



Murray Darling Association Inc.

www.mda.asn.au

ABN: 64 636 490 493

Region 5 Secretary
Renmark Paringa Council

Chairperson, Region 5
Peter Hunter

8580 3000

0447 177 341

Agenda

Region 5 - Ordinary Meeting

Loxton Waikerie Council Offices
Strangman Road, Waikerie

Monday 10 April 2017 at 10.00am
(Morning tea available from 9.30am)

1. ATTENDANCE

1.1 Present:

1.2 Apologies:

Tony Pasin MP	Member for Barker
Tim Whetstone MP	Member for Chaffey
Stephan Knoll MP	Member for Schubert
Cr Jack Gibb	Renmark Paringa Council

1.3 Conflict of Interest Declaration – Material / Actual / Perceived

2. WELCOME

Peter Hunter – Deputy Mayor, Renmark Paringa Council

3. MINUTES OF PREVIOUS MEETING/S - emailed with agenda

Moved:

That the minutes of previous meeting of the MDA Region 5 held on the 10th October, 2016 be accepted as a true & correct summary of the meeting.

Seconded:

Moved:

That the minutes of the Annual General Annual Meeting of MDA Region 5 held on March 6 2017 be received. [ie Formal Adoption at the next AGM]

Seconded:

4. BUSINESS ARISING FROM PREVIOUS MINUTES

4.1 Confirmation of Arrangements for Secretarial Duties

4.2 MDB NRM Board appointment of Engagement Officer @ Murray Bridge

4.3 Other items not currently listed to be dealt with in this agenda

5. MDA CEO REPORT

- 5.1 CEO Summary Report from March of 2017 **emailed with agenda** – discussion
- 5.2 Summary of / issues from the Ministerial Council Meeting held in Mildura - March 2017

6. MDA NATIONAL AGM UPDATE

- 6.1 Renmark Paringa Council Update on actions for the MDA National Conference and AGM to be held Wednesday 11 October to Friday 13 October, based in Region 5
- 6.2 Discussion re input / broad assistance in relation to in the planning of the Conference and AGM.

7. PLANNING & COORDINATION

- 7.1 MDA Board & Future Planning
- 7.2 Frequency / Location / Timing of Region 5 Meetings
- 7.3 Meeting Plan and Set of Actions for Region 5 in 2017

MR LGA Decision to hold a forum with Region 5 & Region 6 irrigators / business / invited guests to form a firm, supported set of proposals / requirements for MDB Plan into the future. Facilitator to be engaged to lead forum.

Consider Council's CEO comments along with our own views concerning the Region 5 AGM Motion:

"That all CEO's generate a list of issues related to the River Murray / Darling (in relation to their individual council areas) that they (and / or their staff / elected members – as time allows) believe need to be discussed / addressed by the Murray Darling Association"

8. GENERAL BUSINESS

- 8.1 Links with Other Regions
- 8.2 CEWH Portfolio Management Plan – Lower Murray-Darling. **Emailed with agenda**
- 8.3 Any Other General Business
Urgent, Late Business

9. NEXT MEETING

Date: Time: Location:

Room Booking / Morning Tea / Set Up & Preparation Responsibilities:

10. CLOSE

*The Murray Darling Association acknowledges and thanks
Loxton Waikerie Council for hosting this meeting of Region 5*



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ABN: 64 636 490 493

Region 5 Secretary
Kelvin Goldstone – Mid Murray Council
kgoldstone@mid-murray.sa.gov.au
8564 6020

Minutes

Region 5 - Ordinary Meeting

District Council of Loxton Waikerie
Strangman Road, Waikerie

Monday 10 October 2016 commencing at 10.00am

1. ATTENDANCE

1.1 Present

Russell Peate	Mid Murray Council
Cr Mark Ward	District Council of Loxton Waikerie
Cr Allan Maddocks	Renmark Paringa Council
Cr Jack Gibb	Renmark Paringa Council
Cr Peter Raison	Mid Murray Council
Peter Smith OAM	Mid Murray Private Member
Naomi Prunckun (from 10.36am)	Renmark Paringa Council
Emma Bradbury (from 10.15am)	Murray Darling Association
Kelvin Goldstone (Secretary)	Mid Murray Council

1.2 Apologies

Tony Pasin, MP	Member for Barker
Tim Whetstone MP	Member for Chaffey
Stephan Knoll MP	Member for Schubert
Ian Mann	Mid Murray Private Member
Cr Adriaan Sakko	Mid Murray Council

2. WELCOME

Russell Peate, Chief Executive Officer, Mid Murray Council welcomed everyone and advised the meeting that following the resignation of Cr Kevin Myers and after discussion with Murray Darling Association Chief Executive Officer, Emma Bradbury, it was agreed that as Chief Executive Officer of the host Council providing Secretarial and administration support for Region 5 he would Chair meetings until formal appointment (of Chairperson and Secretary) are made at the next meeting (Annual General Meeting) after the 2016 National Conference and Annual General Meeting.

Deputy Chairperson, Cr Mark Ward, confirmed he agreed with this approach following discussion with Murray Darling Association Chief Executive Officer, Emma Bradbury.

3. MINUTES OF THE PREVIOUS REGION 5 MEETING

Cr Peter Raison moved that the minutes of the meeting held on 6 June 2016 be taken as read and confirmed.

Seconded Cr Mark Ward.

CARRIED.

4. GENERAL BUSINESS

4.1 Chairperson's Resignation

A copy of Cr Kevin Myers' resignation and response from Emma Bradbury, Chief Executive Officer of the Murray Darling Association had been forwarded to all members.

Cr Mark Ward moved that Cr Kevin Myers' resignation be noted and a letter thanking Kevin for his input and work as Chairperson of Region 5 be sent.

Seconded Peter Smith.

CARRIED.

4.2 Appointment of Chairperson and Secretary

Cr Mark Ward moved that the positions of Chairperson and Secretary (including secretarial support) be filled by Berri Barmera and Renmark Paringa Councils in accordance with Region 5 rotation policy.

Seconded Peter Smith.

CARRIED.

4.3 Expressions of Interest – MDA National Conference Host 2017

10.15 AM

Emma Bradbury, Chief Executive Officer of the Murray Darling Association, joined the meeting via Skype.

Russell Peate welcomed Emma to the meeting.

Cr Mark Ward moved that the expression of interest lodged by Renmark Paringa Council to host the 2017 Murray Darling Association National Conference and Annual General Meeting be endorsed.

Seconded Cr Peter Raison.

CARRIED.

Murray Darling Association Chief Executive Officer, Emma Bradbury, confirmed the expression of interest had been received.

4.4 MDA 2016 AGM Motions on Notice

A copy of Motions on Notice for the National Conference and AGM had been forwarded to all members.

The meeting discussed each listed MDA 2016 AGM Motions on Notice. Considerable discussion ensued on Motion 7 – Recommendation of the Senate Select Committee. Emma confirmed the motion was prepared by Region 3 and accepts concern of SA Regions. Emma confirmed all available information will be provided to allow members to make an informed decision.

4. GENERAL BUSINESS CONT'D

4.5 Region 5 Delegates – MDA 2016 National Conference and AGM

It was noted that Cr Peter Raison, Ian Mann and two representatives from Renmark Paringa Council would be delegates to the 2016 National Conference and AGM.

4.6 Any Other General Business

Cr Jack Gibb raised the following issues:

- a) Wastewater from houseboats including cost, future of system and concerns re Environment Protection Authority requirements/advice.
- b) Continuing problems at Settlers Bend needs further investigation/action.
- c) River flows, querying regular advice possibly to be provided by the Murray Darling Association. Emma confirmed flow rates etc. could be listed on the MDA website, recognising information provided by Bureau of Meteorology, SES and Government agency departments.

Peter Smith wished Emma success with the 2016 National Conference and AGM.

11.00 AM

Russell Peate thanked Emma for her attendance.

Emma Bradbury thanked Region 5 members for their continued support and endeavours. The Skype session concluded.

5. NEXT MEETING

To be held at the Renmark Paringa Council, 61 18th Street, Renmark on a date to be confirmed in early 2017, commencing at 10.00am.

6. CLOSE

11.12 AM The Chairperson declared the meeting closed.

.....
CHAIRPERSON

.....
DATE

*The Murray Darling Association acknowledges and thanks
the District Council of Loxton Waikerie for hosting this meeting of Region 5*



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ABN: 64 636 490 493

Region 5 Secretary
Kelvin Goldstone – Mid Murray Council
kgoldstone@mid-murray.sa.gov.au
8564 6020

Minutes

Region 5 – Annual General Meeting

Renmark Paringa Council Offices
61 18th Street, Renmark

Monday 6 March 2017 commencing at 10.00am

1. ATTENDANCE

1.1 Present

Russell Peate (Chairperson)	Mid Murray Council
Cr Mark Ward	District Council of Loxton Waikerie
Cr Allan Maddocks	Renmark Paringa Council
Cr Peter Raison	Mid Murray Council
Cr Adriaan Sakko	Mid Murray Council
Ian Mann	Mid Murray Private Member
Cr Peter Hunter	Renmark Paringa Council
Cr Andrew Kassebaum	Berri Barmera Council
Naomi Prunckun	Renmark Paringa Council
Emma Bradbury (via Skype)	Murray Darling Association
Kelvin Goldstone (Secretary)	Mid Murray Council

1.2 Apologies

Tony Pasin MP	Member for Barker
Stephan Knoll MP	Member for Schubert
Cr Jack Gibb	Renmark Paringa Council
Peter R Smith OAM	Mid Murray Private Member

2. WELCOME

Russell Peate, Chief Executive Officer, Mid Murray Council welcomed everyone to the meeting.

3. MINUTES OF THE PREVIOUS REGION 5 ANNUAL GENERAL MEETING

Cr Andrew Kassebaum moved that the minutes of the Annual General Meeting held on 16 July 2014 be taken as read and confirmed.
Seconded Cr Mark Ward.

CARRIED.

4. REPORTS

4.1 Chief Executive Officer's Report

A copy of the Chief Executive Officer's report had been forwarded to all members.

Emma Bradbury discussed the contents of the report and invited questions from members.

5. STRATEGIC PLANNING

5.1 Regional Issues and Priorities

Emma Bradbury spoke on MDA strategic planning issues:

- Member Councils encouraged to communicate relevant issues in their Regions.
- Regional Engagement Officer Terms of Reference and role. Terms of Reference to be forwarded to all Region 5 members and the Engagement Officer to be invited to the next meeting.

6. GENERAL BUSINESS

6.1 Combined MDA Regions Meeting

Notes from meeting held on 5 October 2016 had been forwarded to all members.

6.2 MDA Position Statement – Amendments to the Basin Plan

A copy of the Position Statement had been forwarded to all members.

6.3 Information Sessions – Murray Darling Basin Plan

A copy of a press release had been forwarded to all members.

6.4 MDA Meeting with Deputy Prime Minister the Hon Barnaby Joyce – Outcome Report

A copy of the Outcome Report had been forwarded to all members.

6.5 Hon Ian Hunter MLC, Minister for Water and the River Murray

A copy of letter received had been forwarded to all members.

6.6 Mid Murray Council – Submission on the Proposed Amendment to the Basin Plan

A copy of Mid Murray Council's submission had been forwarded to all members.

6.7 2017 Murray Darling Association Conference – Dates

Date confirmed as 11, 12 & 13 October 2017.

6.8 Renmark Paringa Council – National Conference and AGM

A copy of correspondence received had been forwarded to all members.

6. GENERAL BUSINESS CONT'D

6.9 Cr Peter Raison – Mid Murray Council

Apology re comments at Region 5 meeting held at Waikerie on 10 October 2016. A copy had been forwarded to all members.

Resolved that all General Business Items be received and noted.

7. APPOINTMENT OF CHAIRPERSON AND SECRETARY

Resolution from Previous Meeting held on 10 October 2016

Cr Mark Ward moved that the positions of Chairperson and Secretary (including secretarial support) be filled by Berri Barmera and Renmark Paringa Councils in accordance with Region 5 rotation policy.

Seconded Peter Smith.

CARRIED.

7.1 Appointment of Chairperson

Cr Andrew Kassebaum moved that Renmark Paringa Council be appointed Chair of Region 5 for a period of twelve months and resolution from Renmark Paringa Council endorsing Cr Peter Hunter as Chairperson be accepted.

Seconded Cr Mark Ward.

CARRIED.

7.2 Appointment of Secretary

Deferred to next Region 5 meeting.

8. NEXT MEETING

To be held at the Loxton Waikerie Council, Strangman Road, Waikerie on Monday, 10 April 2017, commencing at 10.00am.

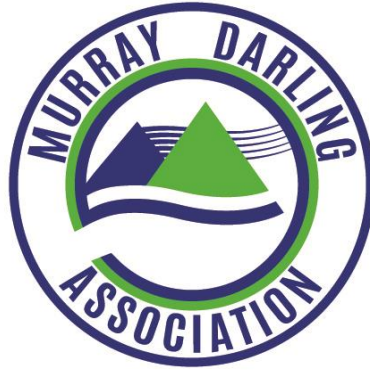
9. CLOSE

11.02 AM The Chairperson declared the meeting closed.

.....
CHAIRPERSON

.....
DATE

*The Murray Darling Association acknowledges and thanks
the Renmark Paringa Council for hosting this meeting of Region 5*



Chief Executive Officer's Region Report Feb/Mar 2017

Prepared by: Emma Bradbury

Chief Executive Officer
Murray Darling Association
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1. Diary/Engagements

06/02/17	GMW Strategic Planning workshop	Moama
07/02/17	Gannawarra Shire Council address – w/ Cr Thurley	Keang
08/02/17	Murrindindi Council address – w/ Cr Thurley	Toowoomba
14/02/17	Meeting Hon Minister Ian Hunter, SA Minister for Water w/ Chairs	Adelaide
14/02/17	Meeting Coorong Council CEO Vince Cammel	Adelaide
15/02/17	2017 MDA Planning Workshop – all Region Chairs	Adelaide
15/02/17	Board Meeting 363 – election of the National Exec	Adelaide
16/02/17	Meeting LGA SA President Mayor Rosenberg, and S Smith	Adelaide
17/02/17	Legatus Central Local Govt address – w/ R8 Chair Cr Clarke	Clare SA
17/02/17	Renmark – Meeting council exec. inspect Conference venues	Renmark
24/02/17	Meeting – Ray Stubbs RAMROC w/ CrThurley	Skype
28/02/17	Western Divisions Annual Conference	Wentworth
02/03/17	Murray River Group of Councils w/ Cr Thurley	Swan Hill
06/03/17	Region 5 AGM	Skype
07/03/17	Bruce Male??	Canberra
07/03/17	Address Board Murray-Darling Basin Authority w/ Cr Thruley	Canberra
07/03/17	Meet senior dept directors, Dept Ag & Water Res w/ Cr Thurley	Canberra
08/03/17	Meeting Hon Sussan Ley MP, Member for Farrer	Albury
09/03/17	Attend inaug Murray Central Regional Boating Advisory Group	Moama
10/03/17	104.3 EMFM Radio – monthly program	Echuca
10/03/17	Interim financial audit – MDA - MRG Auditors	Echuca

2. Strategy

- Continuing to press the purpose of the Murray Darling Association being *to provide effective representation of local government and the communities we represent, at state and federal level in the management of our Basin resources.*
- Arguing for local government to have an active in informing decisions that impact our local communities.
- Promoting recent **reforms** and current achievements of the MDA, including:
 - New [Constitution](#), guarantees proper representation of local government and ensure sectional interests not afforded a disproportionate voice.
 - Structure, model and value of the new MDA.
 - Regional leadership, new memberships, and engagement across the Northern Basin.
 - Equal engagement of council officers with elected delegates to ensure authoritative and properly informed representation of our local government areas.
 - Leadership of a more constructive, united, and informed dialogue between local, state and federal governments across the Basin.
- Future **priorities** including
 - Development of MDA regions Regional Basin Profile & Priorities Plans (issues maps).
 - [Basin Plan Implementation Impacts Evaluation Framework](#) project.
 - Delivering local government an active role in the decision-making processes that impact our communities under the implementation of the Basin Plan.
- Pursuing opportunities for the meaningful development of the strategic alliance outlined in the **Memorandum of Understanding** between the Murray Darling Basin Authority and the Murray Darling Association in support of our shared objectives.

Finance

Our interim audit was conducted this month with exceptionally positive feedback from our auditors, noting their delight in the progress and standards of the association in the three years since they commenced as the MDA's auditors. They also noted the healthy, if lean, state of our finances on budget to deliver our second consecutive surplus.

Advocacy Priorities

Following correspondence last month from the MDA to all Basin Water Ministers requesting support for local government, via the MDA, to be formally recognized and included in the Basin Plan decision making processes, and an opportunity to meet to discuss this, the MDA, along with two other local government groups has been invited

to address the Ministers in advance of the Ministerial Council in Mildura on March 17th. Local government will be represented by the MDA, RAMROC and Murray River Group of Councils.

We have put the case that as the third level of government in Australia, and the one most directly connected to community, local government has a valuable contribution to make in the processes, community consultation, and the formulation of decisions made and taken in the continuing implementation of the Basin Plan.

Response to date has been positive.

- MDA has drafted a response and partnered with a number of member councils across the northern Basin in the preparation of a response/submission to the proposed Basin Plan amendments.
- MDA played an active role in seeking to mitigate adverse impact on local government and communities from the division between the states and the Federal Govt following the meeting of the Ministerial Council of Basin Governments in Adelaide in Nov 2016.

MDA Regional Boundary Review

Water resource plans (WRPs) set out how water resources will be managed. They are developed by the Basin states, or in certain circumstances by the Authority, for approval by the Commonwealth Water Minister.

A water resource plan area is a geographical area, of which there are 14 for surface water, 16 for groundwater and an additional six for surface water and groundwater combined. As far as possible, the boundaries match those of existing state water management areas.

Consider the merits of MDA regional alignments taking WRPs as well as LGA boundaries into consideration. Standing agenda item for all 2017 region meetings.

3. Projects

Social and Economic Impacts Evaluation Framework – funding still not yet secured to commence this project. Meetings in Canberra in March with a number of interested departmental stakeholders. Letters will go out to funding partners in the coming weeks.

Australian Institute of Company Directors – Following positive meetings in Melbourne, we are currently awaiting a project proposal from AICD.

4. Staff Matters

MDA is committed to nurturing new talent and skills. We have recently joined the Schools Friendly Businesses consortium in Campaspe, and have taken on a School Based Apprentice/Trainee, Annette Waters. Annette is student at Rochester Secondary College and has demonstrated an active involvement in community participation over several years.

5. Regions

Meetings calendar 2017 – It is the ideas generated and the minutes/resolutions of the region meetings that provide the *imprimatur* for the MDA to carry forward our advocacy priorities and deliver on our purpose. Region meetings must be well run and attended, with

chairs and committees ensuring that member councils are aware of and engaged in the meetings.

Meeting schedules should be published on the MDA website. Any region that has not provided its 2017 meeting schedule to the MDA for publication on the website should do so immediately.

Region 12 – The MDA welcomes Balonne Shire Council Mayor Richard Marsh and CEO Matthew Magin to the role of Chair of Region 12. We look forward to their valuable contribution and detailed knowledge of Northern Basin issues.

6. In brief – updates

2017 National Conference and AGM Committee – tentative date set for 11-13 October. This event will be held in Renmark.SA. East Coast Conferences has been engaged and a committee formed to organist the conference, with a number of high caliber sponsors already having requested an opportunity to sponsor and present. Senator the Hon Anne Ruston, Assistant Minister for Agriculture and Water Resources and has accepted the MDA's invitation to open the conference.

Premises lease – 463-465 High Street Echuca lease with Parks Victoria renewed for a further 2 years. The co-location of these two organizations in Echuca-Moama is extremely favorable to the MDA, both financially and in providing an exceptionally high quality workplace and positive team environment.

Emma Bradbury
Chief Executive Officer



Australian Government

Commonwealth Environmental Water Office

Commonwealth Environmental Water

Portfolio Management Plan

Lower Murray–Darling

2016–17



Front cover image credit: The River Murray at Waikerie. Photo by Commonwealth Environmental Water Office

Back cover image credit: Commonwealth Environmental Water Office Local Engagement Officer Michelle Campbell at Riverland Field Day. Photo by Callie Nickolai, Natural Resources SA Murray-Darling Basin.

The Commonwealth Environmental Water Office respectfully acknowledges the traditional owners, their Elders past and present, their Nations of the Murray-Darling Basin, and their cultural, social, environmental, spiritual and economic connection to their lands and waters.

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Commonwealth environmental water portfolio management planning

Commonwealth environmental water

The Commonwealth Environmental Water Holder is an independent statutory position established by the *Water Act 2007* to manage the Commonwealth environmental water holdings. The Commonwealth Environmental Water Holder leads and is supported by the Commonwealth Environmental Water Office (the Office), a division of the Australian Government Department of the Environment.

Under the *Water Act 2007*, Commonwealth environmental water must be managed to protect or restore environmental assets, so as to give effect to relevant international agreements. The *Water Act 2007* also requires that the Commonwealth Environmental Water Holder perform its functions and exercise its powers consistently with and in a manner that gives effect to the Basin Plan and that Commonwealth environmental water is managed in accordance with the Basin Plan's environmental watering plan.

Purpose of the document

This document sets out the plans for managing the Commonwealth environmental water portfolio in the Lower Murray-Darling for 2016–17. Efficient and effective management of Commonwealth environmental water requires the utilisation of all portfolio management options, including water delivery, carryover and trade. To support improved outcomes from water use over time, carryover provides the opportunity to optimise water use across water years and to improve water availability early in a water year, while trade provides further capacity to optimise use over the long-term as well as across catchments.

By taking a multi-year approach to planning, portfolio management tools such as use, carryover and trade can be managed for maximising environmental outcomes. The portfolio management plans support transparent, coordinated and adaptive management of the Commonwealth environmental water portfolio, consistent with Basin Plan obligations including the expected outcomes in the Basin-wide environmental watering strategy and the Basin annual environmental watering priorities.

To learn more about the portfolio management planning approach see *Commonwealth environmental water portfolio management planning: Overview of the planning approach in 2016-17* (available at: <http://www.environment.gov.au/water/cewo/publications>).

Delivery partners

Commonwealth environmental water is managed in conjunction with and delivered by a range of partners. In the Lower Murray-Darling, our partners include South Australian Department of Environment, Water and Natural Resources (including Natural Resource Management Boards), New South Wales Office of Environment and Heritage, Victorian Environmental Water Holder, Victorian Catchment Management Authorities, New South Wales Local Land Services, Department of Primary Industries – Fisheries, Department of Primary Industries – Water, the Murray-Darling Basin Authority, the Murray-Darling Wetlands Working Group Ltd, Nature Foundation South Australia, Ngarrindjeri Regional Authority, Renmark Irrigation Trust, scientists engaged in monitoring the outcomes of Commonwealth environmental water use and various community groups and individuals.

This portfolio management plan has been developed in consultation with our delivery partners.

Your input

The management of Commonwealth environmental water relies on considerable advice and assistance from local organisations, state governments and others. Individuals and groups within the Murray-Darling Basin community are encouraged to submit suggestions for the management of Commonwealth environmental water. Please contact the Office via: ewater@environment.gov.au.

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1. Environmental watering in the Lower Murray-Darling

1.1. The Lower Murray–Darling Region

The Lower Murray–Darling Region consists of the River Murray downstream of Lock 15 at Euston to the Murray Mouth, the Darling River below Menindee Lakes and the Great Darling Anabranch. The lower River Murray contains several wetlands of ecological significance, including the internationally important Ramsar listed Coorong and Lakes Alexandrina and Albert, the Riverland (including the Chowilla floodplain), Banrock Station and Hattah Lakes.

Environmental water is sourced via managed releases from River Murray storages including Hume Reservoir, Menindee Lakes, Lake Victoria and River Murray tributaries. Natural cues (e.g. modelled natural flows) may be used to inform the use of environmental water in the lower River Murray, establishing a more natural flow regime and maximising the benefits of environmental water delivery. Environmental water delivery to specific sites within the lower River Murray occurs in two main ways. At low river flows regulating structures or pumping can be used to manage the diversion of water into anabranches, creeks, wetlands and floodplains while in-channel pulses can provide benefits for native fish. At high river flows environmental water is used to augment natural flow to influence the magnitude and duration of floodplain and wetland inundation.

Downstream of Lock 6 in the lower River Murray many wetlands, creeks and anabranches are permanently connected to the main river channel at normal weir pool levels, however, some sites are only connected through the operation of infrastructure or elevated river flows. The seasonally appropriate operation of river infrastructure, such as weirs, barrages and pumps, provides these sites more natural patterns of inundation and drying sequences. Some wetland inundation can be achieved through weir pool manipulation, with a temporary raising of weir pools increasing the area of wetland inundation in low flow conditions whilst using much less water than the equivalent inundation from overbank flows. Water levels within the Lower Lakes and inflows into the Coorong are managed through the operation of barrages at Lake Alexandrina.

Environmental water delivery in the River Murray channel, including the operation of locks and storages is managed by the Murray–Darling Basin Authority (River Murray Operations). Delivery of Commonwealth environmental water is undertaken in collaboration with a number of delivery partners identified above.

Environmental water is managed by a number of water holders in the Murray, including the Commonwealth Environmental Water Holder, The Living Murray, the Victorian Environmental Water Holder, NSW Office of Environment and Heritage and South Australian Department of Environment, Water and Natural Resources. Environmental water portfolios are coordinated to maximise the effectiveness of water delivery for achieving environmental outcomes. For example, the Southern Connected Basin Environmental Watering Committee was established by the Murray–Darling Basin Ministerial Council in October 2014 to coordinate the efficient and effective delivery of all environmental water in the Southern Connected Basin.

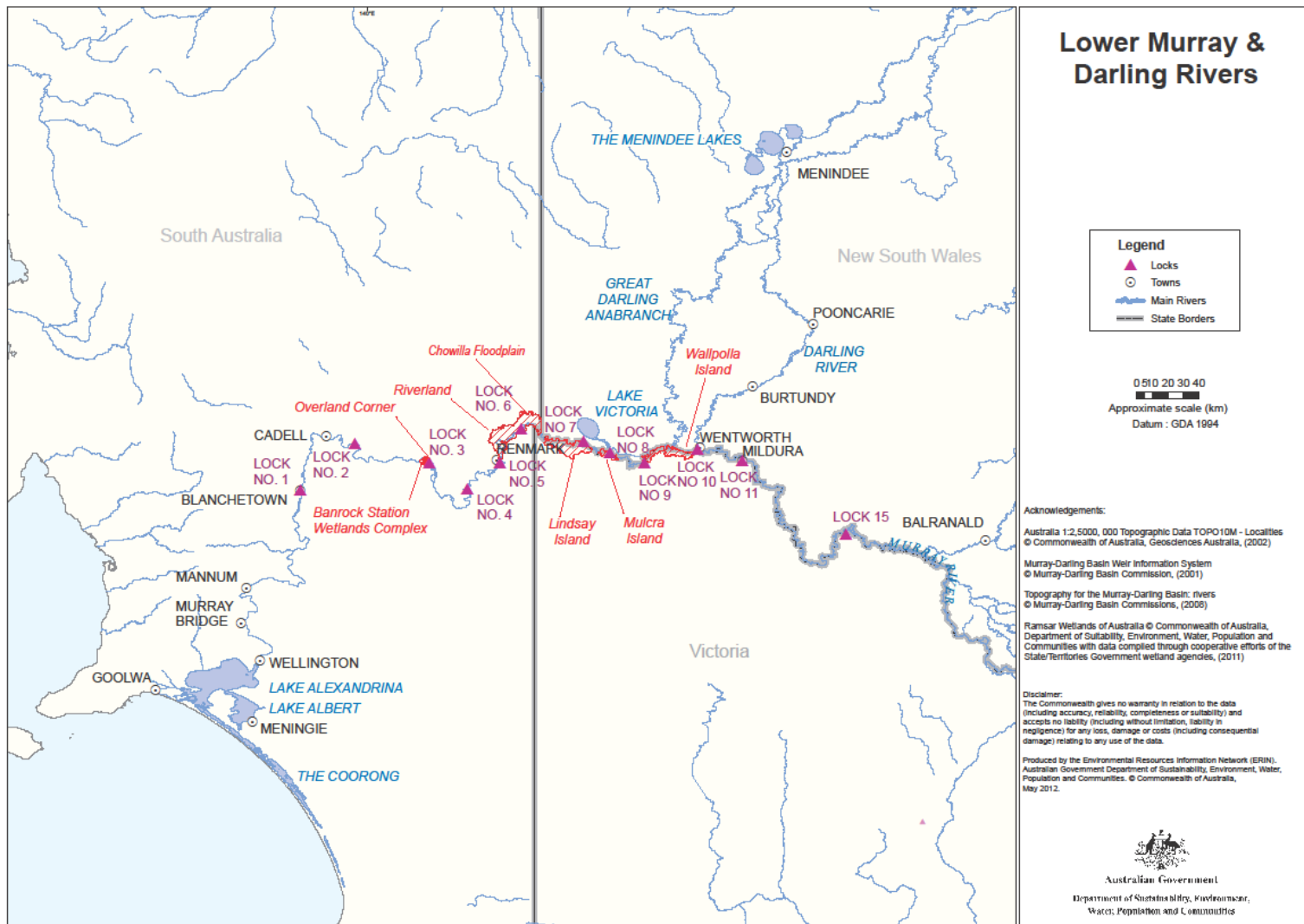


Figure 1: Map of the Lower Murray–Darling Region

1.2. Environmental objectives and outcomes in the Lower Murray-Darling region

The long-term environmental objectives and expected outcomes for the Murray-Darling Basin are described in the Basin Plan's environmental watering plan and the Basin-wide environmental watering strategy. The Basin-wide environmental watering strategy includes quantified environmental outcomes at both a Basin-scale and for each catchment—outcomes relevant for the Lower Murray-Darling region are described in [Attachment A](#).

The Victorian and South Australian state governments have developed long-term watering plans for the Victorian (DELWP 2015) and South Australian Murray (DEWNR 2015) regions. The plans identify the priority environmental assets and ecosystem functions in the catchment, the objectives and targets for these assets and functions, and their watering requirements. Once developed, the New South Wales Murray and Lower Darling plans will also provide key information on the long-term environmental water demands in the catchment. In addition to the long-term watering plans, the Office will continue to draw on existing documentation on environmental water demands developed by state governments (such as annual watering priorities or proposals), local natural resource management agencies and the Murray-Darling Basin Authority.

Based on these strategies and plans, and in response to best available knowledge drawing on the results of environmental watering monitoring programmes, the outcomes being targeted by environmental watering in the Lower Murray-Darling region are summarised in Table 1 below. The objectives and targeted outcomes for water-dependent ecosystems will continue to be revised as part of the Commonwealth Environmental Water Office's commitment to adaptive management.

Table 1: Summary of outcomes being targeted by environmental watering in the Lower Murray-Darling region

BASIN-WIDE OUTCOMES (Outcomes in red link to the Basin-wide environmental watering strategy, MDBA 2014)	EXPECTED OUTCOMES FOR LOWER MURRAY-DARLING ASSETS						
	IN-CHANNEL ASSETS			END OF SYSTEM	OFF-CHANNEL ASSETS		
	River Murray from Euston to Lower Lakes	Lower Darling River	Great Darling Anabranch	Coorong, Lower Lakes and Murray Mouth	Hattah Lakes	Floodplain and wetlands from Euston to South Australian border	Floodplain and wetlands from South Australian border to Lower Lakes
VEGETATION	Maintain riparian and in-channel vegetation condition. Increase periods of growth for non-woody vegetation communities that closely fringe or occur within river channels.			Ensure survival and promote growth and recruitment of <i>Ruppia tuberosa</i> in the south lagoon of the Coorong. Maintain or improve the diversity, condition and extent of aquatic and littoral vegetation at the Lower Lakes.	Maintain the current extent of water-dependent vegetation near river channels and on low-lying areas of the floodplain. Improve condition of black box, river red gum and lignum shrublands. Improve recruitment of trees within black box and river red gum communities.		
WATERBIRDS	Provide habitat and food sources to support waterbird survival and recruitment, and maintain condition and current species diversity.						
				Maintain habitat and food sources to support improvement in waterbird condition and populations within the Lower Lakes and Coorong lagoons (including curlew sandpiper, greenshank, red-necked stint and sharp-tailed sandpiper).	Complete seasonally appropriate colonial bird breeding events that are in danger of failing due to drying.		
FISH	Provide flows to support habitat and food sources and promote increased movement, recruitment and survival/condition of native fish.			Maintain or improve diversity, condition and population for fish populations (inc estuarine-dependent fish) through providing suitable habitat conditions within the Coorong lagoons and maintaining migration pathways that supports species recruitment and survival/condition. Provide flow cues to promote increased movement, recruitment and survival/condition of native fish.	Provide flow cues to promote increased movement, recruitment and survival/condition of native fish (particularly for floodplain specialists).		

INVERTEBRATES	Provide habitat to support increased microinvertebrate and macroinvertebrate survival, diversity, abundance and condition.		
OTHER VERTEBRATES	Provide habitat to support survival, maintain condition and provide recruitment opportunities for frogs and turtles.		
CONNECTIVITY	Maintain baseflows and increase overall flows in the River Murray. Maintain longitudinal connectivity along the Lower Darling and Murray rivers, including connectivity between the two systems in order to fulfil important environmental functions, such as nutrient and sediment transport, organism dispersal and water quality. Maintain lateral connectivity through contributing to an increase in the frequency of freshes, bankfull and lowland floodplain flows.		Maintain latitudinal connectivity (within constraints) to wetlands and floodplains, by contributing an increase in the frequency of lowland floodplain flows.
	Improve the connection of the River Murray to the Coorong and the sea, through supporting increased barrage flows and Murray mouth openness.		
PROCESSES	Increase primary productivity, nutrient and carbon cycling, biotic dispersal and movement. Increase transport of organic matter, salt and nutrients downstream and out the Murray Mouth.		
WATER QUALITY	Maintain water quality and provide refuge habitat from adverse water quality events (e.g. blackwater).	Maintain salinity regimes below critical thresholds for key flora and fauna in the Lower Lakes and Coorong through supporting the export of salt through the Murray Mouth.	Increase mobilisation and export of salt from the River Murray system.
RESILIENCE	Maintain drought refuge habitat and maintenance/condition of native biota (e.g. fish and other aquatic fauna)		

Information sourced from: MDBA (2014a); Department of the Environment (2014); Department of the Environment (2011 and unpublished); MDBA (2013a-i); DELWP (2015), Department of Environment, Water and Natural Resources (2015)

1.3. Environmental flow requirements

Not all environmental demands can and will be met through the use of held environmental water. Some demands are met by regulated water deliveries for consumptive purposes and inter-valley transfers, while others are met by large unregulated/natural flow events or are beyond what can be delivered within operational constraints. Figure 2 shows the broad environmental demands that are in scope for Commonwealth environmental water. Importantly, these are broad, indicative demands and individual watering events may contribute to particular opportunities, such as using infrastructure to deliver water to individual wetlands that would otherwise not be possible due to constraints. Also, there may be opportunities for Basin State governments to remove or modify constraints, which will improve the efficiency and/or effectiveness of environmental watering. Further information on delivery constraints are described in [Attachment B](#).

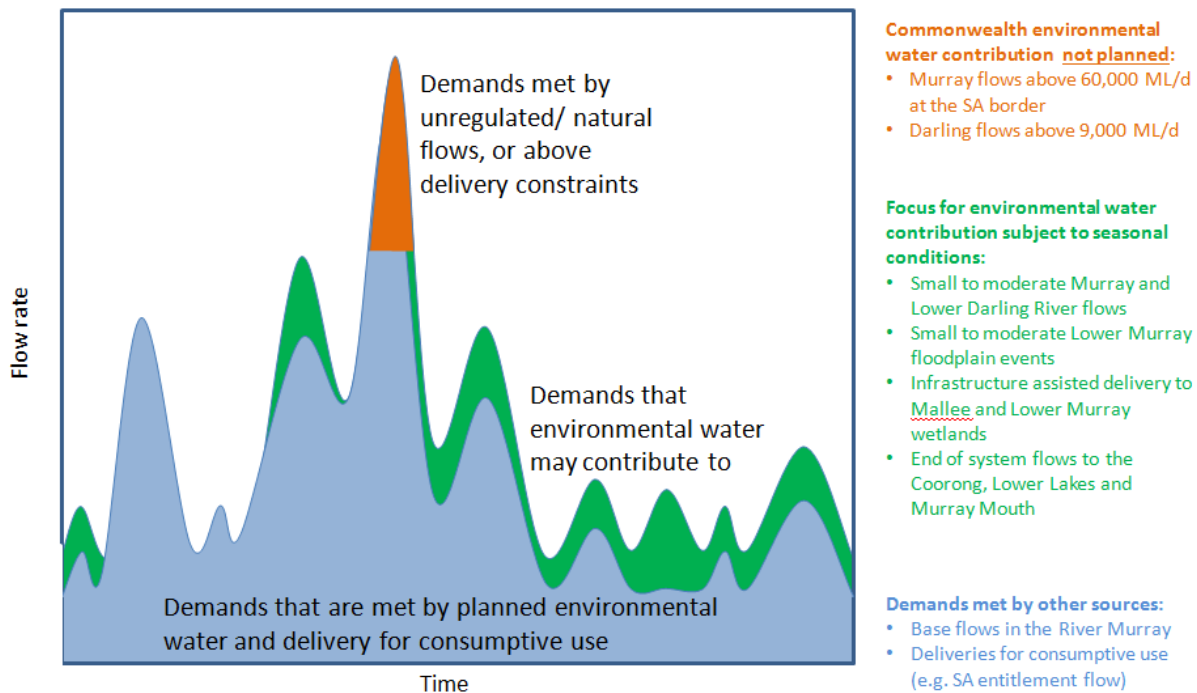


Figure 2: Scope of demands that environmental water may contribute to in the Lower Murray-Darling region

Based on the above outcomes sought and delivery constraints, specific watering requirements (flow magnitude, duration, timing and frequency) have been identified as being in scope for Commonwealth environmental water. These water requirements are described in Table 3. As with the objectives and targeted outcomes, the environmental water requirements will continue to be reviewed and revised in response to new knowledge.

1.4. Monitoring and adaptive management

Operational monitoring is undertaken for all Commonwealth environmental watering actions and involves collecting on ground data with regard to environmental water delivery such as volumes delivered, impact on the river systems hydrograph, area of inundation and river levels. It can also include observations of environmental outcomes.

Intervention monitoring is also being undertaken in the Lower Murray River region. It aims to understand the environmental response from Commonwealth environmental watering with respect to targeted objectives and expected outcomes. Information on the monitoring activities is available at: <http://www.environment.gov.au/water/cewo/catchment/lower-murray-darling/monitoring>. Monitoring information is also provided by state governments and The Living Murray programme.

The outcomes from these monitoring activities are used to inform portfolio management planning and decision-making.

2. Portfolio management in 2016–17

In planning for the management of Commonwealth environmental water, the Office aims to maximise the outcomes achieved from the available water. This includes consideration of the urgency of demands (based on targeted outcomes and watering requirements, watering history and asset condition) and the available supply under different resource scenarios. Plans for water delivery, trade and carryover are then made in a multi-year context, with an assessment also undertaken of need for water in future years.

This planning process is outlined in full in Table 3 below and summarised in the sections below.

2.1. Antecedent and current catchment conditions and the demand for environmental water in 2016–17

During the 2010 to 2012 period, natural flow events and environmental watering actions have resulted in improvements in the condition of many wetlands in the Lower Murray-Darling and promoted ecological recovery following the millennium drought. Drier conditions from 2013 to 2016 have seen some floodplain and wetland sites entering into a natural drying phase, while river flows have also reduced in scale. Environmental water demands for the Lower Murray-Darling in 2016–17 are represented in Table 3 and summarised below:

Lower Darling and Great Darling Anabranch: River red gum and black box vegetation in the Great Darling Anabranch showed positive responses following natural and environmental watering events during 2011 to 2013. However, the Anabranch has not received flows during 2014–15 or 2015-16 resulting in a moderate to high demand for water in 2016–17 to support on-going vegetation recovery. Due to very low water levels in the Menindee Lakes, the Lower Darling River channel received minimum flows in 2014–15 and ceased to flow during 2015-16, resulting in a critical demand for water to manage water quality and reinstate aquatic habitat for native fish populations. Delivery of environmental water to meet this demand has not been possible (see Section 2.3).

River Murray Channel: There is a moderate demand for environmental water to contribute to supporting a more natural seasonality and flow variability, in-stream outcomes (e.g. for fish and critical functions) and to connect the river with low-lying wetlands. While flow-cued spawning fish species spawned in the Mid Murray in 2015-16, in the Lower Murray, negligible spawning has been detected in 2014-15 or 2015-16, likely due to insufficient flow triggers.

Hattah Lakes: Due to the significant watering actions in 2013–14, 2014–15 and smaller action that inundated a portion of the southern lakes in 2015-16 that supported floodplain vegetation, fish spawning and bird breeding, there is a low demand for environmental water in Hattah Lakes unless very wet conditions provide an opportunity to reconnect the lakes with the River Murray to allow fish to return to the river.

Floodplain and wetlands from Euston to South Australian border: These off-channel assets were watered naturally during the 2011 and 2012 river flow events. Smaller-scale inundation has also occurred since 2012–13 assisted by the use of regulating infrastructure or pumping. To maintain on-going recovery of vegetation communities there is generally a moderate to high demand for environmental water in these floodplain wetlands. Brickworks Billabong in the Victorian Mallee also holds a translocated population of Murray hardyhead. The site may require water to provide habitat for this fish population.

Floodplain and wetlands from South Australian border to Lower Lakes: Considerable parts of the South Australian Murray floodplain were watered naturally during the 2011 and 2012 river flow events. Priority wetlands have since received water via infrastructure to support on-going ecosystem recovery (e.g. use of infrastructure within the Chowilla floodplain and pumping to individual wetland sites). To maintain on-going recovery of vegetation communities and Murray hardyhead populations, there is generally a moderate to high demand for environmental water in these floodplain wetlands.

Coorong, Lower Lakes and Murray Mouth: Large volumes of environmental water in recent years have significantly improved conditions in the Lower Lakes, however the Coorong has shown limited recovery. The future survival of *Ruppia* in the Coorong is at risk due to a lack of a sufficient flow regime for flowering and seed set. In recent years salinity levels in the Southern Lagoon have exceeded critical thresholds for seed viability contributing to the on-going decline of the seed bank. Maintaining ongoing connectivity between freshwater and marine environments continues to be crucial for supporting a diverse fish assemblage, and facilitating the movement and recruitment of species that rely on this connectivity. Improvement in spring estuarine conditions is also critical for supporting foraging habitat for migratory waterbirds that are characteristic of the Ramsar site. Flows to the Coorong have been identified as a Basin annual environmental watering priority for 2016-17. Environmental water is required to maintain continuous base flows through the barrages to avoid damage to the site and support salt export from the River Murray and Lower Lakes. With a seasonal outlook indicating dry to moderate conditions (MDBA 2016) the contribution of environmental water to achieving the minimum flow requirements throughout the year is critical.

Murray-Darling Basin 2016-17 environmental watering priorities

In contributing to these demands, the Commonwealth Environmental Water Office will also be aiming to contribute to the following 2016-17 Basin annual environmental watering priorities relevant for the Lower Murray:

- Support viable populations of threatened native fish species by protecting drought refuges and maintain instream habitats
- Contribute to the long-term recovery of silver perch by improving the viability of existing populations and enhancing conditions for recruitment and dispersal to suitable habitats
- Protect aquatic habitat conditions in the Coorong and support native fish movement by optimising flows into the Coorong and through the Murray Mouth
- In moderate conditions, contribute to the long-term recovery of threatened species, (including silver perch), through range expansion and the establishment of new populations
- In moderate conditions, support waterbird populations by watering critical breeding and feeding habitats at the important Basin environmental assets for waterbirds

2.2. Water availability in 2016–17

Forecasts of Commonwealth water allocations

The volume of Commonwealth environmental water likely to be carried over in the Murray for use in 2016–17 is estimated to be between 180-200 GL. Total carryover in the southern-connected Basin is estimated to be 270-290 GL (Table 2).

Allocations against Commonwealth water entitlements in the Murray are determined by state governments and will vary depending on inflows. The following forecasts in Table 2 are based on the best available information including State forecasts and historical inflow scenarios:

Table 2: Forecasts of Commonwealth water allocations (including carryover) in 2016-17 in the Murray Valley as at 30 April 2016.

Entitlement type	Forecasts of Commonwealth water allocations (including carryover) in 2016–17 (GL) ²					
	Very dry ←			→ Very wet		
	95 percentile	90 percentile	75 percentile	50 percentile	25 percentile	10 percentile
NSW Murray (High/Conveyance /General security) (includes lower Darling)	116	199	280	301	394	394
Murray ³ (Victorian High/ low reliability)	207	245	354	409	377	346
Murray (South Australian High security)	148	148	148	148	148	148
Total – Murray	471	592	782	858	919	888
Total – Southern- Connected Basin¹	739	935	1282	1440	1501	1468

Notes:

1. The southern-connected Basin includes the Murrumbidgee, Murray, Lower Darling, Goulburn, Campaspe (excluding Coliban) and Loddon entitlements.
2. Forecasts for regulated catchments are given to the nearest whole gigalitre except where the entitlement held by the Commonwealth is below 1 GL.
3. Total forecast water available in the southern-connected Basin assumes that in Victoria 100 per cent of water held in spillable accounts becomes available under a median or dry scenario and 50 per cent or less becomes available under wetter scenarios. These figures do not include supplementary, unregulated or ground water accruals in the southern-connected Basin.

Information on actual allocations to Commonwealth environmental water holdings can be found at <http://www.environment.gov.au/water/cewo/portfolio-mgt/holdings-catchment> and is updated monthly.

Water resource availability scenarios

Commonwealth environmental water is not managed in isolation. When considering the available resource to meet environmental demands, it is necessary to also factor in the resources managed by other entities and available to contribute to environmental outcomes. Relevant resources include portfolios held by the Commonwealth Environmental Water Holder, New South Wales Office of Environment and Heritage, Victorian Environmental Water Holder, Department of Environment, Water and Natural Resources and The Living Murray, planned environmental water, natural and unregulated flows, conveyance water and consumptive water. Further detail on sources of environmental water in the Lower Murray–Darling is provided in Attachment C.

By combining the forecasts of water held by the Commonwealth with streamflow forecasts, as well as taking into account operational considerations, water resource availability scenarios can be developed ranging from very low to very high. Based on available information moderate to high resource availability scenarios are in scope for 2016–17. Moderate resource availability is most likely at the start of 2016-17 (despite dry conditions, the Commonwealth’s environmental water holdings will be supported by between 270-290 GL of carryover from 2015-16 in the Southern-connected Basin and opening allocations against high reliability accounts), with high or very high resource availability only possible if conditions become wet.

2.3. Overall purpose of managing environmental water based on supply and demand

Environmental water needs (demand) and water availability (supply) both influence the overall purpose of Commonwealth environmental water management. Under different combinations, the management purpose can range from ‘avoiding damage’ to the environment to ‘improving’ ecological health. This in turn informs the mix of portfolio management options available for maximising outcomes. Figure 3 shows how current demands and forecasted supply are considered together.

The overall ‘purpose’ for managing the Commonwealth’s water portfolio in the Lower Murray–Darling for 2016–17 is to protect and/or maintain the condition of most environmental assets, while seeking to avoid irreversible damage or decline to the Coorong and Lower Darling (where feasible).

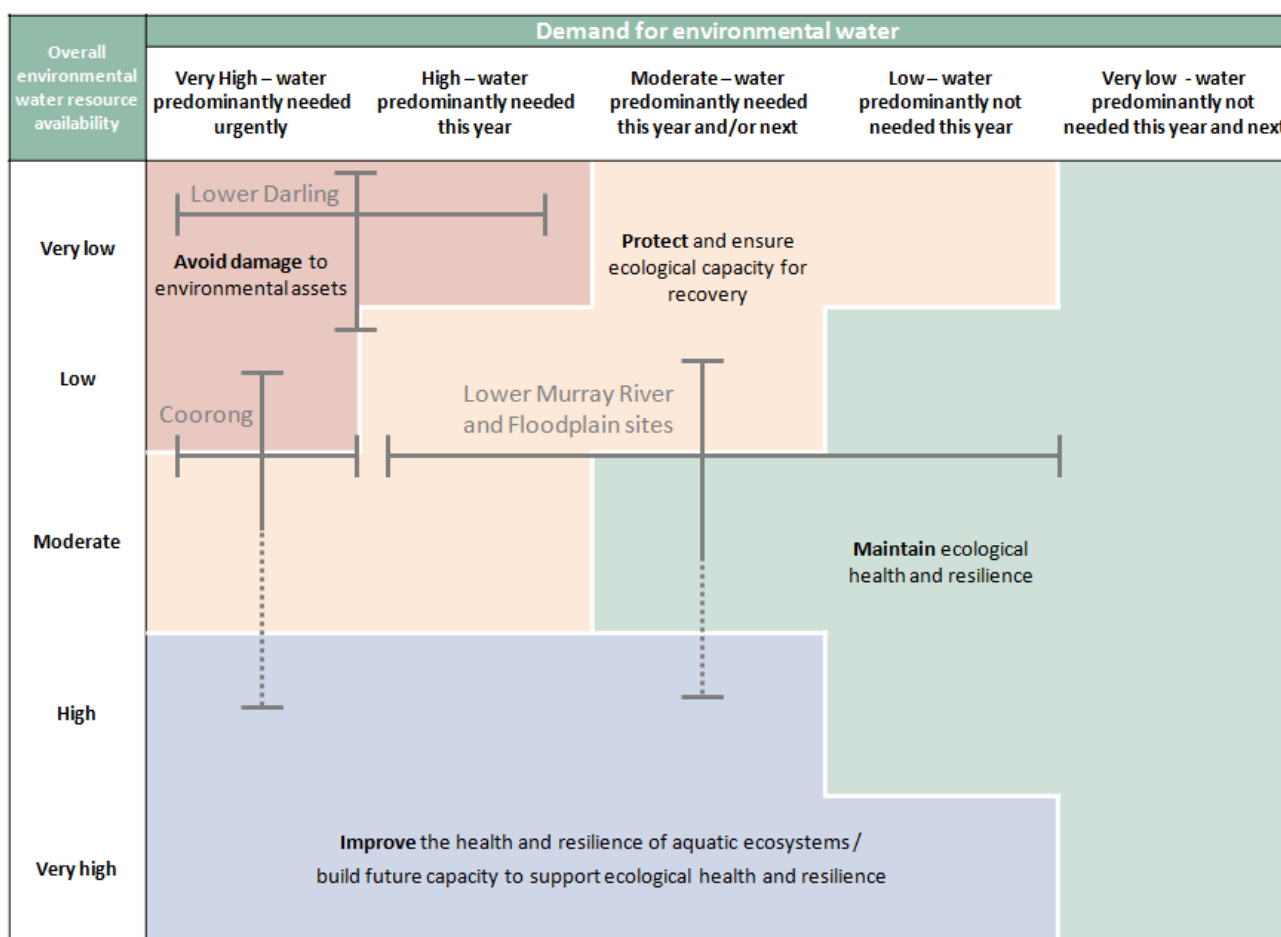


Figure 3: Determining a broad purpose for portfolio management in the Lower Murray-Darling region for 2016–17. Note: grey lines represent the likely range in demand and resource availability for the 2016-17 water year.

Further detail on how the overall purpose for portfolio management changes under different supply and demand scenarios is provided in *Commonwealth environmental water portfolio management planning: Overview of the planning approach in 2016-17* (available at: <http://www.environment.gov.au/water/cewo/publications>).

2.4. Water Delivery in 2016–17

Consistent with the demands and purpose described above, the Office is considering supplying environmental water to the following watering actions for 2016–17 (see also Table 3 for supporting information regarding the basis for determining these watering intentions).

Lower Darling and Great Darling Anabranch 2016-17 (Table 4 option 1)

As described in Section 2.1, due to very low water levels in the Menindee Lakes, the Lower Darling River channel ceased to flow during 2015-16. While there is a high need for environmental flows in the Lower Darling, the Commonwealth Environmental Water Holder will not be able to assist in meeting this need while ever conditions remain dry. If water availability improves and it becomes feasible to deliver environmental water, flows to manage water quality and reinstate aquatic habitat for native fish populations will be a high priority for Commonwealth environmental water use.

River Murray channel, including fringing wetlands and floodplain sites 2016-17 (Table 4 options 3 - 11)

Environmental water is expected to be delivered as a River Murray 'whole of system' in 2016-17. Similar to the approach followed in 2015-16, watering will be guided by natural hydrological triggers (rainfall and inflows) in order to reinstate a portion of the entire flow regime through the year. The 'whole of system' flows will be scalable so that the environmental watering is responsive to seasonal and operational conditions, the scale of hydrological cues and water availability. Environmental flows moving through the system will be able to be used for other activities that are considered seasonally appropriate, such as weir pool raising or drawdown or delivery to off-channel wetland sites.

If conditions are dry and inflow triggers are small, environmental watering will be focused on in-stream watering, such as flow variability and connectivity with low-lying anabranches and wetlands for fish movement and condition, riparian and wetland floodplain vegetation. Larger floodplain events would be out of scope in dry conditions. For example, due to the significant watering actions in 2013–14 through 2015-16 at Hattah Lakes that supported water dependent vegetation and provided improved habitat and food resources for native fish and waterbirds, there is a low demand for environmental water in Hattah Lakes. It is therefore unlikely that Commonwealth environmental water will be delivered to Hattah Lakes in 2016-17 as a drying cycle ensues, unless appropriate natural cues trigger a managed event.

If conditions become moderate to wet, environmental water may be used for modest floodplain watering events (within constraints to avoid adverse third party impacts) for outcomes such as fish breeding and recruitment (or lateral movement from isolated habitats like the Hattah Lakes, back to the Murray River Channel), full reproductive cycles of important floodplain vegetation communities and completion of waterbird breeding events.

Coorong, Lower lakes and Murray Mouth 2016-17 (Table 4 options 12a. and 12b.)

The Coorong remains in critical condition and there is an ongoing high demand for Commonwealth environmental water to protect the condition of the Coorong and ensure its capacity for further recovery in future years. Under dry condition the Commonwealth environmental water will be required to maintain at least minimum flow through the barrages to the Coorong throughout the year. Commonwealth environmental water will be delivered to the lower lakes sourced from upstream watering actions and is intended to be managed to maximise environmental benefits for the Coorong.

Stakeholder feedback

Consultation on long term portfolio management planning has occurred with key delivery partners (South Australian Department of Environment, Water and Natural Resources (including Natural Resource Management Boards), New South Wales Office of Environment and Heritage, Victorian Environmental Water Holder, Victorian Catchment Management Authorities, New South Wales Local Land Services, Department of Primary Industries – Fisheries, Department of Primary Industries – Water, Water New South Wales, the Murray–Darling Basin Authority, the Murray-Darling Wetlands Working Group, Nature Foundation South Australia, Ngarrindjeri Regional Authority, Renmark Irrigation Trust, scientists engaged in monitoring the outcomes of Commonwealth environmental water use and various community groups and individuals. A range of comments were received and incorporated,

with stakeholders supportive overall of the proposed approach. Feedback will be sought on an ongoing basis as planning transitions to implementation phase.

2.5. Trading water in 2016–17

Planning for water trade considers supply and demand within the catchment, and across the Basin. As part of the planning process, the Commonwealth Environmental Water Office undertakes a Basin-wide analysis to identify opportunities to use allocation trade to better match differing demands across catchments (see *Commonwealth Environmental Water Portfolio Management: Basin-wide analysis 2016–17* available at: <http://www.environment.gov.au/water/cewo/publications>).

Where the need arises to adjust the availability of allocations in any valley in the southern-connected Basin, it should be noted that the transfer of allocations from other southern connected catchments would be explored as the preferred and more efficient option to allocation purchase or sale, consistent with the rules identified in state water resource plans that apply to all water users.

Potential trading options in line with this approach will be considered throughout the 2016-17 water year. The Commonwealth Environmental Water Office is also investigating the potential for purchases to augment water for the environment in a number of catchments in the Northern Murray-Darling Basin to meet high environmental water demands (particularly in the Macquarie Marshes, Lower Balonne/Narran Lakes and Border Rivers). Further information will be provided to the market ahead of any trade of Commonwealth environmental water at: <http://www.environment.gov.au/water/cewo/trade/current-trading-actions>.

For more information on the rules and procedures governing the trade of Commonwealth environmental water, see the *Commonwealth environmental water Trading Framework* available at: <http://www.environment.gov.au/water/cewo/publications/water-trading-framework-dec2014>.

2.6. Carrying over water for use in 2017–18

The volume of water carried over for use in 2017–18 will depend upon resource availability and demand throughout the year. A minimum carryover target of 200 GL across the southern-connected Basin is being reserved to meet early season water requirements in 2017-18 and as a risk management strategy should low inflows result in low allocations. As documented in Table 3 below, potential demands early in 2017–18 that require carryover to support include small contributions to winter or early spring flows through the River Murray.

This volume is also reserved as a contingency volume for use in 2016–17 should there be insufficient allocations available and there is a critical need for environmental water (e.g. blackwater or waterbird breeding event).

Carryover volumes will be adjusted throughout the year as the season unfolds in response to both current and future demands and the water available to meet these demands.

Given the connected nature of southern Murray-Darling Basin catchments and the varying carryover, account and use limits, carryover is considered at a broader scale than just the Lower Murray-Darling region. More information on how the Commonwealth makes decisions on carryover is here: <http://www.environment.gov.au/water/cewo/portfolio-mgt/carryover>

Table 3a: Environmental demands, priority for watering in 2016–17 and outlook for coming years in the Lower Murray-Darling – **LOW-MODERATE WATER RESOURCE AVAILABILITY IN 2016–17**

Environmental assets	Indicative demand (for all sources of water in the system)		Watering history (from all sources of water)			2016–17			Implications for future demands		
						Predominant urgency of environmental demand for water	Purpose under moderate resource availability	Potential Commonwealth environmental water contribution?	Likely urgency of demand in 2017–18 if watering occurred as planned in 2016-17	2018–19 Range of likely demand	
	2013–14 moderate	2014–15 drying	2015–16 dry	Met in 2017–18	Not met in 2017–18						
Lower Darling River ¹	Base flows through to River Murray for minimal water quality and fish habitat requirements (200-350 ML/day @Weir 32)	Continuous (cease to flow of 1-3 months during extreme dry conditions, in cooler months only)				Critical	Avoid damage	In a moderate resource availability scenario, it would only be feasible for the Commonwealth to contribute if there are sufficient water levels in Menindee Lakes	Critical	High	Critical
	Small to moderate river flow (7,000 ML/day @ Weir 32 for 10 days in summer)	1-2 in 5 years (max interval unknown)				Moderate to high	Protect or Maintain	Unlikely to be feasible under moderate resource availability as priority likely to be on Lower Darling River flows (see above)	High	Moderate	Critical
Great Darling Anabranch ^{1, 2}	1,500 ML/day from Menindee Lakes for 30-45 days	2 in 10 years (7 years)				Moderate	Maintain		High	Low	High
River Murray from Euston to Lower Lakes, including pool level wetlands ³	River flow of at least 10 000 ML/day @ SA border for up to 60 days in spring/summer	9 in 10 years (2 years)				Moderate	Maintain	Likely Commonwealth environmental water contribution, subject to seasonal cues	Moderate	Moderate	High
	River flow of 15 000-25 000 ML/day @ SA border for up to 90 days in spring/summer	2 in 3 years (2 years)				High	Protect	Potential Commonwealth environmental water contribution, subject to seasonal cues	Moderate	Low	Moderate
	River flow of 25 000-35 000 ML/day @ SA border for up to 60 days in spring/summer	1 in 2 years (3 years)				High	Protect	Unlikely under 'moderate' resource availability	High	Moderate	Becoming critical
Hattah Lakes ⁴	Small action targeting temporary wetlands (inundation to 42-43 m AHD in winter/spring) - up to 22 000 ML via infrastructure, equivalent to natural event of 40-50 000 ML/day at Euston for 26-60 days ¹	1 in 2-3 years (4 years)				Low	Maintain	Not targeted in 2016-17 unless appropriate natural cues trigger a managed event.	Low	Low	Moderate
	Moderate action targeting wetlands and fringing river red gums (inundation to 43.5 m AHD for 90 days in winter/spring) – up to 40 000 ML via infrastructure, equivalent to natural event of 85 000 ML/day at Euston for 7 - 30 days.	1 in 3 years (7 years)				Low	Maintain	Not targeted in 2016-17 unless appropriate natural cues trigger a managed event.	Low	Low	Moderate
	Large action targeting wetlands and river red gum/black box woodlands on floodplain (inundation to 45 m AHD for 90 days), up to 120 000 ML via infrastructure - equivalent to natural event of 150 000 ML/day @ Euston for 7 days anytime in the year.	1 in 8 years (12 years)				Low	Maintain	Not targeted in 2016-17 unless appropriate natural cues trigger a managed event.	Low	Low	Low
Floodplain and wetlands from Euston to South Australian border ⁵	30 000 ML/day @ Lock 8 for 30-60 days targeting low lying wetlands and anabranches, or priority areas via infrastructure	2 in 5 years (4 years)			Wetlands and anabranches	Moderate	Maintain	A high potential to continue system recovery and support native vegetation and fish communities.	Moderate	Low	Moderate
	50 000-60 000 ML/day @ Lock 8 for 60-120 days targeting river red gum forest, lignum shrubland and associated wetlands, or priority areas via infrastructure	1 in 5 years (5 years)			Red gum and lignum received water in 2014-15	Met for large areas of floodplain in early 2011 floods	Maintain	Subject to seasonal cues	Low	Low	Moderate

	Infrastructure delivery to a priority areas of floodplain equivalent to 80 000 ML/day @ Lock 8 targeting river red gum and black box woodland and associated wetlands	1-2 in 10 years (8 years)				Met for large areas of floodplain in early 2011 floods, sequential watering may be required for establishment of black box seedling	Maintain	Subject to seasonal cues, (unlikely under 'moderate' conditions)	Moderate	Low
Floodplain and wetlands from South Australian border to Lower Lakes ⁶	40 000-50 000 ML/day @ South Australian border for at least 30 days targeting river red gum forest, tea tree, lignum, river cooba and associated wetlands, or priority areas via infrastructure	1 in 2 years (3 years)			Individual wetland sites only	Met for large areas of floodplain in early 2011 floods, however floodplain still recovering from drought. Demands for some individual sites lower due to managed water delivery.	Protect	Overbank flows unlikely in a moderate scenario. Commonwealth environmental water may be delivered to individual floodplain / wetland sites using infrastructure.	High	Low
	50 000-60 000 ML/day @ South Australian border for at least 30 days targeting river red gum woodland, black box, cooba, tea tree and lignum and associated wetlands, or priority areas via infrastructure	1 in 2 years (5 years)			Individual wetland sites only	Last met early 2011.	Protect		High	Low
	Infrastructure delivery to a priority areas equivalent to 60 000-70 000 ML/day @ South Australian border targeting black box, cooba, lignum and chenopod and associated wetlands	1 in 3 years (4 years)			Individual wetland sites only	Last met in early 2011.	Protect	Not a focus for water use under 'moderate' resource availability.	High	Low-Moderate
Coorong, Lower Lakes and Murray Mouth ⁷	Minimum barrage flow of 650 GL/yr to maintain maximum salinity of 1000 µs cm ⁻¹ in Lake Alexandrina	1 in 1 year				Critical	Avoid damage	Likely Commonwealth environmental water contribution	High	High
	Barrage flows of 2,000 GL/yr required to maintain maximum salinity of 1000 µs cm ⁻¹ in Lake Alexandrina	Rolling three year average				High	Protect	Likely Commonwealth environmental water contribution	Low-moderate	Low-moderate
	Barrage flows of at least 2,500 GL over two years to avoid damage and protect habitat conditions within the Coorong	9 in 10 years (1 year)				High	Protect	Likely Commonwealth environmental water contribution	Low-moderate	High
	Barrage flows of 6,000 GL every three to five years to maintain and improve habitat conditions within the Coorong	1 in 3 years (5 years)				Moderate	Maintain	Commonwealth likely to contribute to support natural events, should they eventuate	Very low	Very low
	Barrage flows of 10,000 GL every seven to seventeen years to improve habitat conditions within the Coorong	1 in 7 years (17 years)				Met in 2010-11	Maintain	Commonwealth likely to contribute to support natural events, should they eventuate	Very low	Very low

1. Sourced from MDBA (2012b); DPI Fisheries (pers.comm. 2016)

2. Sourced from Nias (2002)

3. Sourced from Wallace et al. (2014), Ecological Associates (2015), Ecological Associates (2010), DEWNR (2015) and MDBA (2012(j))

4. Sourced from MDBA (2012g), (2012j); Roberts and Marston (2011).


5. Sourced from MDBA (2012c): 40 000 ML/day for 45-60 days or 50 000 ML/day for 26-45 days. Total duration of natural flows can include multiple discreet flow pulses above 40-50 000 ML/day with a minimum duration of individual pulses of 7 days.


6. Sourced from MDBA (2014b), MDBA (2012h) and DEWNR (2015)

7. Sourced from MDBA (2012i) and DEWNR (2015)

Key - events in previous years


 means demand was met by Commonwealth environmental water or any other source


 means demand was partially met by Commonwealth environmental water or any other source (may be used to indicate infrastructure assisted delivery)


 means water not provided (or not required)

Note that not all demands require water every year; drying phases are important for floodplains and temporary wetlands or streams


Key - potential watering in 2016-17


 means a high priority for Commonwealth environmental watering (full or partial contribution, and subject to seasonal and operational considerations)


 means a secondary priority for Commonwealth environmental watering, likely to be met via other means (other water holders, or natural flows)


 means a low priority for Commonwealth environmental watering


Key - urgency of environmental demands

 means critical demand i.e. urgent need for water in that particular year to manage risk of irretrievable loss or damage

 means high demand for water i.e. needed in that particular year

 means moderate demand for water i.e. water needed that particular year and/or next

 means low demand for water i.e. water generally not needed that particular year

 means very low demand for water i.e. water generally not needed that particular year or the following year

Note that demand is considered at a generalised scale; there may be specific requirements that are more or less urgent within the flow regime

Carryover potential	A minimum carryover target of 200 GL for the Southern-connected Basin is being reserved to meet early season water requirements across in 2017-18 (See Section 2.6)	-	-
Trade potential	Potential for purchases to augment water for the environment in a number of catchments in the Northern Murray-Darling Basin to meet high environmental water demands. Further information will be provided to the market ahead of any trade of Commonwealth environmental water. Transfer of allocations between catchments in the southern-connected Basin would be explored as the preferred option to allocation purchase or sale, consistent with the rules identified in state water resource plans that apply to all water users.		

Table 3b: Environmental demands, priority for watering in 2016–17 and outlook for coming years in the Lower Murray-Darling - **HIGH WATER RESOURCE AVAILABILITY IN 2016–17**

Environmental assets	Indicative demand (for all sources of water in the system)		Watering history (from all sources of water)			2016–17			Implications for future demands		
	Flow/volume	Required frequency (maximum dry interval)	2013–14	2014–15	2015–16	Predominant urgency of environmental demand for water	Purpose under high resource availability	Potential Commonwealth environmental water contribution?	Likely urgency of demand in 2017–18 if watering occurred as planned in 2016-17	2018–19 Range of likely demand	
			moderate	drying	dry					Met in 2017–18	Not met in 2017–18
Lower Darling River ¹	Base flows through to River Murray for minimal water quality and fish habitat requirements (200-350 ML/day @Weir 32)	Continuous (cease to flow of 1-3 months during extreme dry conditions, in cooler months only)				Critical	Improve	In a high resource availability scenario, it would likely be feasible for the Commonwealth to contribute if there are sufficient water levels in Menindee Lakes	High	High	Critical
	Small to moderate river flow (7,000 ML/day @ Weir 32 for 10 days in summer)	1-2 in 5 years (max interval unknown)				Moderate to high	Improve	Likely to be feasible under high resource availability, but will be a second priority to the more critical demand identified above	Moderate	Low	Moderate
Great Darling Anabranch ^{1,2}	1,500 ML/day from Menindee Lakes for 30-45 days	2 in 10 years (7 years)				Moderate	Improve		Low	Very Low	Moderate
River Murray from Euston to Lower Lakes, including pool level wetlands ³	River flow of at least 10 000 ML/day @ SA border for up to 60 days in spring/summer	9 in 10 years (2 years)				Moderate	Improve	Likely Commonwealth environmental water contribution, subject to seasonal cues	Moderate	Moderate	High
	River flow of 15 000-25 000 ML/day @ SA border for up to 90 days in spring/summer	2 in 3 years (2 years)				High	Improve	Likely Commonwealth environmental water contribution, subject to seasonal cues	Moderate	Low	Moderate
	River flow of 25 000-35 000 ML/day @ SA border for up to 60 days in spring/summer	1 in 2 years (3 years)				High	Improve	Potential Commonwealth environmental water contribution, subject to seasonal cues	Moderate	Moderate	High
Hattah Lakes ⁴	Small action targeting temporary wetlands (inundation to 42-43 m AHD in winter/spring) - up to 22 000 ML via infrastructure, equivalent to natural event of 40-50 000 ML/day at Euston for 26-60 days ²	1 in 2-3 years (4 years)				Low	Maintain	Not targeted in 2016-17 unless appropriate natural cues trigger a managed event.	Low	Low	Moderate
	Moderate action targeting wetlands and fringing river red gums (inundation to 43.5 m AHD for 90 days in winter/spring) - up to 40 000 ML via infrastructure, equivalent to natural event of 85 000 ML/day at Euston for 7 - 30 days.	1 in 3 years (7 years)				Low	Maintain	Not targeted in 2016-17 unless appropriate natural cues trigger a managed event.	Low	Low	Moderate
	Large action targeting wetlands and river red gum/black box woodlands on floodplain (inundation to 45 m AHD for 90 days), up to 120 000 ML via infrastructure - equivalent to natural event of 150 000 ML/day @ Euston for 7 days anytime in the year.	1 in 8 years (12 years)				Low	Maintain	Not targeted in 2016-17 unless appropriate natural cues trigger a managed event.	Low	Low	Low
Floodplain and wetlands from Euston to South Australian border ⁵	30 000 ML/day @ Lock 8 for 30-60 days targeting low lying wetlands and anabranches, or priority areas via infrastructure	2 in 5 years (4 years)			Wetlands and anabranches	Moderate	Improve	A high potential to continue system recovery and support native vegetation and fish communities.	Low	Very Low	Moderate
	50 000-60 000 ML/day @ Lock 8 for 60-120 days targeting river red gum forest, lignum shrubland and associated wetlands, or priority areas via infrastructure	1 in 5 years (5 years)		Red gum and lignum received water in 2014-15		Met for large areas of floodplain in early 2011 floods	Improve	Potential Commonwealth environmental water contribution, subject to seasonal cues	Low	Very Low	Moderate

	Infrastructure delivery to a priority areas of floodplain equivalent to 80 000 ML/day @ Lock 8 targeting river red gum and black box woodland and associated wetlands	1-2 in 10 years (8 years)				Met for large areas of floodplain in early 2011 floods, sequential watering may be required for establishment of black box seedling	Maintain	Subject to seasonal cues, (possible under 'high' resource availability)	Low	Very Low Low
Floodplain and wetlands from South Australian border to Lower Lakes ⁶	40 000-50 000 ML/day @ South Australian border for at least 30 days targeting river red gum forest, tea tree, lignum, river cooba and associated wetlands, or priority areas via infrastructure	1 in 2 years (3 years)			Individual wetland sites only	Met for large areas of floodplain in early 2011 floods, however floodplain still recovering from drought. Demands for some individual sites lower due to managed water delivery.	Improve	Overbank flows possible in a high resource availability scenario, depending on seasonal cues. Commonwealth environmental water may be delivered to individual floodplain / wetland sites using infrastructure.	Moderate	Low Critical
	50 000-60 000 ML/day @ South Australian border for at least 30 days targeting river red gum woodland, black box, cooba, tea tree and lignum and associated wetlands, or priority areas via infrastructure	1 in 2 years (5 years)			Individual wetland sites only	Last met early 2011.	Improve		Low	Very Low Moderate
	Infrastructure delivery to a priority areas equivalent to 60 000-70 000 ML/day @ South Australian border targeting black box, cooba, lignum and chenopod and associated wetlands	1 in 3 years (4 years)			Individual wetland sites only	Last met in early 2011.	Improve	Subject to seasonal cues, (possible under 'high' resource availability)	High	Low-Moderate Becoming critical
Coorong, Lower Lakes and Murray Mouth ⁷	Minimum barrage flow of 650 GL/yr to maintain maximum salinity of 1000 µs cm ⁻¹ in Lake Alexandrina	1 in 1 year				Critical	Avoid damage	Likely Commonwealth environmental water contribution	High	High Critical
	Barrage flows of 2,000 GL/yr required to maintain maximum salinity of 1000 µs cm ⁻¹ in Lake Alexandrina	Rolling three year average				High	Protect	Likely Commonwealth environmental water contribution	Low-moderate	Low-Moderate High
	Barrage flows of at least 2,500 GL over two years to avoid damage and protect habitat conditions within the Coorong	9 in 10 years (1 year)				High	Protect	Likely Commonwealth environmental water contribution	Low-moderate	Low-Moderate High
	Barrage flows of 6,000 GL every three to five years to maintain and improve habitat conditions within the Coorong	1 in 3 years (5 years)				Moderate	Maintain	Commonwealth likely to contribute to support natural events, should they eventuate	Very low	Very low Low
	Barrage flows of 10,000 GL every seven to seventeen years to improve habitat conditions within the Coorong	1 in 7 years (17 years)				Met in 2010-11	Maintain	Commonwealth likely to contribute to support natural events, should they eventuate	Very low	Very low Low

1. Sourced from MDBA (2012b); DPI Fisheries (pers.comm. 2016)

2. Sourced from Nias (2002)

3. Sourced from Wallace et al. (2014), Ecological Associates (2015), Ecological Associates (2010), DEWNR (2015) and MDBA (2012(j))


4. Sourced from MDBA (2012g), (2012j); Roberts and Marston (2011).


5. Sourced from MDBA (2012c): 40 000 ML/day for 45-60 days or 50 000 ML/day for 26-45 days. Total duration of natural flows can include multiple discreet flow pulses above 40-50 000 ML/day with a minimum duration of individual pulses of 7 days.


6. Sourced from MDBA (2014b), MDBA (2012h) and DEWNR (2015)

7. Sourced from MDBA (2012i) and DEWNR (2015)

Key - events in previous years


 means demand was met by Commonwealth environmental water or any other source


 means demand was partially met by Commonwealth environmental water or any other source (may be used to indicate infrastructure assisted delivery)


 means water not provided (or not required)

Note that not all demands require water every year; drying phases are important for floodplains and temporary wetlands or streams


Key - potential watering in 2016-17

 means a high priority for Commonwealth environmental watering (full or partial contribution, and subject to seasonal and operational considerations)

 means a secondary priority for Commonwealth environmental watering, likely to be met via other means (other water holders, or natural flows)


 means a low priority for Commonwealth environmental watering


Key - urgency of environmental demands

 means critical demand i.e. urgent need for water in that particular year to manage risk of irretrievable loss or damage

 means high demand for water i.e. needed in that particular year

 means moderate demand for water i.e. water needed that particular year and/or next

 means low demand for water i.e. water generally not needed that particular year

 means very low demand for water i.e. water generally not needed that particular year or the following year

Note that demand is considered at a generalised scale; there may be specific requirements that are more or less urgent within the flow regime

Carryover potential	A minimum carryover target of 200 GL for the Southern-connected Basin is being reserved to meet early season water requirements across in 2017-18 (See Section 2.6)	-	-
Trade potential	Potential for purchases to augment water for the environment in a number of catchments in the Northern Murray-Darling Basin to meet high environmental water demands. Further information will be provided to the market ahead of any trade of Commonwealth environmental water. Transfer of allocations between catchments in the southern-connected Basin would be explored as the preferred option to allocation purchase or sale, consistent with the rules identified in state water resource plans that apply to all water users.		

3. Next steps

3.1. From planning to decision making

It is important to distinguish between planning and operational decision making. As shown in Figure 4, planning allows the Office to manage the environmental water portfolio in a holistic manner and is an exercise in developing a broad approach or intention, based on the key drivers (demand and supply).

Decision making throughout each year builds on the intention by considering in more detail the specific prevailing factors and additional factors such as costs, risks and constraints to water delivery and market conditions.

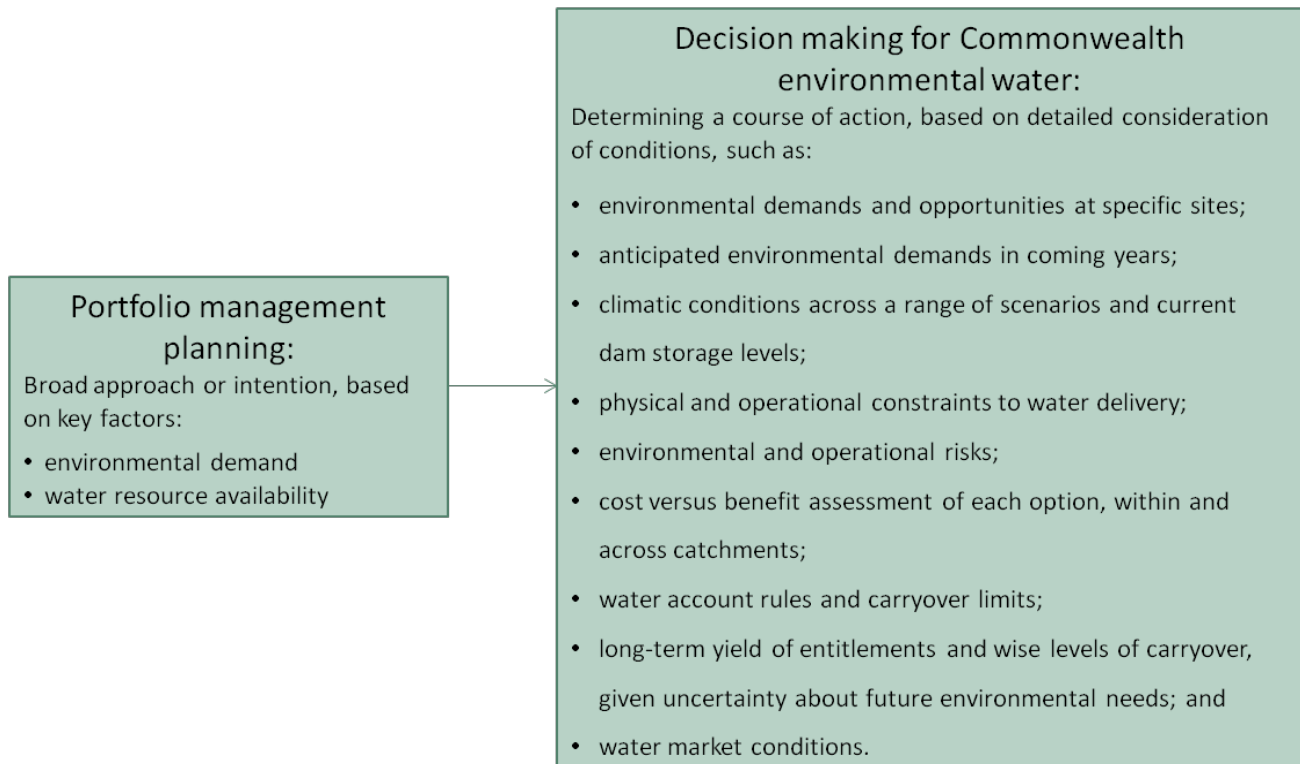


Figure 4: Planning and decision making for Commonwealth environmental water use

3.2. Further information

For further information on how the Office plans for water use, carryover and trade, please visit our web site <http://www.environment.gov.au/water/cewo>

- Water use: www.environment.gov.au/topics/water/commonwealth-environmental-water-office/assessment-framework
- Carryover: <http://www.environment.gov.au/topics/water/commonwealth-environmental-water-office/portfolio-management/carryover>
- Trade: *Discussion Paper – Trade of Commonwealth Environmental Water and Commonwealth Environmental Water Trading Framework:* <http://www.environment.gov.au/water/cewo/trade/trading-framework>

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Attachment A – Expected outcomes from the Basin-wide environmental watering strategy

Expected outcomes from the Basin-wide Environmental Watering Strategy (MDBA 2014) that are relevant to the Lower Murray are described below.

RIVER FLOWS AND CONNECTIVITY

Baseflows are at least 60 per cent of the natural level

A 30–60 per cent increase in the frequency of freshes, bankfull and lowland floodplain flows

Contributing to a 30 per cent overall increase in flows in the River Murray

A 30 to 40 per cent increase in flows to the Murray mouth.

Along with local management, improve the connection of the river to its estuary (the Coorong) and to the sea. The minimum outcomes expected are:

- the barrage flows are greater than 2 000 GL/year on a three-year rolling average basis for 95 per cent of the time, with a two year minimum of 600 GL at any time
- the water levels in the Lower Lakes are maintained above sea level (0m AHD) and for 95 per cent of the time, above 0.4 metres AHD, as far as practicable, to allow for barrage releases
- salinity in the Coorong and Lower Lakes remains below critical thresholds for key flora and fauna including: salinity in Lake Alexandrina is lower than 1,000 EC 95 per cent of the time and less than 1,500 EC all the time; salinity in the Coorong's south lagoon is less than 100 grams per litre 95 per cent of the time
- the Murray mouth is open 90 per cent of the time to an average annual depth of one metre.

VEGETATION (Note: figures are for total Murray catchment)

Maintain the current extent of water-dependent vegetation near river channels and on low-lying areas of the floodplain.

Improve condition of black box, river red gum and lignum shrublands

Improved recruitment of trees within black box and river red gum communities

Increased periods of growth for non-woody vegetation communities that closely fringe or occur within the Murray.

A sustained and adequate population of *Ruppia tuberosa* in the south lagoon of the Coorong, including:

- by 2019, *R. tuberosa* to occur in at least 80 per cent of sites across at least a 50 km extent
- by 2029, the seed bank to be sufficient for the population to be resilient to major disturbances

Vegetation extent

Region	Area (ha)			Shrublands	Non-woody water dependent vegetation
	River red gum	Black box	Coolibah		
Murray (assessment is for entire Murray catchment)	90,600*	41,700*	-	Lignum along the Murray River from the junction with the Wakool River to downstream of Lock 3, including Chowilla and Hattah Lakes	Closely fringing or occurring within the Murray <i>Ruppia tuberosa</i> in the Coorong
Lower Darling	10,300	38,600		Lignum swamps in the Lower Darling region	Closely fringing or occurring within the Darling River and Great Darling Anabranch

Black box condition

Region	Vegetation condition score		Percent of vegetation assessed (within the managed floodplain)
	0 – 6	>6 – 10	
Murray (assessment is for entire Murray catchment)	33 per cent	65 per cent	28 per cent
Lower Darling	72 per cent	28 per cent	85 per cent

River red gum condition

Region	Vegetation condition score					Percent of vegetation assessed (within the managed floodplain)
	0 – 2	>2 – 4	>4 – 6	>6 – 8	>8 – 10	
Murray (assessment is for entire Murray catchment)	2 per cent	1 per cent	10 per cent	51 per cent	35 per cent	51 per cent
Lower Darling	11 per cent	5 per cent	7 per cent	41 per cent	35 per cent	92 per cent

WATERBIRDS

Maintain current species diversity

Increase Basin-wide abundance of waterbirds by 20–25 per cent by 2024

A 30–40 per cent increase in nests and broods (Basin-wide) for other waterbirds

Up to 50 per cent more breeding events (Basin-wide) for colonial nesting waterbird species

By 2019, at a minimum, to maintain populations in the Coorong, Lakes Albert and Alexandrina of the following four key species: curlew sandpiper, greenshank, red-necked stint and sharp-tailed sandpiper, at levels recorded between 2000 and 2014.

Important Basin environmental assets for waterbirds in the Lower Murray

Environmental asset	Total abundance and diversity	Drought refuge	Colonial waterbird breeding	Shorebird abundance	In scope for C'th watering
Coorong, Lower Lakes and Murray Mouth	*		*	*	Yes
Pyap Lagoon		*			Yes
Noora evaporation Basin	*				No
Lindsay-Wallpolla-Chowilla	*				Yes
Hattah Lakes			*		Yes
Darling Anabranch	*				Yes
River Murray and Euston Lakes		*			Yes
Kerang Wetlands	*		*		Yes

FISH

No loss of native species

Improved population structure of key species through regular recruitment, including

- Short-lived species with distribution and abundance at pre-2007 levels and breeding success every 1–2 years
- Moderate to long-lived with a spread of age classes and annual recruitment in at least 80 per cent of years

Increased movements of key species

Expanded distribution of key species and populations

For estuarine species – additional outcomes are:

- detection of all estuarine-dependent fish families throughout 2014–2024
- maintenance of annual population abundance (Catch Per Unit Effort – CPUE) of key estuarine prey species (sandy sprat and small-mouthed hardyhead) throughout the Coorong
- detection of a broad spatial distribution of black bream and greenback flounder; with adult black bream and all life stages of greenback flounder present across >50 per cent of the Coorong in eight out of 10 years
- detection in nine out of 10 years of bi-directional seasonal movements of diadromous species through the barrages and fishways between the Lower Lakes and Coorong
- increased rates of native fish passage in 2019–2024 compared to 2014–2019
- improved population structure of mullet, including spawning aggregations at the Murray mouth in six out of 10 years and recruitment in at least five out of 10 years.

Specific outcomes for key species for the Lower Murray include:

Species	Specific outcomes	In-scope for C'th watering?
Diadromous species (Congolli, short-headed and pouched lamprey)	Upstream expansion facilitated through flows to operate fishways.	Yes
Flathead galaxias (<i>Galaxias rostratus</i>)	Expand the core range in the wetlands of the River Murray.	Yes
Freshwater catfish (<i>Tandanus tandanus</i>)	-	Yes
Golden Perch (<i>Macquaria ambigua</i>)	A 10–15 per cent increase of mature fish (of legal take size) in key populations	Yes
Murray cod (<i>Maccullochella peelii peelii</i>)	A 10–15 per cent increase of mature fish (of legal take size) in key populations	Yes
Murray hardyhead (<i>Craterocephalus fluviatilis</i>)	Expand the range of at least two current populations: Establish 3–4 additional populations, with at least two of these to be within the lower Murray conservation unit and a further population potentially within the Kerang Lakes region.	Yes
Olive perchlet (<i>Ambassis agassizii</i>)	Olive perchlet are considered extinct in the southern Basin. Reintroduction using northern populations is the main option for recovery. Candidate sites may result from improved flow that reinstates suitable habitat in the River Murray.	Restoration of flow to River Murray could support the future reintroduction of the species.
Silver perch (<i>Bidyanus bidyanus</i>)	Improve core range in at additional locations, with candidate sites including lower Darling	Core range is within Mid-Murray region. Only in scope if additional populations are established
Southern purple-spotted gudgeon (<i>Mogurnda adspersa</i>)	Expand the range of current populations (including Jury Swamp).	Yes
Southern pygmy perch (<i>Nannoperca australis</i>)	Establish additional populations in the Lower Lakes	Only if additional populations are established
Trout cod (<i>Maccullochella macquariensis</i>)	For the connected population of the Murrumbidgee–Murray–Edwards, continue downstream expansion.	Yes
Two-spined blackfish (<i>Gadopsis bispinosus</i>)	Establish additional populations (no specific locations identified)	Yes
Yarra pygmy perch (<i>Nannoperca obscura</i>)	Expand the range of current populations including the Lower Lakes/Coorong region	Yes

Important Basin environmental assets for native fish in the Lower Murray

Environmental asset	Key movement corridors	High Biodiversity	Site of other Significance	Key site of hydrodynamic diversity	Threatened species	Dry period / drought refuge	In-scope for C ¹ th watering?
Coorong, Lower Lakes and Murray Mouth	*	*	*		*	*	Yes
Swamps on the lower Murray channel, between Wellington and Mannum (swamp geomorphic region)		*			*		Yes
Kerang lakes					*	*	Yes
Katarapko anabranch	*			*			Yes
Pike anabranch	*			*			Yes
Lower River Murray main channel (from Darling junction downstream)	*	*	*		*	*	Yes
Murray main channel (from Hume dam to Darling junction)	*	*	*	*	*	*	Yes
Chowilla anabranch	*	*	*	*	*	*	Yes
Lindsay–Wallpolla–Mularoo Creek	*	*	*	*	*	*	Yes
Lower Darling main channel	*	*	*	*	*	*	Yes
Darling anabranch			*			*	Yes
Hattah Lakes			*			*	Yes
Euston Lakes (including Washpen and Taila Creeks)					*		Yes

Attachment B – Library of watering actions

Operational considerations in the Lower Murray-Darling region

The delivery of environmental water in the Lower Murray-Darling is currently constrained by the following:

- Menindee Lakes will be managed by New South Wales while storage levels remain below 480 GL. During this period stored water is used to supply essential stock and domestic water to local Menindee and lower Darling River communities. Control over the lakes will revert to Murray-Darling Basin Authority once storage levels increase to above 640 GL.
- Flows greater than 60 000 ML/day result in overbank inundation of floodplain throughout the lower River Murray, including the inundation of privately owned land and private infrastructure. The risk of impacting on public and private infrastructure through the use of environmental water requires further investigation prior to environmental water being used to target these higher flow rates. Flow rates of this magnitude or greater are not within scope for environmental water use in 2015-16.
- Operational and physical constraints in upstream catchment areas may potentially limit the delivery of environmental water in the lower River Murray. Environmental operations in the lower River Murray will need to remain flexible and complement the timing of upstream flows.

Further information about constraints in the Lower Murray–Darling Region is provided by the Murray–Darling Basin Authority, and can be found in the *Constraints Management Strategy 2013 to 2024* (MDBA 2013).

Operational considerations such as delivery methods, opportunities, physical constraints and risks will differ depending on inflows and are summarised in Table 4. Constraints as they relate to specific watering options are described in the standard operating considerations listed in section 3.6 below.

Potential watering actions under different levels of water resource availability

Under certain levels of water resource availability, watering actions may not be pursued for a variety of reasons, including that environmental demand may be met by unregulated flows and that constraints and/or risks may limit the ability to deliver environmental water. Table 4 identifies the range of potential watering actions in the Lower Murray-Darling region and the levels of water resource availability that relate to these actions.

Table 4: Summary of potential watering actions for the Lower Murray-Darling region

Environmental Asset	Indicative demand	Applicable level(s) of resource availability				
		Very Low	Low	Moderate	High	Very High
Lower Darling River	Small to moderate river flow (7 000 ML/day @ Weir 32 for 10 days in summer)			1: <i>Lower Darling River Flows</i> : Contribute to baseflows and freshes in the Lower Darling River		
Great Darling Anabranch	1 500-2 000 ML/day from Menindee Lakes for 30-45 days			2: <i>Great Darling Anabranch Flows</i> : Contribute to a flow along the Anabranch, or extend the recession from a flood event and/or connect the Anabranch with its lakes		
River Murray channel from Euston to Lower Lakes, including fringing wetlands	River flow of at least 10 000 ML/day @ SA border for up to 60 days in spring/summer River flow of 15-25 000 ML/day @ SA border for up to 90 days in spring/summer River flow of 25-35 000 ML/day @ SA border for up to 60 days in spring/summer			3. <i>River Murray Channel Flows</i> : Contribute to in-channel baseflows and freshes, complemented by seasonally appropriate operation of river (weirs) and wetland infrastructure.		
Hattah Lakes	Small action targeting temporary wetlands (inundation to 42-43 m AHD in winter/spring) - up to 22 000 ML via infrastructure, equivalent to natural event of 40-50 000 ML/day at Euston for 26-60 days Moderate action targeting wetlands and fringing river red gums (inundation to 43.5 m AHD for 90 days in winter/spring) – up to 40 000 ML via infrastructure, equivalent to natural event of 85 000 ML/day at Euston for 30 days. Large action targeting wetlands and river red gum/black box woodlands on floodplain (inundation to 45 m AHD for 90 days), up to 120 000 ML via infrastructure - equivalent to natural event of 150 000 ML/day @ Euston for 7 days anytime in the year.	4a. <i>Infrastructure Delivery: Low-lying Wetlands</i> : Contribute flows via pumping to inundate wetlands and waterways within the Hattah Lakes system.				
			4b. <i>Infrastructure Delivery: Wetlands and Fringing River Red Gums</i> : Contribute flows via pumping to inundate wetlands and fringing river red gum communities.			
			4c. <i>Infrastructure Delivery: Wetlands and Floodplain</i> : Contribute flows via pumping targeting red gum woodlands on the lower floodplain and black box on higher level floodplain. 5. <i>Hattah Lakes Overbank Flows</i> : use infrastructure (pumping and regulators) to increase extent and duration of inundation of wetlands and floodplain.			
Floodplain and wetlands from Euston to South Australian border	30 000 ML/day @ Lock 8 for 30-60 days targeting low lying wetlands and anabranches, or portion via infrastructure 50-60 000 ML/day @ Lock 8 for 60-120 days targeting river red gum forest, lignum shrubland and associated wetlands, or portion via		6. <i>Delivery via Lindsay-Mulcra-Wallpolla Floodplain Works</i> : Contribute flows via works to inundate low lying wetlands and anabranches, river red gum forest and/or black box woodland			
		7. <i>Infrastructure Delivery: Mallee Wetlands</i> : Contribute flows via wetland regulators and/or pumping to inundate semi-permanent, temporary and ephemeral wetlands				

Environmental Asset	Indicative demand	Applicable level(s) of resource availability				
		Very Low	Low	Moderate	High	Very High
	<p>infrastructure</p> <p>Infrastructure delivery to a portion equivalent to 80 000 ML/d @ Lock 8 targeting river red gum and black box woodland and associated wetlands</p>					<p>8. <i>Contribution to Overbank Flows:</i> Contribute to flows to re-connect river with river red gum forest and lignum shrubland, subject to appropriate trigger</p>
<p>Floodplain and wetlands from South Australian border to Lower Lakes</p>	<p>40-50 000 ML/day @ South Australian border for up to 90 days targeting river red gum forest, tea tree, lignum, river cooba and associated wetlands, or portion via infrastructure</p>			<p>9. <i>Infrastructure Delivery: Chowilla Floodplain:</i> Use Chowilla Floodplain infrastructure to deliver pulse flows to creeks and inundate parts of the floodplain</p>		
	<p>50-60 000 ML/day @ South Australian border for up to 90 days targeting river red gum woodland, black box, cooba, tea tree and lignum and associated wetlands, or portion via infrastructure</p>	<p>10. <i>Infrastructure Delivery: Lower Murray Wetlands:</i> Contribute flows via wetland regulators and pumping to inundate semi-permanent, temporary and ephemeral wetlands</p>				
	<p>Infrastructure delivery to a portion equivalent to 60-70 000 ML/day @ South Australian border targeting black box, cooba, lignum and chenopod and associated wetlands</p>			<p>11. <i>Contribution to Overbank Flows:</i> Contribute to flows to re-connect river with river red gum forest and lignum shrubland, subject to appropriate trigger</p>		
<p>Coorong, Lower lakes and Murray Mouth</p>	<p>Minimum barrage flow of 650 GL/yr</p> <p>Barrage flows of 2 000 GL/yr required to achieve salinity target in Lake Alexandrina</p> <p>Barrage flows of at least 2 500 GL over two years to avoid damage and protect habitat conditions within the Coorong</p> <p>Barrage flows of 6 000 GL every three years to maintain and improve habitat conditions within the Coorong</p>	<p>12a. <i>Seasonal Lake Level Variation:</i> Between 0.40 m AHD and 0.70 m AHD annually.</p> <p><i>Fishway Flows:</i> Maintain minimum fishway flows.</p> <p><i>Differential Barrage Releases:</i> To provide for seasonally appropriate water levels in the Coorong and connectivity between the Lower Lakes and the Murray Mouth.</p>				
	<p>Barrage flows of 10 000 GL every seven years to improve habitat conditions within the Coorong</p>			<p>12b. <i>Seasonal Lake Level Variation:</i> Between 0.50 m AHD and 0.85 m AHD one in three years.</p> <p><i>Fishway Flows:</i> Maintain minimum fishway flows.</p> <p><i>Differential barrage releases:</i> To provide for seasonally appropriate water levels in the Coorong and connectivity between the Lower Lakes and the Murray Mouth.</p>		

Note: Under certain resource availabilities, options may not be pursued for a variety of reasons including that environmental demand may be met by unregulated flows and that constraints and/or risks may limit the ability to deliver environmental water.

Potential watering actions – standard operating arrangements

Table 4 above identifies the range of potential watering actions in Lower Murray-Darling that give effect to the long-term demands and flow regime identified as being in scope for the Office to contribute environmental water to in any given year. The standard considerations associated with these actions are set out below.

A note on approvals: watering actions in the Lower Murray would be implemented with local delivery partners, who will play a key role in engaging with the local community and third parties and implementing the event. As some actions may be constrained by other demands in the system, the Office will seek advice from river operators on the timing, magnitude and duration of a proposed event. As some actions occur on private land, they require input and/or consent of landholders, community groups and other agencies.

Watering action 1: Lower Darling River flows

Standard operational considerations

- Commonwealth environmental water may be provided to contribute to baseflows and freshes in the Lower Darling River or to contribute water to the recession of higher flow events in this system and in the River Murray. The contribution of environmental water to augment high River Murray flows will have regard to other operational releases, storage management and delivery arrangements.
- The magnitude, duration and timing of environmental releases will be dependent on available environmental water allocations within the water resource area and guided by natural flow cues upstream of the Menindee Lakes.
- When Menindee Lakes storage levels are low (<480 GL) resources within the lakes are managed by New South Wales for critical human needs. Under these conditions options for environmental watering are likely to be limited.
- Due to the low volume of entitlements held in the Lower Darling, Commonwealth environmental water held elsewhere in the southern-connected Basin needs to be transferred for this action to be feasible.

Typical extent: Lower Darling River (in-channel channel flow) from Menindee Lakes to the confluence with River Murray.

Watering action 2: Great Darling Anabranh flows

Standard operational considerations

- Commonwealth environmental water may be provided to contribute to baseflows and freshes in the Great Darling Anabranh providing connectivity between the Anabranh channel and the River Murray, and between the Anabranh and its lakes.
- Planning the timing and magnitude of watering actions needs to consider risks associated with water quality and potential adverse environmental impacts. Delivery channel capacity limitations and potential third party impacts may limit flows to the Anabranh channel.
- Operational considerations as for Action 1.

Typical extent: Anabranh channel from Lake Cawndilla (via Tandou Creek, Packer's Crossing Regulator and Redbank Creek) to the confluence with River Murray.

Watering action 3: River Murray channel flows

Standard operational considerations

- Environmental water will contribute to providing higher base flows and freshes to support in-stream aquatic communities, increase the export of salt and nutrients, contribute to hydrological connectivity with fringing wetlands and support habitat conditions within the Coorong and Lower Lakes.
- Benefits that can be achieved from environmental flows within the river channel can be enhanced through the seasonally appropriate operation of river, wetland and floodplain infrastructure. Complementary operations may include the manipulation of weir pools, wetland regulators and barrage operations.
- This action would typically source water from upstream storages and tributaries, subject to operational feasibility and opportunities to achieve multiple benefits using Commonwealth environmental water across the Southern-connected Basin.

Typical extent: River Murray from Euston to the Lower Lakes, up to a flow rate within the operational constraints identified in Figure 4 to avoid impacting landholders on the Lower Darling and at Morgan in South Australia. This option can also contribute to the Coorong, Lower Lakes and Murray Mouth (Actions 13-15). Regulators may also be used to allow flows to enter low lying anabranches and fringing wetlands (Actions 8 and 11).

Watering action 4: Infrastructure Delivery to Hattah Lakes

Standard operational considerations

- The pump station supplying water to the Hattah Lakes and Lake Kramen only operates when the River Murray water level is greater than 38.3 m AHD (above 5 000 ML/day at Euston). Any impending or ongoing pumping into the Hattah complex would need to be postponed or suspended if River Murray water levels fall below this limit.
- The recently commissioned environmental works (i.e. pumping infrastructure) can achieve a maximum inundation of 45 m AHD. Any inundation beyond this level would need to be via natural flooding.
- Return flows from Hattah Lakes to the River Murray can be facilitated via two regulators located on north and south Chalka Creeks. Adaptive management of return flows will be important to maintain acceptable water quality in Hattah Lakes and provide additional environmental benefit downstream.

Typical extent: Infrastructure allows for simulated natural watering actions of higher magnitude, requiring lower volumes of environmental flow contribution. Small scale temporary wetland inundation to 42-43 m AHD in winter/spring requiring up to 22 000 ML is possible via infrastructure, equivalent to a natural event of 40 000-50 000 ML/day at Euston for 26-60 days. Moderate inundation targeting wetlands and fringing river red gums with inundation to 43.5 m AHD for 90 days in winter/spring requiring up to 40 000 ML is possible via infrastructure, equivalent to a natural event of 85 000 ML/day at Euston for 30 days. Large-scale inundation targeting wetlands and river red gum/black box woodlands on the floodplain with inundation to 45 m AHD for 90 days, requiring up to 120 000 ML is possible via infrastructure, equivalent to a natural event of 150 000 ML/day @ Euston for 7 days anytime in the year.

Watering actions 5, 8 and 11: Contribution to Overbank Flows (within constraints)

Standard operational considerations

- Environmental water may be contributed to channel flows to connect the River Murray with areas of floodplain from Euston through to Wellington (subject to flow constraints at Figure 3). Elevated natural flows are required for environmental water to piggy-back on and resource availability may often be a limiting factor.
- Environmental water delivery may be constrained by other demands on the system, especially during periods of limited channel capacity, and the ability to release and coordinate releases from multiple storages.
- This option will be managed by river operators to avoid unacceptable impacts on land managers and other water users.

Typical extent: Low lying parts of the lower River Murray floodplain that can be inundated by managed flows and that do not create unacceptable third party impacts. Overbank flow actions are managed within the flow constraints identified in Figure 4. Actions 4, 6, 7, 9 and 10 can use infrastructure to provide inundation of higher elevation areas on the floodplain that are not currently achievable by overbank flows within current operational constraints.

Watering action 6: Delivery via Lindsay-Mulcra-Wallpolla Floodplain works

Standard operational considerations

- In addition to large floods (via high River Murray flows influenced by upper Murray tributaries and flows in the Darling River), permanent infrastructure, weir pool manipulation and temporary pumping can facilitate delivery of environmental water to Lindsay, Mulcra and Wallpolla islands.
- Specific flow rates and weir pool levels in the River Murray are required to facilitate environmental watering to Lindsay, Mulcra and Wallpolla islands.
- Some floodplain wetland watering may occur in conjunction with weir pool manipulation to provide wetland inundation in conjunction with higher river water levels and to contribute to fast flowing fish habitat.

Typical extent: *Lindsay Island* - to provide flowing water habitat for fish spawning, winter/spring freshening flows to Lindsay River and Mullaroo Creek would be accomplished by targeting a raising of Lock 7 up to 500 mm above normal operating height during winter. *Wallpolla Island* - to promote wetland condition and aquatic plant diversity, spring inundation of Wallpolla Horseshoe and Finnigans Creek would be accomplished by targeting a raising of Lock 9 up to 500 mm above normal operating height and provision of inflows during September to October. *Mulcra Island* - to restore linkages between river and floodplain habitats, and support lignum communities, winter inundation of Mulcra Island would be accomplished by surcharging Lock 8 up to 800 mm above full supply level during July to August.

Watering actions 7 and 10: Infrastructure Delivery: Mallee Wetlands and Lower Murray Wetlands

Standard operational considerations

- Commonwealth environmental water is delivered to wetlands in the New South Wales and Victorian Mallee in partnership with the Mallee Catchment Management Authority, Victorian Environmental Water Holder, New South Wales Office of Environment and Heritage and Murray-Darling Wetlands Working Group. In South Australia, water is delivered via Natural Resources South Australian Murray-Darling Basin, the Nature Foundation South Australia and site managers (e.g. Banrock Station).
- Key operational considerations including the infrastructure required to deliver water, access arrangements, required approvals and delivery costs (i.e. cost effectiveness).
- Watering may be in conjunction with weir pool manipulation to provide wetland inundation in conjunction with higher river water levels and to contribute to fast flowing fish habitat.
- Drying cycles are a natural characteristic of floodplain wetlands along the River Murray. The watering of wetlands may be undertaken in relation to seasonal conditions.
- Saline water discharged from Mallee sites will need to be carefully monitored as per the water quality and salinity management plan (Basin Plan Chapter 9) and any potential adverse impacts on river water quality mitigated by coordination with adequate dilution flows in the River Murray (including possibly from other environmental watering actions). The Murray-Darling Basin Authority has salinity forecasting tools available to assist.
- Acid sulphate soils and potential groundwater influences are important considerations.

Typical extent: Individual wetland sites in the Mallee region and from the South Australian border to and adjoining the Lower Lakes.

Watering action 9: Infrastructure Delivery: Chowilla Floodplain

Standard operational considerations

- Water can be delivered to a portion of the Chowilla Floodplain using infrastructure such as recently constructed regulators, fishways and upgraded weirs.
- The action needs to be managed in consideration of Action 3 in particular, to ensure there are adequate flows within the river channel to operate the infrastructure and mitigate water quality issues as flows return from the floodplain to the river.
- Infrastructure needs to be operated in conjunction with Lock 6 weir pool.
- Adequate flows need to be maintained through fishways to ensure suitable velocities for effective operation.
- Saline water will need to be carefully monitored (as per action 7 above).

Typical extent: The infrastructure can be operated in a range of ways, including to vary water levels in anabranches and creeks through to supporting the inundation of large areas of floodplain and high elevation wetlands.

Watering action 12: Seasonal lake level variation, differential barrage releases including fishway flows – Coorong, Lower Lakes and Murray Mouth

Standard operational considerations

- Commonwealth environmental water is delivered to the Lower Lakes for supporting outcomes within the lakes and the Coorong. The water levels of the Lower Lakes and barrage operations are managed complementarily for multiple environmental and socio-economic outcomes in the Coorong, Lower Lakes and Murray Mouth.
- The management of lake water levels throughout the year will be guided by seasonally appropriate water level ranges that are appropriate for lake vegetation outcomes accommodating higher water levels in spring and lower water levels in summer-autumn. The effects of wind seiching can have a dramatic impact on water levels in the Lower Lakes including up to Lock 1. Minimum water levels of approximately 0.40 mAHD for managing acid sulphate soils in the Lower Murray Swamps will be maintained for pump access to support management of floodplains in the lower Murray swamps. Achieving this minimum water level for the Lower Murray Swamps may require targeting an average Lake Alexandrina water level of 0.50 m AHD.
- Flows into the Coorong are managed through the barrages situated on Lake Alexandrina. Barrage releases are managed to maintain minimum fishway flows, manage water quality and water levels within the Coorong, with reference to seasonally appropriate lake water levels.
- Commonwealth environmental water will provide continuous barrage flows to contribute to maintaining an open Murray Mouth which is especially important for exporting salt from the Basin in lower flow years. It is also critical for maintaining tidal exchange between the Southern Ocean and the Coorong which helps maintain suitable habitat condition (water quality) within the Coorong Southern Lagoon.
- Specific target lake levels and barrage release rates will reflect seasonal conditions and be agreed by all parties as part of a short term operating plan for the Coorong, Lower Lakes and Murray Mouth.

Typical extent: Coorong North and South lagoons, Lakes Alexandrina and Albert, fringing floodplain wetlands, and the Murray Mouth.

Attachment C – Long-term water availability

Commonwealth environmental water holdings

The Commonwealth holds the following entitlements in the Lower Murray-Darling Region:

- Lower Darling High Security
- Lower Darling General Security
- Murray High Security (South Australia)

In addition the Commonwealth holds entitlements in the Southern-connected Basin that can be used to deliver environmental water to the Lower Murray–Darling Region. The full list of Commonwealth environmental water holdings can be found at www.environment.gov.au/topics/water/commonwealth-environmental-water-office/about-commonwealth-environmental-water/how-much and is updated monthly.

Other sources of environmental water

Other potential sources of held environmental water that may be used to complement Commonwealth environmental water delivery in the Lower Murray–Darling Region include:

- Environment Entitlement – The Living Murray Program (Murray-Darling Basin Authority)
- South Australian Class 9 Wetlands – South Australian Department of Environment, Water and Natural Resources
- South Australian environmental water reserve – South Australian Department of Environment, Water and Natural Resources
- Bulk Entitlement – Victorian Environmental Water Holder
- New South Wales Adaptive environmental water entitlement – New South Wales Office of Environment and Heritage

Planned environmental water

In addition to water entitlements held by environmental water holders, environmental demands may also be met via natural or unregulated flows and water provided for the environment under rules in state water plans (referred to as 'planned environmental water'). Rules for the use of planned environmental water in the lower Murray–Darling Region can be found in the *Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2003* (NSW) and the *Water Allocation Plan for the River Murray Prescribed Water Course 2002* (SA). Planned environmental water relevant to the lower Murray-Darling Region includes:

- Additional Dilution Flow
- New South Wales Lower Darling Environmental Contingency Allowance
- New South Wales Murray Regulated River Water Source Additional Environmental Allowance



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