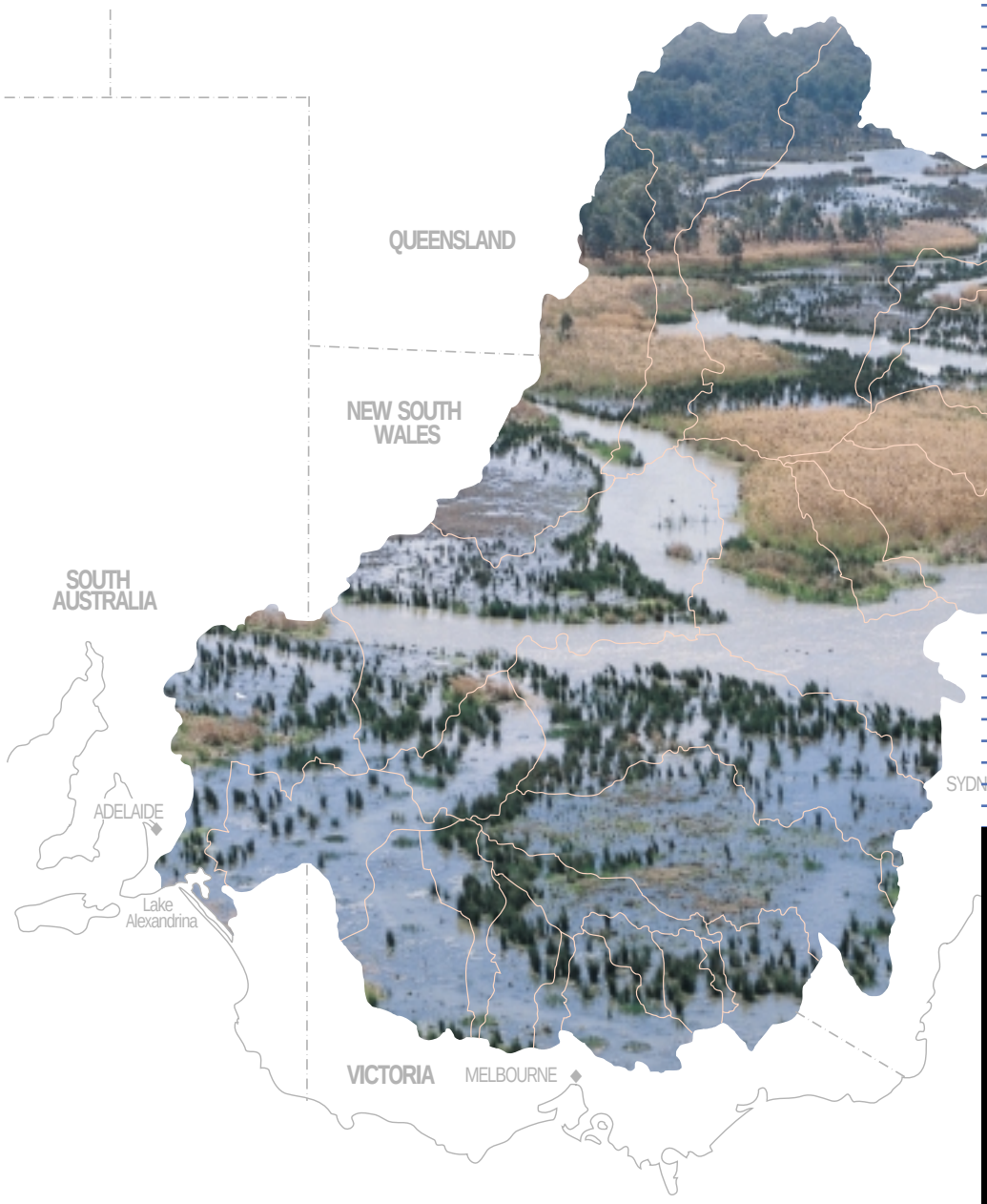
Water Audit Monitoring Report 1998/99

Report of the Murray-Darling Basin Commission on the Cap on Diversions



SIX GOVERNMENTS WORKING IN PARTNERSHIP WITH THE COMMUNITY

Water Audit Monitoring Report 1998/99

August 2000

Water Audit Monitoring Report 1998/99

Report of the Murray-Darling Basin Commission on the Cap on Diversions

AUGUST 2000

Acknowledgements

The development of the Murray-Darling Basin Commission's 1998/99 Water Audit Monitoring Report has involved the valuable input, support and commitment of many people. Each stage of the development of the report was overseen by the members of the inter-governmental working groups and committees. Without naming each particular contributor, thanks are due to the following agencies:

- Commonwealth Bureau of Meteorology, Australia;
- Department of Agriculture, Fisheries and Forestry — Australia;
- Environment ACT;
- NSW Department of Land and Water Conservation;
- QLD Department of Natural Resources;
- SA Department for Water Resources;
- VIC Department of Natural Resources and Environment; and
- VIC Goulburn-Murray Rural Water Authority.

Murray-Darling Basin Commission
GPO Box 409, Canberra ACT 2601
Tel: (02) 6279 0100
Fax: (02) 6248 8053
E-mail: info@mdbc.gov.au
Web Site: http://www.mdbc.gov.au

Published by the Murray-Darling Basin Commission, Canberra, as per the requirement of the *Murray-Darling Basin Agreement* (Schedule F).

ISSN 1442-0414

Designed by City Graphics; Typeset by Brown & Co.

Contents

List of Tables & Figures

List of Tables

List of Figures

1. Introduction

In June 1995, in response to an audit of water use in the Murray-Darling Basin the Murray-Darling Basin Ministerial Council agreed to Cap water use within the Basin. To ensure that the development, management and operation of the Cap is an open and transparent process, the Ministerial Council agreed that an Water Audit Monitoring Report should be produced and published annually.

This report outlines the water usage within the Murray-Darling Basin for the 1998/99 water year, as per the requirements of Schedule F of the *Murray-Darling Basin Agreement*.

In general, the water year is July to June for the Macquarie River and all rivers to the south and October to September for rivers north of the Macquarie.

This report outlines water usage in the States by designated river valley (Section 3.1), includes estimates of the accuracy of water use figures presented (Section 3.2), provides a climatic overview for the water year (Section 3.3), defines the Cap for each State (Section 3.4) and reviews Cap compliance of States (Section 3.5).

In addition to detailing water use, this report also contains information on the States implementation of management rules in designated river valleys that impact on water use within the Basin. Each State has provided a description of their major activities occurring in 1998/99 and further actions that each State plans to undertake over the coming years (Sections 4 to 8).

Other information provided within this report includes water trading throughout the Basin (Section 9), water availability for the year (Section 10) and a comparison of actual and natural flows at key sites within the Basin (Section 11).

Information presented for the first time in this report includes impoundments and losses in major on-stream storages (above 10 GL capacity) (Section 12), the Diversion Cap Register which is maintained in accordance as per the requirements of Schedule F (Appendix A) and Barmah Millewa Forest environmental diversions (Appendix B).

To permit rapid assessment of the findings of this report, Table 1 summarises the compliance of each of the Basin States with the objectives of the Cap.

TABLE 1. 1998/99 Cap Compliance by State

State/Territory	*1998/99 Cap Compliance*
New South Wales	
Border Rivers	A Cap model is not yet available to determine Cap compliance, however, reported diversions of 181 GL is below the long-term Cap preliminary estimate of 195.1 GL.
Gwydir	A Cap model is not yet available to determine Cap compliance, however, reported diversions of 305 GL is below the long-term Cap estimate of 403 GL.
Namoi/Peel	A Cap model is not yet available to determine Cap compliance, however, reported diversions of 280 GL is above the long-term Cap estimate for the Namoi Valley of 241 GL.
Macquarie/Castlereagh/ Bogan	A Cap model is not yet available to determine Cap compliance, however, reported diversions of 367 GL is below the long-term Cap estimate of 464 GL
Barwon-Darling	The Barwon-Darling exceeded Cap for 1998/99 and triggered Schedule F exceedance provisions. A supplementary audit by the IAG was conducted in February 2000. Subsequently, the Murray-Darling Basin Commission Meeting 54 — 14 March 2000 declared the Barwon-Darling in breech of Cap. The NSW Government is to report to Ministerial Council Meeting 29 — 25 August 2000 on proposed measures to bring diversions in the Barwon-Darling within Cap limits.
Lachlan	The Lachlan Valley remained within Cap for 1998/99.
Murrumbidgee	The Murrumbidgee Valley exceeded Cap target for 1998/99, but remained within Schedule F exceedance trigger provisions.

(*continued next page*)

TABLE 1. 1998/99 Cap Compliance by State (continued)

State/Territory	*1998/99 Cap Compliance*
New South Wales (cont.)	
Lower Darling	The Lower Darling remained within Cap for 1998/99.
Murray	The NSW Murray Valley exceeded Cap target for 1998/99, but remained within Schedule F exceedance trigger provisions.
Victoria	
Goulburn/Broken/Loddon	Diversions in the Goulburn/Broken/Loddon exceeded Cap target for 1998/99, but remained within Schedule F exceedance trigger provisions.
Campaspe	Campaspe Valley diversions remained within Cap for 1998/99.
Wimmera-Mallee	A Cap model is not yet available to determine Cap compliance.
Murray/Kiewa/Ovens	Diversions in the Murray/Kiewa/Ovens exceeded Cap target for 1998/99, but remained within Schedule F exceedance trigger provisions.
South Australia	
Metro-Adelaide & Associated Country Areas	Metro-Adelaide & Associated Country Areas diversions remained below the five-year rolling Cap up to and including 1998/99.
Lower Murray Swamps	Lower Murray Swamp diversions remained within Cap for 1998/99.
Country Towns	Country Towns diversions remained below Cap target for 1998/99.
All Other Uses of Water from the River Murray	Diversions for All Other Uses of Water from the River Murray remained below Cap target for 1998/99.
Queensland	
Condamine/Balonne	A Cap model is not yet available to determine Cap compliance. The draft Condamine/Balonne Water Allocation and Management Plan (WAMP) was completed in June 2000 and is currently undergoing a 3 month public review.
Border Rivers/ Macintyre Brook	A Cap model is not yet available to determine Cap compliance. The Border Rivers Flow Management Plan (FMP) is expected to be completed by July 2001.
Moonie	A Cap model is not yet available to determine Cap compliance. The draft Moonie Water Management Plan (WMP) was completed in May 2000 and is currently undergoing revision after completion of the public review process in June 2000.
Warrego/Paroo	A Cap model is not yet available to determine Cap compliance. The Warrego/Paroo/Nebine Water Management Plan (WMP) was completed in June 2000 and is currently undergoing a public review process.
Australian Capital Territory	
	A Cap model is not yet available to determine Cap compliance. Negotiations have commenced to establish a Cap for the ACT and to establish a framework for trade between the ACT and New South Wales.

2. Background

2.1 Audit of Water Use in the Murray-Darling Basin, June 1995

In June 1995, the Commission completed an audit of water use in the Murray-Darling Basin ("An Audit of Water Use in the Murray-Darling Basin", Murray-Darling Basin Ministerial Council, Canberra, 1995). This audit revealed that water diversions from the rivers within the Basin had increased by 8% in the previous six years and were averaging 10,800 GL/year.

This level of diversion had significantly reduced the flows in the bottom end of the River Murray. The audit concluded that median annual flows from the Basin to the sea were only 21% of the flow that would have occurred prior to development. The reduction in flow had occurred most significantly for the small to medium size flood events. Many of these events were completely harvested and the frequency of these flood events had been significantly reduced. It was also found that the end of the river system was experiencing severe drought-like flows in over 60% of years compared with 5% of years under natural conditions.

The change in flow regime has had a significant impact on river health. There has been a contraction in the areas of healthy wetland, native fish numbers have declined in response to the reduction in flow triggers for spawning, salinity levels have risen and algal blooms have increased in frequency in line with the increased frequency of periods of low flow. Further deterioration in river health could be expected if diversion levels were to increase.

The audit examined the scope for diversions to grow further under the water allocation system that existed prior to the Cap. The water allocation system evolved at a time when water managers were trying to encourage development of the water resources of the Basin. As such the system rationed water during periods of shortage but was not effective for controlling diversion during normal non-drought conditions. It was reported that, in the five years before the water audit, only 63% of the water that was permitted to be used was used. The audit found that average diversions could increase by a further 15% if all existing water entitlements were fully developed. Such an increase would reduce the security of supply to existing water users as well as exacerbating river health problems.

2.2 The Cap

The water audit report was presented to the Murray-Darling Basin Ministerial Council in June 1995. The Council determined that a balance needed to be struck between the significant economic and social benefits that have been obtained from the development of the Basin's water resources on the one hand, and the instream uses of water in the rivers on the other. Council agreed that diversions in the Basin had to be capped. An Independent Audit Group (IAG) was appointed to report on the level at which diversions should be capped. In doing so the group took into account the equity issues between the States.

In December 1996, Council considered the Independent Audit Group's report and agreed that:

- For New South Wales and Victoria the Cap is the volume of water that would have been diverted under 1993/94 levels of development plus allowances in the Border Rivers for Pindari Dam (NSW) and in the Goulburn/Broken/Loddon system for Lake Mokoan (Victoria);
- For South Australia, highland irrigation diversions were capped at 90% of existing high security entitlements on licence in 1993/94. This represents a small increase in diversions over 1993/94 levels of development; and
- The Cap for Queensland would be determined after the independently audited Water Allocation and Management Planning (WAMP) and Water Management Planning (WMP) processes had been completed.

Subsequently, the Australian Capital Territory joined the *Murray-Darling Basin Initiative* under a Memorandum of Understanding (MOU) and

agreed to participate in the Cap following the completion of discussions with the Murray-Darling Basin Commission (MDBC), the IAG and the New South Wales Government.

The implementation of the Cap requires considerable change to the way the water allocation system is managed across the Basin. It is likely that these changes will alter the expectations that some water users have regarding their water entitlements. In particular there will be conflict between sleepers (those people who have never used their water entitlement) on the one hand, and those irrigators who have consistently used all their allocation on the other. Both New South Wales and Victoria have established processes implementing the Cap, which will resolve these issues.

Through Capping diversions at 1993/94 levels of development in the two major water using States coupled with the diversion measures planned for South Australia, Queensland and the ACT, the Ministerial Council has effectively established a new framework for water sharing in the Basin. Because of the value placed on water rights, it is important that each State is only using water in line with its Cap. For this reason, the implementation of the Cap requires an integrated reporting framework including significant improvements to the way that diversions are monitored and reported.

This report is a part of this ongoing Cap process. Given the major change in attitude to the allocation and use of water that has occurred as a result of the Cap there has been need for significant development of monitoring and reporting systems by the State agencies. In particular some of the technology based support systems (eg. improved river modelling), are proving to be more involved, time consuming and labour intensive than originally anticipated.

Thus required outcomes, including water user and catchment community understanding and acceptance, are taking longer to be achieved. As such this report does not present a complete and final picture, rather it presents information currently available, highlights areas where information is still unavailable and directions proposed to improve monitoring and reporting performance.

2.3 IAG Review of Cap Implementation 1998/99

At the request of the Ministerial Council, the IAG performed a review of the performance of each State and Territory in progressing the implementation of the Cap during 1998/99 ('Review of Cap Implementation 1998/99', published by the Murray-Darling Basin Ministerial Council, November 1999, Canberra).

This present report represents the third in a series of annual reports and complements the report of the IAG, however the data presented herein are the final figures for the 1998/99 water year and supersede the data reported by the IAG. Most notably, the Murray-Darling Basin diversions in 1998/99 reported in this present report (Table 2) supersede those reported by the IAG in November 1999 (Table 10 of that report).

3. The Year in Review

3.1 Water Use

The data presented in this report has been collected by the relevant State agencies and collated by the MDBC. Accurate diversion data is difficult to obtain, as it requires the collection and collation of thousands of individual water use figures. Table 2 presents the overall water usage figures for the Basin in 1998/99.

The figures indicate that Basin water use in 1998/99 was 11,381 GL, representing the seventh highest on record. Water use in South Australia was the highest on record, Queensland the second

TABLE 2. Murray-Darling Basin Diversions in 1998/99

System		Irrigation Diversion (GL)	Other[1] Diversion (GL)	Total Diversion (GL)
New South Wales[2]	Border Rivers	180	0	181
	Gwydir	305	0	305
	Namoi/Peel	277	3	280
	Macquarie/Castlereagh/Bogan	358	9	367
	Barwon-Darling	246	0	246
	Lachlan	281	8	289
	Murrumbidgee[4]	2,539	12	2,551
	Lower Darling	147	7	153
	Murray	1,882	95	1,978
	Total NSW[3]	**6,215**	**135**	**6,350**
Victoria	Goulburn	1,596	27	1,623
	Broken	18	8	26
	Loddon	42	7	49
	Campaspe	40	36	76
	Wimmera-Mallee	23	131	153
	Kiewa	7	2	9
	Ovens	19	10	28
	Murray	1,717	48	1,765
	Total Victoria	**3,462**	**268**	**3,730**
South Australia	Metro-Adelaide & Associated Country Areas	0	153	153
	Lower Murray Swamps[5]	80	0	80
	Country Towns	0	36	36
	All Other Uses of Water from the River Murray	400	0	400
	Total South Australia	**480**	**189**	**669**
Queensland[2]	Condamine/Balonne	458	9	467
	Border Rivers	113	3	116
	Macintyre Brook	7	0	7
	Moonie	8	0	8
	Warrego	10	0	10
	Paroo	0	0	0
	Total Queensland[6]	**596**	**12**	**608**
Australian Capital Territory[7]		**5**	**18**	**23**
Total Basin		**10,758**	**623**	**11,381**

1. "Other Diversion" includes domestic & stock, town & industrial uses.
2. New South Wales and Queensland diversions include an estimate of unregulated stream diversions.
3. An estimate of NSW floodplain diversions is not available for 1998/99.
4. Murrumbidgee Valley diversions and Lowbidgee diversions are reported together.
5. Water use by Lower Murray Swamp irrigators is based on an estimate of actual crop water use. The metering of diversions is currently being implemented.
6. Floodplain diversions in Queensland are not included in valley totals.
7. ACT diversions are reported as a net figure. The primary usage in the ACT is for urban supply, which has a high return component (approximately 50%).

highest, New South Wales the eighth highest, Victoria the tenth highest whilst diversions in the ACT were well below recent years.

Figure 1 shows the water use (by State) for the period 1983/84 — 1998/99 which enables a comparison of 1998/99 water use with that of previous years. Figure 2 shows the same data as Figure 1 but has the vertical axis re-scaled so that the variation for States with lower overall usage is visible.

Not all diversions are metered and some diversions have to be estimated based on area irrigated or duration of diversion. Section 3.2 provides some indication as to the accuracy of the measurements.

3.2 Accuracy of Measurement

An attempt has been made to assess the accuracy of the diversion estimates in each river valley. Many of the diversions are measured reliably using either metered pumps or gauged offtake channels.

FIGURE 1. Murray-Darling Basin Diversions — 1983/84 to 1998/99

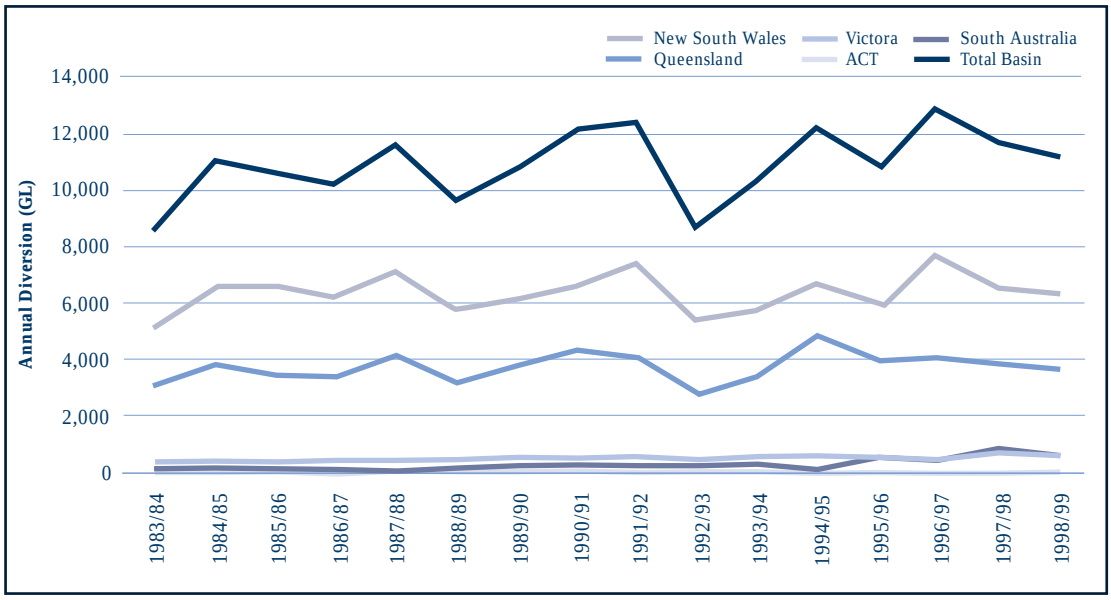
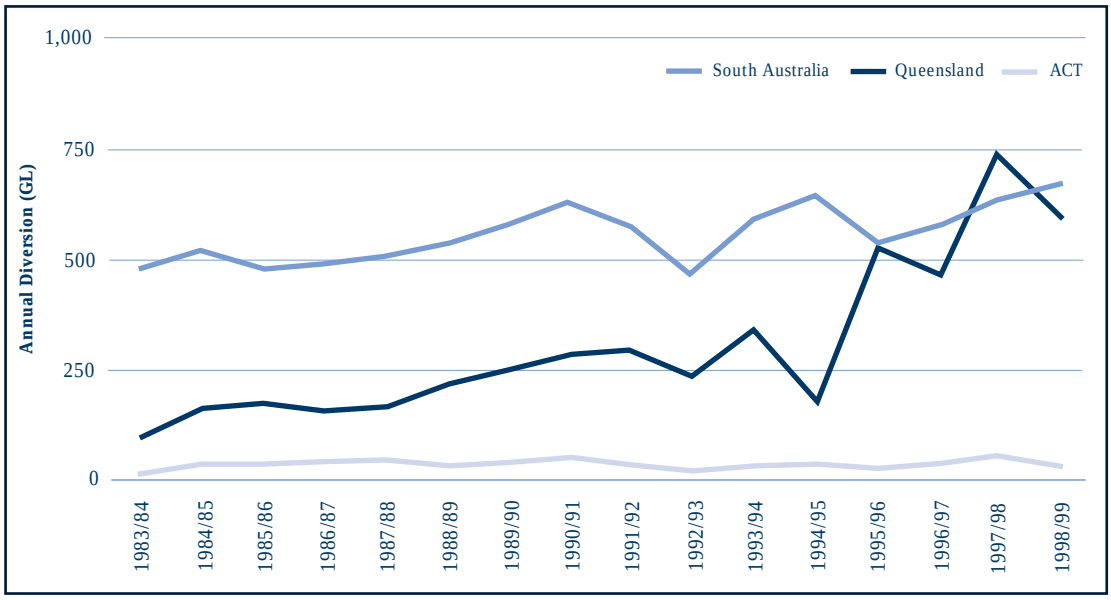


FIGURE 2. Murray-Darling Basin Diversions — 1983/84 to 1998/99 (usage under 1 000 GL/yr)



However a second category of diversions are estimated from regional surveys of areas planted and a third category of estimates is based only on user returns which has proved to be very inaccurate.

Table 3 outlines the confidence the States have in their diversion estimates as reported in Table 2. To develop the figures in Table 3, metered diversions have been assumed to have an accuracy of ±5%, regional surveys ±20% and user returns ±40%.

Analysis of reported diversions for 1996/97 to 1998/99 indicates that the accuracy of measurement has remained static at ±7%.

It is expected that the accuracy of measurement will improve over time as volumetric licenses and allowances are implemented in New South Wales, Queensland and the ACT, in conjunction with the installation of metering in the Lower Murray Swamps, South Australia.

3.3 Climatic Overview 1998/99

- ***Rainfall***

  Figure 3 shows the rainfall deciles for July 1998 to June 1999 inclusive. Above average rainfall was observed throughout most of the

TABLE 3. Accuracy of Diversion Estimates in 1998/99

System		*Diversion (GL)*	*Accuracy ± GL*	*Accuracy ±%*
New South Wales	Border Rivers	181	14	8%
	Gwydir	305	18	6%
	Namoi/Peel	280	28	10%
	Macquarie/Castlereagh/Bogan	367	29	8%
	Barwon-Darling	246	25	10%
	Lachlan	289	17	6%
	Murrumbidgee	2,551	204	8%
	Lower Darling	153	8	5%
	Murray	1,978	99	5%
	Total NSW	**6,350**	**443**	**7%**
Victoria	Goulburn	1,623	81	5%
	Broken	26	5	18%
	Loddon	49	5	10%
	Campaspe	76	5	6%
	Wimmera-Mallee	153	11	7%
	Kiewa	9	2	17%
	Ovens	28	4	14%
	Murray	1,765	106	6%
	Total Victoria	**3,730**	**218**	**6%**
South Australia	Metro-Adelaide & Associated Country Areas	153	8	5%
	Lower Murray Swamps	80	32	40%
	Country Towns	36	2	5%
	All Other Uses of Water from the River Murray	400	25	6%
	Total South Australia	**669**	**66**	**10%**
Queensland	Condamine/Balonne	467	47	10%
	Border Rivers	116	12	10%
	Macintyre Brook	7	0	6%
	Moonie	8	2	20%
	Warrego	10	2	18%
	Paroo	0.04	0.02	40%
	Total Queensland	**608**	**62**	**10%**
Australian Capital Territory		**23**	**3**	**13%**
Total Basin		**11,381**	**791**	**7%**

Basin north of the Murrumbidgee valley, with very much above average rainfall recorded in the northern NSW valleys and Queensland central southern valleys. In contrast, the Victorian valleys received only average rainfall with the southern NSW valleys receiving average to above average rainfall.

Figure 4 shows the rainfall deciles for the period of November 1998 to April 1999 inclusive. Average rainfall was received throughout most of the Basin, with pockets of above average rainfall recorded in NSW, Victoria and a substantial proportion of Queensland.

- ***Temperature***

  Figure 5 shows the temperature anomaly (the difference between the recorded temperatures and the long-term average temperatures) for the period of July 1998 to June 1999 inclusive. Minimal variation from average temperature conditions was observed throughout most of the Basin for this period, although slightly lower temperatures (-0.5 to -1.0°C) were recorded in northern NSW and Queensland.

  Figure 6 shows the temperature anomaly for the period of December 1998 to February 1999 inclusive (the primary irrigation season). Higher than average temperatures were observed for the north western and southern NSW valleys and throughout Victoria (+1.0 to +2.0°C). Whilst average temperature conditions were recorded throughout Queensland, with higher than average temperatures (+1.0°C) extending into the southwest of Queensland.

FIGURE 3. Rainfall Deciles for the Murray-Darling Basin for the July 1998 to June 1999 Period (Source: Commonwealth Bureau of Meteorology, Australia)

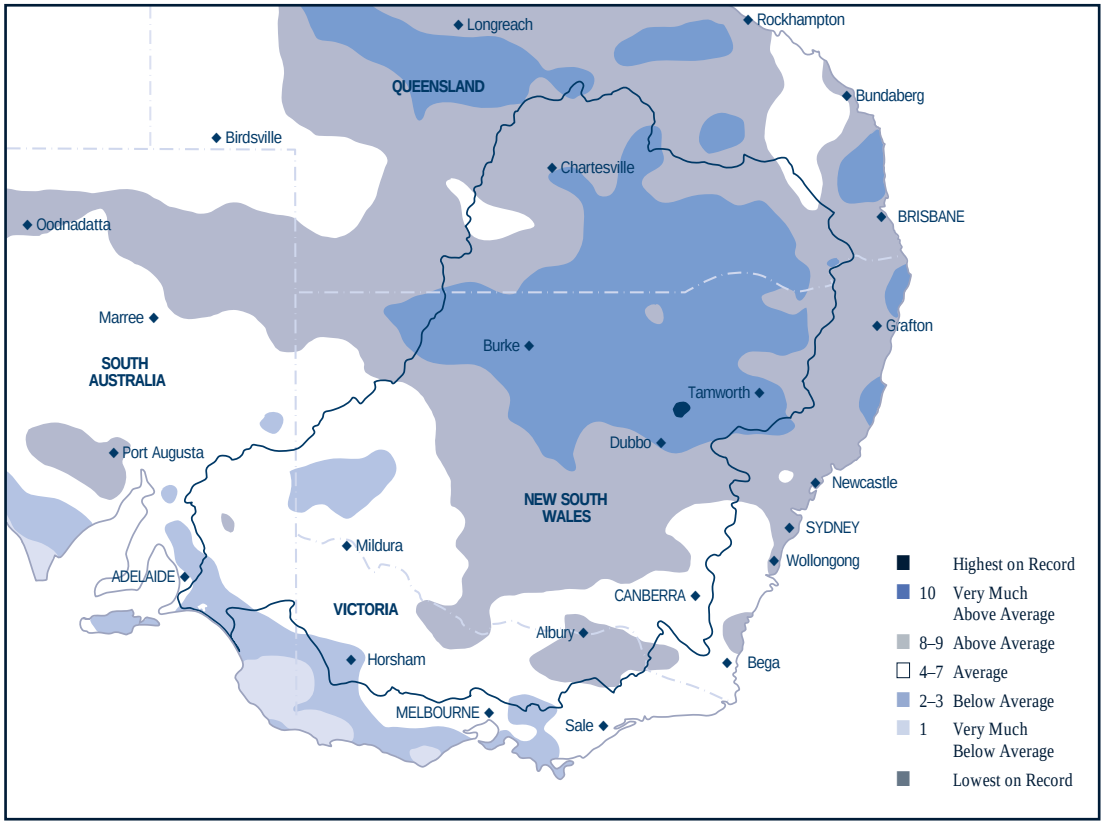


FIGURE 4. Rainfall Deciles for the Murray-Darling Basin for the November 1998 to April 1999 Period (Source: Commonwealth Bureau of Meteorology, Australia)

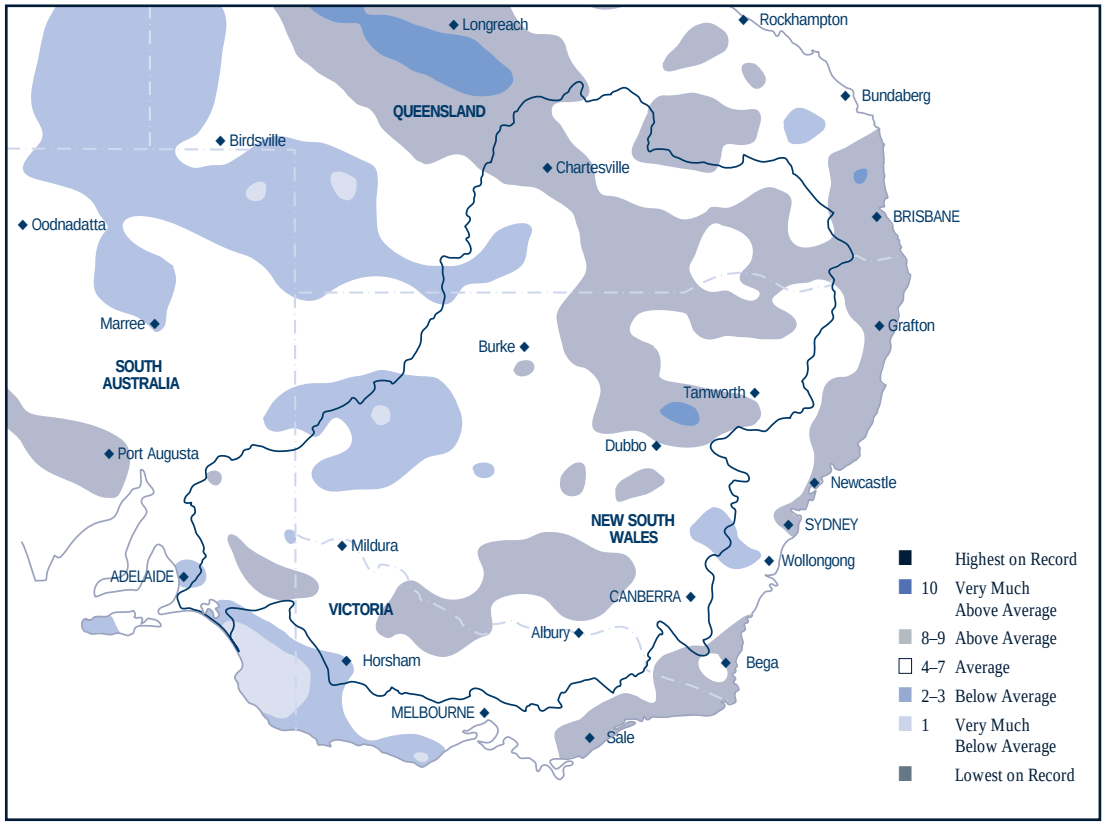


FIGURE 5. Temperature Anomaly for the 12 Month Period July 1998 to June 1999 (Source: Commonwealth Bureau of Meteorology, Australia)

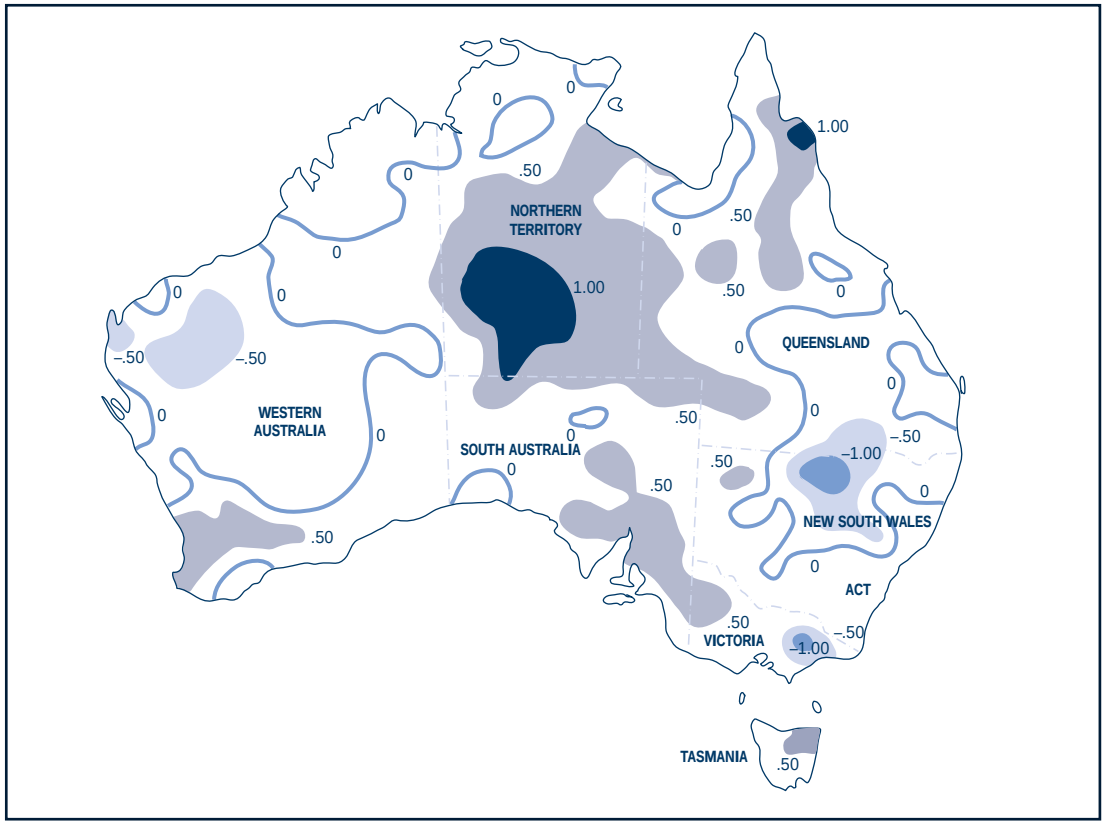
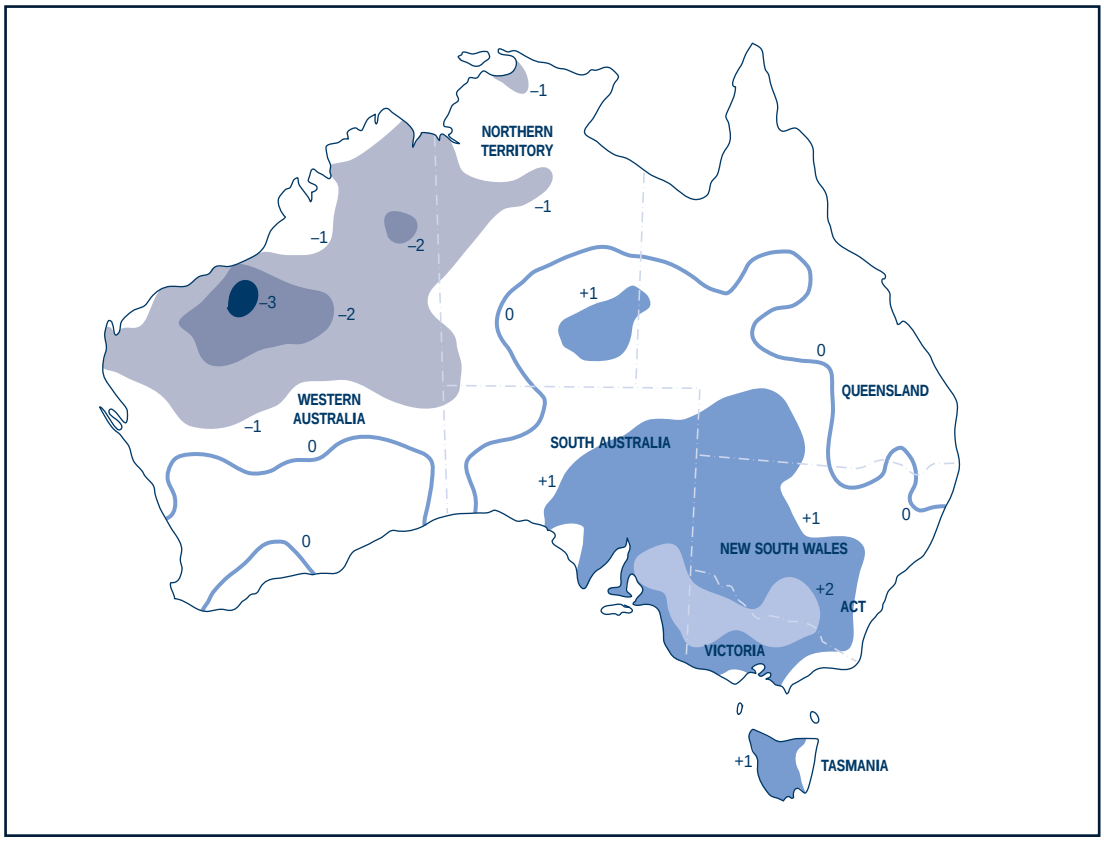


FIGURE 6. Temperature Anomaly for the 3 Month Period December 1998 to February 1999 (Source: Commonwealth Bureau of Meteorology, Australia)



3.4 Definition of Cap

The Murray-Darling Basin Ministerial Council has set the long-term diversion Caps for:

- New South Wales at the volume of water that would have been diverted under 1993/94 levels of development plus an allowance in the Border Rivers for Pindari Dam;
- Victoria at the volume of water that would have been diverted under 1993/94 levels of development plus an allowance (initially 22 GL/year) for Lake Mokoan in the Goulburn/Broken/Loddon system;
- South Australia at:
  - — a total of 650 GL over any five-year period for urban water supply delivered to Metropolitan Adelaide and Associated Country Areas;
  - — 50 GL/year to supply water to Country Towns, subject to the completion of current modelling studies;
  - — 80.2 GL/year for irrigation in the Lower Murray Swamps, adjusted for trade; and
  - — a long-term average diversion for 'All Other Uses of Water from the River Murray' of 440.6 GL/year being 90% of the total allocation of 489.6 GL, adjusted for trade.

The Ministerial Council has not yet set a long-term Cap for Queensland but will do so following the completion of the Water Allocation and Management Planning (WAMP) and Water Management Planning (WMP) processes in that State.

The ACT has agreed to participate in the Cap on diversions under a Memorandum of Understanding (MOU) and will do so following the completion of discussions with the Commission, the IAG and the New South Wales Government.

The Cap in NSW and Victoria is not the volume of water that was used in 1993/94. Rather the Cap in any year is the water that would have been used

with the infrastructure (pumps, dams, channels, areas developed for irrigation, management rules, etc) that existed in 1993/94 taking into account the climatic and hydrologic conditions that were experienced during the year under consideration. A primary task in monitoring the Cap in these States is determining the size of the Cap target for each year. This calculation is done at the end of each year and uses the observed climatic and hydrologic data. In the south of the Basin this will tend to result in lower Cap targets in years when there is significant rainfall in the irrigation areas and larger Cap targets in years with less rainfall when demand is higher. However the annual Cap target will also be affected by the availability of water. In very dry years in the south of the Basin, the annual Cap target will reflect the resource constraints. In the north of the Basin, the Cap target will be very much affected by the opportunities to harvest water into on-farm storages.

Because of these complexities, the calculation of the Cap targets will eventually be made by use of computer models with relationships for water use that includes a range of climatic factors and detailed modelling of flows and storage behaviour. Setting up these models is a major task. To date only a few of the models have been completed and none have been subject to either rigorous peer review or an independent audit. An independent audit of each completed Cap model will be conducted prior to approval by the Commission.

The calculation for the Cap in South Australia is relatively straightforward, although the Cap for the fourth category of South Australian diversions described above is a long-term climate adjusted annual average of 440.6 GL and in extremely dry or wet years may deviate substantially from this value. In the calculation of the Metro-Adelaide Cap, the allocation of 650 GL over 5 years is designed to provide a water supply with 99% security to a major urban city of over 1 million people. This allocation has been based on a 200 year simulation of the amount needed from the River Murray to supplement the primary source from the Mount Lofty Ranges. Actual demand will vary from between about 20 GL (or 10% of Adelaide's needs) to about 190 GL (or about 95% of demand).

Water diversions for 1998/99 are for the fifth water year to be covered by the Cap in the Murray-Darling Basin.

The Ministerial Council has agreed that a State's compliance with the Cap will be tested against the cumulative difference between actual diversions and the calculated Cap targets from 1 July 1997 onwards (Table 4; Appendix A). If that difference exceeds the trigger provisions specified in Schedule F to the *Murray-Darling Basin Agreement*, the Commission must direct the IAG to conduct a special audit of the performance of that State Government in implementing the long-term diversion Cap in the relevant designated river valley. Upon receiving a special audit report from the IAG, which contains a determination that a State has exceeded the long-term diversion Cap in a designated river valley, the Commission must then declare that the State has exceeded the Murray-Darling Basin diversion Cap and must report the matter to the next meeting of the Ministerial Council.

3.5 Comparison of 1998/99 Water Use with the Cap

A comparison of 1998/99 water use with the Cap for each State is as follows:

- ***New South Wales***

  Cap compliance in 1998/99 within New South Wales varied between valleys (Table 4).

  The Cap models for the Border Rivers, Gwydir, Namoi/Peel and Macquarie Valleys have not been completed, therefore a comparative analysis of diversions relative to Cap cannot be undertaken. A Cap model for each of these valleys is expected to be completed in 2000.

  Water use in the Barwon-Darling exceeded Cap for 1997/98 and 1998/99 and triggered Schedule F exceedance provisions. A supplementary audit by the IAG was conducted in February 2000, which confirmed

Cap exceedance. Subsequently, the Murray-Darling Basin Commission Meeting 54 — 14 March 2000 declared the Barwon-Darling in breech of Cap. The New South Wales Government is to report to Ministerial Council Meeting 29 — 25 August 2000 on proposed measures to bring diversions in the Barwon-Darling within Cap limits.

Diversions in the Lachlan and Lower Darling Valleys remained below Cap target for 1998/99. In contrast, water use in the Murrumbidgee and the Murray Valleys exceeded Cap target, although they remained within the exceedance trigger provisions of Schedule F.

- ***Victoria***

  Victorian diversions were within Cap target for 1998/99 for the Campaspe system, 2% above Cap target on the Goulburn/Broken/Loddon system and 1% above Cap target for the Murray/Kiewa/Ovens system (Table 4). This was within acceptable bounds for Cap management as defined in Schedule F of the *Murray-Darling Basin Agreement*.

  A Cap model has not been completed for the Wimmera-Mallee system to date.

  Victoria remains committed to the ongoing development and improvement of Cap models and implementation of Bulk Entitlements to ensure compliance with the Cap.

- ***South Australia***

  South Australia complied with its Cap targets for 1998/99 for the Lower Murray Swamps, Country Towns and 'All Other Uses of Water from the River Murray' (Table 4) and Metro-Adelaide and Associated Country Areas (Table 5).

  South Australia continues to undertake improvement programs and forward moving management initiatives for the sustainability of River Murray water resources and to ensure long-term compliance with the Cap.

- ***Queensland***

  Cap implementation in Queensland has yet to be completed and therefore, it is not possible to provide a statement pertaining to Cap performance for the Queensland catchments for 1998/99.

  The draft WAMP for the Condamine-Balonne and the draft Warrego/Paroo/Nebine WMP were released for public comment in June 2000, whilst the draft Moonie WMP was released in May 2000. It is expected that the Flow Management Plan for the Border Rivers will be completed by July 2001.

- ***Australian Capital Territory***

  Cap implementation in the ACT has yet to be completed.

  Negotiations have commenced to establish a Cap for the ACT and to establish a framework for trade between the ACT and New South Wales.

Table 4 presents a comparison of actual diversions to the annual Cap targets for New South Wales, Victoria, South Australia (except Metro-Adelaide & Associated Country Areas), Queensland and the Australian Capital Territory. Table 5 presents a comparison of actual diversions with Cap target for Metro-Adelaide & Associated Country Areas, South Australia.

TABLE 4. Comparison of Diversions with Cap Levels in 1998/99

System[1]	*Cap Target from Cap Model (GL)*	*Adjustment to Cap Target for Trade*[2] *(GL)*	*Cap Target Adjusted for Trade (GL)*	*Annual Diversion (GL)*	*Cap Credit*[6] *(GL)*	*Cumulative Cap Credit since 1997/98*[6] *(GL)*	*Cap Target Exceedance Trigger (20% of Long-Term Diversion Cap)*[7] *(GL)*
New South Wales							
Border Rivers[3,5]	n/a	2	n/a	181	n/a	n/a	-39
Gwydir[5]	n/a	n/a	n/a	305	n/a	n/a	-81
Namoi/Peel[5]	n/a	n/a	n/a	280	n/a	n/a	-50
Macquarie/Castlereagh/Bogan[5]	n/a	n/a	n/a	367	n/a	n/a	-93
Barwon-Darling	221	0	221	246	-25	-77	-35
Lachlan	330	0	330	289	41	-14	-51
Murrumbidgee	2,359	-38	2,321	2,551	-230	-301	-437
Lower Darling	236	13	249	153	95	201	-29
Murray	1,896	7	1,903	1,978	-75	120	-374
Victoria							
Goulburn]							
Broken[4]]	1,667	0	1,667	1,699	-32	25	-417
Loddon]							
Campaspe	81	4	85	76	9	46	-24
Wimmera-Mallee[5]	n/a	0	n/a	153	n/a	n/a	-32
Kiewa]							
Ovens]	1,782	12	1,794	1,802	-8	124	-331
Murray]							
South Australia							
Metro-Adelaide & Associated Country Areas	*see Table 5*	*see Table 5*	*see Table 5*	*see Table 5*	*see Table 5*	*see Table 5*	*see Table 5*
Lower Murray Swamps	83	-3	80	80	0	0	-17
Country Towns[8]	50	0	50	36	14	0	-10
All Other Uses of Water from the River Murray	441	7	447	400	48	99	-88
Queensland							
Condamine/Balonne[5]	n/a	n/a	n/a	467	n/a	n/a	n/a
Border Rivers[5]	n/a	2	n/a	116	n/a	n/a	n/a
Macintyre Brook[5]	n/a	n/a	n/a	7	n/a	n/a	n/a
Moonie[5]	n/a	n/a	n/a	8	n/a	n/a	n/a
Warrego[5]	n/a	n/a	n/a	10	n/a	n/a	n/a
Paroo[5]	n/a	n/a	n/a	0	n/a	n/a	n/a
Australian Capital Territory[5]	n/a	n/a	n/a	23	n/a	n/a	n/a

1. River valleys grouped thus "]" comprise designated river valleys under Schedule 1 of Schedule F and only a total diversion, cap and difference figure is required for these designated river valleys.
2. Adjustment to Cap target for trade includes exchange rate adjustments to permanent interstate trade.
3. Excludes Cap Target for Pindari Dam.
4. Excludes Cap Target for Lake Mokoan.
5. n/a denotes Cap model is not completed or Cap target has not been able to be determined.
6. The sign convention is that a negative Cap credit value denotes an exceedance of the Cap target adjusted for trade in 1998/99. A negative cumulative Cap credit value indicates an exceedance of the Cap target adjusted for trade on a cumulative basis (since 1997/98).
7. Cap target exceedance trigger values are reported as negative values.
8. The Cap for Country Towns is assessed on an annual basis (see Appendix A).

TABLE 5. Comparison of Diversions with Cap levels in 1998/99 for Metro-Adelaide & Associated Country Areas, South Australia

System	*Total Diversion in 1998/99 (GL)*	*Total Diversion — 5 Years to 1998/99 (GL)*	*5 Year Cap Diversion Target (GL)*	*Difference between Diversion and Cap (GL)*
South Australia				
Metro-Adelaide & Associated Country Areas	153	566	650	84

4. Review by New South Wales of Water Use in 1998/99

4.1 Overview

When introduced in 1995, the Cap was seen as a necessary first step in the evolution of a more sophisticated method of management that preserves the sustainability of both the environment and the communities that depend upon the water within the Murray-Darling Basin. In accordance with this broad objective, from the 1998/99 water year onwards, NSW will be moving in many of its valleys to long-term management plans with annual Cap monitoring, as opposed to annual management and annual monitoring.

The NSW Government has set up community based River Management Committees (RMC's) charged with the task of recommending environmental flow objectives and associated management rules. In most regulated valleys across the State, a set of Environmental Flow Rules (EFR's) have been agreed to by the RMC's and the Government. These rules were implemented for the first time in 1998/99. In the short term, as part of its broader role each of the committees will monitor the impacts of these rules on the environment, the social and economic fabric of a valley and subsequently recommend any appropriate flow modifications. Following five years of experience in the development of flow rules, the Government will establish long-term river flow objectives for each regulated valley in NSW, which will be referred to as River Management Plans (RMP's).

The EFR's that were implemented across the State in 1998/99, are targeted at real environmental gains. The NSW Government agrees that the Cap will remain as a monitoring tool to ensure that downstream users rights, which includes the environment are not degraded. In addition, as part of its role in managing the Cap in NSW, the NSW Department of Land and Water Conservation has developed a set of practical Cap management rules. These rules include limiting the total amount of water available in a valley in any given year by restricting the level of on-allocation and/or off-allocation access and/or the introduction of carryover using a Continuous Accounting allocation system. These rules aim to negate the "use it or lose it" mentality with respect to allocation that has resulted in over use of water in the past. The NSW Department of Land and Water Conservation will continue to use these rules where necessary to ensure Cap compliance across the State.

It is important to note that whilst the EFR's and current management rules will result in long-term average diversions that are below Cap, in some individual years diversions are likely to be above Cap. The ability of these rules to bring long-term diversions to below 1993/94 levels is based upon the assumption that future infrastructure development remains at current levels. Consequently, it will be necessary for the NSW Department of Land and Water Conservation and the RMC's in their review of these rules to ensure that the benefits of the environmental flow rules are protected. This in turn will ensure that long-term Cap compliance is achieved across the State of NSW.

4.2 Border Rivers

Users in the Border Rivers began the 1998/99 season with an allocation of 100% following significant flood events prior to the start of the season. The area irrigated in 1998/99 is estimated at 38,966 ha, which is a minor decrease on the estimated area irrigated in 1997/98. The overall trend in irrigated areas is considered to be static.

By the end of 1998/99, 98 GL of on-allocation, 66 GL of off-allocation water and 0.48 GL of water for town water supply (total usage = 164.5 GL) had been diverted in the NSW regulated section of the Border Rivers. Diversions in the unregulated sections of the catchment in 1998/99 have been estimated to be 16 GL (Table 10). This gives an overall total valley usage for 1998/99 of 181 GL (Table 2; Table 11).

Whilst the Border Rivers IQQM is close to completion, an assessment of Cap compliance based on Schedule F accounting is not possible until the definition of Cap for the Border Rivers is finalised. There was only one change to the

management rules in place in the Border Rivers for the 1998/99 season, that is, the introduction of unlimited carryover.

4.3 Gwydir

In 1998/99, the season began with full resource availability following minor flooding during the two months prior to the season start. A Continuous Accounting (CA) allocation system trial commenced in the Gwydir Valley in 1998/99. In accordance with CA all irrigators were credited with a maximum 150% allocation. All general security licensees are thereby allowed to carryover any unused allocation into the 1999/2000 season. At any time they may receive a new allocation increment (dependent on resource availability) up to a combined limit of 150%. However, in any particular season each licensee will be limited to a maximum on-allocation usage of 100%. It is also likely that irrigators in the Gwydir started the 1998/99 season with full on farm storages due to the high flows late in 1997/98.

Climatically, 1998/99 was slightly wetter than average during the main irrigation season. The area of irrigated cotton planted in 1998/99 has been estimated at 77,000 ha, which represents a minor decrease from the area planted in 1997/98.

In 1998/99, 294 GL of water was diverted in the regulated section of the Gwydir Valley. A further 11 GL has been estimated to have been extracted from the unregulated streams of the catchment (Table 10), resulting in total diversions of 305 GL in the Gwydir Valley for 1998/99 (Table 2; Table 11).

The Gwydir Valley IQQM is close to completion and an assessment of Cap compliance and Schedule F accounting is expected in the near future.

The Gwydir Wetlands Management Plan, which has been in place since 1996, forms the basis of the environmental flow rules, which were introduced in the Gwydir Valley in 1998/99. Long-term modelling using a monthly time step model indicates that this combined suite of management rules would result in expected long-term average diversions approximately 12% below Cap.

4.4 Namoi/Peel

The details of water use and management for the Namoi and Peel Valleys are described individually below as they are managed separately from a resource management perspective.

In the Namoi Valley, the 1998/99 season began with full resource availability following moderate to major flooding during the two months prior to the season start. A Continuous Accounting (CA) allocation system trial commenced in the Namoi Valley in 1998/99. In accordance with CA all irrigators were credited with a maximum 150% allocation. All general security licensees were allowed to carryover any unused allocation into the 1999/2000 season. At any time they may receive a new allocation increment (dependent on resource availability) up to a combined limit of 150%. However, in any particular season each licensee will be limited to a maximum on-allocation usage of 100%. It is also likely that irrigators in the Namoi would have begun the 1998/99 season with full on-farm storages following the high flows late in 1997/98.

Climatically the 1998/99 water year was wetter than median. The cumulative net evaporation for the October 1998 to May 1999 period (used in the Namoi climate-diversion relationship) was well below the historical median. The area of irrigated cotton planted in 1998/99 has been estimated at 75,000 ha, which represents a similar area to that planted in 1997/98.

In 1998/99, 232 GL of water was used in the regulated section of the Namoi Valley. A further 42 GL was estimated as having been extracted from the unregulated streams, resulting in total diversions of 274 GL in the Namoi Valley for 1998/99. An assessment of Cap compliance for 1998/99 using the Namoi IQQM is not yet available, although current estimates of Schedule F accounting indicates a credit of 114 GL to the end of 1997/98. The only indication of performance available at the time of report production comes

from the Namoi Valley climate-diversion relationship. This relationship indicates that the 1998/99 diversion is slightly greater than the annual Cap for 1998/99. However, this result is indicative only and the true performance of the valley can only be assessed once the Namoi IQQM has been updated for 1998/99.

Environmental flow rules were introduced for the first time in the Namoi Valley in 1998/99. Long-term modelling indicates that with these rules and existing management rules in place, long-term average diversions should be approximately 6% below Cap.

The 1998/99 allocation for the Peel Valley was 100%. Between November 1998 and March 1999, 277 mm of rainfall had fallen in the Peel Valley (based upon the combined rainfall indicator used in the Peel climate-diversion relationship). When compared to historical data for the same period this represents close to median rainfall. The estimated area irrigated in the Peel Valley in 1998/99 was 1,280 ha. This represents a decrease of around 34% from the area planted in 1997/98. The total regulated diversion of 6 GL is well within annual Cap tolerance limits for the Peel Valley.

The total diversion from the regulated and unregulated sections of the Namoi and Peel Valleys in 1998/99 was 280 GL (Table 2; Table 11).

4.5 Macquarie/Castlereagh/Bogan

In 1998/99, the Macquarie Valley was given an allocation of 100% following significant flooding during the first few months of the season. Off-allocation was also available during this period. Climatically, the 1998/99 water year was close to median with 288 mm of rainfall recorded over the October 1998 to April 1999 period (based on the combined rainfall indicator used in the Macquarie Valley climate-diversion relationship).

It is estimated that 45,000 ha of irrigated cotton was planted in the Macquarie Valley in 1998/99. This is similar to estimates for 1997/98, but represents a 30% increase from the estimated 34,000 ha planted in 1996/97.

Total consumptive usage in the regulated sections of the Macquarie Valley in 1998/99 was 336 GL. A further 31 GL (Table 10) is estimated to have been extracted from the unregulated section of the Valley, resulting in total diversions in the Macquarie Valley of 367 GL for 1998/99 (Table 2; Table 11). An assessment of Cap compliance for 1998/99 using the Macquarie Valley IQQM is not yet available. The only indication of performance available at the time of report production comes from the Macquarie Valley climate-diversion relationship. This relationship indicates that the 1998/99 diversion is well below the annual Cap for 1998/99. However, this result is indicative only and the true performance of the valley can only be assessed once the Macquarie Valley IQQM has been updated for 1998/99.

4.6 Barwon-Darling

Significant flood events early in the season and generally abundant water supplies resulted in an unconstrained season for irrigation in the Barwon-Darling. Diversions for the season totalled 246 GL (Table 2; Table 11). This is 25 GL above the Cap target for 1998/99 given by the Barwon-Darling IQQM (Table 4). Extensive infrastructure development since 1993/94 lends further support to the fact that users in the Barwon-Darling River system are continually exceeding the MDBMC Cap. The estimated irrigated crop area for the 1998/99 season is 29,125 ha, which is an increase of approximately 13% from previous seasons.

Environmental flow rules, which aim to protect low flows in the Barwon-Darling, were introduced for the first time in 1998/99. However, actual implementation has been forestalled pending the installation of appropriate flow gauging stations for operation.

Schedule F accounting (using the Barwon-Darling IQQM) indicates a debit of 77 GL to the end of 1998/99, which exceeds the estimated trigger for Cap exceedance (of 35 GL) by 42 GL (Table 4; Appendix A).

A supplementary audit by the IAG was conducted in February 2000, which confirmed Cap

exceedance. Subsequently, the Murray-Darling Basin Commission Meeting 54 — 14 March 2000 declared the Barwon-Darling Valley in breech of Cap. The New South Wales Government is to report to Ministerial Council Meeting 29 — 25 August 2000 on proposed measures to bring diversions in the Barwon-Darling within Cap limits.

4.7 Lachlan

In 1998/99, the Lachlan Valley began the season with an allocation of 60% plus an individual carryover of 15%. Large inflows which caused the filling and spilling of Wyangala reservoir resulted in carryover being forfeited and the allocation being increased to 100% by September 1998. Extended periods of off-allocation were available up to early December 1998 in the lower reaches of the system.

Between July 1998 and April 1999, approximately 473 mm of rainfall fell in the Lachlan Valley (based upon the combined rainfall indicator used in the Lachlan climate-diversion relationship). When compared to historical data for the same period this represents well above average rainfall.

Total usage in the regulated sections of the Lachlan Valley in 1998/99 was 278 GL, whilst diversions in the unregulated sections of the catchment in 1998/99 have been estimated at 11 GL (Table 10). The total diversions for the Lachlan Valley in 1998/99 were therefore 289 GL (Table 2; Table 11). This is 41 GL below the Cap target (adjusted for trade) of 330 GL for 1998/99, although Schedule F accounting indicates a cumulative debit of 14 GL to the end of 1998/99 (Table 4; Appendix A).

Existing management rules in the Lachlan Valley include a 100% limit to the announced allocation, a 30 GL limit to off-allocation access, a carryover of up to 30% of the licensed entitlement and the exclusion of high security licences from off-allocation access. No additional Cap action is planned for the Lachlan Valley in 1999/2000. In 1998/99 environmental flow rules were introduced for the first time as part of the NSW Water Reform process. Long-term modelling results indicate that these rules when taken together with existing management rules would result in long-term average diversions that are 4% lower than Cap.

4.8 Murrumbidgee

The Lowbidgee district has been included as a part of the Murrumbidgee Valley for Cap auditing, for the first time in 1998/99.

The Murrumbidgee Valley began the 1998/99 season with an allocation of only 40%. This is the lowest initial allocation since the allocation scheme was introduced. With improved conditions the allocation was gradually increased to 85% in February 1999.

Off-allocation was available from a number of inflow events between July and October 1998. With record low allocations early in the season, general access to off-allocation was permitted early in the season. However, with the allocation level rising to 85%, only diversions by licensees with a history of use quota were accounted as off-allocation.

Net evapo-transpiration for the 1998/99 year, when compared to historical data for the same period, was found to be slightly below median. An estimated 91,460 ha of rice was planted in the Murrumbidgee Valley in the 1998/99 season. This represents a 6% increase from the area planted in 1997/98, but only a 5.7% increase on the area planted in 1996/97.

Usage in the regulated section of the Murrumbidgee Valley in 1998/99 totalled 2,123 GL. This excludes a net transfer out of the Valley of 39 GL (Table 11). Diversions in the unregulated sections of the Murrumbidgee Valley in 1998/99 have been estimated to be 428 GL (Table 10), including controlled diversions through regulators into the Lowbidgee district for 1998/99 of 422 GL. This gives a total Murrumbidgee Valley diversion for 1998/99 of 2,551 GL (Table 2), which exceeds the 1998/99 Cap target (adjusted for trade) of 2,321 GL by 230 GL (Table 4; Appendix A).

Schedule F accounting indicates a cumulative debit of 301 GL to the end of 1998/99, which is within the trigger for Cap exceedence of -437 GL (Table 4; Appendix A).

Existing management rules in the Murrumbidgee Valley include a 100% limit to the announced allocation, a 300 GL limit to off-allocation access and the exclusion of high security licences from off-allocation access. A major step in the NSW Water Reform process formally commenced with the introduction of environmental flow rules for the Murrumbidgee Valley in 1998/99. Long-term modelling indicates that the combined suite of management rules should result in expected long-term average diversions that are approximately 4% below Cap.

Further management rules that are expected to be implemented during 1999/2000 include the introduction of a 10% carry-over provision, a further reduction of the off-allocation access limit to 220 GL and restrictions to temporary transfers by high security licensees.

It should be noted that a Cap auditing methodology is currently being developed for the Lowbidgee district. However, an IQQM module for Lowbidgee (which will be a part of the Murrumbidgee IQQM project) is not expected to be available until sometime during the 2000/2001 season.

4.9 Lower Darling

Diversions in the normally unconstrained Lower Darling Valley totalled 153 GL in 1998/99 (Table 2). This excludes a net transfer into the valley of 10 GL. The Cap diversion target (adjusted for trade) for 1998/99 has been calculated at 249 GL. The 1998/99 diversion is therefore approximately 96 GL below this target. Schedule F accounting indicates a cumulative credit of 201 GL to the end of 1998/99 compared to a Cap target exceedance trigger of –29 GL (Table 4; Appendix A).

No additional Cap action is planned for the Lower Darling in 1999/2000.

4.10 Murray

In 1998/99 the Murray Valley began the season with an allocation of 0%. This represents the lowest initial allocation since the allocation scheme was introduced. However, with improved conditions the allocation was raised to 83% by November 1998 and to 93% in February 1999.

For the October 1998 to April 1999 period (which corresponds to the main period of irrigation) 200 mm of rainfall was recorded in the Murray Valley (based upon the combined rainfall indicator used in the Murray climate-diversion relationship). When compared to historical data for the same period this represents close to median rainfall. An estimated 63,630 ha of rice was grown during the 1998/99 season, which is at a similar level to previous seasons.

The total diversion from the regulated section of the Murray Valley in 1998/99 was 1,972 GL. This excludes a net transfer into the valley of 29 GL (Table 11). Diversions in the unregulated sections of the valley have been estimated at 6 GL for 1998/99 (Table 10). This gives total water usage of 1,978 GL in the Murray Valley for 1998/99 (Table 2; Table 11), which is 75 GL above the Cap target (adjusted for trade) of 1,903 GL. On a cumulative basis, the Murray Valley Cap is 120 GL in credit, in comparison to a Cap target exceedance trigger of -374 GL (Table 4; Appendix A).

In accordance with the in-principle annual environmental allocation for the Barmah Millewa Forest, environmental diversions of 48.7 GL (NSW share) to the Barmah Millewa Forest were undertaken in October 1998, following the September/October 1998 flood in the Victorian Ovens catchment (Appendix B).

In the Murray Valley, the existing management rules include a 100% allocation limit, a carryover of up to 10% of licensed entitlement and a 327 GL off-allocation access limit. The valley carryover limit was increased to 20% in conjunction with a late season allocation increase of 10% in February 1999, nearly all of which was carried over into the 1999/2000 season. No additional Cap action is planned for the Murray Valley in 1999/2000.

5. Review of 1998/99 Water Use in Victoria

5.1 Overview

Details of the factors influencing net water use in each of the Victorian systems in 1998/99 and proposed future water management activities are given below.

5.1.1 Water Use Capping Measures

Victoria has been implementing changes to water management policies since 1990/91, under its water reform program. Ongoing monitoring of the effectiveness of these policies is undertaken. No new policies were introduced for the 1998/99 water year and none are proposed for the 1999/2000 year. Bulk Entitlements for the Murray system were granted in July 1999. Bulk Entitlements for the Campaspe system were lodged for governmental approval in late 1999.

The nature of Victoria's seasonal allocation process also limits diversions. The Goulburn System final allocation was the lowest ever, while the Murray System allocations were at the maximum allowable level. This was the largest ever difference in allocation levels between these two systems.

5.1.2 Volumes Diverted

Volumes diverted during 1998/99 were below Cap level in the Campaspe system, but slightly above Cap in the Goulburn/Broken/Loddon and Murray/Kiewa/Ovens systems. A Cap target has not been determined for the Wimmera-Mallee system.

The total diversion from the Victorian part of the Murray-Darling Basin during 1998/99 was 3,730 GL (Table 2; Table 11). This was less than the diversion in 1997/98 due to the lower allocations, caused by the dry conditions and low resource position. The allocated volume authorised for use was 4,758 GL (including 1,048 GL losses, 210 GL of off-allocation available and 16 GL net temporary trade into Victoria from interstate), resulting in a utilisation of 78% of authorised volume (Table 11).

5.1.3 Off-Quota

Three separate periods of off-quota were declared on the Murray system downstream of Hume Dam during 1998/99. These occurred in July, August and September/October 1998. Customers in the Torrumbarry and Murray Valley irrigation areas could not access water during the July 1999 off-quota period as it fell outside the official irrigation season and channel systems were not available for water delivery. High demand was experienced during the latter two periods due to the dry conditions and low allocation at the time.

Murray off-quota can only be declared when the MDBC advises of surplus flow conditions. During 1998/99, the advice of surplus flow included limits on diversions to major carriers (Yarrawonga Main and National Channels). This 'limited surplus' was difficult to manage due to the high levels of demand, which arose following the off-quota announcement.

5.1.4 Deliveries

- ***Pattern***

  Deliveries commenced in September 1998 following the low initial allocation announcement in August. Good rainfall in September and November 1998 suppressed demand, but from then on conditions were dry and overall demand strengthened to high rates similar to the previous year.

- ***Final Deliveries***

  Total irrigation deliveries for the season were 2,625 GL. Deliveries to Goulburn system and Campaspe system customers were well below the 10 year averages, while deliveries to Murray system customers were above the 10 year average.

- ***Historical Comparison***

  The large difference in allocation between the Murray and Goulburn systems resulted in final deliveries in the Murray system being higher than in 1997/98, and in the Goulburn system being lower. Campaspe deliveries were also lower than in 1997/98 due to the lower allocation. Overall deliveries were 4% lower than in 1997/98.

5.1.5 Trading

The low initial allocations encouraged water trading.

Permanent intra-valley trade of 24,918 ML occurred during 1998/99 (Table 7), which was 4,000 ML higher than the previous record level of permanent trade set in 1997/98.

Temporary intra-valley trade of 183,004 ML occurred during the year (Table 7), which was 53,000 ML less than 1997/98 levels. This was mainly due to the high allocation on the Murray system, which necessitated less need for trading. Trade involving the Murray system was less than half the level of 1997/98, while Goulburn system trading was higher than in 1997/98 due to the low allocation.

Interstate trading continued to rise with a total of 849 ML permanently traded and 41,039 ML temporarily traded, which were approximately double the levels of 1997/98. Of the temporary trade, 28,291 ML was traded into Victoria, with 12,568 ML going to New South Wales and 180 ML to South Australia, representing net temporary interstate trade of 15,543 ML (Table 7).

5.1.6 Environmental Flows

The northern Victorian wetlands used 1,800 ML of its environmental water entitlement during 1998/99.

The Barmah Millewa Forest used 48.7 GL of its 50 GL environmental water entitlement (Victoria's share) during 1998/99 (see Appendix B).

5.2 Goulburn

The initial (August 1998) allocation for gravity customers and private diverters was 40% of Water Right or Licence Volume and no Sales. The allocation gradually increased over the following months until it reached 100% of Water Right or Licence Volume in November 1998. There was no further increase and no Sales was available. This was the lowest allocation ever announced for the Goulburn system.

Lake Eildon, the main water resource for the Goulburn system, was at 31% of capacity at the beginning of the irrigation season. It rose to a peak of 47% in November 1998 before falling to a record low of 20% in May 1999. Although Eildon received some good inflows during spring, cumulative inflows over the 31 months prior to May 1999 were still the second lowest on record.

Waranga Basin operations were managed to achieve very low water levels at the end of the season for the second consecutive year. This assisted winter construction activities at the major outlet and maximised harvesting capacity, thereby conserving water in Eildon.

Overall diversions were below the 10 year average. Of the 1,121 GL authorised for use within the Goulburn basin, 97% or 1,089 GL was used (Table 11). This includes 390 GL of system losses but excludes 534 GL diverted out of the Goulburn Valley into the Campaspe and Loddon Valleys. Diversions originating from within the Goulburn Valley totalled 1,623 GL (Table 2; Table 11).

There was an increase in trading levels over 1997/98, with 1.8 GL net permanent trade out of the Goulburn system and 7 GL net temporary trade in. Whilst within the system (intra-valley) there was 13.9 GL permanently traded and 124.5 GL temporarily traded (Table 7).

Bulk entitlements for the Goulburn system have been in force since 1995.

For the purposes of Cap compliance, the Goulburn basin is included in the Goulburn/Broken/Loddon designated river valley under Schedule F of the *Agreement*. The Goulburn/Broken/Loddon system diversions of 1,699 GL were within acceptable bounds for Cap management, although slightly above the modelled Cap target of 1,667 GL for 1998/99 (Table 4). On a cumulative basis, the Goulburn/Broken/Loddon system is 25 GL in credit, in comparison to a Cap target exceedance trigger of –417 GL (Table 4; Appendix A).

5.3 Broken

The initial allocation for Broken system diverters was 40% of Licence Volume. The allocation increased to 100% of Licence Volume in late

September, and then to the maximum allowable allocation of 100% Licence Volume plus 70% Sales in October 1998. However, as in previous years, supply could only be guaranteed while Lake Mokoan remained free of Blue-Green Algae blooms.

At the beginning of the season Lake Nillahcootie was at 33% of capacity while Lake Mokoan was at 28% of capacity. Nillahcootie slowly rose to 50% capacity by late September 1998 and then filled in the space of two days to its maximum capacity of 40 GL. Lake Mokoan reached a peak level of 45% in November 1998.

Mokoan was closed due to Blue-Green Algae blooms in January 1999.

Total diversions were close to average. Of the 58 GL authorised for use, 45% or 26 GL was used (Table 11).

Bulk Entitlement development for the Broken system is scheduled to commence in late 1999 and be completed by June 2001.

For the purposes of Cap compliance, the Broken basin is included in the Goulburn/Broken/Loddon designated river valley under Schedule F of the *Agreement*. The Goulburn/Broken/Loddon system diversions of 1,699 GL were within acceptable bounds for Cap management, although slightly above the modelled Cap target of 1,667 GL for 1998/99 (Table 4). On a cumulative basis, the Goulburn/Broken/Loddon system is 25 GL in credit, in comparison to a Cap target exceedance trigger of –417 GL (Table 4; Appendix A).

5.4 Loddon

Gravity irrigation customers in the Loddon basin are largely supplied from the Goulburn system via the Waranga Western Channel, and were allocated 100% of Water Right for the season. Private diverters were allocated 100% of Licence Volume.

The combined resources of Cairn Curran, Tullaroop and Laanecoorie were at 33% of capacity at the beginning of the season and rose to a peak of just 37% capacity by November. The low level of these storages resulted in there being no water available to supplement the Pyramid-Boort Irrigation Area.

Usage by private diverters was marginally above average.

Of the 383 GL authorised for use, 88% or 338 GL was used (Table 11). This included 98 GL of losses and 288 GL transferred in from the Goulburn basin to supply gravity customers in the Pyramid-Boort Irrigation Area. Diversions originating from within the Loddon Valley totalled 49 GL (Table 2).

Bulk Entitlement development for the Loddon system is to commence in late 2000 and be completed by December 2002.

For the purposes of Cap compliance, the Loddon basin is included in the Goulburn/Broken/Loddon designated river valley under Schedule F of the *Agreement*. The Goulburn/Broken/Loddon system diversions of 1,699 GL were within acceptable bounds for Cap management, although slightly above the modelled Cap target of 1,667 GL for 1998/99 (Table 4). On a cumulative basis, the Goulburn/Broken/Loddon system is 25 GL in credit, in comparison to a Cap target exceedance trigger of –417 GL (Table 4; Appendix A).

5.5 Campaspe

The Campaspe basin has irrigators supplied from the Campaspe River (Campaspe Irrigation District and private diversions) and from the Goulburn system via the Waranga Western Channel (Rochester Irrigation Area).

The irrigators supplied from the Campaspe River received an initial allocation of 100% of Water Right or Licence Volume, and this did not change for the remainder of the season. The Rochester irrigators were allocated 100% Water Right for the season.

Lake Eppalock was at 46% of capacity at the beginning of the season and rose marginally to 49% capacity in October before falling away due to demand. There was no supplement available to the Waranga Western Channel from the Campaspe system due to the low resource position.

Campaspe District irrigators used their full entitlement as well as 4 GL of water temporarily traded in via inter-valley trade. Private diverters used about 70% of Licence Volume, and traded out a large proportion of their remaining Licence Volume.

Of the 351 GL authorised for use, 82% or 286 GL was used (Table 11). This included 67 GL of losses and 210 GL transferred in from the Goulburn basin to supply Rochester gravity customers. Diversions originating from within the Campaspe Valley totalled 76 GL (Table 2), which were within the Cap target (adjusted for trade) of 85 GL for 1998/99 (Table 4). On a cumulative basis, the Campaspe system is 46 GL in credit, in comparison to a Cap target exceedance trigger of –24 GL (Table 4; Appendix A).

Bulk Entitlements for the regulated part of the Campaspe system were lodged for governmental approval in late 1999.

5.6 Wimmera-Mallee

Despite continuing dry conditions, and above average water demands, the main 1998 winter domestic and stock season was largely completed in November. The season started in May 1998 with the total volume in storage below the 350 GL trigger for supply to recreation lakes. Restrictions on supply to recreation lakes were eased in late-spring following a period of small, but useful inflow to storages.

Significant water efficiency achievements were made during the 1998 season through improved operational practices. Most noticeable was the Charlton channel system; in 1997 this system used 20.6 GL while in 1998, with nearly identical demands, only 15.6 GL was released to the channel offtake.

Inflows over the 1998 winter-spring period were very low at about 20% of average. With the Wimmera basin storages at low levels, a substantial proportion of demands were met by transfers from the Glenelg basin. A total of 114 GL was diverted from the Glenelg River catchment of which 110 GL was transferred from Rocklands Reservoir into the Wimmera basin. Transfers from the Waranga Western Channel (Goulburn/Broken/Loddon system) and from the River Murray totalled a net 6.2 GL, which were used to supply the pipelined domestic and stock and bulk urban system in the Northern Mallee.

Of the 196 GL authorised for use in the Wimmera-Mallee system, 81% or 159 GL was used (Table 11). This includes 100 GL of system losses and 6.2 GL transferred in from other valleys.

The 1998/99 irrigation season commenced with storages holding only 43% of capacity, the lowest season start volume since the 1982/83 drought. The season started with a 150% allocation, which had increased, to 160% by the end of the season. These were the first irrigation restrictions since the 1967/68 season — in normal years an allocation of up to 200% is generally available.

The 1999 domestic and stock season commenced in April 1999 with storages holding only 32% of capacity, the lowest for that time of year since 1978. Except for recreation lakes, restrictions were not imposed, however considerable emphasis was given to water delivery savings. Additional emphasis was also placed on improved efficiency of both on-farm and Authority channels, building on the experiences on the Charlton system in 1998. A strict policy of not supplying customers unless their on-farm works were in acceptable condition, and improved operational arrangements led to an early close to the winter season.

Completion of Stage 3 of the Northern Mallee Pipeline has seen additional water available for environmental flows in the Wimmera and Glenelg rivers. The Wimmera River received 11,051 ML out of the total 16,787 ML of environmental entitlement released to both systems during 1998/99.

The Cap model has not yet been completed for the Wimmera-Mallee, however it is assumed that usage has remained within Cap as there has been no net development in the valley and efficiency savings of the Northern Mallee pipeline and other operational improvements can be demonstrated.

5.7 Kiewa

No allocation was announced for the Kiewa basin, as it is an unregulated system.

Overall usage during 1998/99 was 9.3 GL (Table 2) or 59% of authorised volume (Table 11). Irrigation usage was 7.4 GL (Table 2) or 64% of Licence Volume.

A stream flow management plan for the Kiewa basin is currently being developed.

For the purposes of Cap compliance the Kiewa basin is included in the Kiewa/Ovens/Murray designated river valley under Schedule F of the *Agreement*. The Kiewa/Ovens/Murray system diversions of 1,802 GL were within acceptable bounds for Cap management, although slightly above the modelled Cap target (adjusted for trade) of 1,794 GL for 1998/99 (Table 4). On a cumulative basis, the Kiewa/Ovens/Murray system is 124 GL in credit, in comparison to a Cap target exceedance trigger of –331 GL (Table 4; Appendix A).

5.8 Ovens

No formal allocation announcement is made for the Ovens basin. Licence volume is usually available and Sales entitlement extended whilst storages are spilling. Overall usage has always been less than Licence Volume and 1998/99 was no exception. The Bulk Entitlement conversion process will review these policies.

Lakes Buffalo and William Hovell filled during winter, which is common behaviour for these small storages.

Overall usage during 1998/99 was 28 GL (Table 2) or 51% of authorised volume (Table 11). Irrigation usage was 18.6 GL (Table 2) or 48% of Licence Volume.

Bulk Entitlement development for the Ovens system is scheduled to commence in October 2000 and is expected to be completed by June 2001.

For the purposes of Cap compliance the Ovens basin is included in the Kiewa/Ovens/Murray designated river valley under Schedule F of the *Agreement*. The Kiewa/Ovens/Murray system diversions of 1,802 GL were within acceptable bounds for Cap management, although slightly above the modelled Cap target (adjusted for trade) of 1,794 GL for 1998/99 (Table 4). On a cumulative basis, the Kiewa/Ovens/Murray system is 124 GL in credit, in comparison to a Cap target exceedance trigger of –331 GL (Table 4; Appendix A).

5.9 Murray

The initial (August 1998) allocation for gravity irrigation areas and private diverters was 95% of Water Right or Licence Volume and no Sales. The allocation increased over the following months until it reached the maximum allocation of 100% of Water Right/Licence Volume plus 100% Sales in October 1998 (70% Sales for private diverters not on the Mitta Mitta).

Lake Hume was at 28% of capacity at the beginning of the season while Dartmouth was at 40% of capacity. Hume rose to a peak of 68% capacity in November 1998 and Dartmouth peaked at 58% capacity in early December 1998. At this time Hume resource was shared equally between Victoria and New South Wales, while Victoria had a much greater share of Dartmouth than New South Wales.

Transfers from Dartmouth to Hume commenced in December 1998 and continued at rates of up to 8,000 ML/day until April 1999.

Three periods of off-quota were declared for Murray system irrigators during winter and spring following advice of surplus flow in the River Murray from River Murray Water.

Overall diversions were above the 10 year average. Of the 2,576 GL authorised for use within the Murray Valley (including 210 GL available as off allocation), 70% or 1,793 GL was used (Table 11). This includes 394 GL of losses and 29 GL transferred in from the Goulburn basin to the lower Broken Creek (Murray Valley Irrigation Area). Diversions of water originating within the Murray Valley totalled 1,765 GL (Table 2).

Net permanent inter-valley and interstate trading in the Murray system was 2.0 GL and –0.35 GL,

respectively, which was largely sourced from the Goulburn system. Of the 15 GL permanently bought within the Murray system, 73% of the trade went to the Murray downstream of Nyah. A net 15.5 GL was temporarily traded into the Murray system from interstate (Table 7).

Bulk Entitlements for the Murray system were approved in July 1999.

For the purposes of Cap compliance the Murray basin is included in the Kiewa/Ovens/Murray designated river valley under Schedule F of the *Agreement*. The Kiewa/Ovens/Murray system diversions of 1,802 GL were within acceptable bounds for Cap management, although slightly above the modelled Cap target (adjusted for trade) of 1,794 GL for 1998/99 (Table 4). On a cumulative basis, the Kiewa/Ovens/Murray system is 124 GL in credit, in comparison to a Cap target exceedance trigger of -331 GL (Table 4; Appendix A).

6. Review of 1998/99 Water Use in South Australia

6.1 Overview

South Australia reports diversions under four Cap components:

- Metropolitan Adelaide and Associated Country Areas;
- Lower Murray Swamps;
- Country Towns; and
- 'All Other Uses of Water from the River Murray' (Highland Irrigation).

Water diversions from the River Murray were within Cap for each of these designated components in 1998/99.

Details of the factors influencing water use in South Australia in 1998/99 and proposed future water management activities for each of the Cap components are given below.

6.2 Season Conditions

Weather conditions in South Australia have been drier than average for 1998/99 and these dry conditions have prevailed over most of the State.

The Riverland region in South Australia receives annual average rainfall of less than 300 mm and most of this falls in the winter months. As the growing season largely coincides with the summer months when rainfall is minimal, it is considered to have little impact on irrigation practice. Temperature, however, has been identified as a more significant factor.

Adelaide and its surrounds are supplied with water from the Mount Lofty Ranges catchments and the River Murray. The amount of water that is diverted from the River year to year is significantly influenced by the weather conditions in the Mount Lofty Ranges. Inflows to storages from local catchments in the Ranges have been below average for 1998/99 so diversions from the River were well above average, as they were in 1997/98.

6.3 Metropolitan Adelaide and Associated Country Areas

The Cap for Metropolitan Adelaide and Associated Country Areas is reported over a five-year (rolling average) period of not more than 650 GL. Usage of River Murray water for Metropolitan Adelaide and Associated Country Areas in 1998/99 was 153 GL (Table 2) and the total for the five years to 1998/99 was 566 GL (Table 5; Appendix A).

6.4 Lower Murray Swamps

Since trade became available to Lower Murray Swamp irrigators, the Cap for the Lower Murray Swamps has decreased from its original figure of 83.4 GL in 1993/94 to 80.2 GL in 1998/99 (Table 4; Appendix A). Use is currently considered equal to allocation in the Lower Murray Swamps, however this will change as meters continue to be installed.

6.5 Country Towns

Water use for Country Towns in 1998/99 was 36.4 GL (Table 2). This is 13.6 GL below the annual Cap limit of 50 GL (Table 4; Appendix A).

The Cap for Country Towns is currently under review, pending the completion of a climate-diversion relationship Cap model.

6.6 All Other Uses of Water from the River Murray (Highland Irrigation)

Highland irrigators diverted 399.9 GL or 89% of the trade adjusted Cap for 1998/99, which was 47.6 GL below the Cap target of 447.5 GL (Table 4; Appendix A). This represents an increase in diversions compared to 1997/98. The factors which attributed to this increase include: interstate trade — particularly where the net trade is out of South Australia, maturing permanent crops from new developments, temperature and rainfall. However, these increases have been offset to some degree by improved irrigation efficiency through promotion and development of grower education programs and improved infrastructure. The rate at which new developments emerge also continue to slow as the pool of available water entitlement decreases through the take up of sleeper and/or dozer allocations.

A draft climate-diversion relationship model for pumped highland irrigation is currently being

developed with the expected date of completion in late 2000.

6.7 Future Water Management Activities

South Australia is committed to improvement programs and forward moving management initiatives for the sustainability of River Murray water resources through:

- Development and implementation of 'Local Action Plans' and 'Land and Water Management Plans' to cover all sections of the River Murray catchment in South Australia to ensure that improved irrigation practice and suitable farm management techniques are adopted in a coordinated manner through strong local community commitment;
- Ongoing and developing partnership between the River Murray Catchment Water Management Board and Local Action Planning groups in implementing Local Action Plans;
- Development of a comprehensive Catchment Plan, Water Allocation Plan and Drought Allocation Plan by the River Murray Catchment Water Management Board — The public consultation phase of the development is now complete and the Plans should be available to the public mid-2000;
- Development of a new licensing system with improved audit capabilities;
- Continued rehabilitation of highland irrigation areas to reduce system losses and improve irrigation practice. Only the Loxton irrigation area remains to be rehabilitated for which funding and approval to proceed has now been granted;
- Installation of metering systems for swamp irrigation areas and revising water allocations in line with best practice irrigation practice; and
- Ongoing grower education programs.

7. Review of 1998/99 Water Use in Queensland

7.1 Management Overview

Details of the factors influencing net water use in Queensland in 1998/99 and proposed future water management activities are given below.

Management Planning

Queensland is yet to establish a basis for reporting on Cap performance. This is being developed through the water management planning processes currently in progress in all of the valleys in the Queensland section of the Murray-Darling Basin.

The Water Allocation and Management planning (WAMP) process is progressing in the Condamine-Balonne valley. Following the release of the environmental flow draft technical report for the Condamine-Balonne basin, Queensland has been concerned that the outcomes of the WAMP process might be unduly compromised by the growth in diversions that have occurred whilst the WAMP is under development. As a result, Queensland is reviewing the WAMP process with a view to accelerating its rate of progress and to enable the setting of key policy decisions at an earlier stage of the process.

In this regard it is intended to separate the WAMP process into two distinct phases. The first phase would involve an initial assessment and review of current conditions and trends within the catchment together with an assessment of the potential for further water extraction. Completion of this phase would provide community and Government with an opportunity to set key policy directions at an earlier point in the process. The second phase would involve more detailed studies, consultation and implementation of a detailed management plan.

The Flow Management Planning (FMP) initiative for the Border Rivers (a joint initiative with the DLWC in NSW) has made considerable progress during the year. The daily flow model is complete and the two States are cooperating to develop common principles and objectives for water management planning in the catchment. A revised planning approach is also being discussed based on the streamlined WAMP process that is to be used by Queensland in other parts of the State.

Water Management Plans (WMP's) are being developed for the remainder of the major stream systems in the Queensland section of the Murray-Darling Basin, eg. Warrego, Paroo, Nebine and Moonie Rivers. This planning process is being applied where there is an identified need to more rigorously manage water extraction to preserve the environmental flow balance. At this initial stage WMP's do not lead to the establishment of transferable water entitlement regimes and are generally applied in valleys which have comparatively low levels of water resource development and/or available data. They do not involve the same complexity of hydrologic modelling as is required for a WAMP. Community Reference Panels have been established in each of the 4 valleys during the year and the preparation of daily flow models is well advanced for each catchment.

These planning initiatives are a consultative process aimed at achieving a water management plan in each valley, providing for both improved planning confidence for water users and the continuing health of our river systems.

Operational Directions

It is expected that implementation of these plans will require consideration of a number of allocation and operational changes including:

- The development of key flow performance objectives at various locations across each valley including "end of valley" perspective's;
- Conversion of hectare based irrigation licenses to a volumetric entitlement where this has not already occurred;
- The introduction of volumetric allowances for waterharvesting. Waterharvesting is currently limited only by pump size and pass flow conditions;
- Conversion of pump size to daily diversion rates on extraction licences;

- Event based flow management approaches where diversion opportunity will recognise prevailing climatic and river health conditions;
- The installation of additional gauging station sites to assist in more responsive and accurate flow sharing decision making. Related to this will be the development of multi-criteria decision-making approaches to river management. The establishment of a more extensive monitoring network will support more accurate and detailed water audit monitoring; and
- More comprehensive metering of diversions including time and event recording to improve diversion accountability. About 30% of current diversions in the region are not metered.

Legislative Changes

Legislative reforms are under way in Queensland to establish a statutory basis for the two water management planning processes, WAMP's and WMP's, and to provide for the management of water in an ecologically sustainable way, with equitable and transparent arrangements for water sharing and use. A draft 'Water (Allocation and Management) Bill' is scheduled for release for public discussion in December 1999 and new legislation is likely to be enacted before the end of the 1999/2000 water year.

The new legislation includes provision for the permanent transfer of water entitlement subject to rules to be developed in the management planning process in each valley. Rules will be established in consultation with water users and the community to ensure minimal impact on both other water users and the environment.

The proposed legislation also includes provision for the management and control of overland flow. Consultative management planning exercises are presently under way in the more developed overland flow areas, (Upper Condamine and Lower Balonne) to address the full range of floodplain management issues including waterharvesting. The WAMP and WMP processes will establish the significance and sensitivity of the impacts of floodplain diversions at the basin wide scale. They will also ultimately establish the basin wide boundary conditions or performance targets, which will assist in the subsequent development of floodplain management strategies.

The proposed legislation will provide the statutory base for implementation of the management plans being developed through these processes.

Water Use Efficiency (WUE)

Improvements in rural water use efficiency continue to be promoted through the implementation of the Queensland Government's Rural Water Use Efficiency Initiative.

The four major elements of this initiative are:

- Improvement of 'on farm' water use efficiency;
- Reducing losses from 'on farm' storage;
- Financial incentives for implementation of 'best practice' irrigation management; and
- Reducing losses in bulk irrigation water supply and distribution systems.

The 'on farm' elements of the initiative, although funded by the Queensland Government, are largely being managed and delivered by rural industry organisations and will involve a 'stocktake' of existing water management practices with identification of cost-effective opportunities for improvement. This will be supported by research and development activity and the development of 'best practice' water management codes for each industry.

Losses in bulk water supply and distribution systems are being investigated separately with the initial focus on State owned irrigation infrastructure. An independent consultant is undertaking this investigation to establish whether there are cost-effective opportunities to reduce storage and distribution losses. Financial assistance is also being provided to other water service providers (on a voluntary basis), for similar studies.

Expected outcomes of this initiative will include:

- Improved productivity and economic returns;
- Reduced impacts on the environment; and
- Development of more sustainable rural water systems and practices.

7.2 Water Use Overview

The 1998/99 water year started with most storages, both public and private, full and overflowing after prolonged periods of stream flow in August and September 1998. It was the access to this unseasonal flow event, which contributed to the high level of diversion in the 1997/98 year. The tail of these flows resulted in low flows in most streams continuing through into November 1998. Isolated above average rainfalls in January 1999 and generally above average rainfalls in February and March 1999 contributed to medium floods in most catchments throughout these months. Rainfall through the winter months was generally average with some localised above average falls. Low flows continued from February/March 1999 through to the end of the water year (30 September 1999) in the Eastern streams, with the more Western streams ceasing to flow during August 1999.

Despite the above average rainfall and prolonged low flow in most streams throughout the Queensland portion of the Basin, waterharvesting thresholds weren't exceeded for long periods of time with the only significant waterharvesting events occurring in February and March 1999. Limited opportunity, full storages at the start of the year, and limited irrigation requirements, all contributed to a reduced level of diversions (608 GL) for 1998/99 compared with the previous year (741 GL).

The diversion profile over the last 6 years is shown in Table 6.

Total diversion amounted to approximately 25% of the total flow emanating from Queensland valleys ranging from less than 1% in the undeveloped Paroo system to 28% in the more developed Condamine-Balonne system.

TABLE 6. Summary of Water Use in Queensland

Year	*Diversion (GL)*
1998/99	608
1997/98	741
1996/97	467
1995/96	520
1994/95	176
1993/94	338

Although the 1998/99 diversion volume is lower than the record 1997/98 diversion, the percentage of total flow is higher. This reflects a year of below average run-off and flows, notwithstanding generally above average rainfall.

7.3 Condamine-Balonne

Total water use in the Condamine/Balonne in 1998/99 was 467 GL (Table 2; Table 11).

A Cap model for the Condamine/Balonne is not yet available to determine Cap compliance, however, the draft Condamine/Balonne Water Allocation and Management Plan (WAMP) was released for public comment in June 2000.

Condamine

Total diversion for 1998/99 in the Condamine River was 109 GL. This represents access to about 12% of the valley flow. Average annual flow for the valley is 783 GL.

Water taken by waterharvesting comprised 61% of the water diverted. Limited waterharvesting was available in the Upper Condamine from minor flows in the summer months, although the most significant extractions were from flows in February and March 1999.

Regulated supply from the Upper Condamine Irrigation Project and the Chinchilla Weir Irrigation Project accounted for a further 18% of diversions. Announced allocations started the year at 100% in each of these projects.

A further 15% of diversions can be attributed to unregulated irrigation, which is largely based on

low flows in the upper parts of the catchment. Rainfall during the year was generally above average maintaining good supplies for unregulated irrigation but usage was moderated by reasonably good seasonal conditions.

Balonne

Usage in the Balonne and Lower Balonne decreased in 1998/99 to 358 GL (down from 555 GL in 1997/98). This represents approximately 28% of valley flow. The reduction in extraction reflects limited opportunity but also was affected by full storages coming into the water year. Average annual flow downstream of St George is 1 280 GL.

Total waterharvesting was 291 GL, made up of 91 GL in the regulated section around St George and 200 GL in the Lower Balonne distributary system. All waterharvesting extraction occurred in the February-March 1999 flow event when almost 1,000 GL flowed through the system.

The St George irrigation scheme started the 1998/99 water year with an allocation of 65% which is the maximum allocation given for full storage at the beginning of the year. This was revised up to 100% following the flows in February 1999. A total of 54 GL of allocation water was diverted through the St George Irrigation Scheme. This represents 72% of entitlement. Use was primarily in the channel fed irrigation area as river irrigators made use of their alternate off stream storage supply which was unseasonally 'topped up' in August-September 1998 of the 1997/98 water year.

7.4 Border Rivers/Macintyre Brook

Usage in the Border Rivers/Macintyre Brook system decreased in the 1998/99 year. Total diversions in the Border Rivers/Macintyre Brook system for 1998/99 was 123 GL, comprising of diversions in the Border Rivers of 116 GL and in the Macintyre Brook of 7 GL (Table 2; Table 11). The decrease reflects full storage coming into the water year and also limited irrigation requirements because of seasonal conditions. This usage compares with total flow passing Goondiwindi of 542 GL. When the further flow from the Weir River sub-catchment is taken into account, Queensland access to Border flows represents less than 16% of the valley resource.

Waterharvesting represents 67% of diversions. Although there was some waterharvesting in October 1998 from the tail of August-September 1998 flood flows, the bulk of waterharvesting was from a major flow in March-April 1999 when over 250 GL flowed past Goondiwindi.

The two major dams in the system, Glenlyon Dam near Stanthorpe and Coolmunda Dam near Inglewood, started the year full with announced allocations of 95% and 100% respectively. Regulated usage from these two dams amounted to less than 29 GL for the year. This is about 29% of total entitlement. The shortfall can be attributed to availability of water from off stream storages and limited irrigation requirements in the Macintyre/Dumaresq system, and a continuing Macintyre Brook practice of using less than available allocation.

It is expected that the Flow Management Plan for the Border Rivers will be completed by July 2001.

7.5 Moonie

Usage for the Moonie River system was 8 GL for the 1998/99 water year (Table 2; Table 11). Total flow out of the Valley was 116 GL for the year. Diversion represented less than 7% of flow.

Waterharvesting accounted for the bulk of the diversions from flows in February and March 1999. There is limited development in the Moonie catchment.

The draft Water Management Plan (WMP) for the Moonie was released for public comment in May 2000 and is currently undergoing revision after completion of the public review period on 30 June 2000.

7.6 Warrego/Paroo

Total usage in the Warrego/ Paroo system was estimated at 10 GL for the 1998/99 water year, comprising of diversions in the Warrego Valley of

10 GL and in the Paroo Valley of 0.042 GL (Table 2; Table 11). Flow during the year was well below average at 131 GL for the Warrego River (average 379 GL) and 143 GL for the Paroo River (average 557 GL). Diversions in the Warrego Valley represented less than 8% of natural flow.

Extraction from the Warrego system increased this year with some development of existing waterharvesting licenses. Smaller flows occurred in the Warrego through the summer months and into autumn, with significant waterharvesting opportunities occurring in January and March 1999.

The draft Water Management Plan (WMP) for the Warrego/Paroo/Nebine was released for public comment in June 2000.

8. Review of 1998/99 Water Use in ACT

8.1 Review of Water Use in the ACT

The ACT experienced wet conditions during the early part of the 1998/99 season, which included a mild summer. Rainfall for the year was some 25% above the long-term average and almost twice that of 1997/98, resulting in lower than average net urban consumption of 54.4 GL. System returns from sewage treatment plants were significantly higher in the early part of the year resulting in a significantly lower net urban diversion of 18.2 GL (Table 2). Higher than average winter rain in the early part of the year resulted in storages being filled to capacity and remaining close to that level for the remainder of the year.

There is no firm information available relating to diversions for other than urban water supply purposes, however the passage of water resource legislation in late 1998 will allow this information to be collected in the future. Non-urban consumption is estimated at 5 GL for 1998/99 (Table 2). This resulted in total net diversions in the ACT of 23.2 GL for 1998/99 (Table 2).

Discussions to establish a Cap for the ACT have begun. A number of options ranging from 29 to 172 GL have been considered. The Independent Audit Group (IAG) of the Murray-Darling Basin Commission considered the establishment of an ACT Cap as part of its 1998/99 audit. The IAG concluded that a Cap based solely on 1993/94 consumption (29 GL) that did not acknowledge previous efficiency savings would not be equitable. Similarly the IAG argued that a Cap based on the remaining flows after allowance for environmental flows (172 GL) would be inconsistent with previous IAG recommendations and the two remaining options should be given careful consideration. The IAG further concluded that a framework for trading between the ACT and the Murrumbidgee River in NSW should be established before finalisation of a Cap. Consideration of a framework for trade between the ACT and NSW has begun.

8.2 Progress of Water Reforms in the ACT

Prior to 1998 there was no direct legislative control of water resources in the ACT. Indirect control was exercised through the Land (Planning and Environment) Act 1991 (ACT). The Water Resources Act 1998 (ACT) establishes a framework for the sustainable management of water resources in the Territory. The Act was passed in late 1998 and was implemented at the end of 1999. It requires the establishment of a Water Resources Management Plan that protects environmental flows and makes provision for the sustainable management of the remaining resource. The plan establishes a system of entitlement and licensing that applies to both surface water and groundwater. The Act also places controls on the construction of dams and bores and allows for the trade of water both within the Territory and interstate.

Environmental flow guidelines have now been established. A Water Resources Management Plan has been formulated and following implementation of the Act in December 1999, extraction of all groundwater and surface water for other than stock and domestic use will be licensed. All allocations are volumetric and almost all surface water and groundwater extractions will be metered.

Negotiations have commenced to establish a Cap for the ACT and to establish a framework for trade between the ACT and NSW.

9. Water Trading in the Murray-Darling Basin

9.1 History of Water Trading

In recent years there has been considerable growth in water trading in the Murray-Darling Basin. Water trading has been encouraged by Governments as a means of moving irrigation from those uses which produce low returns to others which can generate greater economic returns. It is also expected to have environmental benefits since increased profits from irrigation will make it easier for managers to invest in more efficient water delivery systems which will produce better returns for the volume of water used and reduce accessions to groundwater.

Initially water trading was confined to trades within irrigation systems. However over time, changes have been made to the trading rules, which have permitted inter-valley and more recently interstate trade to take place. In recent years, Australian governments have been working together to reduce the differences in water entitlements in preparation for the introduction of increased interstate water trading. These changes are part of the water market reform package, which was endorsed by the Council of Australian Governments (COAG) in 1994.

Trade has an impact on the implementation of the Cap. The trade in previously unused entitlements affects the size of the allocation that can be announced by the water managers whilst inter-valley and interstate trade affects the Cap targets for the individual river valleys. It is therefore important that data on water trading be collected and published in the Water Audit Monitoring Report.

Table 7 details the total volume of intra-valley water trades and the net inter-valley and interstate water trades that occurred during the 1998/99 water year.

The sign convention used in Table 7 is that a negative value indicates a trade out of the valley and a positive value indicates a trade into the valley. It can be seen from this that compared to the total volumes of water traded, the inter-valley trades in 1998/99 were small and the interstate trades were negligible. Permanent inter-valley trades will result in permanent changes to the valley Caps usually calculated as the volume of entitlement traded multiplied by an agreed transfer factor. Temporary trades will alter the annual Cap targets usually on a one for one basis. Trade will therefore affect the Caps for individual valleys but will not result in an increase in the overall Cap for the Basin.

Interstate water trading between New South Wales, Victoria and South Australia continued to develop in 1998/99 due in large part to the activation of “sleeper and dozer” licenses. However resource constraints in the New South Wales and Victorian sections of the Murray Valley restricted the supply of available water for trade.

TABLE 7. Intra-Valley, Net Inter-Valley and Net Interstate Water Entitlement Transfers in 1998/99

System	*Permanent Entitlement Transfer* Gross Intra-valley (ML)	Net Inter-valley (ML)	Net Interstate (ML)	Total for Cap Adjustment[1] (ML)	*Temporary Entitlement Transfer*[4] Gross Intra-valley (ML)	Net Inter-valley (ML)	Net Interstate (ML)	Total for Cap Adjustment[2] (ML)
New South Wales								
Border Rivers	222	0	0	0	13,819	0	–1,593	–1,593
Gwydir	12,715	0	0	0	32,000	0	0	0
Namoi/Peel	2,058	0	0	0	21,151	0	0	0
Macquarie/Castlereagh/Bogan	20,332	0	0	0	29,660	0	0	0
Barwon-Darling	0	0	0	0	0	0	0	0
Lachlan	3,963	0	0	0	35,949	0	0	0
Murrumbidgee	13,575	0	0	0	244,432	–39,075	1,093	–37,982
Lower Darling	1,160	0	0	0	4,070	10,172	2,362	12,534
Murray	2,541	0	–3,199	–2,888	81,961	28,903	–19,481	9,422
Total NSW	**56,566**	**0**	**–3,199**	**–2,888**	**463,042**	**0**	**–17,619**	**–17,619**
Victoria								
Goulburn	13,871	–1,801	0	–1,801	124,458	7,073	0	7,073
Broken	205	0	0	0	807	0	0	0
Loddon	292	–25	0	–25	5,547	–1,878	0	–1,878
Campaspe	268	0	0	0	7,403	–385	0	–385
Wimmera-Mallee	47	0	0	0	650	0	0	0
Kiewa	–190	100	0	100	481	0	0	0
Ovens	1,149	–275	0	–275	3,167	–717	0	–717
Murray	9,276	2,001	–351	1,685	40,491	–4,093	15,543	11,450
Total Victoria	**24,918**	**0**	**–351**	**–316**	**183,004**	**0**	**15,543**	**15,543**
South Australia								
Metro-Adelaide & Associated Country Areas[5]	0	0	0	0	0	0	0	0
Lower Murray Swamps	0	–840	0	–840	0	–100	0	–100
Country Towns	0	0	0	0	0	0	0	0
All Other Uses of Water from the River Murray	10,000	840	3,550	4,044	28,273	100	483	583
Total South Australia	**10,000**	**0**	**3,550**	**3,204**	**28,273**	**0**	**483**	**483**
Queensland								
Condamine/Balonne	0	0	0	0	7,372	0	0	0
Border Rivers	0	0	0	0	8,300	0	1,593	1,593
Macintyre Brook	0	0	0	0	0	0	0	0
Moonie	0	0	0	0	0	0	0	0
Warrego	0	0	0	0	0	0	0	0
Paroo	0	0	0	0	0	0	0	0
Total Queensland	**0**	**0**	**0**	**0**	**15,672**	**0**	**1,593**	**1,593**
Australian Capital Territory[6]	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total Basin	**91,484**	**0**	**0**	**0**	**689,991**	**0**	**0**	**0**

1. The total Cap adjustment for permanent trade (including exchange rate adjustments to permanent interstate trade) is comprised of the sum of net inter-valley and net interstate trade for each designated river valley, as per the Diversion Cap Register (Appendix A).
2. The total Cap adjustment for temporary trade is comprised of the sum of net inter-valley and interstate trade for each designated river valley, as per the Diversion Cap Register (Appendix A).
3. The sign convention used is that a negative value indicates a trade out of the valley and a positive value indicates a trade into the valley.
4. Temporary entitlement transfers in Victoria, includes temporary trade in both water right and sales entitlement.
5. The Metro-Adelaide & Associated Country Areas Cap component is non-tradeable, unless the Ministerial Council determines otherwise.
6. Water trading was not permitted in the ACT in 1998/99. Negotiations have commenced to establish a framework for trade between the ACT and NSW.

10. Water Availability for the Year 1998/99

10.1 Water Availability

The 1995 report to the Ministerial Council "An Audit of Water Use in the Murray-Darling Basin", found that water users had only diverted 63% of the water that they had been authorised to use in the previous 5 years (the amount allocated was not restricted to the quantity available and in some years exceeded it.). This highlights the fact that the States' allocation systems have evolved to encourage development of the Basin's water resources and are not well suited to being used to impose a Cap on diversions.

A key step in the process to implement the Cap will be the adjustments that are made to the States' allocation systems. In the process, it is expected that many existing water users who are disadvantaged by the implementation of the Cap will look at other systems and highlight any inconsistencies. To aid such comparisons and to make Cap implementation more transparent, the water used in each valley has been compared with the quantity of water that has been authorised for use in that valley in 1998/99 (see Table 11).

Water is allocated in many different ways across the Basin and there are differences between States, valleys and regions depending upon the reliability of supply and the degree of regulation. These types of allocations are summarised below.

10.1.1 Volumetric Allocations

Water users in regulated streams and in some unregulated systems are issued with volumetric entitlements (see Table 8). These entitlements specify a base volume of water that can be diverted each year and come in three main categories:

- High security entitlements which are available every year;
- Volumetric entitlements on unregulated streams which are available provided there is flow in the stream; and
- Normal security entitlements, which are subject to allocation announcements, made at intervals throughout the season. These entitlements, which include Victorian water right and sales, are the largest category of volumetric entitlement in the Basin. For these entitlements, the volume allocated is the base entitlement multiplied by the announced percentage allocation at the end of the season.

10.1.2 Announced Overdraw

In some valleys an announcement is sometimes made during the season permitting irrigators to draw on next year's allocation. This increases the quantity of water that can be diverted in the season but will, if not cancelled by a spill from storage, reduce the volume available for the next season. The base entitlement multiplied by the announced overdraw is reported in the third column of Table 8.

10.1.3 Allocation Transferred into Valley

A temporary inter-valley transfer will increase the allocation in the purchasing valley and reduce the allocation in the selling valley. The net transfer into each valley has been copied from Table 7 to the fourth column in Table 8.

10.1.4 Carryover and Overdraw from the Previous Year

In some valleys, irrigators have been given the right to carry over unused allocation from the previous season. This system allows individual irrigators to adjust their level of water use to change their risk profile (eg. by use of carryover the irrigator has a greater security of supply in the following year). Ultimately such a system will allow individual irrigators to select their own security of supply and thus allows for a greater diversity of crop types. A carryover from last season, which has not been cancelled as a result of a spill from storage, will add to this season's allocation. Table 9 shows the balance between the carryover from last season and the overdraw utilised (as opposed to announced). The net carryover minus overdraw from 1997/98 adjusted where necessary for any cancellation is included as column 5 in Table 8.

10.1.5 Access to Off-allocation and Water Harvesting

Water is made available to irrigators in regulated streams during periods when storages are spilling or there are unregulated flows by declarations of period's off-allocation. Water diverted in these periods does not count against an irrigator's allocation for the rest of the season. Historically there were no controls over the size of these diversions other than the duration of the event and the licensed pump capacity. However in recent years quotas have been established in some systems and annual limits have been imposed.

Water harvesting licences have been issued in some Queensland streams. Irrigators with these licences are limited by their diversion capacity and by the flow at which they can commence to pump but not by the volume of water they can divert or by the area they can plant.

In some river valleys, a considerable percentage of the water diverted is authorised by the off-allocation or water harvesting rules. In theory it would be possible to determine the maximum volume of water that would be possible to divert each year under these rules by assuming that irrigators divert at their diversion capacity for as long as the flow conditions apply. Although, in practice this does not generally occur as diversion capacity is limited by off-stream storage development and related irrigated areas.

Queensland has adopted this method of reporting (see Table 10). In contrast, New South Wales currently report the use from off-allocation and water harvesting which underestimates the volume of water authorised for diversion (see Table 10).

10.1.6 Area Licences on Unregulated Streams

Some entitlements on unregulated streams specify an area that can be irrigated but not the volume of water which can be diverted. Although, it is possible to estimate the volume of water made available to these licences by multiplying the licensed area by an assumed usage based on crop type.

Queensland has adopted this method of reporting unregulated diversions (see Table 10).

New South Wales is currently moving towards replacing area licences with volumetric entitlements.

10.1.7 Irrigation System Losses

In some irrigation distribution systems, water entitlements specify the rights to water delivered at the farm gate. The losses incurred by the water authority in delivering water from the diversion point on the river to the farm gate are therefore not covered by the announced allocation and need to be added to the allocation to determine the authorised diversion. These losses are included in the fourth column of Table 10. For other irrigation distribution systems such as the privatised districts in the New South Wales Murray, an allowance for system losses has been included in the water entitlement.

10.2 Comparison of Diversions with Water Authorised for Use

The final column in Table 10 lists the total volume of water that could be diverted in 1998/99 if all authorities to use water in 1998/99 were fully utilised (with the qualifications for off-allocation, water harvesting and area licences made in Sections 10.1.5 and 10.1.6). In Table 11 these volumes are compared with the water used in each valley and the percentage use of the water made available by the water authorities for diversion is presented.

In calculating the water used in the New South Wales and Victorian river valleys, the volumes diverted from each stream have to be adjusted for the water diverted from other valleys (second column of Table 11). For example, in the Victorian river valleys water is physically transferred from the Goulburn Valley into the Campaspe and Loddon Valleys via the Waranga Western Channel.

It is expected that diversion as a percentage of the water authorised to be diverted will fluctuate from year to year depending upon the climatic conditions and the degree to which the diversions are constrained by the physical resources available. Typically the utilisation of the allocations will be higher in the drier years and lower in the wetter years, especially in the south of the Basin. It is also expected that allocations would reduce and utilisation increase if the allocation system was tightened to prevent growth in diversions under the Cap. In this context, the 71% utilisation of Basin allocations in 1998/99 is higher than the average of 63% reported for the 5 years to 1993/94 in the 1995 report to the Ministerial Council "An Audit of Water Use in the Murray-Darling Basin".

TABLE 8. Water Allocated in 1998/99

System	Base Valley Water Entitlement[1] (GL)	Announced Allocation[2] (GL)	Announced Overdraw[3] (GL)	Allocation Transferred into Valley[4] (GL)	Net Carryover/ Net Overdraw from 97/98[5] (GL)	Total Allocated Water in Valley[6] (GL)
New South Wales						
Border Rivers	270	111	0	–2	80	189
Gwydir	529	529	0	0	0	529
Namoi/Peel	312	435	0	0	0	435
Macquarie/ Castlereagh/Bogan	670	670	0	0	20	690
Barwon-Darling[7]	527	0	0	0	0	0
Lachlan	665	661	0	0	5	666
Murrumbidgee	2,791	2,420	0	–38	0	2,382
Lower Darling	49	49	0	13	2	63
Murray	2,230	2,182	0	9	111	2,303
Total NSW	**8,043**	**7,057**	**0**	**–18**	**218**	**7,257**
Victoria						
Goulburn	724	724	0	7	0	731
Broken	39	58	0	0	0	58
Loddon	287	287	0	–2	0	285
Campaspe	285	285	0	0	0	284
Wimmera-Mallee	101	96	0	0	0	96
Kiewa	16	16	0	0	0	16
Ovens	57	57	0	–1	0	56
Murray	1,158	1,961	0	11	0	1,972
Total Victoria	**2,667**	**3,484**	**0**	**16**	**0**	**3,499**
South Australia						
Metro-Adelaide & Associated Country Areas[8]	130	237	0	0	0	237[9]
Lower Murray Swamps	80	80	0	0	0	80
Country Towns	50	50	0	0	0	50
All Other Uses of Water from the River Murray	509	509	0	1	0	510
Total South Australia	**769**	**876**	**0**	**0**	**0**	**877**
Queensland						
Condamine/Balonne	225	225	0	0	4	229
Border Rivers	133	129	0	2	0	131
Macintyre Brook	20	20	0	0	0	20
Moonie	4	4	0	0	0	4
Warrego	11	11	0	0	0	11
Paroo	0	0	0	0	0	0
Total Queensland	**392**	**388**	**0**	**2**	**4**	**394**
Aust. Capital Territory[10]	**23**	**23**	**0**	**0**	**0**	**23**
Total Basin	**11,894**	**11,829**	**0**	**0**	**222**	**12,050**

1. Sum of the volumetric entitlements in valley (in NSW this is the sum of general and high security entitlements). Includes unregulated stream entitlements where these are expressed volumetrically (eg. in Victoria).
2. Sum of base entitlements multiplied, where appropriate, by the largest announced percentage allocation in the season. In NSW this includes high security entitlements.
3. Base entitlement multiplied by the announced percentage overdraw.
4. Net temporary inter-valley entitlement transfer from Table 7.
5. Net Carryover less Overdraw from Previous Year (see Table 9).
6. Allocated water = announced allocation + announced overdraw + inter-valley trade + net carryover from last season (in NSW the addition of high security entitlements are also included).
7. Water is allocated in the Barwon-Darling system on an event basis.
8. Indicative average annual allocation from 5-year rolling total of 650 GL.
9. Volume that could be diverted before the 5-year Cap would be exceeded in 1998/99.
10. There is no formal entitlement in ACT to date. Net diversion shown.

TABLE 9. Carryovers and Overdraws for 1998/99

System	Overdraw from 1997/98 (GL)	Carryover from 1997/98 (GL)	Overdraw Cancelled in 1998/99[1] (GL)	Carryover Cancelled in 1998/99[1] (GL)	Net Carryover from 97/98[2] (GL)	Overdraw from 1999/00 (GL)	Carryover to 1999/00 (GL)
New South Wales							
Border Rivers	0	96	0	16	80	0	91
Gwydir	0	218	0	218	0	0	0
Namoi/Peel	0	0	0	0	0	0	0
Macquarie/ Castlereagh/Bogan	0	70	0	50	20	0	391
Barwon-Darling	0	0	0	0	0	0	0
Lachlan	0	110	0	106	5	0	253
Murrumbidgee	0	0	0	0	0	0	0
Lower Darling	0	31	0	29	2	0	10
Murray	0	111	0	0	111	0	359
Total NSW	**0**	**636**	**0**	**419**	**218**	**0**	**1,104**
Victoria							
Goulburn	0	0	0	0	0	0	0
Broken	0	0	0	0	0	0	0
Loddon	0	0	0	0	0	0	0
Campaspe	0	0	0	0	0	0	0
Wimmera-Mallee	0	0	0	0	0	0	0
Kiewa	0	0	0	0	0	0	0
Ovens	0	0	0	0	0	0	0
Murray	0	0	0	0	0	0	0
Total Victoria	**0**	**0**	**0**	**0**	**0**	**0**	**0**
South Australia							
Metro-Adelaide & Associated Country Areas	0	0	0	0	0	0	0
Lower Murray Swamps	0	0	0	0	0	0	0
Country Towns	0	0	0	0	0	0	0
All Other Uses of Water from the River Murray	0	0	0	0	0	0	0
Total South Australia	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Queensland							
Condamine/Balonne	0	4	0	0	4	0	21
Border Rivers	0	0	0	0	0	0	0
Macintyre Brook	0	0	0	0	0	0	0
Moonie	0	0	0	0	0	0	0
Warrego	0	0	0	0	0	0	0
Paroo	0	0	0	0	0	0	0
Total Queensland	**0**	**4**	**0**	**0**	**4**	**0**	**21**
Australian Capital Territory	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total Basin	**0**	**640**	**0**	**419**	**222**	**0**	**1,125**

1. Under certain conditions (such as storage spills), carryovers and overdraws from the previous season can be cancelled.
2. Net carryover is defined as: [(carryover less cancelled carryover) — (overdraw less cancelled overdraw)].

TABLE 10. Water Authorised for Use in 1998/99

System	Total Allocated Water in Valley[1] (GL)	Access to Off-Allocation Water-Harvesting[2] (GL)	Unregulated Stream Use not in Allocation[3] (GL)	System Losses not in Allocation[4] (GL)	Authorised Use in Valley[5] (GL)
New South Wales					
Border Rivers	189	66	16	0	271
Gwydir	529	44	11	0	584
Namoi/Peel	435	39	42	0	516
Macquarie/ Castlereagh/Bogan	690	47	31	0	768
Barwon-Darling	0	0	246	0	246
Lachlan	666	14	11	0	691
Murrumbidgee	2,382	165	428	0	2,975
Lower Darling	63	110	0	0	173
Murray	2,303	327	6	0	2,636
Total NSW	**7,257**	**812**	**791**	**0**	**8,860**
Victoria					
Goulburn	731	0	0	390	1,121
Broken	58	0	0	0	58
Loddon	285	0	0	98	383
Campaspe	284	0	0	67	351
Wimmera-Mallee	96	0	0	100	196
Kiewa	16	0	0	0	16
Ovens	56	0	0	0	56
Murray	1,972	210	0	394	2,576
Total Victoria	**3,499**	**210**	**0**	**1,048**	**4,758**
South Australia					
Metro-Adelaide & Associated Country Areas[6]	237	0	0	0	237
Lower Murray Swamps	80	0	0	0	80
Country Towns	50	0	0	0	50
All Other Uses of Water from the River Murray[7]	510	0	0	0	510
Total South Australia	**877**	**0**	**0**	**0**	**877**
Queensland					
Condamine/Balonne[8]	229	824	0	8	1,060
Border Rivers[8]	131	143	0	0	274
Macintyre Brook	20	3	0	0	23
Moonie	4	47	0	0	51
Warrego	11	37	0	0	48
Paroo	0	0	0	0	0
Total Queensland	**394**	**1,054**	**0**	**8**	**1,456**
Aust. Capital Territory	**23**	**0**	**0**	**0**	**23**
Total Basin	**12,050**	**2,076**	**791**	**1,056**	**15,973**

1. Allocated water from Table 8.
2. The difference between the off-allocation water declared available for use and the off-allocation water used has not been included in this calculation (excludes Queensland). The volume of off-allocation water used and water harvested has been reported for NSW.
3. Unregulated stream entitlement in Victoria is included in the base entitlement.
4. 'System Losses not in Allocation' are losses in those irrigation systems where the entitlement is defined at the farm gate and losses in the distribution system are not covered by an entitlement.
5. Water is allocated in the Barwon-Darling system on an event basis.
6. The water allocated for Metro-Adelaide & Associated Country Areas in 1998/99 is based upon the usage in the previous four years against the five-year rolling total of 650 GL.
7. Water authorised for use is not equal to the Cap component for 'All Other Uses of Water from the River Murray', as this is defined as 90% of the total licensed allocations.
8. Authorised diversions allowed to operate above account flow thresholds without restriction of storages.

TABLE 11. Use of Valley Allocations in 1998/99

System	Diversion from Valley (GL)	Diverted from other Valleys (GL)	Total use in Valley (GL)	Authorised use in Valley (GL)	Use as a % of Authorised Valley use (GL)
New South Wales					
Border Rivers[1]	181	0	181	271	67%
Gwydir	305	0	305	584	52%
Namoi/Peel	280	0	280	516	54%
Macquarie/ Castlereagh/Bogan	367	0	367	768	48%
Barwon-Darling[1]	246	0	246	246	100%
Lachlan	289	0	289	691	42%
Murrumbidgee	2,551	–39	2,512	2,975	84%
Lower Darling[1]	153	10	163	173	94%
Murray	1,978	29	2,007	2,636	76%
Total NSW	**6,350**	**0**	**6,350**	**8,860**	**72%**
Victoria					
Goulburn	1,623	–534	1,089	1,121	97%
Broken	26	0	26	58	45%
Loddon	49	288	338	383	88%
Campaspe	76	210	286	351	82%
Wimmera-Mallee	153	6	159	196	81%
Kiewa	9	0	9	16	59%
Ovens	28	0	28	56	51%
Murray	1,765	29	1,793	2,576	70%
Total Victoria	**3,730**	**0**	**3,730**	**4,758**	**78%**
South Australia					
Metro-Adelaide & Associated Country Areas[2]	153	0	153	237	65%
Lower Murray Swamps	80	0	80	80	100%
Country Towns	36	0	36	50	73%
All Other Uses of Water from the River Murray[3]	400	0	400	510	78%
Total South Australia	**669**	**0**	**669**	**877**	**76%**
Queensland					
Condamine/Balonne	467	0	467	1,060	44%
Border Rivers	116	0	116	274	42%
Macintyre Brook	7	0	7	23	31%
Moonie	8	0	8	51	16%
Warrego	10	0	10	48	21%
Paroo	0	0	0	0	70%
Total Queensland	**608**	**0**	**608**	**1,456**	**42%**
Aust. Capital Territory	**23**	**0**	**23**	**23**	**100%**
Total Basin	**11,381**	**0**	**11,381**	**15,973**	**71%**

1. The authorised use in valley does not satisfactorily describe the volume of water that could be utilised for water harvesting, off-allocation and area licences on unregulated streams.
2. The volume authorised for use for Metro-Adelaide & Associated Country Areas for 1998/99 is the amount that could be used before the 5-year Cap of 650 GL would be exceeded.
3. Water authorised for use is not equal to the Cap component, as this is defined as 90% of the total licensed allocations.

11. Comparison of Actual Flows with Natural Flows

A key factor in the Ministerial Council's decision to implement the Cap was the major changes that had occurred to the flow regime in many of the Basin's rivers. This either presents itself as a change in the seasonality of flow (as occurs below major dams) or a reduction in the total flow volume (as occurs at the bottom end of many of the river valleys). As part of the Cap monitoring process, the States have agreed to report on the way the natural flows in each river have been altered.

The natural flows are estimated from computer modelling studies. Many of the river models are incomplete or not yet modified to allow these numbers to be readily calculated for 1998/99. Table 12 presents the 1998/99 annual flow volumes recorded and the natural flows at a number of selected key sites within the Murray-Darling Basin, whilst the impact of development can be seen graphically in Figures 7 and 8.

TABLE 12. Comparison of 1998/99 Actual and Natural Annual Flows for Key Sites within the Murray-Darling Basin

System	*Actual Flow (GL)*	*Natural Flow (GL)*	*Actual/ Natural (%)*
Inter Basin Transfers			
Snowy Mountain Scheme to Murrumbidgee River	510	–	–
Snowy Mountain Scheme to Murray River	579	–	–
Glenelg River Catchment to Wimmera-Mallee	n/a	–	–
Wannon River Catchment to Wimmera-Mallee	n/a	–	–
New South Wales Tributaries[2]			
Barwon River at Mungindi + Boomi River	457	n/a	n/a
Inflows to Gwydir Wetland	93	n/a	n/a
Gwydir System Outflows to Barwon River	177	n/a	n/a
Namoi System Outflows to Barwon River	519	n/a	n/a
Inflows to Macquarie Marshes	533	n/a	n/a
Macquarie/Castlereagh/Bogan Outflows	1,653	n/a	n/a
Darling River Inflows to Menindee Lakes	7,503	n/a	n/a
Lachlan River at Corrong	265	n/a	n/a
Lachlan River at Booligal	448	543	83%
Murrumbidgee River at Balranald	480	n/a	n/a
Lower Darling River at Burtundy	2,711	n/a	n/a
Victorian Tributaries			
Kiewa River at Bandiana	646	656	99%
Ovens River at Wangaratta	1,426	1,467	97%
Goulburn River at McCoys Bridge	396	2,038	19%
Campaspe River at Rochester	18	68	27%
Loddon River at Appin South	9	68	13%
Wimmera River at Horsham	15	n/a	n/a
Queensland Tributaries			
Condamine/Balonne/Culgoa Flows at NSW Border	669	n/a	n/a
Macintyre River at Goondiwindi	542	n/a	n/a
Moonie River at Fenton	116	n/a	n/a
Warrego River at Cunnamulla	131	n/a	n/a
Paroo River at Caiwarro	143	n/a	n/a
River Murray			
Albury (Doctors Point)	4,218	4,313	98%
Downstream of Yarrawonga Weir	3,540	5,630	63%
Euston	2,926	n/a	n/a
South Australian Border	4,840	n/a	n/a
Barrages	3,455	n/a	n/a

1. n/a indicates data not available.
2. Operational data which may be subject to change.

FIGURE 7. Plots of Flows at Selected Sites Showing 1998/99 Actual and Natural (Modelled) Flows in Victoria

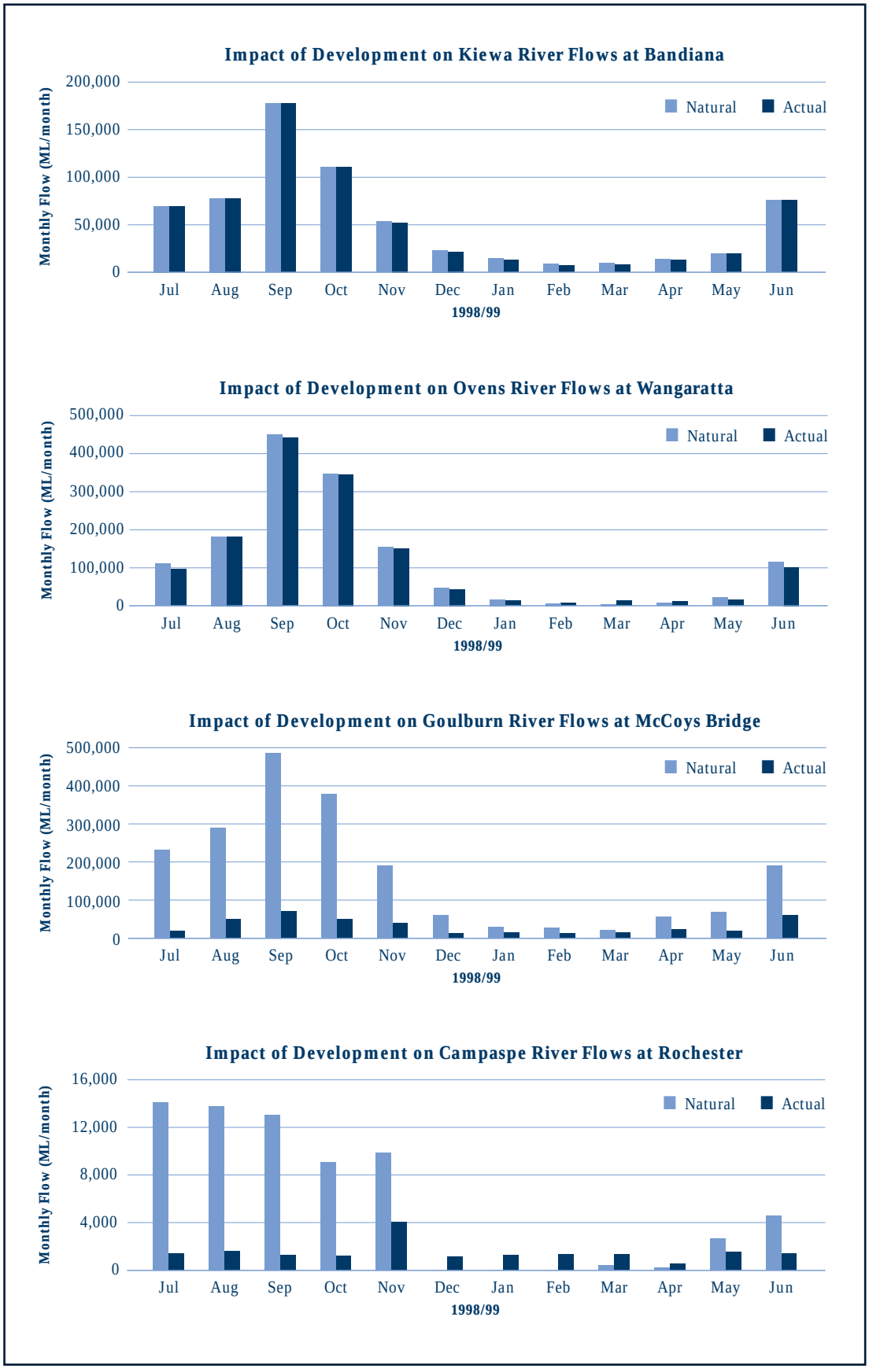
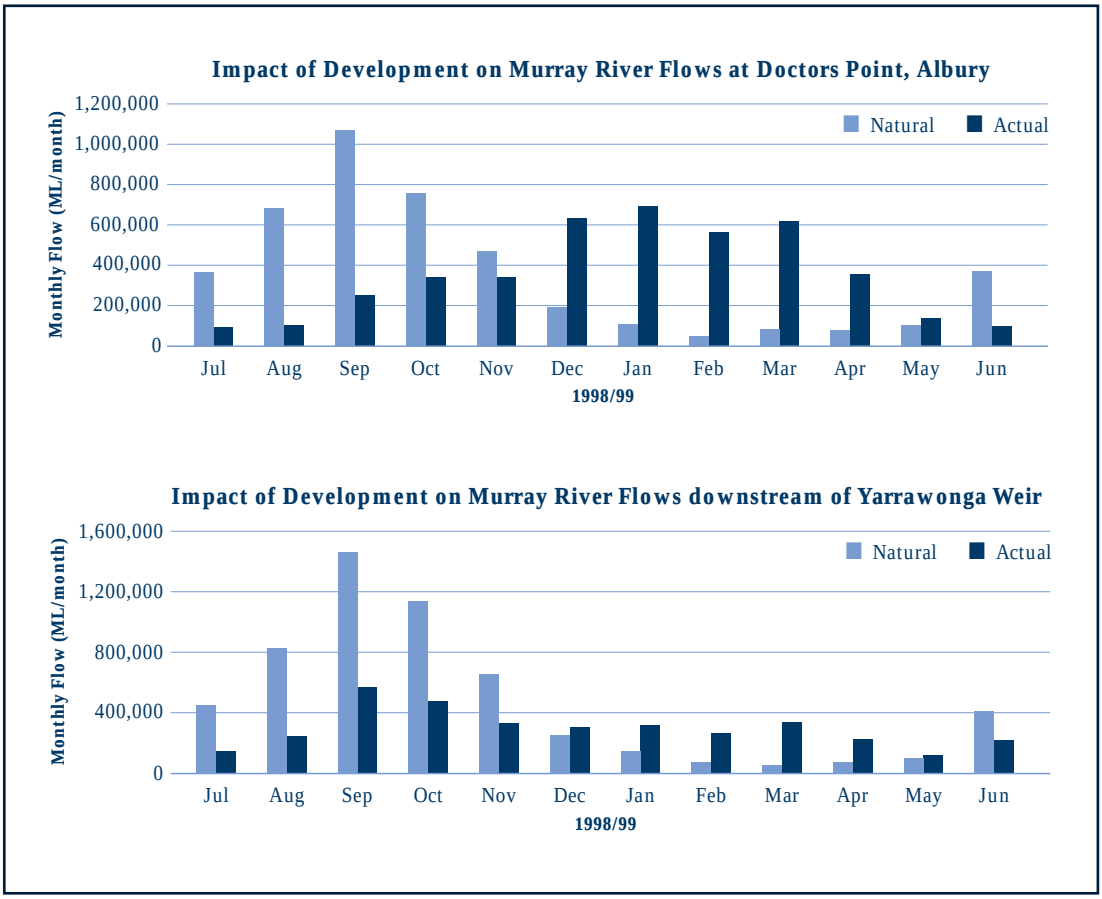


Figure 8. Plots of Flows at Selected Sites showing 1998/99 Actual and Natural (Modelled) Flows of the Murray River



12. Impoundments and Losses in Major On-Stream Storages

The diversion and impoundment of water into major on-stream storage infrastructure provides security and reliability of supply to water users, particularly during periods of adverse climatic conditions.

Typically in periods of high rainfall and high riverine flow conditions, moderate to average volumes of water are diverted for irrigation use, whilst relatively moderate to large volumes are diverted for impoundment into on-stream storages. In contrast, during periods of low rainfall and low riverine flow conditions, generally large volumes of water are required to satisfy irrigation demand. It is during these periods of low rainfall that the volumes impounded in on-stream storages are used to supplement riverine flows.

The impoundments and losses in major on-stream storages (above 10 GL capacity) within the Basin have been included in this report for the first time (Table 13). The volumes reported indicate that the total volume in storage in the Basin in 1998/99 has increased from 10,005 GL to 12,767 GL (50% full). Total evaporative losses for major storages within the Basin were calculated by the respective States and are reported at 1,623 GL, representing 6.4% of total storage capacity. Evaporative losses varied significantly between on-stream storages, ranging from 300 ML (0.01% of storage capacity) at Dartmouth Reservoir, Mitta Mitta River, Victoria to 562 GL (28% of storage capacity) at Menindee Lakes, Lower Darling River, NSW.

TABLE 13. Impoundments and Losses in Major On-Stream Storages (greater than 10 GL capacity) in 1998/99

	Major On-Stream Storage	Completion Date	Storage Capacity (GL)	Volume of Storage at Beginning of Water Year (GL)	Volume of Storage at End of Water Year (GL)	% of Storage Full at End of Year (%)	Increase in Volume of Storage (GL)	Evaporation Losses (GL)	Net Reduction in Flow due to Storage (GL)
Murray-Darling Basin Commission									
Lower Darling	Menindee Lakes[1]	1960	1,999	570	1,922	96%	1,352	562	1,914
Murray	Dartmouth Reservoir	1979	3,906	1,466	1,771	45%	305	0	305
	Hume Reservoir	1936–61	3,038	456	709	23%	253	50	303
	Lake Victoria	1928	680	407	136	20%	–271	115	–156
Total Murray-Darling Basin Commission			**9,623**	**2,899**	**4,538**	**47%**	**1,639**	**728**	**2,367**
Snowy Mountains Scheme in Murray-Darling Basin									
Murrumbidgee River Valley	Jounama Pondage	1968	44	29	24	55%	–5	0	–5
	Talbingo Reservoir	1971	921	914	913	99%	–1	5	4
	Tantangara Reservoir	1960	254	21	22	9%	1	0	0
	Tumut Pondage	1958	53	29	33	62%	3	0	3
Murray River Valley	Geehi Reservoir	1966	21	15	15	71%	0	0	0
	Tooma Reservoir	1961	28	3	4	12%	0	0	0
	Khancoban Pondage	1965	22	8	10	46%	2	0	2
Total Snowy Mountains Scheme			**1,342**	**1,019**	**1,020**	**76%**	**0**	**5**	**5**
Borders Rivers Commission									
Border Rivers	Glenlyon Dam	1976	254	254	215	85%	–39	21	–19
Total Border Rivers Commission			**254**	**254**	**215**	**85%**	**–39**	**21**	**–19**
New South Wales									
Border Rivers	Pindari Reservoir	1962–96	312	312	297	95%	–15	18	3
Gwydir	Copeton Reservoir	1976	1,364	1,342	1,069	78%	–273	66	–207
Namoi/Peel	Chaffey Reservoir	1979	62	62	58	94%	–4	9	5
	Keepit Reservoir	1960	423	407	262	62%	–145	62	–83
	Split Rock Reservoir	1987	397	399	382	96%	–17	37	20

Continued next page

TABLE 13. Impoundments and Losses in Major On-Stream Storages (greater than 10 GL capacity) in 1998/99 (continued)

	Major On-Stream Storage	Completion Date	Storage Capacity (GL)	Volume of Storage at Beginning of Water Year (GL)	Volume of Storage at End of Water Year (GL)	% of Storage Full at End of Year (%)	Increase in Volume of Storage (GL)	Evaporation Losses (GL)	Net Reduction in Flow due to Storage (GL)
Macquarie/Castlereagh/Bogan	Burrendong Reservoir	1967	1,678	267	1,029	61%	762	123	885
	Windamere Reservoir	1984	368	147	211	57%	64	21	85
Lachlan	Carcoar Reservoir	1970	36	9	32	89%	23	6	29
	Lake Brewster	1952	153	0	46	30%	46	66	112
	Lake Cargelligo	1902	36	28	25	70%	–3	23	20
	Wyangala Reservoir	1936–71	1,220	556	1,014	83%	458	79	537
Murrumbidgee	Blowering Reservoir	1968	1,631	246	568	35%	322	30	352
	Burrinjuck Dam	1907–56	1,028	183	255	25%	72	35	107
	Tombullen Off-River Storage	1980	11	8	2	18%	–6	4	–2
	Hay Weir	1981	14	3	13	96%	10	3	13
Total NSW			**8,733**	**3,969**	**5,263**	**60%**	**1,294**	**581**	**1,875**
Victoria									
Goulburn/Broken/Loddon	Eildon Reservoir	1956	3,390	880	761	22%	–119	47	–72
	Lake Mokoan	1971	365	94	132	36%	38	69	107
	Lake Nillahcootie	1967	40	7	17	41%	10	4	14
	Cairn Curran Reservoir	1956	148	38	34	23%	–4	8	4
	Tullaroop Reservoir	1959	74	19	18	25%	–1	4	3
Campaspe	Lake Eppalock	1964	312	132	89	29%	–42	19	–23
	Lauriston Reservoir	1941	20	16	16	81%	0	2	2
	Malmsbury Reservoir	1870	18	11	11	63%	0	2	2
	Upper Coliban Reservoir	1903	37	9	1	3%	–8	2	–6
Wimmera-Mallee	Lake Bellfield	1966	79	73	59	75%	–14	3	–11
	Lake Fyans	1916	21	11	12	57%	1	5	6
	Lake Lonsdale	1903	66	0	0	0%	0	0	0
	Lake Taylor	1923	36	26	27	75%	1	5	6
	Pine Lake	1928	64	31	25	39%	–6	4	–2
	Tooloondo Reservoir	1953	107	63	65	61%	2	9	11
	Wartook Reservoir	1887	29	5	5	17%	0	3	3
Murray/Kiewa/Ovens	*Rocky* Valley Reservoir	1959	28	20	15	53%	–5	0	–5
	Lake Buffalo	1965	24	11	14	56%	3	2	5
	Lake William Hovell	1973	14	5	14	99%	9	1	10
Total Victoria			**4,871**	**1,450**	**1,314**	**27%**	**–137**	**189**	**52**
Queensland									
Condamine/Balonne	Beardmore Dam	1972	82	82	55	68%	–26	38	11
	Chinchilla Weir	1974	10	10	10	98%	0	4	4
	Cooby Dam	1942	21	21	21	100%	0	3	3
	Jack Taylor Weir	1953–59	10	10	10	99%	0	4	4
	Leslie Dam	1985	106	69	67	63%	–2	11	9
Macintyre Brook	Coolmunda Dam	1968	75	75	71	94%	–5	24	19
Total Queensland			**304**	**267**	**234**	**77%**	**–33**	**84**	**50**
Australian Capital Territory									
Murrumbidgee	Bendora Reservoir	1961	11	8	9	81%	0	1	1
	Corin Reservoir	1968	76	43	51	68%	8	2	10
	Googong Reservoir	1979	125	94	124	100%	30	13	43
Total ACT			**211**	**146**	**184**	**87%**	**38**	**16**	**54**
Total Basin			**25,338**	**10,005**	**12,767**	**50%**	**2,762**	**1,623**	**4,385**

1. Volume in storage may exceed storage capacity when Lakes are surcharged. Surcharge capacity is 1,999 GL.
2. N/a denotes data not available.

13. Conclusion

The information and data contained within this report provides a comprehensive review of consumptive water use and management for the 1998/99 water year for the Murray-Darling Basin, as per the requirements of Schedule F of the *Murray-Darling Basin Agreement*.

Total water use in the Murray-Darling Basin in 1998/99 was 11,381 GL.

Information presented for the first time in this report includes impoundments and losses in major on-stream storages (above 10 GL capacity), the Diversion Cap Register which is maintained in accordance as per the requirements of Schedule F and Barmah Millewa Forest environmental diversions.

Resource availability was tightened in most valleys throughout the Basin with the implementation of water management policies in each of the States, in conjunction with the Cap. Resource constraints were evident in the southern valleys within the Basin, particularly with respect to the Murray Valley.

Total water use in the 1998/99 water year represents a utilisation of 71% of the water allocated throughout the Basin. This compares favourably with the 76% utilisation of Basin allocations in 1996/97 and 1997/98.

The accuracy of diversion measurements remained static at ±7% in the 1998/99 water year in comparison to previous years.

It is expected that the accuracy of measurement will improve over time as volumetric licenses and allowances are implemented in New South Wales, Queensland and the ACT, in conjunction with the installation of metering in the Lower Murray Swamps, South Australia.

Interstate water trading between New South Wales, Victoria and South Australia continued to develop in 1998/99 due in large part to the activation of "sleeper and dozer" licenses. However resource constraints in the New South Wales and Victorian sections of the Murray Valley restricted the supply of available water for trade.

The effect of regulation on natural river flows (reported as a percentage of actual flows) varied considerably (13%–99%) between valleys within the Basin. In all instances where data has been reported, natural flows have been impeded to a degree for the purposes of diversion and storage.

It is envisaged that with the completion of Cap models for New South Wales (IQQM models) and Queensland WAMP and WMP processes, the calculation and reporting of natural flows within the Basin will be complete in future reports.

The total volume of water in major on-storages above 10 GL within the Basin in 1998/99 increased from 10,005 GL to 12,767 GL (50% full). Total evaporative losses for major storages within the Basin was 1,623 GL, representing 6.4% of total storage capacity.

Environmental diversions of 97.4 GL were diverted to the Barmah Millewa Forest in October 1998, in accordance with the annual environmental allocation for the Barmah Millewa Forest.

The monitoring of water use relative to Cap compliance within the Murray-Darling Basin is a large, complex and difficult task, which has required substantial resources, cooperation and management from all the governments involved in the *Murray-Darling Basin Initiative*.

It is evident from the progress to date of Cap implementation and the development towards more sustainable water use practices throughout the Murray-Darling Basin, that the continuation of a pro-active water management role by all governments within the *Murray-Darling Basin Initiative* is required. This is to ensure a balance is maintained between the significant economic and social benefits that are derived from the development of the Basin's water resources on the one hand, and the environmental uses of water in the rivers on the other.

Glossary

ACTEW	Australian Capital Territory Electricity and Water.
announced allocation	The percentage of water entitlement declared available for diversion from a regulated stream in a season.
annual allocation	The annual volume of water available for diversion from a regulated stream by an entitlement holder.
authorised use	Total of the water allocated in the valley plus off-allocation and water harvesting use plus unregulated stream use not in allocation and system losses not in allocation.
Border rivers	The rivers and tributaries forming, or intersecting the border between NSW and Queensland.
bulk entitlement	A perpetual entitlement to water granted to water authorities by the Crown of Victoria under the Water Act 1989.
carryover	An unused entitlement from one season that can be used in the next year.
channel capacity	The maximum rate at which water can be delivered through a river reach or an artificial channel.
COAG	Council of Australian Governments.
diversion	The movement of water from a river system by means of pumping or gravity channels.
diversion licence	Specified licences issued for a specified annual volume and diversion rate.
DLWC	The Department of Land and Water Conservation (of NSW).
DNR	The Department of Natural Resources (of Queensland).
DNRE	The Department of Natural Resources and Environment (of Victoria).
dozer allocation	An allocation that is not fully utilised.
DWR	The Department for Water Resources (of South Australia).
EC (unit)	Electrical conductivity unit 1 EC = 1 micro-Siemen per centimetre measurement at 25° Celsius. Commonly used to indicate the salinity of water.
end-of-valley flows	The flow regime at the end of a valley.
floodplain harvesting	The diversion of water from a floodplain into storage(s).
FMIT	First Mildura Irrigation Trust.
gigalitre (GL)	One thousand million or 10^9 litres.
GL	Gigalitre: one thousand million or 10^9 litres.

G-MW	Goulburn-Murray Water (of Victoria).
gravity districts	Districts which use gravity to divert the flow of water from the river.
high security entitlement	An entitlement which does not vary from year to year and is expected to be available in all but the worst droughts.
IAG	Independent Audit Group.
LV	License Volume.
impoundment	The storage of water diverted from a water course.
irrigation	Supplying land or crops with water by means of streams, channels or pipes.
MDBC	Murray-Darling Basin Commission.
MDBMC	Murray-Darling Basin Ministerial Council.
megalitre (ML)	One million litres. One megalitre is approximately the volume of an Olympic swimming pool.
Ministerial Council, the	Murray-Darling Basin Ministerial Council.
ML	Megalitre: one million litres. One megalitre is approximately the volume of an Olympic swimming pool.
Murray-Darling Basin Agreement	The Agreement between the Governments of the four Basin States and the Commonwealth. The current Agreement is the 1992 Agreement.
off-allocation	When unregulated tributary inflows or spills are sufficient to supply irrigation needs and downstream obligations.
on-farm storage	Privately owned storages used to harvest surplus flows or to store unused allocations for use in the following season.
Overdraw	Water diverted in one season against a prospective allocation in the subsequent year.
overland flow	Water that runs off the land following rainfall, before it enters a watercourse, and floodwater that erupts from a watercourse or lake onto a floodplain.
Permanent transfer	The transfer of water entitlements on a permanent basis. The right to permanent transfers allows irrigators to make long-term adjustments to their enterprise and enables new operators to enter the industry.
Private diverters	Licensed to operate privately owned pumps or diversion channels; includes river pumpers and diverters as well as town water supplies.
property right	In this context, the right to ownership of allocated volumes of water.

RAMSAR wetland	A wetland listed on the Register of internationally significant wetlands established by the Convention at Ramsar.
regulated streams/waterways	Streams where users are supplied by releases from a storage. A water licence for a regulated stream specifies a base water entitlement defining the licence holder's share of the resources from a stream.
riparian	Of, inhabiting or situated on the bank and floodplain of a river.
RIT	Renmark Irrigation Trust.
sales water	In Victoria, water that may be purchased by an irrigator in addition to the basic water right. Access to sales water is announced each season as a percentage of water right depending on the available resource.
salinity	The concentration of dissolved salts in groundwater or river water usually expressed in EC units.
sleeper allocation	An allocation that does not have a history of water usage.
temporary transfer	Water entitlements transferred on an annual basis.
unregulated streams	Streams that are not controlled or regulated by releases from major storages.
utilisation	The amount of water available for diversion that is actually diverted.
water entitlement	The legal right of a user to access a specified amount of water in a given period.
water harvesting	The diversion of water from an unregulated stream in Queensland in which the access to water is defined only by a diversion rate and a starting flow in the stream.
WAMP	Water Allocation and Management Planning. It is a process currently under way in Queensland to enable the acceptable level of allocatable water to be determined for a river system. This methodology will determine what part of the flow regime should be preserved for environmental flows, and what part can be made available for consumptive use.
WMRWG	Water Market Reform Working Group.
WR	Water Right.
WUE	Water Use Efficiency.

Appendix A. Diversion Cap Register (see Section 3.5 & Table 4)

Designated River Valley/Cap Component	Adjustment for Net Permanent Trade[2] 1993/94 (GL)	1994/95 (GL)	1995/96 (GL)	1996/97 (GL)	1997/98 (GL)	1998/99 (GL)	Adjustment for Net Temporary Trade[2] 1997/98 (GL)	1998/99 (GL)	Cap Target from Cap Model (GL)
New South Wales									
Border Rivers[5]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	–1.6	n/a
Gwydir	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	n/a
Namoi/Peel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	n/a
Macquarie/Castlereagh/ Bogan	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	n/a
Barwon-Upper Darling	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	128.0
Lachlan	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	364.0
Murrumbidgee	0.0	0.0	0.0	0.0	0.0	0.0	–30.4	–38.0	2,573.8
Lower Darling	0.0	0.0	0.0	0.0	0.0	0.0	5.4	12.5	147.5
Murray	0.0	0.0	0.0	0.0	0.0	–3.2	27.1	9.4	2,030.9
Total NSW	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**–3.2**	**2.2**	**–17.6**	**n/a**
Victoria									
Goulburn/Broken/Loddon[6]	–1.0	–0.5	–1.1	–1.2	–0.1	–1.8	–1.7	5.2	1,972.0
Campaspe	1.0	0.8	1.2	1.2	0.0	0.0	–1.8	–0.4	130.0
Wimmera-Mallee	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	n/a
Kiewa/Ovens/Murray	0.0	–0.4	–0.1	0.0	0.1	1.5	18.1	10.7	1,857.6
Total Victoria	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**–0.4**	**14.6**	**15.5**	**n/a**
South Australia									
Country Towns[7]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0
Lower Murray Swamps[8]	0.0	–0.1	0.0	0.0	–2.1	–0.8	–0.4	–0.1	83.4
All Other Uses of Water from the River Murray	0.0	0.1	0.0	0.0	2.1	4.4	–16.4	0.6	440.6
Total South Australia	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**3.6**	**–16.8**	**0.5**	**574.0**
Queensland[9]									
Condamine/Balonne	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	n/a
Border Rivers	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	n/a
Macintyre Brook	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	n/a
Moonie	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	n/a
Warrego	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	n/a
Paroo	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	n/a
Total Queensland	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.6**	**n/a**
Australian Capital Territory	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**n/a**

1. n/a denotes Cap model not completed or data not available.
2. The sign convention is that a negative value indicates a trade out of the valley and a positive value indicates a trade into the valley.
3. A negative difference between annual diversions and Cap target denotes an exceedance of Cap target.
4. Adjustment to Cap target for trade includes exchange rate adjustments to permanent interstate trade;
5. Excludes Pindari Dam Cap.
6. Excludes Lake Mokoan Cap.
7. Cumulative difference between Cap target and annual diversions are not reported for Country Towns, South Australia.
8. Lower Murray Swamp (South Australia) diversions are deemed to be equivalent to Cap target adjusted for trade.
9. Queensland WAMPs will not be completed until July 2000.

1997/98				1998/99						
Adjustment to Cap Target for Trade (GL)	*Cap Target Adjusted for Trade (GL)*	*Annual Diversion (GL)*	*Cap Credit[3] (GL)*	*Cap Target from Cap Model (GL)*	*Adjustment to Cap Target for Trade[4] (GL)*	*Cap Target Adjusted for Trade (GL)*	*Annual Diversion (GL)*	*Cap Credit[3] (GL)*	*Cumulative Cap Credit[3] (GL)*	*Cap Target Exceedance Trigger (20% of Long-Term Diversion Cap) (GL)*
0.0	n/a	206.0	n/a	n/a	–1.6	n/a	180.8	n/a	n/a	–39.0
0.0	n/a	534.8	n/a	n/a	0.0	n/a	305.5	n/a	n/a	–80.6
0.0	n/a	260.3	n/a	n/a	0.0	n/a	280.0	n/a	n/a	–50.2
0.0	n/a	435.2	n/a	n/a	0.0	n/a	367.1	n/a	n/a	–92.8
0.0	128.0	180.0	–52.0	221.0	0.0	221.0	246.0	–25.0	–77.0	–35.4
0.0	364.0	419.0	–55.0	330.0	0.0	330.0	289.0	41.1	–14.0	–50.8
–30.4	2,543.4	2,615.0	–71.6	2,359.2	–38.0	2,321.2	2,551.1	–229.8	–301.4	–437.2
5.4	152.9	47.6	105.3	236.0	12.5	248.5	153.1	95.5	200.8	–29.4
27.1	2,058.0	1,863.0	195.0	1,896.2	6.5	1,902.7	1,977.7	–74.9	120.1	–374.2
2.2	**n/a**	**6,560.9**	**n/a**	**n/a**	**–20.5**	**n/a**	**6,350.1**	**n/a**	**n/a**	**–1,189.6**
–5.5	1,966.5	1,909.0	57.5	1,667.0	–0.5	1,666.5	1,698.5	–32.0	25.5	–416.8
2.4	132.4	95.5	36.9	81.0	3.8	84.8	75.9	8.9	45.8	–24.4
0.0	n/a	184.1	n/a	n/a	0.0	n/a	153.3	n/a	n/a	–32.4
17.7	1,875.3	1,743.0	132.3	1,782.0	12.1	1,794.1	1,802.2	–8.2	124.1	–331.2
14.6	**n/a**	**3,931.6**	**n/a**	**n/a**	**15.4**	**n/a**	**3,730.0**	**n/a**	**n/a**	**–804.8**
0.0	50.0	35.2	14.8	50.0	0.0	50.0	36.4	13.6	0.0	–10.0
–2.6	80.8	80.8	0.0	83.4	–3.1	80.2	80.2	0.0	0.0	–16.7
–14.2	426.5	374.9	51.6	440.6	6.8	447.5	399.9	47.6	99.1	–88.1
–16.8	**557.2**	**490.9**	**66.3**	**574.0**	**3.7**	**577.7**	**516.5**	**61.2**	**99.1**	**–114.8**
0.0	n/a	544.9	n/a	n/a	0.0	n/a	467.0	n/a	n/a	n/a
0.0	n/a	176.9	n/a	n/a	1.6	n/a	116.0	n/a	n/a	n/a
0.0	n/a	8.8	n/a	n/a	0.0	n/a	7.0	n/a	n/a	n/a
0.0	n/a	8.3	n/a	n/a	0.0	n/a	8.0	n/a	n/a	n/a
0.0	n/a	2.0	n/a	n/a	0.0	n/a	10.0	n/a	n/a	n/a
0.0	n/a	0.0	n/a	n/a	0.0	n/a	0.0	n/a	n/a	n/a
0.0	**n/a**	**740.9**	**n/a**	**n/a**	**1.6**	**n/a**	**608.0**	**n/a**	**n/a**	**n/a**
0.0	**n/a**	**44.2**	**n/a**	**n/a**	**0.0**	**n/a**	**23.2**	**n/a**	**n/a**	**n/a**

Cap Component	*1997/98 Diversions – 5 Years to 1997/98 (GL)*	*1997/98 5 Year Cap Target (GL)*	*1998/99 Diversions – 5 Years to 1998/99 (GL)*	*1998/99 5 Year Cap Target (GL)*
South Australia				
Metro-Adelaide & Associated Country Areas	522.3	650.0	566.0	650.0

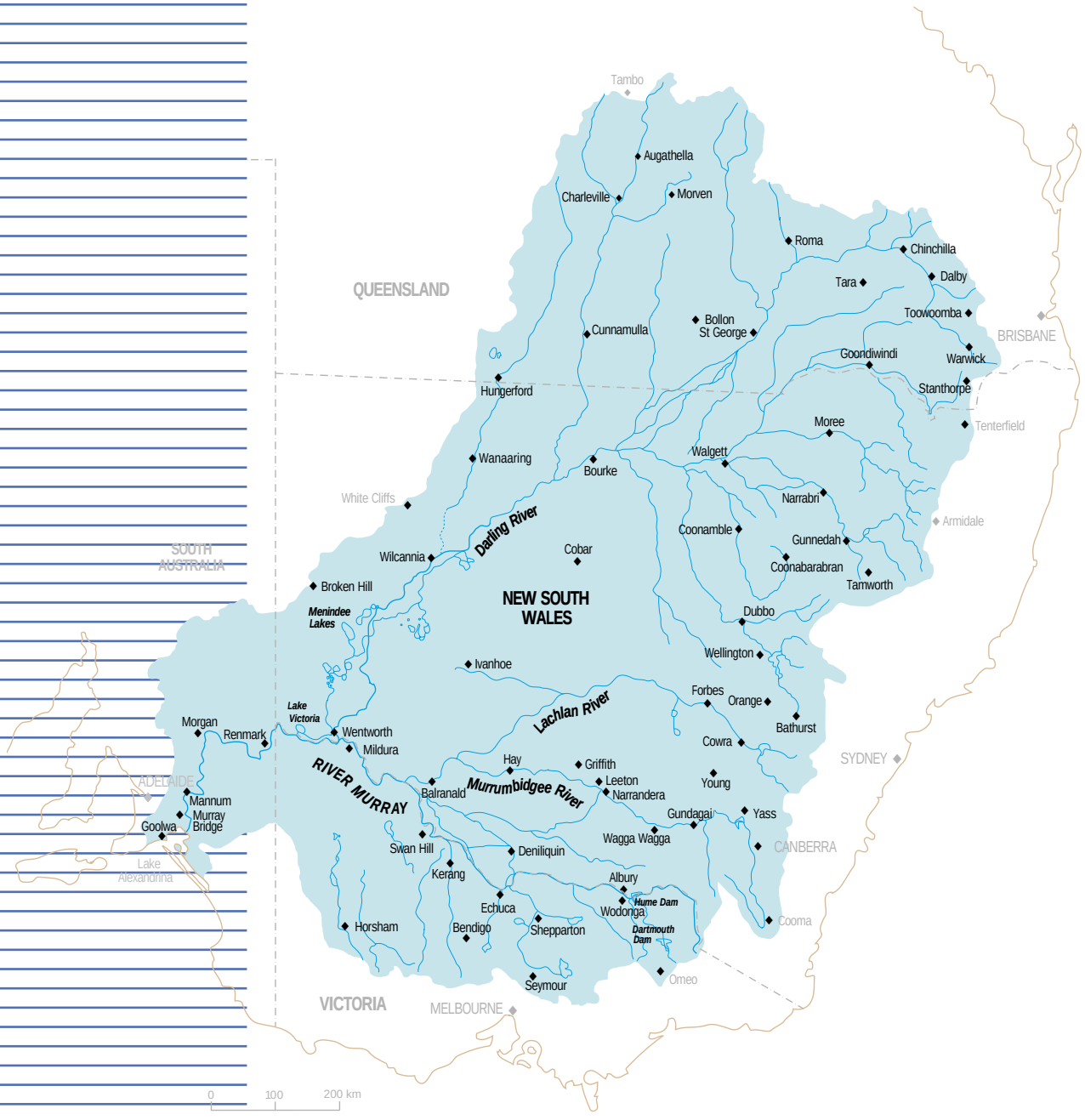
Appendix B. Barmah Millewa Forest Environmental Diversions

In June 1993, the Murray-Darling Basin Ministerial Council Meeting 12–25 June 1993 approved in principle the annual allocation of 100 GL of Murray River water (50 GL provided by NSW and Victoria, respectively) to be used to meet the water needs of the Barmah Millewa Forest ecosystem.

Following the September/October 1998 flood in the Ovens catchment, 97.4 GL of water (equally contributed by NSW and Victoria) was diverted to the Barmah Millewa Forest in October 1998 for environmental purposes. The allocation used by each State is shown below.

State	*Annual Allocation (GL)*	*Allocation Used in 1998/99 (GL)*	*Cumulative Unused Allocation since 1998/99 (GL)*
NSW	50.0	48.7	1.3
Victoria	50.0	48.7	1.3
Total	100.0	97.4	2.6

MURRAY-DARLING BASIN COMMISSION



SIX GOVERNMENTS WORKING IN PARTNERSHIP WITH THE COMMUNITY