



Office of
Environment
& Heritage

Macquarie–Castlereagh Water Resource Plan Area

**Statement of annual environmental watering
priorities 2015–16**

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1. Purpose of this statement

This statement meets the New South Wales Government's obligations to outline the annual environmental watering priorities for the Macquarie–Castlereagh Water Resource Plan Area (WRP Area) as set out in Part 4, Division 4 of Chapter 8: Environmental watering plan of the Murray–Darling *Basin Plan 2012* (MDBA 2012a).

The guidelines for the method to determine priorities for applying environmental water (MDBA 2012b) have been used to identify the environmental watering priorities for 2015–16 for the Macquarie–Castlereagh WRP Area.

The priorities reported here are derived from the *Macquarie Valley Annual Environmental Watering Plan 2015–16*.

2. Macquarie–Castlereagh Water Resource Plan Area description

The Macquarie–Castlereagh WRP Area covers all surface water resources in the area, including those of the Bogan catchment (Map 1). The area includes the regulated Macquarie–Cudgegong water source which is governed by the *Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2004* and the unregulated streams which are governed by three separate water sharing plans for:

- the [Castlereagh River above Binnaway Water Source \(2003\)](#)
- the [Castlereagh \(below Binnaway\) Unregulated and Alluvial Water Sources \(2011\)](#)
- the [Macquarie Bogan Unregulated and Alluvial Water Sources \(2012\)](#).

The Macquarie Marshes (the Marshes) are the Macquarie–Castlereagh WRP Area's largest wetland system and the main focus of managed environmental water releases. The Marshes include a range of wetlands from semi-permanent marshes and lagoons to ephemeral wetlands that are only inundated by the largest floods. The Macquarie Marshes Nature Reserve and parts of the privately owned properties 'Wilgara' and 'U-Block' are listed under the [Convention on Wetlands of International Importance](#) (the 'Ramsar' Convention).

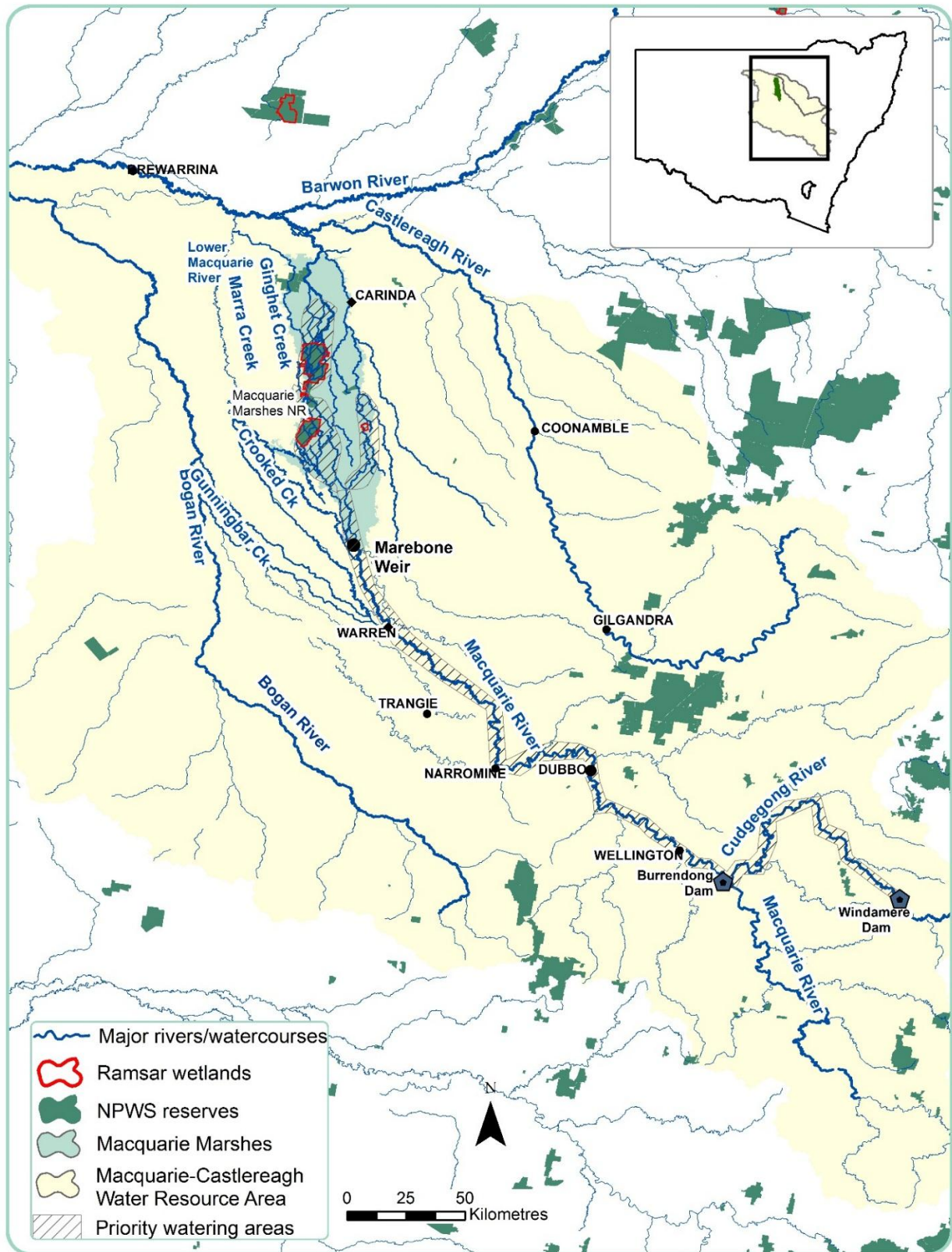
Other environmental assets within the WRP area include significant fish and aquatic ecosystem values, river-fed floodplain wetlands and streams that provide aquatic connectivity.

3. Consultation

The primary vehicle for stakeholder consultation for all environmental water planning in NSW is the environmental water advisory group (EWAG) for a particular WRP area. The Macquarie and Cudgegong Environmental Flows Reference Group (EFRG) provides advice on the development of the Macquarie Valley Annual Environmental Watering Plan.

The Macquarie and Cudgegong EFRG has reviewed and endorsed the annual environmental watering priorities for the Macquarie–Castlereagh WRP Area. The Office of Environment and Heritage (OEH) website has details of the [objectives and membership of the Macquarie and Cudgegong EFRG](#).

Map 1: Annual environmental watering priority areas, 2015–16 – Macquarie–Castlereagh WRP Area



4. Antecedent conditions: previous watering and condition of assets

4.1 Macquarie Marshes

Total gauged inflows to Marebone Weir during the 2014–15 water year (to 28 May 2015) were approximately 84 269 ML, including:

- 33 793 ML of discretionary environmental flows targeted at the Macquarie Marshes
- 10 166 ML of regulated licence irrigation supply
- 37 000 ML of stock and domestic replenishment flows in the Gum Cowl/Terrigal Creek and the Lower Macquarie River, and 'operational surplus' flows
- 3310 ML of regulated river system base flows (10 ML/day).

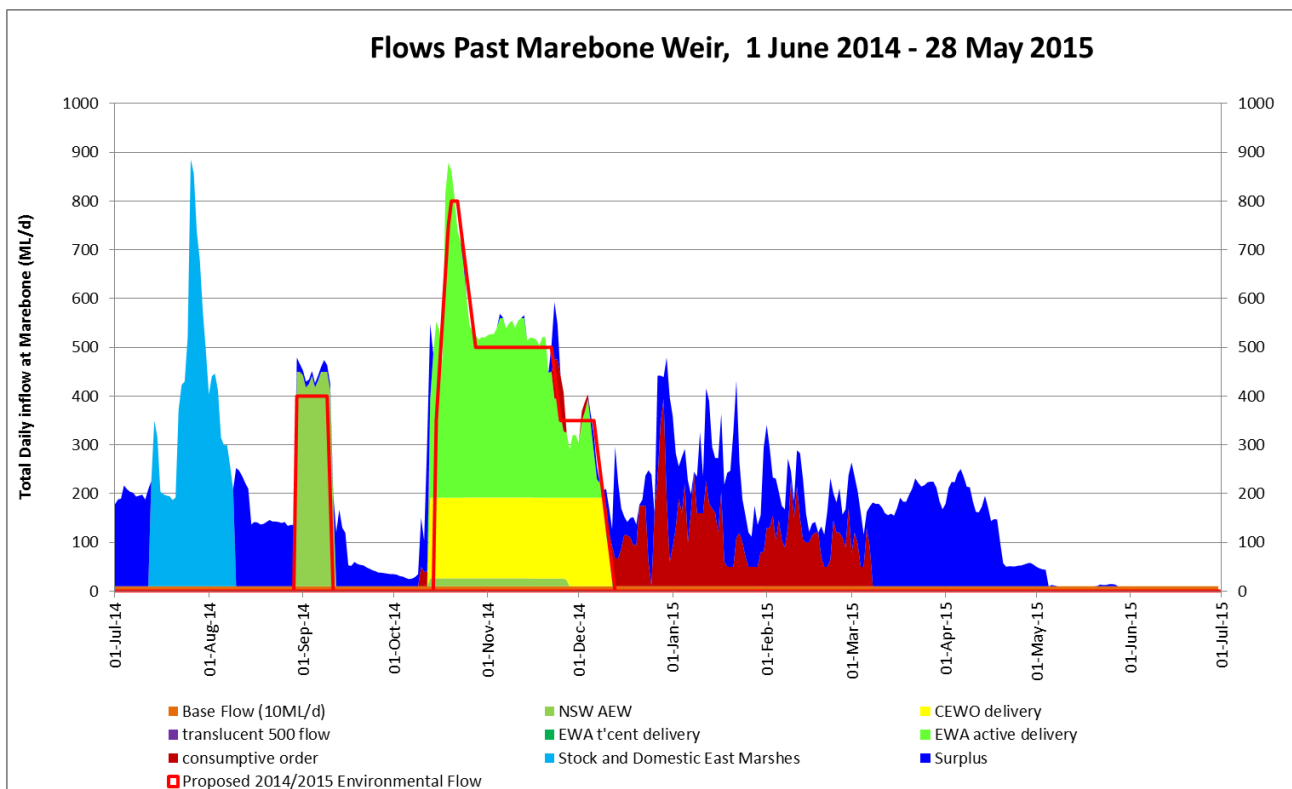


Figure 1: Marshes inflows 2014–15 (until 28 May 2015)

Since July 2012 rainfall in the catchment has been well below average, with Burrendong Dam inflows below the 80th percentile. Tributary flows during winter 2014 provided some freshes through the South and North marshes, and Lower Macquarie River, which connected to the Barwon River.

Initial field observations indicate that groundcover in areas which did not receive water during 2014–2015 contained an increasing percentage of terrestrial plants. Core areas of semi-permanent wetlands that were inundated in the previous water year as well as 2014, continue to have good quality wetland vegetation, while tree condition in most areas was found to be good but possibly declining in some areas.

4.2. Other WRP area assets

An environmental flow was released in the Cudgegong River, with a duration of two days and total volume of 737 ML.

In-stream flows in the regulated Macquarie River between Burrendong and Marebone Weir were relatively low over 2014–15 due to the limited catchment rainfall and low carryover volumes of general security water available for irrigation use.

Stock and domestic replenishment flows were delivered to the Gum Cowal/East Marsh system in September 2014. Winter flows into the Marshes were directed into the North Marsh and Lower Macquarie River. The environmental outcomes of these flows assisted to maintain the values of these systems.

5. Forecast available water

The major climate influence for the season ahead is the warmer than normal sea surface temperatures in the Indian Ocean and that surrounding much of the Australian coastline. In the tropical Pacific, further warming is expected, with the Bureau of Meteorology's (BOM) climate outlook indicating an El Niño is continuing to strengthen. The climate outlook can be viewed at the [BOM website](#).

Discretionary environmental water holdings in the Macquarie–Castlereagh are available from an environmental water allowance under the current water sharing plan and environmental water held by the NSW and Commonwealth governments as licensed entitlements.

Based on proposed carryover and likely adjustments for evaporation and dry conditions, relatively limited volumes of environmental water will be available at the commencement of the 2015–16 water year (Table 1).

Table 1: Environmental water availability – Macquarie–Castlereagh WRP Area

Account	Maximum capacity	Volume expected to be available at 1 July 2015 ¹
Water sharing plan environmental water allowance (EWA)		
EWA: Active general security	96 000 ML	15 424 ML
EWA: Translucent general security	64 000 ML	10 283 ML
NSW environmental water holdings		
General security	48 420 ML	737 ML
Supplementary ²	1 446 ML	1 426 ML
Commonwealth environmental water holdings		
General security	125 448 ML	8722 ML
Supplementary ²	8 292 ML	8 292 ML
Total general security entitlement available³		44 884 ML

¹ Volumes based on available water determination of 0%

² Supplementary account depends on declaration of a supplementary event

³ Prior to any evaporation adjustments and noting the mix of active and translucent EWA sub-accounts

The volumes in Table 1 have not been adjusted for possible future trade. OEH periodically trades water allocation to cover a proportion of water use charges

associated with NSW environmental water holdings (EWH). The volume of environmental water traded in a WRP area is determined by the price in the local market and the targeted level of cost recovery. OEH manages the trade of NSW EWH based on basin-wide environmental water demand and trading opportunities, with consideration of equity between WRP areas over time.

A varying proportion of flows to the Marshes are the result of surpluses from the regulated Macquarie River which are over-and-above base flows and stock and domestic replenishment flows. Some of these are from dam deliveries and others from tributary flows.

There are a range of potential scenarios for water availability in the coming water year. In order to plan ahead, the EFRG uses the most conservative scenario which assumes very dry conditions recommence at the start of a water year. This reflects the standard resource allocation processes used by WaterNSW and is an approach that improves the likelihood of water being available to meet environmental water requirements through a period of dry conditions. If conditions prove to be wetter, environmental water is typically used to enhance the opportunities to achieve significant ecological outcomes triggered by other inflows.

Approximately 45 000 ML will be available in 2015–16 as a result of the carryover provisions and is regarded as the minimum volume available at the start of the year under dry conditions.

The surface water availability scenario for the Macquarie–Castlereagh has been determined by comparing the forecast surface water availability with long-term historic data, following the ‘Guidelines for the method to determine priorities for applying environmental water’ published in MDBA (2012b) (see Appendix A: Table A1). According to the analysis, the surface water availability under the most likely weather scenarios (dry, trending towards very dry) is low to very low.

6. Resource availability scenario and management outcomes

The resource availability scenario (RAS) is based on surface water availability and antecedent conditions (Appendix A: Table A1). The surface water availability is forecast as low to very low and the antecedent conditions are dry trending towards very dry, so the overall RAS for 2015–16 is dry.

With the resource availability scenario most likely to be dry or very dry, the management outcomes (Appendix A: Table A2) include:

- maintenance of environmental assets and ecosystem functions, including consideration of the wet/dry cycle
- maintenance of refuges, especially for threatened species
- support for the survival and viability of threatened species and ecological communities
- avoiding damage to key ecosystem components.

7. Annual environmental watering priorities

Dry scenario plan to meet high Northern Marshes demand

Under a dry scenario, a number of environmental watering priorities have been identified for the Macquarie Marshes for 2015–16, should conditions continue to remain dry and there is no increase in water availability (Table 2).

Table 2: Macquarie–Castlereagh watering site priorities for a dry scenario 2015–16

Components	Objectives	Volume
Vegetation	Meet minimum requirements for permanent and semi-permanent wetland vegetation of an estimated 10 000 ha, targeted at the Northern Marshes but inundating parts of the Southern Marshes <i>en route</i> .	32 000 ML or 27 000 ML* *subject to access to translucent sub-allowance balance.
Soil moisture	Replenish soil moisture levels in the core of the North and South marshes area.	No additional water needed to the above
Frogs	Provide suitable conditions for survival of marsh frog species in core areas (estimated 10 000 ha).	No additional water needed to above
Migratory waterbirds	Support migratory bird habitat by providing muddy flats in early spring.	No additional water needed to above
Colonial nesters	No colonial nesting waterbird species breeding likely to occur.	N/A
Native fish	Provide opportunities for fish conditioning over winter, applying to all fish guilds.	No additional water needed to above
Future years	Retain sufficient carryover to enable critical refugia water delivery to the main Macquarie River to Oxley in 2016–2017.	5000 ML
Aboriginal culture	Engage the local Aboriginal community to identify and support conservation of cultural values.	No additional water needed to above

Under the dry scenario, the primary aims of environmental watering in the Macquarie–Castlereagh WRP Area in 2015–16 will be to:

- avoid damage to permanent and semi-permanent wetland vegetation in the Macquarie Marshes by replenishing core areas of soil moisture and targeting a winter flow to the Northern Marshes to attempt to meet recognised high water demand in this area while achieving other multiple benefits
- provide minimum 2016–2017 carryover volumes that will ensure water availability for the fish refugia in the Macquarie River channel between Warren and Oxley, should dry conditions continue.

In order to meet these objectives, the EFRG has recommended:

1. a 32 000 ML (total) flow targeted at the Northern Marshes, reedbed and river red gum woodlands comprising:
 - Target rate of 1000 ML/day at Marebone Weir, with 200 ML/day down the Marebone Break into the Bulgeraga Creek and 800 ML/day down the Macquarie River.
 - Timing:
 - Flow commencing upon a tributary flow of total volume of 8000 ML/day at Baroona Gauge over three days with 5000 ML of this volume being surplus flow to WaterNSW needs, or

- If a flow trigger has not occurred sooner, commence the flow at 30 July 2015 at Marebone Weir (mid-July release from Burrendong)
 - This 32 000 ML volume depends upon contribution from the Commonwealth Environmental Water Office and NSW Office of Water approval to use water held in the translucent sub-allowance in an 'active' fashion. A total of 27 000 ML would be delivered should this translucent sub-allowance water not be available.
2. the carryover of 5 GL for the 2016–2017 water year, to provide base flows in the Macquarie River to maintain fish refugia in the Macquarie River channel between Warren and Oxley should dry conditions continue.

The flow described in (1) above would have multiple benefits including inundating key wetland areas of the Southern Marshes, with resulting benefits to semi-permanent and woodland vegetation there, plus connectivity to the Barwon River and filling of the shallow groundwater profile which is critical for ongoing wetland condition. It is noted that the full volume (32 000 ML) can only be accessed through use of the balance held in the Macquarie–Cudgegong Water Sharing Plan 'Translucent Sub-allowance'. OEH will commence discussions with NSW Office of Water as to whether this can occur.

Medium condition scenario for wetland system maintenance

The NSW Office of Water predict additional allocation of 22 per cent, equivalent to approximately 66 000 ML, will be available under the 'medium' weather/inflow scenario. The EFRG recommended the following approach for the 2015–2016 water year (Table 3).

Table 3: Macquarie–Castlereagh watering site priorities for a medium scenario 2015–16

Components	Objectives	Volume
Vegetation	Meet minimum requirements for permanent and semi-permanent wetland vegetation of an estimated 10 000 ha, targeted at the Northern Marshes but inundating parts of the Southern Marshes <i>en route</i> . The possible (subject to EFRG August Meeting) addition of a further 45 GL to the Marshes vegetation communities in Spring when productivity is higher and fish breeding can occur.	32 000 ML or 27 000 ML* *subject to access to translucent sub-allowance balance. + 45 000 ML contingency for springtime flow TBC
Soil moisture	Replenish soil moisture levels in the core of the North and South marshes area.	No additional water needed to the above
Frogs	Provide suitable conditions for survival of marsh frog species in core areas (estimated 10 000 ha).	No additional water needed to above
Migratory waterbirds	Support migratory bird habitat by providing muddy flats in early spring.	No additional water needed to above

Colonial nesters	To support colonial nesting waterbird species breeding should they commence breeding.	5000 ML carry-over contingency
Native fish	Provide opportunities for fish conditioning over winter, applying to all fish guilds. Provide 15 GL in contingency to compliment a springtime tributary flow of a suitable size to promote flow specialist fish (e.g. golden and silver perch) breeding.	+15 GL Spring fish flow contingency
Drought strategy for future years	Retain sufficient carryover to enable critical refugia water delivery to the main Macquarie River to Oxley in 2016–2017.	5000 ML
Aboriginal culture	Engage the local Aboriginal community to identify and support conservation of cultural values.	No additional water needed to above

Under the medium condition scenario, the primary aims of environmental watering in the Macquarie–Castlereagh WRP Area in 2015–16 will be to:

- avoid damage to permanent and semi-permanent wetland vegetation in the Macquarie Marshes by replenishing core areas of soil moisture and targeting a winter flow to the Northern Marshes to attempt to meet recognised high water demand in this area while achieving other multiple benefits, plus the consideration of a Springtime flow to the Marshes should conditions be suitable or a tributary flow occurs. This would be confirmed at the August 2015 EFRG meeting
- a contingency to support flow specialist fish species (e.g. golden and silver perch)
- provide carryover volumes that will assist in avoiding damage in the 2016–2017 water year should dry conditions continue.

In order to meet these objectives, the EFRG has recommended:

1. a 32 000 ML flow targeted at the Northern Marshes reedbed and River Red Gum woodlands, comprising:
 - Target rate of 1000 ML/day at Marebone Weir, with 200 ML/day down the Marebone Break into the Bulgeraga Creek and 800 ML/day down the Macquarie River.
 - Timing:
 - Flow commencing upon a tributary flow of total volume of 8000 ML/day at Baroona Gauge over three days with 5000 ML of this volume being surplus flow to WaterNSW needs, or
 - If a flow trigger has not occurred sooner, commence the flow at 30 July 2015 at Marebone Weir (mid-July release from Burrendong)
 - This 32 000 ML volume depends upon contribution from the Commonwealth Environmental Water Office and NSW Office of Water approval to use water held in the translucent sub-allowance in an 'active' fashion. A total of 27 000 ML would be delivered should this translucent sub-allowance water not be available.
2. a 15 000 ML fish flow contingency, should a suitable tributary flow occur in the Macquarie River that may benefit flow specialist species (e.g. golden and silver perch).
 - Timing: TBC, but most likely mid-October – November 2015.

- Target rates: to either augment a tributary flow maximum flow rate ('peak') or to extend the duration of the event to assist fish recruitment following the initial peak.
3. a 45 000 ML springtime contingency flow to the Macquarie Marshes, subject to confirmation of conditions at the August EFRG meeting.
 4. The carryover of 11 000 ML for the 2016–2017 water year, to provide base flows in the Macquarie River to maintain fish refugia in the Macquarie River channel between Warren and Oxley should dry conditions continue, or to support colonial waterbird breeding events, should they occur.

The flow described in (1) above would have multiple benefits including inundating key wetland areas of the Southern Marshes, with resulting benefits to semi-permanent and woodland vegetation there, plus connectivity to the Barwon River and filling of the shallow groundwater profile which is critical for ongoing wetland condition. The events in (2) and (3) would also have several other multiple benefits, depending on their final characteristics.

It is noted that the full volume (32 000 ML) can only be accessed through use of the balance held in the Macquarie-Cudgegong Water Sharing Plan 'Translucent Sub-allowance'. OEH will commence discussions with NSW Office of Water as to whether this can occur.

Flows will be adaptively managed to integrate with other demands in the system to avoid inconvenience for landholders where possible. Where inconvenience is a risk, consultation with potentially affected landholders will occur and agreements sought on acceptable event management.

8. Cooperative arrangements for water delivery

OEH is the environmental water manager for NSW and coordinates environmental watering with advice from the relevant environmental water advisory group. OEH has negotiated cooperative arrangements with the Commonwealth Environmental Water Office and WaterNSW to maximise the benefits of environmental water use in NSW.

OEH has developed strong partnerships with local water and wetland stakeholders across the catchment to promote efficient and effective delivery of environmental outcomes for the key assets in the catchment.

9. Further documentation

Reporting on water used throughout the 2015–16 watering season will be included in OEH's *Environmental Water Use in NSW: Outcomes 2015–16* and also in the Commonwealth's *Annual Report 2015–16: Commonwealth environmental water*, available in late 2016.

References

MDBA 2012a, *Basin Plan*, Murray–Darling Basin Authority, Canberra,
www.mdba.gov.au/what-we-do/basin-plan

MDBA 2012b, *Guidelines for the method to determine priorities for applying environmental water*: Murray–Darling Basin Authority, Canberra,
www.mdba.gov.au/sites/default/files/Basin-Plan/Statutory-Guideline-Nov-2012.pdf

Appendix A: Assessment of resource availability scenarios Table

A1: Determining the resource availability scenario

Surface water availability	Antecedent conditions				
	Very dry	Dry	Median	Wet	Very wet
Very low	Very dry	Very dry	Dry	Dry	n/a
Low	Very dry	Dry	Dry	Moderate	Wet
Median	Dry	Dry	Moderate	Wet	Wet
High	Dry	Moderate	Wet	Wet	Very wet
Very high	n/a	Moderate	Wet	Very wet	Very wet

Source: Modification of table in 'Guidelines for the method to determine priorities for applying environmental water' in the Murray-Darling *Basin Plan* (MDBA 2012b), using ranges for water availability and antecedent conditions rather than the percentile ranges (15 points in each band) used in the plan.

Table A2: Management outcomes for each resource availability scenario

	Resource availability scenario				
	Very dry	Dry	Moderate	Wet	Very wet
Management outcomes	<p>Avoid irretrievable loss of, or damage to, environmental assets</p>	<p>Ensure environmental assets maintain their basic functions and resilience</p>	<p>Maintain ecological health and resilience</p>	<p>Improve the health and resilience of water-dependent ecosystems</p>	<p>Improve the health and resilience of water-dependent ecosystems</p>
	<p>Avoid critical loss of species, communities and ecosystems. Maintain critical refuges. Avoid irretrievable damage or catastrophic events. Allow drying to occur, where appropriate, but relieve severe unnaturally prolonged dry periods.</p>	<p>Support the survival and viability of threatened species and communities. Maintain environmental assets and ecosystem functions, including allowing drying to occur, consistent with natural wetting-drying cycles. Maintain refuges.</p>	<p>Enable growth, reproduction and small-scale recruitment for a diverse range of flora and fauna. Promote low-lying floodplain–river connectivity. Support medium-flow river and floodplain functions.</p>	<p>Enable growth, reproduction and large-scale recruitment for a diverse range of flora and fauna. Support high-flow river and floodplain functions.</p>	<p>Enable growth, reproduction and large-scale recruitment for a diverse range of flora and fauna. Support high-flow river and floodplain functions.</p>

Source: Modification of table in 'Guidelines for the method to determine priorities for applying environmental water' in the Murray-Darling *Basin Plan* (MDBA 2012b), with the objective — 'Promote higher floodplain–river connectivity' — removed from the wet and very wet scenarios.