Australian Government

MURRAY–DARLING BASIN AUTHORITY

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Water Audit Monitoring Report 2009–10

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

April 2011

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Acknowledgments

The development of the Murray-Darling Basin Authority's '2009–10 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:

- Australian Government – Bureau of Meteorology, Australia;
- Australian Government – Department of Sustainability, Environment, Water, Population and Communities
- ACT – Department of Environment, Climate Change, Energy and Water;
- NSW – Office of Water and Energy
- QLD – Department of Environment and Resources Management;
- SA – Department of Water, Land and Biodiversity Conservation;
- VIC – Department of Sustainability and Environment; and
- VIC – Goulburn – Murray Rural Water Corporation.

Published by Murray-Darling Basin Authority
Postal Address GPO Box 1801, Canberra ACT 2601
Office location Level 4, 51 Allara Street, Canberra City
Australian Capital Territory

Telephone (02) 6279 0100 international + 61 2 6279 0100
Facsimile (02) 6248 8053 international + 61 2 6248 8053
E-Mail info@mdba.gov.au
Internet http://www.mdba.gov.au

For further information contact the Murray-Darling Basin Authority office on (02) 6279 0100

This report may be cited as: Water Audit Monitoring Report 2009–10

MDBA Publication No. 144/11

ISBN (on-line) 978-1-921914-06-5
ISBN (print) 978-1-921914-07-2

Cover Images (clockwise from left): David Kleinert – Reed Beds Swamp; Arthur Mostead – Lock 1 Blanchetown, SA; Arthur Mostead – Cathederal Rock National Park, NSW.

FOREWORD

April 2011

The Hon Tony Bourke, MP
Minister for Sustainability, Environment, Water, Population and Communities
Parliament House
CANBERRA ACT 2600

Dear Minister

I have great pleasure in submitting to you the Water Audit Monitoring Report 2009–10. The Council established the Cap in 1995 and set the operating framework in 1996. The Council formalised the operating rules for the Cap in the form of Schedule E (Former Schedule F) to the *Murray-Darling Basin Agreement* in 2000. The Water Audit Monitoring Report 2009–10 is the fourteenth in a series of the reports on the Cap on Diversion and has been produced as a requirement of Schedule E to the *Murray-Darling Basin Agreement*.

The Water Audit Monitoring Report 2009–10 complements the Independent Audit Group Report 2009–10. Whereas the focus of the Independent Audit Group Report is the Cap compliance and the activities related to it, this Report provides a broader picture of the Cap compliance, water use, accuracy of water use figures, climatic overview for the water year, water availability through allocations, off-allocations and water trading, storages losses, and groundwater use.

Schedule E requires the Authority to maintain a Diversion Cap Register. The updated Diversion Cap Register is appended to the Water Audit Monitoring Report. The Diversion Cap Register provides details for every designated Cap valley and for every reporting year since 1997–98 of annual Cap adjustments for trade and Environment Use, trade-adjusted annual Cap targets, annual diversions, annual Cap credits and cumulative Cap credits since 1997–98. This Register is the formal record of diversions and Cap compliance in the Basin.

The text in Chapters 4, 5, 6, 7 and 8 and data published in this Report have been supplied by the States and Territory. The published data are considered to be the best available estimates for Water Diversion, Water Trade, Cap targets and other data. If better estimates become available in future, the Diversion Cap Register will be amended accordingly. The Diversion and Trade figures in this Report are considered to be the latest figures for the water year and supersede those reported in the Independent Audit Group Report 2009–10.

The Authority appreciates the co-operation received from the States and Territory Governments' Officers in compiling this Report.

Yours sincerely

Rob Freeman
Chief Executive

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Tables

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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 the operation of the Cap is an open and transparent process, the Ministerial Council agreed that a Water Audit Monitoring Report should be produced and published annually. Subsequently the Cap arrangements were formalized in the form of Schedule E (Former Schedule F[1]) to the *Murray-Darling Basin Agreement* in 2000.

This report has been produced as a requirement of Schedule E to the *Murray-Darling Basin Agreement*.

The water year for the Cap accounting in the Murray-Darling Basin is July to June.

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 2009–10 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**), environmental water (**Section 11**) a comparison of actual and natural flows at key sites within the Basin (**Section 12**), and impoundments and losses in major on-stream storages (above 10 GL capacity) (**Section 13**).

Section 14 provides information on the use of groundwater in the Basin.

The *Diversion Cap Register*, which is, maintained in accordance with the requirements of Schedule E, is reported in **Appendix A–H.**

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.

1 In 2008, the amended *Murray-Darling Basin Agreement* was appended to the Commonwealth *Water Act* 2007. As part of the amendment, Schedule F was renamed as Schedule E.

Table 1: 2009–10 Cap Compliance by State

State / Territory	2009–10 Cap Compliance
New South Wales	
Intersecting Streams	A Cap is yet to be defined. The valley is unregulated. The 2009–10 diversion was estimated to be 3 GL.
Border Rivers	New South Wales submitted a Cap proposal for Border Rivers, which was assessed by Independent Audit Group. At the time of writing this report, the draft IAG assessment report was being considered by New South Wales Government. The 2009–10 diversion was 115 GL.
Gwydir	An IQQM Cap model audited and approved by the Authority is available to determine the Cap compliance. The 2009–10 diversion of 57 GL was less than the annual Cap target of 70 GL. The Valley has a cumulative Cap credit of 170 GL since 1997–98.
Namoi-Peel	An IQQM model audited and approved by the Authority is available to determine the Cap compliance for the Namoi-Peel valley. The 2009–10 diversion of 170 GL was below the annual Cap target of 238 GL. The Valley has a cumulative Cap credit of 222 GL since 1997–98.
Macquarie/Castlereagh/ Bogan	An IQQM (Interim) model yet to be audited is available to determine Cap compliance. The 2009–10 diversion of 109 GL was below the annual Cap target of 110 GL. The Valley has a cumulative Cap credit of 336 GL since 1997–98.
Barwon-Darling/ Lower Darling	Council Meeting 29–25 August 2000 decided to combine the Barwon-Darling and Lower Darling into a single Designated River Valley for Cap accounting purpose. An IQQM (Interim) for the Barwon-Darling and MSM (Interim) for the Lower Darling, both of which are yet to be audited and approved by the Authority, are available to determine the Cap compliance. The combined Barwon-Darling/Lower Darling valley diversion of 150 GL was above its annual Cap target of 134 GL. The combined Cap Valley was in breach of the Cap during 2003–04 – 2008–09, except for 2006–07. Though the combined Valley's cumulative Cap debit of 4 GL at the end of 2009–10 did not exceed the trigger of 61 GL for special audit, the Independent Audit Group had noted in its report 'Review of Cap Implementation 2009–10' that in the absence of an accredited model for Barwon-Darling, it was not possible to conclude that the long term Cap exceedence in the valley had been addressed.
Lachlan	An IQQM model audited and approved by the Authority is available to determine Cap compliance. The 2009–10 diversion of 26 GL was below the annual Cap target of 61 GL. The Lachlan valley has a cumulative Cap credit of 163 GL since 1997–98.
Murrumbidgee	An IQQM (Interim) model yet to be audited and approved by the Authority is available to determine the Cap compliance. The 2009–10 diversion of 910 GL for the Murrumbidgee valley was above its Cap target of 665 GL. The Valley has a cumulative Cap credit of 1,170 GL since 1997–98.
Murray	The Murray Simulation model (MSM) approved by the Authority is available to determine Cap compliance. The 2009–10 diversion of 439 GL for the Murray valley was below its annual Cap of 950 GL. The Valley has a cumulative Cap credit of 662 GL since 1997–98.
Victoria	
Goulburn/Broken/ Loddon	An approved Cap model known as Goulburn Simulation model (GSM REALM) is available to determine Cap compliance. The 2009–10 diversion of 804 GL for the Goulburn/Broken/Loddon system was below its Cap target of 1119 GL. The Valley has a cumulative Cap credit of 446 GL since 1997–98.
Campaspe	An approved Cap model, the GSM REALM, is available to determine the Cap compliance. The diversion of 26 GL for the Campaspe in 2009–10 was below its Cap target of 48 GL. The Valley has a cumulative credit of 146 GL since 1997–98.
Wimmera-Mallee	A Cap Model (interim) yet to be audited and approved by the Authority is available to determine Cap compliance. The diversion of 9 GL in 2009–10 was below its Cap target of 55 GL and the valley has a cumulative Cap credit of 157 GL since 1997–98.

State / Territory	2009–10 Cap Compliance
Murray/Kiewa/Ovens	The Murray Simulation model (MSM) approved by the Authority is available to determine Cap compliance. The 2009–10 diversion of 971 GL for the Murray/Kiewa/Ovens Cap valley was below its Cap target of 1274 GL and the Valley has a cumulative credit of 1075 GL since 1997–98.
South Australia	
Metro-Adelaide & Associated Country Areas	With the 2009–10 diversion of 150 GL, the Metro-Adelaide & Associated Country Areas diversion was below the five-year rolling Cap up to and including 2009–10. Pending final decision, a separate 'first use licence' has been created to accommodate growth in Metro Adelaide diversions. The five-year total diversion under the 'first use licence' was 16 GL. This left 557 GL of five-year rolling diversion to be accounted against five year rolling Cap of 650 GL.
Lower Murray Swamps	The 2009–10 diversion of 14 GL for the Lower Murray Swamps was below its Cap target of 28 GL for 2009–10. The valley has a cumulative credit of 6 GL since 1997–98.
Country Towns	The 2009–10 diversion of 38 GL for the Country Towns was equal to its Cap target of 38 GL. The Country Towns valley has a cumulative credit of 67 GL since 1997–98.
All Other Purposes	A regression model approved by the Authority is available to determine Cap compliance. The 2009–10 diversion of 371 GL for the All Other Purposes was below its Cap target of 517 GL. The Valley has a cumulative credit of 762 GL since 1997–98.
Queensland	
Condamine and Balonne	On the completion of its Resource Operations Plan, Queensland submitted the Cap proposal for Condamine–Balonne in November 2010, which was assessed by Independent Audit Group in January 2011. The IAG determined that this met the requirements of Schedule E Clause 2(1) (b). The Cap for Condamine–Balonne will operate from 2010–11. With the submission of the Cap proposal for Condamine–Balonne, capping process for all Queensland Murray–Darling Basin valleys is now complete. The 2009–10 diversion was 1049 GL.
Border Rivers/Macintyre Brook	An IQQM (Interim) model yet to be audited and approved is available to determine the Cap compliance. The 2009–10 diversion of 122 GL was below its annual Cap target of 175 GL. The Valley has a cumulative credit of 80 GL since 1997–98.
Moonie	An IQQM (Interim) model audited and recommended for approval is available to determine the Cap compliance. The 2009–10 diversion of 43 GL was below its annual Cap target of 76 GL. As per its Cap definition, the Valley cannot accumulate Cap credit.
Nebine	An IQQM (Interim) model audited and recommended for approval is available to determine the Cap compliance. The 2009–10 diversion of 1GL was below its annual Cap target of 10 GL. As per its Cap definition, the Valley cannot accumulate Cap credit.
Warrego	An IQQM (Interim) model audited and recommended for approval is available to determine the Cap compliance. The 2009–10 diversion of 15 GL was below its annual Cap target of 94 GL. As per its Cap definition, the Valley cannot accumulate Cap credit.
Paroo	An IQQM (Interim) model audited and recommended for approval is available to determine the Cap compliance. The 2009–10 diversion of 2 GL was equal to its annual Cap target of 2 GL. As per its Cap definition, the Valley cannot accumulate Cap credit.
Australian Capital Territory	The ACT long-term Cap has been agreed, But a Cap model is not yet available to determine Cap compliance. The 2009–10 diversion was 17 GL.

2. BACKGROUND

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

In June 1995, the former Commission (now Authority) 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. It is currently estimated that median annual flow from the Basin to the sea is only 27% 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 in-stream uses of water in the rivers on the other. The 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 (New South Wales) and in the Goulburn/Broken/Loddon system for Lake Mokoan (Victoria);
- For South Australia, All Other Purposes diversions were capped at 440.6 GL. This represents an increase in diversions over 1993–94 levels of development but they are below allocations which were established in 1969 when a state cap was imposed; 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.[2]

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 then Murray-Darling Basin Commission (MDBC), the IAG and other jurisdictions. The ACT is now a full member of *Murray-Darling Basin Initiative*.

Through capping diversions at the 1993–94 levels of development in the two major water using states coupled with the Caps for South Australia, and Queensland and the ACT, the Ministerial Council 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 required an integrated reporting framework including significant improvements to the way that diversions are monitored and reported.

The Council in 2000 formalised the Cap arrangements by adopting a new schedule (Schedule F) to the *Murray-Darling Basin Agreement*. Subsequently Schedule F was amended by the Council in 2008. Key amendments include:

- The elaboration of the purpose clause to enable all forms of consumptive surface water use including water from waterways and distributed surface waters (e.g. floodplain harvesting) to be included in the Cap.
- Adoption of a protocol authorising the former Commission (Authority) to adjust the Cap for recovery and use of environmental water;
- Formal inclusion of the Diversions Formula Register in the Schedule;
- Caps for Queensland and ACT defined; and
- Updated definitions for the South Australia Caps.

Following an Intergovernmental Agreement reached in July 2009, the *Murray-Darling Basin Agreement* was amended and made part of the amended *Water Act* (Commonwealth) 2007. Schedule F was renamed as Schedule E as part of the amendments to the *Murray-Darling Basin Agreement*.

This report is a part of the ongoing Cap monitoring process under Schedule E. 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 (e.g. 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 2009–10

As required by Schedule E, the Independent Audit Group audited the performance of each State and Territory in progressing the implementation of the Cap during 2009–10 (*Review of Cap Implementation 2009–10*, published by the Murray-Darling Basin Authority, October 2010, Canberra).

The present report represents the fourteenth in a series of annual reports and complements the report of the IAG. The data presented herein are the latest figures for the 2009–10 water year and supersede the data reported by the IAG. Most notably, the Murray-Darling Basin diversions in 2009–10 reported in this present report (**Table 2**) supersede those reported by the IAG in October 2010 (**Table 20** of that report).

2 Subsequently named as Water Resources Planning

3. THE YEAR IN REVIEW

3.1 Water Diversions

The data presented in this report has been collected by the relevant State agencies and collated by the Murray Darling Basin Authority. 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 diversion figures for the Basin in 2009–10.

The figures indicate that Basin water use in 2009–10 was 5518 GL, representing the fourth lowest on record (27 years of record since 1983-84). Water diversions in New South Wales, South Australia and Victoria was the third lowest on record; in Queensland the highest, whilst diversions in the ACT were the fourth lowest on record.

Figure 1 shows the water diversions (by State) for the period 1983-84 – 2009–10 which enables a comparison of 2009–10 water diversion with that of previous years.

Figure 2 shows the same data as **Figure 1** but has the vertical axis rescaled so that the variation for States with lower overall diversions 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.

Table 2: Murray-Darling Basin Diversions in 2009–10

System	Irrigation Diversion (GL)	Other Diversion[1] (GL)	Total Diversion (GL)
New South Wales[2]			
Intersecting Streams	3	0	3
Border Rivers	113	1	115
Gwydir	54	4	57
Namoi/Peel	162	8	170
Macquarie/Castlereagh/Bogan	97	12	109
Barwon-Darling	139	0	139
Lachlan	19	7	26
Murrumbidgee[4]	852	58	910
Lower Darling	6	5	11
Murray	413	26	439
Total New South Wales[3]	**1,858**	**121**	**1,979**
Victoria[2]			
Goulburn	758	36	794
Broken	4	1	6
Loddon	2	2	4
Campaspe	2	24	26
Wimmera-Mallee	0	9	9
Kiewa	3	1	4
Ovens	7	5	13
Murray	912	42	954
Total Victoria	**1,689**	**120**	**1,809**
South Australia			
Metro-Adelaide & Associated Country Areas	0	57	57
Lower Murray Swamps[5]	14	0	14
Country Towns	0	38	38
All Other Purposes	371	0	371
Total South Australia	**386**	**95**	**480**
Queensland[2]			
Condamine/Balonne	1,048	2	1,049
Border Rivers	106	3	109
Macintyre Brook	13	0	13
Moonie	43	0	43
Nebine	1	0	1
Warrego	15	0	15
Paroo	2	0	2
Total Queensland	**1,227**	**5**	**1,232**
Australian Capital Territory[6]	**1**	**16**	**17**
Total Basin	**5,162**	**356**	**5,518**

1. "Other Diversion" includes domestic & stock, town & industrial uses (Qld figures included with Irrigation Diversion).
2. New South Wales, Victoria and Queensland diversions include an estimate of unregulated stream diversions.
3. An estimate of New South Wales floodplain diversions is not available for 2009–10.
4. Lowbidgee diversions are included in the Murrumbidgee valley diversions.
5. Some water use by Lower Murray Swamp irrigators is based on an estimate of water use, while for farms that have meters the metered volume is used. The metering of diversions is currently being implemented.
6. 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%).

Figure 1: Murray-Darling Basin Diversions – 1983–84 to 2009–10

Figure 2: Murray-Darling Basin Diversions – 1983–84 to 2009–10 (usage under 1400 GL/yr)

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 off-take channels. However, a second category of diversions is estimated from regional surveys of areas planted and a third category of estimates is based only on user returns which have proved to be very inaccurate.

Table 3 outlines the indicative confidence the States have in their diversion estimates as reported in **Table 2**. To derive the accuracy figures in **Table 3**, metered diversions have been assumed to have an accuracy of ± 5%, regional surveys ± 20% and user returns ± 40%. Accuracy for individual valleys has been calculated by volumetrically weighting the accuracy of bulk off-takes (direct diversion points) in that valley.

Analysis of reported diversions for 2009–10 indicates that the accuracy of measurement is 12%. In comparison to 2008–09, it has gone down. This is due to relatively higher volume of diversion in valleys (e.g. Queensland Cap valleys), where the accuracy of diversion is lower.

Diversions in the Lower Murray Swamps, South Australia, were previously not metered; however a rehabilitation program was implemented by the State Government in order to meter all properties. Ninety eight percent of these diversions are metered now. It is expected that the accuracy of measurement will improve over time as volumetric conversion is implemented in Queensland and metering is extended to areas in New South Wales (unregulated) and Queensland which are not currently metered.

It is to be noted that the estimates of accuracy in **Table 3** are indicative accuracy of bulk diversions only and do not in any way, indicate the accuracy of farm gate diversion measurement in an irrigation area. A Murray-Darling Basin Authority (former Commission) study (2006) found that accuracy data on the majority of individual bulk off-takes were not available. Accuracy estimates presented here are based on the assumptions mentioned above, rather than actual data. States are currently developing plans to implement new metering standards developed under the National Water Initiative. These state plans provide input to a national metering plan. Under the national metering plan developed by the Australian Government Department of Sustainability, Environment, Water Population and Communities (formerly the Australian Government Department of Environment, Water, Heritage and the Arts), the bulk–off-takes measurements get a priority. This will provide an opportunity to re-assess the accuracy figures in **Table 3** when new metering standards has been applied.

Table 3: Accuracy of Diversion Estimates in 2009–10

System	Diversion (GL)	Accuracy +/- GL	Accuracy +/- %
New South Wales			
Intersecting Streams	3	1	40%
Border Rivers	115	11	9%
Gwydir	57	7	12%
Namoi/Peel	170	36	21%
Macquarie/Castlereagh/Bogan	109	18	17%
Barwon-Darling	139	28	20%
Lachlan	26	7	27%
Murrumbidgee	910	73	8%
Lower Darling	11	1	7%
Murray	439	45	10%
Total New South Wales	**1,979**	**228**	**12%**
Victoria			
Goulburn	794	43	5%
Broken	6	1	10%
Loddon	4	0	5%
Campaspe	26	1	5%
Wimmera-Mallee	9	0	5%
Kiewa	4	1	14%
Ovens	13	1	10%
Murray	954	65	7%
Total Victoria	**1,809**	**112**	**6%**
South Australia			
Metro-Adelaide & Associated Country Areas	57	4	6%
Lower Murray Swamps	14	1	5%
Country Towns	38	2	5%
All Other Purposes	371	22	6%
Total South Australia	**480**	**28**	**6%**
Queensland			
Condamine/Balonne	1,049	270	26%
Border Rivers	109	8	7%
Macintyre Brook	13	1	5%
Moonie	43	12	27%
Nebine	1	0	22%
Warrego	15	4	23%
Paroo	2	1	38%
Total Queensland	**1,232**	**295**	**24%**
Australian Capital Territory	**17**	**1**	**5%**
Total Basin	**5,518**	**663**	**12%**

3.3 Climatic Overview 2009–10

3.3.1 Rainfall

Figure 3 shows the rainfall deciles for the period of July 2009 to June 2010 inclusive. Approximately two thirds of the Basin received above average rainfall to very much above average rainfall.

A large continuous area surrounding the towns of Charleville and Cunnamulla in Queensland extending across the NSW-QLD border received very much above average rainfall. Small pockets near the towns of Mitchell in Queensland, Coonamble and Deniliquin in New South Wales and Keith in South Australia also received very much above average rainfall.

Most of the Basin area extending from north-west of Queensland to south-west of New South Wales encompassing the towns of Surat in Queensland, Cobar, Menindee in NSW and most of Victoria and South Australia with exception of few pockets received above average rainfall.

A small pocket in north-west of Basin in Queensland; continuous strip in north-east of the Basin encompassing the towns of Tara in Queensland and Tamworth, Cowra, Leeton and Albury in New South Wales, ACT and Wodonga in Victoria received average rainfall. Small pockets surrounding the towns of Bourke, Ivanhoe and Mildura in NSW, Murray Bridge and isolated pocket in north of South Australia in Basin; a irregular shaped patch surrounding the towns of Horsham and Boort in Victoria also received average rainfall.

Two isolated patches surrounding towns of Chinchilla, Oakey and Goondiwindi in Queensland; Inverell and Glen Innes in NSW received below average rainfall. Two very small isolated pockets near towns of Oberon and Tumut in NSW also received below average rainfall.

A very small isolated pocket surrounding the town of Moree in New South Wales received very much below average rainfall.

Figure 4 shows the rainfall deciles for the period of November 2009 to April 2010 inclusive.

Most of the Basin experienced above average to very much above average rainfall, except for one isolated pocket encompassing the towns of Inverell in NSW that experienced below average rainfall.

Two isolated pockets near the towns of Quilpie and St George in Queensland received highest on the record rainfall.

A large continuous and irregular shaped area encompassing the towns of Charleville, Cunnamulla in Queensland; Dubbo, Wilcannia and Mildura of NSW; Swan Hill in Victoria received very much above average rainfall. Four isolated pockets near the towns of Cobar and Cootamundra in NSW; Bright in Victoria and Murray Bridge in South Australia also received very much above average rainfall.

A large continuous irregular shaped area encompassing the towns of Miles and Inglewood in Queensland; Gunnedah, Bourke and Albury of New South Wales; most of Victoria and South ¸Australia in Basin received above average rainfall. A few isolated pockets in northwest of Queensland in Basin, Menindee in NSW and Charlton in Victoria also received above average rainfall.

A large irregular shaped area encompassing the towns of Dalby, Toowoomba and Goondiwindi in Queensland; Glen Innes, Bathurst, Cooma and Tamworth of NSW, Canberra in the Basin received average rainfall. One isolated pocket in northwest of Queensland and small isolated pocket near the town of Eildon in Victoria; a continuous strip encompassing the towns of Burra and Mt Barker in South Australia also received average rainfall.

3.3.2 Temperature

Figure 5 shows the temperature anomaly (the difference between the recorded temperatures and the long-term average temperatures) for the period of July 2009 to June 2010 inclusive. Mildly higher (between +0.5 ^{0}C to +1.0^{0}C) than the average temperature were observed in most of the north of the Basin, while significantly higher (between +1.0^{0}C to +1.5^{0}C) than the average temperature were experienced in the south of the Basin.

A wedge shaped area encompassing the town of Cunnamulla experienced slightly higher (between 0.0^{0}C to + 0.5^{0}C) than average temperatures.

A significantly large area in the north west of the Basin surrounding the town of Charleville in Queensland, Bourke in New South Wales and two wedge shaped area near the border of NSW-Victoria in the Basin; Bordertown in South Australia experienced mildly higher (between +0.5^{0}C to + 1.0^{0}C) than average temperatures.

A continuous irregular shaped area extending from north-east of the Basin in Queensland and NSW to the south of the Basin covering most of Victoria and South Australia experienced significantly higher (between +1.0^{0}C to +1.5^{0}C) than the average temperature. A small pocket near the town of Bourke in NSW also experienced significantly higher (between +1.0^{0}C to +1.5^{0}C) than the average temperature.

A continuous strip extending from north-west of Basin in Queensland to south-west of Basin in NSW experienced extremely higher (between +1.5^{0}C to +2.0^{0}C) than the average temperature. Two isolated pockets encompassing the towns of Deniliquin in NSW, Horsham in Victoria and Burra and Murray Bridge in South Australia also experienced extremely higher (+1.5^{0}C to +2.0^{0}C) than the average temperature.

A small isolated pocket encompassing the town of Dubbo in NSW had experienced extremely higher (between +2.0^{0}C to +2.5^{0}C) than the average temperature.

Figure 6 shows the temperature anomaly for the period of December 2009 to February 2010 inclusive (the primary irrigation season). The southern half of the Basin experienced higher than average temperature than the northern half of the Basin.

The most of northern half of the Basin experienced mildly lower (between 0^{0}C to -2 ^{0}C) than average temperature. A small continuous area in the north-west of the Basin encompassing the towns of Quilpie in Queensland experienced quite lower (between -1^{0}C to -2 ^{0}C) than average temperature. The large continuous area in the north-east of the Basin encompassing the towns such as Cunnamulla in Queensland and Bourke in New South Wales experienced slightly lower (between +0^{0}C to -1 ^{0}C) than average temperature.

A wide irregular strip extending from north-east of the Basin to across middle of the Basin covering the towns of Dubbo and Broken Hill in NSW experienced slightly higher (between 0^{0}C to +1 ^{0}C) than average temperature conditions.

The most of southern half of the Basin had experienced significantly higher (between +1^{0}C to +2 ^{0}C) than average temperature conditions. A wide continuous area encompassing the towns of Mildura, Canberra and Tamworth experienced significantly higher (between +1^{0}C to +2 ^{0}C) than average temperature conditions.

Two isolated pockets encompassing the towns of Deniliquin in NSW, Horsham in Victoria and Burra and Murray Bridge in South Australia experienced extremely higher (between +2.0^{0}C to +3.0^{0}C) than the average temperature.

Warmer temperature in the southern Basin during the growing season increased due to the irrigation demand. On the other hand, due to ongoing drought and consequent lesser water in storages, irrigation supply was restricted in many areas.

Figure 3: Rainfall Deciles for the Murray-Darling Basin for the July 2009 to June 2010 Period

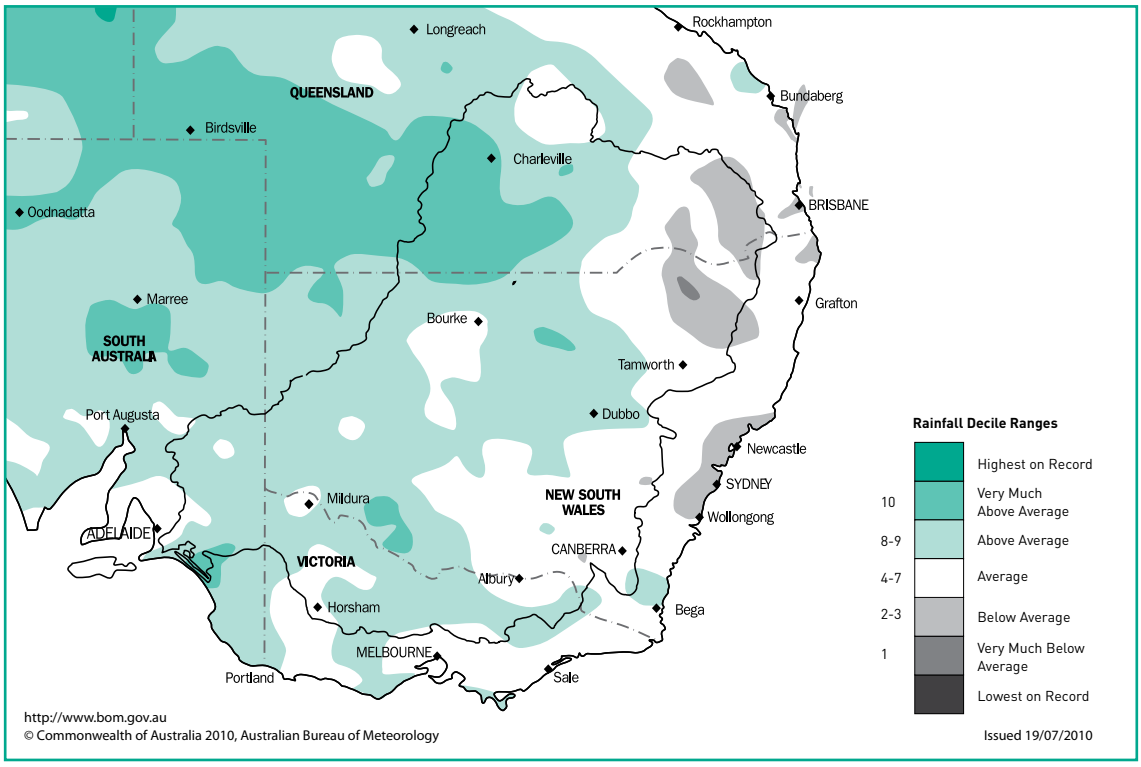


Figure 4: Rainfall Deciles for the Murray-Darling Basin for the November 2009 to April 2010 Period

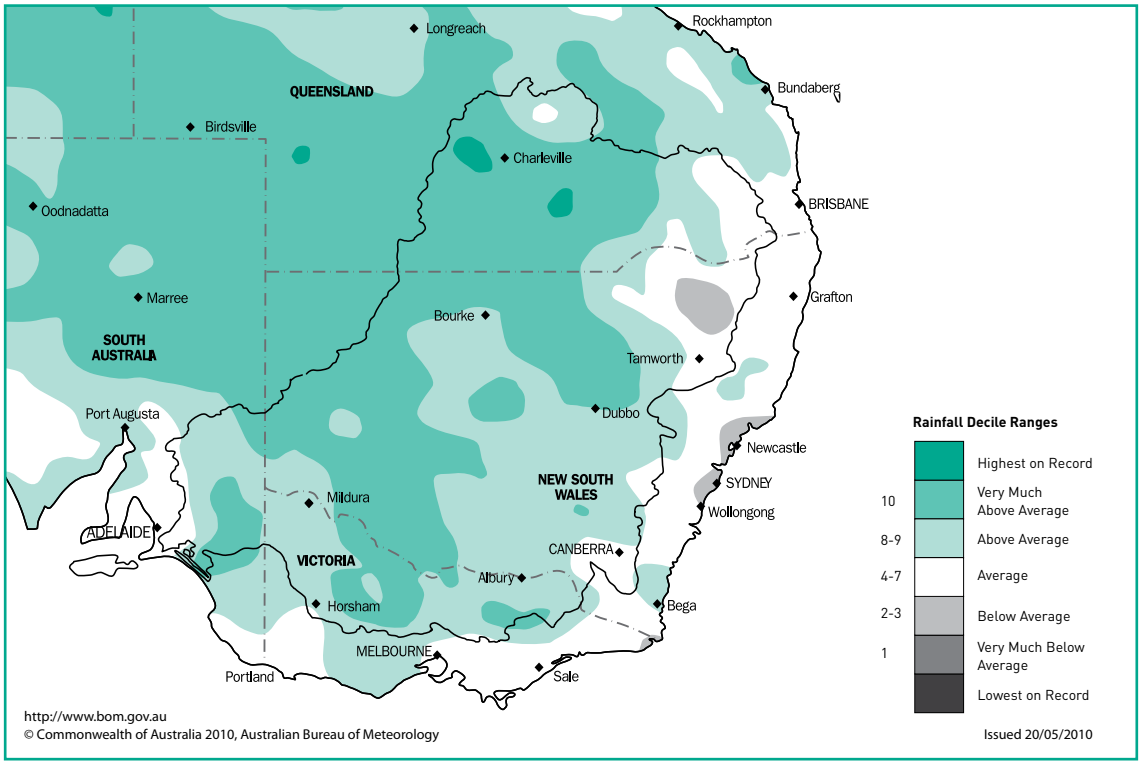


Figure 5: Temperature Anomaly for the 12 Month Period July 2009 to June 2010

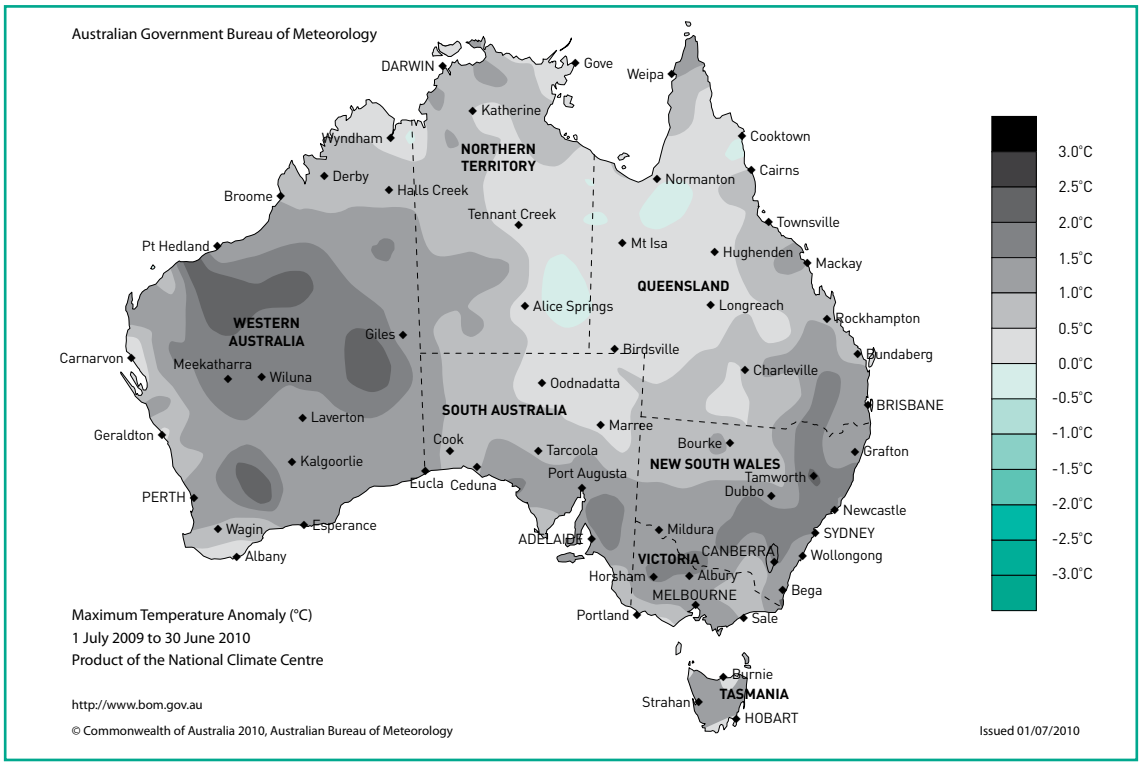
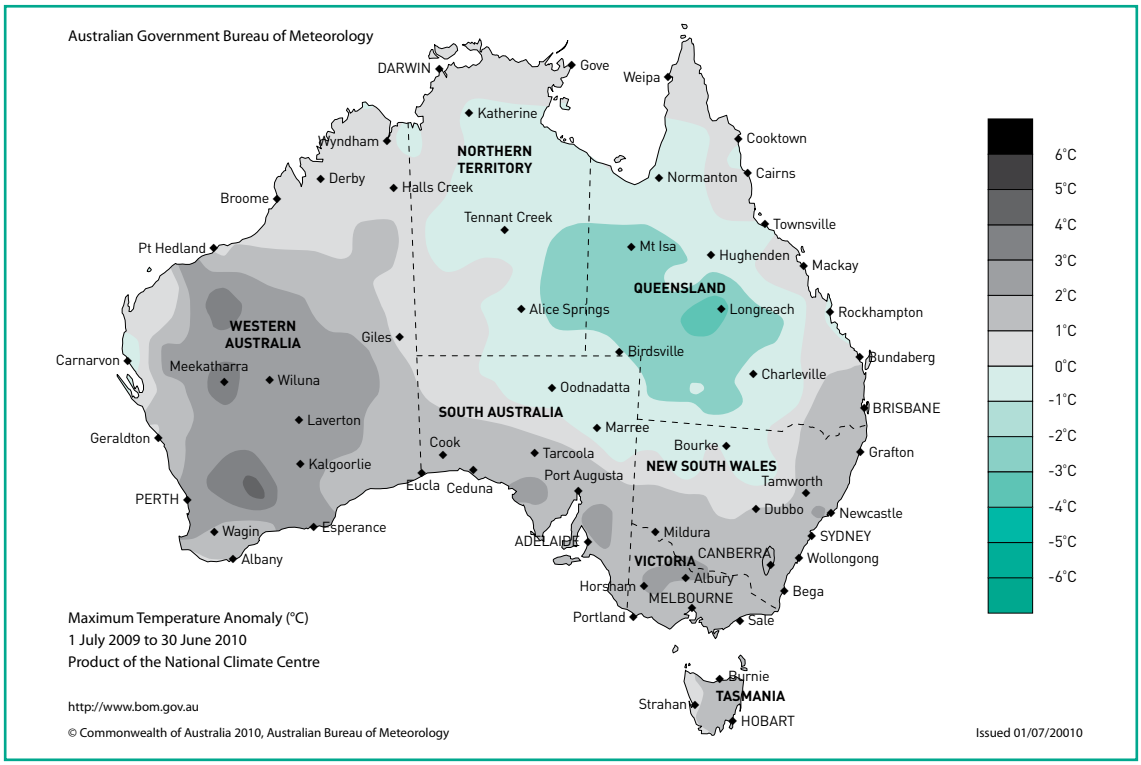


Figure 6: Temperature Anomaly for the 3 Month Period December 2009 to February 2010



3.4 Definition of Cap

The Council formalised its 1996 decision to set the Cap by adopting in 2000 a new Schedule (Schedule F) to the *Murray-Darling Basin Agreement*. Schedule F was subsequently amended in 2009. Following an Intergovernmental Agreement reached in July 2009, the *Murray-Darling Basin Agreement* was amended and made part of the amended *Water Act* (Commonwealth) 2007. Schedule F was renamed as Schedule E as part of the amendments to the *Murray-Darling Basin Agreement*.

Schedule E defines the States' long-term Cap for:

- New South Wales as 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 as 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;
  - 94.2 GL/year for the Lower Murray Swamps comprising (i) 72.0 GL/year for swamp use with unrestricted trade and (ii) 22.2 GL/year non-tradable environmental entitlement; and
  - a long-term average diversion for 'All Other Purposes' of Water from the River Murray of 449.9 GL/year.
- Queensland as the volume of water that would have been diverted under the conditions set out for each river valley in the Resource Operation Plan first adopted by the Government of Queensland in that river valley and published in the Queensland Government Gazette; and
- The Australian Capital Territory as 40 GL plus an allowance for population growth beyond 2006–07. The growth allowance is to be calculated by multiplying 0.75, the per capita consumption of 2006–07 and population growth beyond 2006–07 of the ACT and Queanbeyan. The ACT Cap was agreed by the Council in May 2009.

Queensland finalised the Resource Operations Plans for the Warrego, Paroo, Nebine, and Moonie valleys in early 2006 and submitted Cap proposals for these valleys. Council in 2007 agreed to the Caps for these valleys to apply from 2007–08. Following the completion of the Resource Operation Plan for the Border Rivers in March 2009, Queensland submitted a Cap proposal in October 2009, which was endorsed by the Authority in April 2009. The Cap for Queensland Border Rivers applied from 2009–10. On the completion of Resource Operations Plan, Queensland submitted the Cap proposal for Condamine Balonne in November 2010, which was assessed by Independent Audit Group (IAG) in January 2011. The IAG determined that this met the requirements of Schedule E Clause 2(1)(b). The Cap for Condamine Balonne will operate from 2010–11. With the submission of the Cap proposal for Condamine Balonne, capping process for all Queensland Murray-Darling Basin valleys is now complete.

The Cap in New South Wales 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 is made by use of computer models with relationships for water use that include a range of climatic factors and detailed modelling of flows and storage behaviour. Auditing and approving these models is a major task. Cap models have been developed for most of Cap valleys, for which Caps have been agreed. Out of 24 Cap valleys, Caps have not been defined in 3 valleys and 2 other valleys do not require a Cap model. Of the remaining 19 Cap valleys, Cap models have been approved for 13 and 3 Cap models are currently being audited (Macquarie, Wimmera-Mallee and Queensland Border Rivers). Three Cap models remain to be submitted for audit as follows:

a) The Cap model for Metro Adelaide is in advanced stage of preparation

b) Though the Cap model for the ACT is ready for audit, differences remain on the interpretation of the ACT Cap. Unless this is resolved, the ACT Cap model cannot be audited

c) Cap model(s) for the combined Barwon-Darling/Lower Darling are being prepared for audit.

The annual Cap targets, calculated with the help of Cap models are adjusted for water trades and environmental use of water if applicable.

The calculation for the Cap in South Australia is relatively straight forward; although the Cap for the fourth category of South Australian diversions described above is a long-term climate-adjusted annual average of 449.9 GL. A regression-based accredited model calculates the annual Cap target, which is then adjusted for trade. 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 2009–10 are for the fifteenth 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 (**Appendix E**). If that difference exceeds the trigger provisions specified in Schedule E to the *Murray-Darling Basin Agreement*, the Authority 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 Authority 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.

A slightly different approach for Queensland's Warrego, Paroo, Nebine and Moonie Cap valleys has been agreed by the Council. A special audit will be triggered if the annual diversions exceed the calculated Cap target for the water year. This is in response to the different climatic conditions in the upper Murray–Darling Basin and the rules-based approach to Cap setting agreed to for Queensland.

3.5 Comparison of 2009–10 Water Use with the Cap

A comparison of 2009–10 water use with the Cap for each State is as follows:

3.5.1 New South Wales

Cap compliance in 2009–10 within New South Wales varied between valleys (**Table 4**). All New South Wales valleys except Barwon-Darling/Lower Darling are in cumulative credit. The cumulative debit of 4 GL in the combined Barwon-Darling/Lower Darling Cap valley did

not exceeded the trigger of 61 GL (20% of the long-term Cap) required for a special audit. The combined Cap Valley was in breach of Cap during 2003–04 – 2008–09, except for 2006–07. The Independent Audit Group had noted in 'Review of Cap Implementation 2009–10 – Report of Independent Audit Group' that in the absence of an accredited model for Barwon-Darling, it was not possible to conclude that the long term Cap exceedence in the valley has been addressed.

The interim Cap models for most of New South Wales valleys are available now. The Lachlan, Namoi, the NSW Murray (contained in the Murray Simulation Model (MSM) suite of Cap models), Gwydir and Murrumbidgee Cap models, after an independent audit, were approved by the Authority under Schedule E. The Macquarie and Lower Darling Cap models are being audited and are expected to be accredited by the Authority during 2010.Barwon Darling cap model is likely to be submitted soon. New South Wales has submitted a Cap proposal for Border Rivers. This was assessed by Independent Audit Group. At the time of writing this report, the draft IAG assessment report was being considered by NSW government.

3.5.2 Victoria

The diversions in all Victorian Cap valleys were within their annual Cap target for 2009–10 (**Table 4**). All Cap valleys are in cumulative credit since 1997–98.

The Cap models for all designated Victorian valleys except Wimmera-Mallee have been audited and adopted by the MDBA. The Wimmera-Mallee REALM Cap model is being audited by the Independent Audit group. The unaudited Cap model and Cap targets for the Wimmera-Mallee valley have been used in this report.

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

3.5.3 South Australia

South Australian diversions were within their Cap targets for *All Other Purposes of water from River Murray,* the Country Towns (**Table 4**) and the Metro-Adelaide and Associated Country Areas (**Table 5**). All Cap valleys in South Australia have substantial cumulative Cap credits.

Cap model for *Water use for All Other Purposes from River Murray within South Australia* has been approved by MDBA while Lower Murray Swamps and Country towns do not require a Cap Model. The Cap model for Metropolitan-Adelaide and Associated Country Areas is in the advanced stages of development. This is likely to be submitted for audit in June 2011. 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.

3.5.4 Queensland

Diversions in the Border Rivers, Warrego, Paroo, Moonie, and Nebine valleys of Queensland were within their annual Cap targets for 2009–10 (**Table 4**). As per its Cap definition, Warrego, Paroo, Moonie, and Nebine valleys cannot accumulate Cap credit. The Border Rivers Cap has been accredited and finalised. On the completion of Resource Operations Plan, Queensland submitted the Cap proposal for Condamine Balonne in November 2010, which was assessed by Independent Audit Group (IAG) in January 2011. The IAG determined that this met the requirements of Schedule E Clause 2(1)(b). The Cap for Condamine Balonne will operate from 2010–11. With the submission of the Cap proposal for Condamine Balonne, capping process for all Queensland Murray-Darling Basin valleys is now complete.

3.5.5 Australian Capital Territory

The Australian Capital Territory Cap has been agreed but a Cap model to determine its annual Cap target has not yet been developed. There are differences between the Authority and the ACT on the interpretation of the ACT Cap, which are being resolved. Once these differences are resolved, ACT Cap model will be finalized. Diversion in Cap valley is within their long term cap of 40 GL.

3.5.6 Basin comparison of actual diversions with the annual Cap targets

Table 4 presents a comparison of actual diversions with the annual Cap targets for New South Wales, Victoria, South Australia (except Metropolitan Adelaide & Associated Country Areas), Queensland and the Australian Capital Territory. The last column in **Table 4** is the difference between the modelled and the observed storage at the end of 2009–10.

Usage below the Cap will typically result in the observed storage being greater than the modelled storage. If subsequent years are dry, it is likely that the observed usage will catch up with the Cap as this extra water in storage is allocated and used. If subsequent years are wet, storage may spill and the influence of under-use or over-use will be lost. The storage information therefore qualifies any conclusions that can be drawn on the degree of compliance with the Cap.

Table 5 presents a comparison of actual diversions with Cap target for Metro-Adelaide & Associated Country Areas, Cap Valley of South Australia.

3.6 Measurement of Land-surface (Floodplain Harvesting) Diversions

The Council Meeting 29 – 25 August 2000 agreed to the recommendations of *the Review of Operation of Cap*, which included that "diversions from floodplain and overland flows are included in Cap accounting arrangements as a matter of priority" (**Recommendation 14**).

The Authority is committed to bringing the floodplain diversions within the Cap as per the Council's above decision. It has taken several statutory and administrative measures to this end. These measures include amendments to Schedule E (former Schedule F) and Diversion Formula Register and establishment of two investigation projects to develop a method to estimate land-surface diversions. Significant progress was made and methods and models were developed to estimate the land-surface diversions. However due to the lack of suitable rainfall and the consequent lack of Land-surface diversion events, sufficient data could not be collected to verify the methods and models developed. These projects were expected to be completed by March 2010. To better utilise the investment made in equipment, these projects have been extended for one year and are now expected to be completed by March 2011. After completion of these projects, the Authority will have a tool developed to estimate land surface diversions with reasonable accuracy.

Table 4: Comparison of Diversions with Cap Levels in 2009–10

System	Cap Target from Cap Model (GL)	Adjustment to Cap Target for Trade[1] (GL)	Adjustment to Cap Target for Environment (GL)	Cap Target Adjusted for Trade and Environment (GL)	Total Diversion (GL)	Cap Credit[4] (GL)	Cumulative Cap Credit since 1997–98[4] (GL)	Cap Target Exceedence Trigger (20% of Long-Term Diversion Cap)[5] (GL)	Cumulative Difference (Modelled minus Observed) Storage[8] (GL)
New South Wales									
Intersecting Streams[3]	n/a	0	-16	n/a	3	n/a	n/a	n/a	n/a
Border Rivers[3]	n/a	-9	0	n/a	115	n/a	n/a	-47	n/a
Gwydir	70	0	0	70	57	13	170	-70	-34
Namoi/Peel	238	0	0	238	170	69	222	-73	30
Macquarie/Castlereagh/ Bogan	115	0	-4	110	109	1	336	-98	-95
Barwon Darling/ Lower Darling	224	-68	-22	134	150	-16	-4	-61	238
Lachlan	61	0	0	61	26	36	163	-67	-88
Murrumbidgee	868	-111	-92	665	910	-244	1,170	-472	-627
Murray	1,032	-70	-12	950	439	510	662	-382	-716
Total New South Wales	**2,609**	**-258**	**-146**	**2,230**	**1,979**	**369**	**2,719**	**-1,270**	**-1,292**
Victoria									
Goulburn Broken Loddon[2]	1,236	-101	-16	1,119	804	316	446	-406	-577
Campaspe	21	26	0	48	26	22	146	-24	-19
Wimmera-Mallee[3]	55	0	0	55	9	46	157	-32	-59
Kiewa Ovens Murray	1,266	51	-43	1,274	971	304	1,075	-339	-42
Total Victoria	**2,577**	**-23**	**-58**	**2,496**	**1,809**	**687**	**1,824**	**-802**	**-697**
South Australia									
Metro-Adelaide & Associated Country Areas[6]									
Lower Murray Swamps	58	-30	0	28	14	14	6	-19	n/a
Country Towns	31	7	0	38	38	0	67	-10	n/a
All Other Purposes	309	291	-83	517	371	146	762	-90	n/a
Total South Australia	**398**	**267**	**-83**	**583**	**423**	**160**	**835**	**-119**	**n/a**
Queensland									
Condamine/Balonne[3]	n/a	0	0	n/a	1,049	n/a	n/a	n/a	n/a
Border Rivers & Macintyre Brook[3]	167	9	0	175	122	53	80	-50	n/a
Moonie[3]	76	0	0	76	43	33	n/a	AT	n/a
Nebine[3]	10	0	0	10	1	9	n/a	AT	n/a
Warrego[3]	94	0	0	94	15	79	n/a	AT	n/a
Paroo[3]	2	0	0	2	2	0	n/a	AT	n/a
Total Queensland	**349**	**9**	**0**	**357**	**1,232**	**174**	**80**	**n/a**	**n/a**
Australian Capital Territory[3]	n/a	n/a	n/a	n/a	17	n/a	n/a	n/a	n/a

Note: The sign convention is that a negative Cap credit value denotes an exceedence of the Cap target adjusted for trade in 2009–10. A negative cumulative Cap credit value indicates an exceedence of the Cap target adjusted for trade on a cumulative basis (since 1997–98).

1. Adjustment to Cap target for trade includes exchange rate adjustments for permanent interstate trade and water recovered for environment.
2. Excludes Cap Target for Lake Mokoan.
3. n/a denotes Cap model is not completed or Cap target has not been able to be determined.
4. Cap credit is reported as positive and debit as negative
5. Cap target exceedence trigger values are reported as negative values. The 20% cumulative debit trigger for special audit does not apply to the Moonie, Nebine, Warrego and Paroo Cap valleys, where an annual trigger (AT) applies. In these valleys, whenever the annual diversions exceed the annual Cap targets by any amount, a special audit will be triggered.
6. See **Table 5.**
7. See previous page for explanation on the last column: difference between the modelled & the observed storage.

Table 5: Comparison of diversions with Cap levels in 2009–10 for Metro-Adelaide & Associated Country Areas, South Australia

South Australia	Total Diversion 2009–10 (GL)[1]	Total Diversion – 5 Years up to and including 2009–10 (GL)	5 Year Cap Diversion Target (GL)	Difference between Diversion and Cap (GL)
Gross Metro Adelaide and Associated Country Areas	57	573		
First Use Licence	0	16	16	0
Net Metro-Adelaide & Associated Country Areas against 650 GL 5-year Rolling Cap	57	557	650	93

4. REVIEW OF 2009–10 WATER USE IN NEW SOUTH WALES

4.1 Water Management Overview

The 2009–10 water year saw the continuation of the extreme drought conditions across much of NSW, and the need for on-going drought contingency measures. However, there were some further improvements in water availability during 2009–10, when compared to the previous three water years. For many NSW major regulated rivers, parts of the Water Sharing Plan for each valley that impact on water sharing remained suspended. These valleys include the NSW Murray, Murrumbidgee, Lachlan, Macquarie, and Lower Darling. In the NSW Murray and Murrumbidgee valleys, the inflows have improved slightly, and a number of contingency measures were able to be lifted, such as rationing of water for towns, stock and domestic users, and permanent plantings, and the suspension of some environmental flows was lifted. The small improvements in water availability in NSW, combined with continuing low allocations in other States, has resulted in continuing high volumes of water being traded from NSW to Victoria and South Australia during the year. However, the exception continued to be the Lachlan Valley, which has been subject to similar contingency arrangements for most of the last seven years, and where supply of water for any purpose could not be maintained to the lower valley between November 2009 and March 2010.

Valley Water Sharing Plans are the primary instrument for sharing and managing water resources in NSW. Each Plan includes a long-term diversion management limit (the Plan limit) and rules for adjusting water-sharing if diversions grow beyond the limit set out in the Plan. In all major regulated rivers in the NSW portion of the Basin these Plan limits are below Cap.

The Plan rules are not aimed at keeping diversions below 1993–94 levels in all years. Their primary focus is to produce environmental benefits, while also ensuring that long-term average diversions do not exceed those which would result from 1993–94 development levels. Assessments of long-term diversions will be undertaken annually, and management actions will be undertaken whenever required to ensure that the Plan limit is not exceeded.

NSW and Queensland have now ratified new water sharing arrangements on the Border Rivers that will share resources equitably between the states and provide for the environment through protection of end-of-system river flows. Following this new agreement, NSW has formally proposed a Cap on regulated diversions, based on 1993–94 levels of development, but with an allowance for the enlargement of Pindari Dam that occurred between 1991 and 1994.

4.2 Water Use Overview

Improved climatic conditions this year resulted in most NSW regulated valleys in the Murray-Darling Basin receiving modest General Security allocations during the course of the year. Whilst climatic conditions were generally improved from previous years, the General Security allocations in most valleys became available only in small amounts through the year, and only minimal levels of irrigation occurred when compared to normal levels. General Security effective allocations (announced allocation plus water carried over from the previous water year) reached the following levels: NSW Border (32%), Gwydir (7%), Namoi/Peel (43%), Macquarie/Cudgegong (12%), Lachlan (0%), Murrumbidgee (39%), and Murray (44%).

Assessment of Cap performance for the 2009–10 water year using (in some cases, preliminary) computer simulation models indicated that diversions for seven NSW valleys were below Cap, one valley was above Cap, and one valley (NSW Border Rivers) did not yet have Cap targets to allow an assessment to be made.

For the combined Lower Darling and Barwon-Upper Darling Valleys, the cumulated annual Cap performances from the 1997–98 water year was only slightly above Cap, and well below the trigger for a Special Audit. This year's assessment of Cap performance reflects the further work to refine the computer simulation model for the Barwon-Darling Valley that has recently been undertaken. It is expected that this model will shortly be submitted for accreditation. Despite an improved overall performance, diversions in the Barwon-Darling Valley remain above Cap, and NSW remains committed to returning diversions within Cap for this valley.

All diversions are reported using a July to June water year, and are in accordance with the MDBA Register of Diversion Definitions to the extent that availability of information allows.

4.3 Environmental Water Recovery

This report now includes information on water recovered for the environment from either water savings measures or the purchase of water entitlements. Over the last few years substantial volumes of water entitlements have been recovered through The Living Murray initiative, NSW's Riverbank program, projects undertaken by Water for Rivers for the Snowy River, and the Commonwealth entitlement purchase program. The entitlements reported here are those that are formally owned by government for environmental use. There may be further entitlement purchases not reported here where contracts have been exchanged, but the process to list the changed ownership on the NSW Water Access Licence Register (which can be found at www.lands.nsw.gov.au) is not yet complete.

However, there is additional water made available for environmental purposes through the rules of Water Sharing Plans within NSW. These significant volumes of water are not included in this report, as they do not relate to entitlements and are not accountable under Cap. Whilst work is underway to appropriately reflect these volumes of water for the environment in future reporting, readers need to be aware that this reporting does not yet represent all water committed to environmental purposes within NSW.

4.4 Border Rivers

A Continuous Accounting (CA) allocation system was introduced in the NSW Border Rivers in 2001-02. The new system provides general security licensees with an individual account, which can be credited with water up to 100% of entitlement and allows continuous carryover of any unused water. At any time, they may receive a new allocation increment (dependent on resource availability) up to a maximum limit of 100%. In any particular season, the volume of water that each licensee can use from their account is limited to a maximum of 100%, which is equivalent to a diversion of 266 GL for the valley.

The NSW Border Rivers licensees commenced the season with an average of 21.6% of licensed entitlement in individual accounts, and received a further 10% of licensed entitlement as further resources became available during the water year. There was a net inter-valley transfer of 8.5 GL out of the NSW Border Rivers to the Queensland Border Rivers. This provided a total resource availability of 93 GL (Table 8) for regulated river licences.

Within the regulated river system a total of 101 GL was diverted during 2009–10 in the Border Rivers regulated system, including 38 GL of diversions by supplementary access licences.

Diversions in the unregulated sections of the catchment are not currently monitored in general. However, some users outside of the regulated system in the lower valley are metered. For the majority of unregulated users without meters, a volume of 19 GL, representing estimated average use, has been included as an estimate of unregulated diversions in 2009–10. This provided a total diversion of 115 GL from the regulated section of the NSW Border Rivers (**Table 2**).

Cap accounting was not performed for the 2009–10 water year, as the Cap for the NSW Border Rivers is currently being determined. NSW has proposed a Cap that allows for the enlargement of Pindari Dam, as recommended by the Independent Audit Group. This proposal is currently being considered by the Authority, and Murray-Darling Basin Ministerial Council.

4.5 Gwydir

A Continuous Accounting (CA) allocation system is used for general security licences in the regulated section of the Gwydir Valley which provides licensees with an individual account that can be credited with water up to 150% of entitlement and allows continuous carryover of any unused water. At any time they may receive a new allocation increment (dependent on resource availability) up to a maximum limit of 150%. In any particular season, the volume of water that each licensee can use from their account is limited to a maximum of 125% of licensed entitlement with no more than 300% over any three years. This is equivalent to a maximum diversion of 532 GL for the valley.

The Gwydir Valley commenced the season with an average of 6.8% of licensed entitlement in individual accounts, and received no allocation during the water year. This provided a total resource availability of 54 GL (Table 8) for regulated river licences.

Within the regulated river system a total of 47 GL was diverted during 2009–10, including 5.5 GL of diversions by supplementary access licences.

Diversions in the unregulated sections of the catchment are not currently monitored in general. However, some users outside of the regulated system in the lower valley are metered, but there were no diversions during 2009–10. For the majority of unregulated users without meters, a volume of 10.3 GL, representing estimated average use, has been included as an estimate of unregulated diversions in 2009–10. This provided a total diversion of 57 GL for the Gwydir Valley (**Table 2**).

The Gwydir IQQM model has been accredited following independent review of the model. The Cap target is estimated for the regulated system each year using the Gwydir Valley IQQM. This target is the diversion that would have occurred during 2009–10 with management rules and irrigation development at 1993–94 levels. It is not currently possible to assess a 2009–10 Cap target for the unregulated sections of the valley, and the estimated average annual unregulated diversion is also used to represent the unregulated Cap target each year. The preliminary combined Cap target for 2009–10 is 70 GL. Under the Murray-Darling Basin agreement, annual Cap performances are cumulated from the 1997–98 water year. For the thirteen year period from 1997–98 this indicates a cumulative Cap credit of 170 GL (**Table 4**).

4.6 Namoi/Peel

A Continuous Accounting (CA) allocation system is used for general security licences in the regulated section of the Namoi Valley, which provides licensees with an individual account that can be credited with up to 200% allocation and allows continuous carryover of any unused allocation. At any time they may receive a new allocation increment (dependent on resource availability) up to a maximum limit of 200%. In any particular season, the volume of water that each licensee can use from their account is limited to a maximum of 125% of licensed entitlement with a maximum of 300% over any 3 years. This is equivalent to a maximum diversion of 312 GL for the valley All high security licences and general security licences in the regulated section of the Peel valley are managed using annual accounts, which are forfeited at the end of each water year. The maximum allocation is 100% of licensed entitlement, which is 48 GL.

In 2009–10 Namoi Valley licensees commenced with an average of 24.8% of licensed entitlement in individual accounts, and received 0.6% entitlement during the water year The Peel valley licensees commenced the season with no allocation and received allocation of 100% through the water year. The Upper Namoi/ Manilla valley licensees commenced the season with an allocation of 11.8% and received 50% allocations during the water year. This provided a total resource availability of 125 GL (**Table 8**) for regulated river licences.

Within the regulated river systems a total of 92 GL was diverted during 2009–10, with regulated river licences diverting 70 GL in the Namoi Valley, 4 GL in the Manilla/Upper Namoi Valley, and 18 GL in the Peel Valley. This includes supplementary access licence diversions of 40 GL in the Namoi Valley during periods of high river flows and 5GL in the Peel Valley. There were no diversions by supplementary access licences in the Manilla/upper Namoi Valley.

Diversions in the unregulated sections of the catchment are not currently monitored and, a volume of 78 GL, representing estimated average use, has been included as an estimate of unregulated diversions in the Namoi and Peel Valleys. This provided a total diversion of 170 GL for the greater Namoi Valley (**Table 2**).

The Cap target is estimated for the regulated system each year using the Namoi Valley IQQM, which has been accredited for Cap purposes by the MDBA-appointed independent auditor. This target is the estimated diversion that would have occurred during 2009–10 with management rules and irrigation development at 1993–94 levels. An IQQM for the Peel Valley regulated system has also been developed and used to assess preliminary Cap performance. The Peel Valley IQQM has also been accredited following independent review of the model. It is not currently possible to assess a 2009–10 Cap target for the unregulated sections of the valley, and the estimated average annual unregulated diversion is also used to represent the unregulated Cap target each year. The combined Cap target for 2009–10 is 238 GL. Under the Murray-Darling Basin agreement, annual Cap performances are cumulated from the 1997–98 water year. For the thirteen water years of Cap accounting, this indicates a cumulative Cap credit of 222 GL (**Table 4**).

4.7 Macquarie/Castlereagh/Bogan

Licensees in the regulated section of the Macquarie Valley commenced the season with no allocation, and received no allocation through the water year. This combined with a carryover of 11.2% (Macquarie) and 55.3% (Cudgegong) of licensed entitlement from the 2008–09 water year. High security licences were allocated 100% of their licensed entitlements, but no allocations were made to general security entitlements. These allocations combined to provide a total resource availability of 118 GL (**Table 8**) for regulated river licences.

Within the regulated river systems a total of 74 GL was diverted during 2009–10 during periods of high river flow. This includes supplementary access licences diversion of 9.5 GL in the Macquarie Valley and 2.1 GL in the Cudgegong Valley.

Diversions in the unregulated sections of the catchment are not currently monitored in general. However, some users outside of the regulated system in the lower valley are metered. For the majority of unregulated users without meters, a volume of 35 GL, representing estimated average use, has been included as an estimate of diversions in 2009–10. This provided a total diversion of 109 GL in the Macquarie Valley (**Table 2**).

The Macquarie IQQM was previously submitted for accreditation, and was been recommended for accreditation by the independent reviewer. However, as a result of the continuing drought, the Macquarie IQQM has been further reviewed, and has now being considered by the Authority's independent reviewer.

The Cap target is estimated for the regulated system each year using the Macquarie Valley IQQM. This target is the diversion that would have occurred during 2009–10 with management rules and irrigation development at 1993–94 levels. It is not currently possible to assess a 2009–10 Cap target for the unregulated sections of the valley, and the estimated average annual unregulated diversion is also used to represent the unregulated Cap target each year. The preliminary combined Cap target for 2009–10 is 115 GL. Under the Murray-Darling Basin agreement, annual Cap performances are cumulated from the 1997–98 water year. For the thirteen year period from 1997–98 this indicates a cumulative Cap credit of 336 GL (**Table 4**).

4.8 Barwon-Upper Darling

The Barwon-Darling system does not receive a formal allocation of resources, and only unregulated access is available. The previous system of annual quotas that operated within the valley for the last time during 2006–07, has been restructured so that only 173 GL of access is allocated to users each year, and may be carried over from one year to the next. This is a significant reduction from the 524 GL of annual access provided by the previous quota system.

The Barwon-Darling system again received good inflows from flooding in Queensland. Diversions from the Barwon-Darling River system in the 2009–10 water year totalled 139 GL (**Table 2**).

The Cap target is estimated each year using the Barwon-Darling Valley IQQM, which has not yet been presented for accreditation by the independent auditor. This target is the diversion that would have occurred during 2009–10 with management rules and irrigation development at 1993–94 levels. The preliminary Cap target for 2009–10 is 147 GL. Under the Murray-Darling Basin agreement, annual Cap performances are cumulated from the 1997–98 water year. For the thirteen water years of Cap accounting, this indicates a cumulative Cap debit of 154 GL, which exceeds the trigger for Special Auditing of 34.6 GL.

However, for Cap auditing purposes, the Barwon-Darling and Lower Darling valleys are taken to be one valley and the combined annual Cap performances are cumulated from the 1997–98 water year. For the thirteen year period from 1997–98, this indicates a cumulative Cap debit of 4 GL (**Table 4**).

In recognition of above-Cap diversions in previous years, NSW announced that it would act to bring diversions back within Cap. In 2010 NSW announced that annual allocation of water access would be reduced from 173 GL to 143 GL each year, and that water use by would be limited to twice the annual allocation in any year, and three times the annual allocation in any three year period. It was announced that these rules would be introduced if the 2009–10 Cap performance continued to show that diversions were above Cap. In the interim, annual diversions would be limited to the estimated long-term average Cap of 173 GL, and access to account water from previous water years would be suspended. As the Cap debits for the Barwon-Darling Valley increased in 2009–10, these new measures will now commence in 2011–12.

4.9 Lachlan

In the 2009–10 water year there was continuation of the extreme dry conditions and received no allocation for general security licensed entitlement. An allocation of 100% for high security entitlement and 50% for town water supplies was possible. These allocations continued to be at critically low levels, and they combined to provide with a carryover of 5.5% of licensed entitlement from the 2008–09 water year, a total resource availability of only 17 GL (**Table 8**) for regulated river licences.

Within the regulated river system a total of 10 GL was diverted during 2009–10, including supplementary access licence diversions of 0.5 GL in the Belubula River regulated system (a tributary of the Lachlan which has a small dam to regulate flows).

Diversions in the unregulated sections of the catchment are not currently monitored and, a volume of 15 GL, representing estimated average use, has been included as an estimate of unregulated diversions in the Lachlan Valley. This provided a total diversion of 26 GL for the Lachlan Valley (**Table 2**).

The Cap target for the year is estimated for the regulated system each year using the Lachlan Valley IQQM, which was the first model to be accredited for Cap purposes by the independent auditor. This target is the estimated diversion that would have occurred during 2009–10 with management rules and irrigation development at 1993–94 levels. It is not currently possible to assess a 2009–10 Cap target for the unregulated sections of the valley, and the estimated average annual unregulated diversion is also used to represent the unregulated Cap target each year. The combined Cap target for 2009–10 is 61 GL. Under the Murray-Darling Basin agreement, annual Cap performances are cumulated from the 1997–98 water year. For the thirteen water years of Cap accounting, this indicates a cumulative Cap credit of 163 GL (**Table 4**).

4.10 Murrumbidgee

The 2009–10 water year commenced with critically low water availability. However, improvements in water availability early in 2008–09 enabled towns, domestic and stock, and high security allocations to return to normal levels, and modest allocations were made available to general security users.

General Security licences in the regulated section of the Murrumbidgee Valley commenced the season with no allocation, but received an allocation of 27% through the water year. This combined with a carryover of 11.7% of licensed entitlement from the 2008–09 water year. Local Water Utility and High Security each received

an allocation of 95%, and Domestic and Stock received an allocation of 95%.

Due to the continuing record low level of water availability across the southern Murray-Darling Basin, inter-valley trade of allocated water resulted in a net trade of 111 GL from the Murrumbidgee Valley during 2009–10. This combined to provide a total resource availability of 1,290 GL (**Table 8**) for regulated river licences.

For the regulated river system a total of 806 GL was diverted during 2009–10 including supplementary access licence diversions of 24 GL. For the Lowbidgee Flood Control and Irrigation District, a total of 62 GL was diverted.

Diversions in the unregulated sections of the catchment are not currently monitored and, a volume of 42 GL, representing estimated average use, has been included as an estimate of unregulated diversions in the Murrumbidgee Valley. This provided a total diversion of 910 GL for the Murrumbidgee Valley (**Table 2**).

The Cap target is estimated for the regulated system each year using the Murrumbidgee Valley IQQM, which has now been accredited for Cap purposes by the Authority. This target is the diversion that would have occurred during 2009–10 with management rules and irrigation development at 1993–94 levels. It is not currently possible to assess a 2009–10 Cap target for the unregulated sections of the valley, and the estimated average annual unregulated diversion is also used to represent the unregulated Cap target each year. The combined preliminary Cap target from the model for 2009–10 is 868 GL. Adjustments for inter-valley trade and licences purchased for the environment are then made to determine the volume of credits or debits. Under the Murray-Darling Basin agreement, annual Cap performances are cumulated from the 1997–98 water year. For the thirteen water years of Cap accounting, this indicates a cumulative Cap credit of 1,170 GL (**Table 4**).

4.11 Lower Darling

Towns, stock and domestic users, and high security entitlements received an initial allocation of 100%. General security entitlements in the regulated section of the Lower Darling commenced the season with no allocation but, under the drought contingency arrangements, were allowed to carryover a volume equivalent to 5.9% of entitlement. With the arrival of inflows from flooding in Queensland, control of Menindee Lakes returned to the Authority, and an allocation of 100% was made for and general security entitlements. These allocations, together with water carried over from last year combined to provide a total water resource availability of 97 GL in the Lower Darling, for regulated river licences. With 68 GL being traded to downstream valleys, a total of only 29 GL (**Table 8**) was available for use in the Lower Darling valley in 2009–10.

Within the regulated river systems a total of 10.7 GL was diverted during 2009–10, with regulated river licences accounting for all of the diversions. There was no supplementary access in the regulated system during 2009–10.

The Cap target is estimated for the regulated system each year using the Murray Simulation Model that is currently being reviewed prior to being resubmitted for accreditation by the independent reviewer. This target is the diversion that would have occurred during 2009–10 with management rules and irrigation development at 1993–94 levels. The preliminary Cap target for 2009–10 is 77 GL. Under the Murray-Darling Basin agreement, annual Cap performances are cumulated from the 1997–98 water year. For the thirteen water years of Cap accounting, this indicates a cumulative Cap credit of 150 GL (**Table 4**).

For Cap auditing purposes, the Barwon-Darling and Lower Darling valleys are taken to be one valley and the combined annual Cap performances are cumulated from the 1997–98 water year. For the thirteen year period from 1997–98, this indicates a cumulative Cap debit of 4 GL.

4.12 Murray

Licensees in the regulated section of the Murray Valley commenced the season with no allocation, but received an allocation of 28.3% through the water year and only 15% of licensed entitlement carried over from the 2008–09 water year. An allocation of 97% for towns, stock and domestic users, and high security licences were possible.

These allocations combined to provide a total resource availability of 956 GL (**Table 8**) for regulated river licences.

Within the regulated river system a total of 412 GL was diverted during 2009–10. There was no supplementary access in the regulated system during 2009–10.

Diversions in the unregulated sections of the catchment are not currently monitored and, a volume of 28 GL, representing estimated average use, has been included as an estimate of unregulated diversions in the NSW Murray Valley. This provided a total diversion of 439 GL for the NSW Murray Valley (**Table 2**).

The Cap target is estimated for the regulated system each year using the Murray Simulation Model that has been accredited following the independent review of the model. This target is the diversion that would have occurred during 2009–10 with management rules and irrigation development at 1993–94 levels. It is not currently possible to assess a 2009–10 Cap target for the unregulated sections of the valley, and the estimated average annual unregulated diversion is also used to represent the unregulated Cap target each year. The combined preliminary Cap target for 2009–10 is 1,032 GL. Adjustments for inter-valley trade and licences purchased for the environment are then made to determine the volume of credits or debits. Under the Murray-Darling Basin agreement, annual Cap performances are cumulated from the 1997–98 water year. For the thirteen water years of Cap accounting, this indicates a cumulative Cap credit of 662 GL (**Table 4**).

5. REVIEW OF 2009–10 WATER USE IN VICTORIA

5.1 Overview

Water availability for the 2009–10 irrigation season was constrained by low carryover storage volumes and below average inflows to all northern Victorian storages. At the start of July 2009, a zero allocation was announced by Goulburn-Murray Water (G-MW) for Murray, Goulburn, Broken, Loddon, Campaspe and Bullarook systems. This is the third consecutive year when the opening allocation was zero for all these systems.

The Goulburn and Murray allocations increased in small increments to reach final allocations of 71% and 100% of high-reliability water shares respectively.

The Broken and Loddon systems had final allocations of 17% and 3% respectively. For the second year in a row, no allocation was possible for the Campaspe system. Irrigation areas in the Wimmera Mallee system received no allocation during the 2009–10 bulk entitlement year. There was a 100% allocation for urban, domestic and stock customers supplied from the Wimmera-Mallee pipeline.

A revision to the carryover policy in the Murray, Goulburn and Campaspe systems, which allowed unlimited water to be carried over resulted in a large volume of unused water being carried over from 2009–10 to 2010–11. Carryover has allowed irrigators to have water available to use early in a season before an allocation of high-reliability water shares had been made. A large proportion of the water available in the Broken, Loddon and Campaspe systems in 2009–10 was from water carried over from the 2008–09 season which had very low, and in the case of Campaspe system zero, allocations.

The Minister for Water qualified rights to provide a limited supply to domestic and stock, urban and other commercial customers while allocations to high-reliability water shares are low. Qualifications also reduce or remove the obligations to meet minimum environmental flows in some cases. Qualifications were in place for all systems except the Ovens, Kiewa and Wimmera-Mallee on 1 July 2009. Many aspects of the Qualification of Rights expired in the Goulburn and Murray systems when the allocation exceeded 20% of HRWS, but Qualifications remained in place for the entire season in the Broken, Campaspe and Loddon systems.

Rainfall in the months of July and August was below average and did not produce enough inflows to provide early allocations. Rainfall in September and November generated inflows that allowed allocations to commence. Rainfall from January to April was well above average, contributing to allocation increases late in the season. February and March were the two wettest months in 2009–10.

5.1.1 Water Use Capping Measures

Victoria has been implementing changes to water management policies under its water reform package since 1990–91. The effectiveness of the policies is continually monitored and reviewed. Bulk Entitlements for the Goulburn, Murray, Ovens, Broken, Campaspe, Loddon and Wimmera-Glenelg river systems are now in place. The Bulk Entitlement for the Bullarook system commenced during the 2009–10 season.

Carryover of unused allocation mainly contributes to Cap Credits in the year the water was allocated. Unused allocation carried over from 2009–10 to 2010–11 amounted to 500 GL in the Victorian Murray valley and 385 GL in the Goulburn-Broken-Loddon valley including 11 GL of unused trade for the Goldfields Superpipe that is stored in Lake Eildon. In comparison, the carryover from 2008–09 into 2009–10 for the Victorian Murray and Goulburn/Broken/Loddon valley was 170 GL and 94 GL respectively. One of the main factors for the unused allocation at the end of the 2009–10 season being higher than previous years was that the late season allocation increases in the Murray and Goulburn systems could not be utilised by customers.

5.1.2 Volumes Diverted

The volume diverted during 2009–10 in the Murray/Kiewa/Ovens valley was 970.6 GL. In the Goulburn/Broken/Loddon designated river valley and the Campaspe river valley, diversions were 803.6 GL and 26.1 GL respectively. Wimmera-Mallee valley diversions were 9.0 GL.

Victorian systems diverted 1,809.3 GL from the Murray-Darling Basin during 2009–10. The total Cap target adjusted for trade and environmental allocations, except in the Wimmera-Mallee, was 2496.4 GL.

5.1.3 Off-Quota

Off-quota allocations have not been available in Victorian river valleys since 2003.

5.1.4 Final Deliveries & Historical Comparison

The total volume delivered to northern Victorian regulated systems during 2009–10 was 1,384.3 GL. The total Victorian usage was 65.7% of the total volume allocated.

Deliveries in the Murray/Kiewa/Ovens designated valley were 772.2 GL in 2009–10, compared to 648.6 GL for the previous year. Goulburn/Broken/Loddon valley deliveries were 496.5 in 2009–10, 182.3 GL higher than the 314.1 GL delivered in 2008–09. Deliveries in the Campaspe valley were also higher in 2009–10, with 106.9 GL compared to 80.8 GL delivered in 2008–09.

Total Wimmera-Mallee deliveries including water diverted from other valleys were 8.7 GL in 2009–10, 8.7GL less than in 2008–09. The significant reduction is mostly attributed to the completion of the Wimmera-Mallee Pipeline Project.

5.1.5 Trading

The allocation trade market in Victoria was very active again during 2009–10 with a net volume of 12.1 GL traded into Victoria.

Interstate allocation trading with New South Wales resulted in an overall net inwards transfer to Victoria of 60.9 GL during 2009–10. This volume includes net inwards allocation trade of 66.34 GL from NSW Murray and 8.7 GL from the Darling. A volume of 14.1 GL was traded into the Murrumbidgee River basin.

Trade with South Australia was a net allocation trade of 46.5 GL from Victoria to South Australia, compared to 19.2 GL from Victoria to South Australia in the 2008–09 season.

There was 186.4 GL of allocation trade into the Kiewa/Ovens/Murray valley from other valleys and the reverse trade was 229.9 GL resulting in a net allocation trade out of the Kiewa/Ovens/Murray valley of 43.5 GL.

There was a net volume of allocation trade into the Goulburn/Broken/Loddon valley of 14.4 GL. A total of 129.3 GL was traded in while 114.8 GL was traded out. Net allocation trade to South Australia was 8.9 GL from the Goulburn/Broken/Loddon valley.

During the past five irrigation seasons, water was traded to Campaspe Irrigation District customers who have installed pumps on the Waranga Western Channel. The net volume traded by these customers in 2009–10 was 2.8 GL.

The supply of water to Bendigo and Ballarat from the Goulburn System via the Goldfields Superpipe was supported by 26.4 GL of allocation trade. There was no Goulburn Water Quality Reserve utilised for supply to these regional centres during 2009–10.

The net trade into the Campaspe valley was 43.5 GL, including 26.4 GL for use via the Goldfields Superpipe and 18.7 GL traded for use in the Rochester Irrigation Area.

5.1.6 Environmental Flows

The total volume of water used for environmental purposes was 37.5 GL, of which 27.8 GL was for Murray system forests and wetlands downstream of Nyah. The water used downstream of Nyah was sourced from the Commonwealth (11.2 GL), The Living Murray (8.2 GL), Flora and Fauna (8.0 GL) accounts and a donation of 0.4 GL by the Australian Conservation Foundation. There was no water from the Snowy River Murray Improved Flows (RMIF) account used in 2009–10 as the account had been exhausted during 2008–09. Over half of the total use of environmental water occurred in May and June.

Of the water sourced from the Commonwealth, 4.32 GL was supplied to Lake Walla Walla on the Lindsay River. This is the first time environmental water has been delivered to this lake.

There was 6.4 GL delivered upstream of Nyah, mainly in the Gunbower and Barmah Forests. Water was also delivered to Kinnairds and McDonalds Swamps, Round Lake and Richardsons Lagoon. Of the water use upstream of Nyah, 4.0 GL came from the Flora and Fauna account and the balance of 2.4 GL was water from The Living Murray.

No water was supplied to the Barmah-Millewa Forest from the Victoria and New South Wales Environmental Water Allocations (EWA) during the year.

At 30 June 2010, there was 36.7 GL available in the Victorian EWA account. The volume required to fully repay the volume borrowed against the EWA was 93.8 GL.

Wetlands on the Goulburn and Loddon system were supplied with 3.2 GL of environmental water. The Goulburn wetlands supplied were Reedy Swamp, Black Swamp and Doctors Swamp, while Lakes Yando, Leaghur and Little Lake Boort in the Loddon system received water during 2009–10. Environmental water from the Flora and Fauna account was also used to support the delivery of water from Goulburn Valley Account (GVA) water to the River Murray via the Lower Campaspe River. The transfer of the GVA water by this route improved the environmental health of the Lower Campaspe River.

Environmental water used on the Goulburn, Loddon and Campaspe systems was sourced from the Flora and Fauna account, Loddon Bulk Entitlement and 100 ML of donated water.

In addition to the volumes supplied to forests and wetlands, 5.8 GL from the GVA and 0.8 GL from the Goulburn Water Quality Reserve were used to improve the health of Broken Creek via diversions at Goulburn Weir to the Murray system via Rice's Weir on Broken Creek.

5.2 Goulburn

Gravity irrigation customers and private diverters in the Goulburn System of the Goulburn/Broken/Loddon designated river valley were given an initial allocation of 0% of high-reliability water shares in July 2009. The allocation reached a maximum of 71% of high-reliability water shares on 1 April 2010. There has been no allocation of low-reliability water shares since 1997–98.

Lake Eildon, recovered from being 13.0% full at the start of July 2009 to reach a maximum for the year of 33.5% of capacity in early November 2009. At the 30 June 2010, Lake Elldon held 27.5% of capacity. Lake Eildon has not filled to capacity since 1996.

Waranga Basin only reached 52.7% of capacity in late October 2009. By the end of June 2010, Waranga Basin had not filled to capacity. Unlike the previous three seasons, temporary pumping stations at the Major and Minor outlets at Waranga Basin were not needed to increase water availability to customers as the allocation exceeded 37% without pumping.

The total volume allocated for use in the Goulburn valley was 466.1 GL. Usage in the Goulburn valley was 381.2 GL, or 81.8% utilisation of the total allocated volume.

Approximately 309.1 GL was transferred to the Murray, Campaspe, Loddon and Wimmera-Mallee systems. The total diversion during 2009–10 to the Goulburn valley was 793.5 GL which was well below the ten year average. A total of 4.2 GL was transferred from north to south of the Great Dividing Range to Melbourne Water from the Silver and Wallaby creeks which are tributaries of the Goulburn River. An additional 16.7 GL was transferred to Melbourne Water from the Goulburn River via the Sugarloaf pipeline.

The Goulburn/Broken/Loddon valley is within Cap and maintains a cumulative Cap credit of 445.8 GL.

5.3 Broken

Private diverters in the Broken River system received an initial zero allocation at the start of July 2009. This did not change until a 1% allocation was announced on 1 February 2010. There were four more incremental increases in allocation until the final allocation of 17% was announced on 1 April 2010.

Lake Nillahcootie rose from a low of 12% full at the start of July 2009 to reach a maximum of 31.5% full in early January 2010. At the end of June 2010 the storage was 28.7% full and had not filled to capacity since 2005. Water was harvested into Lake Mokoan during the spring, but the water level dropped below dead storage because of evaporation prior to its decommissioning in early 2010.

The Broken usage equated to 4.7 GL, or 59.8% utilisation of the total allocated volume, which also comprised water carried over from the 2008–09 season.

The Broken system is included in the Goulburn/Broken/Loddon designated river valley, which is within Cap and has a cumulative Cap credit.

5.4 Loddon

On 15 March 2010 an allocation of 3% of high-reliability water shares was announced for the Loddon System (excluding Bullarook Creek). This allocation remained unchanged until the end of June 2010. There was a final allocation of 19% for Bullarook Creek customers.

Cairn Curran and Tullaroop reservoirs reached only 6.8% and 3.1% of capacity respectively. At the 30 June 2010, Cairn Curran and Tullaroop reservoirs had not filled to capacity since 2000 and 1996 respectively.

Laanecoorie reservoir rose from 4.3% in early July 2009 to 24.1% full in mid April 2010. At the end of June 2010, Laanecoorie reservoir had failed to fill to capacity for the sixth consecutive year.

Newlyn reservoir reached a maximum capacity of 38.4%. As was the case in 2008–09, Hepburns Lagoon was effectively empty all year.

Diversions from the Loddon River and tributaries for private irrigation use, domestic and stock, commercial, industrial and urban purposes was very low, amounting to only 1.9 GL.

In years of higher allocations on the Loddon system, the bulk of the supply to Boort is met from the Loddon storages. However, for the eighth year in a row, the supply to the Boort region of the Pyramid-Boort Irrigation Area was solely reliant on the Goulburn system.

The Loddon valley is included in the Goulburn/Broken/Loddon designated river valley for the assessment of Cap compliance which is within Cap and has a cumulative Cap credit. Loddon valley usage was 110.6 GL, or 82.6% of the allocated volume. Irrigation usage within the Pyramid-Hill Irrigation Area accounted for 101.3 GL of the total Loddon valley usage.

5.5 Campaspe

The Campaspe River system supplies private diverters, the Campaspe Irrigation District and the Coliban water supply system. Although physically located within the Campaspe catchment, the Rochester Irrigation Area receives its water from the Goulburn system via the Waranga Western Channel and is part of the Goulburn/Broken/Loddon designated river valley for Cap compliance. Allocations to irrigators in the Rochester Irrigation Area are the same as those in the Goulburn system.

Allocations in the Campaspe system opened at 0% of high-reliability water shares and did not increase during the year. This, together with the 2006–07 and 2008–09 seasons, is the lowest allocation on record.

Lake Eppalock was only 6.0% of capacity in early July 2009. By the end of June 2010, the Lake Eppalock had recovered to 8.7% partly due to net transfers from Goulburn System. As at 30 June 2010, Lake Eppalock had not been full since 1996 although the storage was near full in late November 2000.

The Goldfields Superpipe transferred 7.5 GL from the Goulburn system to Sandhurst reservoir at Bendigo. There was 10.4 GL supplied to White Swan Reservoir at Ballarat comprising 5.5 GL from Lake Eppalock and 4.9 GL from the Goldfields Superpipe. A further 14.0 GL was transferred from the Goulburn system to Lake Eppalock of which 10.4 GL was attributed to Coliban Water and 3.6 GL to Central Highlands Water.

From Lake Eppalock, 2.8 GL was pumped to Bendigo by Coliban Water.

The total volume diverted from the Goulburn system via the Goldfields Superpipe was 26.4 GL including 120 ML to Heathcote.

The 2009–10 Campaspe valley allocation volume was 184.6 GL of which 57.9% was utilised. The Campaspe system comprises gravity irrigation entitlements in the Rochester Irrigation Area and the Campaspe Irrigation District, private diverters, and urban, industrial, domestic and stock entitlements.

There was no water harvested from the Campaspe River to the Waranga Western Channel via the Campaspe Irrigation District channels or the Campaspe Pumps during the year because of the very low Campaspe allocation.

Woodend was supplied with 137 ML from the Campaspe system.

Diversions from the Campaspe designated river valley were 21.6 GL less than the Cap target in 2009–10. The Campaspe valley has a cumulative Cap credit of 146.2 GL.

5.6 Wimmera-Mallee

The Wimmera-Mallee storages remained low. However, some relatively good inflows early in the year allowed an easing of water restrictions for consumptive users. The improved inflows also allowed for good starting allocations. The inflows were still less than the long term average resulting the thirteenth consecutive year of below average inflows to the Wimmera-Mallee system.

Four storages remained empty from the previous year while the other did not recover from very low levels. The maximum combined storage reached was 15.7% of capacity in October 2009 and fell to 10.3% full in June 2010.

The initial 2009–10 allocation for the Wimmera-Glenelg Bulk Entitlements on 1 November 2009 was based on available water of 75.3 GL compared to 25.6 GL at the same time in the previous year. No further allocation was made during 2009–10 with resource improvements being set aside as a reserve for 2010–11. By early July 2010 the accumulated reserve was 2.9 GL.

There was no water supplied by the open channel network. However, the water carting program continued until all customers were connected to the Wimmera-Mallee Pipeline.

From November 2009 all customers (including water for recreation, supplies by agreement, urban and rural customers) supplied from the Wimmera-Mallee pipeline received a 100% allocation. Allocations for SBA customers supplied from headwork storages and the environment were 68% and 19.5% respectively. There was no allocation made available for irrigation. Both Coliban and Wannon water authorities had a 100% allocation.

For the year ending June 2010, diversions from water sourced within the Wimmera-Mallee valley totaled 9.0 GL.

5.7 Kiewa

Total Kiewa usage was 0.5 GL or 46.8% of the urban entitlement volume. A further 3.4 GL was used in the unregulated system. The Kiewa system is included in the Murray/Kiewa/Ovens designated river valley for the assessment of Cap compliance which is within Cap and has a cumulative Cap credit.

5.8 Ovens

Lake Buffalo filled to capacity in early spring and remained full until late January 2010 Lake William Hovell was full by mid July 2009, drawn down to 62.4% full by early April 2010 then recovered to be full by 30 June 2010. While both storages were spilling, customers had access to spill-reliability water shares.

Total Ovens valley usage was 9.6 GL or 25.3% of the allocated volume. A further 3.1 GL was used in the unregulated system. The Ovens valley is included in the Murray/Kiewa/Ovens designated river valley for the assessment of Cap compliance which is within Cap and has a cumulative Cap credit.

5.9 Murray (including Mitta Mitta)

There was zero allocation at the start of July 2009 for Murray system gravity irrigation customers and Mitta private diverters. An allocation of 2% of high-reliability water shares was announced on 1 September 2009 which was subsequently increased in steps to a final allocation of 100% on 1 April 2010.

At the 1 July 2009, Lake Dartmouth was 21.4% full, subsequently recovering to 31.0% full by late November 2009. There was relatively little change in storage volume from early November 2009 to late April 2010. Lake Dartmouth was 32.8% full at the end of June 2010.

Lake Hume rose to a maximum capacity of 40.4% of capacity in early November 2009 and by late April 2010 the storage had been drawn down to 15.5% of capacity. By 30 June 2010 Lake Hume had recovered to be 26.8% full and had not been full since 2000.

The Menindee Lakes returned to MDBA control late in the 2009–10 season after Darling flood waters were harvested into Lake Menindee and Lake Cawndilla.

The total diversion, excluding all environmental diversions, was 954.1 GL for the Victorian component of the River Murray valley. This diversion included 3.5 GL for the Northern Mallee pipeline. The allocated volume was 1153.5 GL, of which 762.1 GL or 66.1% was used.

For the purposes of Cap compliance, the Murray valley is included in the Murray/Kiewa/Ovens designated river valley. Diversions from this valley were 303.6 GL below the 2009–10 Cap target and the accumulated Cap credit for the Murray/Kiewa/Ovens designated river valley is 1,075.3 GL.

6. REVIEW OF 2009–10 WATER USE IN SOUTH AUSTRALIA

6.1 Overview

The 2009–10 season was initially influenced by a period of low water resource availability. In response the South Australian and partner Governments agreed to implement special water sharing arrangements to guarantee conveyance water requirements to facilitate delivery of critical human water needs along the River Murray system. After water was secured for conveyance and critical human water needs, 25 GL was made available to each state for allocation purposes. A number of contingency measures were identified as in previous years but early season improvements offset the need to activate such contingencies.

South Australia announced an opening allocation of 2% on 1 July 2009. A small allocation is necessary to allow water users who take water for domestic purposes from irrigation infrastructure to access water. The final allocation announcement was made in March 2010 at 62%, representing the highest allocation since 2005–06.

South Australia did not purchase any water for irrigation support activities in 2009–10.

Special water sharing arrangements again created advances to South Australia for the third year in a row. The advance was repaid at a rate of 50% of improvements until all advances were repaid by mid October 2009. Afterwards water was shared in accordance with the normal water sharing arrangements under the Murray-Darling Basin Agreement that provided South Australia access to 1/3 of the shared resource improvements. This 1/3 sharing occurred until the period of Special Accounting ceased in March 2010 due to significant improvements in the Menindee Lakes storage volume.

Carryover has allowed irrigators to manage through the period of low water availability and allocations in order to meet both crop survival and production requirements. During 2009–10 work commenced on the development of a formal storage right for South Australia (Schedule G). The South Australian Storage Right Schedule provides formal recognition to carryover and implementation of rules associated with storing this water including, losses associated with storing water through net incremental evaporation and importantly spill rights.

The volume of water available to South Australia at the commencement of 2009–10 based on the Murray-Darling Basin Authority's water availability assessment was 1,056 GL, which includes 696 GL for dilution and losses and 201 GL for critical human water needs (CHWN). The remaining volume was used for meeting carryover and other commitments. By the end of May 2010 the total volume available improved to 1,354 GL and a total of 114.5 GL was only used to supply CHWN. This was lower than 201 GL due to the improvements in Mount Lofty Ranges inflows.

6.1.1 Impact of Low Flows to South Australia

2009–10 was the third successive year in which South Australia received less than its full normal annual Entitlement Flow of 1,850 GL.

The riverine and Lower Lakes environments in South Australia have suffered from the lack of high flows since 2000-01 and in particular since 2006–07. In 2009–10 the flow to South Australia was significantly constrained between July and December at only 60% of the normal Entitlement Flow for that period. From January 2010, South Australia was able to take full Entitlement Flows for the remaining 6 months of the water year due to improvements in the River Murray system and Menindee Lakes/Lower Darling River inflows. The delivery of full Entitlement Flows commenced the refilling of the Lower Lakes.

Water levels in Lake Alexandrina improved from the historically low level of minus 0.93m AHD in January to minus 0.3m AHD by the end of May 2010 following delivery of the 881 GL.

Large areas of the floodplain have not received water for a decade and continued decline of floodplain vegetation occurs, although a number of watering events have occurred via pumping.

A total of 1,690 GL flowed to South Australia including large volumes of water for environmental purposes to Lakes Alexandrina, Albert and the Goolwa Channel. A total of 881 GL was delivered to Lake Alexandrina from a number of different sources, including water sourced from:

- Initial Menindee Lakes releases under the Basin Officials Committee (BOC) agreement;
- Commonwealth Environmental Water Holder water;
- Environmental reserve provided by the South Australian River Murray Drought Water Allocation Decision Framework;
- Dilution and Loss flow from South Australia;
- The Living Murray (TLM) Water from Menindee Lakes; and
- Entitlement Flow provided by the South Australian River Murray Drought Water Allocation Decision Framework.

6.2 River Murray Water Management 2009–10

A small initial allocation of 2% of entitlement for River Murray entitlement holders was announced on 1 July 2009 as a result of low water resource availability. As South Australia's allocation from the shared resources improved, the allocation was increased to 62% of entitlement on 1 March 2010. The late allocation announcement resulted in significant volumes of water being carried over into 2010–11.

This was the seventh consecutive year when entitlements have been restricted from the beginning of a water year.

South Australia implemented the River Murray Drought Water Allocation Decision Framework for the 2009–10 water year. A number of changes occurred to the Framework in October 2009 and March 2010 to enable a change in the allocation of water for general allocations and the environment in response to the repayment of advances and improved water resource availability.

A total of 390 GL was carried over into 2009–10, including 240 GL for Critical Human Water Needs (including 39 GL for 2010–11), 50 GL for the Lower Lakes Environmental Reserve and 100 GL for general allocations. This was the third time that carryover of unused allocation had been permitted in South Australia.

6.3 River Murray Water Use

Total South Australian diversions from the River Murray for 2009–10 were 480.4 GL, which is the second lowest diversion since the introduction of the Cap. This compromised:

- 56.9 GL for Metropolitan Adelaide and associated country areas;
- 37.6 GL for Country Towns;
- 14.3 GL for the Lower Murray Swamps (including ELMA, which is restricted to the same percentage as irrigation allocations);
- 350.6 GL for metered consumption under the All Other Purposes Cap component; and
- 21 GL for non-metered consumption under the All Other Purposes Cap component.

Significant restructuring of irrigation areas in the Riverland continued in response to low commodity prices and incentives for irrigators to exit the industry, which resulted in some water entitlements being transferred to the Commonwealth Government as part of the *Water for the Future* irrigation entitlement buyback scheme.

Below Lock 1, irrigation was again restricted due to low water levels. The Lower Murray Reclaimed Irrigation Area (LMRIA) continued to suffer from low water levels and the majority of irrigators could not access water until later in 2009–10 when water levels started to improve.

Other issues such as cracking of levee banks and irrigation bays also forced irrigators to change irrigation methods and location of water use. The LMRIA has experienced a gradual "drying out" of irrigation bays due to low allocations and water levels. This drying out, along with low water levels, has caused major cracking in some

areas. Irrigation in these areas has now been avoided and water has been traded out and/or irrigation moved to the adjacent highland areas. There has been a major shift from traditional flood irrigation to focussing on growing pasture in the highland areas and feedlot operations. The long-term future of irrigation in this area is currently being addressed through a number of projects as a large volume of entitlement has been permanently traded out of the area during the drought.

6.4 Metropolitan Adelaide and Associated Country Areas

The Metropolitan Adelaide Water Supply System utilises two major water resources: natural catchment inflows into the Mount Lofty Ranges storages; and the River Murray.

Normally the Mount Lofty Ranges are the primary source of water because of the significant costs of pumping water from the River Murray over the Mount Lofty Ranges. The Mount Lofty Ranges storage level is the major factor influencing the amount of water to be pumped from the River Murray. Inflows into the Mount Lofty Ranges Reservoirs improved during spring and as a result only 56.9 GL was pumped from the River Murray. The level 3a enhanced water restrictions remained in place during 2009–10, which includes outdoor water use. In an average year approximately 45% of the water is sourced from the River Murray, but depending on climatic conditions this can be up to 90% in extremely dry years.

Natural inflows into local reservoirs were 143.3 GL and 15 GL was spilt, therefore the useable inflow was 143.3 GL during 2009–10 and as a result 56.9 GL was diverted from the River Murray to supply both Metropolitan Adelaide and other water users located above the reservoirs.

The five-year rolling total (excluding the "First Use Licence" component) diversion for the Metropolitan Adelaide is 556.8 GL, which is 93.2 GL less than the 650 GL limit. The 2006–07 diversion was high due to the additional 60 GL pumped during that year for use during 2007–08 and the 2008–09 pumping was correspondingly less.

6.5 Country Towns

Country Towns used 37.6 GL in 2009–10 and a base allocation of 31 GL was provided to SA Water. To cover the shortfall between the First Ministers endorsed allocation of 31 GL and the total water used, SA Water leased a total of 6.6 GL of unused allocation on the temporary water market.

Outdoor watering restrictions continued to apply to Country Towns water customers. Many of the Country Towns do not have an alternative water supply and are therefore totally reliant on River Murray water.

6.6 Lower Murray Swamps

The Lower Murray Reclaimed Irrigation Areas (LMRIA), located between Mannum and Wellington, were formerly wetlands that were permanently connected to the River Murray. The Cap on the Lower Murray Swamps was agreed in 2001 by Ministerial Council and was based on recognised best irrigation practice applied to approximately 5,000 hectares of former wetlands as well as an additional 780 hectares of the adjoining highland.

Water allocations within the LMRIA have been treated in the same manner as all other irrigation licences, and were set at 62% for 2009–10. A total of 14.3 GL was diverted for irrigation and ELMA use in 2009–10 and this

Table 6.1: Metropolitan Adelaide Cap Assessment

	2005-06	2006–07	2007–08	2008–09	2009–10	Total
Gross Diversion	73.9	203.1	89.4	149.5	56.9	572.8
First Use Licence	16.0	0.0	0.0	0.0	0.0	16.0
Rolling Diversion Against 650 GL Cap	57.9	203.1	89.4	149.5	56.9	556.8
Five Year Cap						650.0
Amount Below Limit						93.2

includes an estimated 7 GL of non-metered use. The 7 GL was calculated by applying the percentage of metered use against the restriction and trade adjusted annual Cap target, which represented 28%.

6.7 All Other Purposes of water from the River Murray

Total usage under the All Other Purposes component of the Cap during 2009–10 was 371.6 GL (including 21 GL for non-metered Stock and Domestic use), or 83% of the long-term average diversion Cap for the All Other Purposes of 450 GL.

This reflects the impact of the restrictions applied to this Cap component. Due to significantly reduced water availability, a maximum allocation of 62% was made available for South Australian River Murray irrigators in March 2010. After this date no further allocations were announced in line with the decision by BOC.

A Cap Model for the All Other Purposes diversions has been developed to enable a comparison of diversions with an annual climate adjusted Cap target. The Cap model for the All Other Purposes is a regression model in which the historical monthly demands are adjusted (de-trended) to reflect 1993–94 levels of development. An annual Cap target is then derived through regression of the de-trended data with rainfall and temperature data from Berri and Loxton and scaled up by 449.9/440.6 GL to account for the transfer of 9.3 GL from the Lower Murray Swamps Cap.

The climate adjusted Annual Cap Target for 2009–10 based on this model was 485.9 GL. This figure is then adjusted to take into account the final announcement of 62% allocation. The climate and restriction adjusted Cap for 2009–10 is 309 GL. In addition, there was an adjustment of 291 GL to allow for temporary and permanent trade adjustments excluding the transfer of environmental water. There was also a -83 GL environmental adjustment for the use of environmental entitlements. This includes 53 GL of water delivered under The Living Murray (TLM) program and 29.5 GL delivered by Commonwealth Environmental water holder.

Of this volume 66.7 GL was sourced from interstate and is included in the trade adjustment. The volume of TLM water recovered within SA, which has been carried over until next year will reduce the Cap when it is used.

The cumulative cap credit generated for 2009–10 is 145.8 GL and the cumulative Cap credit since 1997–98 is now 761.9 GL.

6.8 Water Trade

Significant trading of interstate temporary allocations into South Australia occurred during 2009–10. This trade was due to irrigator reaction to the ongoing drought conditions, a slow start to seasonal allocations and entitlement holders purchasing water for carryover into 2010–11.

This resulted in a net 252.6 GL of water being temporarily traded to South Australia's bulk water account from interstate. South Australia only traded 22 GL outside the state. Some of the temporary trade from South Australia to Victoria was required as a back trade to give effect to a number of decisions of BOC in relation to Menindee Lakes releases. Sometimes trades can result in state owing water because NSW and Victoria supply the water to South Australia equally. This approached allows a method to be applied where there are no negative impacts created to a state's water share.

As these trades do not constitute a transfer of Cap, they have been subtracted from the temporary trade figure. Table below provide details on the temporary trades including the sources for the 2009–10 water year.

Table 6.2: River Murray Interstate Water Trade 2009–10

Interstate Trade	Temporary Trade (GL)
From SA to Victoria	17.8 GL
From SA to NSW	4.2 GL
Total out of SA	**22 GL**
Into SA from Victoria	64.4 GL
Into SA from NSW	210.2 GL
Total into SA	**274.6 GL**

Table 6.3: Environmental Transfers and BOC decisions that are included in the Temporary Trade but do not constitute a transfer of Cap to SA

	(GL)
Transfer of water associated with BOC Decisions	17.724

In addition the cumulative permanent trade adjustment for 2009–10 was 32.4 GL to South Australia and 3.9 GL from South Australia.

6.9 Environmental Water Use

In addition to the 766 GL delivered to the Lower Lakes, other watering activities were undertaken at a number of locations above and below Lock 1 including a number of sites that received water via pumping.

The total use of environmental allocations was 132.6 GL and the volume by which the Cap is reduced for Environmental entitlements and use was 82.6 GL.

7. REVIEW OF 2009–10 WATER USE IN QUEENSLAND

7.1 Water Planning and Management Overview

Queensland has water resource plans (WRPs) in place in all its Murray-Darling Basin catchments. WRPs provide a framework with a strong legislative basis that limits diversions from watercourses, lakes, springs and overland flows, provides for water trading and requires monitoring and reporting of the achievement of plan outcomes. The focus of these plans has been initially on surface water but will extend in the future to consider and incorporate groundwater in priority areas as additional information and improved methods to address its sustainability become available.

The WRPs for Murray-Darling Basin catchments originally included, where available, the identification of unallocated water to address critical future water requirements. In September 2008, Queensland announced the gifting of 10.6 GL of this unallocated water to the Commonwealth Government leaving only 5.5 GL held in reserve. Water allocations were formally granted to the Commonwealth in January 2010. Queensland is currently developing a method of accounting for water purchased by or gifted to the Commonwealth Environmental Water Holder in Cap reporting.

Resource operations plans (ROPs) implement the provisions of WRPs and have been in place for the Moonie, Warrego, Paroo, and Nebine catchments since January 2006, and the Queensland Border Rivers catchment since March 2008. The Condamine and Balonne Resource Operations Plan was finalised for the upper and middle parts of the plan area, excluding the Oakey-Gowrie Creek sub-catchment, on 12 December 2008. The plan was amended on 26 March 2010 to include the Lower Balonne area. Arrangements for the Oakey-Gowrie Creek sub-catchment have been excluded due to complexities associated with the re-use of water released from Toowoomba's waste water treatment plant. It will be included in the ROP through a later amendment.

ROPs largely manage the take of water from watercourses in the Queensland Murray-Darling Basin through limits stated on entitlements and water sharing rules. The take of overland flow water is managed through regulation of works under the *Sustainable Planning Act 2009* and limits on entitlements.

7.1.1 Moonie, Warrego, and Paroo Rivers and Nebine Creek

This is the fourth year in which Cap arrangements have been in place for the Moonie, Warrego, Paroo, and Nebine catchments. Cap models have been reviewed by the independent auditor and agreed changes have been incorporated into the model. Queensland has received a formal request from the Murray-Darling Basin Authority to improve the representation of overland flow take in the Moonie, Warrego, Paroo and Nebine Cap models. Queensland will be discussing the matter further with the Authority but at this stage is not considering any further review of the models pending release of a final Basin Plan.

Diversions reached 56% of the Cap target for the Moonie catchment, 16% for the Warrego, 99% for the Paroo and 10% for the Nebine catchment for the 2009–10 water year.

7.1.2 Border Rivers

A Cap proposal for the Queensland Border Rivers was noted by the Murray-Darling Basin Authority (Chief Executive acting as the Authority) on 26 March 2009 and further noted by the Murray-Darling Basin Ministerial Council at Meeting 1 on 29 May 2009. The Cap model has been submitted to the Murray-Darling Basin Authority for review by an independent auditor and accreditation.

Diversions reached 73% of the Cap target for the Border Rivers catchment for the 2009–10 water year.

An Intergovernmental Agreement that deals with interstate water sharing and access arrangements has been negotiated between Queensland and New South Wales. The access and sharing arrangements outlined in an interim agreement for the shared Border Rivers watercourses were introduced on a trial basis in 2005-06 and have been continued with some modification under the New South Wales – Queensland Border Rivers Intergovernmental Agreement 2008, which was formally finalised by the two state governments early in 2009.

7.1.3 Condamine and Balonne

A Cap proposal for the Condamine and Balonne catchment has been prepared and will be submitted to the Murray-Darling Basin Authority in October 2010. Once the Cap figure has been agreed, water use in the plan area will be audited annually to monitor compliance with the Cap. The Cap model will be submitted for review by the independent auditor and accreditation following submission of the Cap proposal to the Murray-Darling Basin Authority.

7.1.4 Metering

Queensland released a policy on metering water extractions in May 2005, providing a framework for metering across the State. The policy includes metering standards, details of ownership, maintenance and reading of meters, and proposed charging arrangements. The metering project will see the staged introduction of water metering for all un-supplemented water extractions across Queensland over the coming years.

Queensland has commenced metering projects in the Moonie, Warrego, Paroo and Nebine resource operation plan areas. Larger installations deferred pending resolution of issues associated with the National Standards for metering were intended to be installed in 2009–10 but were postponed due to weather conditions.

Metering of un-supplemented water allocations in the Border Rivers catchment is complete. Site assessments have commenced in the Condamine and Balonne catchment and installation of meters is projected to occur in 2011.

7.1.5 Water Use Efficiency (WUE)

The fourth stage of the Rural Water Use Efficiency Initiative (RWUEI) began in July 2009, with $4.5 million available from the Queensland Government over four years.

The RWUEI makes funds available to the major rural industry groups involved in irrigation for programs which focus on water use and energy efficiency. Funding of industry programs is on the basis of agreed milestones and targets being achieved. Limited financial incentives are also available in certain cases to help irrigators improve their on-farm water management.

The initiative invests in an Industry Development Officer employed by Irrigation Australia Limited to improve the standards of service delivery by irrigation consultants, contractors, suppliers and installers in Queensland.

Further information is available on the RWUEI web site at http://www.derm.qld.gov.au/rwue/

7.2 Stream Flow and Water Use Overview

The summer period (November 2009 to March 2010) resulted in above average rainfall in many parts of the Queensland section of the Murray-Darling Basin. Annual rainfall was above average in the western Murray-Darling Basin catchments within Queensland but below average in the eastern catchments.

A key feature of the 2009–10 summer was the continuity of flow that occurred due to multiple rainfall events occurring in December, February and March. The main events included:

- December 2009 – tropical cyclone Laurence caused a low pressure system to bring heavy rainfall and stream flows to central and western Queensland.
- January 2010 – the Warrego, Paroo, Moonie, Border Rivers and Maranoa (sub-catchment of the Condamine and Balonne) catchments experienced minor to moderate flooding as a result of continued rainfall.
- Early February 2010 – tropical cyclone Olga caused moderate to heavy rainfall leading to major flooding in the Condamine and Balonne Rivers and continued moderate flooding in the Paroo and Warrego Rivers.

- Late February and March 2010 – an exceptional monsoonal rain influence over parts of Queensland and the Northern Territory brought two days of rainfall on 1 and 2 March 2010, with totals exceeding 100 mm/day, the largest area of 100 mm plus daily totals in the Australian meteorological record. This level of rainfall on an already wet catchment brought record peak floods to all but one of the Queensland Murray-Darling Basin catchments.

The 2009–10 water year resulted in record river flows:

- Paroo River – record floods above Hungerford near the NSW border with flows peaking at 153 GL/day at Caiwarro.
- Moonie River – highest flooding on record in the lower reaches.
- Warrego River – record highest flooding in the township of Charleville, with regional flooding highest since 1990.
- Maranoa River – highest flooding in 20 years.
- Balonne River – record highest flooding in the township of St George, likely the highest flooding for 120 years.
- Upper Condamine River – substantial flows but no flooding.
- Border Rivers – the only Queensland catchment in the Murray-Darling Basin not to experience major flooding during this period, with flooding only in the lower reaches upstream of Mungindi due to significant flows in the Weir River.

Rain eased in April, although flooding continued in the Balonne River system until late in the month. Rainfall in May and June was generally below average across the Queensland Murray-Darling Basin catchments.

The continuous flows in most of Queensland's streams through summer and beyond provided exceptional water harvesting and overland flow harvesting opportunities, particularly in the Balonne, with total diversions in the Queensland Murray-Darling Basin estimated at 1,232 GL, 78% of which was taken from the Lower Balonne. The record flooding in March 2010 provided exceptional overland flow harvesting opportunities with a total of 398 GL taken in the 2009–10 water year, 94% of which was taken in the Lower Balonne in February and March 2010.

Diversions are comprised of two components: diversions from streams and overland flow harvesting. **Table 7.1** summarises the stream diversions from the Queensland Murray-Darling Basin catchments and the annual flow volumes as measured at key sites for 2009–10. Flows were generally well above the average long term

Table 7.1: Summary for Queensland catchments 2009–10, excluding overland flow

Catchment (gauging station in brackets)	Flow 2009–10 (GL)	Mean Annual Flow (GL)	Diversion 2009–10 (GL)
Condamine and Balonne			
Condamine (Chinchilla)	198	509	65
Condamine/Balonne (Weribone)	2,496	1,092	18
Maranoa (Cashmere)	588	127	2
Lower Balonne (St George)	3,640	1,072	587
Border Rivers			
Granite Belt (Farnbro)	4	74	4
Macintyre/Barwon (Goondiwindi)	193	732	81
Weir (Talwood)	182	138	36
Moonie (Fenton)	472	148	28
Nebine (Roseleigh)	110	Only gauged since 2007	<1
Warrego (Cunnamulla)	1,839	473	12
Paroo (Caiwarro)	2,040	553	<1
		TOTAL	**834**

mean figures, except in the upper reaches of the Condamine and Border Rivers. The high stream flow has resulted in the second highest stream diversion figures since recording began in 1993.

The end of system flows from Queensland Murray-Darling Basin catchments for the year totalled 6,242 GL (**Table 7.2**), compared with 391 GL in 2008–09, highlighting the extreme variability inherent in this part of the Basin.

The level of flow experienced across all catchments, except the Border Rivers, was well above average resulting from the high rainfalls between December and March.

Table 7.2: Cross border flows

Valley	Flow (GL)
Paroo	2,040
Warrego	1,839
Nebine	110
Condamine-Balonne	1,546
Moonie	472
Border	235
Total	**6,242**

Stream diversion across all catchments is estimated to be 834 GL, made up of a combination of supplemented diversion (take from regulated flow associated with public storages under the authority of a water allocation) and unsupplemented diversion (take primarily from water harvesting practices).

Overland flow, in the form of upland flow capture, on-farm rainfall runoff and floodplain diversions, are not included in the diversion figures in Table 7.1. Overland flow diversion has been assessed either from modelling or appraisal by departmental officers in the key areas where water harvesting and floodplain diversion operate together, and it has been estimated that a further 398 GL of diversion has occurred. Total diversion across all catchments from streams and overland flow for 2009–10 is estimated to be 1,232 GL.

Diversions in Queensland are highly variable owing to the ephemeral nature of flow in its streams. For example, the 2009–10 stream diversion of 834 GL contrasts distinctly from the 321 GL stream diversions for 2008–09.

Table 6 shows stream diversion levels for the total Queensland Murray-Darling Basin catchments over the past 17 years. The 834 GL diverted in 2009–10 had an associated cross border flow of 6,242 GL, comparing favourably with 2007–08, when 876 GL of water was diverted from streams in the Queensland Murray-Darling Basin catchments with 3,271 GL of water flowing into NSW.

Public storages are comparatively few in both volume and number across the Queensland Basin valleys. Around one third of these storages are used solely for urban supplies, with many of the other storages also used in part to supply urban needs.

There was significant inflow into public storage infrastructure in the western catchments during the 2009–10 water year. However, storages in the eastern parts of the Basin did not benefit from the high level of rainfall and resultant stream flows, with Cooby Dam (near Toowoomba), Leslie Dam (near Warwick), Glenlyon and Coolmunda Dams (west of Stanthorpe) all below 22% capacity at the end of the year.

7.3 Warrego

Monthly rainfalls in October, December, February and March were significantly above average and total rainfall recorded at Cunnamulla for the 2009–10 year was 639 mm compared to an average annual rainfall of 370 mm.

Average annual flow at Cunnamulla is 473 GL. Stream flow for the Warrego River at Cunnamulla for the 2009–10 water year was a record 1,839 GL, 70% of which occurred in March. This surpassed the previous highest recorded flow of 1,765 GL in 2007–08 and is well in excess of the 2008–09 total of 44 GL.

The normal summer flow pattern in the Warrego River continued, with substantial flows in the months of January, February and March 2010.

Supplemented water diversion in this catchment is limited to a small water supply scheme based on a 4.8 GL weir on the Warrego River at Cunnamulla. The announced allocation (AA) at the start of the 2009–10 water year from the

Cunnamulla Weir Water Supply Scheme was 69%. The AA was increased to 77% on 5 August 2009 and then to 100% on 23 November 2009. Supplemented diversion was 1.4 GL out of a total entitlement of 2.6 GL.

The take of unsupplemented water within this catchment must be in accordance with stated flow conditions at a specified reference point. Diversion of unsupplemented water for the 2009–10 water year was 10.5 GL.

There were three announced periods to take unsupplemented water in the Lower Warrego Water Management Area for 2009–10. The first event commenced in the previous water year and the third began in early January and continued into the next water year.

While the majority of works are equipped with water meters, metering the larger works has been deferred until National Standards had been finalised. The Queensland Department of Environment and Resource Management (DERM) is intending to complete metering on these works in late 2010. Meters will be installed in accordance with manufacturer's specifications if pattern approvals are not available. Water use assessments are currently completed for each of these works.

Overland flowtake from floodplain flows for the catchment is estimated at 3.5 GL based on a broad assessment of infrastructure development and opportunity.

Annual diversion of 15 GL was 16% of the Cap target of 94 GL. Water entitlement holders did not fully avail themselves of the access opportunities provided during the year for a number of reasons, including property development works and entitlements not fully developed.

7.4 Paroo

Rainfall recorded for 2009–10 at Hungerford in the southern part of the Paroo catchment was 463 mm. This was more than double the total recorded last year and well over the long-term average of 297 mm. The peak monthly rainfall received was in February with 153 mm falling, against the long term median for February of 18 mm.

The volume of flow passing the Caiwarro gauging station, which is located on the Paroo River upstream of the Queensland – New South Wales border, was recorded as 2,040 GL for the 2009–10 water year. This is well in excess of the average annual flow of 553 GL (1968 to 2010) at Caiwarro and significantly greater than the 140 GL recorded in the 2008–09 water year. The main flows ranged from 49 GL in November to 1,209 GL in March.

No supplemented water supply exists in this catchment. There are only two unsupplemented water allocations in the Paroo catchment. Diversion was 0.07 GL.

Overland flowtake from floodplain flows for the catchment is estimated at 1.5 GL based on a broad assessment of infrastructure development and opportunity.

The annual diversion of 1.57 GL was 99% of the 2009–10 cap target of 1.58 GL.

7.5 Nebine

Rainfall was well above average in the Nebine catchment with 520 mm recorded at Mulga Downs for the 2009–10 water year against an average of 397 mm. The peak monthly total of 184 mm was recorded in March 2010.

Mean annual flow from the Nebine catchment (including the Noorama and Widgeegoara creeks) is estimated at 33 GL per year. Flows either terminate on floodplains or discharge into the Culgoa River in New South Wales.

The new gauging station installed at Roseleigh Crossing (on Nebine Creek) now has three full years of recording. This gauging station is 10.5 km upstream of the Queensland/New South Wales border. A number of small flow events were recorded at Roseleigh Crossing station, during the summer December to March period. A single large event occurred in March 2010 in Wallam Creek at Cardiff, upstream of Bollon.

Flows in Wallam Creek at Cardiff and Nebine Creek at Roseleigh for 2009–10 totalled around 145 GL and 110 GL respectively.

No supplemented water supply exists in this catchment. There are only four unsupplemented water allocations in the Nebine catchment. Diversion for irrigation was 0.9 GL. Overland flow take from floodplain flows for the catchment is estimated at 0.1 GL based on a broad assessment of infrastructure development and opportunity.

Annual diversion of 1 GL (including overland flow take) was only 10% of the Cap target of 9.7 GL.

7.6 Moonie

Rainfall was average across the catchment during 2009–10. Rainfall in Nindigully, located on the Moonie River in the south west of the catchment, was 503 mm for the year, compared to the average of 516 mm. However, the peak monthly total of 202 mm recorded in March was the highest total for that month since recording began in 1916.

Streamflow for the Moonie River at Fenton, the most downstream gauge in Queensland, was 472 GL in 2009–10. This was more than three times the recorded annual average at this site of 142 GL.

There were a number of small flows from January to February with a subsequent large flow peaking at nearly 48 GL a day in March. Record flooding at this time provided opportunity for floodplain harvesting.

No supplemented water supply exists in this catchment. The majority of the 33 water allocations in this catchment have flow conditions that relate to take of unsupplemented water from watercourses (water harvesting). Diversion for 2009–10 has been estimated at 28 GL, with take primarily occurring in January, February and March.

Take is measured by metered works, however metering of some of the larger works was deferred until National Standards had been finalised. DERM is intending to complete metering on these works in late 2010. Meters will be installed in accordance with manufacturer's specifications if pattern approvals are not available. Water use assessments are currently completed for each of these works.

Overland flowtake from floodplain flows for the catchment is estimated at 15 GL based on a broad assessment of infrastructure development and opportunity. Overland flow take is included in the Cap volume for the Moonie catchment.

The 2009–10 annual diversion for the Moonie catchment was 43 GL (including the floodplain component of overland flow), which was only 56% the Cap target of 76 GL.

7.7 Queensland Border Rivers

Rainfall was generally below average across the Border Rivers catchment for the year. The upper catchment around Stanthorpe recorded 565 mm of rainfall compared to an average of 765 mm. The lower catchment around Goondiwindi recorded 423 mm of rainfall for the year compared to an average of 621 mm, with 158 mm of the annual total falling in March.

On the Dumaresq River the flow passing during the water year was 3.6 GL compared to an average annual flow of 74 GL. There were three flow events in the water year with the largest peaking at 0.3 GL/day.

Nearly 28 GL passed through Macintyre Brook compared to an average annual flow of 89 GL. There was one major flow event during March 2010 which peaked at 5.3 GL/day.

The flow passing during the water year on the Weir River was 182 GL compared to an average annual flow of 138 GL. There was one major flow event during March 2010 which peaked at 11.1 GL/day.

On the Macintyre River the flow was estimated at 193 GL compared to an average annual flow of 732 GL. There was one major flow event during March 2010 which peaked at 27.5 GL/day.

There are two major water supply storages in the Queensland part of the Border Rivers catchment. At 1 July 2009, Glenlyon Dam, the major storage for the Borders Rivers Water Supply Scheme (BRWSS), was at 24 per cent of capacity with around 15 GL available for general use from the Queensland share of the storage. The storage finished the year at 22 per cent of capacity with around 11 GL available for general use from the Queensland share.

Coolmunda Dam on Macintyre Brook is the major storage for the Macintyre Brook Water Supply Scheme. This scheme now operates on continuous accounting. Coolmunda Dam started the year at just under 40 per cent of capacity (27.6 GL) with 13.5 GL in storage accounts and, despite small inflows in March, finished the year at 13 per cent of capacity.

In the 12 months to 30 June 2010, 23 GL of supplemented water, including 2 GL for urban use, was diverted within the Border Rivers Water

Supply Scheme. This included supplemented take from releases from Glenlyon Dam, run of the river flows and 6 GL of bulk water supply provided from the Macintyre Brook Water Supply Scheme. The take of water transferred from NSW (9 GL net) is also included in the total.

A total of 13 GL of supplemented water was diverted in the Macintyre Brook Water Supply Scheme.

Moderate flows in January and March, triggered water harvesting access under the water sharing rules on the Border Rivers with 43.5 GL diverted over the two events. The March flows mostly originated from the Weir River and principally benefited the lower part of the Border Rivers catchment. Although in excess of 100 GL was made available to water users from the event, take was limited by available storage capacity to just over 20 GL. Waterharvesting thresholds were also triggered in the Weir River with 35.7 GL diverted in this catchment.

A further 4.4 GL was diverted for water harvesting and direct irrigation purposes in the Granite Belt, and 0.8 GL of unsupplemented water was taken for urban use, taking the total unsupplemented diversions in the Border Rivers to 84.4 GL for 2009–10.

The majority of diversion in this catchment is metered. Essentially all take under water allocations is metered and take under water licences (mostly area licences in the Granite Belt) is primarily unmetered.

An estimated 1.4 GL of overland flow water was taken during floodplain harvesting in the Border Rivers and Weir River catchments, bringing total diversions in the Border Rivers catchment to 122 GL, 73% of the Cap target of 167.1 GL.

7.8 Condamine-Balonne

The Condamine and Balonne Resource Operations Plan was amended on 26 March 2010 to include the Lower Balonne part of the catchment. A Cap proposal will be presented to the Independent Audit Group at their meeting with Queensland on 29 September 2010 and then submitted to the MDBA in October 2010. Comparisons with Cap targets are likely to be possible for the 2010–11 year.

7.8.1 Condamine

Rainfall was generally below average across the Condamine area. Annual rainfall across the area varied from 475–525 mm against an average of 670 mm. There were generally good falls in the western areas from December onwards, but the February-March event dominates the generally below average rainfalls to the east.

The flow events in February and March 2010 passed along the entire Condamine system. A small event occurred in the lower catchment at this time, though this was generated primarily by tributary inflow. All events were sufficient to provide access to water harvesting.

A total of 634 GL passed Cotswold, at the end of the Condamine system, in 2009–10, compared to the long term average of 609 GL. The flow past Chinchilla (located upstream) for the same period totalled 198 GL.

The major storage for the Upper Condamine Water Supply Scheme, Leslie Dam, started the year at 13 per cent capacity and, with only minor inflow recorded, finished at 9 per cent. No irrigation water was supplied from the storage during the year. The storage remains at critical levels with total capacity reserved for town water supply for the town of Warwick.

Chinchilla Weir started the year at 70 per cent capacity and filled in the March flow events. The weir finished the year at 78 per cent. Announced allocation (AA) for the Chinchilla Weir Water Supply Scheme was 100% for high priority water allocations and 15% for medium priority water allocations at the start of the water year. The AA for medium priority water allocations was increased to 60% on 11 February 2010 and then to 100% on 3 March 2010 as the result of inflows into Chinchilla Weir.

A total of 20 GL of supplemented water was diverted in the Condamine catchment in 2009–10, with 17 GL diverted in the Upper Condamine scheme, including 1 GL for urban use and 2.7 GL at Chinchilla. The volume diverted in the Upper Condamine was totally from run of the river flows which are made available for diversion subject to minimum flow conditions.

Four flows triggered water harvesting access along the trunk stream and three periods of flow provided access in tributaries in the lower section of the Condamine. There were four water harvesting events announced between January and mid-March 2010 in the Upper Condamine Water Management Area.

The volume of un-supplemented water taken over 2009–10 is estimated at 62.8 GL with the majority of take occurring upstream of Chinchilla Weir. About 11 GL of this total was diverted for direct irrigation with 3.8 GL taken from flows supplemented by treated effluent discharged from Toowoomba into the Gowrie-Oakey Creek system. An additional 0.4 GL was taken for urban use.

About 50 per cent by volume of water harvesting diversion in the Condamine catchment area is metered.

An estimated additional 2 GL of overland flow water was taken through floodplain harvesting on the Upper Condamine Floodplain, bringing total diversions in the Condamine to 85 GL.

7.8.2 Balonne

Rainfall in the Balonne and Maranoa was above average and heavily influenced by the monsoonal systems in the summer months and through into March. Rainfall across the area was typically 150 to 250 mm above the 500 to 550 mm average for the year with up to 300 mm occurring in February and March.

Well above-average rainfall recorded in February and March resulted in a moderate flow in February and record flows in March in the upper Balonne (comprising flow through from the Condamine plus tributary inflow). Flows were minimal for the remainder of the water year. The Maranoa had a similar pattern of flows and recorded a 588 GL passing flow for 2009–10 compared to an annual average of 127 GL.

Beardmore Dam started the year at 75 per cent. The dam had no inflow for the first six months of the 2009–10 water year, but filled and over-topped in February, March and April, finishing the year at 85 per cent.

Inflows up to 730 ML per day may be passed downstream for environmental, stock and domestic purposes, or are sometimes held in storage for later release to maximise the benefit to downstream water users. A total of 66 GL of environmental, stock and domestic pass flow was released downstream over five events.

A total of 87 GL (including 0.02 GL from the Maranoa Water Supply Scheme) was diverted from the water supply schemes as supplemented water.

High flows in the Balonne in February and March resulted in the triggering of flow condition based water allocations. Total estimated take in the Lower Balonne is 500 GL, taken over two announced periods. Flooding in the Lower Balonne in February and March allowed an additional take of 375 GL in floodplain harvesting.

An additional 2 GL of water was taken in the Maranoa catchment, bringing total diversions in the Balonne to 964 GL.

Table 6: Water Diversions in Queensland since 1993–94

Year	Diversion (GL)
2009–10	1232
2008–09	383
2007–08	1054
2006–07	160
2005-06	316*
2004-05	392*
2003-04	815*
2002-03	214*
2001-02	341*
2000-01	688*
1999-00	541*
1998-99	609*
1997–98	741*
1996-97	467*
1995-96	520*
1994-95	176*
1993–94	338*

Notes: Water year reported prior to 2006 was 1 October to 30 September. Water year reported post 2008 is 1 July to 30 June.
* Diversions do not include take of overland flow water

8. REVIEW OF 2009–10 WATER USE IN THE AUSTRALIAN CAPITAL TERRITORY

8.1 Review of Water Use in the Australian Capital Territory

The ACT experienced significantly lower than average rainfall during 2009–10 and lower water inflows. Urban water restrictions were in place for all of the reporting period, stage 3 water restrictions were applied for the whole year. The maintenance of water restrictions was the result of lower rainfall and below 50% capacity of the ACT storage levels. In general water storages supplying the Canberra and Queanbeyan urban water supply remained below 50%. Inflows improved during the last quarter of the year (since the start of the next water year there has been marked increase in rainfall and inflows).

An ACTEW corporation analysis reveals that for 2009–10 from stage 3 temporary water restrictions, compared to the estimated demand from the climate adjusted model, 27.5 GL of water was saved in Canberra.

Extractions from storages for the urban supply were 45.2 GL, with returns from sewage treatment plants at 29.2 GL resulting in net urban consumption of 16 GL. Metered non urban consumption was 1.4 GL giving a total net consumption of 17.4 GL.

Consumption was significantly lower than would have been expected for the climatic conditions due to the continuing imposition of demand management arrangements and water restrictions.

8.2 Progress of Water Reforms in the Australian Capital Territory

Water management in the ACT is implemented through the *Water Resources Act 2007*. A number of amendments to improve or clarify the administration of water resource management were passed in 2010.

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 COAG in 1994 and subsequently in 2004 as the *National Water Initiative*.

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 2009–10 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. Permanent trade now occurs as tagged trade, where the entitlement remains with the originating (selling) valley, but the water use takes place in the destination valley. The cap target in the originating valley is reduced and that in the destination valley is increased by the volume of water used in the destination valley. 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 2009–10. 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: Net Water Entitlement Transfers in 2009–10

	Trade Data not affecting Cap		Trade Data affecting Cap			
System	Total Intra-valley Entitlement (Permanent) Sold[1] (GL)	Total Allocation (Temporary) Sold[2] (GL)	Net Tagged trade Inwards[3] (GL)	Net Temporary Trade Inwards[3] (GL)	Adjustment to this Year's Cap for Previous Permanent Trade (GL)	Total Trade Adjustment to this Year's Cap Target (GL)
New South Wales						
Border Rivers	0	30	0	-9	0	-9
Gwydir	102	27	0	0	0	0
Namoi/Peel	3	12	0	0	0	0
Macquarie/Castlereagh/Bogan	68	32	0	0	0	0
Barwon-Darling	0	0	0	0	0	0
Lower Darling	1	81	0	-68	0	-68
Lachlan	69	4	0	0	0	0
Murrumbidgee	154	373	0	-111	0	-111
Murray	117	388	0	-68	-2	-70
Total New South Wales	**513**	**947**	**0**	**-255**	**-2**	**-258**
Victoria[4]						
Goulburn	88	220	-9	-8	0	-
Broken	9	1	0	0	0	-
Loddon	48	35	-2	14	0	-
Total Goulburn/Broken/ Loddon[7]	**145**	**256**	**-11**	**6**	**-109**	**-101**
Campaspe[6]	32	22	-3	44	0	26
Wimmera-Mallee	2	0	0	0	0	0
Kiewa	0	0	0	0	0	-
Ovens	2	1	0	0	0	-
Murray	409	377	14	-37	0	-
Total Kiewa/Ovens/Murray	**411**	**378**	**14**	**-37**	**74**	**51**
Total Victoria	**590**	**656**	**0**	**12**	**-35**	**-23**
South Australia						
Metro-Adelaide & Associated Country Areas[5]	n/a	n/a	0	0	0	0
Lower Murray Swamps	n/a	n/a	0	-1	-29	-30
Country Towns	n/a	n/a	0	7	0	7
All Other Purposes	n/a	n/a	0	229	62	291
Total South Australia	**n/a**	**n/a**	**0**	**235**	**32**	**267**
Queensland						
Condamine/Balonne	8	9	0	0	0	0
Border Rivers	7	29	0	9	0	9
Macintyre Brook	1	2	0	0	0	0
Moonie	0	0	0	0	0	0
Nebine	0	0	0	0	0	0
Warrego	5	0	0	0	0	0
Paroo	0	0	0	0	0	0
Total Queensland	**21**	**41**	**0**	**9**	**0**	**9**
Australian Capital Territory	**0**	**0**	**0**	**0**	**0**	**0**
Total Basin	**1,125**	**1,645**	**0**	**0**	**-5**	**-5**

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.
2. The total Cap adjustment for temporary trade is comprised of the sum of net inter-valley and interstate temporary trade and unused component of permanent trade this year for each designated river valley.
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-tradable, unless the Ministerial Council determines otherwise.
6. Adjustment for Campaspe equals water transferred via Goldfields Superpipe. All other trades are effected by changing the Rochester pumped diversions
7. Goulburn/Broken/Loddon Cap adjustment reduces by the total water transferred via the Goldfields Superpipe.
8. n/a – data not available

10. WATER AVAILABILITY FOR THE YEAR 2009–10

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 used 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 evolved to encourage development of the Basin's water resources and were not well suited to being used to impose a Cap on diversions.

A key step in the process to implement the Cap is adjusting the States' allocation systems. To make Cap implementation more transparent, the water used in each valley has been compared with the quantity of water that has been allocated for use in that valley in 2009–10 (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 Continuous Accounting

In the Border Rivers, Gwydir and Namoi valleys in New South Wales and Condamine-Balonne in Queensland, continuous accounting is in operation. Under this system, water users have individual accounts, which may build up to a specified percentage of the entitlement. The account increases when allocations are made and decreases as water is used. The usage in any season is limited to a specified percentage of the entitlement. Water available under continuous accounting is reported in the fourth 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 fifth column in **Table 8**.

10.1.4 Carryover from the Previous Year

Carryover is available in a number of valleys in New South Wales, Victoria and South Australia. This enables unused allocation in one season to be carried over to the next, up to specified limits. Carryover differs from continuous accounting in that accounts are kept on an annual basis rather than a continuous one. In some valleys, carryover is cancelled as allocations approach 100% or if a storage spills and carryover can also be reduced to allow

for increased evaporations. **Table 9** shows the carryover added to the valley allocation. The net carryover from the previous season is included as column 3 in **Table 8**.

10.2 Allocated Water

The total volume of allocated water under annual accounting equals the sum of allocated water this year, carryover from previous year and water transferred into valley. Under the continuous accounting the total volume of allocated water equals balance of accounts at the end year plus the water transferred into the valley, although this may be subject to overall usage limits. The total volume of allocated water is listed in the last column of **Table 8.**

10.3 Access to Water Not in the Allocation System

10.3.1 Supplementary Access (Off-allocation) and Water-harvesting

Water is made available to irrigators in some regulated streams during periods when storages are spilling or there are unregulated flows by declarations of off-allocation periods. 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. Access to off-allocation has been discontinued in South Australia. In New South Wales, the off-allocation has been redesignated as supplementary access and requires separate licence

Water harvesting licences were issued in most Queensland streams, but the majority have now been converted into tradable water allocations. These water allocations are limited by diversion capacity, the passing stream-flow at which water allocation holder can commence to pump and volumetric limits. The total volume of surface water able to be taken in a Queensland Murray Darling Basin catchment is also limited under the catchment's water resource plan.

10.3.2 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. 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. However this availability can be limited by the low flows in the stream.

10.3.3 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 subtracted from the diversions to determine the use of allocated water. These losses are included in the fifth column of **Table 10**. For other irrigation distribution systems, such as the privatised districts in the New South Wales Murray, an allowance for the system losses has been included in the water entitlement.

10.4 Comparison of Use of Allocated Water with the Allocated Volume

The final column in **Table 10** lists the total use of allocated water. This is worked out by subtracting from the total diversions, the sum of supplementary access/water harvesting (third column), unregulated stream use (fourth column) and system losses (fifth column). In calculating the water used in Victorian river valleys, the volumes diverted from each stream have to be adjusted for the water diverted from other valleys (second column of **Table 10**). For example, in Victoria, water is physically transferred from the Goulburn Valley into the Campaspe and Loddon Valleys via the Waranga Western Channel.

In **Table 11,** allocated volumes are compared with the water used in each valley and the percentage use of the water allocated by the water authorities for diversion is presented.

Until 2003–04, efficiency of an allocation system was measured by comparing diversions with water authorised for use. In theory, it would have been possible to assess the maximum volume of water that could have been diverted under the rules that existed for the water harvesting, unregulated flow and system losses and comparing this with the volume of water used under these rules. In practice, working out this volume was too difficult, and an assumption was made that usage under these three categories equalled the volume authorised for use. This led to an overestimation of the utilisation of authorised water. This system has now been replaced with a new system of comparison of the use of allocated water with the volume of allocation. This gives a better measure of the degree of utilisation but covers only three quarters of the total diversion. The use percentages from 1997–98 to 2003–04 have been recalculated according to the new system. **Figure 7** shows the utilisation of allocations in the Basin since 1997–98.

The 2009–10 utilisation of 58% is lowest since Cap accounting started in 1997–98. This appears quite surprising given dry conditions continuing during 2009–10. But this also reflects the nature of allocation management which is inherently uncertain. If resource situation improves, improvements in allocation are progressively announced during the irrigations; but planting decisions which determine the water resources utilisation, have to be taken early in the irrigation season. The improvement in the resource availability may have come too late to be utilised. Due to the continuing dry spell, irrigators may be reluctant to take risk and unwilling to plant in anticipation of improvement in water availability. This may partly explain comparatively low utilisation.

It is expected that diversion, as a percentage of the water allocated, 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.

Figure 7: Utilisation of allocated water as percentage of the allocated volume since 1997–98.

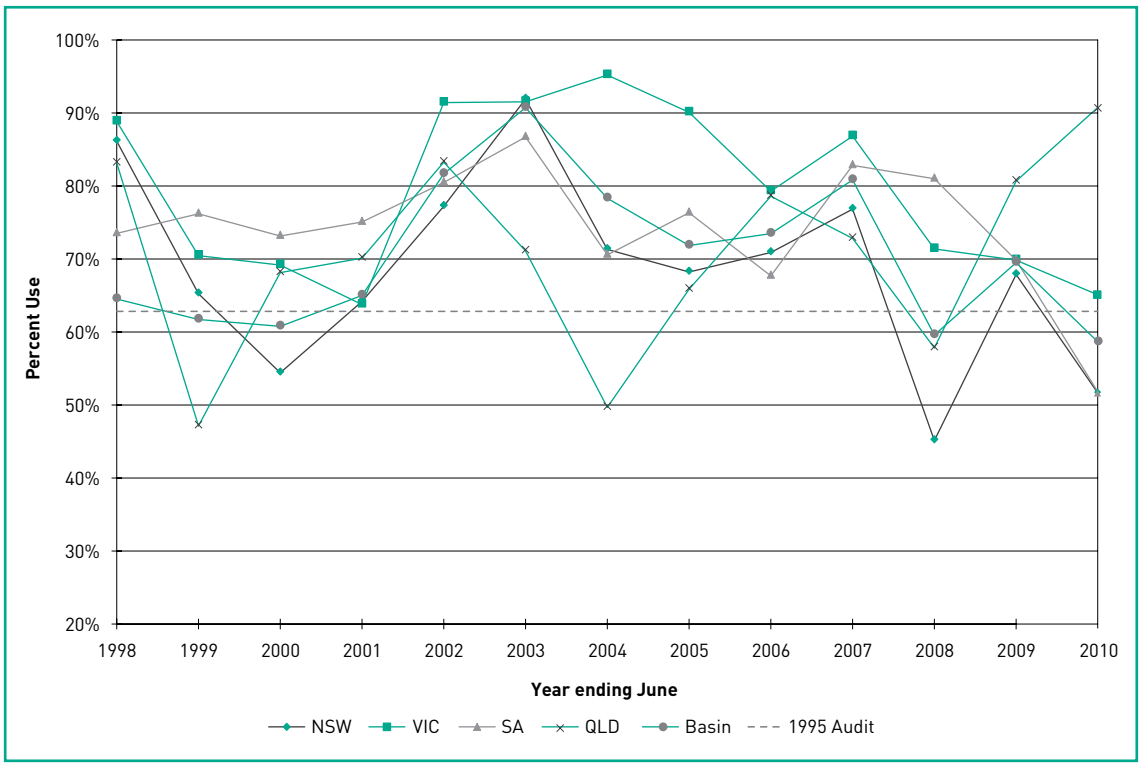


Table 8: Water Allocated in 2009–10

System	Base Valley Water Entitlement [1] (GL)	Announced Allocation [2] (GL)	Net Carryover/ Overdraw from Previous Year [5] (GL)	Water Available under continuous accounting [3] (GL)	Allocation Transferred into Valley [4] (GL)	Net water allocated to Environmental Entitlements (GL)	Total Allocated Water in Valley [6] (GL)
New South Wales							
Intersecting Streams	18	0	0	0	0	0	0
Border Rivers[3]	413	48	53	101	-9	0	93
Gwydir[3]	754	21	34	56	0	-1	54
Namoi/Peel[3]	550	63	62	125	0	0	125
Macquarie/Castlereagh/ Bogan	793	43	79	-	0	-3	118
Barwon-Darling	173	0	0	-	0	0	0
Lower Darling	347	93	5	-	-68	0	29
Lachlan	720	16	1	-	0	-1	17
Murrumbidgee	2,959	1,213	267	-	-111	-79	1,290
Murray	2,501	903	179	-	-68	-57	956
Total New South Wales	**9,229**	**2,400**	**681**	**282**	**-255**	**-142**	**2,682**
Victoria							
Goulburn	993	459	79	-	-18	-54	466
Broken	33	5	3	-	0	0	8
Loddon	248	109	12	-	12	0	134
Campaspe	405	127	16	-	41	0	185
Wimmera-Mallee	175	121	0	-	0	0	121
Kiewa	20	1	0	-	0	0	1
Ovens	63	38	0	-	0	0	38
Murray	1,782	1,092	170	-	-23	-85	1,154
Total Victoria	**3,718**	**1,953**	**280**	**0**	**12**	**-139**	**2,106**
South Australia							
Metro-Adelaide & Associated Country Areas	150	150	0	0	0	0	150
Lower Murray Swamps	47	29	0	0	-1	0	28
Country Towns	50	31	0	0	7	0	38
All Other Purposes	629	398	228	0	229	-152	703
Total South Australia	**876**	**608**	**228**	**0**	**235**	**-152**	**918**
Queensland							
Condamine/Balonne	118	112	0	0	0	0	112
Border Rivers	85	20	0	0	9	0	28
Macintyre Brook	19	13	0	0	0	0	13
Moonie	0	0	0	0	0	0	0
Nebine	0	0	0	0	0	0	0
Warrego	3	3	0	0	0	0	3
Paroo	0	0	0	0	0	0	0
Total Queensland	**225**	**147**	**0**	**0**	**9**	**0**	**156**
Australian Capital Territory[8]	**0**	**0**	**0**	**0**	**0**	**n/a**	**0**
Total Basin	**14,049**	**5,108**	**1,188**	**282**	**0**	**-433**	**5,863**

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 (e.g. in Victoria).
2. The base entitlements multiplied, where appropriate, by the largest announced percentage allocation in the season. In NSW this includes high security entitlements.
3. In continuous accounting, individual accounts can accumulate up to a specified percentage of entitlements but use can be limited to a specified percentage of entitlements during a season.
4. Net temporary inter-valley entitlement transfer from **Table 7.**
5. Net Carryover from Previous Year (see **Table 9**).
6. Allocated water = announced allocation or permitted use under continuous accounting + inter-valley trade + net carryover from last season (in NSW the addition of high security entitlements are also included).
7. The gazetted allocation for Metro Adelaide & Associated Country areas and Country Towns.
8. There is no formal entitlement in ACT to date.

Table 9: Carryovers for 2009–10

System	Carryover from 2008–09 (GL)	Less Carryover Cancelled in 2009–10 (GL)	Less Overdraw used in 2008–09 (GL)	Plus Overdraw cancelled in 2009–10 (GL)	Plus Overdraw from 2010–11 (GL)	Net Carryover for 2009–10 (GL)
New South Wales						
Intersecting streams	0	0	0	0	0	0
Border Rivers	53	0	0	0	0	53
Gwydir	35	0	0	0	0	34
Namoi/Peel	62	0	0	0	0	62
Macquarie/Castlereagh/Bogan	79	0	0	0	0	79
Barwon-Darling	0	0	0	0	0	0
Lachlan	35	33	0	0	0	1
Murrumbidgee	269	2	0	0	0	267
Lower Darling	5	0	0	0	0	5
Murray	195	17	0	0	0	179
Total New South Wales	**733**	**52**	**0**	**0**	**0**	**681**
Victoria						
Goulburn	79	0	0	0	0	79
Broken	3	0	0	0	0	3
Loddon	12	0	0	0	0	12
Campaspe	16	0	0	0	0	16
Wimmera-Mallee	0	0	0	0	0	0
Kiewa	0	0	0	0	0	0
Ovens	0	0	0	0	0	0
Murray	170	0	0	0	0	170
Total Victoria	**280**	**0**	**0**	**0**	**0**	**280**
South Australia						
Metro-Adelaide & Associated Country Areas	0	0	0	0	0	0
Lower Murray Swamps	0	0	0	0	0	0
Country Towns	0	0	0	0	0	0
All Other Purposes	228	0	0	0	0	228
Total South Australia	**228**	**0**	**0**	**0**	**0**	**228**
Queensland						
Condamine/Balonne	0	0	0	0	0	0
Border Rivers	0	0	0	0	0	0
Macintyre Brook	0	0	0	0	0	0
Moonie	0	0	0	0	0	0
Nebine	0	0	0	0	0	0
Warrego	0	0	0	0	0	0
Paroo	0	0	0	0	0	0
Total Queensland	**0**	**0**	**0**	**0**	**0**	**0**
Australian Capital Territory	**0**	**0**	**0**	**0**	**0**	**0**
Total Basin	**1,241**	**52**	**0**	**0**	**0**	**1,188**

1. Under certain conditions (such as storage spills), carryovers from the previous season can be cancelled.
2. Net carryover is defined as: carryover less cancelled carryover less overdraws used during last year plus overdraw permitted this year.

Table 10: Use of Allocated Water in 2009–10

System	Diversion from Valley (GL)	Diverted from other Valleys (GL)	Less Supplementary Access, Water-Harvesting Use and Land Surface Diversions (GL)	Less Unregulated Stream Use (GL)	Less Diversions not in Allocation (GL)	Use of Allocated Water in Valley (GL)
New South Wales						
Intersecting streams	3	0	0	3	0	0
Border Rivers	115	0	38	14	0	63
Gwydir	57	0	6	10	0	41
Namoi/Peel	170	0	45	78	0	47
Macquarie/Castlereagh/Bogan	109	0	12	35	0	62
Barwon-Darling	139	0	0	139	0	0
Lower Darling	11	0	0	0	0	11
Lachlan	26	0	1	15	0	10
Murrumbidgee	910	0	107	42	0	761
Murray	439	0	0	28	0	412
Total New South Wales	**1,979**	**0**	**207**	**365**	**0**	**1,407**
Victoria						
Goulburn	794	-309	0	10	93	381
Broken	6	0	0	1	0	5
Loddon	4	140	0	0	33	111
Campaspe	26	121	0	0	40	107
Wimmera-Mallee	9	0	0	0	0	9
Kiewa	4	0	0	3	0	1
Ovens	13	0	0	3	0	10
Murray	954	43	0	2	233	762
Total Victoria	**1,809**	**-6**	**0**	**20**	**400**	**1,384**
South Australia						
Metro-Adelaide & Associated Country Areas	57	0	0	0	0	57
Lower Murray Swamps	14	0	0	0	0	14
Country Towns	38	0	0	0	0	38
All Other Purposes	371	0	0	0	0	371
Total South Australia	**480**	**0**	**0**	**0**	**0**	**480**
Queensland						
Condamine/Balonne	1,049	0	929	9	6	106
Border Rivers	109	0	77	2	9	21
Macintyre Brook	13	0	0	0	0	13
Moonie	43	0	43	0	0	0
Nebine	1	0	1	0	0	0
Warrego	15	0	14	0	0	1
Paroo	2	0	2	0	0	0
Total Queensland	**1,232**	**0**	**1,064**	**11**	**15**	**141**
Australian Capital Territory	**17**	**0**	**0**	**0**	**0**	**n/a**
Total Basin	**5,518**	**-6**	**1,272**	**396**	**415**	**3,412**

1. "Diversion 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.

Table 11: Use of Valley Allocations in 2009–10

System	Total Allocated water in Valley[3] (GL)	Use of Allocated water in Valley (GL)	Use as a % of Authorised Valley use (%)
New South Wales			
Intersecting Streams[1]	0	0	n/a
Border Rivers[1]	93	63	68%
Gwydir[1]	54	41	76%
Namoi/Peel[1]	125	47	38%
Macquarie/Castlereagh/Bogan	118	62	53%
Barwon-Darling[1]	0	0	n/a
Lower Darling[1]	29	11	37%
Lachlan	17	10	59%
Murrumbidgee	1,290	761	59%
Murray	956	412	43%
Total New South Wales	**2,682**	**1,407**	**52%**
Victoria			
Goulburn	466	381	82%
Broken	8	5	60%
Loddon	134	111	83%
Campaspe	185	107	58%
Wimmera-Mallee	121	9	7%
Kiewa	1	1	47%
Ovens	38	10	25%
Murray	1,154	762	66%
Total Victoria	**2,106**	**1,384**	**66%**
South Australia			
Metro-Adelaide & Associated Country Areas[1]	150	57	38%
Lower Murray Swamps	28	14	51%
Country Towns	38	38	100%
All Other Purposes	703	371	53%
Total South Australia	**918**	**480**	**52%**
Queensland			
Condamine/Balonne[1]	112	106	95%
Border Rivers[1]	28	21	74%
Macintyre Brook[1]	13	13	99%
Moonie[1]	0	0	n/a
Nebine	0	0	n/a
Warrego[1]	3	1	53%
Paroo1	0	0	n/a
Total Queensland	**156**	**141**	**91%**
Australian Capital Territory	**0**	**n/a**	**n/a**
Total Basin	**5,863**	**3,412**	**58%**

1. The use of water not covered by allocations (e.g. water harvesting, off-allocations/ supplementary water, unregulated stream licenses) constitutes a large percentage of the use in these valleys.
2. The volume authorised for use for Metro-Adelaide & Associated Country Areas for 2009–10 is the amount that could be used before the 5-year Cap of 650 GL would be exceeded.
3. Allocated water from **Table 8**

11. ENVIRONMENTAL WATER AND CAP ADJUSTMENTS

Environmental water is the water used for environmental purposes. Protecting, maintaining and/or enhancing the riverine or terrestrial environment are all considered environmental purposes. Environmental water may be provided without creating any legal right or entitlement to water for the environment. However, providing environmental water by way of creating legally recognised right to water for the environment, called environmental entitlement, is preferred. Environmental entitlements are created through relevant State/Commonwealth legislation as continuing entitlements to water to be used for environmental purposes. Environmental water may be created by several means, for example, through purchase of non-environmental entitlements and water savings.

Environmental water that is recovered through savings or other mechanisms for the Snowy and River Murray System, in some cases, require adjustment to the Cap in valleys where this water is recovered or used. Different States treat environmental allocations and environmental uses differently. This affects the timing and manner of Cap adjustment. Ministerial Council Meeting 45 – 23 May 2009 adopted a protocol for adjusting Caps for environmental entitlements and uses. The Protocol provides for different methods for adjusting the Cap. However, a State must seek approval of the Murray-Darling Basin Authority of its proposed method of adjusting the Cap for environmental water. The Protocol requires the Authority to receive data from the States on environmental entitlements created, allocations for environment use, trade in environmental entitlements and allocations, and Cap adjustments for environmental use to be reported and report the information in the Water Audit Monitoring Report. The collated data received from the States related to these matters given in **Table 12 – Table 15.** Total water available for environmental use was 492 GL, total use of environmental allocation was 294 GL, and total net consumptive environmental use was 120 GL. The Cap adjustment for environmental use was 287 GL.

Table 12: Environmental Water Entitlements in 2009–10

System	Total Environmental Entitlements			Entitlements created from Savings made outside the Cap		
	High Reliability Entitlement (GL)	Low Reliability Entitlement (GL)	Environmental Supplementary Access Entitlement (GL)	High Reliability Entitlements (GL)	Low Reliability Entitlements (GL)	Environmental Supplementary Access Entitlements (GL)
New South Wales						
Intersecting Streams	0	8	0	0	0	0
Border Rivers	0	0	0	0	0	0
Gwydir	0	106	20	0	0	0
Namoi/Peel	0	6	0	0	0	0
Macquarie/Castlereagh/ Bogan	0	104	3	0	0	0
Barwon-Darling	0	8	0	0	0	0
Lachlan	1	120	0	0	12	0
Murrumbidgee*	59	204	31	35	0	0
Lower Darling	1	48	250	0	0	0
Murray*	37	258	100	0	0	0
Total New South Wales	**98**	**861**	**404**	**35**	**12**	**0**
Victoria						
Goulburn	114	185	0	0	0	0
Broken	0	0	0	0	0	0
Loddon	3	3	0	0	0	0
Campaspe	5	5	0	0	0	0
Wimmera-Mallee	0	0	0	0	0	0
Kiewa	0	0	0	0	0	0
Ovens	0	0	0	0	0	0
Murray*	195	145	34	22	0	0
Total Victoria	**318**	**338**	**34**	**22**	**0**	**0**
South Australia						
Metro-Adelaide & Associated Country Areas	0	0	0	0	0	0
Lower Murray Swamps	0	0	0	0	0	0
Country Towns	0	0	0	0	0	0
All Other Purposes	81	0	0	0	0	0
Total South Australia	**81**	**0**	**0**	**0**	**0**	**0**
Queensland						
Condamine/Balonne	0	0	0	0	0	0
Border Rivers	0	6	1	0	0	0
Macintyre Brook	0	0	0	0	0	0
Moonie	0	0	1	0	0	0
Nebine	0	0	1	0	0	0
Warrego	0	0	8	0	0	0
Paroo	0	0	0	0	0	0
Total Queensland	**0**	**6**	**11**	**0**	**0**	**0**
Australian Capital Territory	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
Total Basin	**496**	**1,205**	**449**	**57**	**12**	**0**

Table 13: Environmental Water Allocations in 2009–10

System	Environmental Allocation (GL)	Net Availability of Carry-over (GL)	Environmental Allocation borrowed by Non environmental Users (GL)	Use of Environmental Supplementary Access Entitlements (GL)	Net Trade in from Non-Environmental Allocations (GL)	Net transfer in from Environmental Allocations in other valleys (GL)	Water Available for Environmental Use (GL)	Water made available to Environment as the result of Savings Outside Cap (GL)
New South Wales								
Intersecting Streams	0	0	0	16	0	0	16	0
Border Rivers	0	0	0	0	0	0	0	0
Gwydir	0	1	0	0	0	0	1	0
Namoi/Peel	0	0	0	0	0	0	0	0
Macquarie/Castlereagh/ Bogan	0	3	0	1	0	0	4	0
Barwon-Darling	0	0	0	22	0	0	22	0
Lachlan	0	1	0	0	0	0	1	0
Murrumbidgee	97	21	0	2	44	-83	81	0
Lower Darling	48	0	0	0	0	-48	0	0
Murray	48	5	0	0	-3	7	57	0
Total New South Wales	**193**	**31**	**0**	**41**	**40**	**-124**	**183**	**0**
Victoria								
Goulburn	56	28	0	0	0	-30	54	0
Broken	0	0	0	0	0	0	0	0
Loddon	0	0	0	0	0	0	0	0
Campaspe	0	0	0	0	0	0	0	0
Wimmera-Mallee	0	0	0	0	0	0	0	0
Kiewa	0	0	0	0	0	0	0	0
Ovens	0	0	0	0	0	0	0	0
Murray	143	86	-94	0	0	-50	85	4
Total Victoria	**199**	**113**	**-94**	**0**	**1**	**-80**	**139**	**4**
South Australia								
Metro-Adelaide & Associated Country Areas	0	0	0	0	0	0	0	0
Lower Murray Swamps	0	0	0	0	0	0	0	0
Country Towns	0	0	0	0	0	0	0	0
All Other Purposes	35	50	0	0	0	67	152	0
Total South Australia	**35**	**50**	**0**	**0**	**0**	**67**	**152**	**0**
Queensland								
Condamine/Balonne	0	0	0	0	0	0	0	0
Border Rivers	0	0	0	0	0	0	0	0
Macintyre Brook	0	0	0	0	0	0	0	0
Moonie	0	0	0	1	0	1	0	0
Nebine	0	0	0	4	0	4	0	0
Warrego	0	0	0	12	0	12	0	0
Paroo	0	0	0	0	0	0	0	0
Total Queensland	**0**	**0**	**0**	**18**	**0**	**18**	**0**	**0**
Australian Capital Territory	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
Total Basin	**428**	**195**	**-94**	**59**	**41**	**-137**	**492**	**4**

1. New South Wales currently not reporting rules based environmental water including Barmah Millewa Forest Allocation.

Table 14: Environmental Water Use in 2009–10

System	Total use of Environmental Allocations (GL)	Consumptive Use of Environmental Allocations (GL)	Consumptive Environmental Use not covered by an Entitlement (GL)	Total Consumptive Environmental Use (GL)	Percentage use of Environmental Allocations (%)
New South Wales					
Intersecting Streams	16	0	0	0	100%
Border Rivers	0	0	0	0	0%
Gwydir	0	0	0	0	0%
Namoi/Peel	0	0	0	0	0%
Macquarie/Castlereagh/Bogan	4	4	0	4	100%
Barwon-Darling	22	0	0	0	100%
Lachlan	0	0	0	0	0%
Murrumbidgee	55	55	0	55	68%
Lower Darling	0	0	0	0	0%
Murray	9	9	0	9	16%
Total New South Wales	**107**	**69**	**0**	**69**	**58%**
Victoria					
Goulburn	2	2	0	2	4%
Broken	0	0	0	0	0%
Loddon	0	0	1	1	100%
Campaspe	0	0	0	0	0%
Wimmera-Mallee	0	0	0	0	0%
Kiewa	0	0	0	0	0%
Ovens	0	0	0	0	100%
Murray	34	34	0	34	40%
Total Victoria	**37**	**37**	**1**	**37**	**26%**
South Australia					
Metro-Adelaide & Associated Country Areas	0	0	0	0	0%
Lower Murray Swamps	0	0	0	0	0%
Country Towns	0	0	0	0	0%
All Other Purposes	133	14	0	14	87%
Total South Australia	**133**	**14**	**0**	**14**	**87%**
Queensland					
Condamine/Balonne	0	0	0	0	0
Border Rivers	0	0	0	0	0
Macintyre Brook	0	0	0	0	0
Moonie	1	0	0	0	100%
Nebine	4	0	0	0	100%
Warrego	12	0	0	0	100%
Paroo	0	0	0	0	0
Total Queensland	**18**	**0**	**0**	**0**	**98%**
Australian Capital Territory	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
Total Basin	**294**	**120**	**1**	**120**	**60%**

Table 15: Cap Adjustment for Environmental Water Use in 2009–10

System	Component of calculated Annual Diversion Target – that was used for Environment under baseline conditions (GL)	Component of calculated Annual Diversion Target – relating to an Entitlement that has been transferred to Environmental Use (GL)	Component of calculated Annual Diversion Target – relating to a water savings that has been transferred to an Environmental Use (GL)	Environmental Use of an Non-Environmental Allocation (Trade to Environment) (GL)	Non-Environmental Use of an Environmental Allocation (Trade from Environment) (GL)	Water within Cap Transferred to Snowy annual Allocation (GL)	Volume by which Cap is reduced for Environmental Entitlements and Use (GL)
New South Wales							
Intersecting Streams	0	16	0	0	0	0	16
Border Rivers	0	0	0	0	0	0	0
Gwydir	0	0	0	0	0	0	0
Namoi/Peel	0	0	0	0	0	0	0
Macquarie/Castlereagh/ Bogan	0	4	0	0	0	0	4
Barwon-Darling	0	22	0	0	0	0	22
Lachlan	0	0	0	0	0	0	0
Murrumbidgee	0	55	0	0	0	37	92
Lower Darling	0	0	0	0	0	0	0
Murray	0	9	0	0	0	3	12
Total New South Wales	**0**	**107**	**0**	**0**	**0**	**40**	**146**
Victoria							
Goulburn Broken Loddon	0	5	0	0	0	11	16
Campaspe	0	0	0	0	0	0	0
Wimmera-Mallee	0	0	0	0	0	0	0
Kiewa Ovens Murray	12	22	0	0	0	8	43
Total Victoria	**12**	**27**	**0**	**0**	**0**	**19**	**58**
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 Purposes	0	83	0	0	0	0	83
Total South Australia	**0**	**83**	**0**	**0**	**0**	**0**	**83**
Queensland							
Condamine/Balonne	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Border Rivers & Macintyre Brook	0	0	0	0	0	0	0
Moonie	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Nebine	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Warrego	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Paroo	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total Queensland	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Australian Capital Territory	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
Total Basin	**12**	**217**	**0**	**0**	**0**	**59**	**287**

1. No Adjustment to diversions and Cap Target as result of TLM and other environmental use.

12. 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.

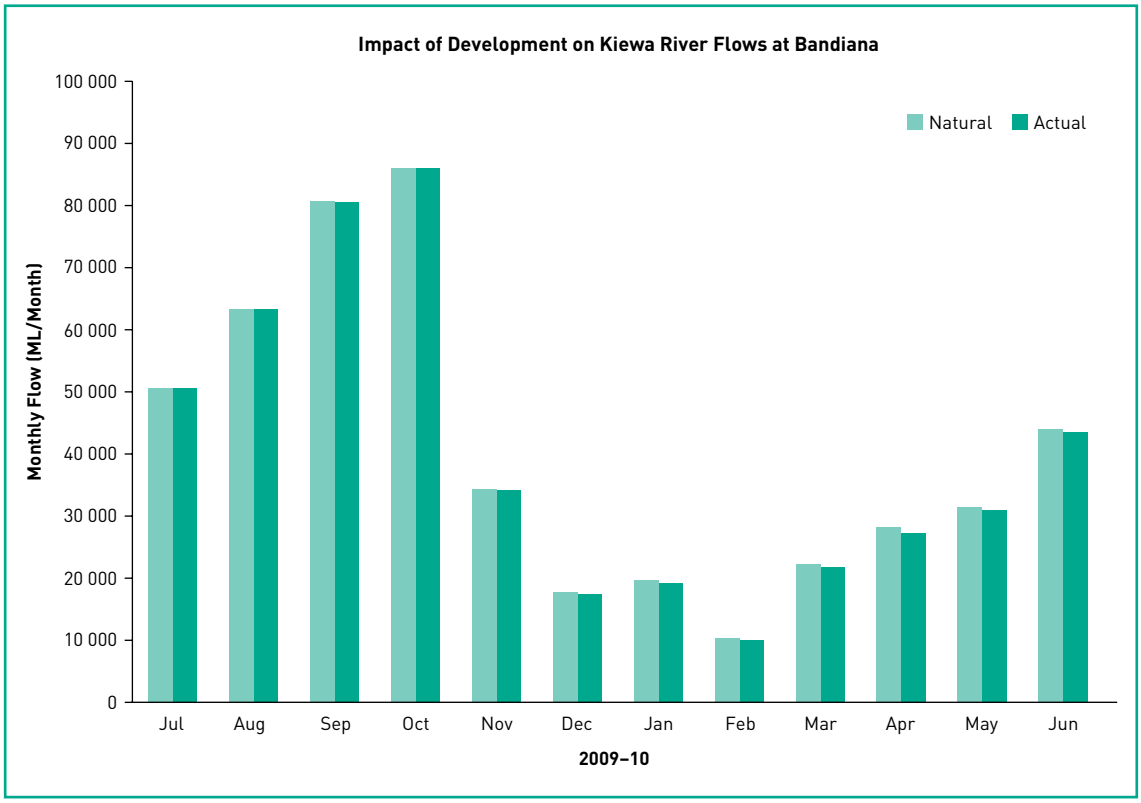
The natural flows are estimated from computer modelling studies. Many of the river models are incomplete, or not yet modified, to allow these numbers to be readily calculated for 2009–10. **Table 16** presents the 2009–10 annual flow volumes recorded and the natural flows at a number of selected key sites within the Murray-Darling Basin, whilst the impact of development can be seen graphically in **Figure 8** and **Figure 9**.

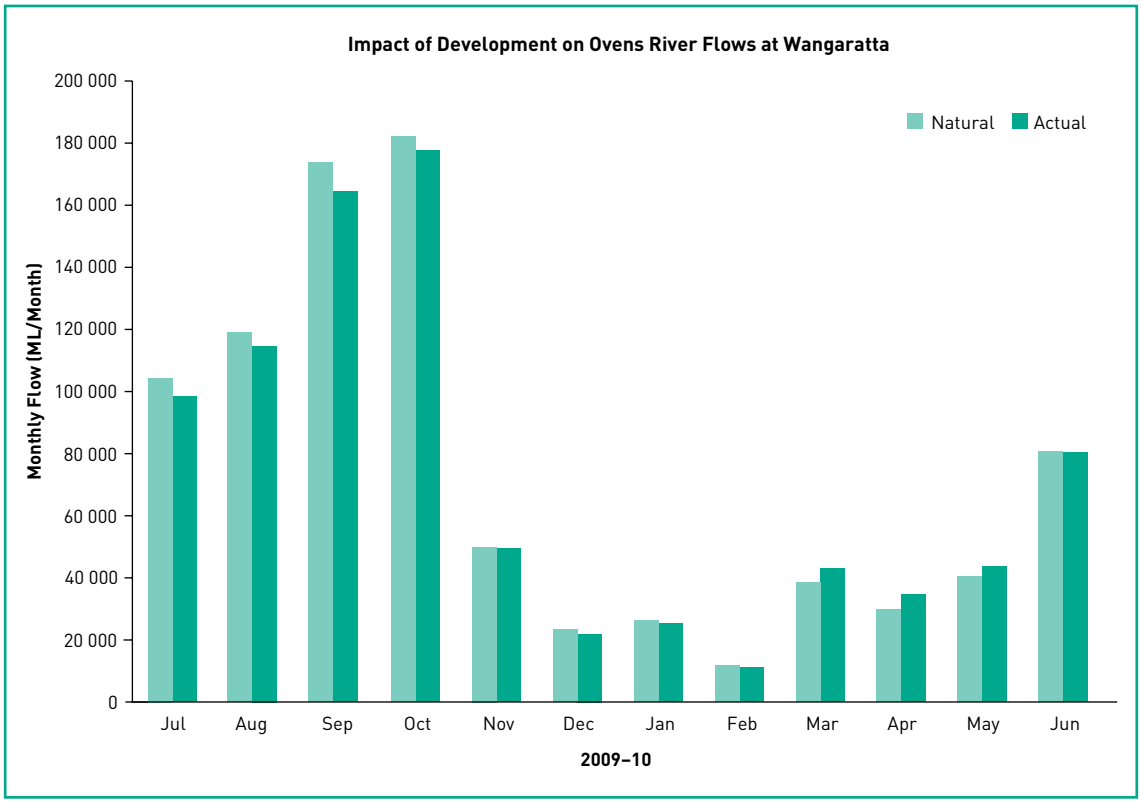
Table 16: Comparison of 2009–10 Actual and Natural Annual Flows for Key Sites within the Murray-Darling Basin

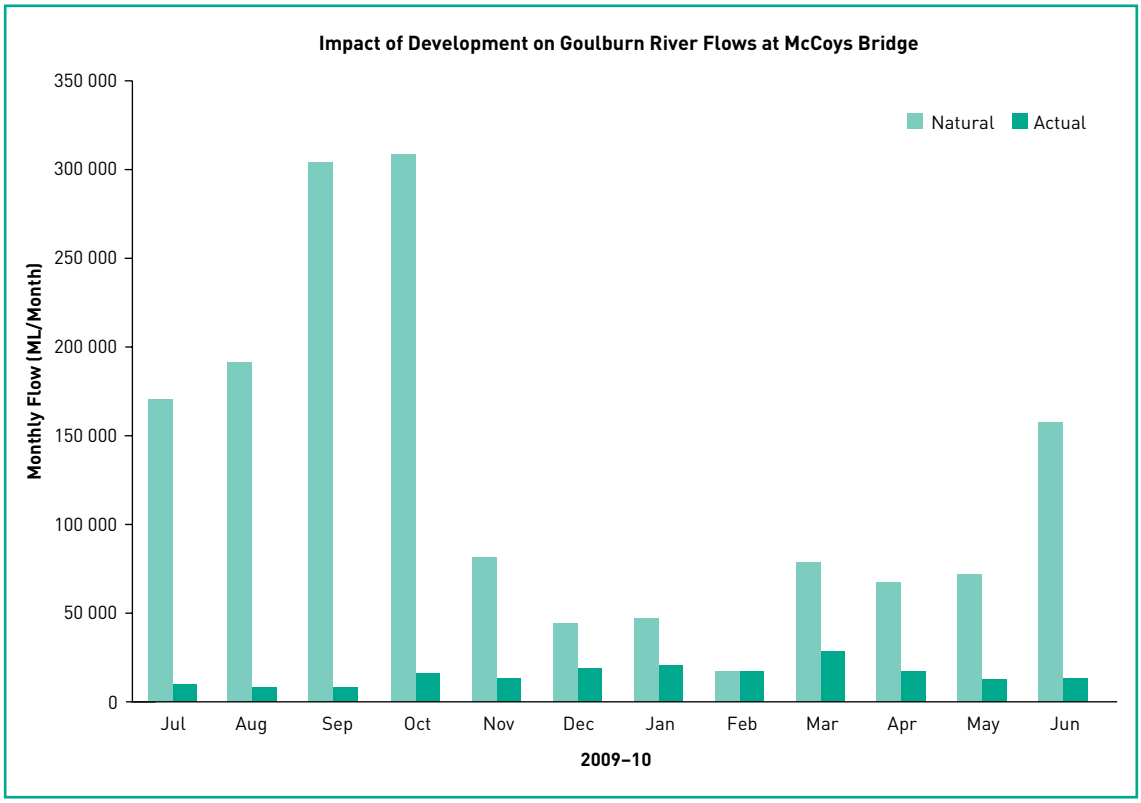
System	Actual Flow (GL)	Natural Flow (GL)	Actual/ Natural (%)
Inter Basin Transfers			
Snowy Mountain Scheme to Murrumbidgee River	51	0	n/a
Snowy Mountain Scheme to Murray River	528	0	n/a
Glenelg River Catchment to Wimmera-Mallee	n/a	n/a	n/a
Wannon River Catchment to Wimmera-Mallee	n/a	n/a	n/a
New South Wales Tributaries			
Barwon River at Mungindi + Boomi River	243	n/a	n/a
Inflows to Gwydir Wetland	18	n/a	n/a
Gwydir System Outflows to Barwon River	5	n/a	n/a
Namoi System Outflows to Barwon River	300	n/a	n/a
Inflows to Macquarie Marshes	12,331	n/a	n/a
Macquarie/Castlereagh/Bogan Outflows	374	n/a	n/a
Darling River Inflows to Menindee Lakes	2,431	n/a	n/a
Lachlan River at Coorong	14	n/a	n/a
Lachlan River at Booligal	20	n/a	n/a
Murrumbidgee River at Balranald	184	n/a	n/a
Lower Darling River at Burtundy	577	n/a	n/a
Victorian Tributaries			
Kiewa River at Bandiana	485	489	99%
Ovens River at Wangaratta	864	880	98%
Goulburn River at McCoys Bridge	184	1,539	12%
Campaspe River at Rochester	5	29	19%
Loddon River at Appin South	0	16	0%
Wimmera River at Horsham	13	87	15%
Queensland Tributaries			
Condamine/Balonne/Culgoa Flows at NSW Border	1,546	n/a	n/a
Macintyre River at Goondiwindi	193	n/a	n/a
Moonie River at Fenton	472	n/a	n/a
Warrego River at Cunnamulla	1,839	n/a	n/a
Paroo River at Caiwarro	2,040	n/a	n/a
River Murray			
Albury (Doctors Point)	2,332	3,134	74%
Yarrawonga	2,358	3,899	60%
Euston	1,948	0	n/a
South Australian Border[3]	1,693	0	n/a
Barrages	0	0	n/a

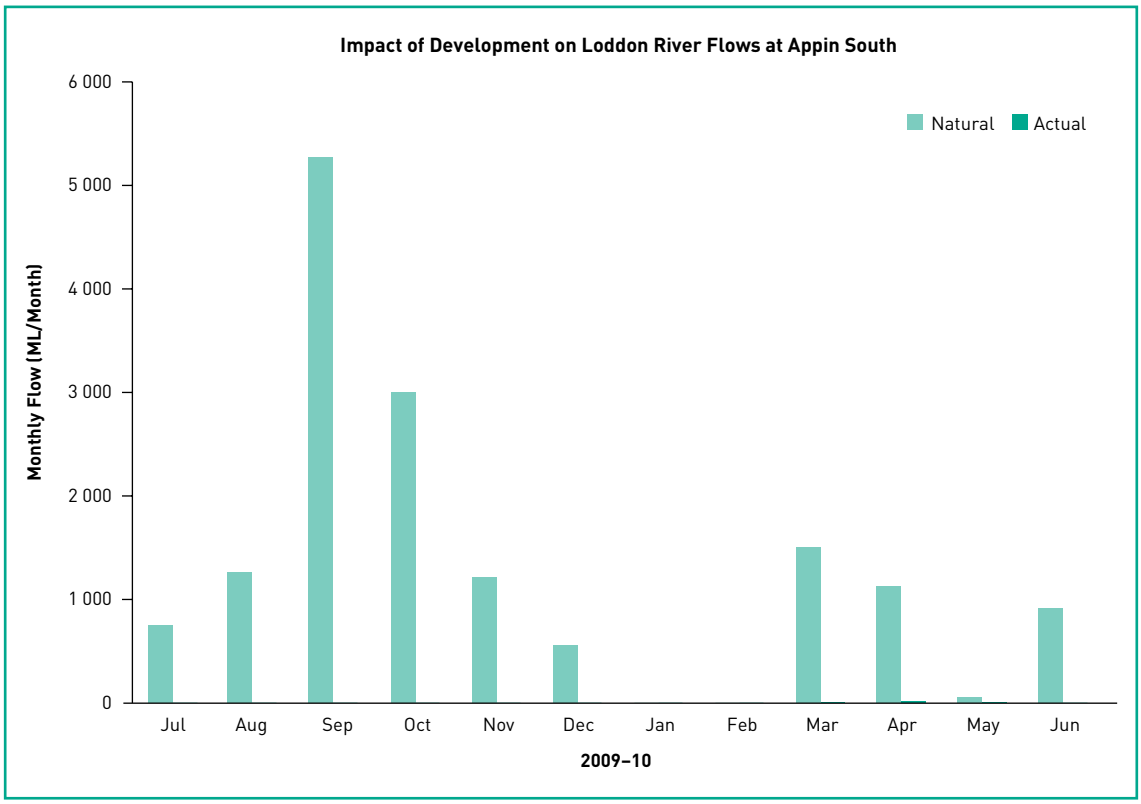
1. n/a indicates data not available or not applicable.
2. Operational data, which may be subject to change.
3. Includes interstate trade.
4. Zero flows in some situations due to rounding off to nearest 1 GL.

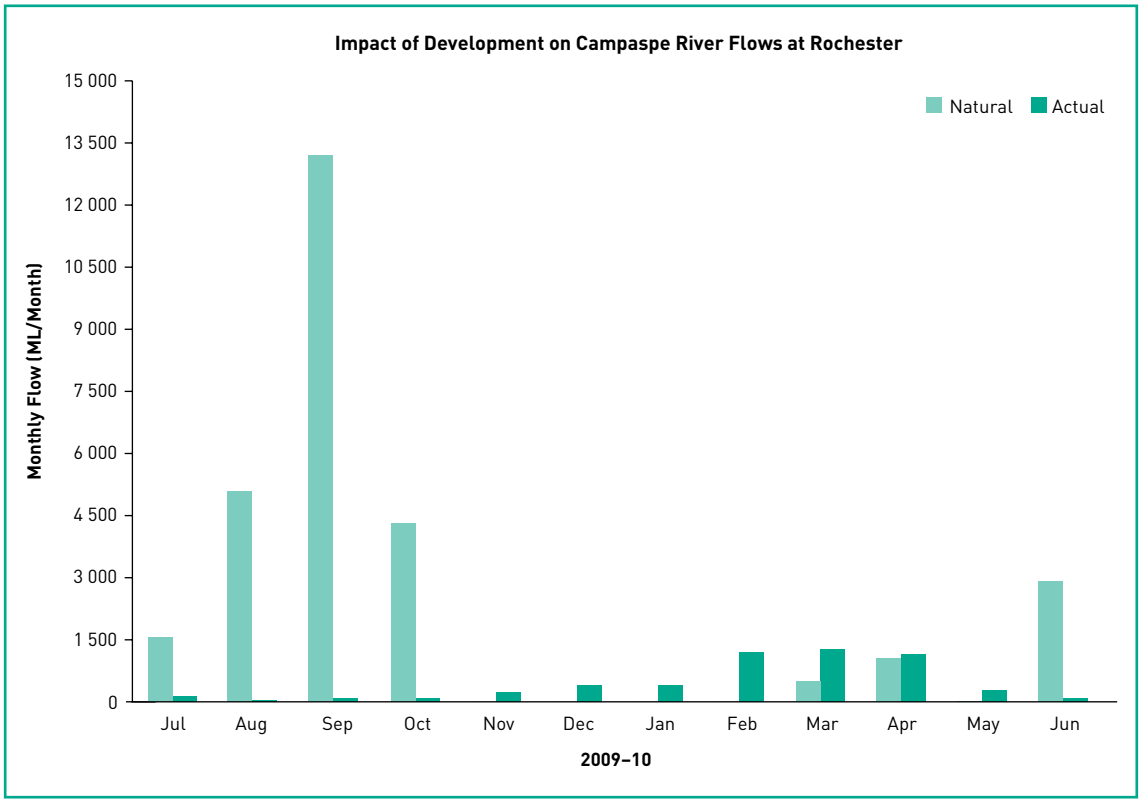
Figure 8: Plots of Flows at Selected Sites showing 2009–10 Actual and Natural (Modelled) Flows in Victoria






Impact of Development on Goulburn River Flows at McCoys Bridge
Natural
Actual
Monthly Flow (ML/Month)
350 000
300 000
250 000
200 000
150 000
100 000
50 000
0
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
2009–10


Impact of Development on Loddon River Flows at Appin South
Natural
Actual
Monthly Flow (ML/Month)
6 000
5 000
4 000
3 000
2 000
1 000
0
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
2009–10


Impact of Development on Campaspe River Flows at Rochester
Natural
Actual
Monthly Flow (ML/Month)
15 000
13 500
12 000
10 500
9 000
7 500
6 000
4 500
3 000
1 500
0
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
2009–10

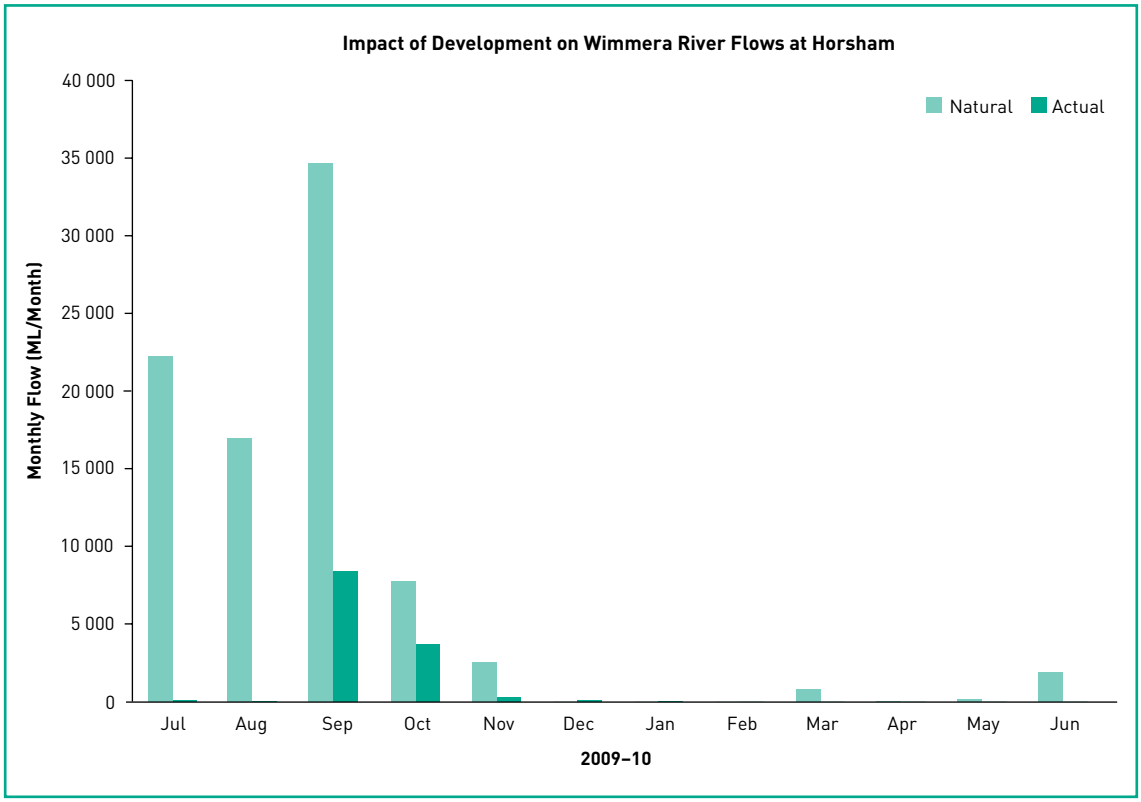
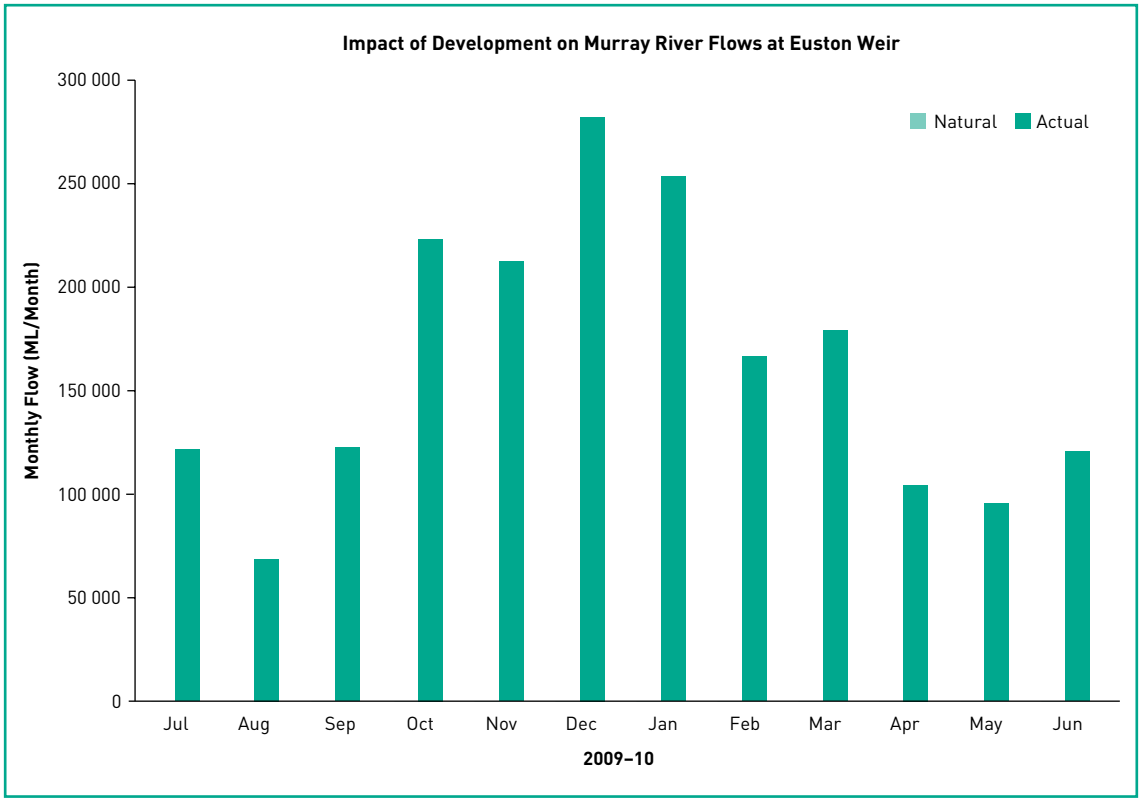
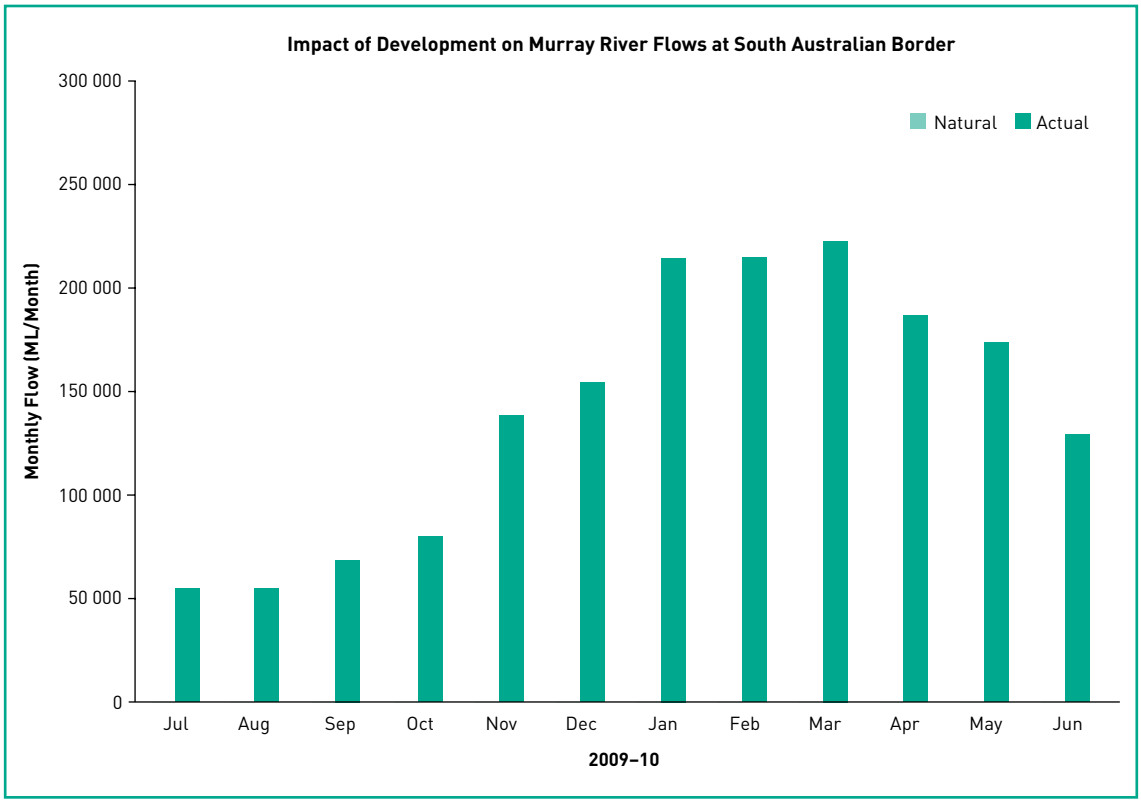
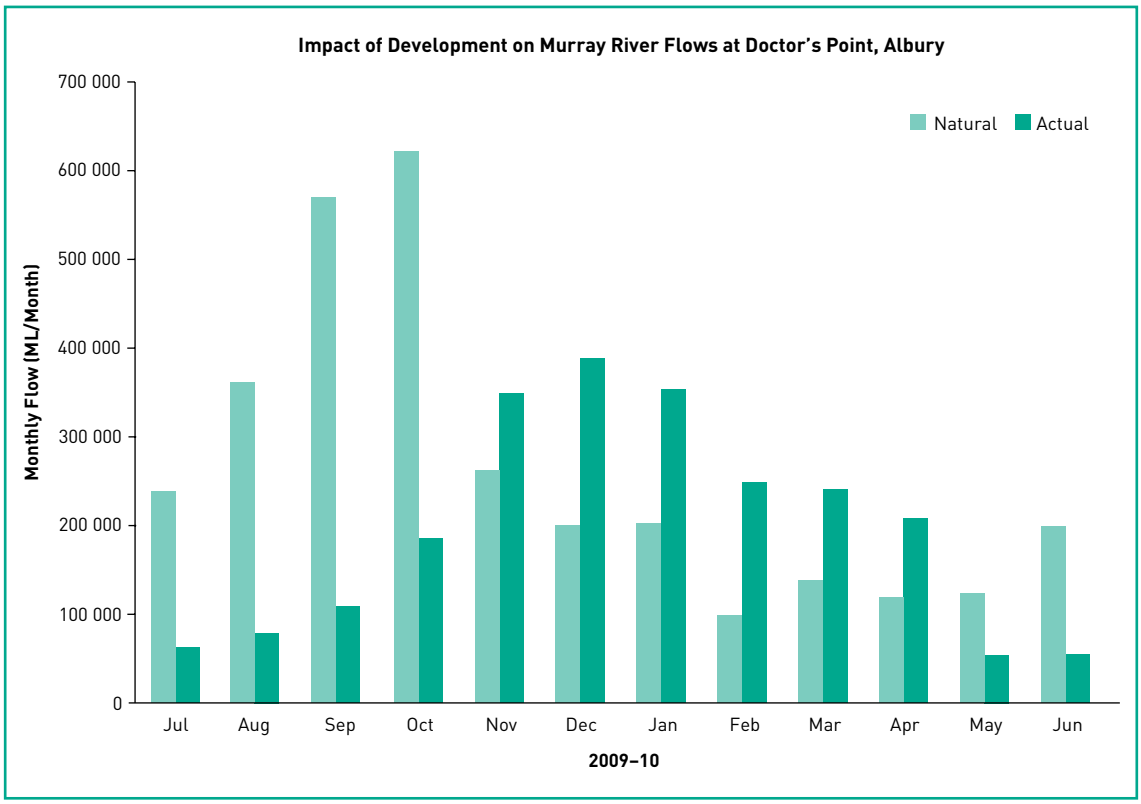
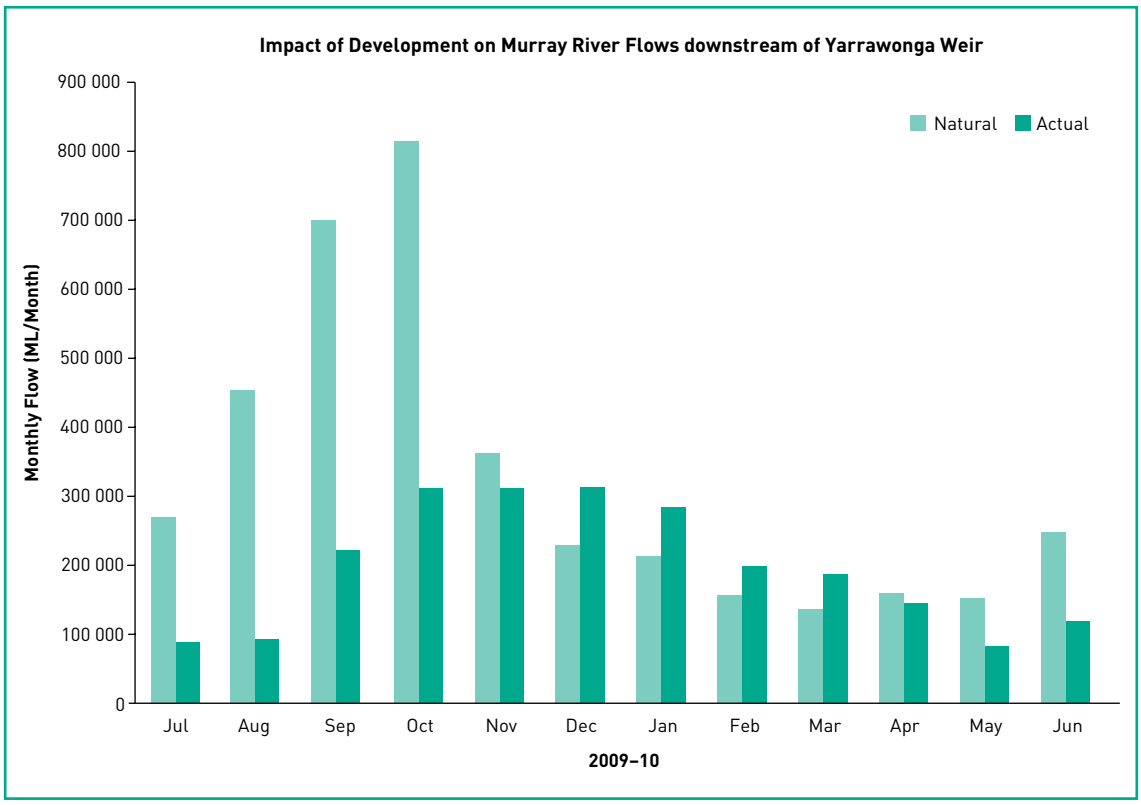

Impact of Development on Wimmera River Flows at Horsham
Natural
Actual
Monthly Flow (ML/Month)
40 000
35 000
30 000
25 000
20 000
15 000
10 000
5 000
0
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
2009–10

Figure 9: Plots of Flows at Selected Sites Showing 2009–10 Actual and Natural (Modelled) Flows in Murray River






Impact of Development on Murray River Flows at Doctor's Point, Albury
Natural
Actual
Monthly Flow (ML/Month)
700 000
600 000
500 000
400 000
300 000
200 000
100 000
0
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
2009–10


Impact of Development on Murray River Flows downstream of Yarrawonga Weir
Natural
Actual
Monthly Flow (ML/Month)
900 000
800 000
700 000
600 000
500 000
400 000
300 000
200 000
100 000
0
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
2009–10

13. 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 are reported in **Table 17**. The volumes reported indicate that the total volume in storage in the Basin in 2009–10 has increased from 5300 GL to 8172 GL (32% full). Total evaporative losses for major storages within the Basin were calculated by the respective States and are reported at 167 GL, representing 0.6% of total storage capacity and equal to 32% of total diversion from the Basin. The net decrease in flow of 3029 GL due to increase in storages and evaporative losses equal to 55% of total Basin diversion.

Table 17: Impoundments and Losses in Major On-Stream Storages (greater than 10 GL capacity) in 2009–10

System	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 Authority									
Lower Darling	Menindee Lakes[1]	1960	2,050	229	1,522	74%	1293	0	1293
Murray	Dartmouth Reservoir	1979	3906	807	1,252	32%	445	0	445
	Hume Reservoir	1936-61	3038	320	796	26%	476	0	476
	Lake Victoria	1928	677	242	354	52%	112	0	112
Total Murray-Darling Basin Authority			**9671**	**1599**	**3924**	**41%**	**2325**	**0**	**2325**
Snowy Mountains Scheme in Murray-Darling Basin									
Murrumbidgee River Valley	Jounama Pondage	1968	44	19	25	56%	5	0	5
	Talbingo Reservoir	1971	921	916	867	94%	-50	6	-43
	Tantangara Reservoir	1960	254	19	24	9%	5	0	6
	Tumut Pondage	1958	53	21	10	19%	-11	0	-11
Murray River Valley	Geehi Reservoir	1966	21	16	15	70%	-1	0	-1
	Tooma Reservoir	1961	28	14	15	54%	1	0	1
	Khancoban Pondage	1965	22	7	13	58%	6	0	6
Total Snowy Mountains Scheme			**1342**	**1013**	**968**	**72%**	**-45**	**7**	**-38**
Borders Rivers Commission									
Border Rivers	Glenlyon Dam	1976	254	60	56	22%	-4	9	5
Total Border Rivers Commission			**254**	**60**	**56**	**22%**	**-4**	**9**	**5**
New South Wales									
Border Rivers	Pindari Reservoir	1962-96	312	134	79	25%	-56	8	-48
Gwydir	Copeton Reservoir	1976	1364	174	100	7%	-74	9	-66
Namoi/Peel	Chaffey Reservoir	1979	62	60	55	90%	-4	1	-3
	Keepit Reservoir	1960	423	155	120	28%	-36	7	-29
	Split Rock Reservoir	1987	397	21	14	3%	-8	6	-1
Macquarie/ Castlereagh/ Bogan	Burrendong Reservoir	1967	1678	253	197	12%	-57	0	-57
	Windamere Reservoir	1984	368	83	68	18%	-15	18	2
Lachlan	Carcoar Reservoir	1970	36	3	2	6%	-1	0	-1
	Lake Brewster	1952	153	0	0	0%	0	0	0
	Lake Cargelligo	1902	36	6	19	53%	13	0	13
	Wyangala Reservoir	1936-71	1220	75	89	7%	14	19	32

System	Major On-Stream Storage	Comple-tion Date	Storage Capa-city (GL)	Volume of Storage at Begin-ning 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)	Evapor-ation Losses (GL)	Net Reduc-tion in Flow due to Storage (GL)
Murrumbidgee	Blowering Reservoir	1968	1631	543	740	45%	197	0	197
	Burrinjuck Dam	1907-56	1028	382	421	41%	39	1	40
	Tombullen Off-River Storage	1980	11	0	0	0%	0	0	0
	Hay Weir	1981	14	0	0	0%	0	0	0
Total New South Wales			**8733**	**1890**	**1903**	**22%**	**13**	**68**	**81**
Victoria									
Goulburn/ Broken/Loddon	Eildon Reservoir	1956	3334	435	921	28%	486	-2	484
	Lake Mokoan	1971	365	0	0	0%	0	0	0
	Lake Nillahcootie	1967	40	5	12	29%	7	0	6
	Cairn Curran Reservoir	1956	147	3	7	5%	4	1	5
	Tullaroop Reservoir	1959	73	3	4	6%	2	1	2
Campaspe	Lake Eppalock	1964	305	18	27	9%	8	2	11
	Lauriston Reservoir	1941	20	6	15	77%	9	0	9
	Malmsbury Reservoir	1870	18	0	0	3%	0	0	0
	Upper Coliban Reservoir	1903	37	0	1	3%	1	0	1
Wimmera-Mallee	Lake Bellfield	1966	79	13	22	28%	9	3	12
	Lake Fyans	1916	18	4	6	31%	2	3	6
	Lake Lonsdale	1903	65	0	3	4%	3	12	15
	Lake Taylor	1923	34	4	23	68%	19	5	25
	Pine Lake	1928	62	0	0	0%	0	0	0
	Tooloondo Reservoir	1953	92	0	0	0%	0	0	0
	Wartook Reservoir	1887	29	10	16	56%	6	10	16
Murray/Kiewa/ Ovens	Rocky Valley Reservoir	1959	28	21	14	48%	-8	-1	-9
	Lake Buffalo	1965	24	15	15	60%	-1	-1	-2
	Lake William Hovell	1973	14	8	14	101%	5	-1	5
Total Victoria			**4785**	**546**	**1099**	**23%**	**553**	**32**	**585**
Queensland									
Condamine/ Balonne	Beardmore Dam	1972	82	43	70	85%	26	26	52
	Chinchilla Weir	1974	10	7	8	78%	0	3	4
	Cooby Dam	1942	23	3	2	10%	0	1	1
	Jack Taylor Weir	1953-59	10	7	9	88%	1	3	5
	Leslie Dam	1985	106	14	10	9%	-4	4	0
Macintyre Brook	Coolmunda Dam	1968	69	27	9	13%	-19	10	-9
Total Queensland			**300**	**103**	**107**	**36%**	**4**	**48**	**52**

System	Major On-Stream Storage	Comple-tion Date	Storage Capa-city (GL)	Volume of Storage at Begin-ning 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)	Evapor-ation Losses (GL)	Net Reduc-tion in Flow due to Storage (GL)
Australian Capital Territory									
Murrumbidgee	Bendora Reservoir	1961	12	8	9	80%	1	0	1
	Corin Reservoir	1968	71	25	43	61%	18	0	17
	Googong Reservoir	1979	121	53	59	48%	6	3	8
	Cotter	1912	4	3	4	99%	1	0	1
Total Australian Capital Territory			**207**	**89**	**115**	**55%**	**25**	**2**	**28**
Total Basin			**25292**	**5300**	**8172**	**32%**	**2871**	**167**	**3038**

1. Menindee Lakes capacity revised based upon 2003 survey
2. The data is from MDBA database as on 15 January 2011. Operational data, which may be subject to change.

14. GROUNDWATER USE IN THE BASIN

14.1 Context

Based on the findings from the Review of the Operation of Cap, the Council in August 2000, agreed to the following recommendations of the former Commission (Authority) related to groundwater:

- Groundwater be managed on an integrated basis with surface water within the spirit of Cap (**Recommendation 20**); and
- A Murray-Darling Basin Groundwater Management Strategy is developed by the Groundwater Technical Reference Group (GTRG) that is based on jurisdictional management of groundwater through sustainable yields and includes investigations clarifying how groundwater management practices may impact upon the integrity of Cap in future (**Recommendation 21**).

The GTRG is currently undertaking many projects aimed at implementing the above recommendations. This section on groundwater is aimed at establishing an integrated reporting framework for surface and groundwater in line with Recommendation 20.

14.2 Groundwater Data for 2009–10

The GTRG supplied the estimated data for sustainable yield (SY), allocation and usage of groundwater in 2009–10 for each Groundwater Management Unit (GMU) in the Basin. The data was further supplemented and analysed using Geographical Information System (GIS) techniques to assign the groundwater data to the designated Cap valleys. Some errors are inevitable in the groundwater data because of the absence of precise information to apportion the aquifers to Cap valleys. However, the analysis presented in **Table 18** is valuable in itself, as it gives a snapshot of the Basin-wide status of groundwater.

The estimated sustainable yields in Groundwater Management Units (GMU) of the Basin are reported to be 1945 GL. Out of this, 2042 GL was already allocated in 2009–10, which constituted 105% of SY. But this allocation percentage does not take into account Victorian SY values as Victoria does not mange its groundwater on the basis of SY. The total usage of groundwater in the Basin was 1300 GL, which was 67% of allocation and 64% of SY. The groundwater usage was 24% of surface water diversion in the Basin. This reinforces the fact that groundwater is an important resource in which there is a considerable scope for future development within the current allocation. A report by Sinclair Knight Merz (2003) estimated that there is strong linkage between groundwater use and surface water flows, with an average reduction in surface water flow of 600 ML for every 1000 ML of groundwater use. This highlights the importance of management of groundwater to the Cap on diversions.

14.3 Groundwater Use since 1999–00

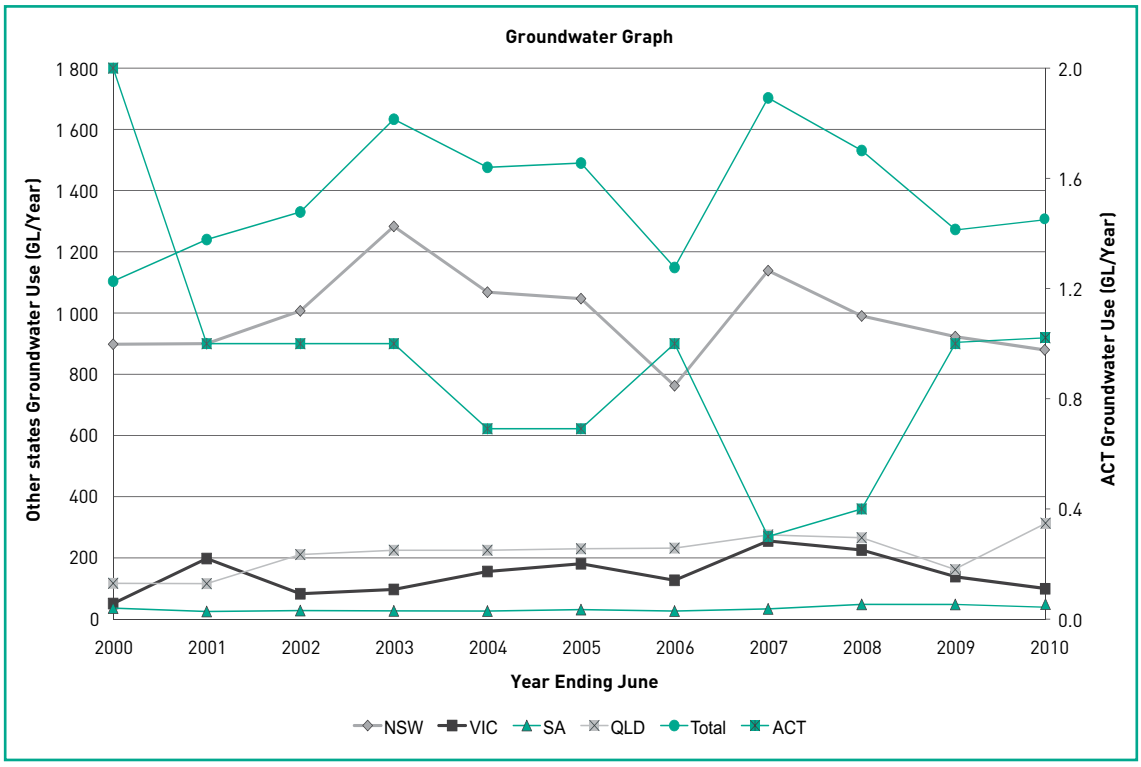
Figure 10 shows the use of groundwater in the Basin since 1999-00, when groundwater reporting started. It is evident from this figure that the groundwater use has been steadily rising. However, deficiency in groundwater data must be noted. Several factors account for this deficiency in data: including changes in groundwater systems, names, their boundaries and policies for determining sustainable yield. The translation factors for converting groundwater data based upon GMUs to that based upon Cap valleys were worked out in 1999–00 based upon the GMU layer analysis facilitated by the data provided by National Land and Water Resources Audit that year. However, these translational factors have not been able to cope with the changes since then. So the groundwater data depicted in **Table 18** and **Figure 10** need to be viewed with extreme caution.

Table 18: Basin-wide Groundwater data for 2009–10 aligned along the designated Cap valleys

Designated River Valley System	Sustainable yield estimate (GL)	Groundwater Allocation (GL)	Groundwater Use (GL)	Surface Water Use (GL)
New South Wales				
Intersecting Streams[4]	37	2	0	3
Border Rivers	37	7	3	115
Gwydir	74	66	68	57
Namoi/Peel	208	271	146	170
Macquarie/Castlereagh/Bogan	164	149	64	109
Barwon-Darling	13	1	0	139
Lachlan	360	387	235	26
Murrumbidgee	323	340	258	910
Lower Darling	0	0	0	11
Murray	137	222	98	439
Total New South Wales	**1353**	**1444**	**871**	**1979**
Victoria				
Goulburn Broken Loddon	113	124	45	804
Campaspe	30	23	13	26
Wimmera-Mallee	3	11	4	9
Kiewa Ovens Murray	95	85	34	971
Total Victoria	**240**	**244**	**95**	**1809**
South Australia				
Total South Australia[3]	**53**	**52**	**37**	**480**
Queensland				
Condamine/Balonne	265	269	273	1,049
Border Rivers	20	25	20	109
Macintyre Brook	0	1	1	13
Moonie	1	1	0	43
Nebine	0	0	0	1
Warrego	5	5	2	15
Paroo	0	0	0	2
Total Queensland	**291**	**301**	**296**	**1232**
Australian Capital Territory	**7**	**1**	**1**	**17**
Total Basin	**1945**	**2042**	**1300**	**5518**

1. Refer **Table 2.**
2. Groundwater figures for New South Wales and Queensland are approximate as they do not include all the groundwater systems within the Cap valley (not all groundwater systems are within a recognised GMU boundary). Sustainable yield for Victoria is not available
3. It is not sensible to divide South Australia Groundwater use into designated valleys.
4. Intersecting Streams include New South Wales Moonie Valley Groundwater data.

Figure 10: Groundwater use in the Basin since 1999–00



CONCLUSION

The information and data contained within this report provides a comprehensive review of consumptive water use and management for the 2009–10 water year for the Murray-Darling Basin, as per the requirements of Schedule E (former Schedule F) to the *Murray-Darling Basin Agreement*. Significant progress have made in developing and accrediting the Cap models, which are used for Cap compliance. Out of 24 Cap valleys, Caps have not been defined in 3 valleys and 2 other valleys do not require a Cap model. Of the remaining 19 Cap valleys, Cap models have been approved for 13 and 3 Cap models are currently being audited (Macquarie, Wimmera-Mallee and Queensland Border Rivers). Three Cap models remain to be submitted for audit as follows. The Cap model for Metro Adelaide is in advanced stage of preparation. Though the Cap model for the ACT is ready for audit, differences remain on the interpretation of the ACT Cap. Unless this is resolved, the ACT Cap model cannot be audited. Cap model(s) for the combined Barwon-Darling/ Lower Darling are being prepared for audit.

Total surface water use in the Murray-Darling Basin in 2009–10 was 5518 GL and groundwater use was 1300 GL.

Information on groundwater usage has been presented for the tenth time in this report.

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. The resource availability during 2009–10 was very tight due to continuing dry conditions

The use of allocated water in the 2009–10 water year represents an utilisation of 58% of the water allocated throughout the Basin. This was lowest utilisation since 1997–98.

The accuracy of diversion measurements was ±12% in the 2009–10 water year.

It is expected that the accuracy of measurement will improve over time as volumetric conversion is implemented in Queensland, and metering is extended to areas in New South Wales (unregulated) and Queensland, which are currently un-metered.

Interstate water trading between New South Wales, Victoria and South Australia continued to develop in 2009–10.

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

The total volume of water in major storages within the Basin in 2009–10 increased from 5300 GL to 8172 GL (32% full). Total evaporative losses for major storages within the Basin were 167 GL, representing 0.6% of total storage capacity and 32% of total Basin diversion.

Except for New South Wales's Barwon-Darling/ Lower Darling combined Cap valley, all valleys for which Cap have been defined were within their Cap. The combined Cap Valley was declared in breach of the Cap in 2007–08. Though the combined Barwon-Darling/Lower Darling Cap Valley's cumulative Cap debit of 4 GL at the end of 2009–10 did not exceed the trigger of 61 GL for special audit, the Independent Audit Group noted in its 'Review of Cap Implementation 2009–10 Report that in the absence of an accredited model for Barwon-Darling, it was not possible to conclude that the long term Cap exceedence in the valley has been addressed. There was large Basin-wide Cap credit.

The groundwater information in 2009–10 was not completely available. Based upon the limited information, the allocation of groundwater in the Basin was 2042 GL and usage was 1300 GL.

Total water made available for environmental use was 492 GL and total use of environmental use allocations was 294 GL. Total Cap adjustments for Environmental water use was 287 GL.

The monitoring of water use relative to Cap compliance within the Murray-Darling Basin is a large, complex, and challenging 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

AHD	Australian Height Datum
Announced Allocation	The percentage of water entitlement declared available for diversion from a regulated stream in a season.
AT	Annual Trigger
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 New South Wales and Queensland.
BRWSS	Border Rivers Water Supply System
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.
CA	Continuous Accounting.
Channel Capacity	The maximum rate at which water can be delivered through a river reach or an artificial channel.
CEWH	Commonwealth Environment Water Holder
CIT	Central Irrigation Trust
COAG	Council of Australian Governments.
CWAS	Critical Water Allocation Scheme
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.
DERM	The Department of Environment and Resource Management (of Queensland)
DNR	The Department of Natural Resources (of New South Wales).
DNRW	The Department of Natural Resources and Water (of Queensland).
DSE	The Department of Sustainability and Environment (of Victoria).
Dozer Allocation	An allocation that is not fully utilised.

DWLBC	The Department of Water, Land and Bio-diversity Conservation (of South Australia).
DWE	The Department of Water and Energy (of New South Wales)
EC (Unit)	Electrical conductivity unit 1 EC = 1 micro-Siemens per centimetre measurement at 25° Celsius. Commonly used to indicate the salinity of water.
ELMA	Environmental Land Management Allocation
EWA	Environmental Water Allocation
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).
Gigalitre (GL)	One thousand million or 10^9 litres.
GIS	Geographical Information System
G-MW	Goulburn-Murray Water (of Victoria).
GMU	Groundwater Management Unit
GSM	Goulburn Simulation Model
GTRG	Groundwater Technical Reference Group
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.
High Reliability Water Share	Legally recognised, secure entitlement to a defined share of water, as governed by the reserve policy
IAG	Independent Audit Group.
Impoundment	The Storage of water diverted from a water course
IQQM	Integrated Quantity Quality Model
Irrigation	Supplying land or crops with water by means of streams, channels or pipes
LMRIA	Lower Murray Reclaimed Irrigation Areas
LSD	Land Surface Diversion
Low Reliability Water Share	Legally recognised, secure entitlement to a defined share of water available after full high reliability water allocation, as governed by the reserve policy. Previously known as sales water.
LV	Licensed Volume.
MDB	Murray Darling Basin
MDBA	Murray-Darling Basin Authority.
MDBC	Former Murray-Darling Basin Commission.
MDBMC	Murray-Darling Basin Ministerial Council.

Megalitre (ML)	One million or 10^6 litres.
MoU	Memorandum of Understanding
MSM	Murray Simulation Model
Ministerial Council, The	Murray-Darling Basin Ministerial Council.
Murray-Darling Basin Agreement	The Agreement between the Governments of the four Basin States and the Commonwealth. The current Agreement is the 2009 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.
REALM	Resource Allocation Model
Regulated Streams/ Waterways	Streams where users are supplied by releases from 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.
RMIF	River Murray Improvement Flows
Riparian	Of, inhabiting or situated on the bank and floodplain of a river.
RIT	Renmark Irrigation Trust.
ROP	Resource Operation Plan
RWUEI	Rural Water Use Efficiency Initiative
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.
SY	Sustainable Yield
Temporary Transfer	Water entitlements transferred on an annual basis.
TLM	The Living Murray

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 by a diversion rate and a starting flow in the stream; and also a volumetric limit where Resource Operations Plans have been implemented.
WRP	Water Resources Planning. It is a process currently underway 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.
WUE	Water Use Efficiency.

APPENDIX A: Cap Register[3] – Annual Cap Adjustments for Trade (GL)

System	1997–98	1998–99	1999–00	2000–01	2001–02	2002–03
New South Wales						
Intersecting Streams[1]	0.0	0.0	0.0	0.0	0.0	0.0
Border Rivers[1]	0.0	-1.6	-3.5	-8.5	-8.7	-13.5
Gwydir	0.0	0.0	0.0	0.0	0.0	0.0
Namoi/Peel	0.0	0.0	0.0	0.0	0.0	0.0
Macquarie/Castlereagh/Bogan	0.0	0.0	0.0	0.0	0.0	0.0
Barwon-Darling/Lower Darling	5.4	13.0	9.0	21.9	7.8	0.0
Lachlan	0.0	0.0	0.0	0.0	0.0	0.0
Murrumbidgee	-33.4	-38.0	-113.7	-21.4	31.5	-14.5
Murray	30.2	6.8	105.8	-12.9	-33.3	30.8
Total New South Wales	**2.2**	**-19.8**	**-2.4**	**-20.9**	**-2.7**	**2.8**
Victoria						
Goulburn/Broken/Loddon cap valley	-3.1	3.3	-7.8	-0.8	0.8	-4.4
Campaspe	0.0	0.0	0.0	0.0	0.0	0.0
Wimmera-Mallee	0.0	0.0	0.0	0.0	0.0	0.8
Murray/Kiewa/Ovens Cap valley	17.7	11.9	0.7	-1.6	-10.4	-17.4
Total Victoria	**14.6**	**15.2**	**-7.1**	**-2.4**	**-9.7**	**-21.1**
South Australia						
Metro-Adelaide & Associated Country Areas	0.0	0.0	0.0	0.0	12.0	11.0
Lower Murray Swamps	-2.6	-3.4	-4.5	-4.7	-4.1	-5.0
Country Towns	0.0	0.0	0.0	0.0	-12.0	-11.0
All Other Purposes	-14.1	7.0	10.8	20.0	9.9	9.7
Total South Australia	**-16.8**	**3.6**	**6.3**	**15.2**	**5.8**	**4.7**
Queensland						
Condamine/Balonne[1]	0.0	0.0	0.0	0.0	0.0	0.0
Border Rivers/Macintyre Brook[1]	0.0	1.6	3.5	8.5	8.7	13.5
Moonie	0.0	0.0	0.0	0.0	0.0	0.0
Nebine	0.0	0.0	0.0	0.0	0.0	0.0
Warrego	0.0	0.0	0.0	0.0	0.0	0.0
Paroo	0.0	0.0	0.0	0.0	0.0	0.0
Total Queensland	**0.0**	**1.6**	**3.5**	**8.5**	**8.7**	**13.5**
Australian Capital Territory[1]	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total Basin	**0.0**	**0.6**	**0.4**	**0.4**	**2.1**	**0.0**

1. No Cap yet has been set for these valleys.

3 The Cap Register in Appendix A-H is an extract from Cap Register 24 stored in MDBA's document management system – TRIM under reference: D11/12002

APPENDIX A: Cap Register – Annual Cap Adjustments for Trade (GL) *continued*

System	2003–04	2004–05	2005–06	2006–07	2007–08	2008–09	2009–10
New South Wales							
Intersecting Streams[1]	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Border Rivers[1]	-3.4	-6.4	-11.6	-6.7	-14.8	-9.5	-8.6
Gwydir	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Namoi/Peel	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Macquarie/Castlereagh/Bogan	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Barwon-Darling/Lower Darling	0.0	-1.1	0.0	0.0	0.0	-27.1	-68.4
Lachlan	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Murrumbidgee	-34.7	8.0	-5.9	-96.8	-139.1	-390.0	-110.8
Murray	34.9	-0.8	0.1	44.2	-19.9	-138.1	-70.1
Total NSW	**-3.2**	**-0.2**	**-17.4**	**-59.3**	**-173.7**	**-564.7**	**-257.8**
Victoria							
Goulburn/Broken/Loddon cap valley	-59.7	-76.6	19.3	-62.3	-218.1	-106.9	-100.5
Campaspe	0.0	0.0	0.0	0.0	21.9	28.7	26.4
Wimmera-Mallee	0.7	-0.4	0.0	1.3	1.1	1.6	0.0
Murray/Kiewa/Ovens Cap valley	34.2	53.8	-9.1	36.1	171.6	258.2	51.2
Total Victoria	**-24.8**	**-23.2**	**10.3**	**-25.0**	**-23.5**	**181.5**	**-22.9**
South Australia							
Metro-Adelaide & Associated Country Areas	9.4	8.8	16.0	0.0	0.0	0.0	0.0
Lower Murray Swamps	-22.1	-32.6	-35.5	-29.4	-21.4	-9.1	-30.26
Country Towns	-9.4	-5.0	-8.0	10.7	6.1	6.1	6.6
All Other Purposes	41.5	45.3	23.0	91.3	192.1	371.8	290.9
Total South Australia	**19.4**	**16.5**	**-4.5**	**72.6**	**176.8**	**368.7**	**267.3**
Queensland							
Condamine/Balonne[1]	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Border Rivers/Macintyre Brook[1]	3.5	6.4	11.6	6.7	14.8	9.5	8.6
Moonie	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nebine	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Warrego	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paroo	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Queensland	**3.5**	**6.4**	**11.6**	**6.7**	**14.8**	**9.5**	**8.6**
Australian Capital Territory[1]	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total Basin	**-5.1**	**-0.6**	**-0.1**	**-5.0**	**-5.7**	**-5.0**	**-4.9**

1. No Cap yet has been set for these valleys.

APPENDIX B: Cap Register – Annual Cap Targets (GL) Adjusted for Trade and Environmental Allocations

System	1997–98	1998–99	1999–00	2000–01	2001–02	2002–03
New South Wales						
Intersecting Streams	n/a	n/a	n/a	n/a	n/a	n/a
Border Rivers	166	181	146	n/a	n/a	n/a
Gwydir	603	269	500	313	423	435
Namoi/Peel	332	316	345	338	334	275
Macquarie/Castlereagh/Bogan	386	592	412	575	577	272
Barwon-Darling/Lower Darling	235	491	337	480	214	141
Lachlan	424	324	270	397	448	243
Murrumbidgee	2557	2550	2022	2721	2673	2116
Murray	1881	2168	1793	2005	1893	462
Total New South Wales	**6584**	**6891**	**5824**	**6830**	**6561**	**3943**
Victoria						
Goulburn/Broken/Loddon cap valley	1980	1653	1590	1678	1587	1004
Campaspe	130	81	76	103	106	85
Wimmera-Mallee	183	190	138	75	88	71
Murray/Kiewa/Ovens Cap valley	1854	1737	1610	1758	1833	1910
Total Victoria	**4147**	**3662**	**3414**	**3614**	**3615**	**3070**
South Australia						
Metro-Adelaide & Associated Country Areas[1]	n/a	n/a	n/a	n/a	n/a	n/a
Lower Murray Swamps	92	91	90	89	90	89
Country Towns	50	50	50	50	38	39
All Other Purposes	412	445	450	473	457	488
Combined AOP + Swamps	504	536	540	563	547	577
Total South Australia	**554**	**586**	**590**	**613**	**585**	**616**
Queensland						
Condamine/Balonne	n/a	n/a	n/a	n/a	n/a	n/a
Border Rivers/Macintyre Brook	n/a	n/a	n/a	n/a	n/a	n/a
Moonie	n/a	n/a	n/a	n/a	n/a	n/a
Nebine	n/a	n/a	n/a	n/a	n/a	n/a
Warrego	n/a	n/a	n/a	n/a	n/a	n/a
Paroo	n/a	n/a	n/a	n/a	n/a	n/a
Total Queensland	**0**	**0**	**0**	**0**	**0**	**0**
Australian Capital Territory[2]	**53**	**41**	**37**	**34**	**37**	**51**
Total Basin	**11337**	**11179**	**9865**	**11091**	**10798**	**7680**

1. See appendix F.
2. Australian Capital Territory has yet to develop a Cap model. No model target was available for 2009–10.The past targets worked out from an Authority model has been recognised as part of the Cap agreement for the ACT.

APPENDIX B: Cap Register – Annual Cap Targets (GL) Adjusted for Trade and Environmental Allocations *continued*

System	2003-04	2004-05	2005-06	2006–07	2007–08	2008–09	2009–10
New South Wales							
Intersecting Streams	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Border Rivers	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Gwydir	151	158	313	75	73	200	70
Namoi/Peel	212	253	293	130	164	245	238
Macquarie/Castlereagh/Bogan	267	166	388	120	218	145	110
Barwon-Darling/Lower Darling	208	153	223	15	185	174	134
Lachlan	91	60	167	86	95	59	61
Murrumbidgee	1884	1410	2459	1089	816	643	665
Murray	1524	1366	1780	243	338	289	950
Total NSW	**4338**	**3566**	**5623**	**1757**	**1889**	**1756**	**2230**
Victoria							
Goulburn/Broken/Loddon cap valley	1622	1642	1591	631	772	588	1119
Campaspe	80	70	41	19	45	45	48
Wimmera-Mallee	66	78	46	22	42	23	55
Murray/Kiewa/Ovens Cap valley	1592	1571	1716	1412	959	898	1274
Total Victoria	**3359**	**3361**	**3394**	**2084**	**1817**	**1554**	**2496**
South Australia							
Metro-Adelaide & Associated Country Areas[1]	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lower Murray Swamps	67	57	59	27	9	8	28
Country Towns	41	43	42	41	37	37	38
All Other Purposes	495	452	448	392	354	425	517
Total South Australia	**603**	**551**	**549**	**460**	**400**	**469**	**583**
Queensland							
Condamine/Balonne	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Border Rivers/Macintyre Brook	n/a	n/a	n/a	n/a	n/a	184	175
Moonie	n/a	n/a	n/a	12	85	36	76
Nebine	n/a	n/a	n/a	2	6	5	10
Warrego	n/a	n/a	n/a	46	77	19	94
Paroo	n/a	n/a	n/a	2	4	1	2
Total Queensland	**0**	**0**	**0**	**63**	**172**	**245**	**357**
Australian Capital Territory[2]	**43**	**38**	**40**	**51**	**27**	**30**	**29**
Total Basin	**8344**	**7516**	**9606**	**4415**	**4305**	**4054**	**5695**

1. See appendix F.
2. Australian Capital Territory has yet to develop a Cap model. No model target was available for 2009–10.The past targets worked out from an Authority model has been recognised as part of the Cap agreement for the ACT.

APPENDIX C: Cap Register – Annual Diversions (GL)

System	1997–98	1998–99	1999–00	2000–01	2001–02	2002–03
New South Wales						
Intersecting Streams	3	3	3	3	3	3
Border Rivers	202	182	197	247	198	137
Gwydir	532	306	448	424	462	238
Namoi/Peel	305	322	350	355	363	294
Macquarie/Castlereagh/Bogan	442	396	437	522	597	411
Barwon-Darling/Lower Darling	266	428	260	487	202	127
Lachlan	429	293	301	423	457	253
Murrumbidgee	2585	2505	1875	2747	2348	1793
Murray	1890	2000	1234	2070	2113	879
Total New South Wales	**6655**	**6435**	**5105**	**7279**	**6745**	**4135**
Victoria						
Goulburn/Broken/Loddon cap valley	1909	1699	1553	1569	1700	1076
Campaspe	96	76	73	113	124	74
Wimmera-Mallee	184	159	103	68	84	60
Murray/Kiewa/Ovens Cap valley	1743	1804	1555	1712	1916	1755
Total Victoria	**3932**	**3738**	**3285**	**3461**	**3824**	**2965**
South Australia						
Metro-Adelaide & Associated Country Areas	153	153	139	104	82	165
Lower Murray Swamps	92	91	90	89	90	89
Country Towns	35	36	37	38	36	39
All Other Purposes	384	409	377	431	413	443
Combined AOP + Swamps	476	500	467	520	503	532
Total South Australia	**664**	**689**	**642**	**662**	**621**	**736**
Queensland						
Condamine/Balonne	545	467	366	360	162	123
Border Rivers/Macintyre Brook	186	123	163	288	163	78
Moonie	8	8	8	31	6	6
Nebine	0	0	0	0	0	0
Warrego	2	10	3	9	10	7
Paroo	0	0	0	0	0	0
Total Queensland	**741**	**609**	**541**	**688**	**341**	**214**
Australian Capital Territory	**44**	**23**	**27**	**34**	**36**	**40**
Total Basin	**12036**	**11494**	**9600**	**12124**	**11567**	**8091**

APPENDIX C: Cap Register – Annual Diversions (GL) *continued*

System	2003-04	2004-05	2005-06	2006–07	2007–08	2008–09	2009–10
New South Wales							
Intersecting Streams	3	3	3	3	3	3	3
Border Rivers	120	125	152	146	131	137	115
Gwydir	169	165	230	139	89	154	57
Namoi/Peel	173	190	234	166	142	188	170
Macquarie/Castlereagh/Bogan	219	102	224	252	75	106	109
Barwon-Darling/Lower Darling	293	186	199	17	221	159	150
Lachlan	59	36	128	73	46	40	26
Murrumbidgee	1775	1618	2200	960	515	602	910
Murray	1312	1241	1667	602	244	341	439
Total NSW	**4122**	**3666**	**5038**	**2358**	**1466**	**1729**	**1979**
Victoria							
Goulburn/Broken/Loddon cap valley	1596	1553	1592	651	684	628	804
Campaspe	73	40	22	14	26	26	26
Wimmera-Mallee	66	50	60	19	45	11	9
Murray/Kiewa/Ovens Cap valley	1478	1493	1578	1406	801	837	971
Total Victoria	**3212**	**3136**	**3252**	**2090**	**1555**	**1503**	**1809**
South Australia							
Metro-Adelaide & Associated Country Areas	82	72	74	203	89	150	57
Lower Murray Swamps	67	57	59	27	15	10	14
Country Towns	35	39	40	41	37	37	38
All Other Purposes	423	453	417	355	282	288	371
Total South Australia	**607**	**620**	**590**	**626**	**423**	**485**	**480**
Queensland							
Condamine/Balonne	575	167	186	57	776	190	1049
Border Rivers/Macintyre Brook	204	192	125	71	210	157	122
Moonie	26	23	2	9	41	29	43
Nebine	0	0	0	0	0	0	1
Warrego	11	11	3	21	23	6	15
Paroo	0	0	0	2	4	1	2
Total Queensland	**815**	**392**	**316**	**160**	**1054**	**383**	**1232**
Australian Capital Territory	**28**	**27**	**32**	**25**	**16**	**19**	**17**
Total Basin	**8785**	**7842**	**9228**	**5260**	**4514**	**4119**	**5518**

APPENDIX D: Cap Register – Annual Cap Credits (GL)

System	Long Term Cap	Schedule E Trigger	1997–98	1998–99	1999–00	2000–01	2001–02	2002–03
New South Wales								
Intersecting Streams	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Border Rivers	234	-47	-36	-1	-51	n/a	n/a	n/a
Gwydir	350	-70	71	-37	52	-111	-38	197
Namoi/Peel	364	-73	27	-7	-5	-16	-30	-19
Macquarie/Castlereagh/Bogan	492	-98	-57	196	-26	53	-20	-139
Barwon-Darling/Lower Darling	306	-61	-31	63	77	-7	11	14
Lachlan	335	-67	-5	31	-30	-27	-9	-10
Murrumbidgee	2358	-472	-29	45	147	-26	325	323
Murray	1908	-382	-9	169	559	-64	-220	-417
Total NSW	**6348**	**-1270**	**-68**	**459**	**722**	**-198**	**18**	**-51**
Victoria								
Goulburn/Broken/Loddon cap valley	2032	-406	71	-45	36	110	-113	-71
Campaspe	122	-24	34	5	2	-10	-18	11
Wimmera-Mallee	159	-32	-1	31	35	7	4	10
Murray/Kiewa/Ovens Cap valley	1696	-339	111	-67	55	46	-83	155
Total Victoria	**4008**	**-802**	**215**	**-76**	**128**	**153**	**-209**	**105**
South Australia								
Metro-Adelaide & Associated Country Areas[1]			128	84	74	109	31	31
Lower Murray Swamps	94	-19	0	0	0	0	0	0
Country Towns	50	-10	15	14	13	12	3	0
All Other Purposes	450	-90	28	36	73	43	44	45
Total South Australia	**594**	**-119**	**171**	**134**	**161**	**164**	**78**	**75**
Queensland								
Condamine/Balonne	729	-146	n/a	n/a	n/a	n/a	n/a	n/a
Border Rivers/Macintyre Brook	245	-49	n/a	n/a	n/a	n/a	n/a	n/a
Moonie	33	-7	n/a	n/a	n/a	n/a	n/a	n/a
Nebine	3	-1	n/a	n/a	n/a	n/a	n/a	n/a
Warrego	39	-8	n/a	n/a	n/a	n/a	n/a	n/a
Paroo	0	0	n/a	n/a	n/a	n/a	n/a	n/a
Total Queensland	**1049**	**-210**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
Australian Capital Territory[2]	**40**	**-8**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
Total Basin	**12040**	**-2408**	**318**	**516**	**1011**	**119**	**-113**	**129**

1. Metro Adelaide has a five-year rolling Cap of 650 GL and does not accumulate Cap credit.
2. Australian Capital Territory has yet to develop a Cap model. No model target (hence any cap credit) was available for 2009–10.The past credits worked out from an Authority model has been recognised as part of the Cap agreement for the ACT.

APPENDIX D: Cap Register – Annual Cap Credits (GL) *continued*

System	Long Term Cap	Schedule E Trigger	2003–04	2004–05	2005–06	2006–07	2007–08	2008–09	2009–10
New South Wales									
Intersecting Streams	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Border Rivers	234	-47	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Gwydir	350	-70	-19	-7	83	-64	-17	47	13
Namoi/Peel	364	-73	39	63	59	-36	22	57	69
Macquarie/Castlereagh/Bogan	492	-98	49	64	164	-132	143	39	1
Barwon-Darling/Lower Darling	306	-61	-84	-33	24	-2	-35	16	-16
Lachlan	335	-67	33	24	40	13	49	19	36
Murrumbidgee	2358	-472	109	-208	259	128	302	41	-244
Murray	1908	-382	212	125	113	-358	94	-52	510
Total NSW	**6348**	**-1270**	**339**	**27**	**741**	**-452**	**558**	**167**	**369**
Victoria									
Goulburn/Broken/Loddon cap valley	2032	-406	26	90	-1	-20	88	-41	316
Campaspe	122	-24	7	30	20	5	19	19	22
Wimmera-Mallee	159	-32	-1	28	-14	3	-3	12	46
Murray/Kiewa/Ovens Cap valley	1696	-339	114	78	138	5	158	61	304
Total Victoria	**4008**	**-802**	**147**	**226**	**142**	**-6**	**262**	**51**	**687**
South Australia									
Metro-Adelaide & Associated Country Areas[1]			111	187	232	100	164	87	93
Lower Murray Swamps	94	-19	0	0	0	0	-6	-2	14
Country Towns	50	-10	5	4	2	0	0	0	0
All Other Purposes	450	-90	72	-1	31	37	72	136	146
Total South Australia	**594**	**-119**	**188**	**189**	**265**	**136**	**231**	**221**	**253**
Queensland									
Condamine/Balonne	729	-146	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Border Rivers/Macintyre Brook	245	-49	n/a	n/a	n/a	n/a	n/a	27	53
Moonie	33	-7	n/a	n/a	n/a	3	43	7	33
Nebine	3	-1	n/a	n/a	n/a	2	6	5	9
Warrego	39	-8	n/a	n/a	n/a	25	54	13	79
Paroo	0	0	n/a	n/a	n/a	0.15	0.08	0	0
Total Queensland	**1049**	**-210**	**n/a**	**n/a**	**n/a**	**31**	**103**	**52**	**174**
Australian Capital Territory[2]	**40**	**-8**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
Total Basin	**12040**	**-2408**	**674**	**442**	**1148**	**-321**	**1051**	**439**	**1390**

1. Metro Adelaide has a five-year rolling Cap of 650 GL and does not accumulate Cap credit.
2. Australian Capital Territory has yet to develop a Cap model. No model target (hence any cap credit) was available for 2009–10.The past credits worked out from an Authority model has been recognised as part of the Cap agreement for the ACT.

APPENDIX E: Cap Register – Cumulative Cap Credits (GL)

System	Long Term Cap	Schedule E Trigger	1997–98	1998–99	1999–00	2000–01	2001–02	2002–03
New South Wales								
Intersecting Streams	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Border Rivers	234	-47	-36	-38	-89	n/a	n/a	n/a
Gwydir	350	-70	71	35	86	-25	-63	134
Namoi/Peel	364	-73	27	20	15	-1	-31	-50
Macquarie/Castlereagh/Bogan	492	-98	-57	139	113	167	147	8
Barwon-Darling/Lower Darling	306	-61	-31	32	109	102	113	127
Lachlan	335	-67	-5	26	-5	-31	-41	-50
Murrumbidgee	2358	-472	-29	16	163	137	461	784
Murray	1908	-382	-9	160	719	655	435	18
Total NSW	**6348**	**-1270**	**-68**	**391**	**1113**	**1003**	**1022**	**970**
Victoria								
Goulburn/Broken/Loddon cap valley	2032	-406	71	26	62	172	59	-12
Campaspe	122	-24	34	39	42	32	14	25
Wimmera-Mallee	159	-32	-1	29	65	72	76	86
Murray/Kiewa/Ovens Cap valley	1696	-339	111	44	99	145	62	217
Total Victoria	**4008**	**-802**	**215**	**139**	**267**	**421**	**211**	**316**
South Australia								
Metro-Adelaide & Associated Country Areas[1]			128	84	74	109	31	31
Lower Murray Swamps	94	-19	0	0	0	0	0	0
Country Towns	50	-10	15	28	42	54	56	56
All Other Purposes	450	-90	28	64	137	180	224	269
Total South Australia	**594**	**-119**	**171**	**176**	**253**	**343**	**312**	**356**
Queensland								
Condamine/Balonne	729	-146	n/a	n/a	n/a	n/a	n/a	n/a
Border Rivers/Macintyre Brook	245	-49	n/a	n/a	n/a	n/a	n/a	n/a
Moonie[2]	33	-7	n/a	n/a	n/a	n/a	n/a	n/a
Nebine[2]	3	-1	n/a	n/a	n/a	n/a	n/a	n/a
Warrego[2]	39	-8	n/a	n/a	n/a	n/a	n/a	n/a
Paroo[2]	0	0	n/a	n/a	n/a	n/a	n/a	n/a
Total Queensland	**1049**	**-210**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
Australian Capital Territory[3]	**40**	**-8**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
Total Basin	**12040**	**-2408**	**318**	**706**	**1633**	**1767**	**1544**	**1642**

1. Metro Adelaide has a five-year rolling Cap of 650 GL and does not accumulate Cap credit.
2. Caps for Moonie Warrego, Paroo and Nebine are annual and do not accumulate Cap credit
3. Australian Capital Territory has yet to develop a Cap model. No model target (hence any cap credit) was available for 2009–10.The past cumulative credits worked out from an Authority model has been recognised as part of the Cap agreement for the ACT.

APPENDIX E: Cap Register – Cumulative Cap Credits (GL) *continued*

System	Long Term Cap	Schedule E Trigger	2003–04	2004–05	2005-06	2006–07	2007–08	2008–09	2009–10
New South Wales									
Intersecting Streams	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Border Rivers	234	-47	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Gwydir	350	-70	115	108	191	127	110	157	170
Namoi/Peel	364	-73	-11	52	110	74	96	153	222
Macquarie/Castlereagh/Bogan	492	-98	57	121	284	153	296	335	336
Barwon-Darling/Lower Darling	306	-61	43	10	34	32	-4	12	-4
Lachlan	335	-67	-17	7	46	59	108	127	163
Murrumbidgee	2358	-472	893	685	944	1073	1374	1415	1170
Murray	1908	-382	230	355	468	109	203	151	662
Total NSW	**6348**	**-1270**	**1309**	**1337**	**2077**	**1626**	**2184**	**2351**	**2719**
Victoria									
Goulburn/Broken/Loddon cap valley	2032	-406	14	104	103	83	171	130	446
Campaspe	122	-24	32	62	81	87	106	125	146
Wimmera-Mallee	159	-32	86	114	99	102	99	111	157
Murray/Kiewa/Ovens Cap valley	1696	-339	332	410	547	553	711	772	1075
Total Victoria	**4008**	**-802**	**463**	**689**	**831**	**824**	**1086**	**1137**	**1824**
South Australia									
Metro-Adelaide & Associated Country Areas[1]	n/a	n/a	111	187	232	100	164	87	93
Lower Murray Swamps	94	-19	0	0	0	0	-6	-8	6
Country Towns	50	-10	61	65	67	67	67	67	67
All Other Purposes	450	-90	341	340	370	407	480	616	762
Total South Australia	**594**	**-119**	**513**	**592**	**670**	**574**	**705**	**762**	**928**
Queensland									
Condamine/Balonne	729	-146	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Border Rivers/Macintyre Brook	245	-49	n/a	n/a	n/a	n/a	0	27	80
Moonie[2]	33	-7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Nebine[2]	3	-1	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Warrego[2]	39	-8	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Paroo[2]	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total Queensland	**1049**	**-210**	**n/a**	**n/a**	**n/a**	**n/a**	**0**	**27**	**80**
Australian Capital Territory[3]	**40**	**-8**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
Total Basin	**12040**	**-2408**	**2286**	**2617**	**3578**	**3024**	**3975**	**4250**	**5471**

1. Metro Adelaide has a five-year rolling Cap of 650 GL and does not accumulate Cap credit.
2. Caps for Moonie Warrego, Paroo and Nebine are annual and do not accumulate Cap credit.
3. Australian Capital Territory has yet to develop a Cap model. No model target (hence any cap credit) was available for 2009–10. The past cumulative credits worked out from an Authority model has been recognised as part of the Cap agreement for the ACT.

APPENDIX F: Cap Register for Metropolitan Adelaide

Year	South Australia – Metropolitan Adelaide	Designated River Valley and Cap		
	Diversion	Gross Metro-Adelaide & Associated Country Areas (rolling 5-year Cap is 650 GL)	First Use License	Net Metro-Adelaide & Associated Country Areas (rolling 5-year Cap is 650 GL)
1997–98	Annual Diversion	153	0	153
	Diversion – 5 Years to 1997–98	555	0	555
1998–99	Annual Diversion	153	0	153
	Diversion – 5 Years to 1998–99	598	0	598
1999–00	Annual Diversion	139	0	139
	Diversion – 5 Years to 1999–00	577	0	577
2000–01	Annual Diversion	104	0	104
	Diversion – 5 Years to 2000–01	614	0	614
2001–02	Annual Diversion	82	12	70
	Diversion – 5 Years to 2001–02	631	12	619
2002–03	Annual Diversion	165	11	154
	Diversion – 5 Years to 2002–03	642	23	619
2003–04	Annual Diversion	82	9	73
	Diversion – 5 Years to 2003–04	572	32	539
2004–05	Annual Diversion	72	9	63
	Diversion – 5 Years to 2004–05	504	41	463
2005–06	Annual Diversion	74	16	58
	Diversion – 5 Years to 2005–06	475	57	418
2006–07	Annual Diversion	203	0	203
	Diversion – 5 Years to 2006–07	595	45	550
2007–08	Annual Diversion	89	0	89
	Diversion – 5 Years to 2007–08	520	34	486
2008–09	Annual Diversion	150	0	150
	Diversion – 5 Years to 2008–09	588	25	563
2009–10	Annual Diversion	57	0	57
	Diversion – 5 Years to 2009–10	573	16	557

APPENDIX G: Cap Register – Annual Cap Adjustments (GL) for Environmental Use

System	2004–05	2005–06	2006–07	2007–08	2008–09	2009–10
New South Wales						
Intersecting Streams	0	0	0	0	0	-16
Border Rivers	0	0	0	0	0	0
Gwydir	0	0	0	0	0	0
Namoi/Peel	0	0	0	0	0	0
Macquarie/Castlereagh/Bogan	0	0	0	-1	0	-4
Barwon-Darling/Lower Darling	0	0	0	0	-11	-22
Lachlan	0	0	0	0	0	0
Murrumbidgee	0	-20	-20	-5	-12	-92
Murray	0	-2	0	0	-3	-12
Total NSW	**0**	**-22**	**-20**	**-6**	**-27**	**-146**
Victoria						
Goulburn/Broken/Loddon cap valley	-18	-16	-4	-9	-7	-16
Campaspe	0	0	0	0	0	0
Wimmera-Mallee	0	0	0	0	0	0
Murray/Kiewa/Ovens Cap valley	-8	-7	-7	-12	-24	-43
Total Victoria	**-26**	**-22**	**-11**	**-21**	**-31**	**-58**
South Australia						
Metro-Adelaide & Associated Country Areas	0	0	0	0	0	0
Lower Murray Swamps	0	0	0	0	0	0
Country Towns	0	0	0	0	0	0
All Other Purposes	0	0	0	-1	-50	-83
Total South Australia	**0**	**0**	**0**	**-1**	**-50**	**-83**
Queensland						
Condamine/Balonne	0	0	0	0	0	0
Border Rivers/Macintyre Brook	0	0	0	0	0	0
Moonie	0	0	0	0	0	0
Nebine	0	0	0	0	0	0
Warrego	0	0	0	0	0	0
Paroo	0	0	0	0	0	0
Total Queensland	**0**	**0**	**0**	**0**	**0**	**0**
Australian Capital Territory	**0**	**0**	**0**	**0**	**0**	**0**
Total Basin	**-26**	**-44**	**-31**	**-29**	**-108**	**-287**

APPENDIX H: Cap Register – Difference in Cumulative Cap Credits between Cap Register 2008–09 and Cap Register 2009–10

System	Cumulative Cap Credit up to year 2008–09 in WAM Report 2008–09	Cumulative Cap Credit up to year 2008–09 in WAM Report 2009–10	Difference in Cumulative Cap Credit	Difference due to			
				Model Cap Targets	Cap Adjustment for Trade	Cap Adjustment for Environment	Diversions
New South Wales							
Intersecting Streams	n/a	n/a	n/a	0	0	0	0
Border Rivers	n/a	n/a	n/a	0	0	0	0
Gwydir	158	157	-2	-2	0	0	0
Namoi/Peel	153	153	0	0	0	0	0
Macquarie/Castlereagh/Bogan	335	335	0	0	0	0	0
Barwon-Darling/Lower Darling	-186	12	198	198	0	0	0
Lachlan	127	127	0	0	0	0	0
Murrumbidgee	1419	1415	-4	0	0	-4	0
Murray	146	151	6	6	0	0	0
Total NSW	**2153**	**2351**	**197**	**202**	**0**	**-4**	**0**
Victoria							
Goulburn/Broken/Loddon cap valley	214	130	-84	-76	0	-8	0
Campaspe	125	125	-1	-1	0	0	0
Wimmera-Mallee	111	111	0	0	0	0	0
Murray/Kiewa/Ovens Cap valley	657	772	115	118	0	-3	0
Total Victoria	**1107**	**1137**	**30**	**41**	**0**	**-11**	**0**
South Australia							
Metro-Adelaide & Associated Country Areas	87	87	0	0	0	0	0
Lower Murray Swamps	-8	-8	0	0	0	0	0
Country Towns	67	67	0	0	0	0	0
All Other Purposes	616	616	0	0	0	0	0
Total South Australia	**762**	**762**	**0**	**0**	**0**	**0**	**0**
Queensland							
Condamine/Balonne	n/a	n/a	n/a	0	0	0	0
Border Rivers/ Macintyre Brook	27	27	0	0	0	0	0
Moonie	n/a	n/a	n/a	0	0	0	0
Nebine	n/a	n/a	n/a	0	0	0	0
Warrego	n/a	n/a	n/a	0	0	0	0
Paroo	n/a	n/a	n/a	0	0	0	0
Total Queensland	**27**	**27**	**0**	**0**	**0**	**0**	**0**
Australian Capital Territory	**130**	**130**	**0**	**0**	**0**	**0**	**0**
Total Basin	**4179**	**4407**	**228**	**243**	**0**	**-15**	**0**

Water Audit Monitoring Report **2009–10**

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MURRAY–DARLING
BASIN AUTHORITY