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MURRAY–DARLING BASIN AUTHORITY

River Murray System Annual Operating Plan (Public Summary)

2010-11 Water Year
1 June 2010 – 31 May 2011

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1 Introduction

The River Murray System Annual Operating Plan (Public Summary) for the 2010-11 water year (1 June 2010 to 31 May 2011) provides context and describes how the River Murray System (the System) may be operated under a number of assumed scenarios in the coming year.

For commercial-in-confidence reasons this Public Summary does not include some aspects of River Murray operations, such as those related to trade and potential releases from the Snowy Mountains Scheme.

The plan has been prepared by the Murray-Darling Basin Authority ('the MDBA' or 'the Authority') with input from the Australian Government, and the States of New South Wales, Victoria and South Australia through the MDBA's Water Liaison Working Group.

The contents of this summary include:

- Chapter 2 - A brief description of the legislative framework relevant to the operation of the River Murray System;
- Chapter 3 – Key considerations and constraints;
- Chapter 4 – System status at 1 June 2010 and potential water availability in 2010-11;
- Chapter 5 – Summary of river operations during the 2010-11 water year under a range of scenarios;
- Chapter 6 – Detailed river operations during 2010-11 (individual structures, reaches and issues); and
- Chapter 7 – a calendar of events.
- Chapter 8 – further information on the River Murray System

The actual conditions that occur in the 2010-11 water year will inevitably be different from these indicative inflow projections, and therefore river operations will also be different to any projection presented. Nevertheless, this plan should provide a useful indication of river operations in the 2010-11 water year. This document may be updated during the year if there is a significant change, such as a large inflow to Menindee Lakes. The States will also receive updates on a regular basis through the Water Liaison Working Group to take into account what has happened as the season progresses.

In the event that this plan has not been finalised prior to the start of the 2010-11 water year (1 June 2010), river operations would continue according to actions outlined in this plan and/or following past practice. In addition, this plan will also apply in the early months next water year (2011-2012) until the 2011-2012 River Murray System Annual Operating Plan is finalised.

2 Legislative Framework

The MDBA co-ordinates the operation of the River Murray System to provide water to the States of New South Wales, Victoria and South Australia in accordance with the Water Act 2007 *(Cth.),* and the Murray-Darling Basin Agreement ('the Agreement') which is a schedule to the Act.

State water entitlements are determined in accordance with Part XII of the Agreement – Distribution of Waters. The MDBA must attain approval of these jurisdictions for any proposed river operations that may have a material impact on State water entitlements and which are not consistent with prior practice.

There is extensive prior practice of river operations. Over decades, several hundred resolutions, practices and rules have been developed to manage the River Murray System, and also provide for variations in specific circumstances. Some of these are at a system or multi-storage scale, some relate to individual storages, and others relate to specific locations along the river. In many instances river operations often involve balancing competing objectives on a day-to-day basis. This is discussed further in Chapter 3.

One of the new functions of the MDBA is to prepare and oversee a Basin Plan. Once a Basin Plan has been approved in 2011 it will be an important consideration when developing subsequent River Murray System Annual Operating Plans.

3 Some key objectives and constraints in operations

3.1 Key Objectives

River operations often involve balancing competing objectives on a day-to-day basis. The following need to be taken into consideration by the MDBA when carrying out river operations:

Structural safety and maintenance - the structures along the River Murray System must be operated in accordance with their fundamental design parameters and having the highest regard for the safety of downstream communities. They also require regular maintenance and at times there is a need for upgrades as the structures age, or as Occupational Health and Safety and engineering standards (e.g. the Australian National Committee on Large Dams guidelines) become more stringent through time. River operations need to ensure that the structural and operational integrity of dams, weirs and other structures is maintained. In addition, the maintenance and improvement of the flow management structures along the River Murray System is scheduled, as far as possible, to not restrict the flexibility needed for river operations required at the time.

Water orders - deliver and account for the water orders of each Southern Basin State in a timely, transparent and efficient manner.

Water security - maintain and, when the need arises, to enhance, the security of supply of water to Southern Basin States.

Water trade - facilitate the transfer of water entitlements and allocations between States and between valleys.

Environmental watering - facilitate the implementation of environmental watering activities.

Other environmental outcomes - mitigate significant adverse environmental events, such as fish kills, unseasonal watering, algal blooms, river bank erosion and acidification.

Water quality - mitigate events that may adversely affect the quality of water available for urban, irrigation, industrial, stock and domestic, and environmental use.

Flooding - manage floods to conserve water and manage impacts on communities.

Aboriginal cultural heritage - facilitate the protection of Aboriginal cultural heritage, in accordance with relevant cultural heritage management plans and by other means.

Navigation and recreation - maintain adequate river depth for navigation and recreational use, in accordance with the Agreement.

Connectivity with other valleys - to take account of and co-ordinate with inflows from tributaries to the River Murray, including regulated catchments such as the Snowy Mountains Scheme and the Goulburn, Murrumbidgee and the Darling Rivers.

If, on any occasion, the MDBA is unable to achieve one or more of the objectives above, in whole or in part, because of a conflict between those objectives and one or more other objectives, the MDBA may, after consulting with the States, will aim to achieve an appropriate balance between conflicting objectives, taking into consideration the surrounding circumstances.

3.2 System constraints

Some key considerations in River Murray System operations are: the considerable variability of both inflows and usage; weir pool operations; the long travel times; and system constraints such as the Barmah Choke. Each is briefly discussed below.

Considerable variability of both inflows and usage. Operations of the River Murray System occur in the context of considerable variability:

- There is extreme variability in the weather of the Murray-Darling Basin, and the river inflows to the River Murray System are amongst the most variable in the world. Short-term rainfall forecasts have improves substantially over recent years and are used to support operational decisions. Medium term rainfall forecasts and run-off forecasts are also improving and serve as a useful guide to what might happen in the future.
- The water market has become increasingly active during recent years, and this growth is expected to continue into the future. The impacts of trade on the timing and location of use of water will become clearer with time.
- The amount of water carried-over from year to year is increasing as irrigators adapt to very low inflows and new carryover policies.
- The amount of water available for environmental purposes is increasing rapidly and its timing and location of use can vary greatly between years.
- There may also be short-term issues along the river, which are difficult to foresee, that can require rapid response. Some issues affecting river operations develop within weeks (e.g. blue-green algal blooms), or within days (e.g. a salinity spike, or a fish kill). Some of these issues could be mitigated by river operations, particularly in years when water is relatively abundant.
- Very rarely, there are emergency river operations carried out (such as the 1996 emergency release from Hume Reservoir) that require an immediate response.

The coordination of inflows. The operation of the River Murray System occurs in coordination with:

- the Snowy Mountain Scheme (operated by Snowy Hydro Limited) – the Snowy Water Licence allows Snowy Hydro substantial flexibility over its day to day release pattern whilst fulfilling water supply targets on an annual basis;
- regulated tributaries, particularly the Goulburn Rivers in Victoria (operated by Goulburn-Murray Water) and the Murrumbidgee River and Billabong Creek in NSW (operated by NSW State Water), including the delivery of water held in Inter-valley trade accounts as a result of water being traded to the Murray;

- tributaries that are primarily unregulated, such as the Kiewa and Ovens Rivers in Victoria; and
- the Darling River in NSW, including the operations of the Menindee Lakes when it is under NSW control.

This coordination is important, as water released from storages within the MDBA's control needs to be managed in conjunction with other regulated and unregulated inflows to the system in order to optimise outcomes.

Weir pool operations. Drawing on or raising weir pools has become a more common practice at some weirs in recent years to assist in meeting environmental or water delivery objectives. These operations may not always match the expectations of local communities that may have previously experienced constant or near constant weir pool levels. River operators can change weir pool levels after balancing objectives in Section 3.1 in the context of the circumstances of the time.

Long travel times. From Hume Dam to Lake Victoria there is limited capacity for re-storage or release of flows along the River Murray. The typical flow time between Hume Dam and Lake Victoria is 25 days, so it is likely that weather conditions will change during this time period and there will be variability in river transmission losses and demand for water. This limited re-regulation capacity affects the level of control that the MDBA has over the flow regime in much of the River Murray, particularly in years of average and high inflows, or during extended hot spells when the available water in the river may be less than orders for a short period of time. Once the water has been released, and there is significant rainfall along the river and hence water orders are cancelled ('a rain rejection'), with subsequent out of bank flows is possible, particularly in the Barmah Choke (discussed further in Chapter 6).

System flow constraints. At various locations in the River Murray System there are flow constraints, which may apply during periods of regulated release, which when breached, may have detrimental social and environmental impacts depending on timing. Some of these constraints include:

Mitta Mitta downstream of Dartmouth: 10,000 ML/day at Tallandoon

Hume to Yarrawonga: 25,000 ML/day at Doctors Point

Release from Yarrawonga Weir (due to "Barmah Choke"): approx 10,400 ML/day

Inlet to Lake Victoria: up to 10,000 ML/day depending on level in Lake Victoria

Outlet from Lake Victoria: up to 10,000 ML/day

Edward River downstream of Stevens Weir: 2,700 ML/day (recently revised from 2,900 ML/day)

Darling River downstream of Menindee Lakes: 9,000 ML/day

Outlet to Darling from Lake Menindee: up to 4,000 ML/day depending on level in Lake Menindee

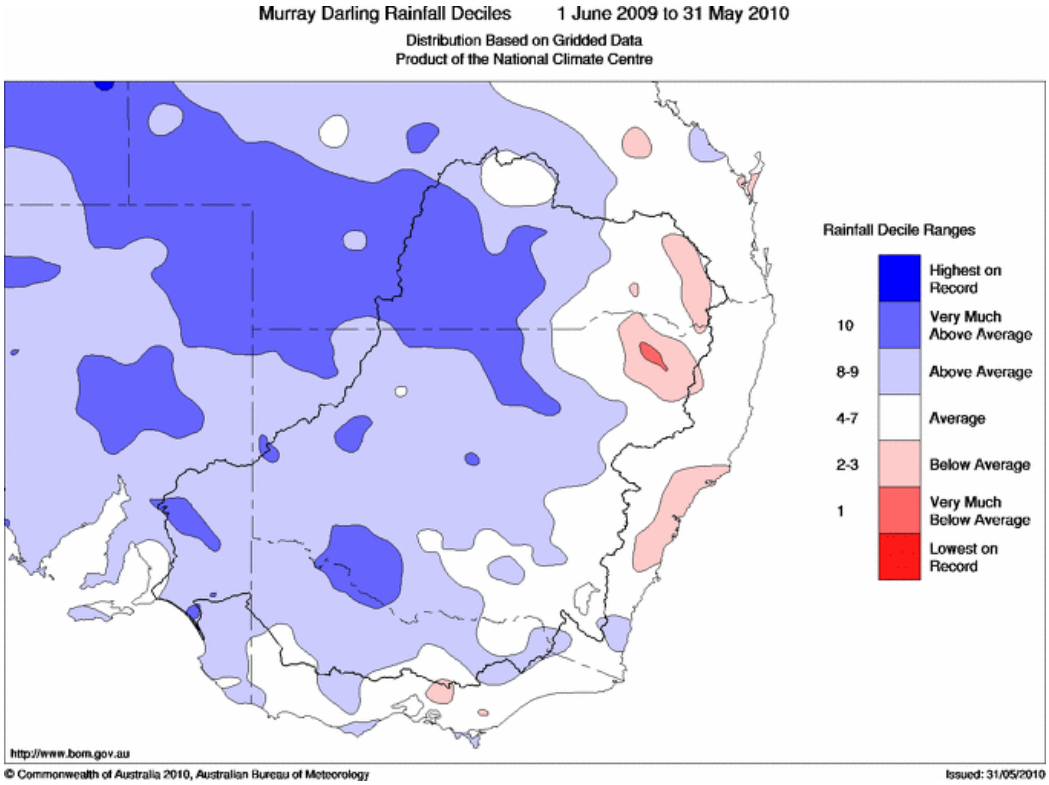
4 Potential water availability in 2010-11

4.1 System status on 1 June 2010

The outlook for the Murray system in the 2010-11 water year is better than at the start of the last 3 years, although sustained periods of above-average rainfall are still needed to remove the longer term rainfall deficiencies that have accumulated over the last 8 to 13 years.

Rainfall across the western part of the Murray-Darling Basin in 2009-10 was above average, with the highest deciles in western Queensland (Figure 1). Although, rainfall in the upper Murray catchment, where the majority of the system inflows are usually generated was close to average, inflows were very much below average.

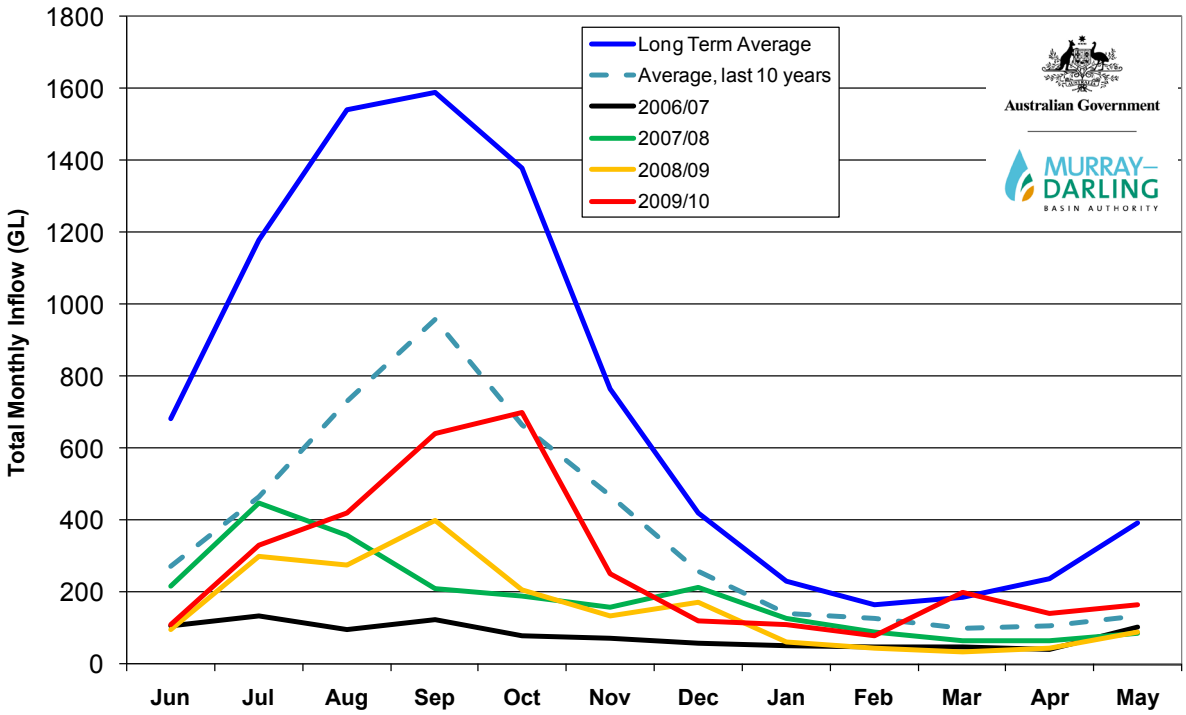
- Figure 1 – Rainfall Deciles – 12 months 1 June 2009 to 31 May 2010



In the 2009-10 water year, Murray system inflows (excluding Snowy releases and Menindee inflows) were 3,210 GL, compared with the long-term average of 8,790 GL. River Murray System inflows have been below average for nine out of the last ten years with inflows in the last four years (Figure 2) being the lowest, 3rd lowest, 6th lowest and 13th lowest in 119 years of records.

The total inflow over the past four years (excluding Snowy releases and Menindee inflows) was about 8,280 GL, which is a record low for a four-year period and represents about 25% of the long-term average.

- Figure 2 – River Murray System inflows (excluding inflows to Menindee and Snowy Mountains Scheme) - recent years and long-term averages

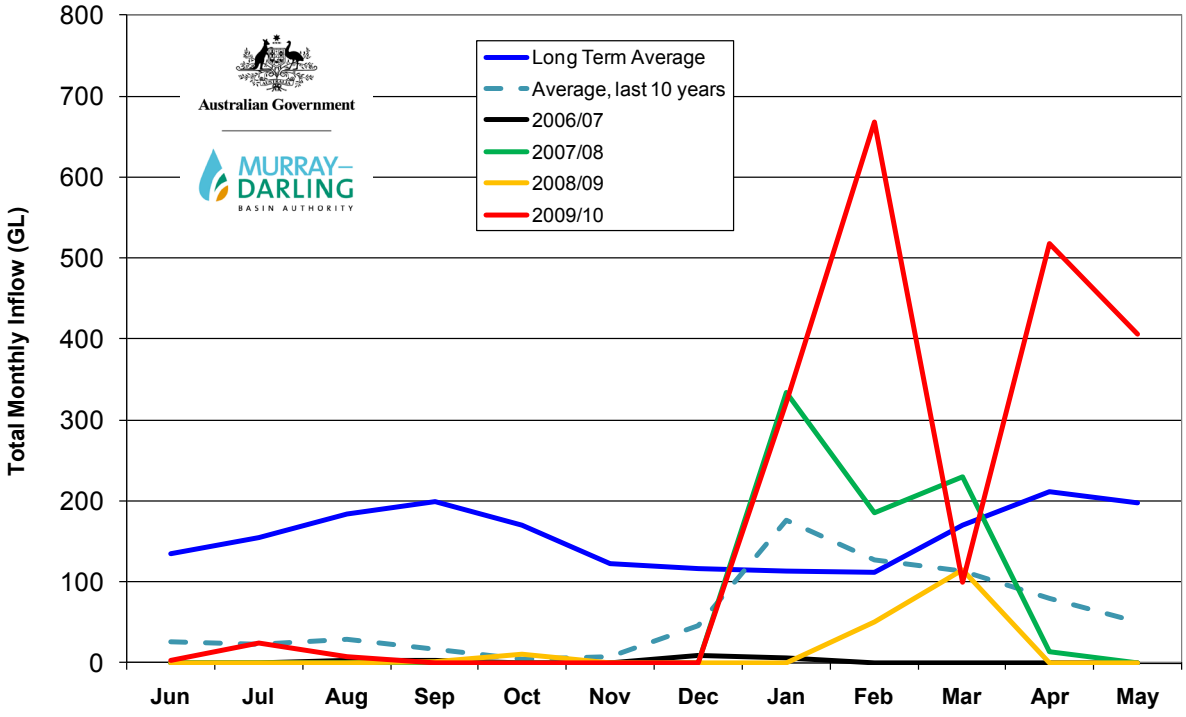


Flooding during the Christmas-New Year period in mid-western NSW resulted in about 1,000 GL reaching Menindee Lakes. Of this, about 500 GL was delivered to the River Murray and shared between the States according to a special arrangement that ensured a significant portion was provided to the Lower Lakes and that there were no adverse impacts on Victoria. The water from subsequent floods in Queensland in late February and early March 2010 is, at end June, still flowing into Menindee Lakes and by the end of July 2010 it is expected to result in about 1,150 GL of inflow to the Menindee Lakes, which reverted to MDBA control in mid-April 2010.

Total inflows to Menindee Lakes during 2009-10 (to end May 2010) were about 2,050 GL, which was slightly better than the long-term average of about 1,900 GL and significantly more than in recent years (Figure 3).

System reserves have improved in the last 12 months, but remain low. The total MDBA active storage on 31 May 2010 was 2,965 GL (Table 1 and Figure 4), including about 929 GL in Menindee Lakes. This is the highest reserve for the end of May since 2006. On 31 May 2010, there was also about 143 GL of water available to the Murray in 2010-11 held in storages in the Murrumbidgee and Goulburn Valleys as a result of earlier trade into the Murray. Total storage in the Snowy Mountains reservoirs (which are managed by Snowy Hydro) remained low, with Lake Eucumbene active storage being 597 GL (14% of active capacity).

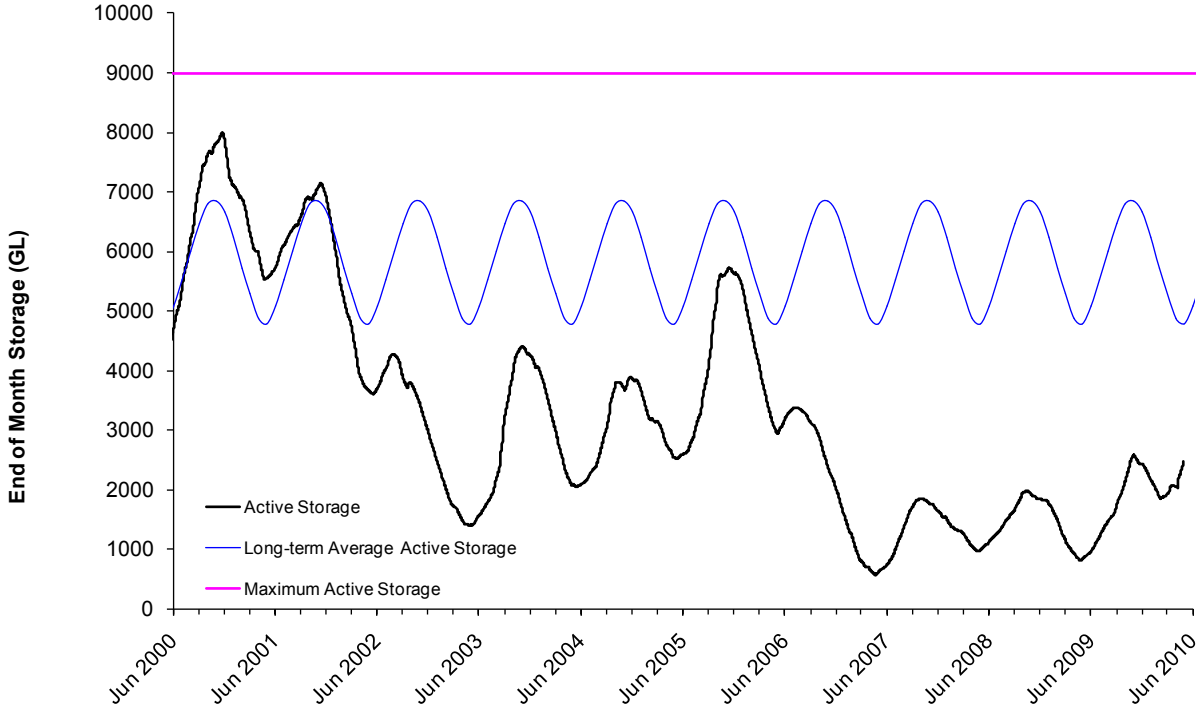
- Figure 3 – Inflows to Menindee Lakes in recent years and long-term averages



- Table 1 – Storage in MDBA major reservoirs on 31 May 2010

Major storage	**Total capacity** (GL)	**Active capacity** (GL)	**Total water in storage** (GL)	**Percentage of total capacity**	**Active water in storage** (GL)
Dartmouth Reservoir	3,906	3,826	1,241	32%	1,161
Hume Reservoir	3,038	3,008	622	21%	592
Lake Victoria	677	577	383	57%	283
Menindee Lakes	1,731	1,251	1,409	81%	929
River Murray System Total	**9,352**		**3,655**	**39%**	**2,965**

- Figure 4 – MDBA active storage June 2000 to May 2010



The capacity to carry-over water from one year to the next is now allowed for many State water entitlements. A significant portion of the late season improvements in allocations in 2009-10 from the Darling River has been carried over into 2010-11. This carryover water contributes about 1,230 GL to the volume of water in storage at the start of 2010-11. For this operations plan, the following private carryover estimates were used: NSW 580 GL, Victoria 520 GL and South Australia 130 GL. The actual private carryover volumes will not be known until the States complete the annual accounting process in July 2010.

One of the major aims of River Murray operations over the past few years has been to keep as much of this carryover water in Dartmouth Reservoir where evaporation losses are minimised. As a result of this action, storage in Dartmouth Reservoir increased over the 2009-10 year from 21% to 32% capacity, however some releases were needed in December and January to maintain levels in Hume Reservoir. The high inflows from the Darling River this year meant that, after March 2010, releases from Hume Reservoir were required to meet only the water demands upstream of Wentworth. Hence, the minimum storage in Hume Reservoir of 470 GL in late April was much higher than the previous three years.

Lake Victoria, at the end of May 2010 was at 57% total capacity (383 GL) and has been used to store and regulate a large proportion of the flows from the Darling River transferred to the Murray. At Menindee Lakes, Lakes Menindee and Cawndilla commenced filling in mid-March 2010 and, with Lakes Wetherell and Pamamaroo at maximum surcharge levels, the total volume stored in the lakes at the end of May was 1,409 GL (81% total capacity).

4.2 Hydrological assumptions for the 2010-11 water year

The overall water availability for the River Murray System is determined by the MDBA at the start of each water year (1 June) and then at least monthly during the year. Throughout the year, the overall water availability is calculated using data and models and assumptions agreed to by each of the jurisdictions. In recent years, as part of drought management, water availability assessments have been prepared twice monthly, even when improvements have been relatively small.

Each determination of annual water availability needs to take into account the available water that is in storage at the time, the amount of water used in that water year so far, and estimates of future inflows (both regulated and unregulated) and the losses that may be experienced in delivering water along the length of the River Murray System for the remainder of the year.

River Murray System scenarios for 2010-11

Since the inflows to the River Murray System cannot be known in advance, this plan addresses the operations that may be undertaken under six different scenarios that cover the likely range of conditions that may be experienced this year.

Each scenario has in-built assumptions regarding inflows from the Snowy scheme, unregulated inflows into Hume Reservoir, inflows into Dartmouth Reservoir and inflows from the tributaries, including the Kiewa, Ovens, Goulburn, Murrumbidgee, and Darling Rivers, conveyance "losses", storage losses and usage patterns.

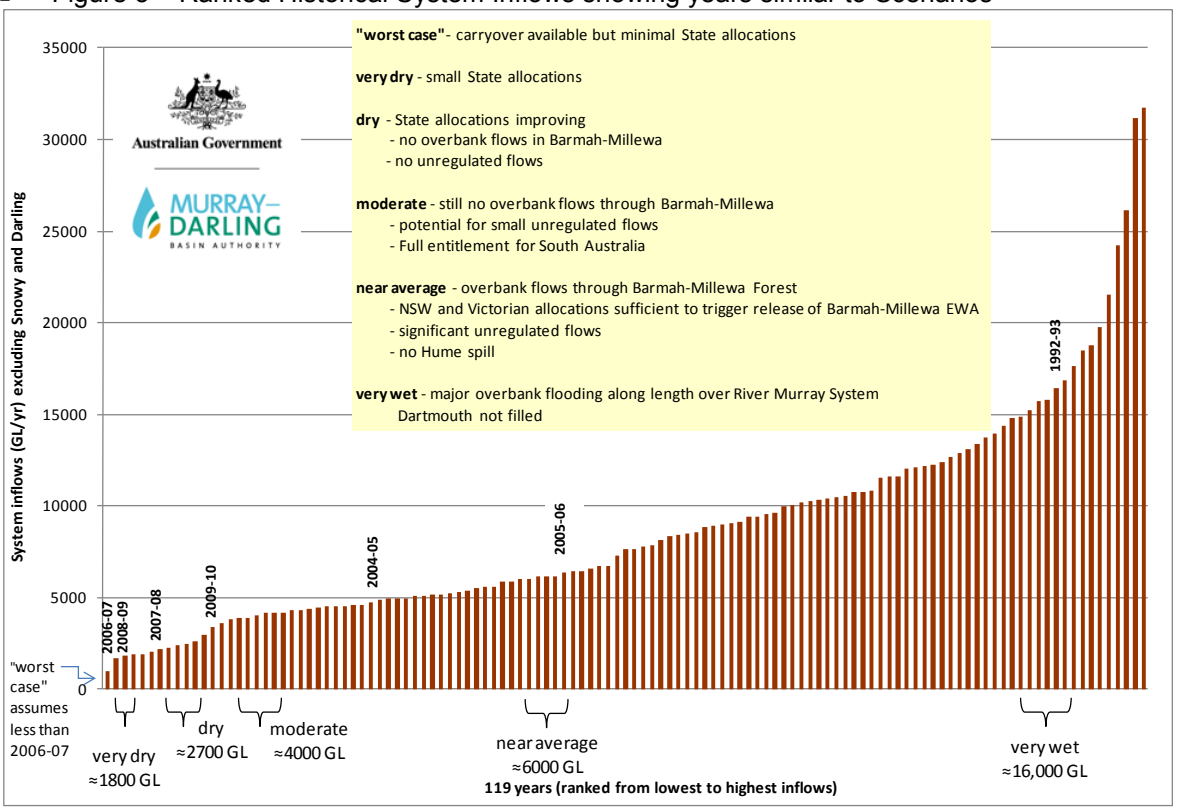
Generally, it is only the volume of water available under the 'worst case scenario' (and updates thereof) that is progressively allocated by the States to their water users. The other scenarios are used to provide indicative quantities of water availability to the States to assist yearly planning for water managers and customers should those wetter scenarios eventuate. The assumptions in each scenario could change in future years as data and models are updated.

The scenarios in this plan are based in information available at 20 June 2010. The scenarios include the impacts of rain up to this date and allow for a recession of inflows to the end of June 2010.

The relative difference between inflows of each of the six scenarios can be compared in Figure 5. The details of the six scenarios are provided in Table 2 and they are labelled according to the assumed River Murray System inflow as follows:

- the 'worst case scenario', assumes 772 GL of River Murray System inflows, which is 198 GL less than the historic minimum inflows of 970 GL that occurred in 2006-07;
- the 'very dry' scenario, assumes River Murray System Inflows of about 1,800 GL, which is comparable to inflows in 2008-09;
- the 'dry' scenario, assumes River Murray System Inflows of about 2,700 GL which is comparable to inflows in 1997-98;
- the 'moderate' scenario, assumes River Murray System Inflows of about 4,000 GL which is comparable to inflows in 1994-95;
- the 'near average' scenario, assumes River Murray System Inflows of about 6,000 GL which is comparable to inflows in 2005-06; and
- the 'very wet' scenario, assumes River Murray System Inflows of about 16,000 GL which is comparable to inflows in 1992-93.

- Figure 5 – Ranked Historical System Inflows showing years similar to Scenarios



- Table 2 – Details of assumptions in each scenario for 2010-11 (all volumes in GL)

Item	worst case*	very dry	dry	moderate	near average	very wet
Active MDBA storage on 31 May 2010	2965	2965	2965	2965	2965	2965
Storage in Valley Accounts on 31 May 2010	143	143	143	143	143	143
Water in transit on 31 May 2010	27	27	27	27	27	27
June 2010 to May 2011 inflows from Upstream of Albury	828	1634	2512	3465	4501	7974
June 2010 to May 2011 inflows from Upstream of Menindee	170	170	170	170	170	170
June 2010 to May 2011 inflows from Victorian tributaries	190	489	722	1220	1967	6420
June 2010 to May 2011 inflows from NSW tributaries	93	93	122	220	476	2970
Upper State usage and SA non dilution Entitlement to end May 2011	0	0	0	0	0	0
Net trade into Upper States this season	0	0	0	0	0	0
Remaining commitments between 1 June 2010 and 31 May 2011						
Conveyance losses along Murray upstream of SA Border	-800	-800	-800	-830	-1250	-2505
Conveyance losses along Lower Darling	-145	-145	-145	-145	-125	-35
Storage losses upstream of the SA Border	-547	-552	-563	-590	-740	-915
Supply of South Australian Dilution and Loss Entitlement	-696	-696	-696	-696	-696	-696
Supply of transfer (trade) water to South Australia	-52	-52	-52	-52	-52	-52
Supply of undelivered South Australian Entitlment from 2009-10	-72	-72	-72	-72	-72	-72
Supply of Additional Dilution Flow duirng 2010-11	-90	-90	-139	-151	-250	-380
Supply of Unregulated Flow to South Australia during 2010-11	0	0	0	0	-100	-5950
Total Murray allocatable water (Tier 1)	**2014**	**3114**	**4193**	**5674**	**6964**	**10064**
Additional available water to Murray due to water tansfers (excluding intra state entitlement tranfers)	**52**	**52**	**52**	**52**	**52**	**52**
Total available water for use	**2067**	**3166**	**4245**	**5726**	**7016**	**10116**

* worst case scenario as at 20 June 2010. Includes a recession to worst case by 1 July 2010 following rain in mid June 2010.

Conveyance water (river losses)

The volume of water set aside for conveyance, which includes losses to evaporation and seepage along the river system, varies between scenarios. The 800 GL allowed for conveyance between Dartmouth Reservoir and the South Australian Border in the 'worst case', 'very dry' and 'dry' scenarios takes a conservative approach and is slightly higher than losses experienced in recent years, i.e. about 750 GL in 2006-07 and about 715 GL in 2009-10 (Figure 6).

The pattern of losses is skewed towards the summer months when evaporation is expected to be higher. The volume and pattern of water set aside for conveyance will be regularly reviewed by MDBA and altered to suit the actual conditions as they develop.

The 800 GL assumes that:

- river flows are at, but not in excess of, channel capacity through the 'Barmah choke' for at least a short period during the year;
- all major wetlands affected by regulated flows are connected at some stage of the year (including Moira Lake, Euston Lakes); and
- weir pools are held at normal operating levels.

If conditions are wetter then conveyance losses will be higher due to increased flooding and consequential evaporation and seepage on the floodplain. They may also be higher due to higher flow rates and river levels across the River Murray System including the need to 'transfer' water at, or possibly above, channel capacity through 'Barmah choke'. Consequently, if conditions improve then it may be appropriate for MDBA to revert to using the conveyance loss pattern previously used for planning purposes prior to 2006-07, which assumed a total of 982 GL for the year.

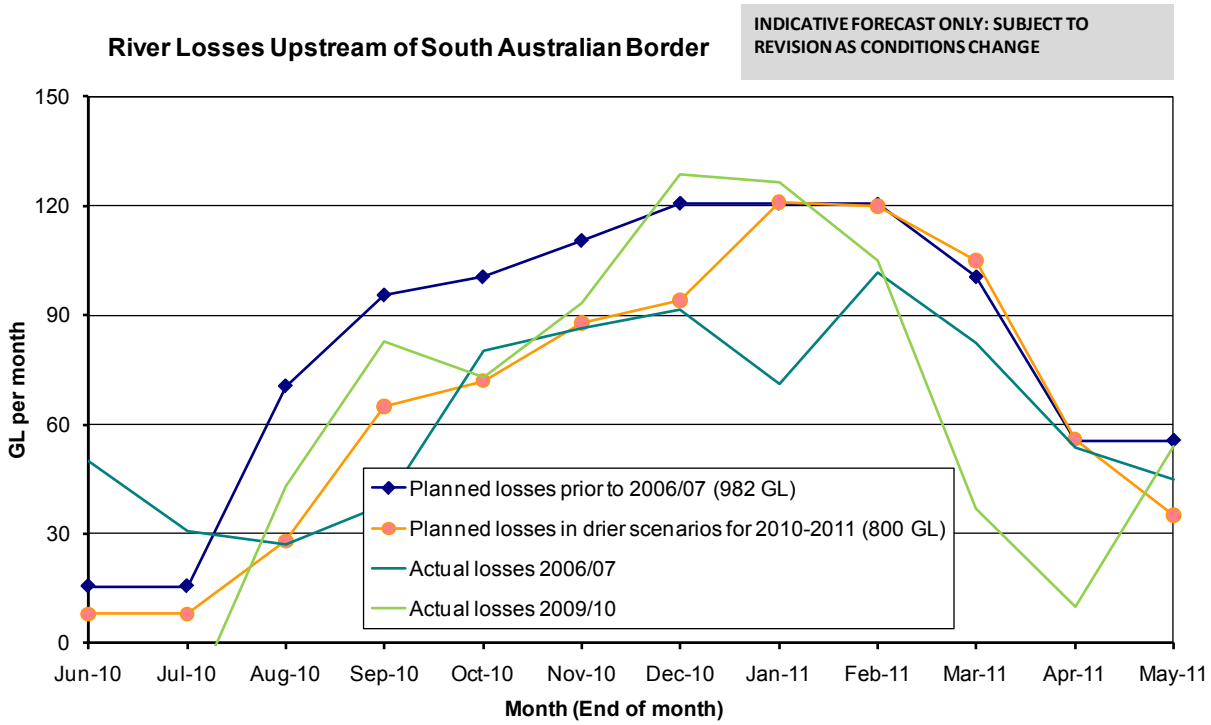
The conveyance loss along the River Murray in South Australia upstream of Wellington is included as part of the South Australian 696 GL Dilution and Loss entitlement. How much evaporates or is otherwise lost between the border and Wellington (just upstream of Lake Alexandrina) and how much flows to the lake will vary from year to year depending on evaporation and local rainfall. For planning purposes it is assumed that about 50% is lost and the other 50% flows to the Lower Lakes.

Storage losses

Assumptions of evaporative losses from storages vary for each scenario, being about 550 GL in the 'worst case scenario' and then increasing in the wetter scenarios (>900 GL in 'very wet' scenario) due to the much larger wetted surface area, particularly over summer, with increased water in storage.

This compares with allowed storage losses at the beginning of last year (2009-10) of about 140 GL in the 'worst case' scenario. The two main reasons for the large increase in planned storage losses are due to the inclusion of Menindee Lakes (now in MDBA control), which has a 'worst case' scenario loss of about 330 GL, and the assumption that Lake Victoria will be operational for all of 2010-11, which required an increase of about 65 GL.

- Figure 6 – Initial assumptions for River Murray System conveyance losses upstream of the South Australian border



5 Summary of water sharing and significant operations for 2010-11

State water entitlements and significant decisions on river operations are primarily driven by the timing and location of inflow events and usage patterns. For the six scenarios outlined in Section 4.2 of this plan, Table 3 provides a summary of water availability; Table 4 provides a summary of important operational decisions that may need to be made while Table 5 provides outlooks to assist environmental management.

The water sharing arrangements (Tier 1) between States are outlined in Part XII of the Murray-Darling Basin Agreement.

- Table 3 – Summary of Water Availability under scenarios

WATER AVAILABILITY	'worst case'	Very dry	Dry	Moderate	Near average	Very Wet
Sharing rules at end of May 2010	Tier 1	Tier 1	Tier 1	Tier 1	Tier 1	Tier 1
Indicative State water entitlements at end May 2011 NSW VIC SA	 680 GL 770 GL 564 GL	 940 GL 1340 GL 844 GL	 1250 GL 1810 GL 1134 GL	 1690 GL 2530 GL 1154 GL*	 2480 GL 2940 GL 1154 GL	 3560 GL 4510 GL 1154 GL
SA Dilution & Loss	696 GL	696 GL	696 GL	696 GL	696 GL	696 GL
Carryover trade delivery to SA	52 GL	52 GL	52 GL	52 GL	52 GL	52 GL
Forecast Minimum Reserve at end May 2011	0 GL	0 GL	0 GL	300 GL*	835 GL	835 GL
Special Accounting	3 States commencing August	3 States commencing August	3 States commencing August	3 States commencing August	3 States commence in August. Victoria exits special accounting during 2010-11	3 States commence in August. Victoria and NSW exit special accounting during 2010-11

* If SA takes less than full entitlement in months from August 2010 the full 1,154 GL will not be reached. Instead, any reduced take of entitlement would be added to the Minimum Reserve.

WATER AVAILABILITY	'worst case'	Very dry	Dry	Moderate	Near average	Very Wet
Internal spill at Lake Victoria (Vic to NSW)	0 GL	0 GL	<10 GL #	100 GL #	390 GL #	0 GL
Lindsay River Allowance	Normal Lindsay River Allowance from 1 July 2010 unless other arrangements agreed			Normal Lindsay River Allowance from 1 July 2010	Normal Lindsay River Allowance from 1 July 2010	Normal Lindsay River Allowance from 1 July 2010
Additional Dilution Flow	≈ 90 GL #	≈ 90 GL #	≈ 139 GL #	≈ 150 GL #	≈ 240 GL #	≈ 360 GL #
Unregulated Flows	0 GL	0 GL	0 GL	<10 GL #	About 100 GL #	About 7800 GL
Assumed usage **NSW** **VIC** **SA Ent. Delivered**	# 420 GL 520 GL 1010 GL	# 660 GL 890 GL 1270 GL	# 890 GL 1280 GL 1530 GL	# 1300 GL 1630 GL 1850 GL	# 1910 GL 1840 GL 1850 GL	# 2060 GL 1790 GL 1850 GL
End of season active storage	760 GL #	910 GL #	1080 GL #	1610 GL #	2400 GL #	5100 GL #

Highly dependent on the timing of improvements in water availability and usage patterns

- Table 4 – Summary of significant river operations under scenarios

RIVER OPERATIONS	'worst case'	Very dry	Dry	Moderate	Near average	Very Wet
Expected Dartmouth release above minimum	~ 700 GL, commencing Oct/Nov up to 5,000 ML/day.	500 - 700 GL, commencing Oct/Nov, up to 5,000 ML/day.	400 - 600 GL, commencing Oct/Nov, up to 5,000 ML/day.	200 - 500 GL, commencing Nov/Dec, up to 4,000 ML/day.	<200 GL, only require if Snowy Creek flow is very low	0 GL
Dartmouth Storage end May	~680 GL (600 GL active)	~850 GL (770 GL active)	~1080 GL (1000 GL active)	~1430 GL (1350 active)	~ 1900 GL (1820 GL active)	~ 2450 GL (2380 GL active)
Hume storage	very low levels (<5% capacity), over summer/autumn, increased chance of algal bloom	very low levels (~10% capacity), over summer/autumn, increased chance of algal bloom	very low levels (~10-capacity), over summer/autumn, increased chance of algal bloom	low levels (~10-20% capacity) in autumn increased chance of algal bloom	No spill but may reach 60% of capacity and ~10-20% capacity through summer/autumn	Spilling from September to December and close to half full at end of year
Operation of Weir pools	Lake Mulwala lowered at end of year. Large variations at other weir pools may be implemented to conserve water in upper storage	Normal regulated weir pool variability	Normal regulated weir pool variability	Normal regulated weir pool variability.	Normal regulated weir pool variability, with some flood operations	Normal weir pool variability, including major flood operations

RIVER OPERATIONS	'worst case'	Very dry	Dry	Moderate	Near average	Very Wet
Lake Victoria level	Maybe very low in summer <200 GL	Maybe very low in summer <200 GL	Normal levels but no spill.	Possibility of inlet capacity causing unregulated flows.	Spilling for 2-3 months	Spilling for 5-6 months
Lake Victoria Operating strategy and Cultural Heritage	Potential exposure of burials for extensive periods and drying out of revegetated areas.	Potential exposure of burials for extensive periods and drying out of revegetated areas.	Potential drying out of revegetated areas.	Operations will need to minimise the length of time the Lake Victoria level is high and be consistent with the LVOS.	Operations will need to minimise the length of time the Lake Victoria level is high and be consistent with the LVOS.	Operations will need to minimise the length of time the Lake Victoria level is high and be consistent with the LVOS.
Lake Victoria 250 GL reserve at end May 2011.	Not required to be met as minimum reserve is zero.	May require additional release from upper storages. MDBA to advise BOC early in 2011 MC: 103 (4)		Able to be met	Able to be met	Able to be met

- Table 5 – Summary of significant environmental operations under scenarios

ENVIRONMENTAL OPERATIONS	'worst case'	Very dry	Dry	Moderate	Near average	Very Wet
Assumed Environmental flow release from Hume	0	0	150	300	600	900
Barmah-Millewa Environmental Water Allocation	312 GL in EWA. 302 GL borrowed and not available. Victoria has 10 GL available	About 340 GL in EWA. ~330 GL borrowed and not available. Victoria has 10 GL available	About 380 GL in EWA. ~370 GL borrowed and not available. Victoria has 10 GL available	412 GL in EWA. NSW share borrowed (231 GL) but Victorian share (181 GL) available	412 GL in EWA. Both NSW and Victorian shares available and triggers for release met.	BMEWA may not be used, partial spill from Hume and up to 400 GL carried over for following year.
Euston Lakes refilling	Dry Lake is filled and Lake Benanee will continue to fill using part of the 800 GL set aside for conveyance for evaporative losses.					
Below minimum flow/height levels	Required at some locations MDBA: 98(2) & 98(1)	May be required at some stage MDBA: 98(2) & 98(1)	May be required at some stage MDBA: 98(2) & 98(1)	Not required	Not required	Not required
Lake Alexandrina at end May 2011	-0.8 m AHD	-0.7 m AHD	-0.4 m AHD	0.0 m AHD	0.55 m AHD and likely flow over barrages during spring	FSL >4,000 GL over barrages.
Lake Albert at end May 2011	-0.4 m AHD	-0.4 m AHD	-0.4 m AHD	0.0 m AHD		

ENVIRONMENTAL OPERATIONS	'worst case'	Very dry	Dry	Moderate	Near average	Very Wet
Goolwa Channel at end May 2011	0.0 m AHD	0.0 m AHD	0.0 m AHD	0.0 m AHD		
Wakool System (NSW Decision)	40 GL replenishment	Normal operations	Normal operations	Normal operations	Normal operations	Normal operations
Salinity	Potentially high salinities along the River Murray System in South Australia.	Potentially high salinities along the River Murray System in South Australia.	Potentially high salinities along the River Murray System in South Australia.	Normal salinity levels expected	Normal salinity levels expected	Potential for high salinity levels following extensive flooding of the Lower Murray
Flooding	In channel flows	In channel flows	Small chance of small flood into Barmah-Millewa Forest, otherwise in channel.	Increased chance of small flood into Barmah-Millewa Forest and central Murray area.	Flooding into Barmah-Millewa Forest and central Murray area.	Extensive and prolonged flooding along entire River Murray System
Chance of blue-green algal blooms along river	There is always a chance of blue-green algal blooms forming somewhere along the River Murray System. Algal blooms generally form during the summer and persist into autumn and have been observed to form in both high flow and low flow years, however the more extensive blooms have been observed more often during dry years. River Murray Operations may be able to assist in dispersing algal blooms in weir pools with 'pulsed' flows on some occasions. However, this is not always feasible, particularly when water is scarce.					

6 River Murray System operations for 2010-11

6.1 Changes to minimum flow rates

As part of drought operations in recent years the minimum flows or river levels have been reduced at some locations. The following temporary departures from standing procedures may be required at some stage during 2010-11 under drier inflow scenarios.

Standing Procedure	Normal minimum	Temporary minimum
Minimum release from Hume Dam	600 ML/day	400 ML/day
Minimum target flow at Doctors Point	1200 ML/day	800 ML/day
Minimum release from Yarrawonga Weir	1800 ML/day	1500 ML/day
Minimum flow at Edward River off take	100 ML/day	80 ML/day
Minimum flow at Gulpa River off take	80 ML/day	30 ML/day
Minimum release from Stevens Weir	150 ML/day	130 ML/day
Minimum river height at Swan Hill	0.6 m local gauge height	0.5 m local gauge height
Minimum release from Euston Weir	2500 ML/day + Sunraysia Demands	1500 ML/day

All of the proposed departures are consistent with operational practices undertaken in the recent drought years and are aimed at maximising available water by reducing evaporative loss in Lake Victoria.

At Swan Hill and downstream, it is expected that flows could fall below normal minimums for prolonged periods in 2010-11 if conditions remain dry. Such low flows have been implemented in recent seasons and are associated with the reduced water demands in the mid and lower reaches of the River Murray System. If wetter conditions ensue, and demands rise, then higher flows and river levels can be expected.

6.2 Weir pool level manipulation

As with recent years, it is expected that there could be significant weir pool manipulations along the River Murray System. Weir pool manipulations may be implemented for a number of reasons including;

- the need to supply downstream water requirements when there are very hot conditions and demands are high;
- to minimise evaporation rates;
- to temporarily store water rather than allow it to pass downstream; and
- to assist in delivering environmental outcomes by flooding or drying adjacent wetlands.

The timing and extent of weir pool manipulations are difficult to predict as they are primarily affected by short-term weather conditions.

Table 6 outlines the recent variations in weir pools that have occurred over the past six years. It is possible that weir pool manipulations of these magnitudes will need to be implemented at some stage in 2010-11. It is also possible that larger weir pool manipulations, outside of these ranges, may be required. The table provides indicated levels that have the potential to impact on water quality and access. In the event that a weir pool needs to be manipulated outside its normal operating range then WLWG will be notified. The public would be notified through the River Murray Weekly Report and in some circumstances via a media release.

- Table 6 – Recent variations in weir pool levels.

Values in brackets refer to changes in weir pool levels that may have significant impacts on river management such as water quality and water access.

	FSL	Weir Pool Lowering	Weir Pool Raising
Lake Mulwala	124.9 m	30 cm (20 cm)	25 cm
Torrumbarry Weir (Lock 26)	86.05 m	40 cm (25 cm)	no surcharge
Euston Weir (Lock 15)	47.6 m	30 cm (25 cm)	no surcharge
Mildura Weir (Lock 11)	34.4 m	10 cm (10 cm)	5 cm
Wentworth Weir (Lock 10)	30.8 m	10 cm (10 cm)	10 cm
Kulnine (Lock 9)	27.4 m	20 cm (25 cm)	25 cm (15 cm)
Wangumma (Lock 8)	24.6 m	50 cm (50 cm)	60 cm (50 cm)
Rufus River (Lock 7)	22.1 m	15 cm (15 cm)	25 cm
Murtho (Lock 6)	19.25 m	10 cm (8 cm)	15 cm (10 cm)
Renmark (Lock 5)	16.3 m	10 cm (8 cm)	50 cm (35 cm)
Bookpurnong (Lock 4)	13.2 m	10 cm (4 cm)	30 cm
Overland Corner (Lock 3)	9.8 m	10 cm (3 cm)	15 cm
Waikerie (Lock 2)	6.1 m	10 cm (8 cm)	20 cm
Blanchetown (Lock 1)	3.2 m	10 cm (10 cm)	15 cm

For Lake Mulwala it is expected that the lake level will be managed within its normal operating range (124.6 to 124.9 m AHD), except during periods of flooding or in an emergency situation. It is not expected that the lake level will be managed as it was in 2007-08 where it was operated between 124.2 and 124.6 m AHD.

At Lock and Weir 11 (Mildura), it is planned to replace one trestle with a new prototype trestle with mechanised gates. The trestle replacement will require the drawdown of the Mildura Weir pool (to about 3.6 m below full supply level), commencing late July. After the work is completed, the weir pool will be raised back to full supply level by mid August.

A ‘Denil’ fishway will also be constructed at Mildura Weir, with construction expected to start in July 2010. To assist with construction, the water level of the Wentworth Weir pool may need to be lowered slightly (by up to 20 cm) during August and September to reduce the water level on the downstream side of Mildura Weir.

There is the potential for significant raising of the pool upstream of Lock 8 during the autumn of 2011. This action would be undertaken in conjunction with TLM works currently being constructed on Mulcra Island to assist in delivering environmental water to that area of the floodplain. The implementation of this action would depend on the availability of environmental water and the completion of the Mulcra Island works.

6.3 Delivering environmental water

'Environmental flow' proposal for 2010-11

There is a considerable volume of environmental water carried over from 2009-10 by The Living Murray (TLM) - largely due to significant late season improvements in allocations in 2009-10. There are also smaller volumes of carryover by other environmental water holders. It is estimated that there will be in excess of 100 GL of environmental water available on 1 July 2010 and this will increase further as State allocations are increased.

The large carryover by TLM was part of a strategy to ensure sufficient water was available in the spring of 2010-11 to initiate an 'environmental flow'. Such an 'environmental flow' could achieve larger scale watering at multiple sites, even if conditions were relatively dry.

Two of the largest sites proposed for watering in 2010-11 are the Barmah-Millewa Forest, which has not seen any significant flooding for five years, as well as the Lower Lakes. There are also a number of smaller sites of high priority that could also be watered as the 'large environmental flow' is flowing down the system.

The concept of a large 'environmental flow' is to achieve significant environmental outcomes for the Barmah-Millewa Forest and further downstream by releasing sufficient volumes of water from Hume Reservoir to enhance river flows downstream of Yarrawonga Weir. These flow rates would be high enough to water portions of the forest and this type of operation has already been proven to be successful in the past in the use of the Barmah-Millewa Environmental Water Allocation (EWA).

Depending on preceding conditions between 20 - 50% of 'overbank flow' (>10,400 ML/day) is normally 'used' by the forest. The remainder of any large 'environmental flow' that returns to the river would be used to provide water to other high priority environmental sites along the river system, including the Lower Lakes. The mostly likely time for implementing the environmental flow is during spring.

In the river flow and storage level figures presented in the remainder of this plan the following assumptions have been made:

- Worst case and Very dry scenarios – no additional environmental release from Hume
- Dry scenario – 150 GL of 'environmental flow' released from Hume Reservoir
- Moderate scenario – 300 GL of 'environmental flow' released from Hume Reservoir
- Near average scenario – 600 GL of 'environmental flow' released plus 400 GL Barmah-Millewa EWA released from Hume Reservoir

- Wet – Hume spills during most of winter spring, effectively producing an automatic environmental watering. Thereafter about 900 GL of 'environmental flow' is released during early summer to prolong the duration of the flood.

Barmah-Millewa Environmental Water Allocation (B-M EWA)

At present there is 312 GL in the B-M EWA of which 302 GL is being loaned to support diversion accounts in NSW and Victoria. Victoria has not borrowed 10 GL and this water is available for environmental use as at 1 July 2010.

Under the wetter cases the B-M EWA would gradually increase to 412 GL. It is likely that under the 'moderate scenario', the Victorian share of the B-M EWA would be repaid to the account and become fully available for use, however it may require a 'near average' scenario for the NSW share to be fully repaid. Under the new rules, the B-M EWA does not now need to be released equally by the upper States.

When combined with a 'near average' scenario and the 'environmental flow' proposal described above, the release of the B-M EWA could provide a significant environmental benefits along the entire river system, including re-filling the Lower Lakes and releasing water through the Barrages.

6.4 Snowy Mountains Scheme

Each year the Murray and Murrumbidgee Rivers receive water from the Snowy Mountains Scheme (SMS) from releases for power generation. The annual volume of water to be released from the Snowy Mountains Scheme is outlined in Schedule F of the Agreement.

In non-drought years, the Required Annual Release (RAR) to the Murray is in the order of 1,062 GL. However, since October 2006 the RAR has been reduced to take into account the very dry conditions in the Snowy Mountains.

The SMS provides a link between the Murray and Murrumbidgee catchments that enables an efficient transfer point for water that is traded between these two catchments. In recent years there has been a considerable volume of trade from the Murrumbidgee to the Murray and some of this has been delivered to the Murray via Murray 1 Power Station. This may be implemented again in 2010-11 if there is sufficient channel capacity through the Barmah Choke.

The SMS RAR at the start of this season assumes that there will be a repeat of the SMS worst inflow on record. As inflows improve over the worst on record, then the improvements are passed onto the Murray and Murrumbidgee catchments via an increase in the RAR. The RAR is reviewed by Snowy Hydro twice monthly. Assumptions have been made for inflows from the Snowy Mountains Scheme in each of the six scenarios outlined in section 4.2.

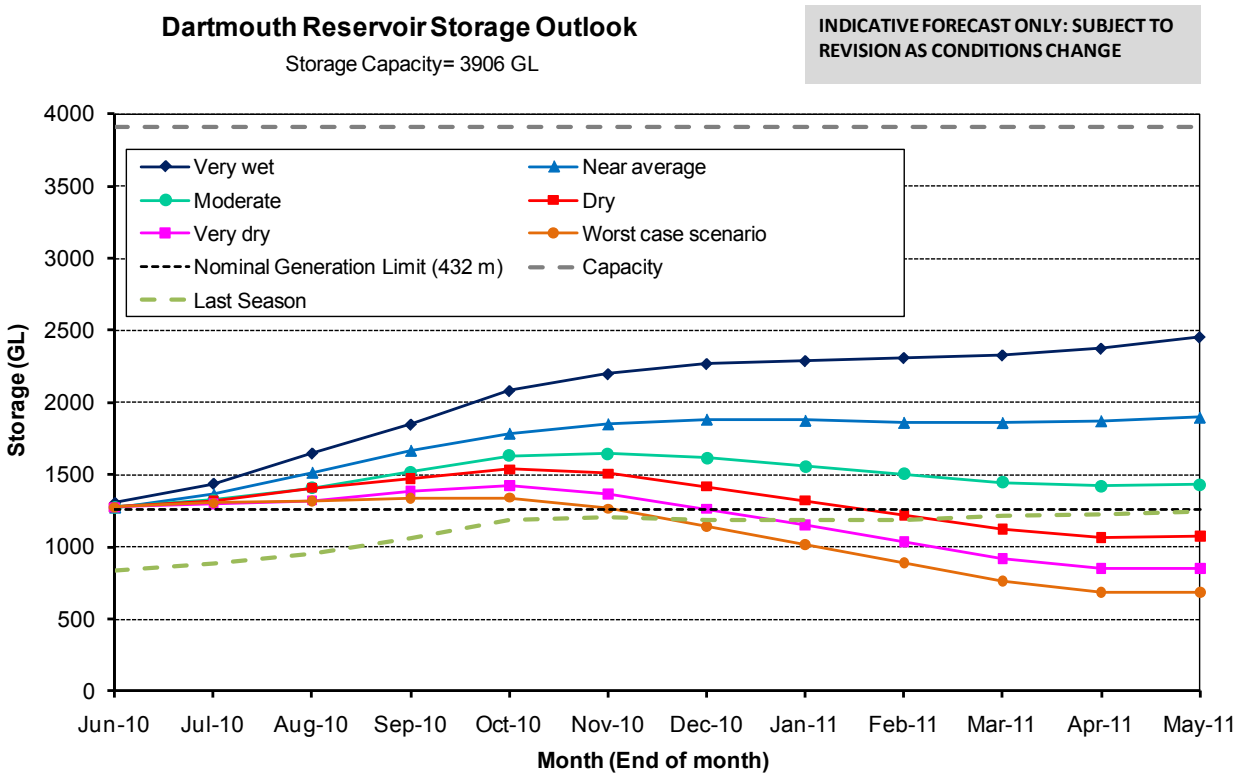
6.5 Dartmouth Reservoir

Key considerations when operating Dartmouth Reservoir are holding reserves for later years, and transferring this water to Hume Reservoir within channel capacity. Based on the storage level on 31 May 2010, indicative storage volume and monthly releases for Dartmouth Reservoir under the six scenarios are shown in Figure 7 and Figure 8.

Under the 'worst case scenario', there may need to be over 700 GL released from Dartmouth and the storage volume would be low (~15% capacity) at the end of the year. Releases from Dartmouth Reservoir will be made as late as possible in the season (may need to start in October/November in drier scenarios), however as in recent years, pulsed releases to improve environmental outcomes (following the guidelines developed by MDBA and Charles Sturt University) will be implemented where possible.

The release rate will aim to be less than 5,000 ML/day, but higher releases of up to 10,000 ML/day rates cannot be ruled out. Both the timing and release rates from Dartmouth will be greatly dependent on the inflow and usage patterns along the River Murray System and the storage volume in Hume Reservoir. In the two wettest scenarios, releases are unlikely to be required from Dartmouth Reservoir.

- Figure 7 – Dartmouth Reservoir storage outlook



If conditions are similar to the last three years, there are likely to be several pulsed transfers from Dartmouth Reservoir to Hume Reservoir to enhance the environmental values of the Mitta Mitta River. These transfers will probably be at flows of up to 5,000 ML/day with maximum transfer rates of up to 140 GL/month. If transfers begin earlier, there will be greater opportunity to pulse releases rather than have flows remaining relatively constant. Between pulses, the minimum flow at Colemans Gauge (200 ML/day) will be provided unless there are water quality issues or the flow at Tallandoon is expected to be below 600 ML/day leading to insufficient flow to assist diversions along the Mitta Mitta River.

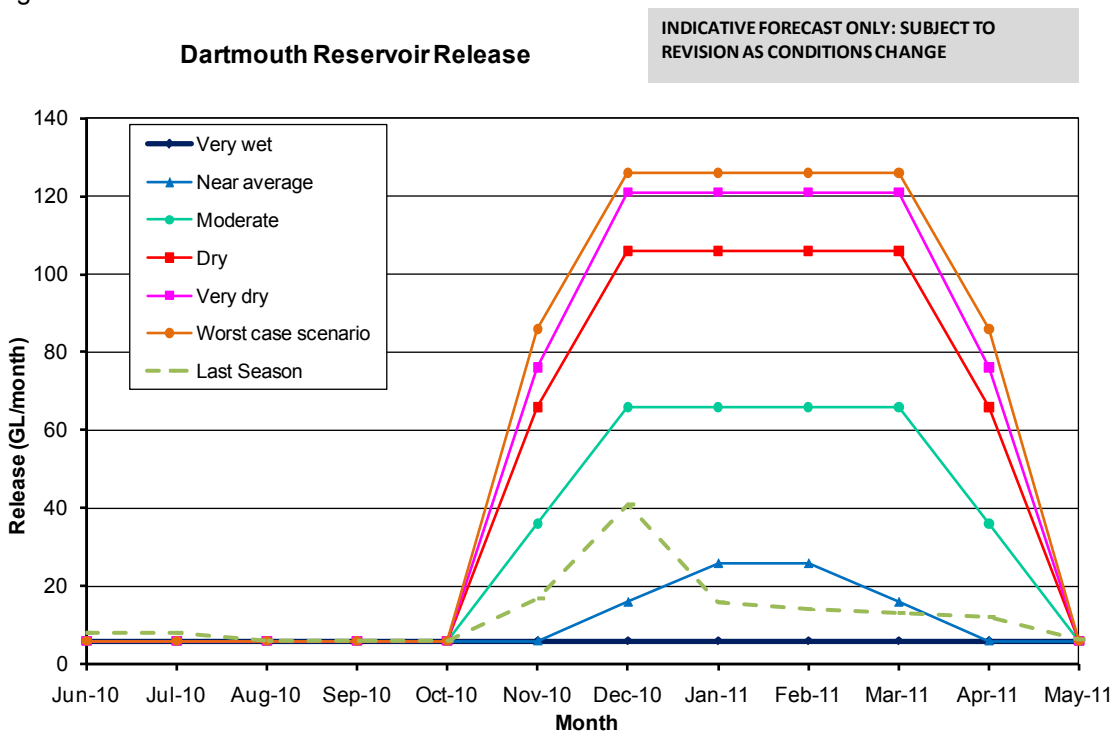
Storage in Dartmouth Reservoir is expected to be above the operating level of the main Power Station in the moderate, near average and very wet scenarios. In the drier scenarios, the storage volume may only be above the operating level of the power station for the early part of the water year.

Even if conditions turn wet during 2010-11, the probability of Dartmouth Dam spilling is extremely low because this large reservoir usually takes several years to fill. Under the very wet scenario, the storage volume is expected to peak at about 2,500 GL (~60% capacity).

In regard to dam maintenance and improvement in the 2010-11 water year, it is not expected that any works at Dartmouth Dam will significantly affect river operations.

An updated capacity table will be implemented for Dartmouth Reservoir in the first half of 2010-11 and the MDBA will provide further information in its Weekly Report at that time.

- Figure 8 – Dartmouth Reservoir release outlook



6.6 Hume Reservoir and flows at Doctors Point

The key consideration when operating Hume Reservoir is that it is the primary regulating structure in the River Murray System. Hume Reservoir stores inflows from the catchment, the Snowy Mountains Scheme, and Dartmouth Reservoir and is the primary structure used to meet downstream demands.

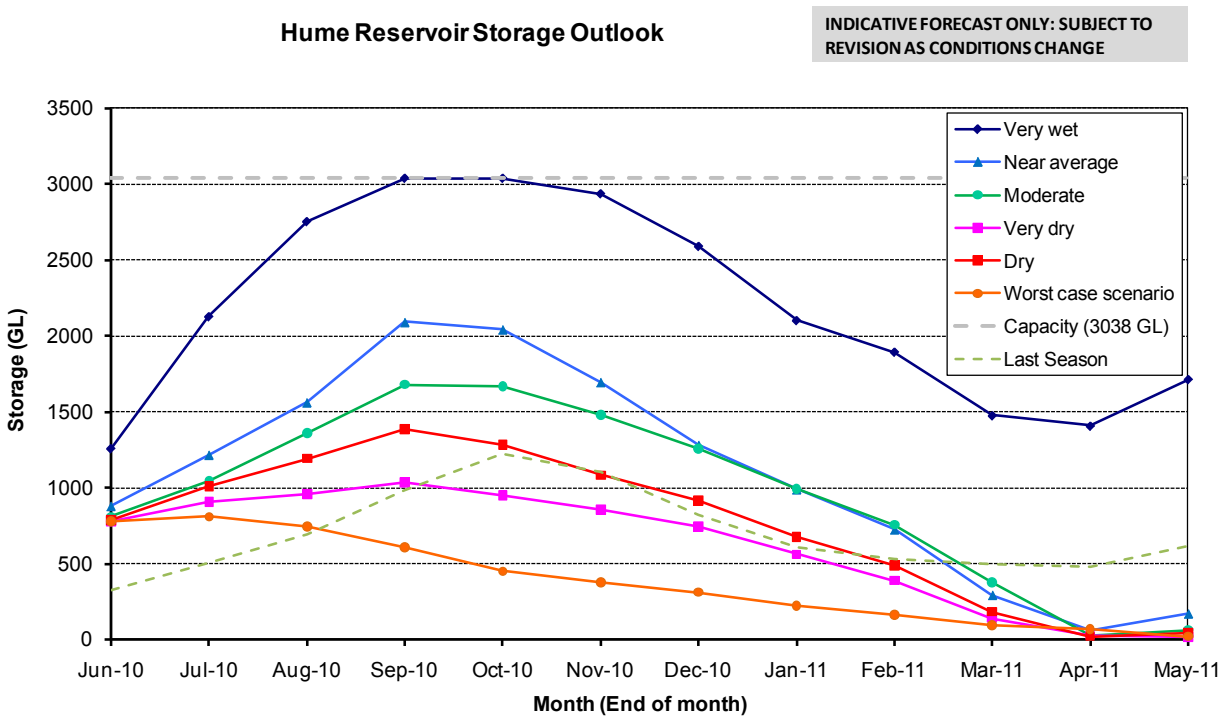
Based on the storage level on 1 June 2010, indicative storage volumes for Hume Reservoir under the six scenarios are shown in Figure 9. Only under the very wet scenario is there a chance of Hume Reservoir spilling. In the moderate and drier scenarios, there could be low volumes of water remaining in Hume Reservoir by late autumn 2011. However, this is highly dependant on usage patterns and the storage volume in Hume Reservoir at the end of the irrigation season is usually greater than in this forecast.

Upgrade works commenced at Hume Dam in the first quarter of 2010. The upgrade will involve further strengthening of the southern junction between the core wall and the spillway. These works will not affect river operations. There are also works planned to commence in 2011 for the southern training wall (the large wall protecting the embankment fill from spillway discharge on the Victorian side). These upgrades will improve dam safety particularly in the event of earthquakes and embankment settlement.

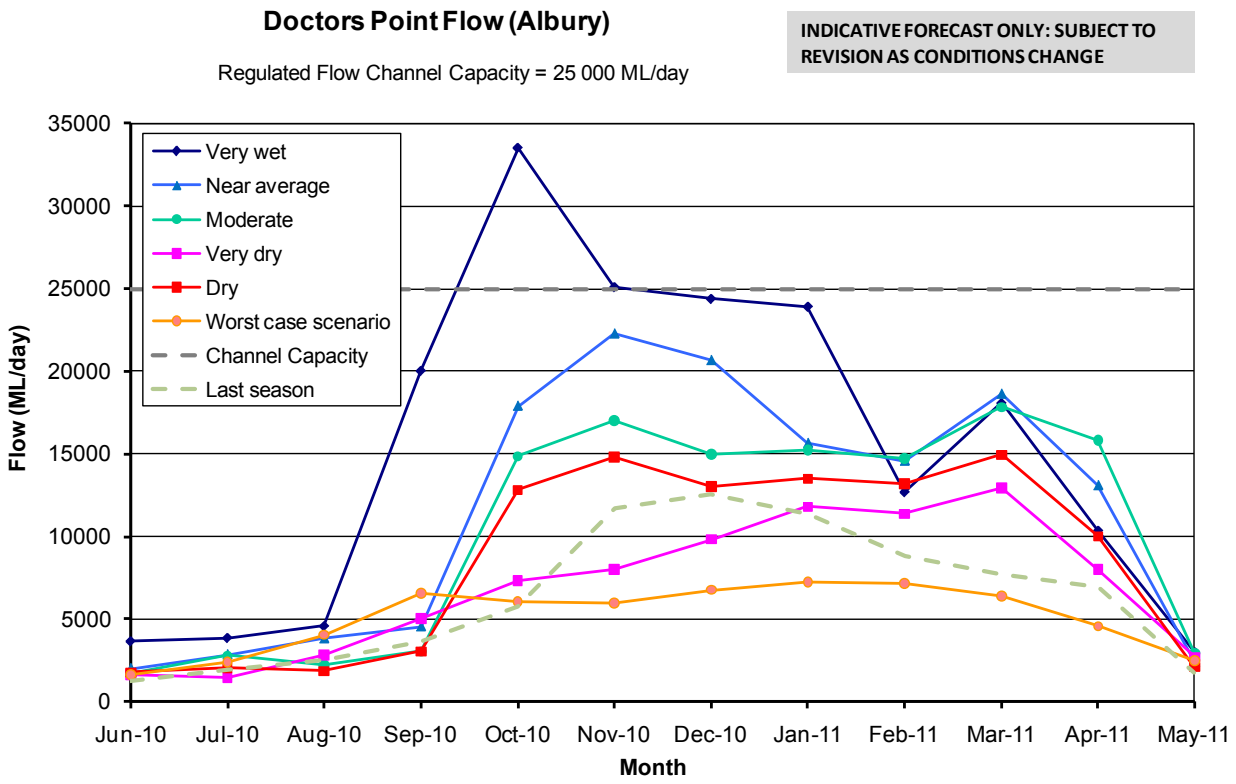
Under the drier scenarios, the flow at Doctors Point may reach only about 7,000 - 13,000 ML/day (Figure 10). However, in the wetter scenarios, there is a possibility that flow may reach 15,000 - 22,000 ML/day during the summer irrigation season. Under the very wet scenarios flooding could result in above channel capacity flows (>25,000 ML/day at Doctors Point) for several months between Hume Dam and Lake Mulwala.

An updated capacity table will be implemented for Hume Reservoir in the first half of 2010-11 and the MDBA will provide further information in its Weekly Report at that time.

- Figure 9 – Hume Reservoir storage outlook



- Figure 10 – Hume Reservoir release outlook – flows at Doctors Point



6.7 Lake Mulwala and the Barmah Choke

Winter-Spring (up to mid December)

It is now five years since there has been any significant watering of Barmah-Millewa Forest and the forest is seen as one of the high priority targets for environmental watering in 2010-11 (see Section 6.3). Large-scale environmental watering proposals for spring-early summer are being developed to facilitate watering of this site, even under the 'worst case' scenario. As such, the storage volume in Lake Mulwala and the release from Yarrawonga Weir during spring and early summer will be managed, where possible, to assist in achieving these environmental outcomes whilst meeting other diversion commitments.

Under the 'worst case' and very dry' scenarios, inflows from the Kiewa and Ovens Rivers will be low and flow rates downstream of Yarrawonga Weir will be well within the channel capacity of the River Murray through Barmah-Millewa Forest. It is possible that the release from Yarrawonga Weir may need to be 'boosted' temporarily (two weeks) to about 9,000 ML/day to allow environmental water to flow into the Barmah-Millewa Forest via regulators.

Under the 'dry' and 'moderate' scenarios there is likely to be an inflow event from the Ovens River approaching, or in excess of, 10,000 ML/day. Under these scenarios, environmental allocations would have increased significantly and, depending on the timing of the inflow, there may be a request to use environmental water to boost an Ovens inflow event to assist watering of the forest (see Section 6.3 and Figure 11). If there is no 'call' for the use of the

environmental water then, the peak flow may be mitigated, but only to an extent that is consistent with past practice (i.e. allow use of irrigation canals and the lake level is not drawn below 124.60 m AHD prior to inflow events, nor raise lake level above 124.9 m AHD (FSL)).

Under wetter scenarios, there is likely to be significant inflow events from the Ovens and Kiewa Rivers and in such circumstances, Lake Mulwala level and releases will be managed in accordance with flood and emergency operating procedures, but again being mindful of the environmental water proposals and the potential release of the Barmah-Millewa EWA. Generally speaking, inflow events can be expected to be passed 'straight through' Lake Mulwala with little mitigation as is the normal practice.

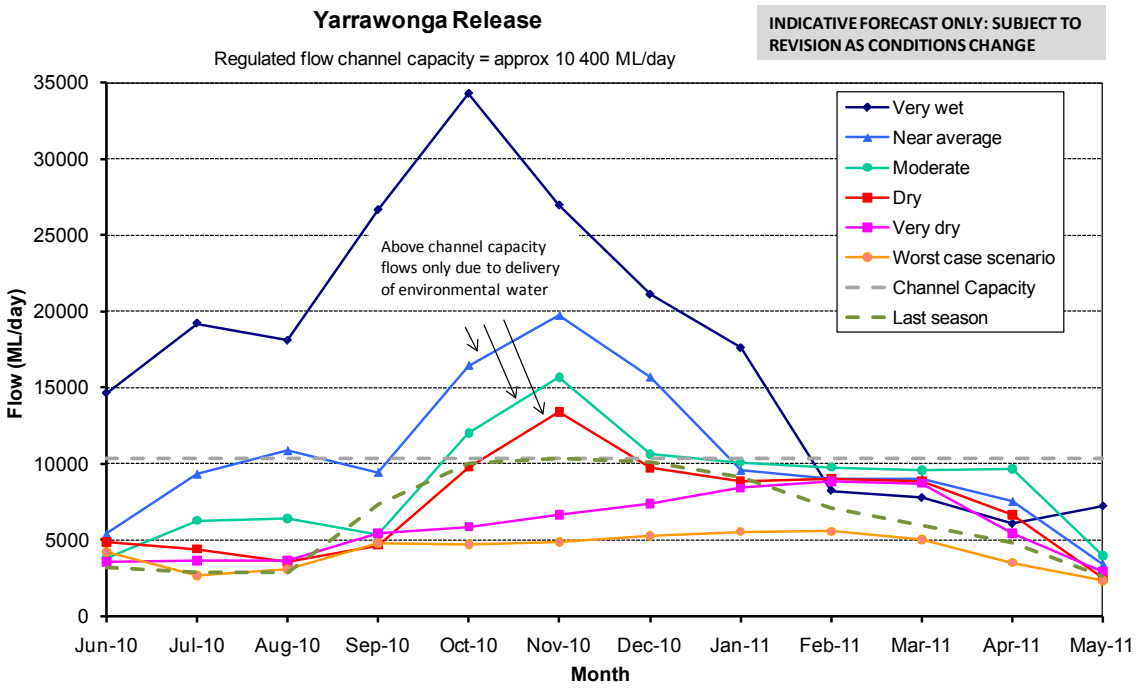
Summer (after mid December) and autumn

In 2010-11, it is expected that Lake Mulwala will be operated within its normal operating range (124.6 to 124.9 m AHD) during the irrigation season.

If there has been a wet spring, then summer inflow peaks and rain rejection events will be mitigated as per past practice (i.e. there is a potential to increase levels to 125.15m AHD for short periods, a potential to draw down lake levels to 124.6 m AHD prior to rain events and utilise irrigation canals where possible).

However, if there has been a very dry spring and only a small part of the forest has been inundated, and environmental water allocations have increased following the summer rain, then some larger watering of the forest may be undertaken in summer/autumn if conditions are suitable. In this case a rain rejection and summer flooding may be allowed to occur and the increased 'losses' debited to environmental water accounts.

- Figure 11 – Yarrawonga Weir release outlook



Barmah Choke capacity constraints

The 'Barmah Choke' is a section of the River Murray (between Yarrawonga and Torrumbarry Weirs) that has the least capacity of any section of the river downstream of Hume Dam. The Barmah Choke is within an area of high ecological value, the Barmah-Millewa Forest.

Releases from Yarrawonga Weir in excess of 10,400 ML/day are sufficient to cause over bank flooding within the forest. About 2,000 ML/day of the 10,400 ML/day is directed to the north via the Edward River and Gulpa Creek, with the remainder (about 8,400 ML/d) flowing south along the Murray past Picnic Point and towards Echuca.

The Barmah Choke can create river operation issues as the restricted channel capacity may limit the amount of water that can be delivered downstream (e.g. to the Torrumbarry Irrigation Area, Sunraysia, and South Australia). These issues are likely to arise when there is a lot of water in Dartmouth and Hume reservoirs, and hence allocations and demand are high, but the tributary inflows downstream of the Barmah Choke (eg from the Goulburn and Murrumbidgee Rivers) are low and there is little water available in the downstream storages (Lake Victoria and the Menindee Lakes).

The rule preventing trade of allocations from above to the below the Choke has been relaxed since September 2007, and has again been relaxed at 1 July 2010. The MDBA will undertake fortnightly reviews of the relaxation, which may result in the need to lift the relaxation at anytime during the water season.

6.8 Lake Victoria

Lake Victoria is expected to fill and spill in the wet and very wet scenarios. It is also possible that the Lake may fill, or have limited inlet capacity, in the moderate scenario which would trigger an unregulated flow event (Figure 12).

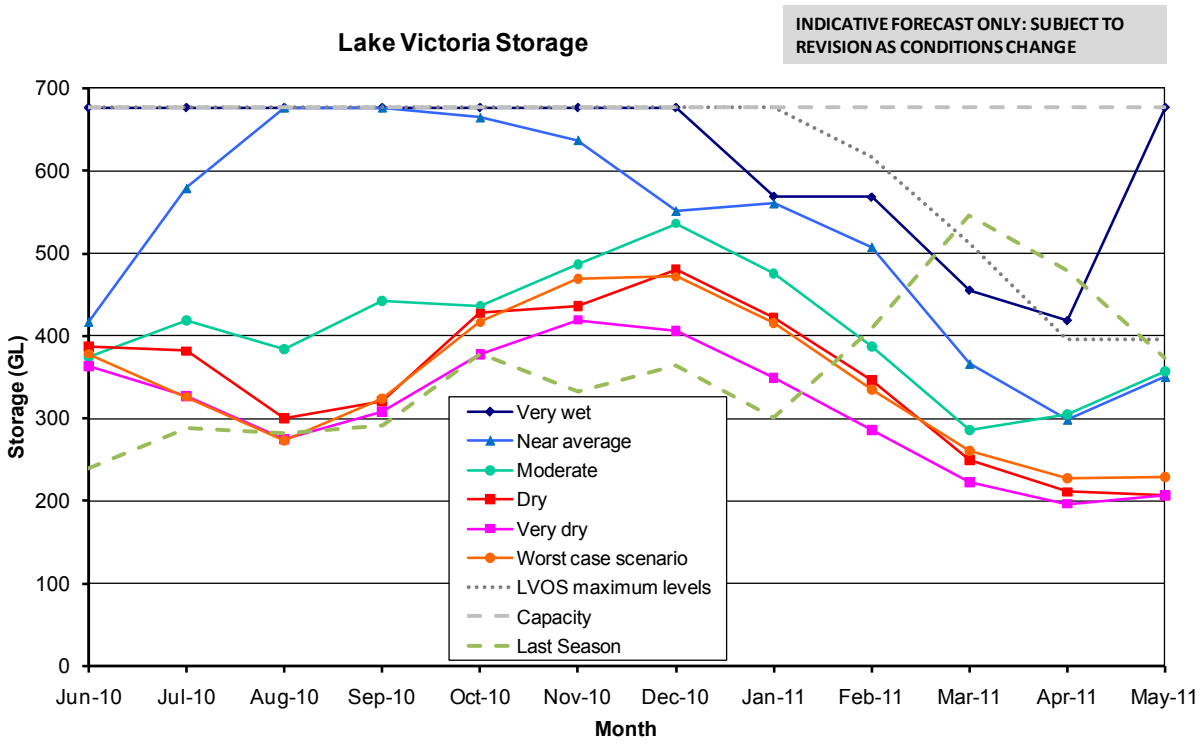
Clause 103 of the Agreement states that the first 250 GL of minimum reserve be held in Lake Victoria at the end of May each year. This would be implemented under the moderate, near average and very wet scenarios. However, in the dry and very dry scenarios, to save water the MDBA may seek Ministerial Council approval to store some of this minimum reserve in upstream storages. Under a 'worst case scenario' the minimum reserve would be close to zero.

A critical constraint on the use of Lake Victoria is that it must be operated and managed to minimise disturbance to Aboriginal cultural heritage and to protect burials that may be exposed by erosion of the foreshore. MDBA will fulfil the intent of the Lake Victoria Operating Strategy (MDBC, 2002) and the Lake Victoria Cultural Landscape Plan of Management (revised 2007) that were developed under the Section 90 consent and Section 87 Permit provided by the, then, NSW Department of Environment, Climate Change and Water.

The Menindee Lakes and Lake Victoria harmony rules will influence the volume in Lake Victoria and this is discussed further in Section 6.9

Gates 1 and 2 of the inlet regulator at Lake Victoria are currently being refurbished and are expected to be completed by early July.

- Figure 12 – Lake Victoria storage outlook



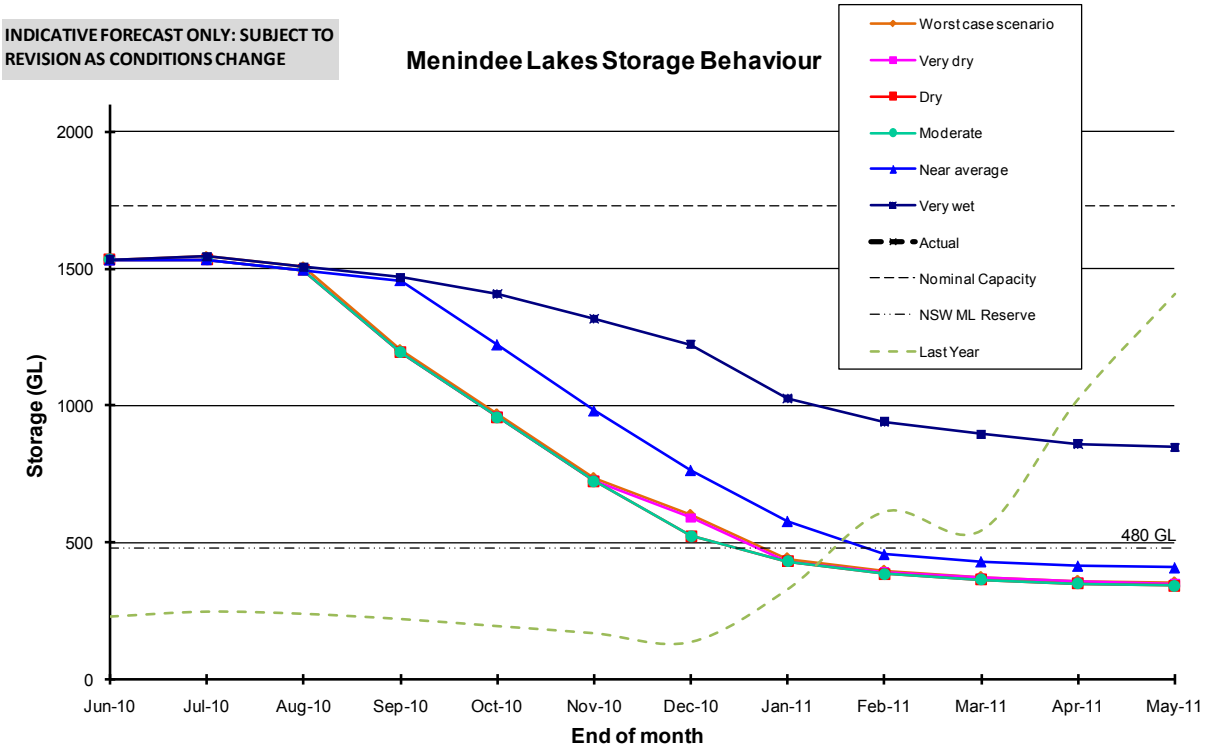
6.9 Menindee Lakes

As at 31 May 2010 the Menindee Lakes had a stored volume of 1,409 GL and were under MDBA control. In all the scenarios presented in this plan, conservative estimates of inflows of 140 GL in June and 30 GL in July 2010 were assumed.

This additional inflow will result in Menindee Lakes reaching at least 1,530 GL (89% capacity) by the end of July 2010. A total stored volume of about 1,900 GL would trigger an internal spill of water from Victoria to New South Wales, as at these levels the Victorian share would reach the maximum permissible. Such storage levels would only occur if good inflows from the Paroo River continue into July, or if there is a significant further inflow event.

After July, it is assumed that the Darling system will not provide further significant inflows into the Murray. This assumption is traditional practice for planning purposes as the hydrology of the Darling River system is difficult to predict and reliable estimates of available water cannot be made for several weeks after rain. If and when significant inflows are observed in the upper Darling River system, routine monthly operational plans would need to be updated. As a general practice further inflows to Menindee Lakes can be expected to be stored preferentially in Lakes Wetherell and Pamamaroo (up to their surcharge level) then in Lakes Menindee and Cawndilla. Any additional inflows would be shared according to the Murray-Darling Basin Agreement or by any other agreement made by Basin Officials Committee or Ministerial Council at that time.

- Figure 13 – Menindee Lakes outlook assuming no further inflows after July 2010.



Releases from Menindee Lakes

Releases from Menindee Lakes will be attributed to the respective allocations of NSW and Victoria according to Clause 120 of M-DB Agreement. The Lakes will be operated in harmony with Lake Victoria and this combined operation of Menindee Lakes and Lake Victoria aims to reduce evaporation losses, whilst minimising the chance of spill from Lake Victoria. Further considerations affecting the operation will include the need to protect cultural heritage at Lake Victoria as well as longer-term security of water supply in the Lower Darling under a return to extreme dry conditions

The normal minimum release (200 ML/day in winter) is expected to be targeted until higher releases are triggered by the 'Harmony Rules between Menindee Lakes and Lake Victoria'. These rules set out 'trigger' storage volumes in Lake Victoria for the end of each month (Table 8). If Lake Victoria storage is forecast to be below these volumes, due to insufficient flow in the River Murray, then releases from Menindee Lakes may be made to achieve the required storage volume in Lake Victoria.

- Table 7 – End of Month 'Trigger' storage volumes (GL) in Lake Victoria

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
660	500	140	180	180	180	180	340	500	680	680	680

If volumes to be delivered to South Australia are less than full entitlement it may not be necessary to target the very high levels over summer in Lake Victoria. The actual releases made from Menindee Lakes, and the subsequent levels in Lake Victoria will consider demands for water in South Australia and also the needs of the Lake Victoria Operating Strategy (LVOS). The LVOS requires the period of time that water levels in Lake Victoria are held high to be minimised. The LVOS aims to minimise erosion at high lake levels and allow for revegetation to protect important cultural heritage.

A further set of rules, which will influence the operation of Menindee Lakes, and Lake Victoria in 2010-11, is that of 'Additional Dilution Flow' (ADF). These rules were developed in 1989 using modelling of historical inflow sequences, prior to the most recent drought sequence, with the aim of reducing river salinities in South Australia. The intent of the rules is a 'use it or lose it' principle whereby additional water is delivered to South Australia rather than it be lost as evaporation from Menindee Lakes. The rules have a set of triggers described below:

South Australia will receive 3,000 ML/day above the daily equivalent of the monthly entitlement flow, whenever both of the following conditions are satisfied

a. the storage in Menindee Lakes exceeds the volumes within the given month as listed under Trigger Storage below (Table 9);
b. the combined storage in Hume and Dartmouth Reservoirs exceeds 2000 GL.

- Table 8 – Volume in Menindee Lakes required to trigger ADF

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1300	1300	1300	1300	1300	1650	1650	1500	1300	1300	1300	1300

Under all scenarios presented in this plan, storage in Menindee Lakes is expected to exceed 1,500 GL on 1 August 2010. In addition, on 1 August the combined storage in Dartmouth and Hume Reservoirs is expected to exceed 2,000 GL. Consequently, it is expected that ADF to South Australia, of 3,000 ML/day above its Entitlement Flow, will commence on 1 August 2010.

The duration of the supply of ADF over the coming year will be driven by a number of factors, including:

- inflows from the upper Murray downstream of Hume;
- diversions by the upper States;
- the flow to South Australia;
- inflows to and release rates from Menindee; and
- the impact of these factors on storage volumes at Lake Victoria and Menindee Lakes.

The following two scenarios are described in more detail to highlight potential outcomes.

Under the drier scenarios, the flow along the River Murray will be relatively low during July and August, as will the level of Lake Victoria. If ADF is triggered in August, then it will be supplied from Lake Victoria and this will further reduce the forecast storage volume in Lake Victoria to below the target levels, which in turn will trigger releases from Menindee Lakes. This action will lower the volume in Menindee Lakes and consequently the ADF would cease when the storage in Menindee Lakes is below the ADF triggers (Table 9). Under the drier scenarios ADF is expected to be triggered for about one month.

Under the wetter scenarios the flow along the River Murray from tributaries downstream of Hume Reservoir may be sufficient to keep Lake Victoria above the End of Month trigger levels (Table 8) until October (or even November). In these scenarios, ADF may last for a longer timeframe (maybe 2 months or longer) as releases from Menindee Lakes will be low and the storage volume will remain above 1,300 GL for a longer period. This outcome could also eventuate if there are further inflows to Menindee Lakes during winter and spring.

Generally, release rates from Menindee Lakes will aim to be below about 6,000 ML/day at Weir 32 to minimise river losses and to preferentially draw from Lakes Menindee and Cawndilla, until the lakes return to NSW control. However, releases of up to 9,000 ML/day at Weir 32 may be implemented if required.

The transfer of control of Menindee Lakes back to NSW is expected to occur in January–February 2011 in the drier scenarios but may remain in MDBA control for a longer period in wetter scenarios due to good inflows from either the Darling or Murray catchments. In the very wet scenario, the volume in storage in Menindee Lakes is likely to remain above 750 GL and therefore would remain in MDBA control for all of 2010-11.

6.10 Maintenance at Locks and Weirs upstream of the SA border

At Lock and Weir 15 (Euston), upgrades of the navigable pass and the piers on the weir, and repairs to erosion in the riverbed are scheduled to commence at the end of June 2010. The works may impact on navigation, although it should not significantly impede operations.

At Lock and Weir 11 (Mildura), it is planned to replace one trestle with a new prototype trestle with mechanised gates. The trestle replacement would require the drawdown of the Mildura Weir pool (to about 3.6 m below full supply level), commencing late July. After the work is completed, the weir pool will be raised back to full supply level by early August. Any higher salinity water will be diverted into Lake Victoria to minimise impacts on the river and to water users in South Australia.

A ‘Denil’ fishway will also be constructed at Mildura Weir, with construction expected to start in July 2010. To assist with construction, the water level of the Wentworth Weir pool may need to be lowered slightly (by up to 20 cm) during August and September to reduce the water level on the downstream side of Mildura Weir.

NSW State Water is constructing fishways at Stevens Weir and the Edward and Gulpa offtakes between May and November 2010. Construction should not have a significant effect on normal river operations.

6.11 Flow to South Australia

The flow to South Australia will be managed on a daily basis in close cooperation with the Government of South Australia. During both June and July 2010 the flow to South Australia will be above the normal entitlement flow of 3 000 ML/day and 3 500 ML/day (Figure 14). This is to deliver 72 GL that was not delivered during 2009-10 as a result of the implementation of a new rating table for the gauging site immediately downstream of the junction of the Murray and Rufus Rivers.

In other months the flow to SA will be influenced by overall water availability, the supply of Additional Dilution Flow (ADF), unregulated flows, the projected monthly requirements for supplying water to Metropolitan Adelaide, Country Towns, irrigation, environmental site demands including dilution and losses and water for the Lower Lakes.

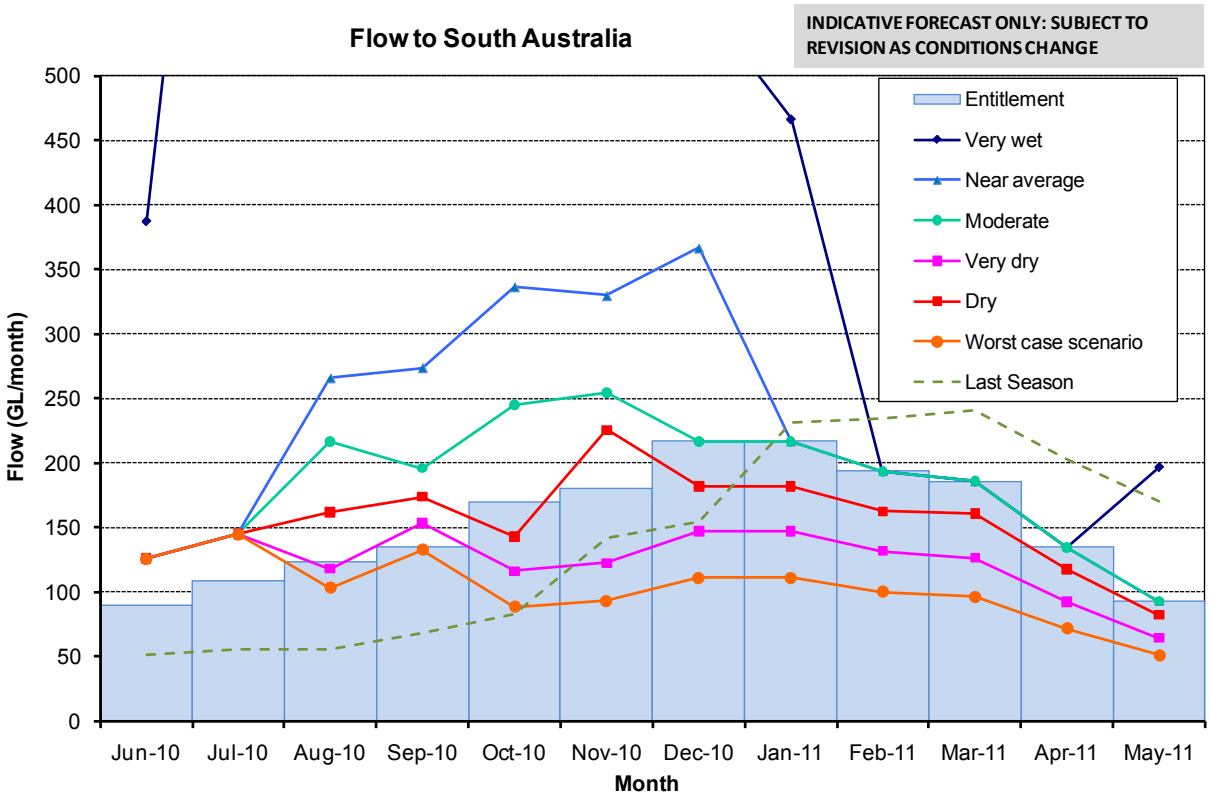
As indicated in Section 6.9, the supply of Additional Dilution Flow (ADF) of 3 000 ML/day is predicted under all water availability scenarios, although the total volume may vary between scenarios. ADF may only be triggered for part of a month under the 'worst case' scenario, or may last for several months under the wetter scenarios. The most likely months for ADF delivery are between August and October 2010. The ADF delivery will provide for improved salinities and water levels below Lock 1 and in the Lower Lakes.

Under the 'worst case' scenario, the flow to South Australia from 1 August will aim to provide a base flow of 970 ML/day into Lake Alexandrina. Under this scenario it is possible there may need to be a temporary increase flows past Wellington to reduce any volumes of saline water pushed upstream by southerly winds towards major diversion points for Metropolitan Adelaide and Country Town water supplies.

Under the very dry and dry scenarios, it is likely that the flow to South Australia will be less than the normal minimum entitlement flow in most months. Under these scenarios South Australia will need to manage monthly flows in order to build a reserve for critical human water needs of 201 GL and private carryover for 2011-12. In order to build this reserve, but also have sufficient flow at other times to meet peak demands, South Australia may seek to use Clause 90 of the Agreement, which allows MDBA, at the request of South Australia, to vary the entitlement from month to month without increasing the total for a sequence of months.

Under the moderate and wetter scenarios, the flow to South Australia could exceed the normal entitlement flow in spring (Figure 15) due to the delivery of environmental water, ADF and potentially also unregulated flows. Unregulated flows are mainly expected under the near average and wetter scenarios.

- Figure 14 – Flow to South Australia outlook



6.12 Locks and Weirs in South Australia

At Lock 6, construction of a fishway is complete and improvements to the navigable pass are scheduled to be completed by July 2010. Environmental works have commenced nearby on Chowilla Creek as part of works to improve the health of the Chowilla floodplain. The works will include the upgrade of two weirs (Pipeclay and Slaneys) and a bank (Bank E), and construction of a major regulator and some minor regulators on the floodplain to pond water and enable the watering of the forest, as well as encourage bird and fish populations. The construction of these environmental works will continue until early 2012. These works are not expected to significantly affect river operations.

At Lock 5, construction of a fishway is also complete and improvements to the navigable pass are scheduled to be completed by July 2010. Navigation pass improvements and fishway construction have commenced at Locks 2 and 4. These works are expected to be completed at Lock 2 by December 2010 and at Lock 4 by June 2011.

Lock refurbishment is scheduled for Locks 6 and 7 in 2010-11 and later at Locks 4, 8 and 9. Lock refurbishment has been completed at Locks 1, 2, 3, 5 and 10. These works will have little effect on river operations, but will significantly impact navigation, as each lock will be closed for approximately three months. There has been wide consultation with stakeholders and the community on the timing of the lock refurbishment program, which involves closure of two locks per year for three months each until 2012.

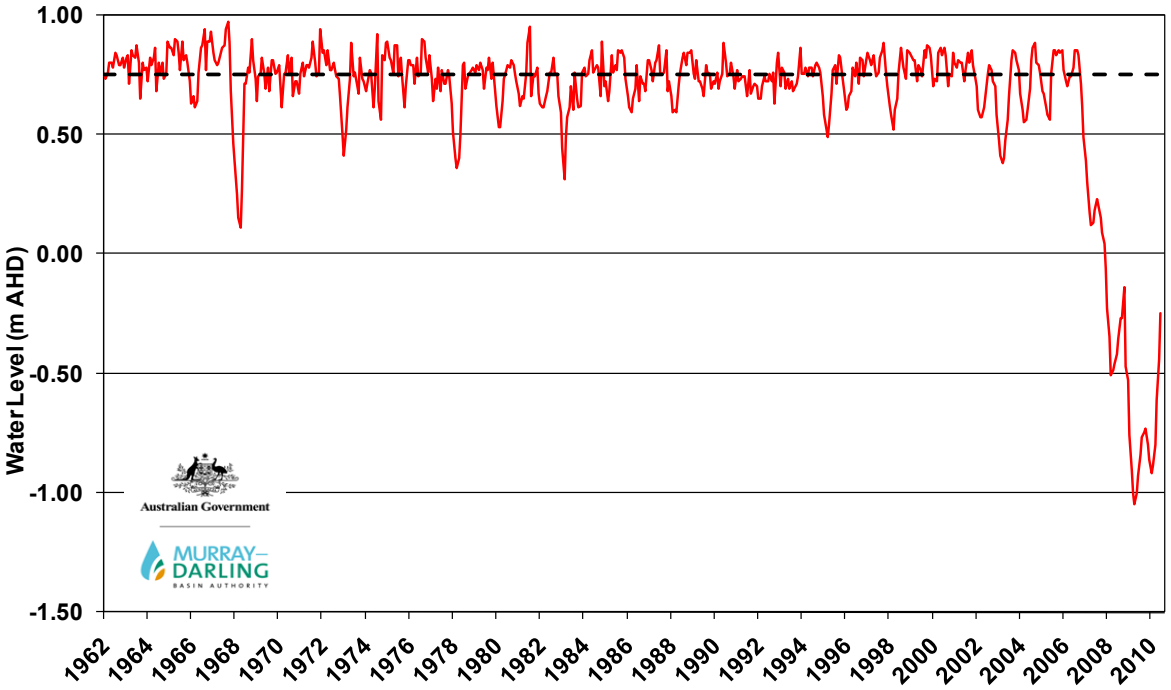
6.13 Lower Lakes and Barrage operation in South Australia

Lakes Alexandrina and Albert (Lower Lakes) are located upstream of a series of five barrages located at Goolwa, Tauwitchere, Boundary Creek, Ewe Island and Mundoo Island. Historically the Lower Lakes were generally a freshwater environment with occasional periods of seawater ingress from the Murray Mouth and Coorong.

During drought periods, prior to the construction of the barrages, higher salinities were recorded in the Lakes and further upstream to Murray Bridge however these periods were often short in duration. Until 2006-07 the Lower Lakes were operated mainly between 0.50-0.85m AHD and water would be discharged in most years from the barrages. With the extreme low River Murray system inflows observed in 2006-07, the Lower Lakes water levels fell to record low levels and have not yet recovered to the pre 2006-07 operating levels (Figure 15).

The Lake Alexandrina water level declined to less than –1.0m AHD in May 2008 and the critical acidification trigger level is –1.5m AHD as adopted by the Murray-Darling Basin Ministerial Council. Localised acidification hotspots have been observed at several locations around both Lakes Alexandrina and Albert and have required active site management to avoid further degradation. In some cases this has included application of limestone to improve the buffering capacity of water, revegetation and building a temporary environmental flow regulator at Clayton to prevent acidification of the Goolwa channel and associated environments in the Finniss and Currency creeks.

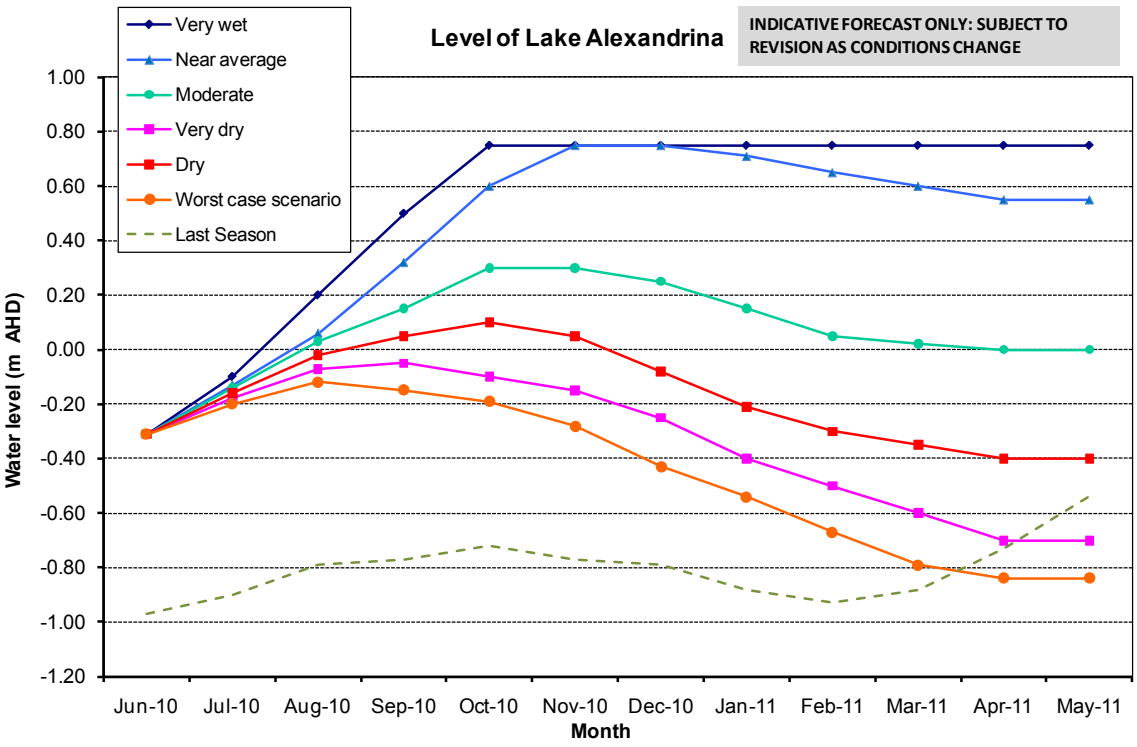
- Figure 15 – Behaviour of Lower Lakes 1962 to end May 2010



At the end of May 2010 the level of Lake Alexandrina was -0.31 m AHD and gradually rising. Under the 'worst case' scenario the level in Lake Alexandrina is expected to peak at about 0 m AHD before falling to about -0.8m AHD (Figure 16) and in this scenario Lake Albert would be kept above -0.5 m by pumping from Lake Alexandrina.

Under the moderate scenario, the water level in Lake Alexandrina will increase to about 0.3 m AHD during spring and remain at or above 0 m AHD for the remainder of the year. Under the wetter scenarios, Lake Alexandrina is expected to fill, as would Lake Albert.

- Figure 16 – Lake Alexandrina outlook



7 Calendar of events affecting operations in 2010-11

Month	Community events	Major Works or Actions	Operational issues
June		Releases from Hume and Dartmouth Dams, and also Menindee Lakes, maintained at minimums. Above-entitlement water delivered to SA to account for shortfall from rating table changes. Lake Victoria – maintenance of inlet gates (May to June 2010).	
July	10–11 July, Junction Rally (a triennial boating event) at Wentworth Weir	Releases from Hume and Dartmouth Dams, and also Menindee Lakes, maintained at minimums. Above-entitlement water delivered to SA to account for shortfall from rating table changes. Commencement of irrigation season in NSW—filling of major channel systems.	Drawdown of Mildura Weir for weir upgrade and construction of fishway. Possible lowering of up to 20 cm at Wentworth Weir to assist with Mildura fishway construction.
August		Expected increase in diversions as warmer weather arrives. Delivery of ADF to SA likely to occur for at least part of the month. Commencement of irrigation season in Victoria—filling of major channel systems. Earliest date that releases from Menindee Lakes would occur.	Refill of Mildura Weir pool completed.
September		Delivery of ADF to SA likely to occur for at least part of the month. Earliest date that transfers from Hume Reservoir to Lake Victoria would commence.	

Month	Community events	Major Works or Actions	Operational issues
October		Delivery of ADF to SA may continue for at least part of the month. Earliest date that transfers from Dartmouth to Hume Reservoir would commence.	
November	26–28 Nov 2010, Lake Mulwala Power Boat festival, including the 2010 World Hydroplane Championships http://www.lakemulwalapower.com.au/		
December	27–31 Dec 2010, Murray River Canoe Marathon, Yarrawonga to Swan Hill http://www.murraymarathon.ymca.org.au/Pages/default.aspx		
January			
February	11–13 Feb 2011, Southern 80 water ski race at Echuca http://www.southern80.com.au/		
March	12–13 Mar2011, Robinvale-Euston water ski classic http://www.waterskiracing.com/Robinvale.html		
April	23–24 April 2011, Mildura 100 water ski race http://www.milduraskiclub.org/		
May		Normal end of irrigation season.	

8 Further information on River Murray System operations

The MDBA will update its routine monthly operational plan, which contains the outlooks of potential storage behaviours and release rates, regularly throughout 2010-11. These updates of the operational plan will be shared with the jurisdictions via Water Liaison Working Group and will be forwarded to Basin Officials Committee as necessary.

This annual operating plan will be reissued only if a significant amendment is required to deal with unforeseen circumstances.

Updates on river operations within the water year will be provided in a number of forms, including:

- the weekly report on river operations;
- forecasts in relation to flows and salinity levels;
- media releases in relation to river operations; and
- special circumstances reports, such as drought updates.

These updates will be released onto the MDBA website (www.mdba.gov.au).

Additional background information on the operations of the River Murray System is available on the MDBA website.