in Queensland, but new rules for trading are currently being developed as part of the Resource Operations Plans in various basins.

Trading in Western Australia can now occur; however, legislation has only recently been passed and no trades have taken place. Water trade has not occurred in Northern Territory and is unlikely to do so until water is scarce. Water trade has not occurred in ACT and no rules are in place.

**Given the current extent of trade, and the likely increases in the near future, we expected considerably more information on the ecological rules for water trade.**

### **2.5.2 Interstate trade**

The MDBC Pilot Project for water trade is located in the Mallee Region of NSW, Victoria and SA. The Pilot is limited to permanent trade in high security water held by private diverters. The aim of the Pilot is to find solutions to water trade that do not result in increased salinity, reductions in environmental flows or degradation of the natural environment.

A recent review of the Pilot Project (Young et al. 2000)<sup>7</sup> found that trade is increasing the value and economic efficiency of water use in the Murray-Darling Basin and that environmental flow impacts of interstate water trading have probably been positive (we note though, that the ecological assessment was not detailed). However, the review also concluded that interstate trading can be expected to have a negative impact on river salinity unless salinity prevention obligations are enforced.

**Apart from the MDBC Pilot Project, mechanisms for assessing the impacts and benefits of interstate trade are poorly developed. The lessons learnt in the MDBC Pilot Project should be considered when developing interstate rules for other regions.**

**Due to the complexity of the environmental outcomes, further case studies on the environmental impacts of water trading are needed.**

### **2.5.3 Monitoring environmental impacts of water trade**

From the information presented, it can be concluded that no jurisdiction has in place sufficient (if any) environmental monitoring to detect the environmental impacts (positive or negative) of water trade. Those jurisdictions that claim to monitor impacts of water trading are generally relying on existing programs. Of the programs currently in place, the IMEF program (Integrated Monitoring of Environmental Flows) in NSW is the only one that is likely to be spatially and temporally comprehensive enough to detect environmental outcomes of water trade. However, this program has a restricted geographic extent.

The MDBC Pilot Project indicates that even when trade is supported by a seemingly rigorous set of environmental considerations that result in improved environmental flows, river salinity may still

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<sup>7</sup> Young M., MacDonald D.H., Stringer R. & Bjornlund H. (2000). *Inter-State Water Trading: A Two-Year Review*. CSIRO Land and Water.

increase. This provides a salient lesson — that without adequate data or river models, predicting the complex interactions between trade, river flows, water quality and river health is, at best, educated guesswork.

The recent and widespread easing of restrictions to water trade (e.g. the separation of water from property rights, etc.), coupled with the increasing demand for water is likely to lead to significant increases in volumes traded in the short term.

**It is a concern that few jurisdictions have the mechanisms in place to monitor the environmental outcomes of water trade. Unless sufficient monitoring and benchmarking begins now, impacts will not be detected and significant opportunities to tailor trading rules to improve ecological condition will be lost. Worse, water trading may lock in further degradation.**

## **2.6 Suitability of monitoring programs to address ecological impacts of water management**

### ***2.6.1 Importance of assessment programs***

Through various research and monitoring programs, our current knowledge of the relationships between river flow and ecological health is improving, but it is far from complete. Consequently, it is critical that allocation of water be undertaken in an adaptive framework. In this context, three key ingredients for adaptive management are:

- an understanding of the current condition of the water resource;
- assessment of the outcomes of current management; and
- use of this information to improve future management.

These are also core requirements of Principle 8 of the *National Principles for the Provision of Water for Ecosystems* (1996). A comprehensive assessment program should consider at least the biota, water quality, flow regime and habitat.

An assessment of these elements provides an indication of the ecological outcomes of catchment management (the impacts on the biota) as well as a diagnostic function, by providing an insight into the causes of these outcomes (water quality, hydrology and habitat).

**Only NSW, Victoria and Queensland have made adequate progress in this area.**

### ***2.6.2 National programs***

All States are contributing to the National Land & Water Resources Audit's Assessment of River Condition (ARC) in the Theme 7 Ecosystem Health section. This program is providing an overview of river condition across the river basins containing intensive agriculture, and is scheduled to report in late 2001. The ARC provides assessment of biota, hydrology, water quality, physical habitat and catchment disturbance, and reports at the reach and basin scales. The ARC is designed to be both a measure of river condition and a tool for identifying management options for rivers.

All States have contributed to the National River Health Program. The objective of the environmental flows part of this program was to undertake a comprehensive assessment of the health of inland waters to provide a sound information base on which to establish environmental flows. Through this program, the first Australia-wide assessment of health of rivers was conducted at approximately 6000 sites across Australia using the AUSRIVAS assessment tool that was developed within this program. These data have also contributed to various State and Territory programs and have formed an integral part of the Assessment of River Condition. The central management, coupled with State/Territory implementation, is critical to uniform assessment, analysis and reporting. However, no mechanism is in place for the ongoing support and maintenance of this program. This would be a small expense shared across the jurisdictions.

**The value of national programs in providing a nationally standardised assessment will be severely compromised without adequate central management. This is a clear role for the Federal Government.**

The importance of these national programs is that they encourage the adoption of standardised methods that produce comparable outputs across the jurisdictions (while recognising the need for some regional flexibility and adaptation), and allow comparisons of the outcomes of river management between jurisdictions.

**The Federal Government is to be commended for taking a lead role in coordinating river health monitoring programs through its coordination of the National River Health Program and the National Land & Water Resources Audit. It is yet to be seen how the results of these programs are incorporated into jurisdictional management.**

The Murray-Darling Basin partner governments are currently determining the implementation of the Sustainable Rivers Audit for the rivers of the Murray-Darling Basin. If adopted, the proposed framework will provide a comprehensive Murray-Darling Basin-wide assessment of river condition based on measurements of biota, hydrology, water quality and habitat.

### ***2.6.3 State and Territory programs***

The IMEF program in NSW is the most intensive broad-scale program currently being undertaken by the jurisdictions. It is designed to monitor the impact of environmental flows in seven key regulated rivers of the Murray-Darling Basin. However, less than half of NSW river length is assessed by this program.

Victoria has developed and implemented the spatially comprehensive Index of Stream Condition (ISC). The ISC is a significant program that provides a comprehensive overview of the condition of the State's streams and rivers. However, the ISC was not designed specifically to detect impacts of environmental flow provisions and may have shortcomings if used for this purpose.

Queensland is currently developing assessment programs that, once implemented, are likely to be comprehensive. As part of the Water Management Planning process, comprehensive condition assessments have been undertaken in some basins.

It appears that comprehensive programs are planned for South Australia. However, until the Catchment Water Management Plans are implemented, these programs cannot be assessed. The remaining jurisdictions have not implemented adequate assessment programs, and there is little, in

the information presented, to suggest that coordinated on-going comprehensive assessments of river condition will be undertaken in the foreseeable future.

**In several jurisdictions (except VIC, NSW and part of QLD) comprehensive on-going assessment of river condition is yet to commence. The assessment that has been implemented is generally insufficiently resourced.**

## **2.7 Implementation of the National Water Quality Management Strategy**

**Overall, the assessment indicates that the jurisdictions have achieved a substantial level of implementation of the COAG initiatives in relation to water quality.**

There has been wide adoption of integrated catchment management approaches to water quality management, including the setting of the environmental values to be protected or restored, and the water quality objectives associated with securing these goals. In most instances, the translation of catchment management plans and water quality assessment was linked to action plans. Universally, these action plans embraced a range of measures, including education, economic incentives, planning and regulatory controls, and infrastructure provision.

Significant difficulties were experienced in assessing the adequacy of the scope of water quality monitoring programs implemented by the jurisdictions to assess performance against the water quality objectives. This difficulty resulted from the very limited reporting by the States on their water quality monitoring programs. Information on water quality monitoring provisions for assessing the performance of action measures was also limited.

**In future, the jurisdictions should be asked to provide more detailed information on the scope of water quality monitoring programs established to assess delivery of water quality objectives, with particular attention to spatial coverage and frequency of sampling.**

## **2.8 Aspects of Integrated Catchment Management (ICM)**

### ***2.8.1 Catchment planning in a basin-wide context***

Apart from many smaller coastal catchments, most river catchments in Australia are nested as part of a larger river basin network. It is important that the location, and hydrological and ecological connections, of a catchment in the broader basin context are taken into account during the development of land and water management plans. Basin-wide organisations, such as the Murray-Darling Basin Commission, Lake Eyre Basin Ministerial Forum or the Fitzroy Basin Association, clearly play a key role providing basin-wide coordination.

**Further development of basin-wide coordination and/or planning groups across each of Australia's major drainage basins is encouraged.**

### ***2.8.2 Holistic, scientific oversight of catchment planning and on-ground actions***

In most jurisdictions, the need for an integrated catchment management process involving all catchment stakeholders has been recognised. Several jurisdictions have well-developed ICM frameworks in place across the jurisdiction. To manage catchments and all their streams, wetlands

and riparian lands effectively, requires decisions and actions to be taken across a broad range of spatial scales, including:

- catchment scale — e.g. environmental flow allocations, land use management, flood management;
- stream/reach scale — e.g. weir and dam management, river health assessments, riparian zone management, fish restocking; and
- habitat/patch scale — e.g. resnagging, gully erosion control, channel form rehabilitation.

In an ecological and hydrological sense, all scales are linked: actions taken at one scale influence ecological outcomes at the other scales. Many important on-ground rehabilitation and assessment projects run by community groups and government agencies are funded or activated at the smaller stream/reach or habitat scales (e.g. Landcare, Waterwatch, some Natural Heritage Trust projects).

**Continuing attention needs to be given to ensuring that these valuable activities are directed towards sub-catchments and streams that provide the greatest benefit to the health of the entire catchment and its waterways. This needs to be recognised by State and national funding agencies.**

### ***2.8.3 What is the appropriate scale for coordinating catchment activities?***

No clear vision seems to have emerged yet on this issue in Australia. While there is certainly an understanding that the ‘catchment’ is an appropriate management ‘unit’, the nested nature of sub-catchments, catchments and basins (as described above) presents managers with a perplexing challenge. Often, different management issues are best addressed at quite different scales.

It is interesting to note that a small jurisdiction such as Tasmania has 28 separate catchment groups, while the much larger NSW now has only 18 catchment management boards (CMB). (There are, however, many more river management committees (RMC) and groundwater committees, sometimes with more than one RMC in a CMB area.) Clearly the higher number of catchment committees in Tasmania reflects the vastly different land forms of (inland) NSW and Tasmania. However, the challenge to management is to balance the hydrological and ecological considerations with community expectations and practicalities regarding logistics and funding.

**A nationally over-sighted assessment of the advantages and disadvantages of different spatial scales for coordinating catchment management activities would be extremely beneficial.**

## 3. LEGAL REGULATORY AND INSTITUTIONAL FRAMEWORKS

### 3.1 Introduction

This report will consider the six Assessment Criteria and Descriptors for each of the six Australian States and two Territories. The report will only refer to the current ‘Water Laws’ in each State. This work looks only at the new Water Acts in each jurisdiction. These Acts do not cover the entire area of water management in any State of Australia. Many other Acts are relevant: notably the Environmental Protection Acts and the Acts allowing for development of land in each State. Until each jurisdiction has a single Act, all relevant legislation needs to be included. Indeed until roads, land use and the many other decisions are made on a catchment basis, the water concerns and management of water to achieve the criteria will be difficult.

In some cases the new Water Act does not cover one of the six criteria; in those cases a note will show which Act covers that issue.

### 3.2 The new Water Acts — legal issues

#### 3.2.1 *Unclear meaning*

While it is tempting to think that a new Act rewrites the laws totally, that is not the actual situation.

Most of these laws are very recent and so no cases exist on them. However, cases would exist on the preceding statutes, and such cases may transform the legal meaning given to the words in that jurisdiction. In addition, there exists the likelihood of High Court Cases such as *Gartner v. Kidman* (1962) 108 CLR 12 which would influence the direction of a decision in the future on the meaning of the words in the statutes, such as ‘watercourse’. In addition to High Court decisions, there will also be pre-existing Acts within the same jurisdiction which would influence decisions, such as Native Title legislation, Environmental Protection Laws, Mining Laws, Acts Interpretations Acts and the Laws of Evidence, to name a few. In addition, later Acts in the same jurisdiction will influence the subsequent interpretation of these Acts. In Victoria and South Australia, pre-existing Groundwater-sharing Acts still prevail over the new Acts.<sup>8</sup> Finally Australia has entered into many treaties and these may also influence decisions on the meaning of the concepts used in the various statutes.

This work will comment on the words chosen in the Acts. In many cases the Acts have tried to cover the field and reduce the impact of previous decisions.

#### 3.2.2 *Type of obligation imposed*

In general this report has focused on the nature of the obligation imposed on the relevant body, i.e. whether they **must** do, or **may** do something. Detailed reference has been made to the Object section of each Act, as the words there will be used to interpret the Act in the event of a dispute. The Objects of an Act are an important tool in interpretation especially in Acts of the type of all of these Acts; that is, Acts to promote a public benefit. Hence, any ambiguity would probably be

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<sup>8</sup> section 6 of the *Water Act Victoria 1989* as amended

construed in favour of protecting the resource. Indeed, generally speaking, all these Acts have reversed the ordinary presumption that Acts should be construed in favour of the person losing a right. These Acts all aim to make protection of the water resource the first goal; however, each Act includes five goals in its objects and one of these is fairness or equity.

Each Act in its objects sets out a number of contradictory goals. In short the five major themes are:

- to apply ecologically sustainable development;
- to protect and restore watercourses;
- to enhance the social and economic benefits to the State;
- to involve the community in; and
- to provide for orderly and equitable<sup>9</sup> sharing of water.

**Such themes are in themselves contradictory and so the community needs to look to the regulatory approach and institutional frameworks set up in order to be able to make choices when conflicts arise. Merely making it compulsory to consider them all cannot satisfy these aims. Judges will incline towards fairness in interpreting these Acts despite the preponderance in some of them towards the environment. So the fairness criterion may tend to undermine some of the ecological objectives unless it is removed, as in South Australia.**

### 3.2.3 *The six criteria*

The six Assessment Criteria have been interpreted in this way:

1. Are the legislative, regulatory and institutional frameworks appropriate to ensure delivery of ecologically sustainable outcomes in relation to the development of new schemes (dams) or extensions to existing schemes (irrigation for agriculture)?
- 2a. Are the legislative, regulatory and institutional frameworks appropriate to ensure delivery of sustainable ecological outcomes in relation to water allocations for the environment?  
and
- 2b. Do the Acts recognise the environment as a legitimate user of water?
3. Are the legislative, regulatory and institutional frameworks appropriate to ensure delivery of ecologically sustainable outcomes in relation to water trading?
4. Are the legislative, regulatory and institutional frameworks appropriate to ensure delivery of effective programs and indicators of river health?
5. Have jurisdictions adopted a State-wide approach to water quality management (including legislative, regulatory and institutional arrangements) consistent with the *Implementation Guidelines* for the NWQMS (1998)<sup>10</sup>?  
and
6. Are the legislative, regulatory and institutional frameworks appropriate to ensure delivery of Integrated Catchment Management practices?

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<sup>9</sup> South Australia does not require 'equitable'.

<sup>10</sup> ANZECC and ARMCANZ (1998). *Implementation Guidelines*. National Water Quality Management Strategy paper no. 3. Australian and New Zealand Environment and Conservation Council, and Agriculture and Resource Management Council of Australia and New Zealand.

### 3.3 Australian Capital Territory

The *Water Resources Act* was passed in 1998 but amended in 1999.

#### **3.3.1 Assessment Criteria 1 — Legislative, regulatory and institutional frameworks to ensure ecologically sustainable outcomes in relation to the development of new schemes or extensions to existing schemes**

The Objects of the Act are set out in its section 3. These are:

- (a) to ensure that the use and management of the water resources of the Territory sustain the physical, economic and social well-being of the people of the Territory while protecting the ecosystems that depend on those resources; and
- (b) to protect waterways and aquifers from damage, and, where practicable, to reverse damage that has already occurred; and
- (c) to ensure that the water resources are able to meet the reasonably foreseeable needs of future generations.

This is a broad Objects clause which does elevate the environmental objective. Environmental flow is defined in section 5 and guidelines in section 9. These sections also state that the Authority **must** prepare guidelines for ascertaining the flow necessary to maintain aquatic ecosystems; however, the Authority must take into account the environmental, economic and social impact of the guidelines. The community must be consulted on the guidelines sections 8 to 10.

The Authority has a **must** obligation in section 19 and again in section 20(1) to prepare a plan which **must** include:

- (a) a description of the water resources of the Territory including the flows required to meet the environmental needs of individual waterways or aquifers or parts of individual waterways or aquifers; and
- (b) the proposed water allocations for the next succeeding 10 years; and
- (c) water allocations to be created for urban water supply, industry and other uses; and
- (d) action to be taken by the Authority to manage water resources of the Territory.

#### **3.3.2 Assessment Criteria 2 — Ecological sustainability of water allocations for the environment**

All water allocations are subject to conditions and the Minister is obliged to take into account the matters in section 29 before deciding whether or not to grant an allocation:

- (a) the availability of water in the area; and
- (b) the existing and likely future demand for water in the area in question; and
- (c) the environmental flow guidelines for the waterway or aquifer in question; and
- (d) any agreement entered into by or on behalf of the Territory with the Commonwealth, a State or another Territory concerning the sharing of water; and
- (e) any other matter the Minister or the Authority, as the case may be, considers relevant.

**This last subsection is very useful from an ecological perspective.**

Licences can be made subject to time conditions in section 35 and the applicants' 'environmental record in the ACT and elsewhere' is also relevant to the decision to grant a licence (section 35(9)). **This is an important power but will require good records.**

### ***3.3.3 Assessment Criteria 3 — Ecologically sustainable development and water trading***

Transfer of allocations is permitted under section 31 only with approval from the authority. If the allocation has been made under a plan (above) then ecological considerations have been included. The transfer must not be approved until the Authority is satisfied that the water will be used by the transferee for the same purpose, section 37, and again the transferee's environmental record is relevant, see section 37(4).

### ***3.3.4 Assessment Criteria 4 — Legislative, regulatory and institutional frameworks to ensure the delivery of effective monitoring programs for river health***

Section 4 imposes powers on the Authority, one of which is to keep the state and condition of the water resources under review (Subsection (a) and 99(d)) to compile and maintain up to date information relating to the water resources of the Territory.

These are **must**-type obligations. This is further reinforced in section 17 where the Authority is again obliged to 'ensure as far as possible' that a continuous program for the assessment of water resources of the ACT is carried out. The Authority is then given a further series of powers and may install equipment on private land as in Northern Territory (identical provision).

### ***3.3.5 Assessment Criteria 5 — Adoption of water quality guidelines***

Section 14(1) (g) imposes the function on the Authority to implement national water resource measures made under national scheme laws or inter-governmental agreements relating to water resources management. This is the ideal clause to insert and it is likely that the Commonwealth would see this as a model for the States. This would oblige the National Water Quality guidelines to be followed.

### ***3.3.6 Assessment Criteria 6 — Integrated Catchment Management***

There is no mention of this term; however, the objects and the plans require an integration of other demands.

### 3.4 New South Wales

The New South Wales Act, the *Water Management Act 2000*, is a major revision of old legislation dating from 1912 and is comprehensive. It is a well-drafted Act and is supported by procedures to apply the Act.

#### 3.4.1 *Assessment Criteria 1 — Ecologically sustainable outcomes for development of new schemes or extension of schemes*

The above is proposed to be achieved by the setting of a broad plan (see section 6) referred to as the State Water Management Outcome Plan. The Plan furthers the objects of the Act and the Water Management Principles in section 5. Neither of these sections uses the words ‘Ecologically sustainable development’. Section 5 (2) sets out the general principles and it is an important discretion to add that a decision-maker must look at the cumulative impacts of water management licences and approvals. Hence, this factor becomes relevant and a judge or other empowered decision-maker can use it to deny a licence.

**Ecologically sustainable development is not defined in the Act. Hence sections 3, 5 and 6 are to substitute for it.**

The Act sets out water management areas in section 11: these are smaller subsets.

Section 12 gives the Minister power to appoint a Committee to do certain tasks, and indeed two or more Committees can be appointed, as long as their tasks do not overlap. This is curious and, on the face of it, **will not promote a sound basis for integrated planning**, despite the Objects clause section 3 and sections 5 and 6. Section 14 requires a Management Committee to carry out the task for which it has been appointed; also it **may** be empowered to generate an entire plan for water management, review a plan or report to the Minister. If it does take on the broader tasks then it must use the principles of ecologically sustainable development (section 14 (3)). As noted, the Act does not define this term. It would seem that the Parliament thought that no-one in the community would agree to be on a Management Committee if they **had** to draft a plan, and so have gone about it this ‘back-door’ way — **unlikely to lead to comprehensive plans**.

Section 34 says that a Management Plan for a water management area **may** contain provisions which identify zones where development should be controlled in order to minimise harm or to minimise the threat to the floodplain management provisions of the plan. The plan may also include control of developments and plan to encourage the abandonment of existing uses that cause harm to water. The words are given the same meaning as in the *Environmental Planning and Development Act 1979*.

#### 3.4.2 *Assessment Criteria 2 — Sustainable ecological outcomes in relation to water allocations for the environment*

The New South Wales Act clearly provides water allocations for the environment in a general power in section 8. This power requires water to be classified into one of three classes under environmental water rules which are to be established for all the water sources in the State by a Plan as soon as practicable. Water source is given a very broad meaning in the dictionary at the end of the Act. It means:

- (a) any river, lake or estuary, or

(b) any place where water occurs naturally on or below the surface of the ground; and includes the coastal waters of the State.

The three classes of environmental water are:

- (a) water that is committed for fundamental ecosystem health at all times, and may not be taken or used for other purposes (environmental health water);
- (b) water that is committed for specified environmental purposes at specified times or in specified circumstances, but may, at other times and in other circumstances, be taken and used for other purposes (supplementary environmental water); and
- (c) water that, pursuant to an access licence, is committed for specified environmental purposes, either generally or at specified times or in specified circumstances (adaptive environmental water).

This is a clear classification of the types of environmental water but will require the plan to be operational before it has any effect. This regime does clearly recognise the environment as a user of water.

### ***3.4.3 Assessment Criteria 3 — Ecological sustainability and water trading***

The Act sets up an Access Licence regime in Part 2A. An Access Licence entitles its holder to a specific share and to take water, and may specify the times and rates and place (section 56). Assuming section 8 has been applied, then these criteria will be satisfied. The particular strategies embodied in the legislation with respect to water trading do not add much to section 8. These are found in section 53 which talks about harvestable rights and section 56 which describes access licences, section 57 which describes categories of licence, which includes high to low security licences, and section 58 which sets out priorities between different classes of access licences in the event of a shortage.

### ***3.4.4 Assessment Criteria 4 — Effective monitoring programs and indicators of river health***

The monitoring program is described as offences for breaches of the Act which amount to breaches of the plans above and breaches of the licensing provisions. If a management plan is created the content of it is highly specified in section 35. It must have:

- (a) a vision statement;
- (b) objectives consistent with the vision statement;
- (c) strategies for reaching those objectives; and
- (d) performance indicators to measure the success of those strategies.

In these, (c) and (d) would require specification of monitoring methods.

Such onerous requirements may make it hard for the Government to find persons willing to serve to draft such plans.

### ***3.4.5 Assessment Criteria 5 — Water quality***

There is a general obligation in section 5(c) which states: ‘... the water quality of all water sources should be protected and wherever possible enhanced’.

The water return flow rules deal with the quality of the water in section 75, which provides for the regulations to determine the criteria. There is no test in the Act as to quality and no mention of quality at all except in section 16(1) (d) which requires any plan to be consistent with Government

policy for water quality. This would be read as to incorporate the Commonwealth guidelines as varied from time to time as other Commonwealth and State laws would make those binding. So whilst not specified, the National Water Quality standards would be applicable.

#### ***3.4.6 Assessment Criteria 6 — Integrated catchment management***

The problems discussed in assessment Criteria 1 would seem to limit this. The concept is not defined in the Act and can only hope to be achieved if the plans above are comprehensive.

Once a draft five-year Strategy for Water Management in New South Wales exists then this may be more possible. Other Acts are relevant here too; for example, the *Environmental Planning and Assessment Act 1979* (EP&A Act).

### 3.5 Northern Territory

The Water Act was passed in December 2000.

#### 3.5.1 *Assessment Criteria 1 — Legislative, regulatory and institutional frameworks to ensure ecologically sustainable outcomes in relation to the development of new schemes or extensions to existing schemes*

The Act does not have an Objects clause but rather defines the beneficial uses of water; section 4 the interpretation section. These are:

- (a) agriculture — to provide irrigation water for primary production including related research;
- (b) aquaculture — to provide water for commercial production of aquatic animals;
- (c) public water supply — to provide source water for drinking purposes delivered through community water supply systems;
- (d) environmental — to provide water to maintain the health of aquatic ecosystems;
- (e) cultural — to provide water to meet aesthetic, recreational and cultural needs;
- (f) manufacturing industry — to provide water for secondary industry including related research; and
- (g) riparian — to provide water for the purposes permitted under sections 10, 11 and 14.

This is an object clause of the standard format emphasising use of water with the one environmental clause. Sections 10, 11 and 14 give rights to owners to take water analogous to stock and domestic rights.

**The Act does not oblige the Minister or Controller to balance environmental with other uses but gives the power (sections 22 and 23) to declare beneficial uses in a water control district (see Assessment Criteria 2).**

The Act has a pollution focus and these rather curious monetary definitions of environmental harm. The definition of material environmental harm means environmental harm that:

- (a) is not trivial or negligible in nature;
- (b) results or is likely to result in not more than \$50,000 being spent in taking appropriate action to prevent or minimise the harm or rehabilitate the environment; or
- (c) results in actual or potential loss or damage to the value of not more than \$50,000.

Environment means all aspects of the surroundings of man, including the physical, biological, economic, cultural and social aspects.

Serious environmental harm is that requiring more than \$50,000 being spent and

- (a) damages an aspect of the environment that is of high conservation value or of special significance; or
- (b) is irreversible or otherwise of a high impact or on a wide scale.

The penalties for these breaches include a cleanup cost but in addition the penalties are trivial in amount — \$500.

#### 3.5.2 *Assessment Criteria 2 — Ecological sustainability of water allocations for the environment*

The Minister has power under section 22 to declare a water control district and then declare the beneficial uses of water in that district. Water allocation plans **may** be made for these water control districts and if so the plan **must** ensure:

- (a) water is allocated within the estimated sustainable yield to beneficial uses;
- (b) the total water use for all beneficial uses is less than the sum of the allocations to each beneficial use;
- (c) the right to take or use water, under a licence granted, is able to be traded in part or full;
- (d) the full cost for water resources management is recovered through administrative charges.

This appears to answer these criteria **as long as plans are drawn up and implemented**.

### **3.5.3 Assessment Criteria 3 — Ecologically sustainable development and water trading**

The Controller has power to authorise, amend or modify water trading and other licences such as water exploration licences. The Controller **may** consider these issues. **The may is weak, given the tough nature of the issues below** (once again it is too early to see how this power has operated in practice):

- (a) the availability of water in the area in question;
- (b) the existing and likely future demand for water for domestic purposes in the area in question;
- (c) any adverse effects likely to be created as a result of activities under the permit, licence or consent on the supply of water to which any person other than the applicant is entitled under this Act;
- (d) the quantity or quality of water to which the applicant is or may be entitled from other sources;
- (e) the designated beneficial uses of the water and the quality criteria pertaining to the beneficial uses;
- (f) the provisions of any agreement made by or on behalf of the Territory with a State of the Commonwealth concerning the sharing of water;
- (g) existing or proposed facilities, on or in the area of, the land in question for the retention, recovery or release of drainage water, whether surface or sub-surface drainage water;
- (h) the adverse effects, if any, likely to be created by such drainage water resulting from activities under the licence on the quality of any other water or on the use or potential use of any other land;
- (i) relevant land use objectives under the Planning Act; and
- (j) all other matters the Controller considers relevant in making the decision or which he or she is required by or under any other law in force in the Territory to take into account.

These provisions all seem to have a predominantly ‘use’ rather than ‘environment’ bias, although section 4d above would also need to be considered.

The environmental criteria as discussed above to the allocation of water licences and transfers are allowed under section 92 with no further environmental consideration.

### **3.5.4 Assessment Criteria 4 — Legislative, regulatory and institutional frameworks to ensure the delivery of effective monitoring programs for river health**

Section 34 is a comprehensive requirement on the Controller to ensure as far as possible that a continuous program for the assessment of water resources is carried out including the investigation, collation and analysis of data concerning the occurrence, volume, flow characteristics, quality, flood potential and the use of water resources. The Controller is also given power in section 35 to install equipment on private land and also in section 79.

### ***3.5.5 Assessment Criteria 5 — Adoption of water quality guidelines***

The Act has a clear section devoted to water quality guidelines from section 72 onwards. The section reposes enormous discretion in the Administrator of the NT (Controller) or delegate to declare the water quality standards in relation to waste or water. Then all licence holders must reach that standard. If an action is carried out with approval under the Waste Pollution Act then this does not offend the Water Act. Whilst the national standards are not referred to it would be difficult for an Administrator to deviate from them. However, it would be a question of constitutional law as to who could enforce the action to get the standard to be closer to the national standard.

### ***3.5.6 Assessment Criteria 6 — Integrated Catchment Management***

Section 90 requires the Controller to have regard to the Planning Act when determining water licences and rights of use of water.

### 3.6 Queensland

The Water Act was enacted on 13 September 2000; however, some of it is deemed to have commenced in July 2000 when Sun Water (the rural provider) was corporatised. Finally, in September 2000, guidelines were introduced in relation to the financial and economic assessment of new water infrastructure. Queensland is in the unusual situation of having a history of the big 18 local governments providing about 80% of water connections in Queensland.

#### *3.6.1 Assessment Criteria 1 — Legislative, regulatory and institutional frameworks to ensure ecologically sustainable outcomes in relation to the development of new schemes or extensions to existing schemes*

The Act has a Preliminary to the second chapter, which amounts to an Objects clause. This Preliminary sets out that the purpose of the Act is to advance sustainable management and efficient use of water and other resources by establishing a system for the planning, allocation and use of water. The next section defines ‘Sustainable management’ and then the term ‘efficient use’ as used in the definition of sustainable management is also defined. Finally, on its own, principles of ‘ecologically sustainable development’ are defined. This definition incorporates the precautionary principle<sup>11</sup> and hence is very modern and robust and other Cases from other jurisdictions will be persuasive in ensuring this gets the widest possible interpretation in the event of a court decision. Section 12 states that if a function or power is conferred on an entity, that entity must perform the function or exercise the power in a way that advances this Chapter’s purpose, that is incorporates these three definitions. This is a broad requirement on the entities to advance a broad environmental purpose. The definitions appear to be all encompassing.

For the reader’s convenience the definitions are set out below.

#### *Sustainable management*

Sustainable management is management that:

- (a) allows for the allocation and use of water for the physical, economic and social well-being of the people of Queensland and Australia within limits that can be sustained indefinitely;
- (b) protects the biological diversity and health of natural ecosystems; and
- (c) contributes to the following—
  - i) improves the planning confidence of water users now and in the future regarding the availability and security of water entitlements;
  - ii) the economic development of Queensland in accordance with the principles of ecologically sustainable development;
  - iii) maintaining or improving the quality of naturally occurring water and other resources;
  - iv) protecting water, watercourses, lakes, springs, aquifers, natural ecosystems and other resources from degradation and, if practicable, reversing degradation that has occurred;
  - v) Aboriginal interests;
  - vi) providing for the fair, orderly and efficient allocation of water to meet community needs;
  - vii) increasing community understanding of the need to use and manage water in a sustainable and cost efficient way;
  - viii) encouraging the community to take an active part in planning the allocation and management of water;
  - ix) integrating administration of this Act with other natural resources Acts.

<sup>11</sup> Almost verbatim from the 1992 intergovernmental agreement

*Principles of ecologically sustainable development:*

- (a) decision making processes should effectively integrate both the long-term and short-term economic, environmental, social and equitable considerations;
- (b) if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;
- (c) the present generation should ensure the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;
- (d) the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making;
- (e) recognition of the need to develop a strong, growing and diversified economy that can enhance the capacity for environmental protection;
- (f) decisions and actions should provide for broad community involvement on issues affecting them.

Section 35 requires that the Minister must plan for the allocation and sustainable management of water to meet Queensland's future water requirements, including, for example, the protection of natural ecosystems and security of supply to water users. The CEO must provide information for planning purposes. The Minister may then prepare a water plan under section 38 for any part of Queensland.

**3.6.2 Assessment Criteria 2 — Ecological sustainability of water allocations for the environment**

The environment is recognised as a legitimate user of water as above in the definition above of sustainable management in (c) (iii) and (c) (iv).

Environmental Flow objectives are specified in the Act to be relevant criteria in creating plans in section 46(3) as the plans provide a framework for water allocation. However, environmental flow is only one of the criteria, as the Minister must consider cultural, economic, environmental and social requirements (section 47g). Environmental flow objectives are defined in the dictionary to mean, for a water resource plan, a flow objective for the protection of the health of natural ecosystems for the achievement of ecological outcomes.

**3.6.3 Assessment Criteria 3 — Ecologically sustainable development and water trading**

The water trading provisions are found in section 70 onward. A person proposing to use water for irrigation must have a water and land management plan and such plans must conform to guidelines if these are set out by the Minister (sections 72 and 73). There are some exemptions to the requirement to have a plan. Once a plan exists then resource operations plans and operations licences will be issued and old water licences will be converted into water allocations (section 94). Then in section 94(b) dealings with water allocations can be registered.

Section 98 gives power for the Minister to set up a plan which may limit the ability to trade water between different locations in or outside Queensland or for different purposes. In any conflict, the Plan prevails over any licence (section 125).

The registration details required for water allocations are comprehensive requiring details of the purpose for which the water may be taken. At all times any transfer is subject to the conditions set out in section 134. These include that the transfer is compatible with environmental flow objectives and water allocation security objectives, and is in the public interest, and the transfer will not significantly affect water entitlement holders, resource operations licence holders or natural ecosystems in an adverse way. This reinforces the Chapter 2 provisions in Assessment Criteria 1 above. The same rules apply for a lease of a water allocation.

#### ***3.6.4 Assessment Criteria 4 — Legislative, regulatory and institutional frameworks to ensure the delivery of effective monitoring programs for river health***

Operationally, the Minister is required to collect data in order to be able to set the plans in place to meet the multiple objectives. See section 47. This requirement one would expect would lead eventually to an effective scheme of information gathering. However, in common with all Acts, this Act, on the face of it, does not specify how resources are to be allocated. However, such a bold and clear obligation would leave the Minister open to a review of his decisions if he had not collected enough adequate river flow data. Indeed the Minister must give public notice of his intention to draft a plan in an information report under section 39. Part of this report must include the ‘Proposed arrangements for technical assessment using best scientific information available and relevant to the preparation of the plan’. The contents of the final plan are described in section 46 and these require the Minister to ‘state the water and natural ecosystem monitoring requirements to assist in assessing the effectiveness of the proposed management strategies’.

#### ***3.6.5 Assessment Criteria 5 — Adoption of water quality guidelines***

There is no reference to the National Water Quality Guidelines in the main text of the Act, nor in the definitions. However, in the event of a dispute, these guidelines would be used as defacto standards as the obligation of an entity would be to provide water that is fit for the purpose. The Department of Health is responsible for the regulation of drinking water and it is stated that a review of the Health Act may incorporate the national guidelines.

#### ***3.6.6 Assessment Criteria 6 — Integrated Catchment Management***

This is not specifically mentioned in the Act either; however, it is likely that the Chapter 2 provisions adequately cover this, as do the provisions about plans.

### 3.7 South Australia

South Australia was the first State to pass the new law to comply with the COAG requirements, and it produced a second State water plan in 2000. This plan is very comprehensive.

#### *3.7.1 Assessment Criteria 1 — Legislative, regulatory and institutional frameworks to ensure ecologically sustainable outcomes in relation to the development of new schemes or extensions to existing schemes*

The Objects (section 6) are to establish a system for the use and management of the water resources of the State,

- (a) that ensures that the use and management of those resources sustain the physical, economic and social well-being of the people of the State and facilitate the economic development of the State while:
- i) ensuring that those resources are able to meet the reasonably foreseeable needs of future generations; and
  - ii) protecting the ecosystems (including their biological diversity) that depend on those resources; and
  - iii) that, by requiring the use of caution and other safeguards, reduces to a minimum the detrimental effects of that use and management.

In subsection (b) all persons involved in administration of the Act, which includes Local Councils, need to:

- i) maintain or improve the quality of naturally occurring water with resulting benefits to other natural resources of the State including the land and its soil, native vegetation and native animals; and
- ii) protect watercourses, lakes, surface and underground water from degradation, and where practicable, to reverse degradation; and
- iv) keep the State and condition of water resources of the State under review; and
- v) identify alternative sources of water and facilitate the use of water from those sources; and
- vi) encourage members of the community to take an active part in planning....; and
- vii) promote public awareness....; and
- viii) integrate, as far as practicable, the administration of this Act and other legislation dealing with natural resources.

#### *3.7.2 Assessment Criteria 2 — Ecological sustainability of water allocations and allocations for the environment*

Watercourses are either prescribed or not prescribed in sections 7 and 8. There is an environmental test to be satisfied by persons taking water from a prescribed watercourse. A licence (section 9) is needed for a prescribed watercourse and the watercourse would be subject to a comprehensive plan.

**For a non-prescribed watercourse, the test (in section 7(3)) is much less onerous, and does not appear to offer clear means for protecting the environment.**

It states that a person must not take water if to do so:

- (a) would detrimentally affect the enjoyment of the amenity of water in a watercourse or lake by the occupier of the land.

The licencing system involves holding allocations and taking permits, and the Minister's decision must not be at variance with the relevant plan.

### **3.7.3 Assessment Criteria 3 — Legislative, regulatory and institutional frameworks to ensure the ecological sustainability of water trading**

Transfer of licences is covered in Division 3 of the Act. All transfers are subject to the relevant plan and the Minister has power to refuse a transfer to a person who has committed an offence against the Act. (section 38(5)). The Minister has power to reduce the water allocation amount of the transferred licence (section 39) and this discretion is exercised on the basis of the public interest (section 41).

### **3.7.4 Assessment Criteria 4 — Legislative, regulatory and institutional frameworks to ensure delivery of effective monitoring programs and indicators of river health**

Section 6, the Objects, states this clearly: to keep the state and condition of water resources of the State under review. There is no limitation on these words so the Minister **must** do it.

Section 92 also specifies the content of plans for prescribed resources and this must address:

3(a)

- i) the quality and the quality of the water comprising the water resources of the Catchment Board; and
- ii) the health of the ecosystems that depend on that water; and
- iii) assess the need for water of those ecosystems.

A plan done for the Onkaparinga Catchment Board does not have a complete assessment of the water needs of aquatic animals such as fish and invertebrates nor flora. It does include terrestrial animals.

### **3.7.5 Assessment criteria 5 — Adoption of national water quality guidelines**

Not mentioned specifically, but any application would refer to these standards as these represent best practice. Quality of water is often mentioned, such as in the obligations under the plans to monitor the quantity and quality of water (section 92(f)).

### **3.7.6 Assessment Criteria 6 — Legislative, regulatory and institutional frameworks to ensure delivery of Integrated Catchment Management**

Section 6, the Objects, states this clearly but with the limitation of as far as practicable:

- ix) to integrate, as far as practicable, the administration of this Act and other legislation dealing with natural resources.

This practicable limitation means the assessment by the Minister that he/she preferred to spend the limited amount of money he/she has on other reports, etc., would make him/her immune from review. **It is generally the case that decisions of the Minister which are optional cannot be reviewed.** You cannot say he/she should do this if it is a discretion or that he should spend the money in this way.

### 3.8 Tasmania

The *Water Management Act 1999* has one of the best sets of provisions addressing the six assessment criteria. The Act is clearly embedded in a State-wide Resources and Management and Planning System, and all legislation has common and inter-related objectives on sustainability and environmental management. This means that many of the definitions of environmental harm, environmental improvement plan and material environmental harm have the same meaning as in other Acts such as the *Environmental Management and Pollution Control Act 1994*. This is a good idea, to promote consistency.

The State Government has initiated a Water Development plan and this is due for completion in mid-2001. The objective of the plan is set out in the Act, which is to

provide a strategic context for sustainable water use and development by analysing strategic issues, highlighting strategic choices and providing a framework for Government and community action.

#### 3.8.1 *Assessment Criteria 1 — Ecologically sustainable outcomes for development of new schemes or extension of schemes*

The Minister is bound to make decisions to achieve these objectives. The Act abolishes all pre-existing rights to the taking of naturally occurring water and vests all rights in the Crown to be administered according to the Act (section 8).

The objectives of the Act (section 6) are comprehensive and are to:

- (a) promote sustainable use and facilitate economic development of water resources; and
- (b) recognise and foster the significant social and economic benefits resulting from the sustainable use and development of water resources for the generation of hydro-electricity and for the supply of water for human consumption and commercial activities dependent on water; and
- (c) maintain ecological processes and genetic diversity for aquatic ecosystems; and
- (d) provide for the fair, orderly and efficient allocation of water resources to meet the community's needs; and
- (e) increase the community's understanding of aquatic ecosystems and the need to use and manage water in a sustainable and cost effective manner; and
- (f) encourage community involvement in water resource management.

All entities involved in the administration of the Act must perform a function, or exercise the power in such a manner as to further the objectives above.

These objectives of this Act are set clearly in the context of the broader resource management and planning system in Tasmania which is set out in Schedule 1 to the Water Management Act. Schedule 1 also includes a comprehensive definition of sustainable development.

Sustainable development means managing the use, development and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic and cultural well-being and for their health and safety while:

- (a) sustaining the potential of natural and physical resources to meet the reasonably foreseeable needs of future generations; and
- (b) safeguarding the life supporting capacity of air, water, soil and ecosystems; and
- (c) avoiding, remedying or mitigating any adverse effects of activities on the environment.

The Minister must, when making a decision under the Act that is based wholly or partly on an assessment of the quality of water available or the periods during which water is available, have regard to the needs of ecosystems that depend on the water resource for water, **and** also any effect that the decision may have on the commercial operations of major users of water from that resource.

**This provision seems to provide a capacity to entrench existing rights, but in the event of new works the Minister would be obliged only to look at the first part, i.e. *have regard to the needs of ecosystems that depend on the water resource for water.***

The Minister has powers to exempt a person from the Act but not if the exemption would be from a requirement not to cause material environmental harm or serious environmental harm. The Minister has the power (section 14) to order that a management plan be prepared for an area. If so ordered, the plan must include:

- (a) an assessment of the quantity of water needed by the ecosystems that depend on a water resource and the times at which, or the period during which, those ecosystems will need that water; and
- (b) an assessment of the likely detrimental effects arising from the taking or use of water from that resource on the quantity of water available to meet the needs of the ecosystems that depend on the resource; and
- (c) assessment of the likely detrimental effects of a plan on the quantity of water.

Water may be allocated and transferred, but only after the requirements of (a) and (b) above are met. The Act is clear in section 16 that a water management plan may, in order to improve the management of a water resource, change the basis on which water is allocated.

Notwithstanding that, a consequential variation of a licence to maintain consistency with the plan results in a reduction or increase in a water allocation of the licence. This is a clear power to change. The vexed issue of compensation is dealt with by providing an equitable procedure for reducing the amount taken from any licence and must consider any pre-existing sureties attaching to licences. **Hence, the Act is still elevating past rights in some cases.** Compensation is further dealt with in section 88. No compensation is payable if the reduction is made to ensure that the total quantity of water permitted to be taken from the relevant water resource does not prevent the quantity from being available for ecosystems as in section 14 above.

All plans must be reviewed every five years (section 33) after adoption.

### **3.8.2 Assessment Criteria 2 — Sustainable ecological outcomes in relation to water allocations for the environment**

The assessment criteria above cover this. However, it will be up to a court to define ecosystem, as no other definition is imported from another Act and it is not defined in this Act. No doubt a broad interpretation will be taken.

### **3.8.3 Assessment Criteria 3 — Ecological sustainability and water trading**

The provisions under Assessment Criteria 1 are drafted to include trading. There are extra restrictions on trading, however, in sections 95 following. The licence may be limited to a certain parcel of land and the transfer must be consistent with any plan and section 97 (2) (c) requires that

the transfer 'Could not reasonably be expected to lead to material environmental harm or serious environmental harm', and (d) will not have a significant adverse impact on other persons taking water from the relevant water resource. Conditions may be imposed on the transfer, such as to reduce the amount (section 101). The Minister **may** require additional information to be provided from an environmental consultant, section 102.

**3.8.4 Assessment Criteria 4 — Legislative, regulatory and institutional frameworks to ensure delivery of effective monitoring programs and indicators of river health**

Section (d) of the Water Management Act requires the Minister to compile, maintain and update information in respect of the water resources of Tasmania.

**3.8.5 Assessment Criteria 5 — Water quality**

Water quality is managed through the State Water Quality Management Policy 1997, which was developed in the National framework. There is no specific mention of this in the Act, but there are numerous references to the Health Act and an obligation to consult.

**3.8.6 Assessment Criteria 6 — Integrated Catchment Management**

These words are not used but the whole tenor of section 14 covers this. In addition many resources Acts are grouped together and called the State Resource Management and Planning System (RMPC) and this RMPC incorporates planning legislation and local government so as to provide the links to achieve Integrated Catchment Management.

### 3.9 Victoria

The *Water Act 1989* was amended in May 1999.

The Objects of the *Water Act 1989* are:

- (a) to re-state, with amendments, the law relating to water in Victoria;
- (b) to provide for the integrated management of all elements of the terrestrial phase of the water cycle;
- (c) to promote the orderly, equitable and efficient use of water resources;
- (d) to make sure water resources are conserved and properly managed for sustainable use for the benefit of present and future Victorians;
- (e) to maximise community involvement in the making and implementation of arrangements relating to the use, conservation or management of water resources;
- (f) to eliminate inconsistencies in the treatment of surface and groundwater resources and waterways;
- (g) to provide better definition of private water entitlements and entitlements of Authorities;
- (h) to foster the provision of responsible and efficient water services suited to various needs and various consumers;
- (i) to provide recourse for persons affected by administrative decisions;
- (j) to provide for the protection of catchment conditions;
- (k) to replace many forms of detailed administrative supervision of Authorities with general supervision by the Minister, through approved corporate plans and express directions;
- (l) to continue in existence and to protect all public and private rights to water existing before the commencement of the relevant provisions of this Act.

#### ***3.9.1 Assessment Criteria 1 — Ecologically sustainable outcomes for development of new schemes or extension of schemes***

Victoria is explicit in requiring any work on new schemes or existing schemes to be assessed for ecological sustainability before any changes can be made to a Bulk Entitlement order. Ecological sustainability is not defined in section 3 with all the other definitions, so the ambit of the concept is not defined by the Act but rather by judges, or maybe the definition of the word in another Act.

The role of the Minister is defined in section 22. The Minister **must** ensure a continuous program of assessment of water resources takes place. The items to be considered in the program of assessment include ‘in stream use’; see below. The broad requirements to collect the data on which to base the assessment are listed in section 23. These are expressed as the Minister **may**. The list is comprehensive, but he/she does not have to do any of the actions. Annual reports on the assessment program, however, are available to the public through the mechanism of being included in each Annual report to Parliament of the Department (section 26).

The power for an Authority to make an application for a Bulk Entitlement order is found in section 36 and the words ‘ecologically sustainable’ are not. The Authority applying, however, **must** put in the application particulars about matters from section 40 (b) to (i). These are similar to ecological sustainability. The items are:

- (a) the existing and projected availability of water;
- (b) the existing and projected quality of water;
- (c) any adverse effect the allocation or use of water is likely to have on
  - i) ....., or
  - ii) a waterway or aquifer, or

- iii) the drainage regime, or
- iv) the environment, including the riverine and riparian environment;
- (g) the need to protect the environment, including the riverine and riparian environment;
- (h) an approved management plan for any relevant groundwater protection area;
- (i) the conservation policy of the Government.

This does not use the words ‘instream flow’ so the application of it is likely to cause some confusion.

Minister **may** cause a plan to be created for an area in section 64.

Licences under section 51ff can be limited with conditions to protect a waterway, to protect the environment — riparian and riverine — and aquifers.

Minister may set up Water Management Schemes section 213 and then the Minister has functions to investigate, cause schemes for improved management of waterway drainage and floodplains to be implemented, and to develop public awareness campaigns.

### ***3.9.2 Assessment Criteria 2 — Sustainable ecological outcomes in relation to water allocations for the environment***

As above, ‘sustainable ecological outcomes’ is not defined but the term ‘In stream use’ is defined in the definitions section (section 3) and used in section 22.

In stream use in relation to water includes:

- (a) the maintenance of aquatic, riparian, floodplain and wetland ecosystems, and
- (b) the maintenance of aesthetic, scientific and cultural values; and
- (c) water-based recreational activities; and
- (d) fishing for commercial purposes; and
- (e) the maintenance of water quality; and
- (f) navigation.

There is a procedure under a Government Policy pre-dating the new Act, which applies to any Authority wanting to do works. Proposals must be sent to DNRE and the Department considers if the social and environmental implications of the project have been thoroughly considered. This is considered, in the COAG report, to satisfy the ecological sustainable outcomes. Also the Government has two other Acts in place: the *Environmental Protection and Biodiversity Act 1999* and *Environmental Effects Act 1978*.

### ***3.9.3 Assessment Criteria 3 — Ecological sustainability and water trading***

Section 40, if properly applied, would answer an application for water trading, as one section would allow the changes in purpose to be considered in licence allocation. Section 225 provides the power to sell water, subject always to the power of the authority to impose conditions. The authority has the power to approve the transfer, though provisions for ensuring no negative environmental impact are unclear. Water rights can be transferred interstate, section 224A, subject to the approval of the host Authority. The Victorian transferor then cannot buy more water, section 224A(3).

**3.9.4 Assessment Criteria 4 — Effective monitoring programs and indicators of river health**

These would rely on a plan being approved and the criteria in section 40 applying. The *Environmental Effects Act 1978* is stated to have a role in the COAG report, but this is not defined.

Bulk Entitlement order plans in relation to four major rivers are completed and many are actively under progression. Management of entitlements has been delayed due to data problems, with the last two years being droughts so surveys to gather environmental data were not possible. River Restoration Plans are a major conservation policy of the Government, section 40, and these are being developed for stressed rivers. These refer to the 'instream flow' concept.

**3.9.5 Assessment Criteria 5 — Water quality**

Not mentioned specifically in the Water Act.

This is not really surprising given that Victoria has other environmental protection legislation which deals with water quality. In December 2000 the EPA released a background paper providing a basis for discussion on the revision of the 'State environment protection policy (Waters of Victoria)'. In May 2001, further consultation on the revision through an outline of the proposed draft Policy was released.

Compliance with the NWQMS is an issue for Victoria, but some of the policy documents have indicated inclusion of these criteria. Victoria is working towards developing a new regulatory framework for drinking water quality.

**3.9.6 Assessment Criteria 6 — Integrated Catchment Management**

Not mentioned in the Water Act.

In Victoria, Catchment Management Authorities are responsible for co-ordinating integrated catchment management. The water plans under the Water Act would feed into the Regional Plans formulated under another Act. This is not mentioned in the Water Act at all yet, but is clear Government Policy; see COAG report section 9.5.1. The Regional Management plans have a very broad scope incorporating land use.

### 3.10 Western Australia

In WA the process was to amend the *Rights in Water and Irrigation Act 1914*.

The amendments were delayed by community concerns about water rights and compensation. The legislation has been stated as passed in November 2000. Comment here is based only on a public information explanatory document, not the most recent amendments. This is not a final document, and comments must be viewed in this context. The introduction to the explanatory memo by Roger Payne, CEO, Waters and Rivers Commission, makes it plain that the changes to water management 'will take considerable time to be fully realised'. The explanatory memo also states that existing policies generally represent good management and will not be overturned and that we will see a steady evolution in water resources management and protection. Generally the new amendments consolidate the laws and apply definitions from other laws into the new Act. This is a good idea as it promotes certainty.

#### ***3.10.1 Assessment Criteria 1 — Legislative, regulatory and institutional frameworks to ensure ecologically sustainable outcomes in relation to the development of new schemes or extensions to existing schemes***

The proposed amendments to the Act include amendments to the title to widen it to be an Act relating to rights, management, use and protection of water resources and for irrigation schemes. The old Act was read in conjunction with some objects of the Commission, which broadened the old Act. It is proposed to insert those broader objectives in the new Act. The objectives will then read:

To promote

- the sustainable management of the State's water resources;
- the integrated management of the State's natural resources;
- the orderly, equitable and efficient use of water resources; and
- members of the community taking an active role in managing these resources.

Sustainable management is the management of the use, development and protection of the State's water resources and the protection of the State's water resources so as to allow Western Australians to provide for their social, physical, economic and cultural well-being while:

- (i) ensuring that water resources are able to meet the reasonably foreseeable needs of future generations;
- (ii) safeguarding the life support capacity of water resources; and
- (iii) avoiding, remedying or mitigating significant adverse effects of activities on the environment.

All persons administering this Act must have regard to these objectives. New schemes and extensions to old ones thus need to meet the sustainability criteria. These criteria are considered to amount to a 'duty of care' and would apply to all users including the Commission, landholders, holders of Native title and persons with indirect influence, i.e. drilling contractors. The duty is to prevent foreseeable harm to each other and to the environment. The Commission and local water management committees are proposed to be given the function to prepare land use and management plans incorporating standards, guidelines and codes of practice for the use of water resources.

### ***3.10.2 Assessment Criteria 2 — Ecological sustainability of water allocations and allocations for the environment***

Here, the amendments to the Western Australian Act go beyond getting an approval from the Minister for the Environment through the EPA. Under the old scheme, many water- and land-affecting activities were beyond the power of the Commission. The new Act will require the Commission to have a say in all decisions on aspects of water management, especially those which require a balance of environmental and economic decisions. The EPA will still have a role through regulations and schedules developed under any Environmental Protection Policy. However, it appears the Commission will have a ‘concentration of power in a body having the mandate to impose sustainable management is a sound and robust institutional arrangement’.

The Commission has developed a policy for determining Environmental Water Provision. The definition proposed to be adopted is:

Environmental Water Provisions are the water ... that are provided as a result of the water allocation decision making process taking into account the ecological, social and economic impacts. They meet, in part or in full, the ecological water requirements.

This definition, according to the COAG submission, recognises the need to integrate all demand for water, and those ecological needs and others cannot be expressed solely in terms of volumes of flow.

All water allocation plans under the new Act are to have defined purposes, make explicit provision for water for the environment and have a defined process for their preparation. The plans lead toward a merit selection process for new allocations of water, not the ‘first in first served’.

### ***3.10.3 Assessment Criteria 3 — Legislative, regulatory and institutional frameworks to ensure the ecological sustainability of water trading***

The plans above will also include rules for trading in water entitlements and the proposed law will tighten up considerably the rules relating to trading, to be consistent with the Objects of the Act. Trading will only be allowed in areas where there is inadequate water to satisfy the requirements of people wishing to use water and if the Commission is satisfied that adequate local rules exist to manage the trade.

Primarily environmental controls are proposed to be applied to water trading approvals in order to protect and enhance the environment, not merely to not harm it. The Commission wants to be able to vary plans (with the aid of local communities) and hence vary licences if the environment requires protection. The Commission may require an expert to make an assessment of the effect of granting the application for trade. The expense is to be borne by the applicant. Indeed, this amounts to a merit selection process for the allocation of water and permission to trade.

### ***3.10.4 Assessment Criteria 4 — Legislative, regulatory and institutional frameworks to ensure delivery of effective monitoring programs and indicators of river health***

This is mentioned in the Act as part of the formulation of the duty of care.

***3.10.5 Assessment criteria 5 — Adoption of national water quality guidelines***

Salinity is the major issue and the plan process above will be involved in making the hard choices in deciding the local rules for use. The State Water Quality Management Strategy has been through Cabinet for approval as implementation of the National Water Quality Management Strategy.

The WA government can foresee resourcing problems for WA resource management agencies.

***3.10.6 Assessment Criteria 6 — Legislative, regulatory and institutional frameworks to ensure delivery of Integrated Catchment Management***

Integrated Natural Resource Management strategies have been implemented and a framework document exists to enable flexibility and that the management is community based. Some groups have negotiated partnership agreements, i.e. South-West Catchments.

## 4. REVIEW OF STATE AND TERRITORY PROGRESS

### 4.1 Australian Capital Territory

The National Competition Council recognises that the reforms may be applied in different ways depending upon the specific circumstances faced by jurisdictions. The ACT does not have a rural water sector and argued that these reforms are not required. Nevertheless, it would seem reasonable that the principles of Ecologically Sustainable Development embodied in the NCC Third Tranche Assessment Framework should be broadly complied with.

#### 4.1.1 *Ecological sustainability of new schemes and extensions to schemes*

- (i) Are assessments independent and based on best scientific practice?
  - The ACT does not have a rural water sector and, as a signatory to the MDBMC Cap on diversions, is not likely to develop one. A future dam for urban water supply may be in the planning but it would not be considered a rural scheme.
- (ii) Are assessments made prior to commencing the scheme or extensions to the scheme?
  - Not applicable (see above).
- (iii) Are potential impacts on streamflow, riparian and floodplain condition taken into account in the planning and approval process?
  - Not applicable (see above).
- (iv) Is the scale of the ecological assessment commensurate with the scale of the development — does the assessment extend downstream?
  - Not applicable (see above).
- (v) Are suitable mechanisms in place for monitoring impacts on the environment of new schemes or extensions to existing schemes?
  - Not applicable (see above).

#### 4.1.2 *Environmental water allocations*

- (i) Are allocations consistent with the *National Principles for the Provision of Water for Ecosystems* (ARMCANZ and ANZECC, 1996)?
  - Yes.
- (ii) Is the process consistent with the stressed systems identified in the Second Tranche report?
  - No assessment.
- (iii) Is the process for establishing environmental allocations documented and implemented?
  - The *Environmental Flow Guidelines* became a statutory document in December 1999, and the *Water Resources Management Plan* in February 2000. Licensing of water use commenced on 10 December 1999 and now covers almost all water use in the ACT.
- (iv) How appropriate are the methods for assessing the environment's water needs?
  - *Environmental Flow Guidelines* describes the processes used to develop environmental flows. ACT uses a holistic approach based on sound scientific principles. The aim is to maintain the integrity, natural seasonality and variability of the flow regime, and to

consider all components (catchments, streams and rivers, storages, wetlands, the riparian zone).

- Flow data are obtained by various methods (specified in the documents provided) to provide a minimum of 10 years of record to determine flow percentiles, etc. Four categories of flow are provided in environmental flows: low flows, flushing flows, special purpose flows and maintenance of impoundment levels.
  - The flows for special purposes are not well understood in the ACT. However, research to understand these is being undertaken in an adaptive framework — spawning flows in the Cotter River illustrate the approach being taken.
  - Water levels in storages are also managed to maintain viable communities of aquatic plants and associated aquatic biota.
- (v) Is there a scientific process for identifying environmental flows?
- The processes described above are based on best practice in Australia, although it is acknowledged in the documentation that ecological data are generally insufficient to define environmental flows in ecological terms and for special ecological purposes.
  - This application of the holistic approach defines flow events and sequences from the hydrological record, based on scientific principles, rather than on precise knowledge of the low or flushing flow requirements of species or ecosystem processes. The ACT approach is designed to make use of new knowledge about fish and other requirements, as it becomes available.
  - As described above, the methods used in the ACT aim to use the best scientific information available, and in the Cotter River research is being undertaken to underpin the environmental flow allocations.
- (vi) Does the framework provide an appropriate balance between the environment and other users?
- Water management plans, programs and methods for determining environmental flows and protecting aquifers are likely to achieve a better balance between water users.
  - Licensing of water use commenced on 10 December 1999 and now covers almost all water use in the ACT. The Act permits reductions in allocations where waterways or water quality conditions or potential damage to ecosystems indicate the necessity to restore water to the system.
  - No new allocations of water can be made unless provided for in the Water Resources Management Plan.
- (vii) Is the framework likely to maintain or improve river health?
- Environmental flow processes described above are likely to maintain or improve river health; in some systems, significant restoration can be expected if flows are of sufficient quantity and distributed over time to reflect the natural hydrographs for each aquatic ecosystem. It appears that environmental flow objectives are being achieved.
  - The process is adaptive, and takes account of new knowledge.
- (viii) Does the system of environmental water allocations recognise the whole water cycle?
- The ACT has policies, programs and environmental flow methods in place to assess water needs of all relevant components. The ACT is developing procedures to integrate groundwater into the determination of environmental flows. Two types of aquifer occur: alluvial and fractured rock aquifers.
  - Water abstraction from aquifers is conservative, pending further work on their influence on surface flows.

- (ix) In relation to the magnitude of the task, have jurisdictions made substantial progress towards providing allocations for stressed and other rivers?
- Yes.
- (x) Will allocations be reviewed after five years?
- No assessment.

#### **4.1.3 Water trading**

- (i) How are the ecological and hydrological constraints of catchments assessed and are they considered?
- No specific environmental rules for water trading have been published.
- (ii) Are ecological constraints considered when determining cross-border trading?
- According to the NSW submission, interstate trading will not commence until ACT agrees to a water diversion Cap and appropriate administrative arrangements are in place with MDB States.
- (iii) Are there suitable mechanisms in place to monitor the environmental outcomes of water trading?
- No specific environmental rules for water trading have been published.

#### **4.1.4 Environmental monitoring programs**

- (i) Are there State-wide programs for assessing river health?
- ACT has contributed to the National Land & Water Resources Audit's Assessment of River Condition, and the National River Health Program.
  - ACT has established a network of water quality monitoring and biotic assessment (using AUSRIVAS and fish).
- (ii) Where rivers cross borders, is the assessment framework consistent and coordinated between States, when needed?
- No.
  - Participation in the Sustainable Rivers Audit will ensure consistency between MDB governments.
- (iii) Is there a formal process for adaptive management?
- There does not seem to be a process for adaptive management.
- (iv) Are the monitoring programs and State-wide assessments underpinned by the best available scientific knowledge?
- ACT Environment is a partner in the CRC for Freshwater Ecology and a participant in the project 'Assessment of River Health'.

#### **4.1.5 Water quality**

- (i) Is water quality assessment linked to land-use planning and management?
- The ACT has adopted a total catchment management-based management framework, with statutory links with planning and regulatory controls. Strategies are implemented through planning and regulatory agencies.

- The ACT Water Quality Management Plan (1987) and Integrated Catchment Management Framework (2000) have been revised. There is ongoing development of sub-catchment management plans by community groups, including representation by agencies. These programs have a wide scope, including educational and economic incentives, planning and regulatory controls, and infrastructure provision.
- (ii) Have environmental values and associated water quality guidelines or objectives been set?
- Environmental values were identified in the Territory Plan 1993. They were developed in wide consultation with the community.
  - Associated water quality guidelines were incorporated in the *Environmental Protection Act 1997*.
  - There is ongoing development of sub-catchment management plans by community groups that include representation of agencies.
- (iii) Are State-wide water quality monitoring programs in place?
- The ACT and Sub-region Water Quality Sub-committee was established in 1969, including NSW membership, to advise on coordinated monitoring and water quality issues. Extensive Territory-wide monitoring programs are being undertaken by lead agencies (Environment ACT, ACT Health, ACTEW) with annual reporting of waterway condition.
  - Monitoring programs are designed to assess key water quality strategic issues (eutrophication/nutrient management, stormwater sediment management), in addition to ongoing trend analysis.
- (iv) Are the programs spatially and temporally adequate?
- There is comprehensive Territory-wide coverage of waters. No information was provided against which to assess the adequacy of frequency of monitoring or design of program.
- (v) Are State-wide assessment procedures for interpreting water quality data in place?
- Lead agencies undertake assessment in the context of statutory water quality objectives or guidelines. There is annual reporting on the Condition of Waterways, and State of Environment reporting.

#### **4.1.6 Integrated Catchment Management (ICM)**

- (i) Does the ICM framework provide suitable protection of rivers having high environmental value?
- It is noted that the ACT ICM framework ‘supports the development of sub-catchment management plans’. So far, two such plans have been developed. No timetable for development of plans covering the rest of the ACT was supplied.
  - No information was provided on how local on-ground activities are coordinated across the ACT.
  - The submitted information does not show how individual streams having high environmental value are identified at the Territory level and prioritised (as appropriate) for ICM funding.
- (ii) Does the ICM approach use the best available scientific and technical knowledge?
- Assessment was not possible as no relevant information has been provided.

## 4.2 New South Wales

### 4.2.1 *Ecological sustainability of new schemes and extensions to schemes*

- (i) Are assessments independent and based on best scientific practice?
  - No evidence is provided of the use of best scientific knowledge and practice. This is not to imply that this is not occurring, but it is impossible for an assessment to be made based on the submitted information.
- (ii) Are assessments made prior to commencing the scheme or extensions to the scheme?
  - This appears to be a statutory requirement under the Water Management Act. However, details of the assessment process have not been provided.
- (iii) Are potential impacts on streamflow, riparian and floodplain condition taken into account in the planning and approval process?
  - Assessment cannot be made — relevant information was not supplied.
- (iv) Is the scale of the ecological assessment commensurate with the scale of the development — does the assessment extend downstream?
  - Assessment cannot be made — relevant information was not supplied.
  - It is likely that catchment management plans will be extensive and that downstream impacts will be considered in the approval process. If assessment does not include consideration of adjoining and downstream catchments then this should be addressed.
- (v) Are suitable mechanisms in place to monitor impacts on the environment of new schemes or extensions to existing schemes?
  - Assessment cannot be made — relevant information was not supplied.

### 4.2.2 *Environmental water allocations*

- (i) Are allocations consistent with the *National Principles for the Provision of Water for Ecosystems* (ARMCANZ and ANZECC, 1996)?
  - In regulated systems most principles are met. However, the limited allocations provided in some regulated systems will barely satisfy Principle 4.
  - It is yet to be seen whether allocations for the environment currently being established for unregulated streams will satisfy Principle 4.
- (ii) Is the process consistent with the stressed systems identified in the Second Tranche report?
  - A detailed protocol has been developed to identify stressed rivers, based on analysis of change in river flow regimes and other condition indicators, and all streams have been assessed.
- (iii) Is the process for establishing environmental allocations documented and implemented?
  - Basic approach, rules and options are outlined in policy documents.
  - Government has a complementary, two-part process for developing environmental objectives. One part involves providing interim environmental objectives to guide early river management planning and action. The other involves independent inquiries in individual catchments to recommend longer-term environmental objectives and practical strategies to achieve them.

- Twelve interim environmental objectives have been developed and were endorsed by Government in September 1999. Bulk Access Regimes are to be set in rivers at risk, stressed rivers and those with high conservation values by December 2001.
  - Critical coastal catchments have been assessed by the Healthy Rivers Commission (Williams, Hawkesbury-Nepean, Shoalhaven, Clarence and Bega). Inquiries are proposed or have commenced for the Tweed-Brunswick, Hastings-Manning, Richmond, Georges and Hunter rivers.
- (iv) How appropriate are the methods for assessing the environment's water needs?
- Community reference groups develop and modify the environmental objectives and environmental flow rules and other operational management rules.
  - There is relatively little description of precise methods for defining environmental objectives and environmental flows based upon them. No set environmental flow method is used, but rather a variety of methods and approaches have been adopted. Environmental objectives are reviewed, risks of impact due to flow change are identified, river flows are analysed and probable ecological responses associated with flow changes to date are identified. The types of environmental objectives are listed and summarised below.
    - ▶ Interim river flow objectives — these range from protection of pools in dry times and protection (and mimicking) of natural flows (an all-embracing objective), to managing water for wetlands, floodplains and groundwaters for ecosystems, and minimising effects in weirs and other structures. Water quality objectives are also set for rivers and estuaries.
  - The basic approach is to restore or preserve critical quantities and temporal patterns of flow and monitor outcomes via Integrated Monitoring of Environmental Flows (IMEF). IMEF is an adaptive management approach. It is only being undertaken in seven regulated rivers in the Murray-Darling Basin. It remains to be seen what programs will be used to monitor outcomes in the remaining unregulated rivers.
  - Objectives are adjusted to meet the requirements of individual catchments and rivers.
- (v) Is there a scientific process for identifying environmental flows?
- The process of setting environmental objectives and environmental flows for each catchment appears to be a 'community-based' expert panel approach based on scientific knowledge plus risk assessment. Integrated Monitoring of Environmental Flows tracks the ecological outcomes of environmental flows using a wide range of indicators. To date, it is not possible to model flow-ecology relationships and predict outcomes of changes in flow regime. Experts advise on likely effects of flow regulation and flow restoration and outcomes from the implementation of operational rules for water management.
  - Environmental objectives and risks associated with flow changes to date are based on best scientific knowledge of the rivers under study, though this can be inadequate, particularly in unregulated systems.
  - Integrated Monitoring of Environmental Flows is built on ecological principles, knowledge of likely outcomes of flow preservation or restoration, and on accepted scientific approaches to the monitoring of river 'health'. It is a sound assessment program, where implemented.
- (vi) Does the framework provide an appropriate balance between the environment and other users?
- The Act gives first priority to environmental issues and water allocations.

- Interim environmental flows were instituted from early 1998. It is likely that these environmental allocations may prove to be insufficient in several valleys.
- (vii) Is the framework likely to maintain, enhance or restore river health?
- All of these ecological outcomes are likely to occur in some rivers or reaches.
  - The environmental flow process is likely to maintain or improve river health, and in some (but not all) rivers, significant restoration can be expected depending upon the environmental flows allocated and the water management principles developed.
  - Outcomes will depend upon how much water is allocated to environment and how well natural patterns of timing of flows are maintained or restored. The process is adaptive; thus the ecological outcomes of environmental flows are yet to be seen. Assessment of outcomes will have to await results from the Integrated Monitoring of Environmental Flows and other programs.
- (viii) Does the system of environmental water allocations recognise the whole water cycle?
- NSW has policies and programs in place to assess the water needs of all components.
- (ix) In relation to the magnitude of the task, have jurisdictions made substantial progress towards providing allocations for stressed and other rivers?
- Stressed rivers assessment reports have been prepared for all catchments in the State.
  - Interim environmental flows for regulated rivers in the Murray-Darling Basin have been set, and their appropriateness is to be tested by the Integrated Monitoring of Environmental Flows program.
  - The Murray-Darling Basin Cap has been implemented in the major regulated rivers, and unregulated rivers are being brought into line with the Cap.
  - The Healthy Rivers Commission inquiries listed above have addressed environmental flows in critical coastal rivers, and more are in progress. Bulk Access Regimes will be completed for all classes of rivers and groundwaters by December 2001.
  - Groundwater policies have been developed for groundwater-quality protection and groundwater-dependent ecosystems. Sustainable yields have been determined for all aquifers at risk from over-extraction; they are being progressively determined for other aquifers.
  - Priority aquifers have been identified for the development of management plans by 2003. In total, 26 plans need to be developed.
- (x) Are allocations to be reviewed after five years?
- River Management Plans will be place for a 10-year period, with a five-year review, but changes at this stage trigger compensation which may be a disincentive to effective adaptive management.

#### **4.2.3 Water trading**

- (i) How are the ecological and hydrological constraints of catchments assessed and are ..they considered?
- Trading in water-access licences is subject to the rules set out in the relevant local Water Management Plans. The NSW submission states (S 6.9.12) that ‘issues such as the establishment of exchange rates and greater consistency in assessing environmental impacts [of water trading] are being addressed ...’. However, there is insufficient information in the NSW submission to verify this statement.

- There is need for a coordinated overview of water trading in NSW. There is a danger of a fragmented approach developing if locally devised River Management Plans do not properly consider larger-scale issues and the interdependency of ground- and surface-water use. The NSW submission is not clear on the processes in place to ensure coordination of trading rules between plans.
  - NSW submission states ‘restrictions on trade in NSW are in place to deal with environmental issues’. However, there is no supportive evidence for this statement. The rules associated with water trading are to be developed by the River Management Committees (or Groundwater Management Committees) for each river management plan.
  - Specifically, for water trades associated with the MDBC Pilot Project (this may extend to other trades, but there is insufficient information in the NSW submission to assess that), transfers of water entitlements and new irrigation developments require the preparation of an environmental impact assessment and a Farm Water Management Plan. The environmental impact assessment ensures that issues of water supply, water quality, land capability and suitability, environmental and nature conservation, and cultural and heritage significance are considered before any proposal is approved.
  - A Farm Water Management Plan has to be prepared for all new irrigation developments.
- (ii) Are ecological constraints considered when determining cross-border trading?
- NSW is a participant in the MDBC Pilot Interstate Water Trading Project. The pilot project considers the physical constraints to trade, and will only authorise trades that can be accommodated.
  - Submissions indicate that water trading between Queensland and NSW will commence once joint environmental water management rules have been agreed upon and a diversion Cap (in the Murray-Darling Basin) has been set by Queensland. It is expected that this will occur by mid-2001. However, it is not clear how this will occur until Queensland has Resource Operations in place,
  - Trading with ACT will not commence until ACT signs up to the Cap on diversions in the MDB.
- (iii) Are there suitable mechanisms in place for monitoring the environmental outcomes .....of water trading?
- There is no specific State-wide process for assessing the ecological outcomes of water trading.
  - For the seven regulated rivers in the Murray-Darling Basin, the Integrated Monitoring of Environmental Flows program will provide information on the ecological outcomes of environmental flows. Significant impacts of water trading are likely to be identified by this assessment program. For the State’s unregulated rivers there is no clearly defined State-wide process for assessing environmental outcomes of water management.

#### **4.2.4 Environmental monitoring programs**

- (i) Are there State-wide programs for assessing river health?
- NSW has contributed to the National Land & Water Resources Audit’s Assessment of River Condition, and to the National River Health Program.

- The Stressed Rivers Assessment was used to classify the environmental and hydrological stress of all NSW rivers. This provided a snapshot of current condition to be used for prioritising management and planning. The Stressed Rivers Assessment was a desktop study relying on information already collected on hydrology, land use and conservation issues and did not involve field sampling. The Stressed Rivers Assessment was a spatially comprehensive program that assessed all sub-catchments in the State, but it suffered from a lack of data in many sub-catchments. All regulated rivers (using NSW definition of regulation) were classified as stressed.
  - NSW has adopted different approaches to the determination of water sharing arrangements in its regulated and unregulated river systems. In regulated rivers an environmental monitoring program (the Integrated Monitoring of Environmental Flows (IMEF)) has been developed to assess the physical, chemical and biological changes in the river system as a result of the environmental flow rules. In the seven regulated rivers (major regulated rivers in the Murray-Darling Basin) in which it was undertaken, the IMEF assessment is a comprehensive program.
  - The Pressure-Biota-Habitat (PBH) approach has been trialled in a limited number of unregulated rivers. The PBH approach uses three kinds of variables: human generated pressure on rivers, components of the biota, and aspects of bio-physical habitat. The future of this program is under review.
  - The Healthy Rivers Commission has used independent inquiries into several coastal catchments to set water quality and river flow objectives.
  - The NSW Rivers Survey provided a comprehensive State-wide assessment of river health based on fish. There is no commitment to further funding of this program. However, lessons learnt from the NSW Rivers Survey are being incorporated into IMEF.
- (ii) Where rivers cross borders, is the assessment framework consistent and coordinated between States?
- Apart from the national programs, there is limited consistency in the monitoring programs between NSW and the adjoining jurisdictions. This is being addressed along the Border Rivers with the joint development of a Border Rivers Water Management Plan and associated river condition assessment with Queensland.
  - Participation in the Sustainable Rivers Audit will ensure consistency between Murray-Darling Basin governments.
- (iii) Is there a formal process for adaptive management?
- Water Management Plans that consider trading rules will be in place for a 10-year period, with a five-year review, but changes at this stage may trigger compensation which may be a disincentive to effective adaptive management. The IMEF program currently underway in the seven regulated rivers in the Murray-Darling Basin will provide information for the review of the plan for these rivers. However, there does not appear to be a process in place for collecting information for the review of Water Management Plans in unregulated rivers.
- (iv) Are the monitoring programs and State-wide assessments underpinned by ..... the best available scientific knowledge?
- Integrated Monitoring of Environmental Flows is underpinned by sound scientific advice from agency technical experts.
  - DLWC and EPA are members of the CRC for Freshwater Ecology and participants in the project 'Assessment of River Health'.

- DLWC has recently released the document *Integrated Monitoring of Environmental Flows: Design Report* by B. Chessman and H. Jones, DLWC April 2001, which clearly documents the IMEF method.

#### 4.2.5 Water quality

- (i) Is water quality assessment by the States linked to land-use planning and management?
  - NSW has adopted a sound total catchment management-based management framework to link water quality assessment with land-use management and planning. Strategies are implemented through planning and regulatory agencies, lead State and Local Government agencies and water agencies.
  - The *Water Management Act 2000* provides a framework for integrated government and community partnership in developing Water Management Plans. These programs are wide in their scope and incorporate education, economic incentives, planning and regulatory controls, and infrastructure provision.
- (ii) Have environmental values and associated water quality guidelines or objectives been set?
  - Interim environmental values have been released for 31 catchments. Water quality guidelines have been identified, against objectives detailed in the 'water quality and river flow interim environmental objectives', as stated on the EPA web site <<http://www.epa.nsw.gov.au/ieo/index.htm>>.
  - Wide community representation has been legislated for, with respect to Catchment Management Committees and River Management Committees.
- (iii) Are State-wide water quality monitoring programs in place?
  - Extensive State-wide monitoring programs are being undertaken by lead agencies (DLWC, EPA) with State and local Catchment Management Committees reporting.
  - A State Water Monitoring Committee has been established to coordinate monitoring.
  - Water reform packages 95 & 97 and the *Water Management Act 2000* have established State-wide frameworks.
- (iv) Are the programs spatially and temporally adequate?
  - There is reasonably comprehensive State-wide coverage of waters. No information has been provided against which to assess the adequacy of frequency of monitoring or design of programs.
- (v) Are there established State-wide assessment procedures in the interpretation of water quality data?
  - The Healthy Rivers Commission was established 1995 to examine water quality objectives for critical coastal waters. The DLWC and the EPA assess inland streams. Lead agencies undertake assessment in the context of statutory water quality objectives or guidelines.

#### 4.2.6 Integrated Catchment Management (ICM)

- (i) Does the ICM framework provide suitable protection to rivers having high environmental value?
  - It is noted that the NSW Government has 'developed a broad suite of policies to protect rivers of high environmental values and sensitivities'. However, no details of these policies have been provided. It is also noted that 'a number of wetland

management policies and guidelines are assisting the protection of (these) sensitive areas’.

- Assessment cannot be made until details are provided to show how the ‘broad suite of policies’ is put into action in a coordinated way at the community and catchment scale.
  - Is there catchment- or sub-catchment-scale oversight and coordination of the location, scale and techniques applied to on-ground actions? If not, this should occur as a matter of priority.
  - The submitted information does not show how the individual rivers that have high environmental value are identified at the State level and prioritised (as appropriate) for ICM funding.
- (ii) Does the ICM approach use the best available scientific and technical knowledge?
- Assessment is not possible as no relevant information has been provided.

## 4.3 Northern Territory

### 4.3.1 *Ecological sustainability of new schemes*

- (i) Are assessments independent and based on best scientific practice?
  - It is noted in the report that there is an ‘...absence of scientific methods for determination of environmental requirements in the Territory’. This is a disappointing situation given that other northern jurisdictions (viz. Queensland) have made substantial progress in this area. It is noted that there is relevant research currently under way, but progress in this area would appear, from the information supplied, to be unsatisfactory.
- (ii) Are assessments made prior to commencing the scheme or extensions to the scheme?
  - Assessment cannot be made — relevant information was not supplied.
- (iii) Are potential impacts on streamflow, riparian and floodplain condition taken into account in the planning and approval process?
  - Assessment cannot be made — relevant information was not supplied.
  - The strong flow seasonality of many northern floodplain rivers should be the cause for special attention in the planning and approval process.
- (iv) Is the scale of the ecological assessment commensurate with the scale of the development — does the assessment extend downstream?
  - Assessment cannot be made — relevant information was not supplied.
- (v) Are suitable mechanisms in place for monitoring impacts on the environment of new schemes or extensions to existing schemes?
  - Assessment cannot be made — relevant information was not supplied.

### 4.3.2 *Environmental water allocations*

- (i) Are allocations consistent with the *National Principles for the Provision of Water for Ecosystems* (ARMCANZ and ANZECC, 1996)?
  - The conservative contingent allocations for the environment rules are broadly consistent with the National Principles for the Provision of Water for the Environment.
- (ii) Is the process consistent with the stressed systems identified in the Second Tranche report?
  - The NT submission argues that there are no over-allocated or stressed water resources in NT. We are unable to provide detailed commentary on this contention.
- (iii) Is the process for establishing environmental allocations documented and implemented?
  - A contingent environmental allocation process has been documented and implemented across the Territory.
- (iv) How appropriate are the methods for assessing the environment’s water needs?
  - NT has not established or adopted scientific methods for determining environmental water requirements. It is contended that contingent allocations for the environment (as described below) provide a conservative sustainable balance between the environment and other users. This may be the case, but no scientific justification is provided to support the contention.

- (v) Is there a scientific process for identifying environmental flows?
- Surface water extraction in the Top End is limited to no more than 20% of stream flow at any time.
  - Such extraction is generally not viable in the Arid Zone, but up to 5% of overland flow diversions may be permitted for stock water supplies. Groundwater extraction licenses are limited so that groundwater-dependent ecosystems are protected where known. This limits extraction to no more than 20% of the recharge rate.
  - As scientific information becomes available from research underway in the NT, the contingent environmental allocations will be reviewed.
  - Environmental flows research is continuing in the Katherine region.
  - Groundwater resource investigations have been undertaken to aid in establishing the regional water balance and yield potential of the Alice Springs area.
- (vi) Does the framework provide an appropriate balance between the environment and other users?
- It is unclear whether water allocations will provide a long-term sustainable balance between the environment and other users. The contingent allocations may be reasonable in the short term but further environmental planning development is required.
- (vii) Is the framework likely to maintain, enhance or restore river health?
- All are likely to occur in the systems investigated thus far. Outcomes will depend upon the amounts of water and how well the natural patterns of timing of flows are restored. The process is adaptive; results are yet to be seen.
- (viii) Does the system of environmental water allocations recognise the whole water cycle?
- The NT has policies and programs in place to assess water needs of surface and groundwater systems, and particular policies for the Arid Zone.
- (ix) In relation to the magnitude of the task, have jurisdictions made substantial progress towards providing allocations for stressed and other rivers?
- As noted, contingent allocations have been made.
  - A first draft water balance for the Katherine region is now complete and will be refined over the next 3–6 months, following which a draft water allocation plan is expected to be completed.
  - Work to define the water allocation plan for the Darwin Region is progressing, with public release expected in July 2001.
- (x) Are allocations to be reviewed after five years?
- Contingent environmental allocations will be reviewed as new scientific information becomes available from research underway. No specific time period is mentioned in the documents provided.

#### 4.3.3 *Water trading*

- (i) How are the ecological and hydrological constraints of catchments assessed and are they considered?
- Trading of water entitlements must be in accordance with local water allocation plans. These plans are currently being developed, but none has been completed. Therefore an assessment of their adequacy cannot be undertaken.

- Trading rules have not been developed. The NT submission argues that until there is resource scarcity, there will not be the demand to drive water trading. Nevertheless, appropriate planning processes should be considered.
- (ii) Are ecological constraints considered when determining cross-border trading?
  - There is insufficient information provided for assessing whether cross-border ecological constraints will be adequately considered.
- (iii) Are there suitable mechanisms in place for monitoring the environmental outcomes of water trading?
  - Trade has not occurred and so on-ground assessment cannot be made.

#### **4.3.4 Environmental monitoring programs**

- (i) Are there State-wide programs for assessing river health?
  - NT has contributed to the National Land and Water Resources Audit's Assessment of River Condition, and the National River Health Program.
  - There are no other on-going Territory-wide programs for assessing river health.
- (ii) Where rivers cross borders, is the assessment framework consistent and coordinated between States?
  - No information presented.
- (iii) Is there a formal process for adaptive management?
  - Water allocation plans must be reviewed at no more than five-year intervals, but it is not clear if or how this information will be incorporated.
- (iv) Are the monitoring programs and State-wide assessments underpinned by the best available scientific knowledge?
  - No information presented.

#### **4.3.5 Water quality**

- (i) Is water quality assessment by the States linked to land-use planning and management?
  - The NT has adopted a strong integrated catchment-based approach to resource management, including community-based catchment management groups, regional natural resource management groups, and a Territory and Local Government Partnership Program. There are strong links between Landcare groups and Catchment Water Advisory Committees.
  - Establishment of Catchment Water Advisory Committees has been initiated under the Water Act across a number of catchments and groundwater basins.
- (ii) Have environmental values and associated water quality guidelines or objectives been set?
  - There has been Territory declaration of beneficial uses and associated water quality guidelines under the Water Act, for all regions in which there is currently development. (Twenty-two plans are complete for catchments, groundwater and coastal management; a further seven are in preparation).
  - Catchment Water Advisory Committees have had a role in development of objectives.

- (iii) Are State-wide water quality monitoring programs in place?
  - Catchment Water Advisory Committees have been established, under the Water Act, across a number of catchments and groundwater basins.
  - These Catchment Water Advisory Committees have a role in coordinating water quality monitoring. A Territory-wide monitoring program is being undertaken by the Natural Resources Division of Dept Lands, Planning & Environment.
- (iv) Are the programs spatially and temporally adequate?
  - No assessment — there is inadequate information against which to assess the adequacy of frequency of monitoring or design of program.
- (v) Are there established State-wide assessment procedures in the interpretation of water quality data?
  - No assessment — inadequate information against which to assess this descriptor.

#### **4.3.6 *Integrated Catchment Management (ICM)***

- (i) Does the ICM framework provide suitable protection of rivers having high environmental value?
  - It is indicated in the NT report that an integrated regional resource management process exists.
  - Landcare groups are active in 70% of the Territory with on-ground activities, though there does not appear to be a formal mechanism for coordination of on-ground activities at the catchment level (other than perhaps in the two catchments noted above).
  - Based on the information supplied, it would appear that the level of planning, coordination and on-ground implementation of ICM principles and action in the Northern Territory is less than expected.
  - The submitted information does not show how the individual rivers that have high environmental value are identified at the Territory level and prioritised (as appropriate) for ICM funding.
- (ii) Does the ICM approach use the best available scientific and technical knowledge?
  - Assessment is not possible as no relevant information was provided.

## 4.4 Queensland

### 4.4.1 Ecological sustainability of new schemes and extensions to schemes

- (i) Are assessments independent and based on best scientific practice?
- Independence cannot be assessed — no details were provided of the assessment process.
  - Natural Resources & Mines (DNRM) have sought critical review of their environmental flow and biological assessment processes, by the CRC for Freshwater Ecology. Continuance of such reviews by expert groups is welcomed, and we encourage and support this process.
  - The State's Water Resource Plan process also includes expert opinion provided by the Technical Advisory Panels. DNRM is encouraged to draw on as broad a knowledge base as is possible for the Technical Advisory Panels, including knowledge available from outside the State.
  - Notwithstanding the above, a clear description should be provided of the institutional arrangements that enable community and government decision-makers to obtain and use this information and knowledge. Details should be provided about the method, and amount, of allocating government funds to the acquisition and dissemination of best scientific knowledge within government departments and to community groups involved in developing water management plans.
- (ii) Are assessments made prior to commencing the scheme or extensions to the scheme?
- The *Water Act 2000* assessment provisions appear to apply only to *major* developments. The cumulative effect of smaller off-channel storages (including water harvesting into ring tanks) should not be under-estimated. The Act can control the allocation of water which can be taken into these storages, but there appear to be no controls on the building of such storages if they fall outside s480/1. Urgent attention should be given to ensuring that principles of environmentally sustainable development are applied to all catchment water resources developments, no matter what their size.
  - The Nathan Dam Impact Assessment was considered as an example of ecological sustainability assessment procedures in the jurisdiction. The report lists likely impacts, and comments on how the impact might be mitigated. The comments on the potential impacts are not always supported by best scientific knowledge. For example, the identified impact: 'The dam will replace an existing barrier to fish movement with a more formidable barrier', carries the comment: 'The need for, and a practical means of fish transfer will be determined in accordance with the Fisheries Act associated'. This comment is not supported — there are no practical means of ensuring fish transfers past large dams, and deleterious impacts on migratory fish species must be expected.
- (iii) Are potential impacts on streamflow, riparian and floodplain condition taken into account in the planning and approval process?
- This would appear to be the case under the provisions of the Water Act, Water Resource Plans, Resource Operations Plans and Licences. However, the extent to which the potential impacts are *taken into account* is not clear from the submitted information; nor will it be clear until the Resource Operations Plans have been finalised and implemented.

- It is noted that there are moratoria on the issuing of new licences to extract water, and also restrictions on the construction of new works likely to lead to an increase in water diversions in the Condamine-Balonne and Border Rivers systems. Further consideration of these moratoria is encouraged, as is their extension to river systems elsewhere in the State until their environmental water requirements are adequately assessed and provided for.
- (iv) Is the scale of the ecological assessment commensurate with the scale of the development — does the assessment extend downstream?
- Difficult to assess based on information supplied. It would appear that assessment consideration extends downstream in the nominated catchment but not necessarily to adjoining catchments downstream. This is of particular concern for systems such as the Condamine-Balonne and the Border Rivers that cross the border into NSW.
- (v) Are suitable mechanisms in place to monitor impacts on the environment of new schemes or extensions to existing schemes?
- Assessment cannot be made — relevant information was not supplied.

#### 4.4.2 *Environmental water allocations*

- (i) Are allocations consistent with the *National Principles for the Provision of Water for Ecosystems* (ARMCANZ and ANZECC, 1996)?
- Yes, at the river basin scale.
- (ii) Is the process consistent with the stressed systems identified in the Second Tranche report?
- Major river basins with high levels of development and special issues are being addressed in Water Resource Plans.
- (iii) Is the process for establishing environmental allocations documented and implemented?
- The water resource planning framework established by the *Water Act 2000* is two-tiered. Water Resource Plans define environmental flow objectives and water allocation and security objectives at a strategic level. Resource Operations Plans operationalise the objectives defined in the Water Resource Plans.
  - The process is documented fully in Water Resource Plans for the Fitzroy, Cooper, Burnett and Boyne and in draft Water Resource Plans for other priority rivers.
  - Resource Operations Plans are being developed in rivers that have completed Water Resource Plans, but plans are at an early stage.
- (iv) Is there a scientific process for identifying environmental flows?
- Queensland has devised the Benchmarking methodology to develop recommendations on environmental flows. The Benchmarking methodology involves making comparisons between the river reaches under consideration and a set of reference reaches that are subject to varying levels of impact resulting from existing water resource development. The reference reaches are selected to cover a range of types and levels of change in hydrologic regime.
  - Once the linkages between hydrologic regime change and geomorphological and ecological impacts are documented, the reference reaches become 'benchmark sites' (both negative and positive) which assist in development of environmental flow recommendations and performance measures.

- Conceptual ‘link’ models are developed to show relationships between flow (and other environmental factors) and riverine and estuarine ecosystem structure, and also interactions between ecosystem components.
  - Key hydrological indicators are flow indicators that have geomorphological and ecological relevance. They form the basis of the environmental flow performance measures.
  - A Technical Advisory Panel is appointed by DNRM for each Water Resource Plan. The role of the panel has varied between Water Resource Plans. In the case of the Fitzroy, the majority of the investigations were carried out by DNRM, with periodic reviews by the Technical Advisory Panel. In the case of the Condamine-Balonne, the environmental flow study was carried out collaboratively between DNR policy staff and the Technical Advisory Panel. In the remainder of the Water Resource Plans, the Technical Advisory Panel has had the primary responsibility for the environmental investigations, and the independent advice they have provided has been published under the names of the members of the panel. This latter approach is supported.
  - Quantitative models may be used to predict the implications of the water resource development scenarios for specific ecosystem components. For example, in the Burnett Basin Water Resource Plan, hydraulic geometry models were used to assess the implications of alternative water resource management scenarios for channel dimensions.
  - The Benchmarking Methodology has been reviewed by the CRC for Freshwater Ecology on two occasions.
- (v) Does the framework provide an appropriate balance between the environment and other users?
- Alternative water resource management strategies are evaluated from environmental, social and economic viewpoints, and this information is used by the Government to make a decision on behalf of the community in relation to water allocations (and therefore environmental flow allocations). Factors that are taken into account in the Government’s decision include COAG water reform policies, the *National Principles for the Provision of Water for Ecosystems* (ARMCANZ & ANZECC, 1996) and advice from the Technical Advisory Panels.
- (vi) Is the framework likely to maintain, enhance or restore river health?
- Queensland is mainly engaged in protecting existing flow regimes from change, in basins with options for water resource development in the future. Flow restoration options are identified in Water Resource Plans and may be addressed at the Resource Operations Plan stage. Resource Operations Plans have yet to implement environmental flows.
  - The process of setting environmental flows is adaptive, and the results from Water Resource Plans, Resource Operations Plans and monitoring of ecological outcomes are yet to be seen. The risk assessment framework used in benchmarking is likely to result in maintenance and/or improvement of the condition of river reaches in many instances. In some instances the recommended limits to change in flow regime (Environmental Flow Limits) may not be achieved. In these instances, there is a risk that river condition may deteriorate.
- (vii) Does the system of environmental water allocations recognise the whole water cycle?
- The framework of Water Resource Plans and the Benchmarking Methodology assesses all components listed, but to date the Benchmarking Methodology does not have an explicit process for providing water for groundwater-dependent ecosystems.

- The Water Resource Plan process is working on inclusion of groundwater issues in environmental flow assessments.
  - Groundwater basins are being mapped in each Water Resource Plan catchment.
- (viii) In relation to the magnitude of the task, have jurisdictions made substantial progress towards providing allocations for stressed and other rivers?
- Four have been completed (Fitzroy, Burnett, Cooper, Boyne).
  - Five are in progress (Barron, Border Rivers, Condamine-Balonne, Logan, Pioneer).
  - Two have recently commenced (Burdekin, Mary).
  - Hydrological models have been commenced for the Greater Brisbane and Nerang River Water Resource Plan.
- (ix) Are allocations to be reviewed after five years?
- Water Resource Plans will be reviewed after 10 years with the option for review at five years 'if required'. The grounds for defining 'if required' should be elaborated.

#### 4.4.3 *Water trading*

- (i) How are the ecological and hydrological constraints of catchments assessed and are they considered?
- Temporary trades have been available for approximately 10 years. The Queensland submission does not mention the rules associated with these temporary trades.
  - A pilot program for permanent trade of existing licences is underway in the Mareeba Dimbulah Irrigation area in which four permanent trades have occurred. However, there is no mention in the Queensland submission of the environmental considerations associated with these trades.
  - The Queensland submission argues that water allocation transfer rules established in the Resource Operations Plan will address environmental issues and hydrological constraints and ensure that there is no net increase in consumption. However, until Resource Operations Plans are finalised this cannot be assessed.
- (ii) Are ecological constraints considered when determining cross-border trading?
- The NSW submission argues that there is an understanding between Queensland and NSW that interstate trading will commence once joint environmental water management rules have been agreed and a diversion Cap (in the Murray-Darling Basin) has been set by Queensland.
- (iii) Are there suitable mechanisms in place to monitor the environmental outcomes of water trading?
- The Resource Operations Plan will specify how the ecological outcomes of water management (including water trading) will be assessed. These have not yet been developed.
  - DNRM has engaged members of the Burnett and Barron Technical Advisory Panels to develop explicit statements of the geomorphological and ecological outcomes of the water allocations recommended in Water Resource Plans.

#### **4.4.4 Environmental monitoring programs**

- (i) Are there State-wide programs for assessing river health?
- Queensland has contributed to the National Land and Water Resources Audit's Assessment of River Condition.
  - Queensland has contributed to the National River Health Program.
  - The initial river condition assessments for the Water Resource Plans are generally comprehensive and cover the recommended elements.
  - However, ongoing river condition assessments are developed as part of the Water Resource Plans. The Resource Operations Plans detail the water and ecosystem monitoring practices that will apply; however, none of these has been completed and so their suitability cannot be assessed.
  - DNRM is developing significant new methods for determining river health that have been endorsed by a CRCFE review<sup>12</sup>.
- (ii) Where rivers cross borders, is the assessment framework consistent and coordinated between States?
- Apart from the national programs, there is limited consistency across State borders. This is being addressed in the Border Rivers with the joint development of the Border Rivers Water Management Plan and associated river condition assessment with NSW.
  - Participation in the Sustainable Rivers Audit will ensure consistency between Murray-Darling Basin governments.
- (iii) Is there a formal process for adaptive management?
- Monitoring results, supported by scientific evidence, can be used to make amendments to water allocations provided through the Water Resource Plans. The Water Resource Plans will be reviewed after 10 years with the option for review at five years if required.
- (iv) Are the monitoring programs and State-wide assessments underpinned by the best available scientific knowledge?
- Yes, through peer review of DNRM technical experts' work, and the use of scientific panels (Technical Advisory Panels). DNRM is a member of the CRC for Freshwater Ecology and a participant in the project 'Assessment of River Health'.
  - A robust framework for monitoring stream health has recently been developed by the South-east Queensland Regional Water Quality Management Strategy (SEQRWQMS — The Strategy). DNRM has agreed to implement the framework widely, and is adapting it to water allocation issues.

#### **4.4.5 Water quality**

- (i) Is water quality assessment by the States linked to land-use planning and management?
- Queensland has adopted a strong ICM-based approach to resource management, incorporating community-based catchment management groups, regional natural resource management groups, and a State & Local Government Partnership Program. The Landcare and Catchment Management Council was established in 1997 to provide

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<sup>12</sup> CRCFE 2000. *Developments of Relationships between Flow Regime and River Health*. Technical report 6/2000. CRC for Freshwater Ecology.

strategic advice on landcare and catchment management issues, and to coordinate community and government partnership.

- The Environmental Protection Policy provides the framework for development of urban water management plans. Initial focus was on the SEQ Regional Water Quality Management Strategy.
- (ii) Have environmental values and associated water quality guidelines or objectives been set?
- Environmental Protection (Water) Policy 1997 provides a framework for setting environmental values and water quality guidelines on a river catchment basis. Eight Regional Strategy Management Plans have been endorsed by Government, with a further four undergoing community input.
  - Catchment Management Coordinating Committees have completed 27 catchment strategies, with a further eight in progress; 80% of the State is covered by a catchment strategy.
- (iii) Are State-wide water quality monitoring programs in place?
- No assessment — there is inadequate information against which to assess the adequacy of frequency of monitoring or design of program. However, we note recent work by DNRM which provides significant promise, e.g. McNeil, V.H., Churchill, R.C., Marshall, C.J. and Choy, S.C. (2000), *Preliminary Risk Assessment of Water Quality in Queensland River Basins*. Department of Natural Resources, Queensland.
- (iv) Are the programs spatially and temporally adequate?
- No assessment — there is inadequate information against which to assess the adequacy of frequency of monitoring or design of program.
- (v) Are there established State-wide assessment procedures in the interpretation of water quality data?
- No assessment — there is inadequate information against which to assess this descriptor.

#### 4.4.6 *Integrated Catchment Management (ICM)*

- (i) Does the ICM framework provide suitable protection to rivers having high environmental value?
- The submitted information does not show how rivers that have high environmental values are identified at the State level and prioritised (as appropriate) for ICM funding.
  - The information provided does not show how Landcare, NHT-funded and other catchment on-ground activities are coordinated at the catchment, though it may be that Catchment Management Coordinating Committees provide this function.
  - It is noted that Fact Sheets are available from DNRM in certain (unspecified) areas related to sustainable land and water management practices. Availability and extent of dissemination of these fact sheets was not specified.
  - It is noted that, in 1999, DNRM released *Guidelines for Developing Regional Strategies On Natural Resources Management and Biodiversity Conservation*. The development of these guidelines is commended. Information describing how the guidelines are disseminated and put into action in individual catchments would be useful.
- (ii) Does the ICM approach use the best available scientific and technical knowledge?
- Assessment is not possible as no relevant information has been provided.

## 4.5 South Australia

### 4.5.1 *Ecological sustainability of new Schemes and extensions to schemes*

- (i) Are assessments independent and based on best scientific practice?
  - This cannot be assessed — no details provided about the assessment process.
- (ii) Are assessments made prior to commencing the scheme or extensions to the scheme?
  - This appears to be a statutory requirement under the Water Resources Act. However, details of the assessment process have not been provided.
- (iii) Are potential impacts on streamflow, riparian and floodplain condition taken into account in the planning and approval process?
  - Assessment is difficult to make due to lack of details in report. However, it is noted that statutory powers are provided to deliver actions that are *complementary* to riparian and wetland management and rehabilitation, and that an assessment of the environmental requirements of the Lower Murray wetlands is under way.
- (iv) Is the scale of the ecological assessment commensurate with the scale of the development — does the assessment extend downstream?
  - Assessment cannot be made — the relevant information has not been supplied.
- (v) Are suitable mechanisms in place for monitoring impacts on the environment of new schemes or extensions to existing schemes?
  - Assessment cannot be made — the relevant information has not been supplied.

### 4.5.2 *Environmental water allocations*

- (i) Are allocations consistent with the *National Principles for the Provision of Water for Ecosystems* (ARMCANZ and ANZECC 1996)?
  - South Australia has submitted a detailed response to this question. The submitted policies and procedures adequately address these principles. However, widespread on-ground activities in support of Principles 4 and 5 are not evident.
- (ii) Is the process consistent with the stressed systems identified in the Second Tranche report?
  - In South Australia, stressed systems are addressed primarily through the process of prescription of the water resources under the *Water Resources Act 1997* or under the previous Act of 1990. There are now 16 prescribed water resources across the State that require a water allocation plan. The final plan for prescribed water resources will be completed late in 2002.
- (iii) Is the process for establishing environmental allocations documented and implemented?
  - South Australia's policies and processes for assessing water requirements and water plans are broadly documented in the report provided (e.g. COAG Strategic Water Framework 1994, response to Sections 4(b), and Implementation of the Water Reforms in South Australia (p. 14 of the State Report)). A similar detailed response to the need to take account of the work of ARMCANZ and ANZECC is provided (i.e. the National Principles, pp. 17–20).
  - The broad framework of the assessment of water requirements is also provided (see below), with some indication of the methods used (a wide range is employed to suit the nature of systems in this State). Particular attention is being given to groundwaters,

ephemeral streams, and weirs and wetlands, as well as the inland river systems of the arid zone.

- (iv) How appropriate are the methods for assessing the environment's water needs?
- A range of approaches is being used to determine the water needs of the environment. These methods include flow percentiles, expert scientific panels, modified habitat assessment methods, a modified 'Petts' method, and a modified NSW Conservation Council method for assessing groundwater-dependent ecosystems. State coordination and/or direction on selection and application of appropriate methods would be beneficial.
- (v) Is there a scientific process for identifying environmental flows?
- To date, it is not possible to model flow–ecology relationships in South Australian surface- and groundwater-dependent ecosystems. Expert panels advise on likely impacts of flow regulation and on environmental water needs. South Australia is working to improve knowledge and assessment and allocation methods to provide water for ecosystems. Details of such studies are listed in the report (under National Principle 11).
  - There is limited knowledge of the ecology and water requirements of seasonal and episodic streams and groundwater-dependent systems in South Australia (the predominant water-dependent systems in the State).
  - South Australia uses ecological principles, best scientific knowledge of hydrology–ecology relationships and flow manipulations to develop recommendations on environmental flows and water allocations and to achieve flow and water regime restoration. In all cases, temporal and spatial variability are taken into consideration.
  - The ARIDFLO project is developing a model of hydrology–ecology relationships for arid-zone rivers, and trials are being conducted to manipulate hydrological regimes for wetlands along the River Murray and in weir pools.
- (vi) Does the framework provide an appropriate balance between the environment and other users?
- The Act provides that water allocation plans must balance social, economic and environmental needs for water, and set a rate of use that is sustainable.
  - Environmental flow processes outlined above are likely to maintain or improve the balance of water to the environment; and in some rivers, significant restoration of flows and ecological processes can be expected.
- (vii) Is the framework likely to maintain, enhance or restore river health?
- River health outcomes will depend upon the amount of water and on how well natural patterns of timing of flows are restored. Methods being used take account of spatial and temporal variability of flows and water regimes. The process is adaptive; results are yet to be seen for most systems.
- (viii) Does the system of environmental water allocations recognise the whole water cycle?
- South Australia has policies and programs in place for assessing the water needs of all components. Significant research is being undertaken to improve the knowledge base with respect to episodic and groundwater-dependent systems, and to understand the implications of many small farm dams for overland flows.
- (ix) In relation to the magnitude of the task, have jurisdictions made substantial progress towards providing allocations for stressed and other rivers?
- In South Australia there are now 16 prescribed water resources across the State that require a water allocation plan. Of these, the Minister adopted nine before 2 January

2001. A further six were to be adopted before 2 July 2001. The final plan for prescribed water resources will be completed late in 2002.

- The River Murray Catchment Water Management Board has released its draft Water Allocation Plan (WAP) for the River Murray prescribed watercourse. This can be finalised after resolution of the Lower Murray Cap and related matters.

(x) Are allocations to be reviewed after five years?

- A five-yearly review of water allocation plans is one of the State's policies under the State Water Plan 2000. The Minister also has power to reduce allocations if ecosystems are threatened.

#### **4.5.3 Water trading**

(i) How are the ecological and hydrological constraints of catchments assessed and are they considered?

- The context for transfer of water licences is provided by the relevant Catchment Water Management Plans, which have been developed with an extensive community consultation process. Water Allocation Plans are the main vehicle for achieving provision of water for the environment and they must include an assessment of the environment's water needs, provide monitoring arrangements and describe how water trading will apply in that area. These plans have to comply with the principles outlined in the State Water Plan.
- The River Murray Catchment Water Management Board draft Water Allocation Plan for the River Murray covers water trading rules. However, this discussion paper was not provided for assessment.

(ii) Are ecological constraints considered when determining cross-border trading?

- Yes, with NSW and Victoria through participation in the MDBC Water Trading Pilot Project.

(iii) Are there suitable mechanisms in place to monitor the environmental outcomes of water trading?

- Information was not provided in the submission.

#### **4.5.4 Environmental monitoring programs**

(i) Are there State-wide programs for assessing river health?

- South Australia has contributed to the National Land and Water Resources Audit's Assessment of River Condition.
- South Australia has contributed to the National River Health Program.
- South Australia's State Water Plan aims to provide a State-wide assessment and monitoring of changes in the condition of the State's water resource, and a State Water Monitoring Coordinating Sub-Committee has been established. This committee is devising a method for the development of a State-wide monitoring program. However, no evidence of its current status was presented.
- The Catchment Water Management Plans must set out a program to monitor the health of the water-dependent ecosystems. However, until these are implemented, no on-ground assessment can be made.

- Implementation appears to be linked to the completion and implementation of Catchment Water Management Plans. Currently only two plans are complete (Onkaparinga; Northern Adelaide & Barossa Catchment), one is imminent, three are due by the end of 2001 and another is scheduled for completion in 2002.
- (ii) Where rivers cross borders, is the assessment framework consistent and coordinated between States?
- This cannot be assessed on information presented.
  - Participation in the SRA will ensure consistency between MDB governments.
- (iii) Is there a formal process for adaptive management?
- Monitoring is to be undertaken as directed in the Catchment Water Management Plans (once produced) and these will provide information for the five-year reviews of these plans.
- (iv) Are the monitoring programs and State-wide assessments underpinned by the best available scientific knowledge?
- This matter was not addressed by the submission.

#### 4.5.5 *Water quality*

- (i) Is water quality assessment by the State linked to land-use planning and management?
- South Australia has adopted a strong integrated catchment-based approach to resource management, including community-based catchment management groups, regional natural resource management groups, and a State and Local Government Partnership Program.
  - Under the *Water Resources Act 1997*, a large number of catchment management boards have been established across the State, at both the rural and urban levels.
  - A Discussion Paper on Drainage in the Lower Murray has been released. Strategies comprise a range of education, economic incentives, planning and regulatory controls, and infrastructure provision.
- (ii) Have environmental values and associated water quality guidelines or objectives been set?
- There has been enactment of Environmental Protection (Water Quality) Policy 2000 under the *Environmental Protection Act 1993*.
  - The State Water Plan 2000 establishes State-wide policy for the management of all water-dependent ecosystems.
  - Catchment management plans incorporate the identification of environmental values and associated water quality guidelines.
- (iii) Are State-wide water quality monitoring programs in place?
- A State Water Monitoring Coordination Sub-Committee has been established to coordinate monitoring across agencies.
  - Extensive State-wide monitoring programs are being undertaken by lead agencies (SA Water, Catchment Management Boards, EPA ) with State and local reporting.
- (iv) Are the programs spatially and temporally adequate?
- There is comprehensive State-wide coverage of waters. No information was provided against which to assess the adequacy of frequency of monitoring or design of program.

- (v) Are there established State-wide assessment procedures in the interpretation of water quality data?
- A new State Water Archive is being developed which will bring together information on the location, quantity, quality, use, allocation and management of water resources.

#### **4.5.6 *Integrated Catchment Management (ICM)***

- (i) Does the ICM framework provide suitable protection to rivers having high environmental value?
- Nine interim Natural Resource Management Committees have been developed. However, the basis for determining scientific, technical and community representation on these committees appears to be poorly defined, based on comments, such as: 'Some committees are largely skills based and some are representative (p. 27)'.
  - It is noted that significant progress has been made in implementing action plans that include water quality, erosion control and riparian zone management, for four Mount Lofty Catchments using NHT funds. It is also noted that the Little Para and Marne catchments have had similar plans developed.
  - The lack of progress on integrated catchment land and water management plans for areas other than these around Adelaide remains a significant concern.
  - It is noted the riparian management plans have been have been developed for four other catchments.
  - The submitted information does not show how rivers that have high environmental value are identified at the State level and prioritised (as appropriate) for ICM funding.
- (ii) Does the ICM approach use the best available scientific and technical knowledge?
- Assessment was not possible as no relevant information has been provided.

## 4.6 Tasmania

### 4.6.1 *Ecological sustainability of new schemes and extensions to schemes*

- (i) Are assessments independent and based on best scientific practice?
  - Insufficient information provided on which to make assessment.
- (ii) Are assessments made prior to commencing the scheme or extensions to the scheme?
  - Insufficient information provided on which to make assessment.
- (iii) Are potential impacts on streamflow, riparian and floodplain condition taken into account in the planning and approval process?
  - Insufficient information provided on which to make assessment.
- (iv) Is the scale of the ecological assessment commensurate with the scale of the development — does the assessment extend downstream?
  - Insufficient information provided on which to make assessment.
- (v) Are suitable mechanisms in place to monitor impacts on the environment of new schemes or extensions to existing schemes?
  - Assessment cannot be made — relevant information has not been supplied.

### 4.6.2 *Environmental water allocations*

- (i) Are allocations consistent with the *National Principles for the Provision of Water for Ecosystems* (ARMCANZ and ANZECC, 1996)?
  - Principles 5, 7, 8 and 11 not satisfied.
- (ii) Is the process consistent with the stressed systems identified in the Second Tranche report?
  - A State Working Group was established in 1997 to oversee the development of Water Management Plans in conjunction with the implementation of the State WQM Policy. The group is responsible for setting priorities for Water Management Plans using an agreed process for quantitatively defining catchment priorities according to stresses placed on their waters, or other special management requirements.
- (iii) Is the process for establishing environmental allocations documented and implemented?
  - The Department for Primary Industries, Water and Environment (DPIWE) has adopted a regional approach for a suite of activities to address the Environmental Flow Requirements of rivers. The agency is assessing Environmental Flow Requirements for river systems using detailed methods for stressed river systems and rapid assessment desktop methods for lower priority systems. The suggested management approach has been fully documented in Fuller & Read (1997) *Environmental Flows Assessment and Allocation*, DPIF Report Series WRA 97/07.
- (iv) How appropriate are the methods for assessing the environment's water needs?
  - Protected Environmental Values are values identified for each system, and are deemed to be values or uses of the environment that must be protected.
  - A flow chart of the process for setting environmental flows is provided. The issues flow chart considers the importance of flow variability, the importance of water quality, and habitat requirements. The minimum flow requirements to satisfy flow and water quality objectives are then determined in the form of a flow regime.

- However, the details of the methods for determining the minimum flow requirements and the flow regime are not set out in the documentation provided. This is a critical omission.
- (v) Is there a scientific process for identifying environmental flows?
- The framework outlined above has strong scientific foundations.
  - Ecological models of river health being developed under the National River Health Program provide a basis for assessing impacts of existing water resource developments and environmental flows. These models are based on invertebrates, but algae may be included in the future. Methods for determining the minimum flow requirements and the flow regime needed to meet ecosystem values are presently being developed through a research process.
  - The identification of ecosystem values, such as endangered species (plant or animal), native fish populations, riverine vegetation (riparian zone), stream habitat for flora and fauna, wetland and/or estuary values, uses a scientific process and best available scientific knowledge. Predictive ecological models based on invertebrates and, in the future, algae, are based on rigorous science.
- (vi) Does the framework provide an appropriate balance between the environment and other users?
- Environmental flow assessments have been completed for stressed rivers using detailed methods, and for lower priority systems using desktop methods. These assessments have focused on the north-eastern area and the midland and southern areas of Tasmania.
  - The frameworks and methods outlined above have the *potential* to achieve a better balance between water users and in favour of the environmental values of aquatic ecosystems. However, actual progress to date is less than expected.
- (vii) Is the framework likely to maintain, enhance or restore river health?
- Environmental flow assessments have been completed for a number of rivers (see below). Only if flow variability and minimum flow requirements have been met (as the environmental flows flowchart suggests), are environmental flows likely to achieve maintenance or improvements and/or restoration of river condition. However, there are no details on the environmental flows allocated in terms of quantity or the distribution of flows over time (e.g. seasonal patterns), frequency of small floods, etc., for the rivers assessed, to date. It is not possible to judge the ecological outcomes from the documentation provided.
- (viii) Does the system of environmental water allocations recognise the whole water cycle?
- Unable to make an assessment from the information provided.
- (ix) In relation to the magnitude of the task, have jurisdictions made substantial progress towards providing allocations for stressed and other rivers?
- Environmental flow assessments have been completed for stressed rivers using detailed methods, and for lower priority systems using desktop methods. These assessments have focused on the north-eastern area and the midland and southern areas of Tasmania. The north-western region and the rest of the State will be the focus of environmental flow assessment during 2001–02. Rivers in the south-west are primarily within the World Heritage Area and are the lowest priority for environmental flow assessments.
  - While Tasmania has undertaken some assessments, it is yet to make any substantial progress with environmental flow allocations.

- (x) Are allocations to be reviewed after five years?
- Water Management Plans will be reviewed after five years.

#### 4.6.3 *Water trading*

- (i) How are the ecological and hydrological constraints of catchments assessed and are they considered?
- It appears that Tasmania has not yet developed State-wide processes for determining rules for water trading.
  - However, the Tasmanian Government's submission indicates that '...implementing procedures to facilitate water trading' is a principal component of implementing the *Water Management Act 1999* and that, generally, trading is restricted until all entitlements that were attached to land title are converted to water licences.
- (ii) Are ecological constraints considered when determining cross-border trading?
- Not applicable.
- (iii) Are there suitable mechanisms in place to monitor the environmental outcomes of water trading?
- Unable to make an assessment as no information provided.

#### 4.6.4 *Environmental monitoring programs*

- (i) Are there State-wide programs for assessing river health?
- Tasmania has contributed to the National Land and Water Resources Audit's Assessment of River Condition, and the National River Health Program.
  - Tasmania has no coordinated State-wide programs for assessing river health, but there are several ad hoc programs underway:
    - ▶ 'State of the River Reports' have been completed for four catchments and are underway in a further six. These contain assessments of water quality, aquatic health (AUSRIVAS) and other (not described) measures of river health. AUSRIVAS models are developed for northern and western regions of the State, with models being developed for the remainder.
    - ▶ The Index of Stream Condition, developed in Victoria, is being used to assess streams in the north-eastern region. The Index of Stream Condition assesses hydrology, geomorphology, habitat, biota and water quality.
  - These ad hoc reports will only be useful in this context if they are undertaken in a coordinated fashion such that they are adequate to report trends and provide information for management decisions. Evidence to support this was not presented.
- (ii) Where rivers cross borders, is the assessment framework consistent and coordinated between States?
- Not applicable.
- (iii) Is there a formal process for adaptive management?
- No such system has been developed, or documented.
- (iv) Are the monitoring programs and State-wide assessments underpinned by the best available scientific knowledge?

- No evidence was provided to demonstrate the use of best available scientific knowledge.

#### 4.6.5 Water quality

- (i) Is water quality assessment by the States linked to land-use planning and management?
- There is a strong integrated catchment-based approach to resource management, including community-based catchment management groups, regional natural resource management groups, and a State and Local Government Partnership Program. The development of a State Natural Resource Management strategy has been initiated.
  - Protection of environmental values is linked with planning and regulatory controls. The *Water Management Act 1999* provides for licensing arrangements and development of water management plans. There are now 28 catchment management and regional groups operating in the State.
  - The *Water Management Act 1999* provides for development of catchment management plans. A total of 28 catchment management and Regional Natural Resource Management Groups are now operating, with a strategy for plan development at various stages. Strategies comprise a range of educational and economic incentives, planning and regulatory controls, and infrastructure provision.
- (ii) Have environmental values and associated water quality guidelines or objectives been set?
- There is provision under the State Policy on Water Quality Management (1997) for designation of environmental values and water quality guidelines.
  - Protected environmental values and water quality guidelines have been completed for nine catchments, to date, with another 10 proceeding.
  - A State Working Group was established in 1997 to oversee the development of water management plans. The Group is responsible for setting water values. A total of 28 catchment management and regional groups are now operating in the State.
- (iii) Are State-wide water quality monitoring programs in place?
- There is a network of continuous monitoring stations at 11 sites around the State. Given that 28 catchments are identified this seems insufficient to provide a comprehensive program. A State Water Development Plan is currently being developed, providing for a strategic approach to water resource development.
- (iv) Are the programs spatially and temporally adequate?
- No information has been provided against which to assess the adequacy of frequency of monitoring or design of program.
- (v) Are there established State-wide assessment procedures in the interpretation of water quality data?
- State of Rivers reports have been completed for four catchments during 1999/2000.
  - The Australian River Assessment System (AUSRIVAS) model of river health has been adopted for assessment of environmental benefits of environmental flows. DPIWE publishes catchment-based strategic State of Rivers' reports which provide information on the current status of water quality, health and river condition. Reports for four catchments are complete, and a further six studies are in progress.

#### 4.6.6 *Integrated Catchment Management (ICM)*

- (i) Does the ICM framework provide suitable protection of rivers having high environmental value?
- The admitted lack of progress in the implementation of a framework for Integrated Catchment Management and associated integrated land and water management planning in Tasmania is a matter of significant concern.
  - Few details were supplied about the Integrated Catchment Management process in Tasmania, other than that there are now ‘twenty-eight catchment management and regional NRM groups operating in the state, with catchment and NRM plans and strategies at various stages of development and implementation’.
  - The State Water Quality Management policy contains provisions for dealing with erosion control, stormwater run-off from land disturbance, agricultural run-off and forestry operations. However, the policy does not seem to have yet been transferred into catchment plans.
  - It is noted that ‘Guidelines for Good Agricultural Land Practice’ in Tasmania are being developed using NHT funds. The first draft of this document was completed in mid-2000. The delay in producing the final guidelines and in ensuring implementation across the State is a matter of concern.
  - It is noted that Tasmania has in place a legally enforceable Forestry Code, but no details were provided to show how this code relates to the protection of streams and their riparian zones and floodplains (where they occur).
  - The submitted information does not show how the individual rivers that have high environmental value are identified at the State level and prioritised (as appropriate) for Integrated Catchment Management funding.
- (ii) Does the ICM approach use the best available scientific and technical knowledge?
- Assessment was not possible as no relevant information has been provided.

## 4.7 Victoria

### 4.7.1 *Ecological sustainability of new schemes and extensions to schemes*

- (i) Are assessments independent and based on best scientific practice?
  - No evidence is provided of the use of best scientific knowledge and practice. This is not to imply that this is not occurring, but it is impossible for an assessment to be made based on the submitted information.
- (ii) Are assessments made prior to commencing the scheme or extensions to the scheme?
  - The *Water Act 1989* requires ecological sustainability to be assessed before any revisions are made to bulk entitlements, with bulk entitlements being affected by changes to rural schemes and dam construction. However, details of the assessment process have not been provided.
- (iii) Are potential impacts on streamflow, riparian and floodplain condition taken into account in the planning and approval process?
  - Assessment is difficult to make based on the information supplied. However, the recommendations outlined in the Farm Dams (Irrigation) 2000 review are supported — namely that interim sustainable diversion limits should be established State-wide for all waterways and catchments, and that all infrastructure developments should be considered in Stream Flow Management Plans.
- (iv) Is the scale of the ecological assessment commensurate with the scale of the development — does the assessment extend downstream?
  - Assessment is difficult to make based on the information supplied. However, if all developments are included in considerations of sustainable diversion limits and streamflow management plans, as recommended in the Farm Dams (Irrigation) 2000 review, then there would be a reasonable expectation that this will occur. If assessment does not include consideration of adjoining downstream catchments then this should be addressed.
- (v) Are suitable mechanisms in place to monitor impacts on the environment of new schemes or extensions to existing schemes?
  - Assessment cannot be made — relevant information has not been supplied. However, aspects of the Victorian Index of Stream Condition may form a reasonable basis for monitoring impacts, if supplemented by biotic indices and carried out over appropriate time scales.

### 4.7.2 *Environmental water allocations*

- (i) Are allocations consistent with the *National Principles for the Provision of Water for Ecosystems* (ARMCANZ and ANZECC, 1996)?
  - Allocations obtained through the Bulk Entitlement and Stream Flow Management Plan processes in over-allocated streams are not likely to address Principle 5 fully, and review of allocations to the environment will be necessary.
- (ii) Is the process consistent with the stressed systems identified in the Second Tranche report?
  - Stressed basins are defined as those where any environmental flows negotiated via the Bulk Water Entitlement process do not fully meet environmental objectives.

- These stressed rivers are being identified and their environmental flows are being addressed through the implementation of Stream Flow Management Plans and River Restoration Plans.
- (iii) Is the process for establishing environmental allocations documented and implemented?
- Water allocations for the environment are addressed via a two-phase process. Mechanisms for doing this are documented.
  - Stage 1 involves conversion to Bulk Water Entitlements where managers can negotiate improved environmental flows or secure bulk entitlements for the environment. Provisions for environment are also made in Stream Flow Management Plans for unregulated rivers. In Stage 2, stressed basins are identified and addressed through Stream Flow Management Plans and River Restoration Plans. Progress, to date, involves completion of 15 bulk entitlements, the Farm Dams Review and the launch of the Snowy River restoration initiative.
  - The Stream Flow Management Plans for unregulated rivers establish environmental flow objectives, immediate and, where necessary, long-term environmental flows, mechanisms to achieve the latter, rostering rules and rules governing the granting of any new licences.
- (iv) How appropriate are the methods for assessing the environment's water needs?
- Many improvements in environmental flows have been negotiated during Stage 1. However, it remains to be shown whether these improvements are sufficient to arrest the decline of river health in these systems.
  - In the Bulk Water Entitlement process, the final outcome may still not meet environmental requirements. Stage 2 deals with these 'stressed' rivers, where environmental flows do not meet environmental requirements.
- (v) Is there a scientific process for identifying environmental flows?
- The current State-wide method for environmental flow determinations is not described in the documents provided. This State-wide method is being reviewed to take into account experiences with 10 different Stream Flow Management Plans, and national as well as international developments.
  - The Victorian Government is currently preparing the Victorian River Health Strategy. This strategy will establish a framework for the integrated management of Victoria's rivers and streams. The draft strategy was due for release and public comment in June 2001.
  - The process of setting environmental objectives and environmental flows to meet those objectives for each catchment certainly involves scientific advice, and may perhaps be termed an Expert Panel Approach combined with risk assessment.
- (vi) Does the framework provide an appropriate balance between the environment and other users?
- To date, improved environmental flow regimes have been negotiated in 82% of Bulk Water Entitlement conversions, e.g. the Thomson River passing flow below Cowwarr Weir has been increased from 25 ML/day to 125 ML/day. The documentation provided does not indicate how this quantity of flow will be distributed in time. Opportunity is available via the *Water Act 1989* to conduct formal reviews of environmental flows as further relevant information is collected. This implies an adaptive management approach, as advocated in other jurisdictions. However, no details of any such reviews were in the documentation provided.

- Stream Flow Management Plans for unregulated rivers establish environmental flow objectives, immediate and, where necessary, long-term environmental flows, mechanisms to achieve the latter, rostering rules and rules governing the granting of any new licences.
- (vii) Is the framework likely to maintain, enhance or restore river health?
- The improved environmental flow regimes negotiated in 82% of Bulk Water Entitlement conversions are likely to achieve maintenance or improvements to river condition, provided that sufficient quantities of water are distributed in time to achieve near natural seasonal patterns of flow, small floods, etc.
  - The details of how flows are distributed over time are not available in the documentation provided.
- (viii) Does the system of environmental water allocations recognise the whole water cycle?
- The Victorian framework for allocating water to the environment assesses all components listed.
  - Both surface and groundwater environmental flows and management plans are being developed, and overland flows are considered, for example, in relation to the influence of farm dams on the hydrology of streams and rivers. The Snowy River restoration project is giving consideration to the lower tidal reaches and the estuary.
  - The current State-wide method for environmental flow determinations is not described in the documents provided; thus it is not clear how other estuaries will be taken into consideration in catchment water management plans.
- (ix) In relation to the magnitude of the task, have jurisdictions made substantial progress towards providing allocations for stressed and other rivers?
- Major progress to date involves completion of 15 bulk entitlements, the Farm Dams Review and the launch of the Snowy River restoration initiative.
  - Stream Flow Management Plans for 20 unregulated rivers, not covered under the Bulk Water Entitlement program, are in progress. Three of these have community endorsement and two are in operation. Six will be endorsed by the community in mid-2001.
  - River Restoration Plans are being developed for priority stressed rivers where environmental flow provisions are made through Bulk Water Entitlements. River Restoration Plans are being developed in three priority rivers: the Thomson, the Avoca and the Glenelg. Work has begun on the Wimmera River.
  - Fifteen Groundwater Supply Protection Areas have been established and Groundwater Management Plans are being developed and implemented.
- (x) Are allocations to be reviewed after five years?
- Stream Flow Management Plans are to be reviewed after five years.

#### **4.7.3 Water trading**

- (i) How are the ecological and hydrological constraints of catchments assessed and are they considered?
- For unregulated rivers, trading rules, along with environmental flow provisions and rostering provisions, are established through the development of the Stream Flow Management Plans. Also, the draft recommendations of the Farm Dam Review include

environmental flow considerations in the development of trading rules for unregulated streams.

- In regulated rivers, water-trading rules are established through the bulk entitlement program. There is insufficient information in the Victorian submission to assess these rules.
  - A trading handbook is being developed for the Northern Victorian Water Exchange that may describe ecological and hydrological constraints to water trading; however, this handbook has not been sighted for this assessment.
  - Specifically, for water trading associated with the MDBC Pilot Project (this may extend to other trades, but there is insufficient information to assess that):
    - ▶ for new irrigation developments (which would acquire water through trading) a comprehensive plan must be prepared, to ensure no net conservation loss, no increase in river salinity, no loss of wetland values and no net loss of native vegetation.
  - Within areas of the State where salinity management is of particular concern (e.g. between Nyah and the South Australian border), there can only be trading to suitable land classes. For example, no water can be traded into the high salinity impact zones.
- (ii) Are ecological constraints considered when determining cross-border trading?
- Yes, through participation in the MDBC Water Trading Pilot Project. No information has been presented from which to make assessment outside of the MDBC Pilot Project area (e.g. with SE South Australia and with NSW Mid-Upper Murray).
- (iii) Are there suitable mechanisms in place to monitor the environmental outcomes of water trading?
- No specific programs are mentioned in the Victorian submission for assessing the ecological outcomes of water trading. The State-wide river health assessment program, Index of Stream Condition, is designed to identify ecological outcomes of water management, but the study design is not optimised for determining the environmental impacts of water trading.

#### **4.7.4 Environmental monitoring programs**

- (i) Are there State-wide programs for assessing river health?
- Victoria has contributed to the National Land and Water Resources Audit's Assessment of River Condition and the National River Health Program.
  - Victoria has developed the Index of Stream Condition assessment as a comprehensive State-wide program for monitoring river health. The Index of Stream Condition assessment comprises indices for hydrology, geomorphology, habitat, biota and water quality.
  - The Index of Stream Condition is designed to be measured each five years and so it will take several cycles of the program to detect trends.
  - The Index of Stream Condition provides State-wide information at the reach scale (950 reaches have been assessed). The Catchment Management Authorities undertake the assessment, coordinated by DNRE.
  - Victoria supports a significant long-term research project into the environmental impacts of environmental releases in the Campaspe River.

- (ii) Where rivers cross borders, is the assessment framework consistent and coordinated between States?
  - Participation in the Sustainable Rivers Audit will ensure consistency between MDB governments.
- (iii) Is there a formal process for adaptive management?
  - The results of the Index of Stream Condition assessment are to be used by the Catchment Management Authorities, together with their regional communities, to set management objectives, determine management priorities and measure the effectiveness of long-term programs in their catchments.
  - The results of the Index of Stream Condition assessment and other monitoring data are available to the public on the Web at <<http://www.vicwaterdata.net/>>.
  - The Index of Stream Condition is not likely to be comprehensive enough to assess the ecological impacts of environmental flow allocations.
- (iv) Are the monitoring programs and State-wide assessments underpinned by the best available scientific knowledge?
  - The Index of Stream Condition was developed in consultation with a scientific reference group and the assessment methods are published in peer reviewed scientific literature.
  - DNRE and EPA are members of the CRC for Catchment Hydrology and the CRC for Freshwater Ecology and participants in the project 'Assessment of River Health'.

#### **4.7.5 Water quality**

- (i) Is water quality assessment by the States linked to land-use planning and management?
  - Victoria has adopted a total catchment management-based management framework to link water quality assessment with land-use planning and management. Strategies are implemented through lead State and Local Government agencies, planning and regulatory agencies and water agencies. Strategies comprise a range of education and economic incentives, planning and regulatory controls, and infrastructure provision.
  - Strong links are present between Catchment Management Authorities and Land Protection Boards through the establishment of Regional Catchment Strategies and State Environmental Protection Policies. Improved integrated resource management services are provided by Catchment Management Authorities, which comprise representatives of land-use sectors across catchments, and Land Protection Boards.
- (ii) Have environmental values and associated water quality guidelines or objectives been set?
  - There is a strong framework of State Environmental Protection Policies, identifying environmental values and water quality guidelines.
  - A statutory consultative process has been set up with respect to the development of policies.
  - Catchment Management Authorities have been established to develop environmental values. They have extensive stakeholder membership.
  - Specialist Nutrient Management Plans have been established for 16 catchments.

- (iii) Are State-wide water quality monitoring programs in place?
  - Extensive State-wide monitoring programs are being undertaken by lead agencies (EPA, Regional Water Boards or Catchment Management Authorities) with State and local authorities reporting.
- (iv) Are the programs spatially and temporally adequate?
  - There is comprehensive State-wide coverage of waters. No information has been provided against which to assess the adequacy of frequency of monitoring or design of program.
- (v) Are there established State-wide assessment procedures in the interpretation of water quality data?
  - There is an ongoing program of benchmarking of the environmental condition of Victoria's waterways. Lead agencies undertake assessment against statutory water quality objectives or guidelines. There is statutory assessment under the State of Environment Reporting.

#### **4.7.6 *Integrated Catchment Management (ICM)***

- (i) Does the ICM framework provide suitable protection to rivers that have high environmental value?
  - Implementation Committees oversee on-ground works programs and monitor performance and report to Catchment Management Authorities. The Implementation Committees also appear to have a major influence on setting priorities for works, and the specific activities undertaken. This approach is supported.
  - It is noted that 16 catchment-based nutrient management plans are being implemented. This planning activity is commended.
  - The submitted information does not show how the individual rivers that have high environmental value are identified at the State level and prioritised (as appropriate) for Integrated Catchment Management funding.
- (ii) Does the ICM approach use the best available scientific and technical knowledge?
  - Assessment is not possible because no relevant information has been provided.

## 4.8 Western Australia

### 4.8.1 *Ecological sustainability of new schemes and extensions to schemes*

- (i) Are assessments independent and based on best scientific practice?
  - Assessment cannot be made — relevant information was not supplied.
- (ii) Are assessments made prior to commencing the scheme or extensions to the scheme?
  - Assessment cannot be made — relevant information was not supplied.
- (iii) Are potential impacts on streamflow, riparian and floodplain condition taken into account in the planning and approval process?
  - Assessment cannot be made — relevant information was not supplied.
- (iv) Is the scale of the ecological assessment commensurate with the scale of the development — does the assessment extend downstream?
  - Assessment cannot be made — relevant information was not supplied.
- (v) Are suitable mechanisms in place for monitoring impacts on the environment of new schemes or extensions to existing schemes?
  - Assessment cannot be made — relevant information was not supplied.

### 4.8.2 *Environmental water allocations*

- (i) Are allocations consistent with the *National Principles for the Provision of Water for Ecosystems* (ARMCANZ and ANZECC, 1996)?
  - Western Australia is complying with the National Principles.
- (ii) Is the process consistent with the stressed systems identified in the Second Tranche report?
  - Provision for the environment is set in all water systems, from a ‘notional or interim allocation limit’ in under-allocated and under-stressed systems, to formal Ecological Water Provisions in areas that are highly or fully developed [stressed].
  - Ecological Water Provisions are the water regimes that are provided as a result of the water allocation decision-making process, taking into account ecological, social and economic impacts. They may meet in part or in full the Ecological Water Requirements.
  - Ecological Water Requirements are the water regimes needed to maintain ecological values of water-dependent ecosystems at a low level of risk.
- (iii) Is the process for establishing environmental allocations documented and implemented?
  - Principles for determining Ecological Water Provisions are contained in the T2 Assessment report, pp. 552 and 553, and set out in the Commission’s recently released ‘Environmental Water Provisions Policy for Western Australia’ (see section 2.4).
  - In areas where there is little technical knowledge available, and the water resource is determined as being not stressed (under-allocated), a ‘notional or interim allocation limit’ may be set which relates to a percentage of the ‘engineeringly practical diversion limit’ for surface water, or a percentage of the rainfall in certain groundwater areas.
  - In areas that are highly or fully developed (i.e. allocations greater than 70% of sustainable yield) the allocations for water-dependent ecosystems are based on scientific investigations which determine the Ecological Water Requirements.

- In areas with high conservation values, it may be determined that all water should be allocated to ecological values, such as is proposed for the Shannon River.
  - The transition from providing notional or interim allocations to Ecological Water Requirement status is driven in many cases by growth pressures, whether potential or real. Ecological Water Requirements are then converted to Environmental Water Provisions to take into account the socio-economic pressures associated with allocation planning. In these areas, the allocations for consumptive uses follow the allocation to the environment.
  - Each of these major allocation-planning proposals was formally reviewed and approved by the EPA.
- (iv) How appropriate are the methods for assessing the environment's water needs?
- The Commission's recently released 'Environmental Water Provisions Policy for Western Australia' (see section 2.4) takes account of the Holistic Approach (Arthington et al. 1992), and recent reviews of environmental flow methods published by LWRDC. Western Australia has developed a process for determining environmental flows (i.e. Ecological Water Requirements) based upon these broad environmental flows frameworks. The steps in the process are:
    - ▶ identify the ecological values of water-dependent ecosystems and all ecosystem components and ecological processes sustaining those values, and which are sensitive to changes in water regime;
    - ▶ determine Ecological Water Requirements for sensitive ecosystem components that sustain the ecological values;
    - ▶ model the water resource system to estimate the water available for consumptive use with the Ecological Water Requirements applied;
    - ▶ formulate management objectives for the water resource system including social water requirements;
    - ▶ propose Ecological Water Provisions using existing information on Ecological Water Requirements taking vital consumptive and social uses into consideration.
  - It is a matter of concern that Ecological Water Provisions may provide less water to ecosystems than the recommended Ecological Water Requirements. When this occurs for environmentally significant proposals, the allocation of water is also subject to formal review under the *Environmental Protection Act 1986*.
  - The procedures rely heavily on past and ongoing research on rivers and groundwater wetlands, and also involve original field work to gather additional data on flow–ecology relationships, effects of barriers, etc. Proof of such work being completed and critically reviewed was not provided.
- (v) Is there a scientific process for identifying environmental flows?
- WRC uses an expert panel approach, drawing on appropriate experts to undertake the appropriate investigations. It is unclear if scientific expertise from outside the State is regularly called upon.
  - The Commission has developed methods for the determination of Ecological Water Requirements and Ecological Water Provisions for groundwater-dependent ecosystems. Knowledge gained and approaches devised in the Gngangara and Jandakot mounds studies are being applied elsewhere in the determination of Ecological Water Provisions for high priority groundwater systems.
  - In systems of high ecological and conservation value, it may be determined that all water should be allocated to ecological values, such as is proposed for the Shannon

River, i.e. Ecological Water Requirements may be accommodated in full in Ecological Water Provisions.

- (vi) Is the framework likely to maintain, enhance or restore river health?
- The processes and methods used in Western Australia to develop Ecological Water Requirements and Ecological Water Provisions are likely to maintain, improve and/or restore water-dependent ecosystems, if suitable environmental allocations are made.
- (vii) Does the system of environmental water allocations recognise the whole water cycle?
- Overland flows can be managed under local by-laws if the use of the overland flow causes a reduction in the flow of a watercourse, or if it has a significant effect on the quality of the water or an ecosystem. To date, Western Australia has not had any significant developments in this regard and by-laws have not been formulated.
  - In all proclaimed groundwater areas of the State, allocation limits for consumptive use have been set. Explicit in this limit is the allocation to the environment, which has been set prior to the allocation for consumptive use.
- (viii) In relation to the magnitude of the task, have jurisdictions made substantial progress towards providing allocations for stressed and other rivers?
- Preliminary Ecological Water Requirements have been determined for all 44 surface water basins and 174 groundwater management units in the State, through the recently completed 'WA Water Assessment 2000' work. The State contends that the Audit represents a substantial allocation of water to the environment. However, the scientific basis for the allocations remains unclear.
  - All existing Ecological Water Provisions are in place and enforced through allocation plans and licensing. New Ecological Water Provisions being determined will be enforced through incorporation in allocation plans and keeping licensed allocations to within sustainable limits.
  - The Audit indicated that only two of the 174 groundwater management units (GMUs) in the State were over-allocated (i.e. allocations exceeded the sustainable limit). Strategies are in place to bring use back to sustainable limits for these two GMUs within the next five years. Some GMUs have sub-areas with localised over-allocation, compensated for by adjacent sub-areas with lower allocations. Work is underway to resolve these by resurveying use, reallocation, or review/redistribution of sustainable limits.
  - The Audit indicated that none of the 44 surface water basins in the State or 303 sub-catchment areas are over-allocated. If not already done, these conclusions should be subject to independent, critical scientific review.
- (ix) Are allocations to be reviewed after five years?
- Western Australia has implemented, and formalised in legislation, plans specifying Ecological Water Provisions, sustainable limits and the requirements of licensing. Licences can be amended to ensure they comply with the current plan. The legislation allows plans and licences to be altered at any time, as it is proposed that problems be addressed as they are, rather than constrain changes to a five- or ten-year frequency. The maximum interval between reviews is unclear.

### 4.8.3 *Water trading*

- (i) How are the ecological and hydrological constraints of catchments assessed and are they considered?
- Environmental controls are proposed for application to water trading approvals in order to protect and enhance the environment, not merely to not harm it. The Commission may require an expert to make an assessment of the effect of granting the application for trade, with the expense to be borne by the applicant. However, the grounds for requiring an expert assessment are not specified.
  - The WA submission indicates that:
    - ▶ full implementation of trading in water entitlements has not occurred because of delayed passage of legislation;
    - ▶ all licences are tradeable as of 10 January 2001, a public register of licences has been established but no trades have eventuated.
  - Western Australia claims to be ‘... committed to ensuring the development and operation of trading markets to promote ecologically sustainable activities’, though no evidence has been supplied to support this contention.
  - Management plans at each level of planning across the State (regional, sub-regional and local area management plans) are likely to be the vehicle for determining local rules for water trading. However, insufficient information was presented in the WA report to assess whether this has occurred, or will occur in the future. That there has been no trade in licences in WA, to date, means that any proposed rules have not been tested.
- (ii) Are ecological constraints considered when determining cross-border trading?
- For the Ord Stage 2 Scheme there is an agreement with NT that WA water allocation legislation will apply throughout the project area and that NT drainage legislation will apply to drains that discharge into the Territory.
  - However, there is insufficient information provided in the WA submission to assess whether cross-border ecological constraints will be adequately considered.
- (iii) Are there suitable mechanisms in place for monitoring the environmental outcomes of water trading?
- Information was not provided, and until implemented no assessment of on-ground action can be made.

### 4.8.4 *Environmental monitoring programs*

- (i) Are there State-wide programs for assessing river health?
- Western Australia has contributed to the National Land and Water Resources Audit’s Assessment of River Condition, and the National River Health Program.
  - There does not appear to be any coordinated, on-going State-wide assessment of river health; if this is so, it is a matter of significant concern.
- (ii) Where rivers cross borders, is the assessment framework consistent and coordinated between States?
- No information was presented, but this is an issue for the Ord River region.
- (iii) Is there a formal process for adaptive management?
- No information presented.

- (iv) Are the monitoring programs and State-wide assessments underpinned by the best available scientific knowledge?
- No information presented.

#### **4.8.5 Water quality**

- (i) Is water quality assessment by the States linked to land-use planning and management?
- The State Water Quality Management Strategy has been through Cabinet for approval as implementation of the National Water Quality Management Strategy. This went out for consultation in February 2001 with an eight-week consultation period.
  - The WA government can foresee resourcing problems for WA resource management agencies.
- (ii) Have environmental values and associated water quality guidelines or objectives been set?
- It was noted in the report that the WA Government is moving towards the adoption of a Natural Resource Management strategy at the regional and sub-regional levels. However, it is a matter of concern that this has not already occurred.
  - There are extensive land-use management – river water quality management links in cases such as the Swan-Canning, Peel, Wilson and other estuaries.
  - The *Urban Stormwater Quality Management Manual 1998* has been developed. Strategies comprise a range of education and economic incentives, planning and regulatory controls, and infrastructure provision.
  - Water Source Protection Plans, the Swan-Canning Cleanup Program, the Vasse River Action Plan, and Land Conservation District Committees exist.
  - Environmental Protection Policies are yet to be developed.
- (iii) Are State-wide water quality monitoring programs in place?
- Agencies are currently developing a State Water Quality Management Strategy, as the basis for implementation of the NWQMS.
- (iv) Are the programs spatially and temporally adequate?
- No assessment — there is insufficient information against which to make assessment.
- (v) Are there established State-wide assessment procedures in the interpretation of water quality data?
- This appears not to be the case, based on the submitted information.

#### **4.8.6 Integrated Catchment Management (ICM)**

- (i) Does the ICM framework provide suitable protection of rivers having high environmental value?
- In some catchments in south-west WA, there has been excellent progress in developing an ICM framework that has led to a range of on-ground activities for land and water management. No lists of catchment or other ICM groups, or of integrated land and water management plans throughout the State were provided.
  - In general, progress outside the south-west urban areas (with the possible exception of the Ord Catchment) in developing ICM and related on-ground activities has been less than would be expected at this stage.

- The submitted information does not show how the individual rivers that have high environmental value are identified at the State level and prioritised (as appropriate) for ICM funding.
- (ii) Does the ICM approach use the best available scientific and technical knowledge?
- Assessment is not possible as no relevant information was provided.



## OTHER PUBLICATIONS OF The Cooperative Research Centre for Freshwater Ecology

The Cooperative Research Centre for Freshwater Ecology publishes a range of books, guidelines, newsletters, technical reports and brochures. These publications can be ordered from the Cooperative Research Centre for Freshwater Ecology at its Albury centre, by phoning 02 6058 2310, or by email to [enquiries@mdfrc.canberra.edu.au](mailto:enquiries@mdfrc.canberra.edu.au).

Many reports are also available on our web site at <http://freshwater.canberra.edu.au>.

### Books

Mussared, D. 1997. *Living on Floodplains*. Limited copies available. (\$22.00 including GST, postage and handling.)

### Brochures

- Billabongs, floodplains and river health
- The Chaffey Dam project
- Effects of a drying phase on the ecology of Menindee Lakes
- Environmental flows for the Campaspe River
- Providing an ecological basis for the sustainable management of Menindee Lakes
- Fish and rivers in stress — the NSW Rivers Survey
- Lowland rivers
- Carp, villains or victims?
- Snags: a valuable but scarce resource
- Sustainable rivers: the Cap and environmental flows
- The water forum

### Guidelines

Lawrence, I. & Breen, P. 1998. *Design Guidelines: Stormwater Pollution Control Ponds and Wetlands*. (\$25.00 including GST, postage and handling.)

### Identification Guides

The CRC for Freshwater Ecology sells identification guides to the invertebrates of Australian inland waters, including:

Hawking, J. & Smith, F. 1997. *Colour Guide to Invertebrates of Australian Inland Waters*. ID Guide no. 8. (\$26.40)

Hawking, J. 2000. *Key to Keys: A Guide to Keys and Zoological Information to Identify Invertebrates from Australian Inland Waters*. 2nd edn. ID Guide no. 2. (\$24.20)

Prices include GST, postage and handling.

**Technical reports** (\* indicates also available at <http://freshwater.canberra.edu.au>)

CRC for Freshwater Ecology. 1996. *Managing Collaboration for Scientific Excellence*.

- \*Cottingham, P. 2000. *Scientific Forum on River Condition and Flow Management of the Moonie, Warrego, Paroo, Bulloo and Nebine River Basins*.
- Cottingham, P., Whittington, J. & Hillman, T. 1999. *Riverine Management and Rehabilitation Scoping Study*.
- \*Cottingham, P., Georges, A., Briscoe, D., Butcher, R., Cullen, P., Deere, D., Harris, J., Hughes, J., Knowles, M., Lake, S., Lanertz, K., Paul, T., Reed, J., Williams, S. & Yates, D. 2000. *Managing Biodiversity in the Sydney Water Supply Catchments*. Technical report 9/2000.
- \*Cottingham, P., Hart, B., Adams, H., Doolan, J., Feehan, P., Grace, M., Grayson, R., Hamilton, D., Harper, M., Hibbert, B., Lawrence, I., Oliver, R., Robinson, D., Vollebergh, P. & Whittington, J. 2000. *Quantifying Nutrient–Algae Relationships in Freshwater Systems*. Outcomes of a workshop held at Monash University, 8 August 2000. Technical report 8/2000.
- Cottingham, P., Anderson, J., Breen, P., John, J., Langford, J., Moverley, J., O'Connor, N., Parslow, J., Rooney, G., Walsh, C. & Whelan, M. 2001. *Outcomes of the NRHP Urban Sub-program*. Report of a workshop held at Environment Australia, Canberra, 21 February 2001. Available only on the web site, <http://freshwater.canberra.edu.au>.
- Cottingham, P., Barton, J., Finlayson, B., Hart, B., Quinn, G., Raadik, T. & Stewardson, M. 2001. *Development of a Rehabilitation Plan for the Lower Thomson and Macalister Rivers*. Technical report 5/2001.
- \*Cottingham, P., Beckett, R., Breen, P., Feehan, P., Grace, M. & Hart, B. 2001. *Assessment of Ecological Risk Associated with Irrigation Systems in the Goulburn-Broken Catchment*. Technical report 3/2001.
- \*Cottingham, P., Carpenter, S., Hilborn, R., Kitchell, J. & Stow, C. 2001. *Large-scale Ecological Studies and Their Importance for Freshwater Resource Management*. Technical report 4/2001.
- CRCFE. 1996. *Managing Collaboration for Scientific Excellence*.
- CRCFE. 1996. *The Murray-Darling Freshwater Research Centre's Lower Basin Laboratory: An opening seminar*.
- CRCFE. 1997. *Sampling Nutrients in Aquatic Ecosystems*.
- CRCFE. 1997. *What is River Health?* Proceedings of an International Conference, University of Canberra 5–6 November, 1997.
- \*Cullen, P., Whittington, J. & Fraser, G. 2000. *Likely Ecological Outcomes of the COAG Water Reforms*.
- \*Cullen, P. et al. 2001. *Knowledge-seeking Strategies of Natural Resource Professionals*. Synthesis of a workshop held in Bungendore, NSW, 5–7 June 2000. Technical report 2/2001.
- \*Davis, J. & Finlayson, B. 2000. *Sand Slugs and Stream Degradation: The Case of the Granite Creeks, North-east Victoria*. Technical report 7/2000. (\$27.50 including GST, postage and handling.)
- Davis, J., Brent, P. & Hart, B. 1998. *The Ecology of the Yarra River*.
- Georges, A., Doody, S., Young, J. & Cann, J. 2000. *The Australian Pig-nosed Turtle*.
- Growns, J. & Gawne, B. 1998. *Environmental Flows — Summary Document*.
- \*Growns, J. & Marsh, N. 2000. *Characterisation of Flow in Regulated and Unregulated Streams in Eastern Australia*. Technical report 3/2000.

- \*Harper, M., Burdon, F. & Lawrence, I. 2000. *Development of Options for a Quantitative Lowland River Model*. Progress report ScA1.
- Harris, G. 1996. *Catchment and Aquatic Ecosystems Nutrient Ratios, Flow Regulation and Ecosystem Impacts in Rivers Like the Hawkesbury-Nepean*.
- \*Hart, B. & Cottingham, P. 2000. *Nutrient Loads from the Macalister Irrigation District*. Outcomes of the specialist workshop held at Monash University, 14 April 2000. Technical report 5/2000.
- \*Hughes, J. 2000. *Selection and Screening of Aquatic Taxa for Proposed Dryland Refugium Project*. Final report. ScC1.
- \*Hyne, R.V. & Maher, W.A. 2000. *Macroinvertebrate Biomarkers: Links to Toxicosis and Changes in Populations or Communities*. ScD5.
- \*Kennard, M., Pusey, B. & Arthington, A. 2001. *Trophic Ecology of Freshwater Fishes in Australia*. Progress report. ScD6.
- Lawrence, I., Bormans, M., Oliver, R., Ransom, G., Sherman, B., Ford, P. & Wasson, B. 2000. *Physical and Nutrient Factors Controlling Algal Succession and Biomass in Burrinjuck Reservoir, NSW*. Available only on the web site, <http://burrinjuck.canberra.edu.au>.
- Lintermans, M. 2000. *The Status of Fish in the Australian Capital Territory: A Review of Current Knowledge and Management Requirements*.
- \*Nielsen, D.L. & Hillman, T.J. 2000. *The Status of Research into the Effects of Dryland Salinity on Aquatic Ecosystems*. A discussion paper arising from a salinity workshop in Albury, NSW, 13 December 1999. Technical report 4/2000.
- \*Norris, R., Coysh, J., Linke, S., Walsh, C. & Choy, S. 2000. *'Dirty Water' Models, Predicting Community Composition for Streams in Disturbed Landscapes*. Summary report. ScD1.
- Ransom, G., Morgan, P., Cullen, P., Allen, D., Sinclair, D. & McGregor, D. 1998. *The Effect of Sewage Phosphorus Loads Using Phosphorus-free Laundry Detergent: Thurgoona Case Study*.
- Reid, D., Harris, J. & Chapman, D. 1997. *NSW Inland Commercial Fisheries Data Analysis*.
- Shalder, R.D., McKelvie, I.F. & Hart, B.T. 1998. *The Measurement of Bioavailable Phosphorus in Natural Water — Final Report*.
- Sheldon, F. 1999. *Spencer Regions Strategic Water Management Study: Environmental Flow Criteria*.
- Sherman, B., Ford, P., Hatton, P., Whittington, J., Green, D., Baldwin, D., Oliver, R., Shiel, R., van Berkel, J., Beckett, R., Grey, L. & Maher, W. 2001. *The Chaffey Dam Story*. Final report for CRCFE projects B.202 and B.203. 2001. Available only on the web site, <http://freshwater.canberra.edu.au>.
- Thoms, M.C. 1999. *The Condition of the Namoi River System*.
- \*Thoms, M., Norris, R., Harris, J., Williams, D. & Cottingham, P. 1999. *Environmental Scan of the Namoi River Valley*. Report for the Department of Land and Water Conservation and the Namoi River Management Committee.
- \*Thorncraft, G. & Harris, J.H. 2000. *Fish Passage and Fishways in New South Wales: A Status Report*. Technical report 1/2000.
- \*Udy, J., Hunter, H., Bunn, S., Browne, C. & Fellows, C. 2000. *Groundwater Nutrient Concentrations in Riparian Zones of Agricultural Catchments*. Final report. ScB4.

- \*Whittington, J. 2000. *Technical Review of Elements of the WAMP Process of the Queensland DNR*. Outcomes of a workshop at the River Glen Conference Centre, 9–10 November 1999.
- \*Whittington, J. 2000. *Development of Relationships between Flow Regime and River Health*. Outcome of a joint workshop between Cooperative Research Centre for Freshwater Ecology and Queensland Department of Natural Resources. Technical report 6/2000.