

National Competition Council

Victoria: allocation of water to the environment

**National Competition Policy Deferred 2003
Water Reform Assessment**

May 2004

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Abbreviations

CoAG	Council of Australian Governments
CMA	Catchment Management Authority
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ANZECC	Australian and New Zealand Environment and Conservation Council
VRHS	Victorian River Health Strategy
TAP	Technical Audit Panel

Introduction

In 1994, the Council of Australian Governments (CoAG) agreed to a strategic framework for the reform of the water industry (CoAG water reform agreement). Clause 4 obliges governments to establish comprehensive systems of water entitlements including allocations to the environment to maintain the health and viability of river systems and groundwater basins. For river systems that are overallocated or are deemed to be stressed, governments agreed to provide a better balance in water resource use, including appropriate allocations to the environment to enhance/restore the health of river systems.

The 1999 tripartite meeting (recommendations subsequently endorsed by CoAG senior officials) determined that governments should:

- submit individual publicly available implementation programs by 1999, outlining a priority list of river systems and groundwater resources, including all river systems which have been overallocated or are deemed to be stressed, and detailed implementation actions and dates for allocations and trading;
- demonstrate substantial progress in implementing programs by 2001, including at least allocations in all river systems which have been overallocated, or are deemed to be stressed; and
- substantially complete allocations for all river systems and groundwater resources identified in their implementation programs by 2005.

Victoria identified 11 stressed and overallocated river systems in its 1999 implementation program. By the time of the 2001, NCP assessment Victoria had not addressed in full the obligation to allocate water to the environment in the State's stressed and overallocated river systems. The Victorian Government committed, however, to a three-year Stressed Rivers Program for improving the health of its stressed rivers. Under this program Victoria was to have completed flow rehabilitation plans for five stressed river systems for the 2003 NCP assessment. In the 2001 NCP assessment, the Council considered that this program offered a comprehensive program for addressing the State's stressed rivers.

By the time of the 2003 NCP assessment, Victoria:

- had completed a flow rehabilitation plan for the Lerderderg River;
- determined a course of action for Badger Creek (and allocated some funding);
- was still to finalise the flow rehabilitation plans for the Thomson and Macalister rivers, although these plans were significantly advanced;

- had completed a flow rehabilitation plan for the Maribyrnong River and implemented the recommended environmental flows in many reaches, but had decided not to implement the plan in the remaining reaches;
 - instead Victoria referred the plan to the Port Phillip and Westernport Catchment Management Authority (CMA) to incorporate specific actions to improve river health into the CMA's regional catchment strategy and river health planning processes;
 - it also committed to implementing the streamflow management plan for King Parrot Creek in place of restoring flows in the remaining reaches of the Maribyrnong River.
- was progressing flow rehabilitation arrangements for the remaining six stressed and/or overallocated river systems.
- had released a green paper, *Securing our water future – a green paper for discussion* (DSE 2003), which identified additional rivers — the Moorabool, Goulburn, Campaspe, Yarra, Barwon and Latrobe rivers — as very likely to be stressed or at some risk of being stressed.

In the 2003 NCP assessment the Council acknowledged that Victoria had made progress, but found that the Government had not finalised its arrangements for providing environmental flows in several of the State's stressed river systems. Accepting that the work on national water industry arrangements foreshadowed by CoAG at the time of the 2003 NCP assessment may have consequences for Victoria's water management arrangements including for environmental allocations to stressed and overallocated rivers, the Council deferred the 2003 assessment of Victoria's work in this area.

This deferred 2003 NCP assessment report considers Victoria's actions relating to the Thomson, Macalister and Maribyrnong rivers (stressed river systems on Victoria's 1999 implementation program). Victoria had previously undertaken to determine environmental flow arrangements in these rivers by 2003. This deferred assessment also reports on Victoria's progress in implementing the streamflow management plan for King Parrot Creek. Finally, it summarises Victoria's progress towards the obligation to substantially complete environmental allocations for all river systems and groundwater resources identified in 1999, including the additional rivers identified as stressed and/or overallocated in the green paper.

CoAG environmental water obligations

CoAG's 1994 water reform agreement recognises the environment as a legitimate user of water. Among other things, it obliges governments to allocate water for environmental purposes, having regard to the water needs required to maintain the health and viability of river systems and groundwater basins, with priority to river systems that are overallocated or deemed to be stressed (box 1).

Box 1: Provision of water to the environment

Governments are to establish a sustainable balance between the environment and other uses, including formal provisions for the environment for surface water and groundwater. In doing so, governments are to have regard for the ARMCANZ/ANZECC National Principles for the Provision of Water for Ecosystems (box 2).

Environmental requirements are to be determined wherever possible on the best available scientific information and governments are to have regard to the intertemporal and interspatial water needs required to maintain the health and viability of river systems and groundwater basins. For river systems that are overallocated or deemed to be stressed, governments are to provide a better balance in water resource use, including appropriate allocations to the environment to enhance/restore the health of river systems.

Governments should also consider environmental contingency allocations, with a review of allocations five years after they have been initially determined.

The 1999 tripartite meeting clarified the commitment to provide water for the environment and timeframes:

For the second tranche [1999], jurisdictions submitted individual implementation programs, outlining a priority list of river systems and/or groundwater resources, including all river systems which have been over-allocated, or are deemed to be stressed, and detailed implementation actions and dates for allocations and trading to the NCC for agreement, and to Senior Officials for endorsement. This list is to be publicly available.

For the third tranche [2001], States and Territories will have to demonstrate substantial progress in implementing their agreed and endorsed implementation programs. Progress must include at least allocation to the environment in all river systems which have been over-allocated, or are deemed to be stressed.

By 2005, allocations and trading must be substantially completed for all river systems and groundwater resources identified in the agreed and endorsed individual implementation programs.

Reference: CoAG water reform agreement, clauses 4(b)–4(f); and 1999 tripartite meeting (CoAG endorsed the recommendations from this meeting).

Under the CoAG water reform agreement, governments should allocate water to the environment having regard to the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) and Australian and New Zealand Environment and Conservation Council (ANZECC) National Principles for the Provision of Water for Ecosystems (box 2). A key objective of the national principles is to sustain and, where necessary, restore ecological processes and the biodiversity of water-

dependent ecosystems, recognising that appropriate water flow is critical for maintaining natural ecological processes and biodiversity.

Box 2: ARMCANZ/ANZECC National Principles for the Provision of Water for Ecosystems

Principle 1: River regulation and/or consumptive use should be recognised as potentially impacting on ecological values.

Principle 2: Provision of water for ecosystems should be on the basis of the best scientific information available on the water regimes necessary to sustain the ecological values of water dependent ecosystems.

Principle 3: Environmental water provisions should be legally recognised.

Principle 4: In systems where there are existing users, provision of water for ecosystems should go as far as possible to meet the water regime necessary to sustain the ecological values of aquatic ecosystems whilst recognising the existing rights of other water users.

Principle 5: Where environmental water requirements cannot be met due to existing uses, action (including reallocation) should be taken to meet environmental needs.

Principle 6: Further allocation of water for any use should only be on the basis that natural ecological processes and biodiversity are sustained (that is, ecological values are sustained).

Principle 7: Accountabilities in all aspects of management of environmental water should be transparent and clearly defined.

Principle 8: Environmental water provisions should be responsive to monitoring and improvements in understanding of environmental water requirements.

Principle 9: All water uses should be managed in a manner which recognises ecological values.

Principle 10: Appropriate demand management and water pricing strategies should be used to assist in sustaining ecological values of water resources.

Principle 11: Strategic and applied research to improve understanding of environmental water requirements is essential.

Principle 12: All relevant environmental, social and economic stakeholders will be involved in water allocation planning and decision-making on environmental water provisions.

In considering governments' arrangements for allocating water to the environment, in the light of the guidance provided by the 1994 CoAG water reform agreement and the national principles,¹ the Council looks for governments to establish arrangements that:

1. are based on the best available science, wherever possible, and use strategic and applied research (principles 2 and 11);

¹ ARMCANZ/ANZECC national principles 3 and 10 are not directly relevant to governments' decisions on environmental allocations. The Council considers water pricing (national principle 10) in assessing progress with urban and rural pricing and the legal recognition of environmental water provisions (principle 3) in assessing governments' implementation of obligations on water entitlements. These matters are not considered in this report.

2. achieve a balance between environmental needs and human use that provides the water needed to sustain healthy aquatic ecosystems, while recognising, in systems where there are existing users, the existing rights of those users (principles 1, 4, 5, 6 and 9);
3. involve monitoring and adaptive management where the regular assessment of ecosystem health guides water management processes (principle 8); and
4. involve stakeholder consultation and transparent processes that are robust, involve the timely provision of relevant information to all interested parties and allow wide public consultation (principles 7 and 12).

Best available science

The environmental water obligations in the CoAG water reform agreement and principle 2 of the ARMCANZ/ANZECC national principles state that the 'best available science' should be used to determine environmental needs. The CoAG water reform agreement states:

4(d) that the environmental requirements, wherever possible, will be determined on the best scientific information available ...

Environmental flow assessment had its beginnings in the freshwater riverine systems and usually comprised simple hydrology-based approaches. Consequently, early environmental water allocations were based on historical hydrological information and involved determination of a 'minimum flow' for a river or a specific reach. More recently, there have been advances in environmental flow methodologies, and holistic models such as the Best Practice Framework (Arthington *et al.* 1998) and the model recommended by Land and Water Australia (Schofield *et al.* 2003) are now recognised as more scientifically robust than minimum flows.

While there are several different types of holistic methodologies, each typically involves:

- a multidisciplinary approach involving biologists, ecologists, geomorphologists, hydrologists and water quality specialists to ensure that all ecological and physical processes are considered;
- consideration of all elements of the water system including: surface water, such as rivers, floodplain wetlands, receiving water bodies (for example, estuaries); groundwater; and terrestrial systems linked through the groundwater table;
- use of data that are comprehensive, relevant, current and subject to quality control and quality assurance arrangements;

- consideration of the entire water regime (that is variability, duration, magnitude, frequency and timing), which is especially important in Australia where rainfall frequency and intensity are highly variable and native flora and fauna have adapted to variable flow environments;
- consideration of human use constraints;
- peer review of the recommended flow regime to ensure that sustainable conclusions are formed through a transparent process; and
- an ongoing monitoring phase that targets key ecological and physical performance indicators tied to an adaptive management process to allow for evaluation of implemented water regimes and consequential improvements in management of the system.

Consistent with the holistic approach, aquatic science has moved away from 'environmental water allocations' or 'minimum flows' that specify a volume of water in any given year or a minimum amount of water required by the environment. Current scientific research suggests that the minimum flow approach is not sufficient for Australian conditions where variable flow regimes are common and native flora and fauna are adapted to, and in many cases reliant on, variability in water regimes to complete lifecycle processes. CoAG's use of the term 'water regime' in the National Water Initiative (CoAG 2003a) reflects the change from the minimum flow approach that has occurred over the past decade. The National Water Initiative (CoAG Team 2: Integrated Management of Environmental Water and Strategic Infrastructure Improvements) objective is:

...improved environmental and water quality outcomes, including river and aquifer health and the protection of water dependent ecosystems and environmental services, through the provision of adequate environmental water regimes for management at basin or catchment-scale. (CoAG 2003b)

The Council's approach to assessing governments' actions to provide water to the environment is guided by the above characteristics as indicators of the 'best available science'. In accord with ARMCANZ/ANZECC national principle 2, the Council looks for governments to determine environmental water allocations using a holistic method establishing a water regime for the whole system. The Council also looks for governments to continue to improve their scientific understanding of environmental water requirements. National principle 11 refers to the need for research into improving the methods of determining environmental water requirements and to committing resources into applying these methods to specific aquatic systems.

The Council accepts that existing scientific knowledge differs among jurisdictions and among aquatic systems and that in some systems there is likely to be considerable knowledge gained from managing and

observing the system over many years that may be relevant to decisions on environmental flows. The Council also accepts that demands on governments' resources mean that it is not always possible to complete all-encompassing scientific studies for every system prior to determining allocation arrangements. The Council looks, however, for governments to undertake strategic and applied research to determine the environmental water requirements of their more significant aquatic systems, particularly those deemed to be stressed or overallocated, and to transparently report the results of such research.

A balance between environmental needs and human uses

CoAG's reference to the work of ARMCANZZ/ANZECC in the section of the 1994 water reform agreement that deals with environmental allocations indicates that water management arrangements should aim to ensure the long-term sustainability of aquatic ecosystems (national principle 2). This intent is also reflected in the National Water Initiative, which seeks to 'ensure ecosystem health by implementing regimes to protect environmental assets at a whole-of-basin, aquifer or catchment scale' (CoAG 2003a). Within this objective of achieving a sustainable balance between environmental and human uses, the ARMCANZ/ANZECC national principles call for governments to adopt arrangements for providing water to the environment that recognise the existing rights of other water users.

In some surface and groundwater systems, long term sustainability may be achieved by maintaining existing ecological values. In systems where there are existing users, however, there will generally have to be trade-offs between the needs of the environment and those of other (human) users. While a return to pristine or natural conditions is rarely feasible, improving the ecological health of stressed rivers is likely to require more water for environmental purposes, possibly by reallocating water from existing users. Similarly, it may be necessary to reallocate water from entitlement holders to the environment in systems that are currently overallocated. The possibility that reallocation may be necessary is recognised in national principle 5.

To determine whether water use is at a level that ensures the sustainable ecological health of aquatic systems, the Council considered the meaning of the term 'ecological health'. The ANZECC (2000) National Water Quality Management Strategy and the National River Health Initiative (Department of Environment and Heritage 2002) define ecological health as:

The ability of an ecosystem to support and maintain key ecological processes and organisms so that their species compositions, diversity and functional organisations are as comparable as possible to those occurring in natural habitats within a region.

The phrase 'within a region' in the above definition recognises that Australia is a diverse continent and that aquatic systems in different bioregions have varying characteristics.² Bioregions are large land areas characterised by broad, landscape-scale natural features and environmental processes that influence the functions of entire ecosystems. The bioregion concept recognises that ecosystems vary with topographic, climatic and geomorphic features, rather than political or social boundaries. Aquatic systems in different bioregions therefore have different ecological characteristics and needs (for example, river systems in the Australian Alps region will have different characteristics and needs from those of the Darwin Coast). As a consequence, assessment of environmental water requirements and water regimes needs to be considered from relevant bioregional contexts.

While the ANZECC (2000) definition is useful, it relates only to the ecological health or integrity of an ecosystem in isolation from human use. It may therefore be important for determining a baseline condition, but less practical where there are human use constraints or where systems are highly modified and unlikely to be able to return to pristine condition. To this end, the Scientific Reference Panel established by The Living Murray Initiative (2003) defined the term 'healthy working river' as a river that is managed to provide a sustainable compromise between the condition of the river and the level of human use. A water regime based on the healthy working river approach would not return an aquatic system to pristine condition. It would, however, sustain ecological objectives indefinitely. The Living Murray Initiative advocates a holistic approach, with the water regime, condition of floodplain wetlands and in-channel habitats and water quality all considered. The end point will not be a pre-European flow regime. Rather, it will be one that meets the tests of long-term ecological sustainability.

The CoAG National Water Initiative also reflects the approach of defining specific ecological objectives for individual systems. The terms of reference for the National Water Initiative (CoAG Team 2) include the development of specific ecological objectives for individual systems based on their ecological, social and economic values.

Environmental water may be obtained from a range of sources, including a reduction in delivery losses through the upgrading of infrastructure and pipelining, increased water use efficiency on farm and changes in land-use practices. In some systems, however, there may be no alternative to obtaining water for the environment from reallocations from existing users. The Living Murray Initiative First Step decision, which is to provide an average of 500 GL/year of 'new' water after five years for environmental purposes, recognises that this water could come from a range of sources, including reallocations. Similarly, the CoAG National

² The concept of regionality or bioregions has been further defined by Environment Australia (now Department of Environment and Heritage) (see Environment Australia 2000).

Water Initiative recognises a range of mechanisms for recovering water for the environment, including reallocations.

The essential point is that the CoAG water reform agreement obliges governments to take action, sometimes including reallocation, to achieve sustainable ecological systems. The Council's approach is to consider whether governments are establishing allocation arrangements that are likely to achieve a sustainable balance. Consequently, the Council looks for governments' water management arrangements to demonstrate the following characteristics.

- Ecological sustainability objectives should be specific to individual systems and contextually consistent with the relevant bioregion.
- The allocation of environmental water in aquatic systems where there are existing users should be sufficient to achieve a 'healthy working river'.
- The allocation of environmental water in aquatic systems where ecological health is adequate should be at a level that maintains ecological health.

The Council accepts that it may not always be possible for governments to introduce arrangements that achieve a sustainable balance immediately, particularly in systems where the volume of water already allocated for consumptive use is significant. Notwithstanding this, in systems where there is significant consumptive use, the Council looks for governments to introduce arrangements that achieve a sustainable balance within a reasonable timeframe, taking account of socioeconomic and environmental benefits and costs.

Monitoring and adaptive management

The 1994 CoAG water reform agreement states, in relation to work by governments on water allocations or entitlements, that:

4(e) in undertaking this work, jurisdictions would consider establishing environmental contingency allocations which provide for review of the allocations five years after they have been determined ...

Clause 4(e) indicates CoAG's intent that environmental water allocations be monitored and reviewed, with appropriate changes in management made on the basis of monitoring outcomes. In support of this, national principle 8 advocates the use of monitoring and adaptive management in the development of environmental water provisions. Ecological health is not a directly measurable parameter, and environmental managers must be careful to choose indicators that reflect the state of aquatic ecosystems. The Living Murray Initiative suggests that indicators should meet the criteria of relevance, responsiveness and repeatability. There are

a number of systems and nationally recognised guidelines that aim to meet these requirements, such as:

- ANZECC (2000a) Monitoring Guidelines — national guidelines for the design of chemical, physical and biological monitoring programs for aquatic systems;
- Index of Stream Condition — developed by the Victorian Government — which assesses river health by integrating biological, hydrological and chemical parameters; and
- AusRIVAS (Australia wide Rivers Assessment Scheme) — used in the National River Health Program — which is based on biological parameters and habitat assessment.

A key element of the above guidelines is that governments tailor monitoring programs to the specific ecological objectives for the aquatic system and monitor at intervals sufficient to detect ecological change. The guidelines also support an adaptive management (or Adaptive Environmental Assessment and Management) approach. Developed by a Canadian research facility in the 1970s, adaptive management recognises:

- the need for management decisions to examine economic, social and environmental values in an integrated way;
- the presence of many diverse stakeholders in environmental management issues; and
- the uncertainty inherent in environmental processes (Holling 1978).

In assessing compliance with the CoAG obligations on environmental allocations, the Council looks for governments to apply monitoring and adaptive management techniques that promote long-term sustainability. In particular, adaptive management should incorporate the results of monitoring as feedback leading to the adjustment of management regimes. In the context of environmental water regimes, this means using the results of monitoring to evaluate and adjust flow management at regular intervals (two to five years).

Stakeholder consultation and transparent processes

The national principles imply that water management processes should be transparent, consultative, include representative decision-making processes and be based on full and robust information and analysis.

The Council considers CoAG's emphasis on robust public processes to mean that governments' decisions on environmental allocations should be based, wherever possible, on comprehensive, relevant and rigorous

information about the ecological requirements of ecosystems and the impacts of changes in management arrangements. Any analysis, whether of an ecological, economic or social nature, that is material to the allocation decision should be defensible and robust and, where possible, have been independently reviewed. Governments should ensure that interested stakeholders (including the affected community) have timely access to all relevant information, including scientific information on the water regime required to sustain ecological values (consistent with a healthy working river); information on the extent of any socioeconomic trade-offs and the rationales for the trade-offs; and science-based information on the expected impact of any trade-offs on ecological values.

Stakeholders should have the opportunity to provide input and feedback into the water management process. Decision-making bodies should be broadly representative of the interested stakeholders and the affected community. This may be achieved, for example, through balanced representation on decision-making bodies or at least ensuring that particular interest groups are not overrepresented.

Victoria's approach to providing water to the environment

Victoria allocates water to consumptive uses and the environment through the bulk entitlements regime for regulated rivers.³ For unregulated rivers environmental flows are governed by streamflow management plans, or in lower priority rivers, by Statewide management rules. For groundwater sources where allocations exceed 70 per cent of the sustainable yield, Victoria establishes a groundwater supply protection area and develops groundwater management plans.

The Victorian River Health Strategy (VRHS) adopted in 2002 involves the Government developing specific measures, including flow rehabilitation plans for stressed rivers. The aim of the VRHS is to achieve ecological health, maintain high value river assets and manage river threats. The strategy states that Victoria sets its stressed river priorities on the basis of:

- the value of the environmental and community assets;
- the level of environmental and community gain for the resources invested; and

³ A bulk entitlement defines the volume of water that an authority may take from a river or storage, the rate at which it may be taken and the reliability of the entitlement. Victoria also allocates bulk entitlements to urban water authorities for unregulated rivers.

- real community commitment towards the long term improvement of river health.

In its green paper, the Victorian Government proposes that it build on the VRHS as the policy framework for the integrated management of Victoria's rivers, floodplains, wetlands and estuaries and to address key elements of the National Water Initiative. In relation to returning water to the environment in stressed systems the green paper proposes that, for unregulated rivers, agreed environmental flows in 80 per cent of the streamflow management plans would be met within 10 years. This would be achieved in two main ways: by converting summer pumping licences to winter fill licences, where this is permitted within the winter sustainable diversion limit, or reducing the total volume available for extraction. For regulated systems, the green paper proposes that the Government increase the volume of environmental water by investing in system savings, buying water on the water market and/or refining management systems. The green paper also proposes to give responsibility to the CMAs for managing the environmental water reserves. The Government considers this would ensure environmental flows are considered in the broader context of river health and catchment management thereby separating the management of environmental water from the management of consumptive water.

Victoria's progress in 2003

Since the 2003 NCP assessment, Victoria has taken the following actions to implement its obligation to allocate water to the environment.

- The Thomson and Macalister Environmental Flows Task Force has reported its environmental flow recommendations to the Minister for the Environment (Thomson and Macalister Environmental Flows Task Force 2004).
- Victoria implemented a range of specific actions and is addressing flow stress and other environmental problems in the Maribyrnong River.
- Victoria is determining the best means of implementing the recommendations of the draft Streamflow Management Plan for King Parrot Creek.
- Victoria has continued to make progress towards allocating water to the environment in its remaining river systems and groundwater basins.

Thomson and Macalister rivers

The Thomson and Macalister are major rivers in the Thomson Basin. Water is diverted from them for irrigation and drinking water purposes.

The Government identified the Lower Thomson and Macalister rivers, which comprise the sections of the Thomson River downstream from the Thomson Reservoir to the Latrobe River, and the Macalister River downstream from Lake Glenmaggie, as stressed and/or overallocated in its 1999 implementation program.

In 2000, the West Gippsland CMA, Southern Rural Water, the Melbourne Water Corporation, the Gippsland Coastal Board and the (then) Department of Natural Resources and Environment reached the Agreement on an Environmental Flows Package for the Lower Thomson and Macalister Rivers. This agreement included environmental flow rules for the Thomson and Macalister rivers, with additional rules for sharing flows between Rainbow Creek and the Old Thomson River under the bulk entitlement conversion process. The agreement also committed the parties to work towards further improvements in environmental flows and catchment health in the Thomson and Macalister rivers, including programs for habitat improvement and the potential enhancement of flow patterns leading to a review of the bulk entitlement provisions. Under the bulk entitlement process for the Thomson and Macalister rivers, flows in the Thomson River have been increased from 25 ML a day to 125 ML a day (or natural, but no less than 50 ML a day) and flows in the Macalister River have been increased from 15 ML a day to 60 ML a day (this can be reduced to 30 ML a day under certain conditions).

The Victorian Government established the Thomson Macalister Environmental Flows Task Force to oversee the implementation of the Agreement on Environmental Flows Package for the Lower Thomson and Macalister rivers. The task force was chaired by the Mr Llew Vale OAM, Chief Executive Officer of the West Gippsland CMA (Thomson Macalister Environmental Flows Task Force 2004). It also included representatives from Southern Rural Water, the Department of Sustainability and Environment, the Department of Primary Industry, Environment Victoria, the Gippsland Coastal Board, the Melbourne Water Corporation, and community and irrigator representatives. Box 3 lists the terms of reference for the task force.

Box 3: Terms of reference for the Thomson Macalister Environmental Flows Task Force

- (a) Oversee the implementation of the Agreement on Environmental Flows, including:
- implementation of the environmental flow recommendations under the bulk entitlements;
 - developing rules for splitting environmental flows between the Thomson River and the Rainbow Creek;
 - implementing the flow monitoring trial on the Thomson and Macalister rivers aimed at improving flow monitoring arrangements;
 - further development of environmental flow objectives;
 - development of a program for river management works to improve riparian habitat;
 - investigation of dam translucency rules for environmental flow releases from Lake

- Glenmaggie and improving flood flow patterns on the Thomson River;
- developing a protocol for allocating water efficiency savings;
 - review of environmental flow provisions in the Southern Rural Water and Melbourne Water Corporation bulk entitlements by September 2003;
 - review of adequacy of passing flows in relation to discharge of wastes under EPA licence; and
 - development of a work program and implementation plan.
- (b) To take into account in the above implementation program the findings and recommendations of other scientific studies associated with the Gippsland Lakes catchment, for example, the current CSIRO study.
- (c) Recommend other work required to implement the Agreement on Environmental Flows.
- (d) Develop a communication strategy to be used at all stages of the implementation.

Source: The Thomson Macalister Environmental Flows Task Force 2004, p. 3.

The Thomson Macalister Environmental Flows Task Force released its report and recommendations on environmental flow options for the Thomson and Macalister rivers in February 2004. The task force concluded that the ecological health of the Thomson and Macalister rivers has been degraded over time as a result of human consumptive use and that further degradation is likely without a change in management. To address the identified problems the task force recommended to the Government that it:

- plan future flow and catchment management actions to achieve the environmental objectives set out in the environmental flow studies (box 4);
- revise the environmental objectives relating to the rivers to include measurable outcomes that can be monitored; and
- set the long term aim of any environmental flow regime enhancement to provide flow components at the level, timing, frequency and duration of the environmental flow recommendations.

Box 4: Environmental objectives for the Thomson and Macalister rivers

The overall environmental objective for the Thomson and Macalister rivers is to maintain (where in good condition) or rehabilitate the environment to a condition where the ecological health of the rivers is sustainable over time. The objectives for specific elements of river health can be summarised as:

- maintain or rehabilitate self sustaining populations of all native fish species historically recorded in the Thomson and Macalister rivers;
- maintain or rehabilitate reference condition aquatic macroinvertebrate communities;
- maintain or rehabilitate native riparian vegetation communities and structure, including zonation of different species up the banks;
- maintain or rehabilitate in-stream and marginal vegetation;
- maintain or improve water quality in deep pools;

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- maintain or rehabilitate nutrient cycling inputs to the river;
 - maintain or rehabilitate channels for diversity; and
 - rehabilitate biodiversity in riverine floodplain wetlands.

Source: The Thomson Macalister Environmental Flows Task Force 2004, p.10–11.

The task force convened two technical panels; one to evaluate a flows study for the Thomson River and another to undertake the same task for the Macalister River. The technical panels presented preliminary environmental flow analyses, prepared by Earth Tech (2003a; 2003b) and SKM (2003a; 2003b), using the FLOWS method. The preliminary environmental flows analyses found that there would need to be an average annual increase in environmental flows of around 57 GL (40 GL from the Thomson River and 17 GL from the Macalister River) to meet environmental flow objectives.

Because of resource and information constraints, the FLOWS method does not include groundwater. Victoria advised that the exclusion of groundwater is not significant because there is only a small volume of groundwater associated with the Thomson River at Denison. Victoria limits the extraction of groundwater at Denison and is developing a groundwater management plan. The Victorian Government advised that the plan is expected to be submitted to the Minister for Environment by June 2004.

The environmental flows analyses indicated that the volume of water needed to meet the Thomson and Macalister environmental flow objectives is likely to have large adverse social and economic effects. The analyses showed there would be an impact especially on metropolitan water users (possibly requiring early construction of a new reservoir to augment the Melbourne water supply and/or increases in the frequency and severity of water restrictions) and farmers in the Macalister Irrigation District during dry years (farm businesses potentially face higher costs because they would need to purchase supplementary feed and water and/or reduced farm income because milk production would fall).

In response to these findings, the task force commissioned further studies to evaluate approaches for achieving the environmental objectives while mitigating the adverse social and economic effects. The studies presented water resource modelling to determine the impact of five different flow scenarios on consumptive users (irrigators and urban water supply users) and a benefit cost analysis to determine the net social benefit or cost associated with each flow scenario.⁴ The five flow scenarios range from the full environmental flows (defined as those expected to achieve each of the ecological objectives with a high degree of certainty) to the flow level under the current bulk entitlement rules (for which there is

⁴ The task force considered that the method used to determine environmental costs could not be compared directly with the measure of irrigator or Melbourne urban user costs, but could be used to compare the relativities of the benefits and costs of the five scenarios.

a low to medium expectation of achieving the ecological objectives). The scenarios represent a progressive compromise with increasing risk that the environmental objectives will not be met. Table 1 presents a summary comparison of the key results for the water flow scenarios in terms of the environmental, water resource and benefit-cost impacts.

In addition, the Victorian Government has established a panel of scientific experts — the Technical Audit Panel (TAP) — to independently assess flow studies, including those undertaken for the Thomson and Macalister rivers. The TAP examined the information and scientific methods used to determine environmental flows for the two rivers to assess whether the information and methods were the best available at the time and whether the risks (to both the environment and consumptive users) were appropriately assessed. The TAP considered that both environmental flows studies were conducted in a professional and transparent manner and were well designed in terms of the information and scientific methods used. It found the model and methods to have been adequately reviewed. The TAP noted, however, that the studies made minimal reference to data quality control. In addition, the TAP considered that a clearer evaluation of the environmental risks and the associated (short and long term) costs would have assisted the discussion on environmental flows.

Table 1: Water flow scenarios for the Thomson Macalister river systems, environmental, water resource and benefit-cost comparisons

		Scenario					
		Unit	1	2	3	4	5 ^a
Total increase in environmental flows ^b	GL a year (%)	56.6 (13.4%)	41.4 (9.8%)	30.9 (7.3%)	19.7 (4.7%)	0	
Probability of meeting environmental objectives ^c							
Fish – resident		100%	100%	100% (T) Med (M)	High (T) Low (M)	Med (T) Low (M)	
Fish – migratory		100%	High	Med (T) Low (M)	Med (T) Low (M)	Low	
Macroinvertebrates		100%	100%	100%	High (T) Low (M)	Med (T) Low (M)	
Riparian vegetation		100%	Medium	Medium	Low	Low	
In-stream vegetation		100%	High	High (T) Low (M)	Med (T) Low (M)	Med (T) Low (M)	
Floodplain wetlands		100%	Low	Low	Low	Low	
Geomorphology		100%	Medium	Medium	Medium	Low	
Ecosystem processes		100%	Medium	Medium	Medium	Low	
Water resource implications ^d							
Lowest allocation	Per cent of water right	21%	35%	38%	49%	66%	
Allocation of 100% or more of water right	no. of years out of 100	84	84	84	91	94	
Allocation of 120% or more of water right	no. of years out of 100	67	72	74	84	92	
Net benefit (cost) ^e							
<i>4% discount rate</i>							
Lowest estimate	A\$m	(90.6)	(103)	(81.9)	(85)	27 ^f	
Highest estimate	A\$m	(64.2)	67	82	37	84 ^f	
<i>8% discount rate</i>							
Lowest estimate	A\$m	(51.3)	(28)	(16.7)	(37)		
Highest estimate	A\$m	37.1	86	105	(14)		

^a Scenario 5 represents the current bulk entitlement rules. ^b Represents the average annual outflows relative to the bulk entitlement. Under the bulk entitlement the average annual outflows from the Thomson and Macalister rivers are 420.6 GL/yr. ^c Box 4 details the environmental objectives. Med: Medium (T) Thomson River. (M) Macalister River. ^d Holders of water rights are entitled to sell allocations in excess of 100 per cent. ^e Figures rounded to the nearest whole number. Represents the lowest and highest figures among a matrix of estimates determined from high and low impact scenarios. The estimates represent additional benefits and costs compared to the current bulk entitlement estimates. ^f Measures of the environmental benefits only. That is, the estimates exclude costs to Melbourne urban users and Southern Rural Water irrigators.

Source: The Thomson Macalister Environmental Flows Task Force 2004.

After considering the studies' findings and the TAP evaluations, the task force recommended that the Victorian Government adopt a staged 10 year program of progressively implementing increases in environmental flows. The task force recommended that the increased flows come from water saving measures, considering that this would be the best way to achieve the environmental objectives while reducing the impact on irrigators and Melbourne urban users. It identified options for achieving savings and recommended that the Government undertake further work to determine measures to deliver the necessary savings.

The task force recommended that initial flow increases, along the lines of scenario 4 and 3 (see table 1) commence in 6-12 months (stage 1) and 2-3 years (stage 2), respectively. In 5-6 years (stage 3) the Government should implement the flow regime associated with scenario 2, which involves an overall increase in environmental flows of 9 per cent. Under this scenario there is a medium to high chance of achieving the geomorphology, ecosystem processes and biological objectives, but a low chance of meeting wetland objectives.

The task force recommended that during the first three stages the Government should develop scientifically defensible and measurable objectives for river health and regularly monitor and review progress, including a major review at the end of stage 3. The task force considered that where necessary the environmental flows should be adjusted to ensure that ecological objectives are met. Should the monitoring data show that the environmental flows are sufficient to meet each of the long term ecological objectives then no further adjustment would be necessary.

Earth Tech released its final monitoring program in February 2004 (Earth Tech 2004). This program builds on the Index of Stream Condition method for assessing river health over time, sets out the location and frequency of sampling, incorporates existing historical information on the health of the rivers and links monitoring to the ecological objectives for the rivers. It proposes a review prior to the implementation of the environmental flows specified in the flow rehabilitation plan to assess the baseline information, and reviews during the early stages of implementation and at five year intervals. Earth Tech noted that the bulk entitlements are planned for review on a five year basis and these reviews should be considered with the monitoring program reviews. Earth Tech also nominated the West Gippsland CMA as a suitable body to manage the program and be responsible for coordinating and implementing the monitoring plan.

The task force recommended that the Government conduct a further major review at the end of 10 years (stage 4). The purpose of this review would be to assess the ecological health of the rivers against the long term ecological objectives to determine the appropriate environmental flows.

The task force also considered that any improvement in the environmental flow regime should be integrated with a program of river

management works so as to deal with flow and other (non-flow) aspects of river health. Consequently, it recommended that the Waterway Action Plan for the Thomson River be implemented concurrently with the environmental water flows and that the Government develop and implement a similar plan for the Macalister River. The task force recommended that the Government establish a community working group to interact with the monitoring process.

As the recommendations of the task force potentially have implications for Melbourne's water supply, the Government intends to announce its decision on this matter in the white paper in the context of deciding on its overall water management framework. In the meantime the Government committed to some immediate actions for improving the health of the Thomson and Macalister rivers.

- The Government allocated \$8 million from the Water Trust to improve water efficiency in the Macalister Irrigation District for the purpose of improving flows and reducing nutrients entering the Gippsland Lakes. Some \$5 million of this will fund implementation of a total channel control system for part of the Macalister Irrigation District, which is expected to realise water savings of 5000 ML a year. This would enable the short term return of critical flow components to both the Thomson and Macalister rivers.
- The Government is contributing funds for habitat restoration and improvements to water quality. Part of the \$12.8 million in funding for the Gippsland Lakes Future Directions Initiative is to be spent on reducing sediment and nutrient input into the lakes and on 25 water quality projects to be implemented in the Thomson and Macalister catchments.
- The Government provided \$1.6 million over two years to the West Gippsland CMA to undertake river health works, initiate a monitoring program for adaptive management and finalise actions to address flow stress and amend the bulk entitlements.
- The Government is investigating the feasibility of providing for fish passage at Cowwarr Weir and Horseshoe Tunnel on the Thomson River.

Comments from stakeholders

Environment Victoria considers that 'there were serious deficiencies in relation to the process for preparation of the flow rehabilitation plan for the Thomson and Macalister rivers' (EV 2004). While Environment Victoria provided this comment in response to the Council's call for submissions on water reform for the 2004 NCP assessment, the Council considered Environment Victoria's comments in this deferred assessment because the comments focus on the arrangements for the Thomson and Macalister rivers.

Environment Victoria has three main concerns.

1. Important information had been lost in the progression through to the final report, such as details on the risks to wetland fish and endangered species from adoption of scenario 2;
2. The taskforce did not receive important information until very late in the process. In particular, the task force did not receive the report from Melbourne Water on the implications for Melbourne's water resources of providing different environmental flows until January 2004. The technical audit panel had not assessed the modelling undertaken by Melbourne Water for the task force report released for public comment in February 2004 and therefore the task force could not have adequately considered the implications of the Melbourne Water report and put forward appropriate recommendations. In light of this experience, Environment Victoria considered that key reports should be made available to task forces at least three months prior to the release of task force reports for community comment.
3. The taskforce did not consider all the information it could have and as a result was looking at problems rather than solutions. For example, the task force did not consider all possible water saving options identified by the Melbourne Water Resources Strategy Committee which, if implemented, could provide more water than the scientific studies recommended is needed to fully meet the environmental needs of the Thomson River. The task force did not consider unallocated water from Blue Rock Dam. Advice produced by Victoria in 2001 indicated that a review of the unallocated water was to be completed by August 2002. The green paper suggests that this review has not yet commenced.

Maribyrnong River

The Maribyrnong River, located to the northwest of Melbourne, comprises two main subcatchments, Jacksons Creek, which is a regulated system, and Deep Creek, which is unregulated. The river is a major corridor for wildlife, providing both habitat and passage for native fish including the vulnerable Australian Grayling. Birdlife also uses the corridor, including sections of riparian forest, which are very depleted throughout, in the western parts of the region (Port Phillip and Westernport CMA 2000). The catchment also supports some of the last remaining areas of native grassland close to Melbourne. The Council is not aware of any significant interconnected groundwater sources in the area.

In 1995 Victoria established a scientific reference panel, which found the Maribyrnong River to be stressed because of poor water quality (sewage, storm water and industrial pollutants) and changes in the flow regime. Although only 5 per cent of the total flow from the river is extracted, some subcatchments are used more intensively resulting in flow stress in some reaches (Condina et al. 2000).

The (then) Port Philip Catchment and Land Protection Board and the (then) Department of Natural Resources and Environment commissioned consultants to prepare a flow rehabilitation plan for the Maribyrnong River (Heron, Doeg and Sovitslis 2002). The consultancy team comprised three biologists guided by a steering committee with representatives from government and the community. The plan outlines potential management options to improve the current flow regime to assist in restoring the environmental values of the system. In preparing the plan, the consultants developed a 'novel' flow stress index to analyse the flow regime of the river. The plan uses a holistic approach and assumes that ecological stress increases the more the flow regime deviates from the natural flow.

The consultants investigated 21 reaches of the Maribyrnong River, but were not able to apply the flow stress index to nine of these because of a paucity of data. For each of the remaining 12 reaches the consultants used the index to compare the flows occurring each season with the natural flows, to determine the ecological impacts of the altered flow regime. Their results indicated that high or moderate stress is evident in both Jacksons Creek and Deep Creek during low flow season and in Barringo Creek (a tributary of Jacksons Creek) during June. Flow stress in Jacksons Creek is primarily due to increased summer flows caused by releases from Rosslynne Reservoir to meet irrigation demand as well as inflows from the Sunbury waste treatment plant. Stress in Deep Creek is due to insufficient summer flows and prolonged cease to flow conditions.

The Maribyrnong River plan developed detailed environmental objectives for Jacksons Creek and Deep Creek upstream of the main river channel.

- For Jacksons Creek, the flow objective is to reduce the impact of irrigation releases during the low flow season to return it to a more natural low flow regime. The plan identified several options that could achieve this, primarily: managing the timing and volume of releases; selecting alternative storage/distribution options (such as off-stream storage and piping water to irrigators); reducing or relocating demand; and finding alternative supply sources for irrigation. The plan acknowledged that some or all of the options may not be able to be fully implemented because of local constraints and the impact on the social and economic values of the catchment. It reported that the ecological gains from investment in restoring the health of the creek would be relatively small.
- For Deep Creek, the plan noted that, based on existing information, implementation of the cease-to-divert trigger in the streamflow management plan of 3 ML a day significantly reduced the flow stress in the lower reaches. However, the flow rehabilitation plan could not be completed to the stage of recommending flow arrangements because of data inadequacies. The plan considered that it was necessary to undertake a farm and catchment dam assessment and investigations to address data inadequacies identified during the study.

The plan does not contain provisions for monitoring or review. It does, however, contain recommendations for further investigations to address data gaps identified during the study, such as the farm and catchment dam assessment mentioned above. It also prioritises the actions necessary before the flow rehabilitation plan is implemented.

At the time of the 2003 NCP assessment Victoria had implemented most of the flows for the Maribyrnong River proposed in the plan. The actions undertaken comprised:

- increased summer flows to 3 ML a day in Deep Creek and its tributaries;
- increased summer flows in Barringo Creek under the bulk entitlements process through the following passing flow provisions:
 - 3, 10 and 5 ML a day at Gisborne, Sunbury and Keilor, respectively;
 - passing flow not to fall below 1 ML a day at Gisborne and Sunbury townships; and
 - when Rosslynne Reservoir does not spill, capping of water entitlements and a spring flush of 20 ML a day for 10 days in November.

In addition, Victoria's *Water (Irrigation Farm Dams) Act 2002* came into operation on 4 April 2002. It amended the Water Act 1989 and extends licensing arrangements to cover all irrigation and commercial water uses. Among other things, Victoria is using the information collected through the licensing process to determine the impact of farm dams on its waterways.

Victoria decided not to proceed with further implementation of the flow rehabilitation plan for the Maribyrnong River because it considers that the Statewide return in terms of environmental outcomes from investing in flow restoration activities would be greater for other rivers. The 2003 green paper does not list the Maribyrnong River as being stressed or at risk of being stressed because the level of water extracted from the river is low — about 6 per cent of total flows (DSE 2003). Nevertheless, Victoria acknowledges that it has obligations in relation to the river arising from the 1994 CoAG water reform agreement. The Government has referred the flow rehabilitation plan to the Port Phillip and Westernport CMA to implement specific actions to improve catchment and river health.

- The Port Phillip and Westernport CMA is developing a regional river health strategy containing proposed actions for the Maribyrnong River over the short and medium to long term. Victoria advised that a draft strategy is likely to be released for public comment in June 2004. There has been some delay in completing the strategy because the CMA is reviewing its regional catchment strategy, which provides the overarching framework for the river health strategy.

- As part of the Victorian Government's Stressed Rivers Program, the Port Phillip and Westernport CMA has received \$30 000 to investigate options to manage summer stress in Jacksons Creek. The CMA has received a further \$110 000 under the program and a grant of \$175 000 from the Victorian and Australian governments to conduct on-ground habitat works to protect the low flow aquatic habitat in Deep Creek. The Port Phillip and Westernport CMA also expects participating landholders to contribute to the cost of this work.
- The Victorian Government has installed fish passages at all barriers on the Maribyrnong River.

In addition, Southern Rural Water is developing a streamflow management plan for the Upper Maribyrnong, which will define and provide legal protection for the minimum passing flows and licensed extractions. Victoria advised the Council that the draft plan is complete, but not released for public comment. Southern Rural Water has deferred further development of the plan until after the Government defines the sustainable diversion limits (the maximum volume of water that can be diverted from a sub-catchment during winter) and releases the white paper.

King Parrot Creek

In place of implementing the remaining environmental flows planned for the Maribyrnong River, Victoria decided to implement the streamflow management plan for King Parrot Creek, which it considered would provide greater environmental benefits for the level of commitment required. The King Parrot Creek Catchment is of high conservation value. The creek provides habitat for the endangered Macquarie Perch and a diverse array of plant and animal species.

Water in King Parrot Creek has been heavily used for a long time. The catchment management authority has not issued a new water licence since 1968. Despite this, flows in King Parrot Creek are regularly depleted in summer, affecting water users and threatening the remaining fish population and other flora and fauna. Current extraction in the catchment is unsustainable and this is threatening long term environmental values, which is also likely to adversely affect recreation and tourism values.

The King Parrot Creek Consultative Committee, which comprised representatives of the catchment management authorities, urban and rural water businesses, irrigators, local and State government and Environment Victoria, released the draft streamflow management plan for consultation in October 2001 (KPC SFMP Consultative Committee 2001).

The draft plan recommends a minimum environmental flow of 12 ML a day; commencing at 7 ML a day and increasing by 1 ML a day each year until the recommended flow is reached after five years. The draft plan

notes that there is evidence that groundwater extraction may be contributing to the low summer flows in the creek during summer and indicates that groundwater and surface water will need to be conjunctively managed.

The committee had insufficient information to make specific recommendations on winter flows, but considered that winter flows should be higher than 12 ML a day and there should be some provision for flushing flows and high flows. The draft plan recommends that an appropriate winter period environmental flow regime methodology be developed and this study be completed within 12 months of the plan approval. The plan identifies that Victoria is in a process of developing sustainable diversion limits, which determine the volume of water that can to be taken from an unregulated catchment as winter fill. As a precautionary measure the draft plan proposes a range of changes to water licensing conditions to cap and reduce extraction of water from the creek and to limit water trading to within the catchment.

The plan proposed that, wherever possible, water supplies should be metered. The committee considered that where metering reveals a historic reliance on water use above the existing licence volume, that the trading rules allow irrigators to increase their licence volume to match the historic level of use by the purchase of additional licence volumes from within the catchment. Similarly, it does not propose the withdrawal of sleeper licences.

The committee indicated that its support for the recommendations in the plan were contingent on the Government offering an acceptable level of government incentive to assist existing irrigators to make on-farm adjustments (construction of storages, installation of different watering systems and the purchase of increased licence volumes of water) during the transition period as a result of introducing a minimum environmental flow. The committee did not assess in any detail the likely extent or cost of on-farm changes that would be required as a result of implementing the recommended minimum flows. The plan does note, however, that 'most irrigators in the lower catchment are either not actively irrigating or are familiar with the low reliability of supply and have adapted their watering regimes and general farm operations around the period when inadequate water is generally available' (KPC SFMP Consultative Committee 2001, p. 31).

The committee proposed that the plan be reviewed every three years. It nominated the (then) Department of Natural Resources and Environment to develop and implement a monitoring and assessment program for fish and other relevant biota populations in the King Parrot Creek population and to make the information available to the community of the catchment, prior to the review of the plan. The committee considered that Natural Resources and Environment should also develop action plans for the species listed under the *Flora and Fauna Guarantee Act 1988* before the next plan review.

In response to the draft plan the Victorian Government allocated \$280 000 from its Stressed River Program to the Goulburn Broken CMA to:

- assess the impact of the 12 ML a day rule on domestic and stock users;
- identify options for protecting water supplies, if the 12 ML a day environmental flow is instituted;
- develop a revised streamflow management plan establishing an environmental flow of 12 ML a day;
- develop a compliance and education program; and
- implement the agreed environmental flow package.

Since the release of the draft plan Goulburn-Murray Water has been managing the creek through a minimum flow of 20 ML a day over the winterfill months. To ensure that a flow of 20 ML a day is maintained, restrictions on use commence once flows fall to 30 ML a day. Victoria advised that it intends to formalise this rule in the final streamflow management plan. In addition, Melbourne Water is subject to passing flow rules under the draft bulk entitlement. The final bulk entitlement will be determined after the streamflow management plan is finalised. The Victorian Government expects the King Parrot Creek Consultative Committee to submit a final plan to the Minister for Environment by the end of 2004.

In 1997 Victoria established a groundwater management area for the region around Kinglake, which includes the King Parrot Creek Streamflow Management Plan area. Victoria intends to develop a groundwater management plan for this area in 2006-07. In the meantime Goulburn-Murray Water has placed an embargo on issuing further groundwater licences. Consistent with the requirements of the Water Act, the authority's general policy is not to grant a groundwater licence where use of groundwater has the potential to impact on streams.

Discussion and analysis

Thomson and Macalister rivers

The Victorian Government is currently considering the environmental flow recommendations in the task force report and intends to announce its decision in the white paper. In this deferred assessment, the Council considered NCP compliance for 2003 on the basis of Victoria's proposed approach, but cannot reach a final conclusion until there is a decision by the Government on the task force recommendations. Given this, in the

2004 NCP assessment, the Council will consider Victoria's progress with delivering the recommended environmental flows.

Best available science

The environmental flows studies, from which the task force determined its environmental flows recommendations, used the Victorian FLOWS method. This method links identified achievement of environmental objectives to specific elements of a holistic river flow regime. The studies were conducted by multidisciplinary teams comprising hydrologists, geomorphologists, ecologists (macroinvertebrate, fish and vegetation) and modellers.

The environmental flow studies considered all elements of the Thomson/Macalister aquatic system including floodplain wetlands, terminal receiving waters and tributaries as well as in-channel flora, fauna and ecological processes. The studies also investigated implications for the Ramsar-listed wetlands (the Gippsland Lakes) even though these are outside the Thomson and Macalister river catchment. (None of the flow options, alone, was found to be sufficient to address the environmental problems in the Ramsar-listed wetlands. Victoria is undertaking a range of separate initiatives to address the broader environmental problems in these wetlands.) Groundwater was not included in the environmental flow studies for cost reasons. While groundwater is not a significant element of the Thomson/Macalister system, Victoria expects to develop a groundwater management plan by June 2004.

By adopting a multi-disciplinary approach that considers key aspects of the river system, Victoria has taken a holistic approach to determining the environmental flow needs for the Thomson/Macalister system. The major reviews by the two technical panels and the associated recommendation that Victoria amend or improve management arrangements and develop measurable objectives for river health where necessary represent a robust scientific basis for determining the environmental measures for the Thomson/Macalister system. If the Government takes up the review recommendations it is likely that Victoria will achieve the environmental objectives for the system. The Council considers that Victoria has demonstrated due regard for the ARMCANZ/ANZECC national principles relating to best available science in relation to the work on the Thomson/Macalister system.

A balance between environmental needs and human use

In the long term the flow plan will meet all environmental objectives recommended by the best available science. In the short to medium term the plan proposes trade-offs from the ecological approach recommended by the best available science to ameliorate adverse social and economic outcomes. While the short to medium term approach will deliver many of the environmental objectives, there is a risk that Victoria, by adopting

flows that represent a trade-off from the 'best' ecological approach over the next 5 to 6 years, will not meet the ecological objective of rehabilitating biodiversity in riverine floodplain wetlands. The proposed program of monitoring and regular review would, however, enable any such problems to be identified. If the Government adopts the proposed monitoring program, and commits to addressing any problems it identifies including by ensuring there are adequate environmental allocations, then it is likely that Victoria's approach will achieve an appropriate balance between environmental needs and human use.

Environment Victoria expressed concern that the task force had not adequately considered water saving options. The key task force recommendations for increasing environmental flows rely entirely on obtaining water savings without considering in detail the available options or discussing how these might be implemented or funded. The task force recommended that the Government assess the feasibility, benefits and impacts of water saving options, prior to the deciding how best to proceed.

The capacity to provide additional environmental water to the Thomson and Macalister system is integral to Victoria being able to deliver the flows recommended by the task force. Implementation of the task force proposal that Victoria investigate water savings options (and show that the recommended flows can be delivered in the Thomson/Macalister system) is therefore essential to Victoria demonstrating that it has satisfactorily addressed CoAG obligations on environmental allocations. Moreover, if Victoria finds it cannot provide the recommended flows entirely from water savings, it would need to provide them from other sources if it is to achieve the balance in uses recommended by the task force. In the 2004 NCP assessment, the Council will look for Victoria to have undertaken the investigation of water savings options recommended by the task force.

Monitoring and adaptive management

The monitoring program for the Thomson and Macalister rivers sets the framework for monitoring designed to measure changes in river health to determine whether the specific ecological objectives for the Thomson and Macalister rivers are being met and determine the effectiveness of the waterway action plan. The flow plan is able to be refined and updated, based on monitoring outcomes and new research. At this stage, however, the specific monitoring outputs are not linked to the water management regime for the two rivers because the West Gippsland CMA has not yet implemented the monitoring program. The Council will report on this issue in the 2004 NCP assessment to ensure the West Gippsland CMA has progressed implementation of the monitoring program in accordance with CoAG obligations.

Stakeholder consultation and transparent processes

Victoria adopted a comprehensive, robust and open consultation process in developing the Thomson and Macalister arrangements. The task force overseeing the process included representatives of all major stakeholders throughout the catchment. It comprised two irrigators and representatives of environmental, state and local government interests. The analytical work undertaken for the task force examined several flow options using an independently verified method consistent with best available science, and compared the social and economic impacts on water users of changes in water availability. The task force gave interested stakeholders access to relevant information and acknowledged where there are limits to the scientific or sampling data that could affect the quality of the analyses presented.

Environment Victoria expressed concern, however, that Melbourne Water did not provide its modelling report to the task force until January 2004 and that the TAP had not assessed the modelling by the time the task force report was released for public comment in February 2004. Environment Victoria considered that the task force could not have adequately considered the implications of the Melbourne Water report and put forward appropriate recommendations. Environment Victoria was also concerned that the task force had not fully considered available water saving options.

The Council considers that timely receipt of information will contribute to improved outcomes. The national principles imply that water management processes should be transparent and based on full and robust information and analysis. The task force made clear that the TAP had not independently assessed the results of the water resource modelling, but that this would occur. The task force accepted the results as likely to be of the 'appropriate order expected'. In addition, the adaptive management approach adopted by the task force allows the environmental flows to be adjusted on the basis of any new information. This would include the TAP assessment of the water resource modelling and new information and analysis derived from its proposal to further consider water saving options. The flow rehabilitation plan also provides for ongoing community involvement so that water management processes remain transparent and open to public scrutiny. On balance, therefore, the Council considers that the flow rehabilitation plan for the Thomson and Macalister rivers was developed through a sufficiently transparent, comprehensive and robust processes showing due regard for the ARMCANZ/ANZECC national principles.

Maribyrnong River

Victoria listed the Maribyrnong River as a stressed system on its 1999 implementation program (arising from the tripartite meeting). Subsequent evidence indicates, however, that the river may not face a significant risk

of flow stress (DSE 2003). The flow rehabilitation plan also indicates that flow variability is more of a problem than insufficient water.

Victoria acknowledges nevertheless that it has obligations in relation to the river arising from the 1994 CoAG water reform agreement. It has restored flows to recommended levels in most reaches of the river in line with the recommendations in the flow rehabilitation plan. Victoria is also taking other actions through the CMA processes to improve the health of the Maribyrnong River.

Aspects of Victoria's approach to developing the flow rehabilitation plan and the plan's content raise some questions, however, about the extent to which the plan has had regard to the ARMCANZ/ANZECC national principles.

Best available science

The consultancy team that developed the flow stress index included only biologists. Because there was no involvement by other water specialists, there was little opportunity for a multi-disciplinary analysis of the river conditions. While the consultancy team adopted a holistic method for the entire water regime, it did not explain its system for determining the relative ecological importance of the various flow components and it did not consider elements of the system outside the stream channel. There was no peer review of the method employed or the conclusions drawn. The plan highlights gaps in knowledge and data, but there is no attempt at assessing the quality of the data.

A balance between environmental needs and human use

Given the evidence on flow stress and likely ecological costs and benefits, the Council acknowledges Victoria's argument that restoring environmental flows in the remaining reaches may result in little ecological gain at possibly substantial financial cost and certainly less ecological return than investing in other systems. The Council accepts that Victoria's proposals for further research and restoration work through CMA processes demonstrate due regard for the ARMCANZ national principles in terms of providing an appropriate balance between environmental needs and human use.

Monitoring and adaptive management

While the Maribyrnong River Flow Rehabilitation Plan contains recommendations for further investigations, it does not include a monitoring program. Moreover, there are no explicit links between the plan and routine river health monitoring by the Environment Protection Authority, and there are no provisions for adapting the plan to accommodate the findings of further investigations or ongoing monitoring.

Stakeholder consultation and transparent processes

While a steering committee comprising representatives of the major stakeholder groups with interests in the river oversaw the development of the plan, there is little evidence of wider stakeholder consultation.

King Parrot Creek

Victoria committed in 2003 to implementing a streamflow management plan for King Parrot Creek as an alternative to full implementation of the Maribyrnong River plan. Victoria listed King Parrot Creek on its 1999 implementation program.

Victoria is behind its own schedule for completing water management arrangements for King Parrot Creek. It released the draft streamflow management plan in October 2001. For the 2003 NCP assessment, Victoria advised the Council that the final plan would be completed by June 2003, but Victoria now advises that it does not expect to submit the final plan to the Minister for the Environment until the end of 2004. Victoria does not intend to develop a groundwater management plan for the Kinglake area encompassing the King Parrot Creek catchment until 2006-07. However, Victoria did not list the Kinglake groundwater area on its 1999 implementation program.

Best available science

Victoria's draft plan for King Parrot Creek centres on ensuring minimum summer flows, an approach consistent with best available science at the time. Nevertheless, the plan also considers winter flow stress and groundwater resource issues and the Victorian Government has interim measures in place to manage all identified environmental water issues.

Given that Victoria nominated implementation of the streamflow management plan for King Parrot Creek as an alternative to full implementation of the environmental flows recommendations for the Maribyrnong River, the Council expects Victoria to finalise the streamflow management plan expeditiously. The Council also expects the final plan to determine the environmental water allocations for the creek using a holistic approach consistent with current best practice methods. In finalising the plan the Council will look for Victoria to address the data gaps identified in the draft plan and to determine flows that redress both summer and winter flow stress.

A balance between environmental needs and human use

The plan proposes to implement the recommended environmental flows over a five year period to provide irrigators with time to make necessary on-farm changes. While this approach recognises the rights of existing

water users, there is no assessment of the relative costs and benefits and therefore the Council is unable to determine whether the plan achieves an appropriate balance between environmental needs and human use. The final plan needs to fully assess the impact of implementing the environmental water allocations in order to demonstrate due regard for the ARMCANZ/ANZECC national principles in relation to achieving a balance between environmental needs and human use.

Monitoring and adaptive management

The plan proposes regular monitoring and review, which should enable managers to adjust the environmental water provisions in the creek to meet the objectives in the plan for river health.

Stakeholder consultation and transparent processes

The consultative committee that developed the streamflow management plan comprised representatives of the major stakeholder groups with an interest in the creek. The plan also adopts an open and consultative process and encourages timely provision of relevant information to stakeholders. The plan demonstrates due regard for the ARMCANZ/ANZECC national principles 7 and 12.

Progress towards full implementation of NCP environmental water reform obligations

CoAG senior officials endorsed a reform timetable that requires governments to substantially complete, by 2005, water management arrangements (including environmental allocations) for all (surface water and groundwater) systems on their 1999 implementation programs. Stressed and overallocated river systems were to have been addressed by 2001. The Council's view in past assessments was that while Victoria had not completed its stressed river arrangements, it was achieving reasonable progress. Victoria's 2003 commitment to develop environmental flow arrangements for two stressed rivers each year is evidence of a continued commitment by Victoria.

Victoria completed most of its bulk entitlements program (covering regulated rivers) by the time of the 2003 NCP assessment. The Government's most recent advice is that it is likely to complete all bulk entitlements by December 2004. Victoria also expects to finalise virtually all its streamflow and groundwater management plans by June 2004. Victoria has, however, completed only three streamflow management plans, whereas in 2003 it had scheduled 13 (of a total of 42) plans for completion by June 2003. At this rate of progress, Victoria is unlikely to complete its streamflow management plans in accord with the CoAG timeframe. The Council notes, however, that Victoria anticipates that

some medium to low risk river systems will be able to be managed according to a set of statewide rules, covering licensing limitations, rostering, trading, monitoring and compliance requirements, rather than a full streamflow management plan.

In addition to the Thomson, Macalister and Maribyrnong rivers, Victoria is progressing the development of water management arrangements for the remaining six stressed rivers — the Avoca, Broken, Wimmera, Loddon, Glenelg and Snowy rivers — on its 1999 program. Victoria has completed environmental flow assessments for the Avoca, Broken, Wimmera and Glenelg rivers and is progressing with its bulk entitlements program for these rivers. It has implemented some environmental flows for the Wimmera and Glenelg rivers using water savings associated with the construction of the Northern Mallee pipeline. Victoria has published a draft river health strategy for the Loddon River. For the Snowy River, Victoria has identified and commenced a range of water savings projects as part of the Snowy Rescue Plan to return 21 per cent of the flow to the river over 10 years.

The Department of Sustainability and the Environment identified other stressed systems in its 2003 green paper (DSE 2003). It identified the Moorabool, Goulburn, Campaspe, Yarra, Barwon and Latrobe rivers as very likely to be stressed or at some risk of being stressed. The Barwon and Moorabool rivers are on Victoria's 1999 implementation program, but were not identified as stressed at that time. The other rivers were not part of Victoria's 1999 implementation program.

In accord with the timeframe endorsed by CoAG senior officials, the Council will look for Victoria to substantially complete allocation arrangements for all river systems and groundwater resources on its 1999 program by 2005, and particularly those systems identified as stressed or overallocated. While the 1994 water reform agreement places no formal NCP obligation on Victoria to implement allocation arrangements in rivers that were not part of the implementation program in 1999, the Council encourages Victoria to introduce arrangements for these systems as soon as possible. The Council will take account of any completed plans in considering Victoria's compliance with the obligation to allocate water to the environment in the forthcoming 2004 and 2005 NCP assessments.

Conclusions and recommendations

Under the CoAG strategic water reform framework, governments needed to have made substantial progress in implementing arrangements to provide water to the environment by 2001, including allocations in all river systems that they identified in 1999 as overallocated or stressed. CoAG established a deadline of 2005 for the substantial completion of allocation and trading arrangements for all river systems and groundwater resources on governments' 1999 implementation programs.

In past assessments, the Council accepted some delay by Victoria in finalising its arrangements for allocating environmental water in the 11 stressed and overallocated rivers on its 1999 implementation program because the State was continuing to make progress towards achieving its obligations in this area.

In the 2003 NCP assessment the Council acknowledged Victoria's progress, but found that the Government was still to determine its approaches to providing environmental flows in three of the State's five priority stressed rivers — the Thomson and Macalister river systems and the Maribyrnong River. Given Victoria's progress and noting that the work foreshadowed by CoAG on the National Water Initiative may have implications for Victoria's approach, the Council deferred the 2003 NCP assessment of Victoria's performance.

Since the 2003 assessment, Victoria has continued to work towards implementing the environmental allocations in accord with the CoAG water reform agreement, making the following progress.

- The Thomson and Macalister Task Force finalised its report on options for flow rehabilitation for the Thomson and Macalister rivers and the Government has commenced some river restoration projects pending its decision on the task force report as part of the Victorian white paper on water.
- The Port Phillip and Westernport CMA is developing a draft strategy containing proposed actions for the Maribyrnong River over the short and medium to long term.
- The Victorian Government provided funds to the Port Phillip and Westernport CMA to investigate options to manage summer stress in Jacksons Creek and to conduct on-ground habitat works to protect the low flow aquatic habitat in Deep Creek.
- The Victorian Government allocated \$280 000 from its Stressed River Program to the Goulburn Broken CMA to assess the impact of the recommendations in the King Parrot Creek streamflow management plan, develop a compliance and education program relating to the catchment and implement the agreed environmental flow package. Goulburn Murray Water is currently managing the creek by ensuring a minimum flow of 20 ML a day, with further groundwater extraction embargoed pending finalisation of a groundwater management plan.
- The Victorian Government is progressing the development of arrangements for allocating environmental water in the remaining six stressed rivers from its 1999 implementation program. The Government has identified another six rivers as at significant risk of flow stress and has signalled that it will take action to address this stress.

The Council considered the analysis of the Thomson Macalister Environmental Flows Task Force report and the findings of the TAP in

conducting this deferred assessment. Victoria has adopted a comprehensive, robust and open consultation process and determined environmental flows by employing the best available science. The proposed flow plan includes recommendations which, if adopted by the Victorian Government, should meet all environmental objectives.

The task force's staged approach to meeting the full environmental flow recommendation is likely to deliver an appropriate balance between outcomes for the ecology and existing users. Its success depends, however, on obtaining water entirely from water saving measures. There is little analysis of the feasibility of particular water saving options. Moreover, there is no link between the monitoring outputs and the water management regimes for the two rivers as the monitoring program is yet to be fully implemented. Victoria will need to develop its proposals for water savings for the Thomson and Macalister river systems further (in accord with the task force recommendations) and fully implement a monitoring program that ensures the health of the rivers can be properly managed.

The task force report is currently before the Government, which expects to announce its approach in the white paper. Provided the Government supports the proposed approach, adopts feasible water saving options and/or obtains the recommended environmental water from other sources and implements a monitoring program that is linked to the management regime, the Council would consider Victoria to have satisfactorily addressed its obligations relating to the allocation of environmental water in the Thomson/Macalister system. Accordingly, while the Council considers that Victoria has now satisfactorily addressed its obligations for the 2003 NCP assessment, the Council will further consider Victoria's implementation of the Thomson/Macalister arrangements in the 2004 NCP assessment after the white paper is available.

The Department of Sustainability and the Environment does not list the Maribyrnong River as at risk or likely to be stressed because only a small volume of water is extracted from the river. While the flow rehabilitation plan for the Maribyrnong River found that some sub-catchments are subject to moderate to high flow stress, it concluded that flow variability is more of a problem than insufficient water. The plan included recommendations to improve or restore the health in some of the affected waterways. It also identified data gaps and considered that further research was required before the appropriate environmental flows could be determined.

The Council considers that there are some deficiencies in the flow rehabilitation plan. The plan did not take a multi-disciplinary approach and does not consider all elements of the ecological system. Also, the plan was not subject to peer review or wider consultation with affected stakeholders and interested parties. Victoria has, however, implemented most recommendations and is addressing some of the data gaps. It is not restoring flows in all reaches because it considers this would provide a limited return in comparison to investment in other systems. The

Government has referred the flow rehabilitation plan to the Port Phillip and Westernport CMA to implement actions to improve catchment and river health as part of its regional river health strategy. The CMA is expected to address the deficiencies in the flow rehabilitation plan in this process, which is under way. The CMA has also received funding to implement a range of specific river health initiatives. Acknowledging that the 1994 water reform agreement obliges governments to allocate water to the environment to enhance/restore system health and the evidence that the Maribyrnong River is unlikely to be at risk of stress because there is insufficient water, the Council accepts that Victoria's proposals for further research and restoration work through CMA processes meets CoAG obligations for this 2003 deferred assessment.

Victoria will need, however, to finalise its water management arrangements for the Maribyrnong River by 2005. The Council will consider Victoria's progress in the 2005 NCP assessment, when it will look for the Port Phillip and Westernport CMA to have developed and be implementing a comprehensive regional river health strategy. The Council will look for the strategy to address the deficiencies in the existing flow rehabilitation plan, including consultation on the appropriate trade-offs between consumptive and environmental uses and implementation of an effective monitoring and review process.

In reaching this conclusion, the Council has taken account of Victoria's actions to restore flows in King Parrot Creek, which Victoria indicated forms a substitute to further investment to restore flows in the Maribyrnong River. Victoria has implemented a range of interim measures to address the general problems identified in the draft streamflow management plan relating to summer and winter flow stress and groundwater extraction. Victoria is behind schedule, however, in finalising its water management arrangements for the creek and the scientific methods used in the draft plan are no longer consistent with best practice. In addition, the plan does not include a comprehensive assessment of the trade-offs between the environment and the rights of existing users. In the 2005 NCP assessment, the Council will look for Victoria to have finalised a streamflow management plan for King Parrot Creek that addresses all data gaps identified in the draft plan, clearly spells out the effect of trade-offs between the environment and the rights of existing users and determines appropriate environmental flows for the creek on the basis of best available science.

Finally, in this deferred assessment the Council took account of Victoria's progress towards completing water management arrangements for all rivers on its 1999 implementation program, including those identified as at significant risk of flow stress. Victoria is making good progress with its bulk entitlements program and progressing water management arrangements for its remaining stressed rivers. It is behind schedule in completing its streamflow management plans, but is implementing new processes that may assist it to meet the 2005 deadline.

In the 2004 NCP assessment, the Council will consider Victoria's progress in implementing water management arrangements for river and groundwater sources against the 2005 CoAG deadline for substantial

completion of allocations on governments' agreed implementation programs. This will include:

- consideration of Victoria's progress with its bulk entitlements program and in finalising streamflow and groundwater management plans to ascertain that Victoria is on track to achieve substantial completion of all plans and implementation arrangements by 2005;
- an assessment of a sample of completed streamflow management plans (and related arrangements) to determine the extent to which they address the obligations in the CoAG water reform agreement and the ARMCANZ/ANZECC National Principles for Provision of Water to Environment (having regard to the seasonality, frequency, magnitude and duration of flow events); and
- an assessment of flow rehabilitation plans (and related arrangements) for the Avoca, Broken, Glenelg, Loddon, Snowy and Wimmera rivers as well as any plans completed for other rivers Victoria deems to be stressed or overallocated to determine the extent to which they address the obligations in the CoAG water reform agreement and the ARMCANZ/ANZECC national principles.

The Council considers that Victoria has met its CoAG obligations for this 2003 deferred assessment. The Council therefore recommends no reduction in Victoria's 2003-04 competition payments for environmental water allocation issues.

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