

# MANAGING THE MENINDEE LAKES IN 2004-2005

December 2004

Information Paper No. 04-05 (1)

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## INTRODUCTION

This information paper has been prepared to provide information about the on-going management of the Menindee Lakes during the current drought.

The paper provides information about management of flows upstream and downstream of the Lakes since January and how it is proposed to manage the flows and water supply in 2004-05 if conditions remain dry.

**Fig 1:  
Darling River , Feb 2004,  
near Moorara Station  
upstream of Pooncarie**



## FLOW MANAGEMENT IN 2004

### i. Flows Upstream of Menindee Lakes

Flows during 2003/04 have been similar to those of the Federation drought of 1902/03 in that the Darling River ceased to flow for long periods.

The Darling River has experienced the worst drought and flow sequence recorded in the past 150 years. The river, at Wilcannia has ceased to flow for months, broken only by an occasional small flow. These flows have barely maintained the town water supply requirements of towns upstream of the Menindee Lakes storages, and have not provided sufficient inflows to the Menindee Lakes to secure town water supply for Broken Hill beyond 18 months.

In the past year, there have been three rain events that have contributed to flows in the Barwon-Darling river system that have added water into the Menindee Lakes.

In December 2003, rain caused a small rise in river flow with a total volume of about 32,000 megalitres (ML) passing Mungindi, of which about 12,000ML flowed into Lake Wetherell in the Menindee Lakes.

During this flow NSW irrigators in the Border Rivers were denied access to supplementary water and an embargo was imposed on both 'B' & 'C' class licences on the Barwon Darling. Irrigators around Bourke with permanent plantings were allowed access to sufficient water to keep these trees alive.

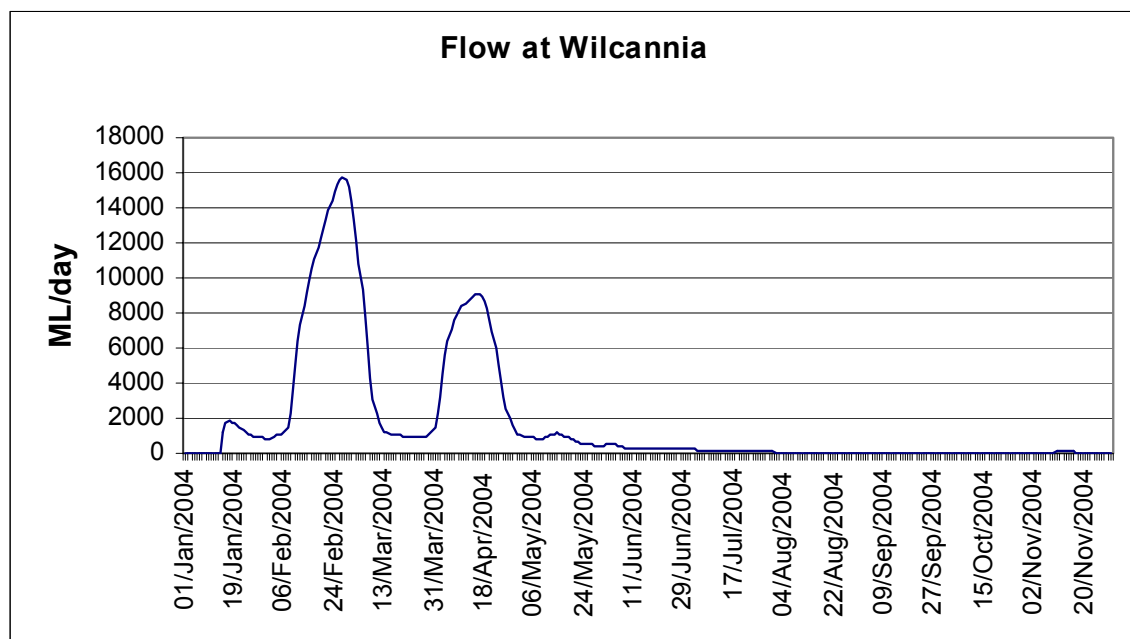
Collectively, the restrictions ensured the priority for water supply was always town water supply along the length of the river.

In mid and late January 2004 there was widespread rain throughout much of northern NSW and southern Queensland with rainfall totals up to 200mm in the Gwydir and Namoi Valleys and heavier falls of up to 280mm in the Weir and Moonie catchments.

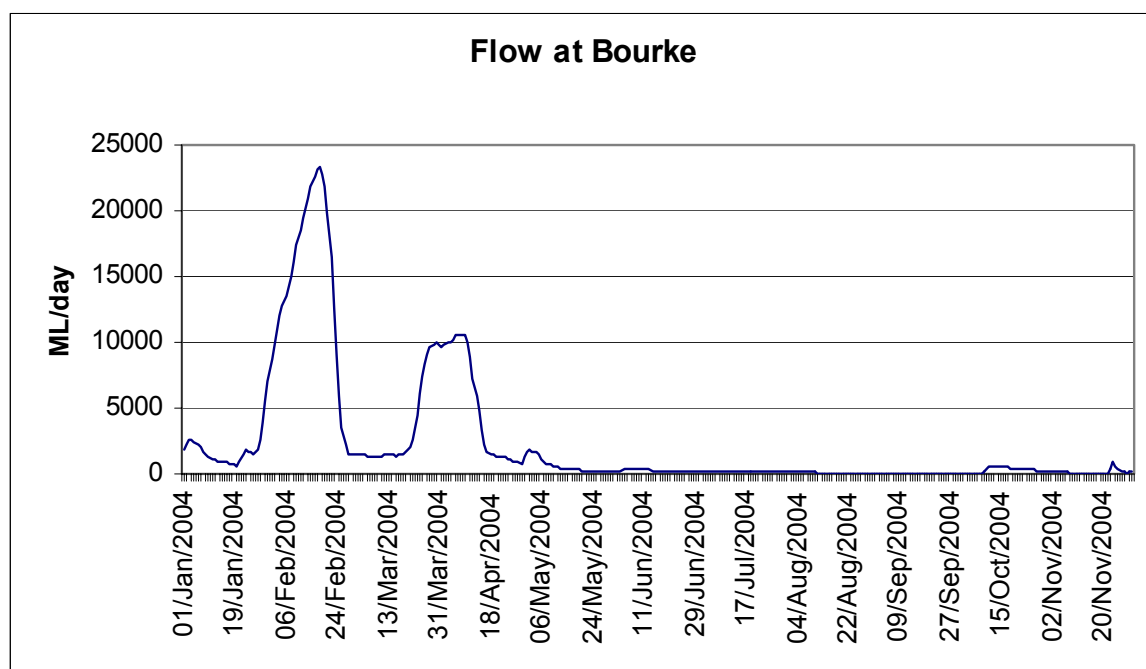
Further rain fell in March throughout much of the same area, again generating flows in the Barwon-Darling River. At Bourke, the first high flow reached 22,835 ML/day on the 19<sup>th</sup> February 2004 and the second peak of 10,561 ML/day on the 9<sup>th</sup> of April.

Since then there has been little rainfall and flow upstream of the Menindee Lakes has continued to reduce. However, as with most extended droughts, smaller inflow will pass into the lakes and will have to be managed on an event by event basis.

**Fig 2: Flow as measured at Wilcannia from 1<sup>st</sup> Jan 2004 to 20<sup>th</sup> Nov 2004**



**Fig 3: Flow as measured at Bourke from 1<sup>st</sup> Jan to 20<sup>th</sup> Nov 04**



**ii. Inflow and storage management in the Menindee Lakes during 2004**

In January 2004, volumes in the Menindee Lakes had reduced to around 20,000 ML, with all the remaining water stored in Lake Wetherell and Lake Tandure.

Following rain in upstream catchments at the end of January, an estimated 350,000 ML was forecast to flow into the Menindee Lakes commencing in March. This volume was sufficient to fill Lake Wetherell with about 45,000 ML left over.

This left the Department with a choice of two options:

- i. either divert the remaining water into Lake Pamamaroo; or,
- ii. use it to increase flows in the Darling River downstream of Menindee.

Lake Pamamaroo has a ‘dead storage’ of about 30,000 ML from which water cannot be released, and, as the lake had been dry for a considerable period, high seepage losses would have been expected.

This meant that diverting water to Lake Pamamaroo would have provided little immediate benefit for water supply, other than to ‘wet-up’ the bed of the lake and reduce losses should there be a follow-up inflow.

At the same time, the water quality in the river downstream of Menindee was highly saline having an adverse impact on irrigated crops. There had been extensive algae blooms and in previous weeks an extensive ‘fish kill’ of Murray Cod had occurred.

When all things were considered, the Department agreed that the additional water would be released downstream.

A total of 315,000 ML ultimately flowed into Lake Wetherell during that event, well below the forecast 350,000 ML, and after the release downstream, the rest was stored in Lake Wetherell.

Good rainfall on 13<sup>th</sup> and 14<sup>th</sup> March in the Weir River and Barwon catchments resulted in an inflow of about 157,000 ML. This was sufficient to fill Lake Wetherell and allow 99,000 ML water to be diverted into Lake Pamamaroo during April and May.

Also in May 2004, 156,000 ML was transferred by State Water from Lake Wetherell to Lake Pamamaroo, to enable assessment of the integrity of the levee system that had not been wet for a considerable time.

Storage volumes of Lakes Wetherell and Pamamaroo peaked at 254,675 ML in April and 146,945 ML in June respectively. Lake Menindee and Lake Cawndilla remain dry.

**Table 1: Volumes in Lakes Wetherell and Pamamaroo – Jan 2004 to Nov 2004 (in megalitres)**

Lake	Jan 04	Feb 04	Mar 04	Apr 04	May 04	Jun 04	Jul 04	Aug 04	Sep 04	Oct 04	Nov 04
Wetherell	26382	223325	242596	254675	216916	192949	191064	187294	178223	168000	156000
Pamamaroo	0	0	0	99000	128770	146945	139830	136616	130848	125000	112000

### iii. Flows downstream of Menindee

At the end of December 2003 it was estimated that only about 20,000 megalitres remained available in the Menindee Lakes, excluding the residual pool of Lake Tandure that had separated from the main body of Lake Wetherell. There was still no flow upstream.

At this stage, it was estimated that if flows were to continue to be released downstream to meet stock and domestic and the already restricted irrigation demands, water supply to Broken Hill would only last until March 2004. By ceasing flows downstream, this supply could be extended until September 2005.



**Fig 4:**  
Remains of PS Rodney,  
exposed in the Darling  
River, Feb 2004, near  
Moorara Station, north  
of Pooncarie

In 2004, to the end of November, a total of 126,480 ML has been released to the Lower Darling River including releases from Lake Wetherell and from Lake Pamamaroo.

**Table 2: Monthly releases (in ML) from the Menindee Lakes – Jan 2004 to Nov 2004**

Lake	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Wetherell	800	30,050	33,475	7,375	4,400	1,700	0	0	0	0	0
Pamamaroo	0	0	0	2,400	3,000	24,000	2,480	2,660	3,460	5,780	4,900

Following the completion of the environmental assessments, flows to the Lower Darling River downstream of Weir 32 were stopped on 31<sup>st</sup> December 2003.

Water users downstream of Weir 32 could only pump from residual pools, or from groundwater bores although it is known that the supply of fresh groundwater is very limited.

As January progressed, the water remaining in these pools dwindled and became increasingly saline, and at times the water temperature exceeded 30°C.

Following the rain across northern NSW in mid-January it was estimated that some water would pass through the length of the river and into Lake Wetherell. In response, DIPNR immediately increased flows downstream of Weir 32 to 150 megalitres per day. This volume was the absolute minimum necessary to replenish the dwindling residual pools in the river and to protect the remaining native fish stocks, while at all times conserving water supply for Broken Hill as a priority, should dry conditions continue.

It was also important that these flows be managed so as not to push highly saline water into the upstream reaches of the Wentworth weir pool near Ellerslie. The water here was fresh and if saline water had been pushed into the weir pool, this would have had immediate damaging impact on the horticulture and grapevine developments.

However, after a week during which daily temperatures were extreme, it was apparent that the releases were insufficient to pass through the river and flows were increased to 300 megalitres per day on the 28<sup>th</sup> January. The severity of the high temperatures is indicated by that fact that during mid February over a 10 day period, 8 days exceeded 40°C with a peak of 46°C being recorded. The extreme temperatures significantly raised the water temperatures increasing transmission losses and depleting the storage volume.

More rain fell across northern NSW at the end of January that was finally sufficient to ensure a significant inflow into the Menindee Lakes. In mid-February, inflows from the mid-January rainfall had started to flow into Lake Wetherell and dilute the saline water that remained. The flows to the Lower Darling River were increased from 300 megalitres per day to 700 and progressively up to 7,000 megalitres per day to provide an environmental flow to the Lower Darling River. The flows were then reduced to 300 megalitres per day where they were maintained until July 2004.

The ‘environmental flow’ was managed by DIPNR together with the Murray-Darling Basin Commission, so that the saline water was pushed through the Lower Darling, Lake Victoria and Murray River to the sea. It took over three months for the saline water to pass through the system.

Following the good rainfall in January and a smaller rain event in March there has been no rainfall to generate further flows in the Darling River, sufficient to provide any substantial increase in water available in the Menindee Lakes.

Since July, to conserve water, DIPNR has maintained flows downstream of Menindee to less than that specified in the water sharing plan, as the turbidity of the water being released from Lake Pamamaroo, has reduced the potential for algae blooms to develop downstream up until now.



**Fig 5:  
Weir 32,  
21<sup>st</sup> October 2004**

## WATER QUALITY AND THE ENVIRONMENT

### i. Salinity

By January 2004, the quality of water in Lake Wetherell, in the Menindee weir pool and in the remaining pools of the Darling River downstream was saline and continuing to increase as hot and dry conditions continued.

**Table 3: Salinity (in EC’s) at selected sites in the Darling River Oct 2003 to Apr 2004**

SITE	SALINITY EC UNITS (EC)						
	14 Oct 03	18 Nov 03	16 Dec 03	13 Jan 04	17 Feb 04	17 Mar 04	13 Apr 04
<b>Wilcannia</b>	588	630	572	631	166	227	145
<b>Weir 32</b>	1,169	1,493	2,410	2,460	1,495	400	496
<b>Burtundy</b>	1,780	2,060	2,580	3,470	4,320	263	379

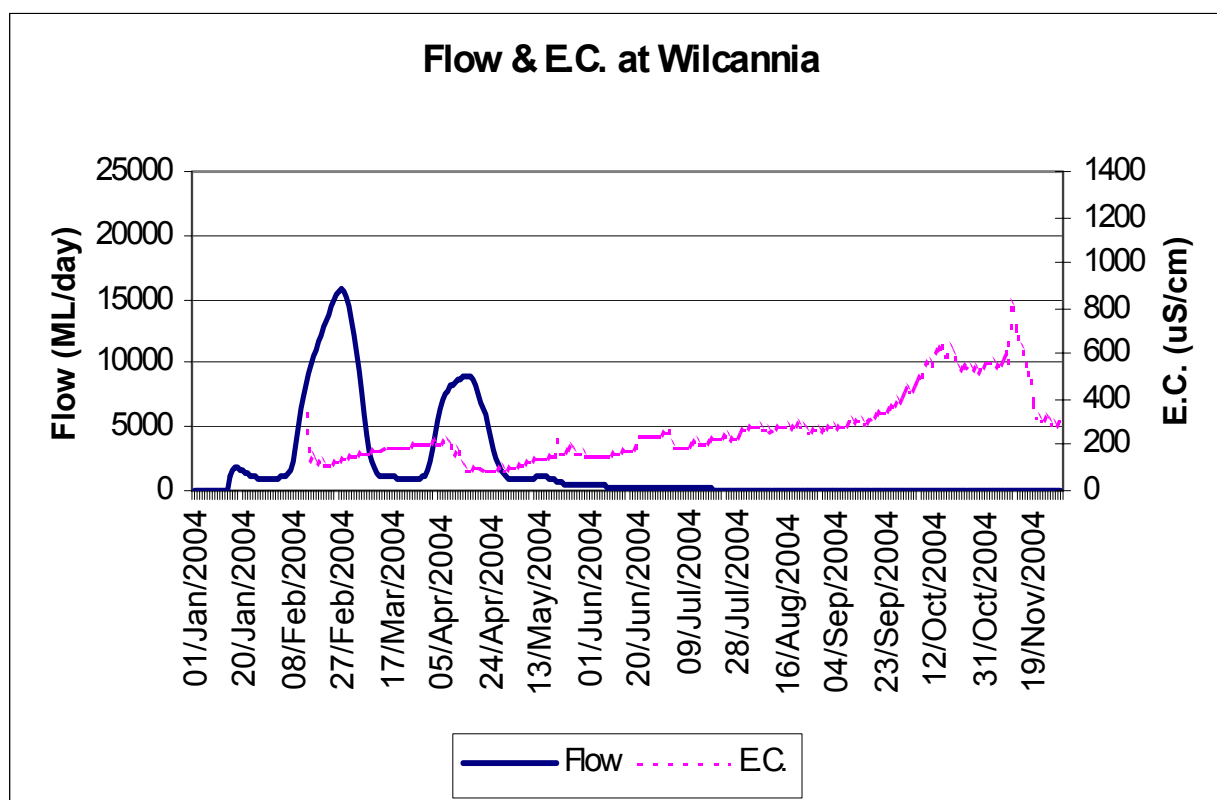
To keep the public informed of the salinity situation, numerous media releases were issued and water quality reports were faxed to Lower Darling users, between 18<sup>th</sup> February and 16<sup>th</sup> March.

In February 2004, the inflow to Lake Wetherell from rain that had fallen upstream in mid January, provided a significant dilution effect that is demonstrated at the monitoring sites along the river.

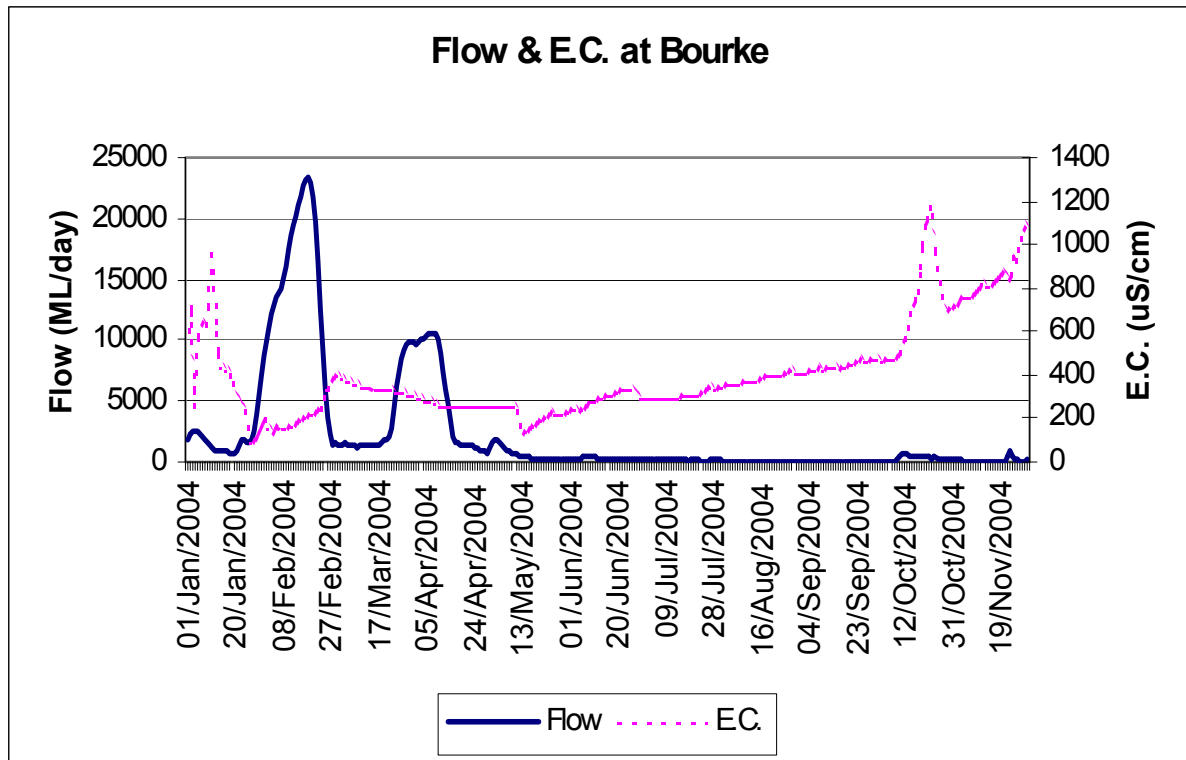
When the bulk of the forecast inflows passed into Lake Wetherell, it provided a significant dilution effect, reducing the high salinities that have persisted over the past year.

At Ellerslie, salinity peaked at just over 4,000 EC on 4<sup>th</sup> March. By 10<sup>th</sup> March, salinity was lower at 634 EC and by 13<sup>th</sup> March it had reduced to 267 EC.

**Fig 6: Flow and Salinity as measured at Wilcannia from 1<sup>st</sup> Jan 2004 to 19<sup>th</sup> Nov 2004**



**Fig 7: Flow and Salinity as measured at Bourke from 1<sup>st</sup> Jan 2004 to 19<sup>th</sup> Nov 2004**



**ii. Algae blooms**

Up until February 2004, there were extensive stretches of the Darling River, both upstream and downstream of Menindee affected by algal blooms. All of these were dispersed following the high flows that occurred after January in the upstream catchments.

Since February, the quality of water being released to the Lower Darling River has been relatively turbid. During the cooler months this has reduced the potential for algae development.

The Department is continuing monitoring but it is important to be aware of, and to avoid drinking, cooking or being in contact with discoloured water or water which has a musty odour.

**iii. Fish kills**

In February 2004, following a sequence of hot days when day time air temperatures constantly exceeded 40°C and water temperatures exceeded 30°C, an extensive fish kill was reported in the Darling River, downstream of Menindee between Tolarno and Whurlie stations.

**Table 4 - February maximum temperatures (°C):**

<b>1<sup>st</sup></b>	<b>2<sup>nd</sup></b>	<b>3<sup>rd</sup></b>	<b>4<sup>th</sup></b>	<b>5<sup>th</sup></b>	<b>6<sup>th</sup></b>	<b>7<sup>th</sup></b>	<b>8<sup>th</sup></b>	<b>9<sup>th</sup></b>	<b>10<sup>th</sup></b>	<b>11<sup>th</sup></b>	<b>12<sup>th</sup></b>	<b>13<sup>th</sup></b>	<b>14<sup>th</sup></b>
28.4	28.6	NR	32.5	38.8	41.2	43.2	43.5	39.4	45.4	43.6	44.0	NR	46.2
<b>15<sup>th</sup></b>	<b>16<sup>th</sup></b>	<b>17<sup>th</sup></b>	<b>18<sup>th</sup></b>	<b>19<sup>th</sup></b>	<b>20<sup>th</sup></b>	<b>21<sup>st</sup></b>	<b>22<sup>nd</sup></b>	<b>23<sup>rd</sup></b>	<b>24<sup>th</sup></b>	<b>25<sup>th</sup></b>	<b>26<sup>th</sup></b>	<b>27<sup>th</sup></b>	<b>28<sup>th</sup></b>
46.0	41.8	40.0	40.4	39.5	45.5	37.6	23.2	27.5	30.4	31.5	32.5	35.4	38.0

The fish kill was nearly all Murray Cod, and it has been estimated that between 1,000 and 5,000 may have died. An independent review was undertaken by the Murray-Darling Freshwater Centre which found that the fish kills was caused by "... a combination of oxygen depletion (due most likely to a combination of extreme temperature, high algal respiration and organic loading), with the possible added stress of sulphide and/or ammonia toxicity."

At the time of the fish kill, only minor releases of between 150 and 300 ML/d were being made to the river downstream of Menindee. These flows were to replenish pools to protect native fish, without pushing highly saline water into the River Murray.

For future management, it is now clear that flows of 300 ML/d will not be sufficient to replenish pools along the length of the river, when the river has previously ceased to flow, and may increase the organic load in the residual pools. But at the same time with no flow, it is likely that the fish kills may have occurred anyway.

## WATER MANAGEMENT IN 2004-2005

Without significant inflows into the Menindee Lakes in the coming months, managing the available water to meet the competing demands of consumptive water users and the needs of the environment will not be easy.

After consideration of all of the issues, DIPNR proposes to manage flows in the Lower Darling River, and provide water for consumptive users during 2004-2005 as indicated below. These arrangements assume no inflows into the Menindee Lakes during this period and should inflows occur, management arrangements will be reviewed accordingly.

### **i. River flows**

During spring 2004, flows in the Lower Darling River have reduced below the minimum flows recommended in the Water Sharing Plan for the Murray and Lower Darling Rivers, as it is considered that reducing flows will not lead to adverse water quality or environmental impacts.

Water saved in the Menindee Lakes as a result, may be used to extend security of town water supply or to increase water availability, where appropriate, for general security consumptive use.

If there has been no significant inflow into the Menindee Lakes by December 2005, DIPNR will most likely be required to cease all flows to the Darling River downstream of Weir 32, as occurred in December 2003 to conserve the remaining water for town water supply.

## **ii. Town water supply**

At the beginning of October 2004, there is sufficient water to meet town water supply requirements for at least 18 months.

If, and when, Lake Tandure separates from Lake Wetherell, DIPNR will consider pumping water from the residual pool of Lake Tandure, to make additional water available for town water supply.

Should drought conditions continue beyond 2004-2005, water remaining in Lake Wetherell and the Weir 32 pool after December 2005 will be reserved for town water and stock and domestic purposes only.

Any inflows into the Menindee Lakes during 2004-05 will be preferentially set aside to ensure that water supply for town water and stock and domestic purposes is extended to a minimum of 18 months, before any volume is allocated for other consumptive purposes.

## **iii. Irrigation supply**

In 2004-2005, high security irrigators will have access to 100 percent of their licensed entitlement.

Water availability for irrigation is secure for high security uses in 2004-2005, and it is expected that water availability for general security purposes will rise, at least until December 2004.

At the beginning of September 2004, there was sufficient water available to meet 30 percent of the licensed entitlement for general security irrigators.

By reducing downstream flows below the minimum flows recommended in the Water Sharing Plan, sufficient water was saved to enable general security allocation to be increased to 47 percent at the end of October. Similarly, general security allocation was increased to 50 percent on the 1<sup>st</sup> December.

Should inflows occur that are greater than those required to extend town water, and stock and domestic purposes beyond 18 months, and are surplus to environmental needs, additional water will then be set aside for high security irrigation in 2005-06 after which water may also be made available for licensed general security users.

#### **iv. Potential for inflows**

Long-term climate and river flow records would suggest that there is a high likelihood of some inflows into the Menindee Lakes in the coming 12 months. However, given the highly variable nature of flow in the Darling River, the water management arrangements have been developed on a worse-case scenario.

DIPNR believes that adopting the proposed water management arrangements, town water supply, including that for Broken Hill, will be secured well beyond any previous drought sequence.

Similarly, by adopting these arrangements the potential for environmental impacts such as fish kills will be minimised at least until 2006. Water quality is always expected to decline over time during a drought as salinity increases and there will always remain the potential for the development of algal blooms in the river, particularly within the weir pools environments.

These arrangements provide an appropriate water sharing regime between high priority needs such as Broken Hill town water supply, the river environment and the needs of water users to maintain jobs and to generate income into the region.

## FURTHER INFORMATION

Information regarding the management of the Menindee Lakes is available from the offices of the NSW Department of Infrastructure, Planning and Natural Resources at:

Buronga	Enterprise Way Buronga, NSW, 2739	Phone 03 50219400 Fax 03 50213328
Albury	Dean Street Albury, NSW, 2640	Phone 02 60416777 Fax 02 60414223
Deniliquin	Edwardes Street Deniliquin, NSW, 2710	Phone 03 58819200 Fax 03 58813465

or at the office of State Water at:

Menindee	Candilla Street Menindee, NSW, 2879	Phone 08 80914401 Fax 08 80914265
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Department of  
**Infrastructure, Planning and Natural Resources**  
Murray-Murrumbidgee Region