

Department of Climate Change, Energy, the Environment and Water

Prerequisite policy measures: NSW annual evaluation and review 2022–23

July 2024



Acknowledgement of Country



Department of Climate Change, Energy, the Environment and Water acknowledges the traditional custodians of the land and pays respect to Elders past, present and future.

We recognise Australian Aboriginal and Torres Strait Islander peoples' unique cultural and spiritual relationships to place and their rich contribution to society.

Artist and designer Nikita Ridgeway from Aboriginal design agency – Boss Lady Creative Designs, created the People and Community symbol.

Prerequisite policy measures: NSW annual evaluation and review 2022–23

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Abbreviations

Abbreviation	Description
BCS	Biodiversity, Conservation and Science Group in the NSW Department of Climate Change, Energy, the Environment and Water (formerly Environment and Heritage Group or EHG)
BMEWA	Barmah–Millewa (forest) Environmental Water Allowance
CEWH	Commonwealth Environmental Water Holder
CEWO	Commonwealth Environmental Water Office
DCCEEW	Australian Government Department of Climate Change, Energy, the Environment and Water
EEWD Project	Enhanced Environmental Water Delivery Project
EWA	environmental water allowance
EWAG	environmental water advisory group
EWC	Environmental Water Committee (Tier 1)
EWHS	environmental water holders (includes NSW DCCEEW BCS and CEWH)
EWIG	Environmental Water Improvement Group
GL	gigalitre (one thousand million litres)
GS	general security (water licence)
HEW	held environmental water
KEQ	key evaluation question (as part of the evaluation framework)
MAA	Murray Additional Allowance
MDBA	Murray–Darling Basin Authority
MIL	Murray Irrigation Limited
ML	megalitre (one million litres)
MLS	Menindee Lakes System
NSW DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
PEW	planned environmental water
PPMs	prerequisite policy measures

Abbreviation	Description
RMIF	River Murray Increased Flow
SAL	supplementary access licence
SCBEWC	Southern Connected Basin Environmental Watering Committee
SO&O	Specific Objectives and Outcomes (as listed in Section 2 of the <u>MDBA Basin Officials Committee Objectives and outcomes for river operations in the River Murray System (O&O) document</u>)
TLM	The Living Murray (water licence)
Water Group	Water Group in the NSW Department of Climate Change, Energy, the Environment and Water (formerly DPE Water)

Preface

This report is the fourth annual review and evaluation (annual review) of prerequisite policy measures (PPMs) implementation in NSW. It examines the PPMs environmental watering actions and implementation processes within NSW jurisdiction during the 2022–23 water year. The evaluation component has been prepared as per the NSW PPMs Evaluation Framework.

During 2022–23, a total of 503 GL of environmental water deliveries in NSW resulted in 479 GL of ‘return flows’ being recognised at the South Australian border. This is the largest volume of return flows from NSW protected to date. The key achievements for the use and improvement of PPMs in NSW during 2022–23 included:

- An environmental watering event in the Great Darling Anabranch that used 60 GL of held environmental water (HEW) with the entire delivery volume recognised as return flow to the SA border. This flow aimed to facilitate juvenile native fish to migration from Lake Cawndilla to the Murray River.
- Environmental water deliveries in the Lower Darling used 113 GL of HEW with 107 GL of return flows protected at the SA border. These deliveries aimed to improve and maintain large bodied native fish populations, improve water quality and prevent fish-deaths.
- The annual Murray multi-site event used 95 GL of NSW environmental water, with 89 GL of return flows delivered to multiple sites during the one event.
- Operational water deliveries to meet environmental water flow targets in the Wakool River.
- An environmental watering event in the Edward/Kolety River targeting flows downstream of Stevens Weir for native fish population recovery post hypoxic water conditions. This event used 24 GL with 23 GL of return flows protected.
- The use of a new accounting arrangement to enable the opening of the Niemur River regulator when the Murray River is in regulated conditions to provide winter and autumn base flows. A total of 206 ML was debited and protected as a return flow.
- An environmental watering event in the Murrumbidgee used 202 GL of HEW with the entire delivery protected as return flows at the SA border. This event provided elevated base flows to protect native fish from poor water quality caused by sharp falls in water level post flooding.

There was a high degree of goodwill and cooperation between agencies in implementing PPMs in the 2022–23 water year. Whilst the collaboration enabled successful environmental water deliveries there were several inefficiencies. PPMs implementation could be improved by:

- streamlining the ordering process to reduce operator risk and complexity for the environmental water holder
- developing new procedures for annual and contingency planning to improve river operator and environmental water holder knowledge and reduce uncertainty during events when unforeseen conditions arise
- developing loss accounting arrangements for environmental water deliveries in the Murrumbidgee River to facilitate the recognition of return flows.

The evaluation framework criteria of consistency, efficiency and effectiveness were used to assess the implementation of PPMs during the 2022–23 water year. All three criteria received a rating of ‘average’, which corresponds to ‘evidence of minimal positive performance, below expectation’. The ratings were based on moderate performance indicator scores and one low result for risk identification. The ratings were determined by comparing the evidence provided by river operators and environmental water holders, to the scoring guide (Appendix D of the Evaluation Framework).

The performance indicators displayed an increasing trend for information quality and provision, and there were no decreasing trends. The increasing trends can be attributed to additional resourcing for PPMs implementation within key agencies. The ratings reflect that there is still further work required to streamline and embed the implementation processes. The evaluation framework is a useful tool that indicates where the improvement is required.

Summary of recommendations

The recommendations arising from the 2022–23 annual review report are outlined in Table 1.

Table 1: Recommendations of the 2022–23 annual review

	2022–23 Recommendations	Arising from
R.1	Water Group to collaborate with other agencies to streamline the PPMs implementation process, including fit-for-purpose water ordering, documentation of risks and mitigation measures, and reporting requirements	Carried over from 2021–22
R.2	Water Group to collaborate with WaterNSW to develop a method for completing a post-event comparison of losses debited as per assumed use statement with ‘actual’ loss	Carried over from 2021–22
R.3	WaterNSW to provide return flows split by water holder for the Murray and Murrumbidgee floodplain water use estimates	KEQ 1
R.4	Water Group to collaborate with WaterNSW and environmental water holders to develop a procedure for both annual planning and contingency planning for environmental watering deliveries	KEQ 2
R.5	Water Group to create a central location for the latest versions of the accounting methods and grant access to the PPMs Working Group	KEQ 2
R.6	Water Group to update the procedures manuals to clarify the accounting of air-space releases, rainfall rejection, Lowbidgee weir pool filling, piggybacking on translucency flows and recognition of return flows from supplementary access licences	KEQ 2
R.7	Water Group to develop a policy on PPMs from Menindee Lakes System when under NSW control	Carried over from 2021–22
R.8	Water Group to determine assumed uses for directed releases in the Murrumbidgee and return flows from mid-Murrumbidgee and Lowbidgee wetlands	Carried over from 2021–22
R.9	Water Group to progress a review of the procedures manuals and update as necessary to reflect new actions and the outcomes of recommendations	KEQ 5

Contents

Acknowledgement of Country	ii
Abbreviations	iii
Preface.....	v
Summary of recommendations	vii
1 Introduction.....	10
2 Requirements for the annual review.....	11
3 PPMs actions undertaken in NSW in 2022–23	13
3.1 2022–23 resource summary	13
3.2 Summary of PPMs actions in 2022–23.....	14
3.3 Great Darling Anabranh and Lower Darling/Baaka (LOD22/23-01 & LOD22/23-02).....	19
3.4 Murrumbidgee (MBG22/23-05).....	20
3.5 Murray multi-site and Edward/Kolety–Wakool.....	22
4 Evaluation of PPMs implementation processes.....	24
4.1 Evaluation findings.....	26
4.2 Consistency.....	28
4.3 Efficiency	31
4.4 Effectiveness	35
5 Next steps	38
Appendix A WaterNSW Annual Environmental Release River Operations Reports	39
Annual Environmental Release River Operations Report – Lower Darling 2022–23.....	39
Annual Environmental Release River Operations Report – Great Darling Anabranh 2022–23	52
Annual Environmental Release River Operations Report – Hume Multi-site events 2022–23 ...	62
Annual Environmental Release River Operations Report – Wakool System 2022–23	72
Annual Environmental Release River Operations Report – Edward River DS Stevens Weir 2022–23	82
Annual Environmental Release River Operations Report – Niemur River	89
Annual Environmental Release River Operations Report – Murrumbidgee River 2022–23.....	95
Appendix B BCS Group Annual Environmental Watering Statement.....	112
Appendix C Downstream Edwards Weir loss method.....	119
Appendix D Niemur River loss method	120
Appendix E Key evaluation questions.....	125
Appendix F Evaluation results.....	127

Appendix G Fulfillment of roles and responsibilities.....	131
Appendix H PPMs Working Group Work Plan as of April 2024.....	137
Meetings and administration	137
Reporting and communication	138
Watering priorities and technical tasks (by valley)	139

1 Introduction

Prerequisite policy measures (PPMs) are legislative and operational rule changes introduced as part of the Murray–Darling Basin Plan (Basin Plan). The measures are designed to support the effective and efficient use of held environmental water (HEW) in the Murray–Darling Basin southern connected system.

The Murray–Darling Basin Authority (MDBA) assessed PPMs as being in effect in NSW from 1 July 2019. MDBA’s PPMs assessment reports for all Basin states are available on the MDBA website:

www.mdba.gov.au/water-management/basin-plan/key-elements-basin-plan/prerequisite-policy-measures

In NSW, PPMs are being implemented in the NSW Murray and Lower Darling and the Murrumbidgee regulated rivers. The NSW Government has adopted an adaptive management approach to support continuous improvement in PPMs implementation for held environmental water delivery in these river systems. More detailed information on the background and implementation of PPMs in NSW is available on the Water Group’s website:

water.dpie.nsw.gov.au/our-work/projects-and-programs/environmental-water-management-in-nsw/what-we-are-working-on-now/pre-requisite-policy-measures

This report presents the findings and recommendations from the annual review of the implementation of PPMs in NSW during the 2022–23 water year, from 1 July 2022 to 30 June 2023. The annual review is a key component of the NSW Government’s commitment to the ongoing implementation of PPMs under the adaptive management framework.

The review was conducted by the department with input from the Biodiversity, Conservation and Science Group (BCS), WaterNSW, Commonwealth Environmental Water Office (CEWO) and MDBA.

The purpose of the annual review is to:

- Support continuous improvement of PPMs processes to improve environmental water management, and
- Provide transparency about the use of PPMs in the 2022–23 water year.

This annual review report focuses on environmental watering actions that use PPMs (that is, piggybacking or return flow recognition) under NSW jurisdiction only. The assessment of any multi-jurisdictional PPMs environmental watering actions undertaken during the water year is beyond the scope of this review.

This annual review report will be provided to the MDBA as part of NSW’s requirement under the Basin-wide Environmental Water Protection Strategy and Implementation Plan.

The annual review is not designed to describe or assess environmental outcomes or benefits resulting from the PPMs watering actions. Reporting on the use of water for the environment and its outcomes is a matter for separate consideration by the environmental water holders and their respective agencies (see www.environment.nsw.gov.au/topics/water/water-for-the-environment/planning-and-reporting/water-for-environment-outcomes-2022-23 and www.dcceew.gov.au/water/cewo/publications/2021-22-basin-scale-evaluation).

2 Requirements for the annual review

The matters for consideration in the annual review are set out in Section 5.2 of the *Prerequisite Policy Measures: Procedures Manual for the NSW Murray and Lower Darling Regulated Rivers*¹ and the *Prerequisite Policy Measures: Procedures Manual for the Murrumbidgee Regulated River*² ('the procedures manuals'). Table 2 below outlines the matters from the procedures manuals that this annual review is required to consider and the relevant section of this report that addresses those matters.

This 2022–23 annual review was conducted in accordance with these requirements, including consideration of reports provided by the river operator (WaterNSW) and environmental water manager (BCS) that document the environmental watering actions undertaken using PPMs. These reports are the:

- WaterNSW's 'Annual Environmental Release River Operations Report' (Appendix A WaterNSW Annual Environmental Release River Operations Reports) that documents the application of specific agreed and trial actions, the accounting of water delivery and transmission losses including a comparison of forecast and actual environmental water use, and
- BCS's 'Annual Environmental Watering Statement' (Appendix B BCS Group Annual Environmental Watering Statement) that details the watering events for the year including the sites targeted and environmental outcomes as well as any risks and mitigation measures and stakeholder consultation.

This annual review was conducted using the evaluation framework for PPMs implementation. This involves evaluating the implementation of PPMs against three key criteria: consistency, efficiency, and effectiveness. Applying this framework provides the ability to track the functioning of PPMs over time.

¹water.dpie.nsw.gov.au/__data/assets/pdf_file/0006/549519/NSW-PPM-Procedures-Manual-for-the-NSW-Murray-and-Lower-Darling-Dec-2022.pdf

²water.dpie.nsw.gov.au/__data/assets/pdf_file/0007/549520/NSW-PPM-Procedures-Manual-for-the-Murrumbidgee-Regulated-River-Dec-2022.pdf

Table 2: Matters for consideration in the annual review and the corresponding section where they are addressed.

Section of this report	Matters for consideration
Section 3: Results	<ul style="list-style-type: none"> • the results and recommendations of the reporting elements provided by the river operator and environmental water manager <ul style="list-style-type: none"> — Appendix A WaterNSW Annual Environmental Release River Operations Reports — Appendix B BCS Group Annual Environmental Watering Statement
Section 4.2: Consistency	<ul style="list-style-type: none"> • whether general operational procedures were followed for the delivery of HEW via PPMs. • any issues relating to PPMs raised through consultation with stakeholders in the valley
Section 4.3: Efficiency	<ul style="list-style-type: none"> • whether the current PPMs actions and the associated supporting measures provide for the efficient use of held environmental water • whether there are sufficient mitigation measures in place and whether they have been effective • reporting on the implementation of improvements from previous review, including consideration of recommendations provided by the PPMS Working Group
Section 4.4: Effectiveness	<ul style="list-style-type: none"> • whether the current PPMs actions and the associated supporting measures provide for the effective use of held environmental water • whether the actions and associated supporting measures should be expanded, modified, or remain unchanged • any proposals for variations or new actions and/or supporting measures that may be brought forward by the river operator or the environmental water holder

3 PPMs actions undertaken in NSW in 2022–23

3.1 2022–23 resource summary

The 2022–23 water year experienced higher-than-average rainfall and periods of flooding across the Murray Darling Basin³. The widespread rainfall revitalised many river systems, reconnecting key wetlands and floodplains. The focus of the environmental water program was to ensure sites had access to these flows for a duration that allowed the native plants and animal populations to grow as well as using targeted deliveries to mitigate the impacts of the hypoxic floodwater.⁴

Throughout the year, major storages remained full or near full. River operations in the state continued to focus on managing flood risks with most rural storages either spilling or releasing water for airspace operations and flood mitigation at various times during the water year. With the El Niño system being declared by the Bureau of Meteorology in the first quarter of 2023, storages began to fall away from their full supply capacity by the end of the water year.

The Murrumbidgee regulated system experienced very wet conditions in the 2022–23 water year. All higher priority licence holders received their maximum 100% allocation and high security licence holders received their full 95% opening allocation⁵. General security licence holders commenced the water year with a 35% allocation and supplementary licence holders received 100% allocation.

Similarly, in the NSW Murray regulated river, all higher priority licence holders received their maximum 100% allocations. High security licence holders received their maximum 100% allocations. General security licence holders commenced the water year with a 43% allocation.

The Menindee Lakes system remained above the 640 GL threshold and hence a shared Murray resource, in accordance with the Murray–Darling Basin Agreement. The inflows from the Barwon–Darling River resulted in the most significant inflows to the Menindee Lakes in almost a decade. The hypoxic flood water from the large inflows, combined with a range of other factors, contributed to significant water quality issues, including a mass fish death event in mid-March 2023.

³ <http://www.bom.gov.au/climate/current/financial-year/aus/summary.shtml>

⁴ <https://www.environment.nsw.gov.au/topics/water/water-for-the-environment/planning-and-reporting/water-for-environment-outcomes-2022-23>

⁵ https://www.industry.nsw.gov.au/__data/assets/pdf_file/0005/516911/was-regulated-river-20220701.pdf

3.2 Summary of PPMs actions in 2022–23

PPMs were used to enable directed releases and return flows for five environmental watering actions across the Lower Darling, the Great Darling Anabranch, the Murrumbidgee, the Murray and the Edward/Kolety–Wakool systems during the 2022–23 water year (Figure 1). Table 3 provides a summary of events and sections 3.3–3.5 provide further detail on each event. BCS Group provide a reference number which covers all water actions across an area (shown in Figure 1 and the subheadings in this section) while WaterNSW provide an event reference number for each event, which is shown in the event summary tables in each section.

Figure 1: Stretches of river (highlighted in green) where PPMs environmental watering actions occurred during the 2022–23 water year.



Table 3: Summary of environmental watering events that used PPMs in 2022–23

Details	Great Darling Anabran	Lower Darling/Baaka	Murrumbidgee	River Murray Multi-Site	Edward River /Edward Kolety–Wakool River system
BCS Group event number	LOD22/23-01	LOD22/23-02	MBG22/23-05	MUR22/23-01	MUR22/23-08
WaterNSW reference	Events#1-PPMS-GDA	Events#1&2-PPMS-LDR	Events#1a,1b&2-PPMS-MBG	Event#1&2-PPMS-Hume Multisite	Event#1-PPMS-Edward River, Event#1-PPMS-Wakool system, Event#1-PPMS-Niemur River
Further details	Section 3.3	Section 3.3	Section 3.4	Section 3.5.1	Section 3.5.2
Objective of environmental watering action	Provide connectivity to allow fish passage of juvenile perch from Lake Cawndilla to the Murray River.	Maintain and improve large bodied native fish populations.	Elevate base flows in the Murrumbidgee River and Yanco-Billabong Creeks to protect native fish from poor water quality caused from sharp falls in water level as flows return from unregulated to regulated conditions.	Deliver flows along the Murray from Hume Dam to the SA border, to provide ecological outcomes as per the NSW Murray-Lower Darling Long-term Environmental Watering Plan.	Delivery of environmental water targeting different in channel flow rates through each of the rivers throughout the season. Mitigate flood recession hydrograph. Provide flow variability conducive to native fish breeding and recruitment.
Environmental site/s watered	Great Darling Anabran (Lake Cawndilla to the Murray River)	Lower Darling/Baaka channel (Weir 32 to the Murray River)	Murrumbidgee River and Yanco Creek channels.	Millewa Group – Ramsar site wetland, Werai Forest – Tumudgery Creek & Reed Bed RAMSAR wetland, Yallakool, Wakool, Colligen–Niemur, Edwards River, Murray River channel	Werai Forest – Tumudgery Creek & Reed Bed – Ramsar wetland, Yallakool-Wakool, Colligen–Niemur, Edwards River, Murray River channel.

Details	Great Darling Anabran	Lower Darling/Baaka	Murrumbidgee	River Murray Multi-Site	Edward River /Edward Kolety–Wakool River system
Delivery period	February – June 2023	February to June 2023	November 2022 – June 2023	July 2022 – June 2023	January 2023 – April 2023
PPMs action	Great Darling Anabran (via directed releases from Lake Cawndilla when a shared resource). Return flow recognition to SA border.	Lower Darling in-channel delivery (via directed releases from Menindee Lakes when a shared resource). Return flow recognition to SA border.	Directed releases from storage/s to meet a target flow at downstream site/s. Return flow recognition to SA border.	Directed release and assumed use (return flows)	Accounting for diversion of operational water to meet environmental flow targets (environmental water accounting). Return flow recognition to the SA border.
Assumed use method / accounting method	<p><i>Determination of debit:</i> the volume released from the Lake Cawndilla outlet to meet the order.</p> <p><i>Determination of return flow:</i></p> <p>i. after adjusting for travel time, when the daily average flow passing Tara Downs (425054) is equal to or exceeds releases, no losses are to be applied</p> <p>ii. after adjusting for travel time, when the daily average flow passing Tara Downs is less than releases, the return flow is equal to the flow at Tara Downs.</p>	<p><i>Determination of debit:</i> additional releases from storage, calculated as the difference between actual releases and those estimated to have been made without the environmental water order</p> <p>Minimum of:</p> <ul style="list-style-type: none"> • The target flow +10% minus required operational flow, or • The observed flow minus required operational flow. <p><i>Determination of return flow:</i> Proportional loss lookup table.</p> <p><i>Determination of return</i></p>	<p><i>Determination of debit:</i> additional releases from storage, calculated as the difference between actual releases and those estimated to have been made without the environmental water order (operational requirement including intervalley trade).</p> <p>Minimum of:</p> <ul style="list-style-type: none"> • The target flow +10% minus required operational flow, or • The observed flow minus required operational flow <p><i>Determination of return flow:</i> TBD. As the target flow was end of system (Balranald), in-channel losses were socialised to the delivery point.</p> <p><i>Determination of return flow (SA</i></p>	As per SO&O 2.4 & 2.5.	<p><i>Wakool System Loss - Determination of debit:</i> A seasonal loss rate is applied to additional deliveries required to meet environmental water target flow above the loss threshold.</p> <p><i>Determination of return flow:</i> Not applicable for this accounting arrangement, noting that diversions are made using operational water only.</p> <p><i>Niemur River loss –</i> Apply a 37% loss rate to the additional flow at the Niemur off-take regulator (see Appendix D).</p>

Details	Great Darling Anabran	Lower Darling/Baaka	Murrumbidgee	River Murray Multi-Site	Edward River /Edward Kolety–Wakool River system
	<i>Determination of return flow (SA border): Incremental loss look up table. No losses applied when the system is in unregulated conditions. New accounting method for when Tara Downs is back-water effected using Bulpunga gauge.</i>	<i>flow (SA border): Incremental loss look up table (Boundary Bend to SA). No losses applied when the Murray is in unregulated conditions.</i>	<i>border): Incremental loss rate (look up table). No losses applied when the Murray is in unregulated conditions.</i>		<i>Downstream Stevens Weir (see Appendix C). No losses applied when the Murray is in unregulated conditions.</i>
Total volume of held environmental water ordered by BCS (ML)	60,225	113,456	202,208	94,527	32,876
Total volume of held environmental water debited by WaterNSW (ML)	60,225 <i>CEWH - 60,033 NSW GS - 192</i>	113,456 <i>CEWH - 43,399 NSW GS - 2,016 TLM - 68,041</i>	202,208 <i>CEWH - 126,967 NSW GS - 15,241 TLM - 60,000</i>	94,527 <i>CEWH - 80,102 TLM - 14,425</i>	32,876 <i>CEWH - 23,554 & 9,322*</i>
Return flow volume recognised (end of system) (ML)	60,225 <i>CEWH - 60,033 NSW GS - 192</i>	106,794	202,208 <i>CEWH - 126,967 NSW GS - 15,241 TLM - 60,000</i>	89,218	20,785 <i>CEWH - 20,785**</i>

Details	Great Darling Anabranh	Lower Darling/Baaka	Murrumbidgee	River Murray Multi-Site	Edward River /Edward Kolety–Wakool River system
Return flow volume recognised (SA border) (ML)	60,225 <i>CEWH - 60,033 NSW GS - 192</i>	106,794	202,208 <i>CEWH - 126,967 NSW GS - 15,241 TLM - 60,000</i>	89,218	20,785 <i>CEWH - 20,785**</i>

*23,554 ML was delivered downstream of Stevens Weir, 9,322 ML was delivered into the Yallakool/Wakool and Colligen/Niemur Rivers.

**no return flows from the Edward/Kolety–Wakool system event

3.3 Great Darling Anabranh and Lower Darling/Baaka (LOD22/23-01 & LOD22/23-02)

The use of PPMs enabled 166 GL of return flows to be recognised at the South Australian border from one environmental water directed release made from Menindee Lakes down the Great Darling Anabranh (GDA) (Event#1-PPMs-GDA in Table 4) and two Lower Darling releases (Event #1-PPMS-LDR and Event #2-PPMS-LDR in Table 5) over the 2022–23 water year.

Table 4: Overview of the environmental watering event that used PPMs in 2022–23 in the Great Darling Anabranh.

LOD22/23-01	Event#1-PPMs-GDA
Delivery start date	16/02/2023
Delivery end date	30/06/2023
Total volume of environmental water delivered	60,225 ML
Total volume of environmental water debited as reported by WaterNSW	60,225 ML (CEWH)
Return flow volume recognised (end of system)	60,225 ML was recognised in the River Murray. There was no loss in the GDA as the flow at Tara Downs remained above the flow at the Lake Cawndilla outlet, as per the PPMs accounting arrangements.
Return flow volume recognised (SA border)	60,225 ML recognised at SA Border. No additional losses were applied due to unregulated conditions in the River Murray.
Target daily flow rates and volumes.	Averaging 388 ML/day vary from 50 to 1000 ML/day for 135 days requiring 50,357 ML.
Actual daily flow rates / e-water component and volumes	Averaging 446 ML/day vary from 39 to 1421 ML/day for 135 days delivering 60,225 ML.

Table 5: Overview of environmental watering events that used PPMs in 2022–23 in the Lower Darling/Baaka.

LOD22/23-02	Event #1-PPMS-LDR	Event #2-PPMS-LDR
Delivery start date	16/03/2023	19/04/2023
Delivery end date	30/03/2023	30/06/2023
Total volume of environmental water delivered (ML)	61,480	51,976
Total volume of environmental water debited as reported by WaterNSW (ML)	61,480 <i>TLM - 48,300</i> <i>CEWH - 13,180</i>	51,976 <i>TLM - 19,741</i> <i>NSW GS - 2,016</i> <i>CEWH - 30,219</i>
Return flow volume recognised (end of system)	59,949 ML delivered to the Murray recognised as environmental water. There were losses of 1,530 ML in the Lower Darling River from Weir 32 to Burtundy	46,245 ML was delivered to the Murray recognised as environmental water. There were losses of 5,731 ML in the Lower Darling from Weir 32 to Burtundy
Return flow volume recognised (SA border) (ML)	59,949 ML delivered to the SA border recognised as environmental water. No further losses applied as the Murray River was in unregulated conditions.	46,245 ML was delivered to the SA border recognised as environmental water. No further losses applied as the Murray River was in unregulated conditions.
Target daily flow rates and volumes.	Averaging 3,682 ML/day for 15 days requiring 55,231 ML	Averaging 671 ML/day for 73 days requiring 49,052 ML
Actual daily flow rates and volumes	Averaging 4,840 ML/day for 15 days requiring 72,605 ML	Averaging 925 ML/day for 73 days requiring 68,418 ML
Actual daily e-water component and volume	Averaging 4,099 ML/day for 15 days requiring 61,480 ML	Averaging 712 ML/day for 73 days requiring 51,976 ML

3.4 Murrumbidgee (MBG22/23-05)

Two environmental watering actions using directed releases and return flows were undertaken in the Murrumbidgee system from December 2022 to June 2023 – PPMS Event #1a (d/s Maude) and PPMS Event #1b (Balranald) in Table 6. These events aimed to dilute low dissolved oxygen floodwater coming back into the river from the Lower Murrumbidgee and Lower Lachlan floodplains.

A third event (PPMS Event #2 in Table 6) occurred late in the water year to supplement a small rainfall event/airspace release to connect the Lowbidgee wetland assets providing native fish with connectivity and movement cues back to the main river channel.

Table 6: Overview of environmental watering events that used PPMs in 2022–23 in the Murrumbidgee.

MBG22/23-05	PPMS Event #1a (d/s Maude)	PPMS Event #1b (Balranald)	PPMS Event #2
Delivery start date	23/12/2022	20/02/2023	26/06/2023
Delivery end date	20/02/2023	12/04/2023	30/06/2023
Total volume of held environmental water delivered and debited as reported by WaterNSW (ML)	49,253 <i>TLM - 48,000</i> <i>CEWH - 1,253</i>	139,911 <i>TLM - 12,000</i> <i>CEWH - 112,670</i> <i>NSW GS - 15,241</i>	13,044 (CEWH)
Return flow volume recognised (end of system)	49,253 ML No losses applied to e-water in the Murrumbidgee as orders placed at Balranald located at the end of system, losses are socialised to the delivery point.	139,912 ML As per event #1a.	13,044 ML (CEWH) As per event #1a.
Return flow volume recognised (SA border)	49,253 ML As above, no further losses in Murray River as it was under unregulated conditions to SA.	139,912 ML As per event #1a.	13,044 ML As per event #1a.
Target daily flow rates and volumes.	Averaging 5,327 ML/day for 55 days requiring 293,000 ML	Averaging 2,530 ML/day for 65 days requiring 164,500 ML	Target a peak height of 6,500-7,000 ML/day @ Balranald
Actual daily flow rates and volumes	Averaging 6,064 ML/day for 55 days requiring 333,533 ML	Averaging 3,339 ML/day for 65 days requiring 214,692 ML	Averaging 6,197 ML/day for 6 days requiring 37,182 ML
Actual daily e-water component and volume	Averaging 1,750 ML/day for 55 days requiring 96,269 ML	Averaging 1,813 ML/day for 65 days requiring 117,850 ML	Averaging 2,174 ML/day for 6 days requiring 13,044 ML

3.5 Murray multi-site and Edward/Kolety–Wakool

3.5.1 Murray multi-site

A multi-site watering event from Hume Dam to South Australia (MUR22/23-01) used water from NSW held environmental water (HEW) licences in the River Murray regulated system. A total of 94,527 ML of HEW was debited. The River Murray multi-site accounting method used was the difference between releases without environmental water (the hypothetical operational requirements) and the delivery of the environmental water hydrograph, using the agreed loss rate for the calculation of return flow. This multi-jurisdictional ‘Hume to South Australia’ event was undertaken as part of PPMs in the River Murray system overseen by the joint venture states and is therefore not considered further in this report.

3.5.2 Edward/Kolety–Wakool

During the 2022–23 water year there were three events targeting the Edward/Kolety–Wakool River system. The event targeting flows downstream of Stevens Weir (Edward River DS Stevens Weir 2022–23 in Table 7) from January to February 2023, aimed to mitigate the flood recession hydrograph and dilute hypoxic floodwater. An ‘ad-hoc’ methodology for the event was agreed on by all agencies prior the event (included in Appendix C), however, no losses were applied due to the Murray being in unregulated conditions for the duration of the event. The accounting method was subsequently replaced by the ‘Niemur method’ that was applied to “Niemur River 2022–23” below.

Another event (“Edward/Kolety–Wakool River system 2022–23” in Table 7) aimed to deliver baseflows from March to April 2023 in the Colligen, Yallakool and Wakool River systems. These base flows aimed to provide connectivity and opportunities for native fish spawning and recruitment. This event largely re-used flows delivered as part of the multi-site River Murray Hume to South Australia event. Outside the multi-site period additional operational deliveries were made in the Wakool system to meet environmental flow targets ordered against a Commonwealth Held Environmental Water licence. For these operational deliveries a loss rate is used to calculate the losses to be charged to the environmental water holder due to the Wakool being less efficient than the Edward and Murray rivers.

A third event (“Niemur River 2022–23” in Table 7) to deliver baseflows to the Niemur River during regulated conditions occurred for the first time due to the development of a new PPMs accounting arrangement (included in Appendix D) developed by the Water Group in collaboration with the environmental water holders and WaterNSW. The Niemur regulator was opened in April 2023, however, losses were only applied for one day due to unregulated conditions downstream of Stevens Weir for the remainder of the event.

Table 7: Overview of environmental watering events that used PPMs in 2022–23 – Edward/Kolety–Wakool.

MUR21/22-08	Edward River DS Stevens Weir 2022–23	Edward/Kolety–Wakool River system 2022–23	Niemur River 2022–23
Delivery start date	20/01/2023	15/03/2023	22/06/2023
Delivery end date	02/02/2023	17/04/2023	22/06/2023
Total volume of water delivered to support environmental watering (ML)	23,553 (CEWH)	9,322 (CEWH)	206 (TLM)
Total volume of environmental water ordered (ML) as provided by BCS	23,553 (CEWH)	10,948 (CEWH)	30,700 (TLM)
Total volume of environmental water debited (ML) as reported by WaterNSW	23,553 (CEWH)	9,322 (CEWH)	206 (TLM)
Return flow volume recognised (end of system) (ML)	20,785 (CEWH)	No return flows recognised due to the event using operational water deliveries	206 (TLM)
Return flow volume recognised (SA border) (ML)	20,785 (CEWH)	As above.	206 (TLM)
Target daily flow rates and volumes.	Averaging 2200 ML/day for 14 days requiring 28,600 ML (CEWH)	Averaging 80 ML/day for 35 days in the Wakool, 342 ML/day for 35 days in the Yallakool and 403 ML/day for 35 days in the Colligen requiring a total of 28,875 ML (CEWH)	Averaging 423 ML/day for 71 days (TLM)
Actual daily flow rates and volumes	Averaging 2,253 ML/day for 14 days requiring 31,536 ML (CEWH)	Averaging 83 ML/day for 35 days in the Wakool, 398 ML/day for 35 days in the Yallakool, 395 ML/day for 35 days in the Colligen requiring 30,660 ML (CEWH)	Averaging 206 ML/day for 1 day (TLM)
Actual daily e-water component and volume	Averaging 1,682 ML/day for 14 days delivering 23,553 ML (CEWH)	Averaging 266 ML/day for 35 days requiring 9,322 ML (CEWH)	Averaging 206 ML/day for 1 day (TLM)

4 Evaluation of PPMs implementation processes

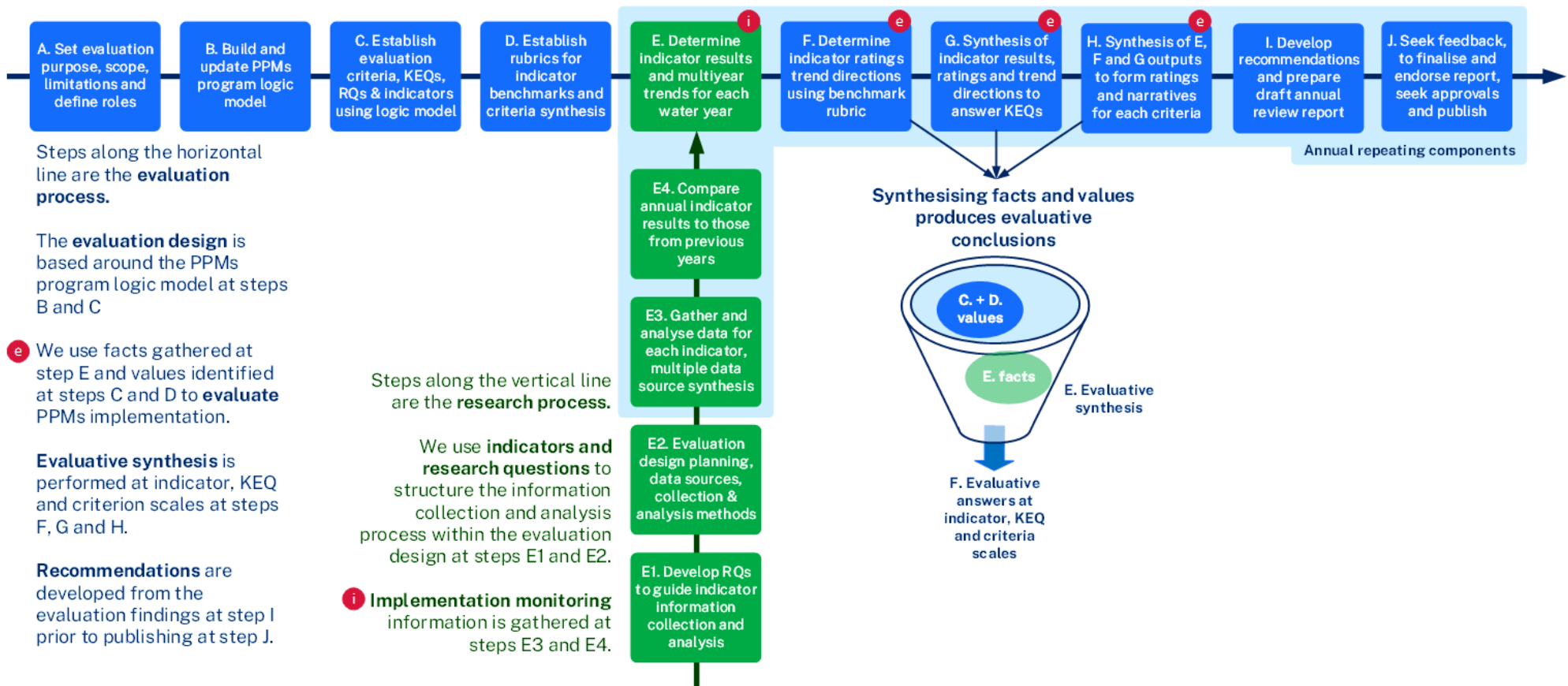
A framework to evaluate the performance of PPMs implementation in NSW was developed by the Water Group in 2023. The framework was a recommendation of the 2019–20 and 2020–21 annual review reports and was designed to expand on the annual review requirements outlined in the procedures manuals. The *Evaluation Framework for PPMs Implementation in NSW – Prerequisite Policy Measures, September 2023* was first applied to the annual review for the 2021–22 water year and is published on the department’s [Pre-requisite policy measures webpage](#).

The purpose of the framework is to be objective, systematic and track the performance of PPMs implementation over time. The framework uses three key criteria of consistency, efficiency, and effectiveness. These criteria reflect the requirements for environmental water protections as described in the Basin-wide Environmental Water Protection Strategy (adopted at Basin Officials Committee meeting 81 in 2021).

The framework structure shown in Figure 2 is used to navigate the evaluation process. Evaluation steps E through to J were undertaken as part of this annual review. The framework uses a program logic model of PPMs procedures and broad knowledge of implementation processes as the basis for the selection of key evaluation questions (KEQs) and performance indicators (PIs). The evaluation framework sets five KEQs to be answered annually using a range of indicators as shown in Appendix E Key evaluation questions.

The 2022–23 evaluation findings for each KEQ are summarised in Section 4.1. Results from the evaluation indicator analysis are provided in Appendix F Evaluation results. The indicator results and KEQ findings informed the recommendations for this annual report.

Figure 2: Steps for PPMs process evaluation (extracted from the NSW PPMs Evaluation Framework)



4.1 Evaluation findings

The three evaluation criteria scored an 'average' rating for the 2022–23 water year, meaning minimal improvement in the implementation of the PPMs program. The criteria ratings were based on the mostly moderate ratings for performance indicators and mostly neutral multi-year performance indicator trends (shown in Table 8). No performance indicators achieved a 'high performance' rating during the 2022–23 water year. The focus area that performed at a low level was 'risk identification'.

Trends for the performance indicators were mostly neutral, meaning they remained at moderate performance, with increasing trends for information provision and information quality. This can be attributed to the additional resourcing for PPMs implementation by WaterNSW in 2023. The other increasing trend was for 'implementation'. This reflects the work undertaken by the department to first understand the issues arising during deliveries using PPMs, and then address these issues by amending accounting measures or procedures and updating the procedures manuals accordingly.

The performance indicator 'risk identification' retained a low score for 2022–23 reflecting that despite the risk assessments undertaken by both the environmental water holders and river operators there is still little documentation of the consideration of risks during PPMs implementation.

The value-based rating for each performance indicator (shown in Table 8) was determined by comparing the evidence to the scoring guide (Appendix D of the Evaluation Framework). The evidence included document reviews (that is, reviews of reports provided by the river operators and environmental water holders), and information gathered from any clarifying interviews with relevant agencies or PPMs working group discussions.

Narrative results for each KEQ and key findings associated with each criterion are provided in the following sections.

Table 8: PPMs performance indicator rating summary 2022–23

Consistency performance indicators (KEQ 1 & 5)	Rating	Trends since PPMs started
PI 1a Roles and responsibilities	Moderate	➡ neutral
PI 1b Roles and responsibilities	Moderate	➡ neutral
PI 2a Information quality	Moderate	⬆ increasing
PI 3 Impediments or barriers	Moderate	➡ neutral
Consistency	Average	➡ neutral
Efficiency performance indicators (KEQ 2, 4 & 5)	Rating	Trends since PPMs started
PI 2b Information provision	Moderate	⬆ increasing
PI 4 Risk identification	Low	➡ neutral
PI 5 Adaptive response & improvement changes	Moderate	➡ neutral
PI 7 Balance within risk management	Moderate	➡ neutral
Efficiency	Average	➡ neutral
Effectiveness performance indicators (KEQ 3 & 5)	Rating	Trends since PPMs started
PI 6 PPMs outcomes	Moderate	➡ neutral
PI 8 PPMs Implementation	Moderate	⬆ increasing
Effectiveness	Average	➡ neutral

4.2 Consistency

Consistency interpretation:

Whether the PPMs process was followed as intended and activities were implemented consistently to support return flows and piggybacking of environmental water; whether consistency improves through time.

To understand the degree of consistency of PPMs process implementation, identify constraints and barriers to implementation.

During the 2022–23 water year most of the PPMs procedures were performed to support piggybacking and return flows of environmental water. Key agencies demonstrated a clear understanding of their roles and were able to meet the fundamental responsibilities in the ordering and delivery of environmental water.

The activities that were not completed primarily related to the post-event review process. The key barriers to the completion of this work includes a lack of resourcing, clear responsibilities, and procedures for this work. The evaluation of the consistency criteria reflects the relative infancy of the PPMs water reform and addressing the deficit in adaptive management is a key step to improving PPMs implementation. There was no change to ratings or indicator trends for the 2022–23 year for the consistency performance indicators except for ‘information quality’ that increased from low to moderate. This reflects the improvements in reporting by all agencies with supporting information. Despite an improvement in the quality of reporting by the river operator the environmental water holders are still not receiving the return flows split by water holder for all systems, the Murrumbidgee usage outside of the main river channel is not being provided routinely and more regular usage estimates are required. A summary of indicator results is provided in Table 9.

Table 9: Evaluation result summary for implementation consistency

Consistency performance indicators (KEQ 1 & 5)	Rating	Trends since PPMs started
PI 1a Roles and responsibilities	Moderate	➡ neutral
PI 1b Roles and responsibilities	Moderate	➡ neutral
PI 2a Information quality	Moderate	⬆ increasing
PI 3 Impediments or barriers	Moderate	➡ neutral
Consistency	Average	➡ neutral

4.2.1 KEQ 1 – How consistently were PPMs implemented during the last water year and how did that compare to previous years?

In the 2022–23 water year, the key responsibilities for PPMs implementation were mostly fulfilled and ten watering events relying on PPMs took place. This demonstrated agencies generally have a good understanding of their roles and requirements. Assumed use methods as per the procedures manual were applied for e-water deliveries in the Lower Darling, Great Darling Anabranch, Edward/Kolety–Wakool system, Niemur River, Murrumbidgee River as well as being applied to HEW entering the Murray from the Murrumbidgee and Lower Darling. Losses for the multi-site delivery in the Murray River were applied as per SO&O2.5.

Appendix G Fulfillment of roles and responsibilities offers a summary of the operational procedures followed for actions in the 2022–23 water year. Crosses or ticks represent whether the procedure was implemented and is marked against the responsible agency/agencies only.

Across the requirements of the roles and responsibilities agreement:

- 11/11 requirements met for Planning (an improvement from 10/11 in 2021–22)
- 6/9 requirements met for Implementation (an improvement from 5/9 in 2021–22)
- 8/12 requirements met for Adaptive management (an improvement from 7/12 in 2021–22)
- 3/3 requirements met for Consultation (not assessed in 2021–22)

Gaps in implementation were generally around risk identification and reporting, interagency communication and adaptive management procedures. The procedure for environmental water holders and river operators to “work collaboratively to develop orders for environmental water actions and recommend appropriate risk mitigation strategies” was considered only somewhat complete. Although BCS and WaterNSW both have risk assessment processes in place, there was limited collaboration on risk. BCS conducts a risk assessment of environmental watering actions as part of the event planning process in e-flow. WaterNSW considers the risks associated with all water orders. The risks of under/overestimating the volume of environmental water used and potential forfeiture risks, and their mitigation measures were documented in the Annual Environmental Release River Operations Report.

Risks to other water users are also generally considered at a bulk level during the initial planning stage when assumed use arrangements are being determined. The risk assessment process should also identify any risks to third parties such as inundation of property or safety risks.

There were no known adverse outcomes in the delivery of environmental water during the 2022–23 year. However, further work is required to document the risk assessment processes in the procedures manuals. This was also a recommendation of the evaluation of the 2021–22 water year.

The adaptive management procedures not completed were to ‘build and expand data sets’, ‘hindcasting and review’ and ‘refining/improving accounting arrangements.’ Work to modify existing arrangements during 2022–23 was conducted reactively if there were unforeseen scenarios. No work to review the arrangements using post-event accounting methodologies was conducted.

The post-event review is important to ensure that the level of conservatism in the accounting arrangements is commensurate with the risk to other water users. No post-event reviews have been conducted to date to compare ‘actual’ losses to assumed use. The capability to do this review using the MDBA Source model is currently being developed by River Murray Operations for the multi-site

event and this method may be replicated for NSW PPMs events where appropriate. Further work needs to be done embed the post-accounting procedures into PPMs implementation. A post-event review of the Edward–Wakool was a recommendation of the 2021–22 report that will be retained. This work has been progressed in the 2023–24 water year.

Stakeholder consultation was completed as required by the Procedures Manual. No issues were raised by external stakeholders regarding the use of PPMs.

Breach of TLM water delivery in 2022–23

In June 2023, 206 ML of jointly managed water was unintentionally accounted against TLM NSW Murray licence for an environmental water event on the Niemur River (instead of CEWH). There was no recognition of return flows from this event. This constitutes an accounting breach as this delivery was not within a TLM Icon Site and was not supported by a SCBEWC commitment.

Once the breach was identified, the MDBA EWC team worked with NSW to identify options to update the retail accounting to another water holder. This was not possible as accounts had been finalised and closed for 2022–23.

Improvements in the procedures manual to provide clarity on the approval process for environmental water orders will help mitigate the risk of this occurring again. This will include the need for the river operator to check the licence conditions prior to delivery of the order. In addition, monthly reporting of accounting by the river operators will enable the environmental water holders with access to information so that any errors can be identified and rectified prior to the closing of accounts.

4.2.2 KEQ 5 - How can the consistency of PPMs be improved?

No new recommendations have been made based on the finding from 2022–23 evaluation of consistency that were not already highlighted in 2021–22 evaluation. Some progress on the recommendations below has been made, including work by the EEWD Project team to improve the ordering process and work by the Water Group to conduct post-event accounting for deliveries in the Wakool and Yanco Creek systems. Further work is needed to ensure post-event accounting is completed on an annual basis.

Table 10: Update on 2021–22 recommendations relating to KEQ 5 and implementation consistency

Recommendation	Arising from
The Water Group collaborate with other agencies to streamline the PPMs implementation process, including fit-for-purpose water ordering, documentation of risks and mitigation measures and reporting requirements	Carried over from 2021–22 In progress
The Water Group collaborate with WaterNSW to develop a method for completing a post-event comparison of losses debited as per assumed use statement with 'actual' loss	Carried over from 2021–22 In progress
WaterNSW to provide return flows split by water holder for the Murray and Murrumbidgee floodplain water use estimates.	KEQ 1

4.3 Efficiency

Efficiency interpretation:

Whether the implementation of the PPMs process was timely, activities could be easily implemented, how the process (and supporting arrangements) has improved over time.

To understand whether the PPMs process is easy to follow and practical to implement across the agencies.

To identify possible improvements within the PPMs process and document for action through the PPMs adaptive management process; to understand issue size and agency perspectives.






The PPMs processes were adequately implemented however not in the timely or efficient manner that is required as per the Procedures manuals. Investment in environmental water accounting from WaterNSW has resulted in significant progress on improving the timeliness of reporting and the performance indicator rating shifting from low to moderate resulting in an increasing trend.

Throughout 2022–23 the efficiency of PPMs implementation improved slightly due to improvements in the timeliness of reporting. There were still some inefficiencies with several accounting issues that required ad-hoc interagency meetings to resolve. Whilst these issues were successfully negotiated, work to provide additional detail in the procedures manuals around these issues, such as the accounting of air-space releases and rainfall rejection, would increase the efficiency of PPMs planning, delivery and accounting.

The completion of the recommendations from previous years declined slightly since the 2021–22 annual review. This was due to the scope of the recommendations from the previous year being quite large actions requiring collaboration by multiple agencies. The performance indicator rating of moderate was incomplete recommendations have been retained in this year’s work plan.

Risk management retained a low performance rating despite risk assessment and mitigation measure being in place, there is little documentation with regards to the consideration of risks during PPMs implementation.

Table 11: Evaluation result summary for implementation efficiency

Efficiency performance indicators (KEQ 2, 4 & 5)	Moderate	Trends since PPMs started
PI 2b Information provision	Moderate	 increasing
PI 4 Risk identification	Low	 neutral
PI 5 Adaptive response & improvement changes	Moderate	 neutral
PI 7 Balance within risk management	Moderate	 neutral
Efficiency	Average	 neutral

4.3.1 KEQ 2 – Was the PPMs process implemented efficiently during the last water year and how did that compare to previous years?

The creation of the new 'Manager Environmental and Cultural Water' role as well as additional resourcing within WaterNSW has significantly improved the timeliness of reporting. The annual reports were submitted within the required timeframe to a high standard. This is a significant improvement from the previous water year where reporting was significantly delayed, in part due to flooding and emergency operations taking place. WaterNSW has embedded the accounting arrangements within the operational spreadsheets. This has further improved the timeliness of reporting; however, the monthly reporting requirement is not yet met reliably, with the environmental water holders needing to follow-up with WaterNSW to receive water usage and return flows in the Murrumbidgee. The ability to undertake 'within-event' or 'real-time' reporting remains a complex issue that is still being investigated.

Opportunities to further streamline the annual reporting process were identified. WaterNSW recommended that the reconciliation of watering events could be provided to the Water Group post event rather than annually and the water order volume be reported by the environmental water holder rather than the operator. WaterNSW also raised that the environmental water orders are revised multiple times during events requiring the accounting to be updated with each new order.

The PPMs ordering process has been highlighted as resource intensive by both environmental water holders and operators. There are multiple ordering systems as well as a detailed written order format. Due to the complexity of the ordering system and resourcing constraints the environmental water managers have on occasion submitted the order via the WaterNSW ordering system after the commencement of the watering event increasing liability for the operators. The EEWD Project team are conducting a review of the ordering process for the Murray multi-site delivery and will share the recommendations with the PPMs Working Group.

WaterNSW have also highlighted increasing the visibility of upcoming environmental watering events as an opportunity to improve the efficiency of PPMs implementation. This could be achieved through an annual planning process that involves sharing the watering plan and river operating outlook or forecast for the upcoming water year. The ability for the WaterNSW Source model to provide an annual forecast is still in development; however, there may be some forecasting work that can be provided to the environmental water holders in the interim.

Throughout the year ad-hoc meetings between agencies were required to discuss several PPMs accounting issues. This was due to a lack of clarity in the procedure manuals regarding the accounting of air-space releases, rainfall rejection, Lowbidgee Supplementary Access Licences, piggybacking on translucency releases and filling the Lowbidgee Weir Pool. These issues were resolved for the 2022–23 water year; however, they need to be detailed and updated in the procedures manuals.

Updates to the following accounting methods were required to address errors and missing information for the 2022–23 water year:

Table 12: Updates to PPMs accounting methods during the 2022–23 water year

	Issue	Resolution
Lower Darling	Loss method in the procedures manual was missing whether losses applied during unregulated conditions in the Murray River	No losses apply when Murray in Unregulated conditions to be consistent with arrangement for HEW from the Lower Darling
Murrumbidgee	Error found in the calculation for the loss percentages for the Murrumbidgee method for HEW entering the Murray River resulting in higher losses.	Table corrected. Due to unregulated conditions in the Murray River there were no losses applied in the 2022–23 water year and hence no impact from the error.
Great Darling Anabranh	Tara Downs gauge back-water effected and return flow policy not able to be followed.	Loss method amended to use the Bulpunga gauge instead of Tara Downs when backwater effected.

The above issues did not result in any significant impacts to environmental water holders or other consumptive licence holders; however, it reflect that the methods are still being tested and improved. Where new methods had been developed but not yet published in the procedures manual there was confusion around the correct version. A central location for the latest versions would ensure that superseded versions are not used.

4.3.2 KEQ 4 – Are adaptive management processes effective in improving PPMs implementation?

Whilst significant progress on the recommendations from the 2021–22 water year was made to improve PPMs implementation, only 2 of the 9 recommendations were completed. This is a decrease from the previous year where 5 of the 10 recommendations were completed. This is partially because two of the additional positions within the Water Group, (funded by the Commonwealth Federal Funding Agreement), were not filled until July 2023 and hence there was limited capacity during the 2022–23 year.

Table 13: Recommendations from the 2021–22 PPMs annual evaluation and review

	2021–22 Recommendations	Status
R.1	The Water Group determine assumed uses for directed releases in the Murrumbidgee	In progress
R.2	The Water Group collaborate with other agencies to streamline the PPMs implementation process, including: – fit-for-purpose water ordering – documentation of risks and mitigation measures – reporting requirements	In progress
R.3	The Water Group to convene a workshop to discuss accounting issues in the Murrumbidgee and develop a set of principles for PPMs implementation	In progress (Note complete as of August 2023)
R.4	The Water Group develop a policy on PPMs from Menindee Lakes System when under NSW control	In progress
R.5	The Water Group review the Edward/Kolety river assumed use statement, work with River Murray Operations (RMO) to simplify and improve accuracy for varying conditions	In progress (Note complete as of March 2024)
R.6	The Water Group develop a policy on the use of MIL escapes for return flows	In progress
R.7	The Water Group collaborate with WaterNSW to develop a method for completing a post-event comparison of losses debited as per assumed use statement with ‘actual’ loss	In progress
R.8	PPMs Working Group update the NSW PPMs work plan to include recommendations from this annual review report and prioritise, taking into consideration other high priority PPMs tasks and resource availability	Complete
R.9	The Water Group to progress a review of the procedures manuals and update as necessary to reflect new actions and the outcomes of recommendations	Complete (Updated December 2022)

The recommendations from the 2021–22 water year that were not been completed were included in the recommendations for the 2022–23 water year.

4.3.3 KEQ 5 – How can the efficiency of PPMs be improved?

The procedures manuals set out clear arrangements that have enabled PPMs to be operable within the NSW water management framework however, it has become apparent that further detail is required. This need is similar to the experience of the MDBA in implementing PPMs in the Murray River. Despite the SO&O documenting the operational procedures for the River Murray System, the MDBA has developed an additional resource the ‘River Murray Environmental Watering Manual’ (EWM) that provides further detail to guide management decisions for environmental water planning, delivery and accounting for river operators and environmental water planners. There may be opportunities to replicate some procedures or details from the Murray manual within the NSW procedures manuals where appropriate. Providing further guidance on the implementation of PPMs in NSW will provide improved efficiency.

Table 14: Update on 2021–22 recommendations relating to KEQ 5 and implementation efficiency

Recommendation	Arising from
Develop a procedure for annual planning that includes collaboration between river operators and environmental water holders to share information on the annual outlook/forecast scenarios and annual watering plan and discuss any risks or opportunities arising	KEQ2
Create a central location for the latest versions of accounting methods (interim measure until Procedures manuals are updated)	KEQ2
Procedures manuals updated to include clarity on the accounting of air-space releases, rainfall rejection, Lowbidgee Weir Pool filling, piggybacking on translucency flows and recognition of return flows from supplementary access licences (SALs)	KEQ2

4.4 Effectiveness

Effectiveness interpretation:

Whether the NSW PPMs implementation process is effective in providing a secure, operable, adaptive and transparent framework for the protection of held environmental water (PPMs do not currently apply to planned environmental water).

To determine whether adaptive improvement processes are working; to inform recommendations for implementation design improvement; to identify opportunities to improve the PPMs process and refine related activities.

PPMs are generally effective in improving the use of accounting of environmental water. The accounting arrangements that are in place and were used during the 2022–23 water year demonstrate these efficiencies.

Environmental water events using PPMs were undertaken in the Lower Darling, the Great Darling Anabranh, the Murrumbidgee and the Edward/Kolety–Wakool system, as well as multi-site events in the River Murray.

During 2022–23 a total of 503 GL of environmental water deliveries in NSW resulted in 479 GL of ‘return flows’ being recognised at the South Australian border.

Individual event hydrographs provided in the Annual Environmental Release River Operations Report (Appendix A WaterNSW Annual Environmental Release River Operations Reports) show the volumes of event hydrographs compared with the volume of environmental water debited.

The performance indicator for PPMs outcomes retained a moderate rating due to despite the lack of post-event accounting the majority have not been in place for over three years and hence are not yet overdue for review. The performance indicator trend for PPMs implementation increased due to improvements and new accounting measures being developed and included in the procedure manuals.

Table 15: 2021–2022 evaluation result summary for implementation effectiveness

Effectiveness performance indicators (KEQ 3 & 5)	Moderate	Trends since PPMs started
PI 6 PPMs outcomes	Moderate	↔ neutral
PI 8 PPMs Implementation	Moderate	↑ increasing
Effectiveness	Average	↔ neutral

4.4.1 KEQ 3 – How effective are PPMs in improving the use and accounting of environmental water?

PPMs are generally effective in improving the use of accounting of environmental water. The accounting arrangements that are in place and were used during the 2022–23 water year demonstrate the high use of return flows, however no post-event accounting has been done to compare the water use that would have occurred if PPMs were not in place.

In the 2022–23 water year a new accounting arrangement was developed to facilitate opening the Niemur regulator to provide a baseflow in the Niemur River over winter when the Murray was in regulated conditions. The losses were considered to be ‘unrealistically high’ by the MDBA, due to a discrepancy between the MDBA Wakool system loss model and the Water Group water balance using gauge data. The decision to adopt a 75th percentile loss rather than a 90th percentile loss was made to address the fact that local rainfall events may have artificially driven up losses when using the Water Group method. The arrangement was accepted as a ‘trial’, however, further work is needed to refine this method in the future.

In the 2023–24 water year, accounting methods for the Werai Forest and Yanco Creek return flow recognition have been approved for use. In addition, the review of the Edward/Kolety–Wakool accounting method has been completed and has resulted in a new accounting method that improves accuracy and operability. As these methods were completed in the 2023–24 water year they have not been considered in this annual review.

There are still some gaps in the accounting arrangements for environmental watering actions that limit the effectiveness of PPMs. These accounting arrangements include:

- Return flows from within channel and overbank directed releases in the Murrumbidgee ordered to points upstream of Balranald
- Return flows from the mid-Murrumbidgee and Lowbidgee wetlands

4.4.2 KEQ 5 – How can the effectiveness of PPMs be improved?

All water orders for environmental delivery using PPMs were accepted for all events in the 2022–23 water year. In previous years there was a rejection of the water order for the recognition of return flows from Menindee Lakes. Currently, this is at the NSW Government discretion however a recommendation from the MDBA of review of PPMs in NSW was to provide further clarity on this issue. The development of a NSW policy on PPMs from the Menindee Lakes System when under NSW control has been an outstanding recommendation from previous annual reviews. It is

recommended that this item is carried over to the 2023–24 work plan to provide clarity for all parties.

Table 16: Update on 2021–22 recommendations relating to KEQ 5 and implementation effectiveness

Recommendation	Arising from
The Water Group develop a policy on PPMs from the Menindee Lakes System when under NSW control	Carried over from 2021–22 In progress
The Water Group determine assumed uses for directed releases in the Murrumbidgee and return flows from mid and Lowbidgee wetlands	Carried over from 2021–22 In progress
The Water Group progress a review of the procedures manuals and update as necessary to reflect new actions and the outcomes of recommendations	KEQ 5

5 Next steps

The Water Group will progress recommendations from this evaluation and review via the PPMs Working Group Work Plan (see Appendix H PPMs Working Group Work Plan as of April 2024). New recommendations will be incorporated into the work plan, then prioritised and scheduled by the PPMs Working Group.

The Water Group will aim to improve the consistency, efficiency, and effectiveness of PPMs by first providing additional staff resources to work on the recommendations. The additional resources will focus on recommendations carried over from 2021–22 (R.1, R.2, R.7 and R.8) and will aim to update the procedures manuals for publication in 2024–25, which encompasses most recommendations.

Appendix A WaterNSW Annual Environmental Release River Operations Reports

Annual Environmental Release River Operations Report – Lower Darling 2022–23

This report was prepared by WaterNSW in accordance with the reporting requirements described under Section 5.1 of the Prerequisite Policy Measures Procedures Manual for the Murrumbidgee Regulated River and the Prerequisite Policy Measures Procedures Manual for the NSW Murray and Lower Darling Regulated Rivers.

Report prepared by:	David Wood	Report approved by	Jonathan Belej
Position	Water Planning and Delivery Specialist South	Position	Manager Water Planning and Delivery – South
Contact number	0429310422	Contact number	0436 950 529
Date prepared	28/10/2023	Date approved	11/12/23

Environmental watering actions

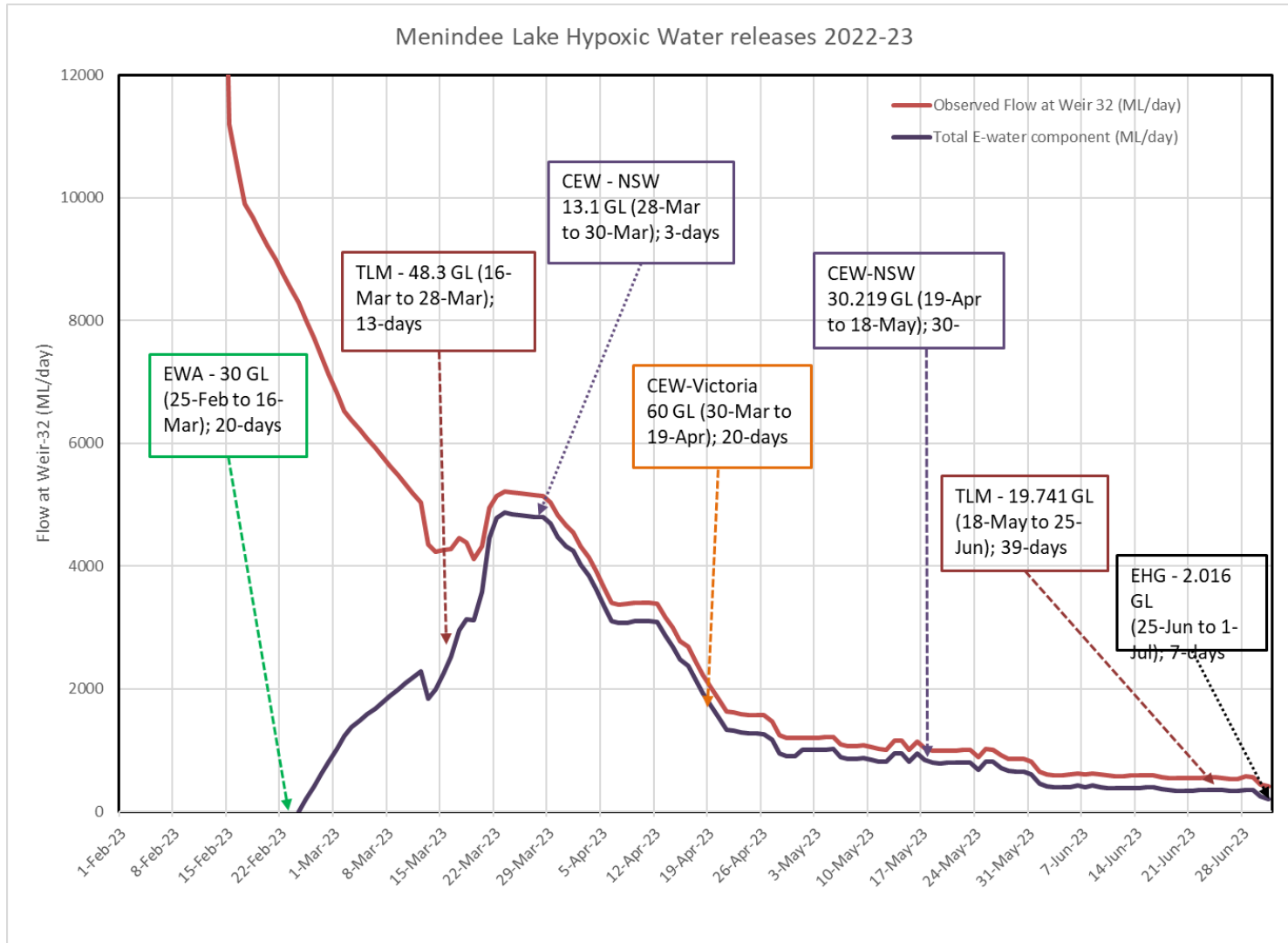
Table 17 provides an overview of the environmental water actions undertaken using PPMs in the 2022–23 water year.

Table 17: Summary of PPM watering actions in 2022–23

Name of environmental watering action	Event#1-PPM-LDR	Event#2-PPM-LDR
River system	Lower Darling River	Lower Darling River
Type of PPM event	Directed releases from Menindee Lakes via the Lower Darling River	Directed releases from Menindee Lakes via the Lower Darling River
General description of watering action	Provide environmental water to: Slow the recession of the flood at Weir 32, to support native fish by mitigating hypoxic water; and Contributing to elevated baseflows over autumn and winter, to provide food and habitat for surviving fish.	Provide environmental water to: Slow the recession of the flood at Weir 32, to support native fish by mitigating hypoxic water; and Contributing to elevated baseflows over autumn and winter, to provide food and habitat for surviving fish.
Start date	16/3/2023	19/4/2023
End date	30/03/2023	30/6/2023
Was this an agreed or interim action?	Agreed	Agreed

Name of environmental watering action	Event#1-PPM-LDR	Event#2-PPM-LDR
Delivery pathway	Residual held environmental water from the Lower Darling at Burtundy, recognised through to the South Australian border without regulation in Lake Victoria.	Residual held environmental water from the Lower Darling at Burtundy, recognised through to the South Australian border without regulation in Lake Victoria.
Environmental site/s watered	Lower Darling in-channel delivery (via directed releases from Menindee Lakes when a shared resource).	Lower Darling in-channel delivery (via directed releases from Menindee Lakes when a shared resource).
Total volume of water delivered (ML)	61,480 ML	51,976 ML
Accounting method used	Whilst Menindee Lakes are a shared storage, MDBA will undertake the bulk level accounting of environmental releases from Weir 32 and provide daily and monthly usage numbers to WaterNSW for retail accounting requirements. Return flows to South Australia will be based on the Procedures Manual for the NSW Murray and Lower Darling Regulated Rivers (2022) as appropriate	Whilst Menindee Lakes are a shared storage, MDBA will undertake the bulk level accounting of environmental releases from Weir 32 and provide daily and monthly usage numbers to WaterNSW for retail accounting requirements. Return flows to South Australia will be based on the Procedures Manual for the NSW Murray and Lower Darling Regulated Rivers (2022) as appropriate

Figure 3: All environmental water releases Lower Darling River February 2023 – June 2023



Water orders

Table 18 provides an overview of the environmental water orders received for Prerequisite Policy Measures in the 2022–23 water year (including any order that was subsequently refused/rejected).

Further detail is attached in Attachment A as needed, including water orders and assumed use statements. If any water order using PPMs was refused, documentation and rationale are provided supporting this decision.

Table 18: Water orders received by WaterNSW in 2022–23 – Lower Darling River

Order number	Event-1	Event-2	Event-2 Amended
Organisation submitting order	DPIE	DPIE - EHG	DPIE - EHG
Date order was submitted	16/3/2023	27/4/2023	11/5/2023
Volume of order (ML)	CEWH – 6,103 TLM – 49,128	CEWH - 25,000 TLM – 13,828	CEWH - 24,097 TLM – 17,117 NSW – 1,200
Organisation delivering order	WaterNSW	MDBA	MDBA
Release date	16/3/2023 – 30/3/2023	19/4/2023 – 30/6/2023	19/4/2023 – 30/6/2023
Form of water order submitted (e.g. Form A, email, verbal, other)	Emails	Email – Word Version	Email – Word Version

Order number	Event-1	Event-2	Event-2 Amended
List of supporting documents	D2023-162939 - 2023-03-16 Email - CEWH use_ Menindee Ops releases from DPIE to WaterNSW	D2023 - 162937 2023-04-27 Email - PPM Order - Lower Darling_Baaka Water Order	D2023- 162938 - 2023-05-11 Email - PPM Order Lower Darling_Baaka Water Order - Amendment No_ 1

Comparison of forecast and actual environmental water use

Event #1- PPM Lower Darling River

- target daily flow rates and volumes.
 - Averaging 3,682.1 ML/day for 15 days requiring 55,231.5 ML.
- actual daily flow rates and volumes
 - Averaging 4,098.7 ML/day for 15 days delivering 61,480 ML.
- forecast losses and actual losses (at an appropriate temporal scale for the event)
 - There were losses of 1,530.8 ML in the Lower Darling River from Weir 32 to Burtundy. No further losses were recognised to the Murray River as it was unregulated for the period of this flow as as per the PPM accounting arrangements.
- volume of environmental water debited (with licence corresponding licence numbers)
 - A total of 61,480 ML was debited from HEW licences.

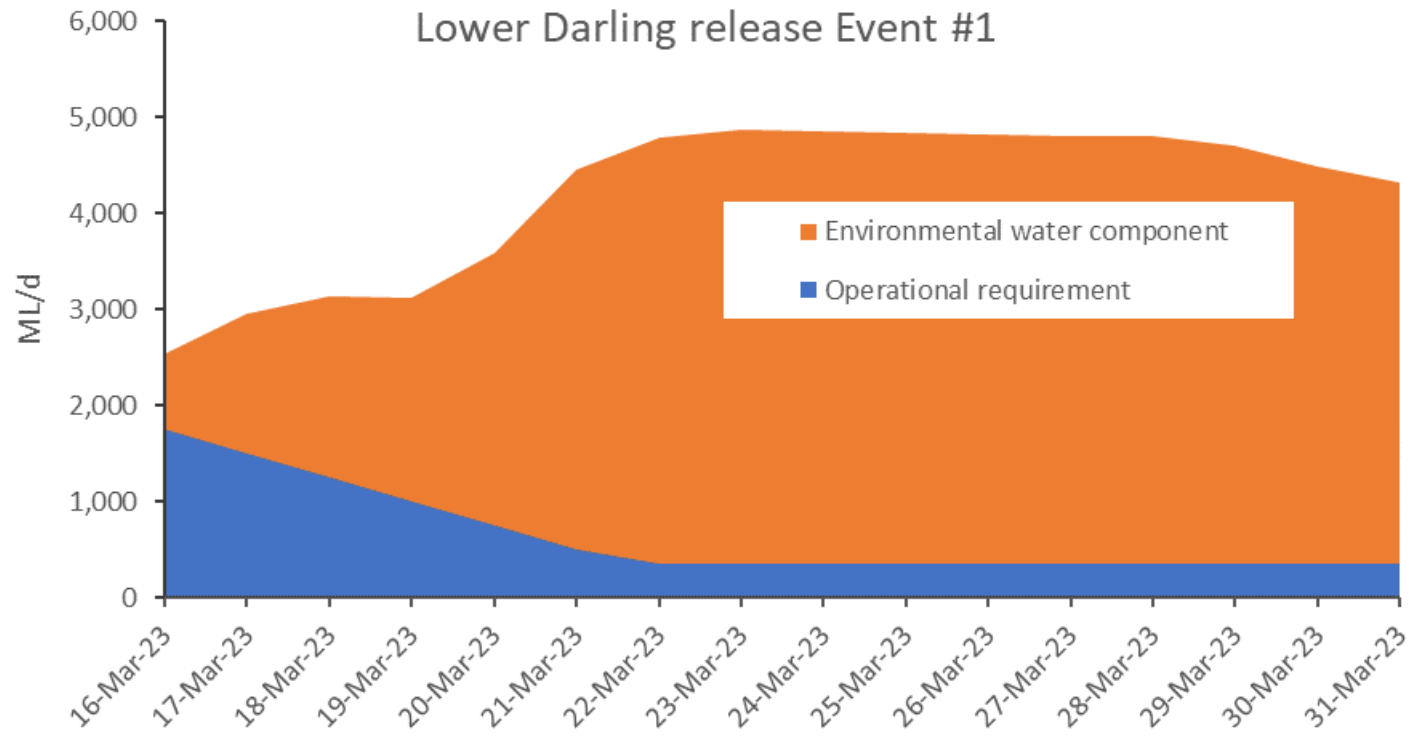
Table 19: Orders and usage assigned to water access licences

Licence #	Orders (ML)	Usage (ML)
60AL582512	49,128.3	48,300

Licence #	Orders (ML)	Usage (ML)
60AL583376	6,103.2	13,180

- volume of water delivered to the Murray Valley that will be recognised as environmental water.
 - 59,949.2 ML was delivered to Murray Valley
 - Out of which about Nil ML is deemed to be lost in the Murray system and hence 59,949.2 ML will be recognised at SA Border

Figure 4: Lower Darling release event #1



Event #2 – PPM Lower Darling River

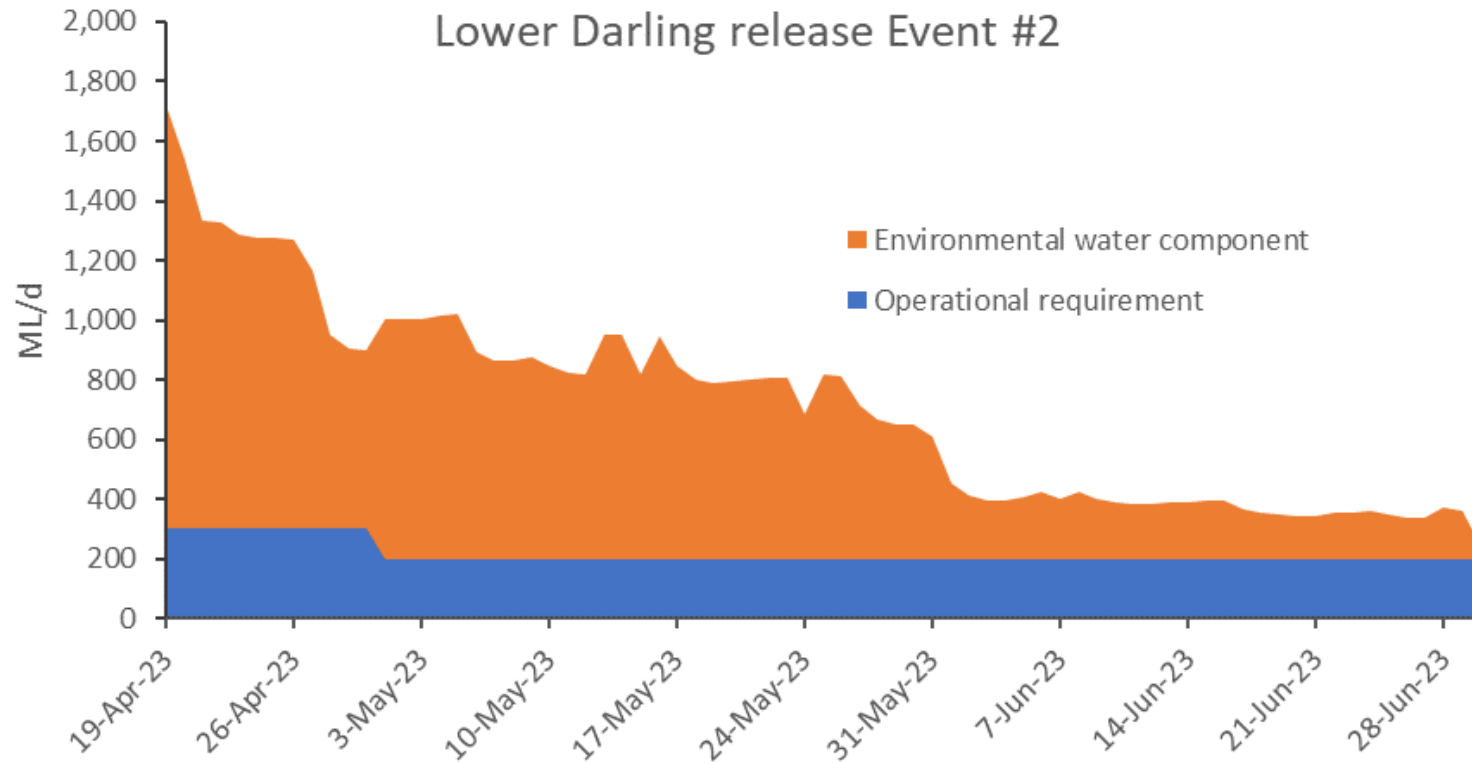
- target daily flow rates and volumes.
 - Averaging 671.9 ML/day (vary from 250 to 1,850 ML/day) for 73 days requiring 49,052.2 ML.
- actual daily flow rates and volumes
 - Averaging 712 ML/day for 73 days delivering 51,976 ML.
- forecast losses and actual losses (at an appropriate temporal scale for the event)
 - There were losses of about 5,731 ML in the Lower Darling River from Weir 32 to Burtundy. No further losses were recognised to the Murray River as it was unregulated for the period of this flow as per the PPM accounting arrangements.
- volume of environmental water debited (with licence corresponding licence numbers)
 - A total of 51,976 ML was debited from HEW licences.

Table 20: Orders and usage assigned to water access licences

Licence #	Orders (ML)	Usage (ML)
60AL582512	18995.8	19741
60AL583376	30056.4	32235

- volume of water delivered to the Murray Valley that will be recognised as environmental water.
 - 46,245 ML was delivered to Murray Valley
 - Out of which about Nil ML is deemed to be lost in the Murray system and hence about 46,245 ML will be recognised at SA Border

Figure 5: Lower Darling release event #2



Stakeholder consultation

Table 21 provides a summary of stakeholder consultation. Supporting documents are included in Attachment C.

WaterNSW do not undertake stakeholder consultation as part of environmental water delivery. WaterNSW role is operational and is a key stakeholder of the environmental water holders. All stakeholder consultation regarding delivery of environmental water is undertaken by the environmental water holders.

Table 21: Summary of stakeholder consultation

Date	Stakeholder forum/name	Environmental watering action/s discussed	Type of consultation	Summary of feedback	Stakeholder requests	List of supporting documents
14/03/2023 to 27/06/2023	DPI, CEWO, DPI EHG, Fisheries, MDBA, WaterNSW	How water will be accounted for if delivered from different lakes	Hypoxic Water committee meetings	E-water to be available to manage the DO downstream of Main Weir, through to Weir 32	Potential operational releases from the lakes by WaterNSW and MDBA	Meeting minutes by Veronica Silberschneider, DPE
24/03/2023	DPI EHG, DPI Fisheries, CEWO, MDBA, WaterNSW	2022–23 Lower Baaka environmental flow discussions	TAG – Team Meetings	River Operations update, HEW use options	Operational update (Releases, inflows and Lake levels for fish passage etc.), Water quality, E-water use options, Monitoring update, Comms and engagement	

Date	Stakeholder forum/name	Environmental watering action/s discussed	Type of consultation	Summary of feedback	Stakeholder requests	List of supporting documents
Weekly meetings	DPI – EHG, WaterNSW	Water accounts, water orders	Murray & Lower Darling environmental water updates		Accounts update	
Monthly meetings	DPI, WaterNSW	PPM/Southern Basin e-water discussion	Current/planned events, progress on actions from the PPM workplan	Discuss all things PPM/southern Basin e-water related		

Recommendations to improve future environmental watering actions

Table 22 provides a summary of key issues encountered in 2022–23 and recommendations for addressing these. Supporting documents are included in Attachment D.

Table 22: Summary of issues and recommendations

Environmental watering action	Issue	Agencies involved	Stakeholders involved	Recommendations	List of supporting documents
All events	Water order process requires improvement	DPI	DPI EES, CEWO, TLM, DPE	Ordering process needs to use WaterNSW water ordering system and be applied prior to start of events.	

Environmental watering action	Issue	Agencies involved	Stakeholders involved	Recommendations	List of supporting documents
All events	Planning	DPI	DPI EES, CEWO, TLM, DPE	Clear annual planning foresight required by e-water holders (under different scenarios) to provide operators an opportunity to look at long-term forecasting. Planning needs to be a little less reactive.	

Attachments

Attachment A – Water orders

- D2023-162939 - 2023-03-16 Email - CEWH use_ Menindee Ops releases from DPIE to WaterNSW
- D2023 - 162937 - 2023-04-27 Email - PPM Order - Lower Darling_Baaka Water Order
- D2023- 162938 - 2023-05-11 Email - PPM Order Lower Darling_Baaka Water Order - Amendment No_ 1

Attachment B – Assumed Use Statements and evidence of other calculations used

- D2023-058847 01 July 2023 - Menindee Lower Baaka HEW Hypoxic Event 2022-2023_MDBA Version Updated 2023-07-26

Attachment C – Details of stakeholder consultation and feedback

Attachment D – Supporting documents for key issues encountered and recommendations to address these

Annual Environmental Release River Operations Report – Great Darling Anabranch 2022–23

This report was prepared by WaterNSW in accordance with the reporting requirements described under Section 5.1 of the Prerequisite Policy Measures Procedures Manual for the Murrumbidgee Regulated River and the Prerequisite Policy Measures Procedures Manual for the NSW Murray and Lower Darling Regulated Rivers.

Report prepared by:	David Wood	Report approved by:	Jonathan Belej
Position:	Water Planning and Delivery Specialist South	Position:	Manager Water Planning and Delivery South
Contact number:	0429310422	Contact number:	0436 950 529
Date prepared:	28/10/2023	Date approved:	11/12/2023

Environmental watering actions

Table 23 provides an overview of the environmental water actions undertaken using PPMs in the 2022–23 water year.

Table 23: Summary of PPM watering actions in 2022–23

Name of environmental watering action	Event#1- PPM-GDA
River system	Great Darling Anabranch
Type of PPM event	Directed releases from Cawndilla Lake via the Great Darling Anabranch
General description of watering action	Provide environmental water to: Support aquatic plants and animals in the Anabranch and to facilitate dispersal of juvenile golden perch from Lake Cawndilla to the Anabranch and ultimately the Murray
Start date	16/2/2023
End date	30/6/2023
Was this an agreed or interim action?	Agreed
Delivery pathway	Menindee Lakes downstream to South Australian border, via the Great Darling Anabranch.
Environmental site/s watered	Great Darling Anabranch (via directed releases from Lake Cawndilla when a shared resources).

Name of environmental watering action	Event#1- PPM-GDA
Total volume of water delivered (ML)	60,227 ML
Accounting method used	<ol style="list-style-type: none"> 1. After adjusting for travel time, when the daily average flow passing the Tara Downs gauge (425054) is equal to or exceeds releases, no losses are to be applied and the full volume of the environmental debit is recognised at the South Australian border, 2. After adjusting for travel time, when the daily average flow passing Tara Downs is less than releases, the flow at Tara Downs is reduced by a loss value and recognised at the South Australian border. The loss value applied is equivalent to the proportional daily loss that occurred between the Bulpunga gauge (425011) and Tara Downs 3. After adjusting for travel time, when flows at Tara Downs reach 0 ML/day, no return flows are to be recognised.

Water orders

Table 24 provides an overview of the environmental water orders received for Prerequisite Policy Measures in the 2022–23 water year (including any order that was subsequently refused/rejected).

Further detail in Attachment A is provided as needed, including water orders and assumed use statements. If any water order using PPMs was refused, documentation and rationale supporting this decision are provided.

Table 24: Water orders received by WaterNSW in 2022–23 (excluding orders for RMIF, MAA and BM-EWA)- Event #1- PPM Great Darling Anabranh.

Order number	1
Organisation submitting order	DPIE
Date order was submitted	24/3/2023
Volume of order (ML)	52,357
Organisation delivering order	WaterNSW
Release date	16/2/2023 – 30/06/2023
Form of water order submitted (e.g. Form A, email, verbal, other)	Email – Excel hydrograph
List of supporting documents	D2023 – XXXX 2023-03-24 email - RE: DPE EHG Environmental Watering Requirements for releases from Lake Cawndilla

Comparison of forecast and actual environmental water use

Event #3 – PPM Great Darling Anabranh

- target daily flow rates and volumes.
 - Averaging 388 ML/day (vary from 50 to 1,000 ML/day- see target HEW hydrograph below) for 135 days requiring 50,357 ML.
- actual daily flow rates and volumes
 - Averaging 446.1 ML/day (vary from 39 to 1421 ML/day) for 135 days delivering 60,225 ML.
- forecast losses and actual losses (at an appropriate temporal scale for the event)
 - There was no loss in the Greater Darling Anabranh as flow at Tara Downs remained above outlet inflow as per the PPM accounting arrangements
- volume of environmental water debited (with licence corresponding licence numbers)
 - A total of 60,225 ML was debited from HEW licences.

Table 25: Orders and usage assigned to water access licences

Licence #	Orders (ML)	Usage (ML)
60AL583376	53,534.8	60,225

- volume of water delivered to the Murray Valley that will be recognised as environmental water.
 - 60,225 ML was delivered to Murray Valley
 - There was no loss in the Greater Darling Anabranh as flow at Tara Downs remained above outlet inflow as per the PPM accounting arrangements.

Figure 6: Event #1 – PPM Great Darling Anabranh target flow at actual location

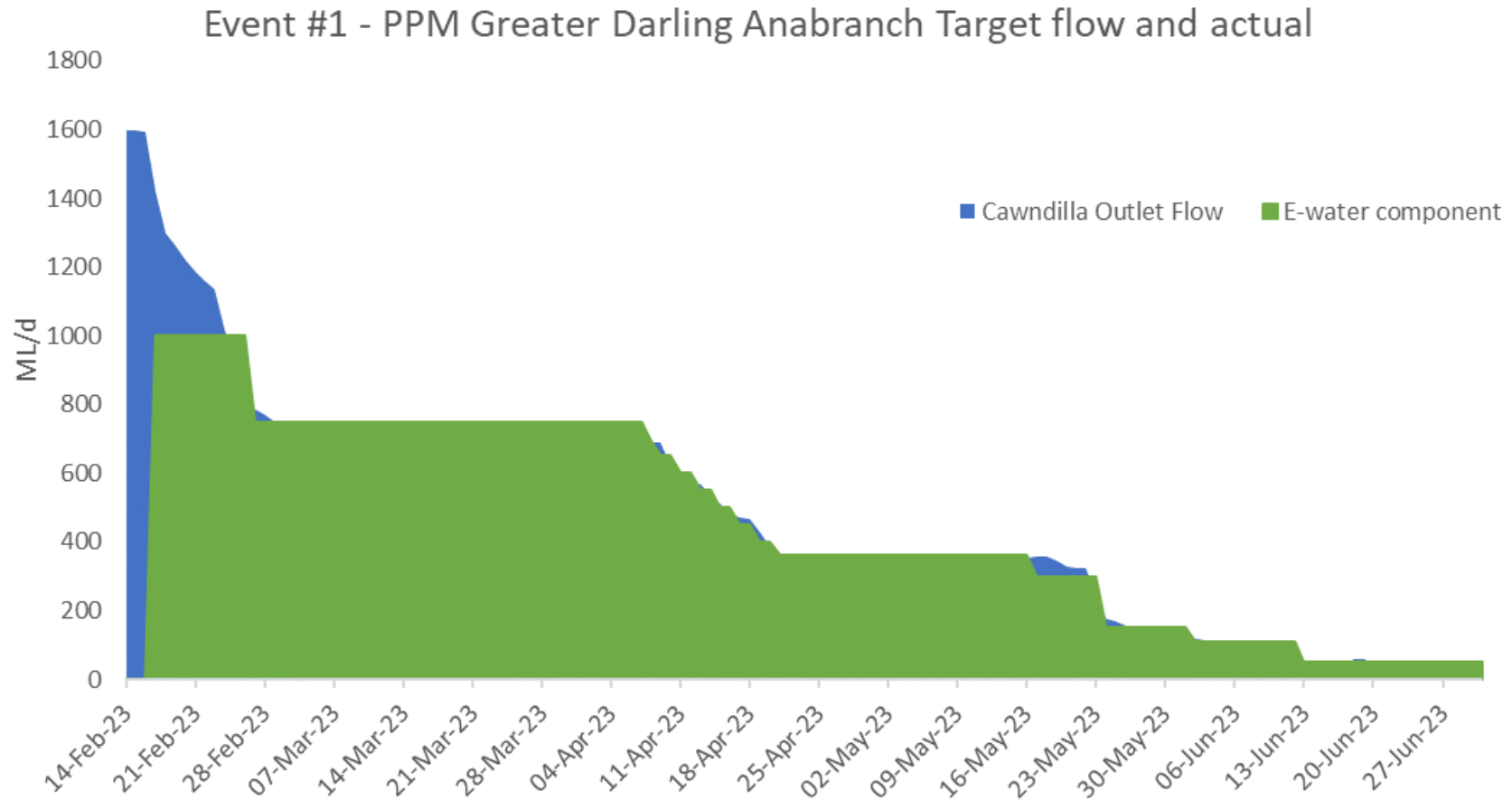
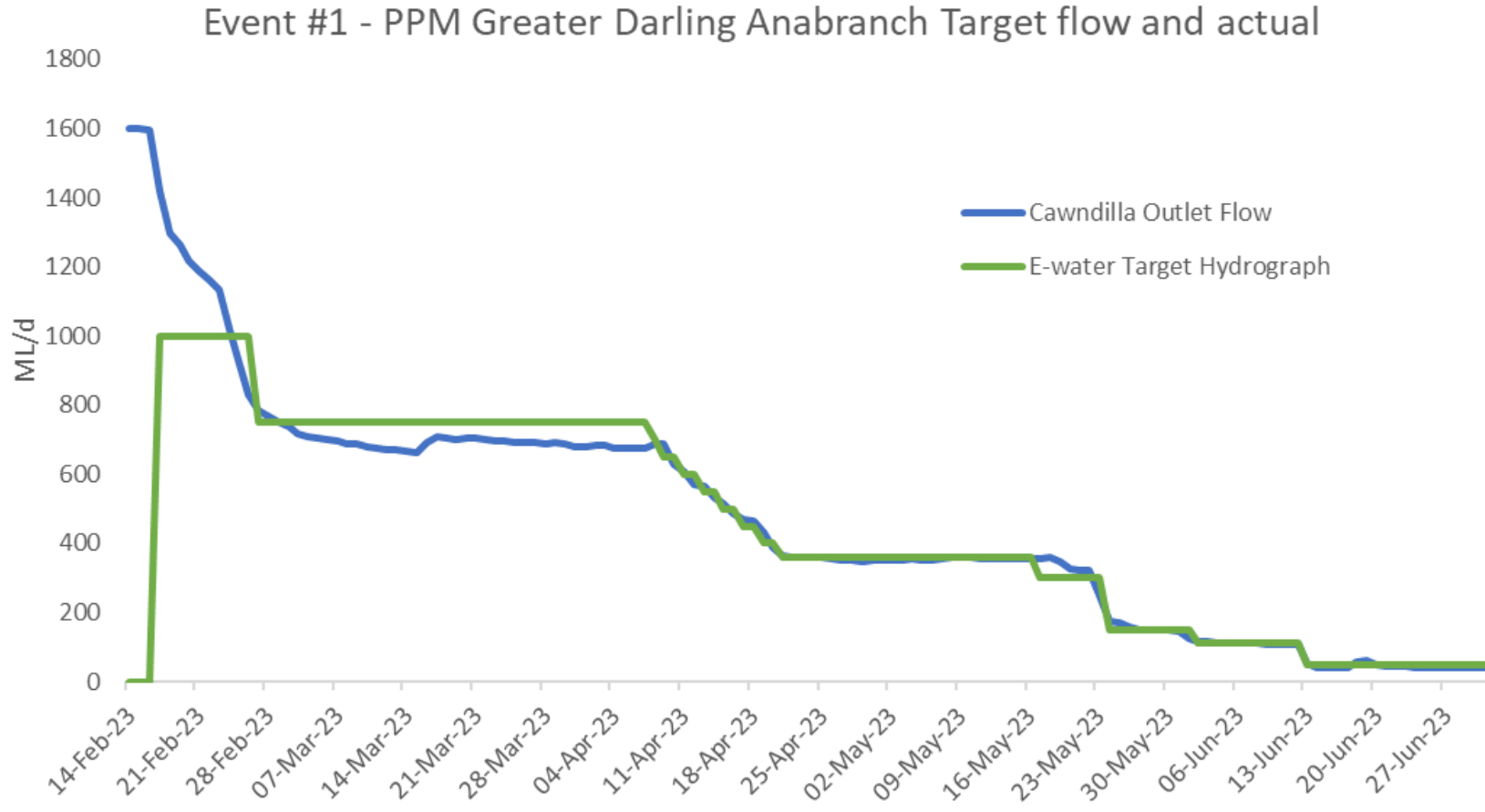


Figure 7: Event #1 PPM Great Darling Anabranch target flow at actual location



Stakeholder consultation

Table 26 provides a summary of stakeholder consultation. Supporting documents are included in Attachment C.

WaterNSW do not undertake stakeholder consultation as part of environmental water delivery. WaterNSW role is operational and is a key stakeholder of the environmental water holders. All stakeholder consultation regarding delivery of environmental water is undertaken by the environmental water holders.

Table 26: Summary of stakeholder consultation.

Date	Stakeholder forum/name	Environmental watering action/s discussed	Type of consultation	Summary of feedback	Stakeholder requests	List of supporting documents
14/03/2023 to 27/06/2023	DPI, CEWO, DPI EHG, Fisheries, MDBA, WaterNSW	How water will be accounted for if delivered from different lakes	Hypoxic Water committee meetings	E-water to be available to manage the DO downstream of Main Weir, through to Weir 32	Potential operational releases from the lakes by WaterNSW and MDBA	Meeting minutes by Veronica Silberschneider, DPE
24/03/2023	DPI EHG, DPI Fisheries, CEWO, MDBA, WaterNSW	2022–23 Lower Baaka and Anabranh environmental flow discussions	TAG – Team Meetings	River Operations update, HEW use options	Operational update (Releases, inflows and Lake levels for fish passage etc.), Water quality, E-water use options, Monitoring update, Comms and engagement	

Date	Stakeholder forum/name	Environmental watering action/s discussed	Type of consultation	Summary of feedback	Stakeholder requests	List of supporting documents
Weekly meetings	DPI – EHG, WaterNSW	Water accounts, water orders	Murray & Lower Darling environmental water updates		Accounts update	
Monthly meetings	DPI, WaterNSW	PPM/Southern Basin e-water discussion	Current/planned events, progress on actions from the PPM workplan	Discuss all things PPM/southern Basin e-water related		

Recommendations to improve future environmental watering actions

Table 27 provides a summary of key issues encountered in 2022–23 and recommendations for addressing these. Supporting documents are included in Attachment D.

Table 27: Summary of issues and recommendations

Environmental watering action	Issue	Agencies involved	Stakeholders involved	Recommendations
All events	Water order process requires improvement	DPI	DPI EES, CEWO, TLM, DPE	Ordering process needs to use WaterNSW water ordering system and be applied prior to start of events.

Environmental watering action	Issue	Agencies involved	Stakeholders involved	Recommendations
All events	Planning	DPI	DPI EES, CEWO, TLM, DPE	Clear annual planning foresight required by e-water holders (under different scenarios) to provide operators an opportunity to look at long-term forecasting. Planning needs to be a little less reactive.

Attachments

Attachment A – Water orders

- 2023-1641895 2023-03-24 Email - DPE EHG Environmental Watering Requirements for releases from Lake Cawndilla from MH

Attachment B – Assumed Use Statements and evidence of other calculations used

- 2023-164899 2022–23 accounting (HEW) GDA calcs

Attachment C – Details of stakeholder consultation and feedback

Attachment D – Supporting documents for key issues encountered and recommendations to address these

Annual Environmental Release River Operations Report – Hume Multi-site events 2022–23

This report was prepared by WaterNSW in accordance with the reporting requirements described under Section 5.1 of the Prerequisite Policy Measures Procedures Manual for the Murrumbidgee Regulated River and the Prerequisite Policy Measures Procedures Manual for the NSW Murray and Lower Darling Regulated Rivers.

Report prepared by:	David Wood	Report approved by:	Jonathan Belej
Position:	Water Planning and Delivery Specialist South	Position:	Manager Water Planning and Delivery South
Contact number:	0429310422	Contact number:	0436950529
Date prepared:	30/11/2023	Date approved:	10/12/2023

Environmental watering actions

Table 28 provides an overview of the environmental water actions undertaken using PPMs in the 2022–23 water year.

Table 28: Summary of PPM watering actions in 2022–23

Name of environmental watering action	Event#1-PPM- Hume Multisite	Event#2-PPM- Hume Multisite
River system	Murray River	Murray River

Name of environmental watering action	Event#1-PPM- Hume Multisite	Event#2-PPM- Hume Multisite
Type of PPM event	Directed releases from Hume Dam; Assumed use for directed releases from Hume Dam	Directed releases from Hume Dam; Assumed use for directed releases from Hume Dam
General description of watering action	<p>The objective is to deliver flows in the River Murray downstream of Yarrawonga Weir to provide the following ecological outcomes as described in the NSW Murray-Lower Darling Long-term Environmental Watering Plan for the Yarrawonga to Barmah reach (and Edward-Wakool):</p> <ul style="list-style-type: none"> • Native fish – dispersal / condition (all species), pre-spawning, condition (flow pulse specialists) • Ecosystem functions through longitudinal connectivity along the Murray, and Edward-Wakool – connectivity with low lying wetlands, hydraulic diversity and productivity and transport of nutrients and carbon • Native Vegetation – in-channel woody and non-woody, wetland vegetation and low-level river red gum condition 	<p>The objective is to deliver flows in the River Murray downstream of Yarrawonga Weir to provide the following ecological outcomes as described in the NSW Murray-Lower Darling Long-term Environmental Watering Plan for the Yarrawonga to Barmah reach (and Edward-Wakool):</p> <ul style="list-style-type: none"> • Native fish – dispersal / condition (all species), pre-spawning, condition (flow pulse specialists) • Ecosystem functions through longitudinal connectivity along the Murray, and Edward-Wakool – connectivity with low lying wetlands, hydraulic diversity and productivity and transport of nutrients and carbon • Native Vegetation – in-channel woody and non-woody, wetland vegetation and low-level river red gum condition
Start date	18/07/2022	26/12/2022
End date	2/08/2023	14/02/2023

Name of environmental watering action	Event#1-PPM- Hume Multisite	Event#2-PPM- Hume Multisite
Was this an agreed or interim action?	Agreed	Agreed
Delivery pathway	Hume Dam to Murray River	Hume Dam to Murray River
Environmental site/s watered	Murray River	Murray River
Total volume of water delivered (ML)	42,520 ML	57,698 ML
Accounting method used	<p>As per the specific objectives and outcomes as described in the Objectives and Outcomes for River Operations in the River Murray System as published on the MDBA website.</p> <ul style="list-style-type: none"> • 2.4 Directed releases from Hume Dam • 2.5 Assumed use for directed releases of held environmental water from Hume • Any change to the sequence of e-water product used will be made through an email request from DPE-EHG. • It is acknowledged that new water accounting arrangements for directed releases from Hume Dam 	<p>As per the specific objectives and outcomes as described in the Objectives and Outcomes for River Operations in the River Murray System as published on the MDBA website.</p> <ul style="list-style-type: none"> • 2.4 Directed releases from Hume Dam • 2.5 Assumed use for directed releases of held environmental water from Hume <p>Any change to the sequence of e-water product used will be made through an email request from DPE-EHG.</p> <p>It is acknowledged that new water accounting arrangements for directed releases from Hume Dam following airspace management were agreed at WLWG in September 2021 and are now in effect.</p>

Name of environmental watering action	Event#1-PPM- Hume Multisite	Event#2-PPM- Hume Multisite
	<p>following airspace management were agreed at WL WG in September 2021 and are now in effect.</p> <ul style="list-style-type: none"> NSW DPE Water and WaterNSW have developed a water accounting method to calculate environmental water use in the Niemur River for this event. 	NSW DPE Water and WaterNSW have developed a water accounting method to calculate environmental water use in the Niemur River for this event.

Water orders

Table 29 provides an overview of the environmental water orders received for Prerequisite Policy Measures in the 2022–23 water year (including any order that was subsequently refused/rejected).

Further detail in Attachment A is provided as needed, including water orders and assumed use statements. If any water order using PPMs was refused, documentation and rationale supporting this decision are provided.

Table 29: Water orders received by WaterNSW in 2022–23 (excluding orders for RMIF, MAA and BM-EWA)- Event #1 & #2 Hume Multisite.

Order number	1	2	3	4	5	6
Organisation submitting order	DPIE - EHG	DPIE - EHG	DPIE - EHG	DPIE - EHG	DPIE - EHG	DPIE - EHG
Date order was submitted	13 July 2022	26 July 2022	05 Aug 2022	25 Aug 2022	24 Jan 2023	21 Apr 2023

Order number	1	2	3	4	5	6
Volume of order (ML)	CEWH – 30,000	CEWH – 50,000	CEWH – 50,000	CEWH – 100,000	CEWH – 113,171 TLM – 32,500	CEWH – 55,580 TLM – 30,700
Organisation delivering order	MDBA	MDBA	MDBA	MDBA		
Release date	1 July 2022 – 31 January 2023	1 July 2022 – 31 January 2023	1 July 2022 – 31 January 2023	1 July 2022 – 31 January 2023	1 Oct 2022 - 15 Feb 2023	21 Apr 2023 – 30 Jun 2023
Form of water order submitted (e.g. Form A, email, verbal, other)	Email	Email	Email	Email	Email	Email
List of supporting documents			5,691 ML of MAA ordered 26/7/22 to 8/8/22 (Not part of PPM); Approved by DPIE email on 26/8/22	5,691 ML of MAA (Not part of PPM);	MAA 5,691 ML RMIF 56,000 ML (Not part of PPM);	RMIF 56,000 ML (Not part of PPM);

Comparison of forecast and actual environmental water use

Table 30 provides an overview of:

- target daily flow rates and volumes.
 - See Figure 8
- actual daily flow rates and volumes
 - See Figure 8
- forecast losses and actual losses (at an appropriate temporal scale for the event)
 - Not available from WaterNSW – data is held by MDBA and request will need to be made for this analysis
- volume of environmental water debited (with licence corresponding licence numbers)

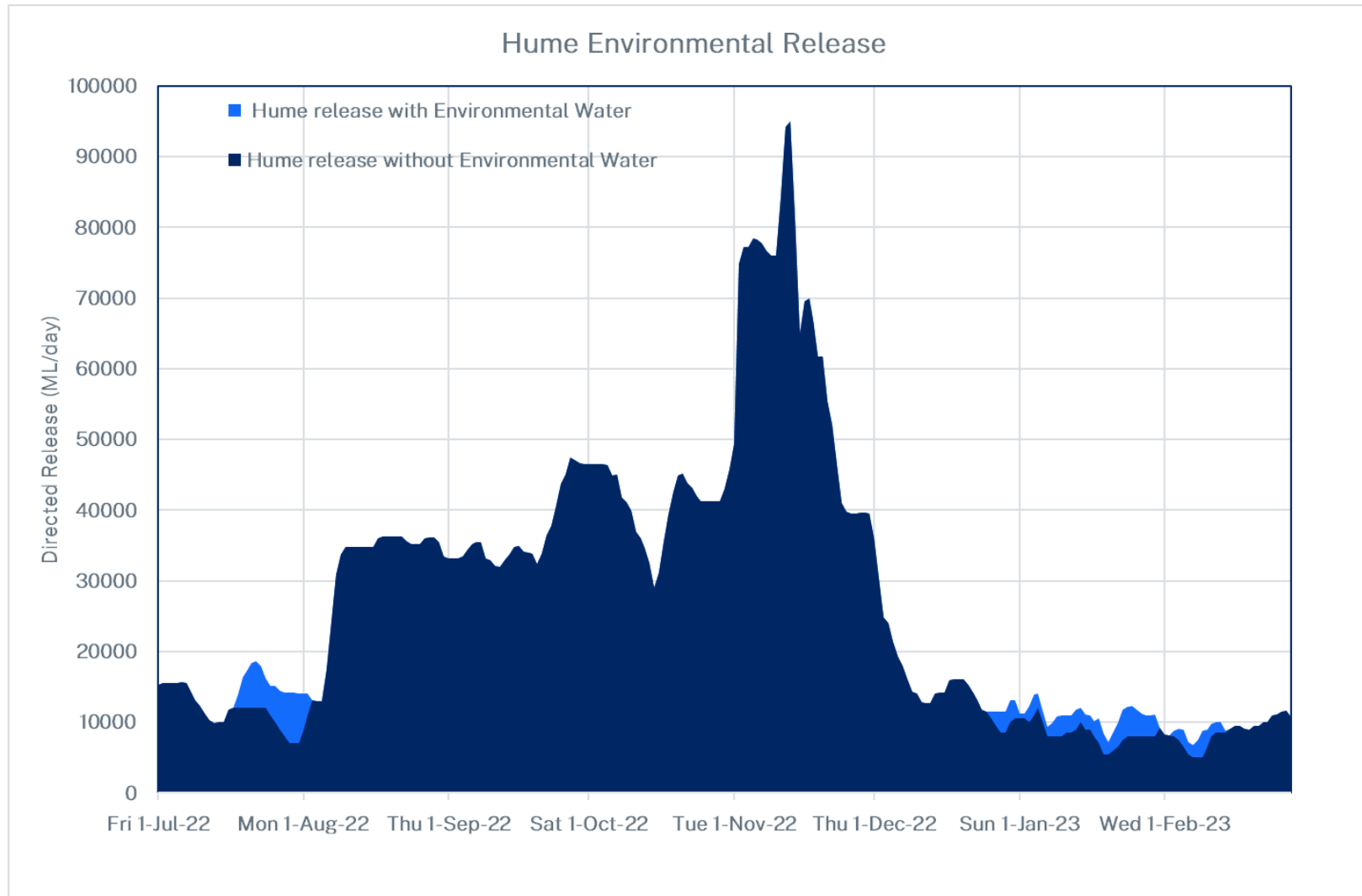
Table 30. Comparison of forecast and actual environmental water use

Row Labels	Sum of Orders	Sum of Usage
50AL507293	50,690	14,425
50AL513824	161,634	80,102
50AL507295	13,526	0
Grand Total	225,849	94,527

- volume of water delivered to the Murray Valley that will be recognised as environmental water.
 - All releases for this event were made from Murray storages – as such the debit volume of 89,218 ML is the recognised environmental water volume delivered to the Murray for this event.

Supporting information included in Attachment B.

Figure 8: Hume Environmental release with and without environmental water



Stakeholder consultation

Table 31 provides a summary of stakeholder consultation. Supporting documents are attached in Attachment C.

WaterNSW do not undertake stakeholder consultation as part of environmental water delivery. WaterNSW role is operational and is a key stakeholder of the environmental water holders. All stakeholder consultation regarding delivery of environmental water is undertaken by the environmental water holders.

Table 31: Summary of stakeholder consultation

Date	Stakeholder forum/name	Environmental watering action/s discussed	Type of consultation (eg. Workshop, webinar, phonecall, letter, survey, public exhibition)	Summary of feedback	Stakeholder requests	List of supporting documents
Meetings Monthly	Water Liaison Working Group	Operational updates	Online meetings		River ops and forecast update	
Weekly / fortnightly online meetings	Barmah Millewa Ops Advisory Group- GMW, VEWH, GBCMA, WaterNSW, NSW OEH, NSW Parks, CEWO, EWC, YYNAC, DEW, PV	Operational updates	Online meetings	Current river operations Accounting update Update on e-water use plans and critical ecological targets Confirmation/discussion of regulator settings and decision points, field report	River ops and forecast update	

Recommendations to improve future environmental watering actions

Table 32 provides a summary of key issues encountered in 2022–23 and recommendations for addressing these. Supporting documents are included in Attachment D.

Table 32: Summary of issues and recommendations

Environmental watering action	Issue	Agencies involved	Stakeholders involved	Recommendations
All events	Water order process requires improvement	DPI	DPI EES	Ordering process needs to use WaterNSW water ordering system and be applied prior to start of events.
All events	Planning	DPI	DPI EES, CEWO, TLM, DPE	Clear annual planning foresight required by e-water holders (under different scenarios) to provide operators an opportunity to look at long-term forecasting. Planning needs to be a little less reactive.
All events	BMEWA, RMIF, and MAA accounts	DPE and MDBA	DPE, MDBA and WaterNSW	The accounts for planned environmental; water are to maintained by “the operator”, which is defined as MDBA in the WSP.

Attachments

Attachment A – Water orders

- D2023-162553 2022-07-15 Email - River Murray Multi-site order to start 13 July 2022 from EHG to WaterNSW
- D2023-162552 2023-05-16 Email - NSW River Murray Multi-Site - Amendment No_ 8 - Winter Flow Water Order from EHG to WaterNSW
- D2023-162554 2022-07-26 Email - Water Order Amendment #1_ NSW Murray Multi-site event from EHG to WaterNSW
- D2023-162555 2022-08-05 Email - Water Order Amendment #2_ NSW Murray Multi-site event from EHG to WaterNSW
- D2023-162556 2022-08-26 Email - RE_ Water Order Amendment #3_ NSW Murray Multi-site event Confirmation on MAA by DPE
- D2023-162557 2022-08-26 Email - Water Order Amendment #3_ NSW Murray Multi-site event from EHG to WaterNSW
- D2023-162573 2022-12-23 Email - Water Order Amendment #4_ NSW Murray Multi-site Event from PC to SG
- D2023-162558 2023-01-25 Email - Water Order Amendment #5 - NSW Murray Multi-site Event from EHG to WaterNSW
- D2023-162559 2023-04-24 - Email - NSW Murray Multi-Site - Winter Flow Water Order from EHG to WaterNSW

Attachment B – Assumed Use Statements and evidence of other calculations used

- D2023-162560 2023-07-11 Finalised RMS Bulk Environmental Water Accounts for 2022–23 Water Year_From MDBA to stakeholders
- D2023-162561 GOVTEAMS FINALISED 2022-23 Water Year RMS BULK & Daily 1 July 2023-Charts
- D2023-064018 - Summary of Murray HEW delivery 2022–23 Updated 2023-07-27

Attachment C – Details of stakeholder consultation and feedback

Attachment D – Supporting documents for key issues encountered and recommendations to address these

Annual Environmental Release River Operations Report – Wakool System 2022–23

This report was prepared by WaterNSW in accordance with the reporting requirements described under Section 5.1 of the Prerequisite Policy Measures Procedures Manual for the Murrumbidgee Regulated River and the Prerequisite Policy Measures Procedures Manual for the NSW Murray and Lower Darling Regulated Rivers.

Report prepared by:	David Wood	Report approved by:	Jonathan Belej
Position:	Water Planning and Delivery Specialist South	Position:	Manager Water Planning and Delivery South
Contact number:	0429310422	Contact number:	0436 950 529
Date prepared:	28/11/2023	Date approved:	10/12/2023

Environmental watering actions

Table 33 provides an overview of the environmental water actions undertaken using PPMs in the 2022–23 water year.

Table 33: Summary of PPM watering actions in 2022–23

Name of environmental watering action	Event#1- PPM-Wakool system
River system	NSW Murray
Type of PPM event	Return flows
General description of watering action	Provide flow variability conducive to native fish breeding and recruitment
Start date	15/03/2023
End date	18/04/2023
Was this an agreed or interim action?	Agreed
Delivery pathway	Colligen -Wakool-Yallakool Flow
Environmental site/s watered	Edward-Wakool River system
Total volume of water delivered (ML)	Total e-water delivered to the site from multi-site and ordered system delivery – 21,536 ML Debit ordered system delivery – 9,322 ML Multi-site delivery – 12,214ML
Accounting method used	Determination of use by agreed loss rate

Water orders

Table 34 provides an overview of the environmental water orders received for Prerequisite Policy Measures in the 2022–23 water year (including any order that was subsequently refused/rejected).

Further detail is provided in Attachment A as needed, including water orders and assumed use statements. If any water order using PPMs was refused, documentation and rationale is provided supporting this decision.

Table 34: Water orders received by WaterNSW in 2022–23.

Order number	1
Organisation submitting order	DPE EHG
Date order was submitted	15/07/2023
Volume of order (ML)	10,948 ML
Organisation delivering order	WaterNSW
Release date	15/03/2023 – 18/04/2023
Form of water order submitted (e.g. Form A, email, verbal, other)	Email – WaterNSW Water Order Form
List of supporting documents	Attachment A

Comparison of forecast and actual environmental water use

Provide an overview of:

- target daily flow rates and volumes.
 - See Figure 9, Figure 10, Figure 11
- actual daily flow rates and volumes
 - See Figure 9, Figure 10, Figure 11
- forecast losses and actual losses (at an appropriate temporal scale for the event)
 - Analysis has not been completed.
- volume of environmental water debited (with licence corresponding licence numbers)

Table 35: Comparison of forecast and actual environmental water use

Row Labels	Sum of Orders	Sum of Usage
50AL503537	10,948*	9,322
Grand Total	10,948	9,322

* As per the email order with targets on 24/3/2023

- volume of water delivered to the Murray Valley that will be recognised as environmental water.
 - All releases for this event were made from Murray storages – as such the debit volume of 9,322 ML is the recognised environmental water volume delivered to the Murray for this event.

Supporting information is in Attachment B.

Figure 9: PPM event in Wakool

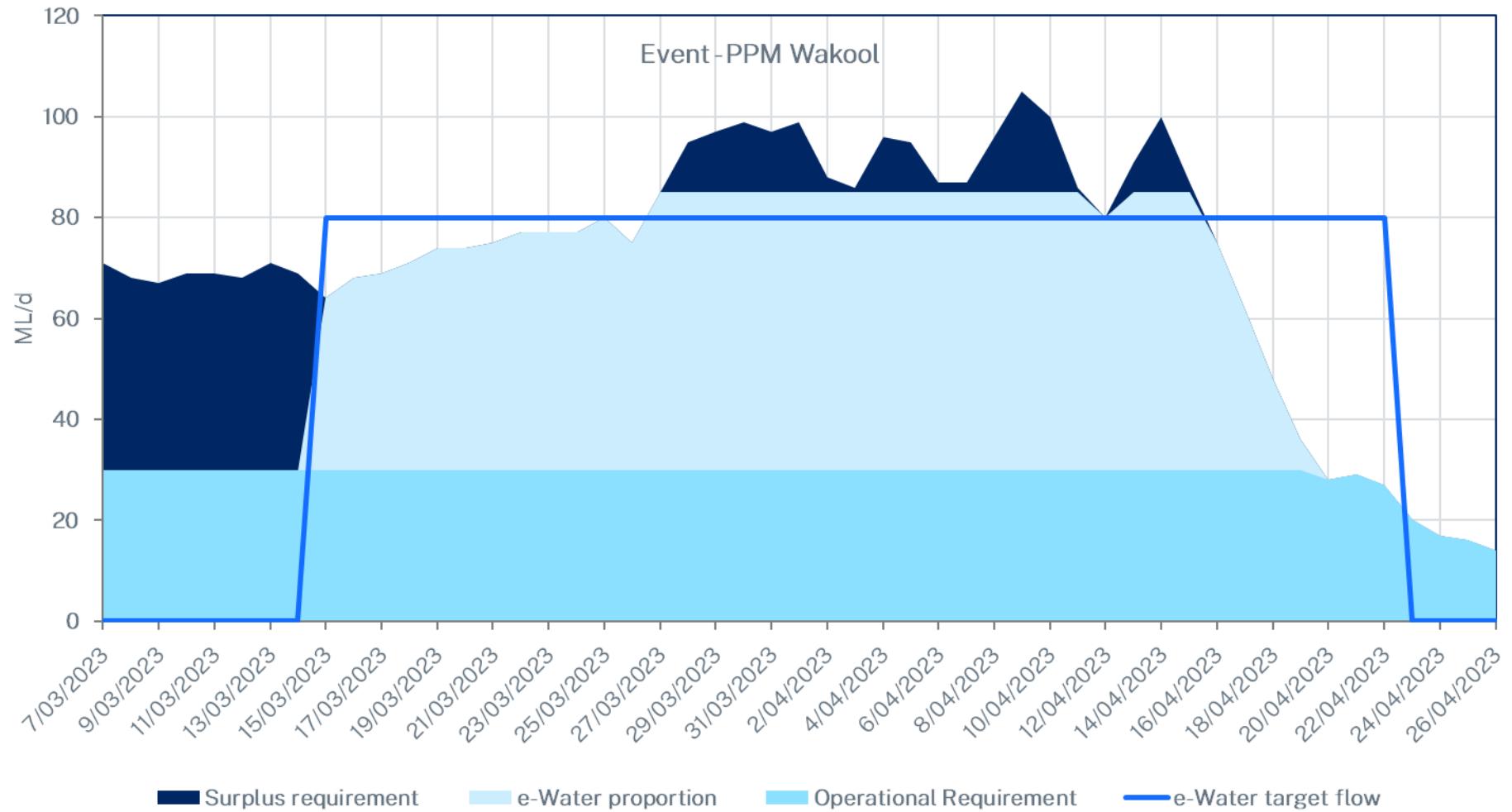


Figure 10: PPM event in Yallakool

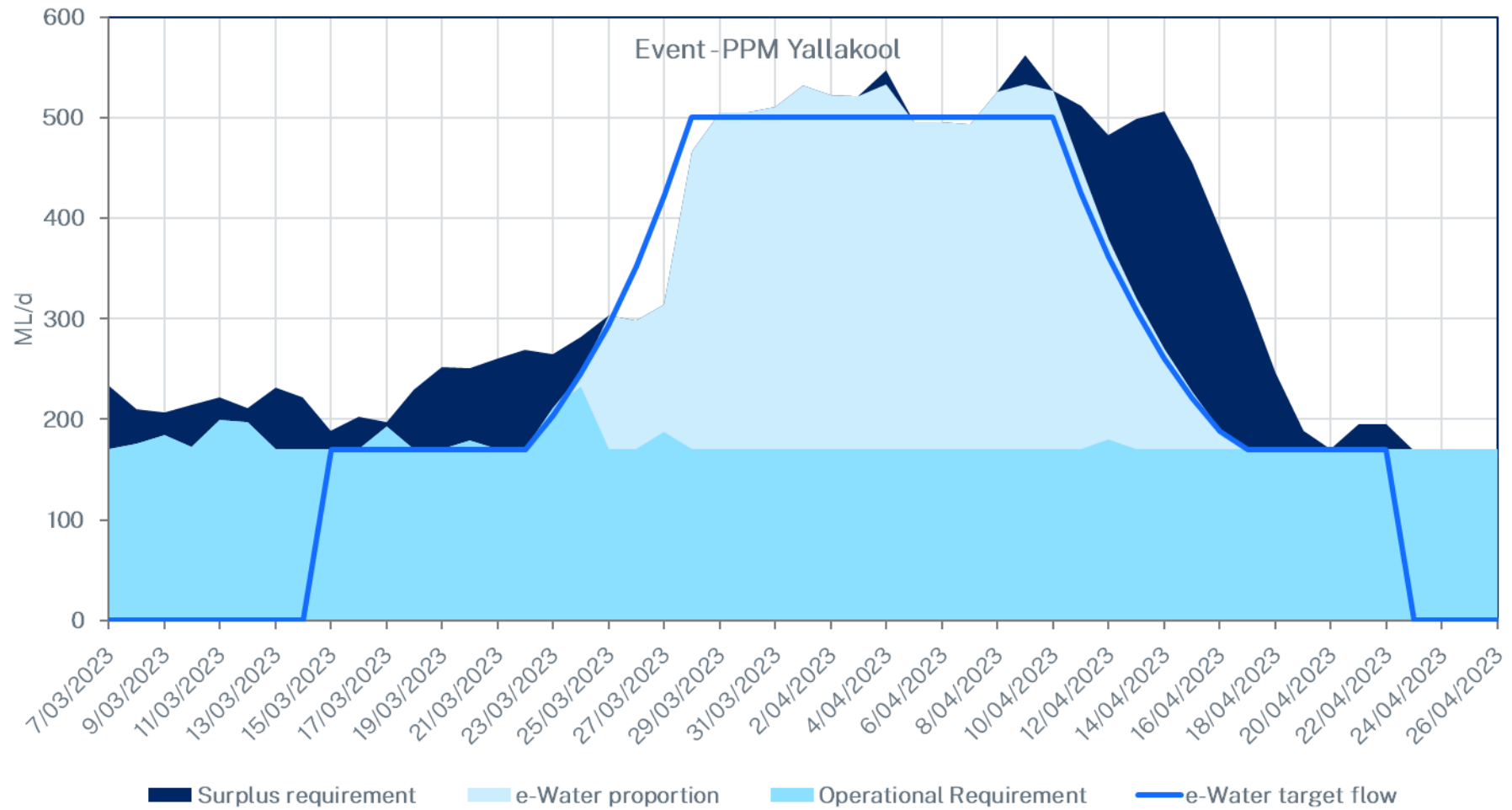
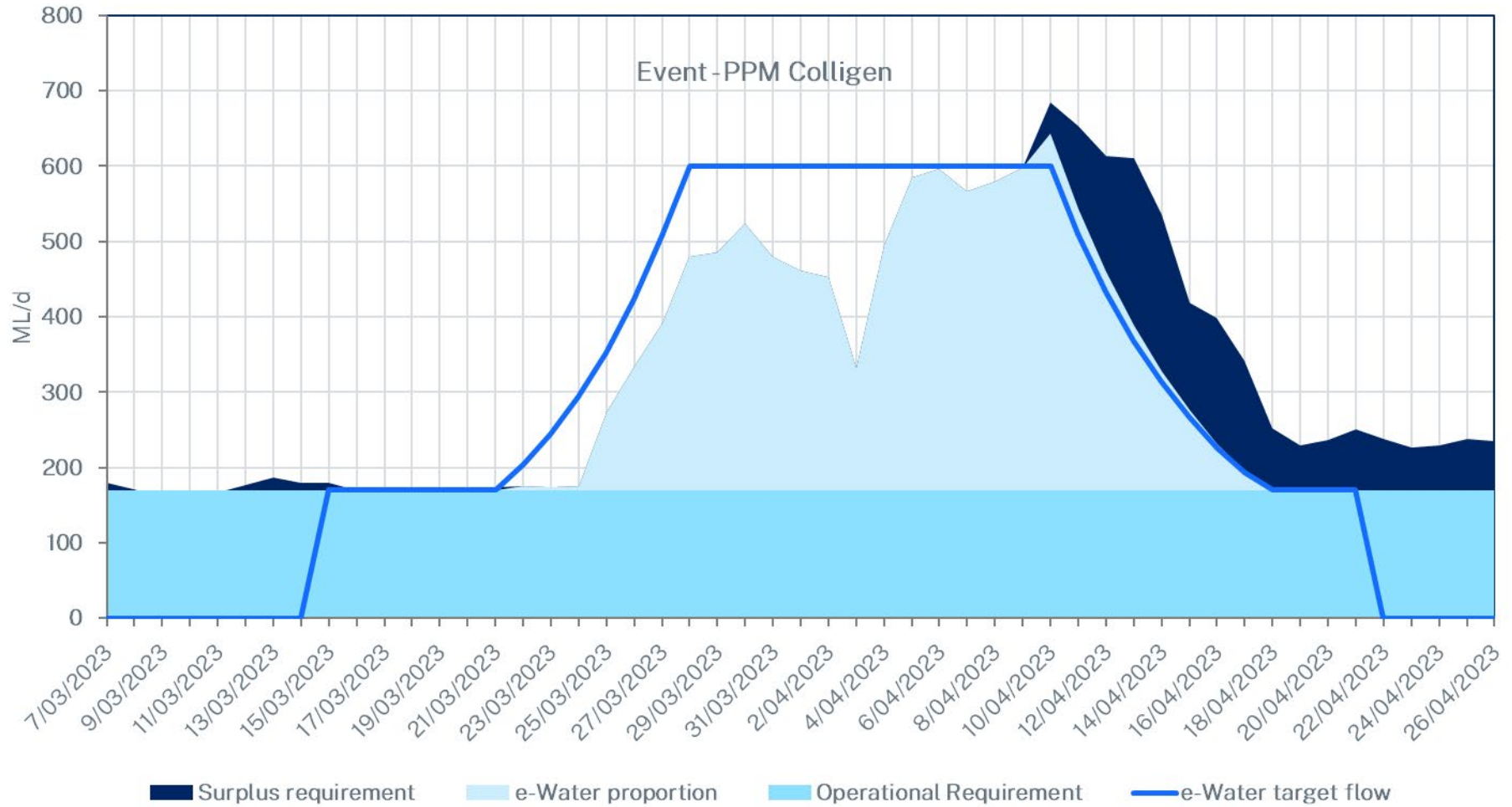


Figure 11: PPM event in Colligen



Stakeholder consultation

Table 36 provides a summary of stakeholder consultation. Supporting documents included in Attachment C.

WaterNSW do not undertake stakeholder consultation as part of environmental water delivery. WaterNSW role is operational and is a key stakeholder of the environmental water holders. All stakeholder consultation regarding delivery of environmental water is undertaken by the environmental water holders.

Table 36: Summary of stakeholder consultation

Date	Stakeholder forum/name	Environmental watering action/s discussed	Type of consultation (eg. Workshop, webinar, phonecall, letter, survey, public exhibition)	Summary of feedback	Stakeholder requests
12/7/2022	DPI EHG	Hume Multi-site re-use	Email	Gate settings	Maintain Wakool offtake fully open and maintain both the Yallakool and Colligen offtakes at around 400 ML/day
9/12/2022	DPI EHG	Hume Multi-site re-use	Email	Gate settings	Have flows vary a little bit as weir pool levels/flows vary
Weekly / fortnightly online meetings	Edward-Wakool Operations Advisory Group	Operational updates	Online meetings	HEW actions	River ops and forecast update

Recommendations to improve future environmental watering actions

Table 37 provides a summary of key issues encountered in 2022–23 and recommendations for addressing these. Supporting documents are included in Attachment D.

Table 37: Summary of issues and recommendations

Environmental watering action	Issue	Agencies involved	Stakeholders involved	Recommendations
All events	Water order process requires improvement	DPI	DPI EES, CEWO, TLM, DPE	Ordering process needs to use WaterNSW water ordering system and be applied prior to start of events.
All events	Planning	DPI	DPI EES, CEWO, TLM, DPE	Clear annual planning foresight required by e-water holders (under different scenarios) to provide operators an opportunity to look at long-term forecasting. Planning needs to be a little less reactive.
All events	Water order instructions	EHG	WaterNSW DPI-Water	Instructions to be in a standard format similar to Hume Multi-site

Attachments

Attachment A – Water orders

- D2023-162574 2023-03-24 Edward-Wakool autumn flow targets from EHG to WaterNSW

Attachment B – Assumed Use Statements and evidence of other calculations used

- D2023-056242 E-water Account Method - Wakool System – 2022–23 Assessed 2023-06-27 updated 2023-07-25

Attachment C – Details of stakeholder consultation and feedback

- D2023-162576 2022-07-12 Yallakool_ Colligen and Wakool offtakes From EHG to WaterNSW
- D2023-162575 2022-12-09 Environmental Order for Edward-Wakool From EHG to WaterNSW

Attachment D – Supporting documents for key issues encountered and recommendations to address these

Annual Environmental Release River Operations Report – Edward River DS Stevens Weir 2022–23

This report was prepared by WaterNSW in accordance with the reporting requirements described under Section 5.1 of the Prerequisite Policy Measures Procedures Manual for the Murrumbidgee Regulated River and the Prerequisite Policy Measures Procedures Manual for the NSW Murray and Lower Darling Regulated Rivers.

Report prepared by:	David Wood	Report approved by:	Jonathan Belej
Position:	Water Planning and Delivery Specialist South	Position:	Manager Water Planning and Delivery South
Contact number:	0429310422	Contact number:	0436 950 529
Date prepared:	12/12/2023	Date approved:	12/12/2023

Environmental watering actions

Table 38 provides an overview of the environmental water actions undertaken using PPMs in the 2022–23 water year.

Table 38: Summary of PPM watering actions in 2022–23.

Name of environmental watering action	Event#1 PPM-Edward River
River system	Edwards River D/S Stevens Weir
Type of PPM event	Return Flows
General description of watering action	Mitigate flood recession hydrograph
Start date	20/01/2023
End date	02/02/2023
Was this an agreed or interim action?	Agreed
Delivery pathway	Stevens weir
Environmental site/s watered	Edwards River
Total volume of water delivered (ML)	23,554 GL (CEWH)
Accounting method used	Niemur:Edwards (30:70) split with 30% loss in Niemur with Murray Incremental loss method.

Water orders

Table 39 provides an overview of the environmental water orders received for Prerequisite Policy Measures in the 2022–23 water year (including any order that was subsequently refused/rejected).

Further detail is provided in Attachment A as needed, including water orders and assumed use statements. If any water order using PPMs was refused, documentation and rationale supporting this decision are provided.

Table 39: Water orders received by WaterNSW in 2022–23 (excluding orders for RMIF, MAA and BM-EWA)- Event #1 – PPM Edward River.

Order number	WM-8080
Organisation submitting order	DPE - EHG
Date order was submitted	20/01/2023
Volume of order (ML)	49,800 ML
Organisation delivering order	WaterNSW
Release date	17/01/2023 – 31/03/2023
Form of water order submitted (e.g. Form A, email, verbal, other)	Email
List of supporting documents	WM-8080

Comparison of forecast and actual environmental water use

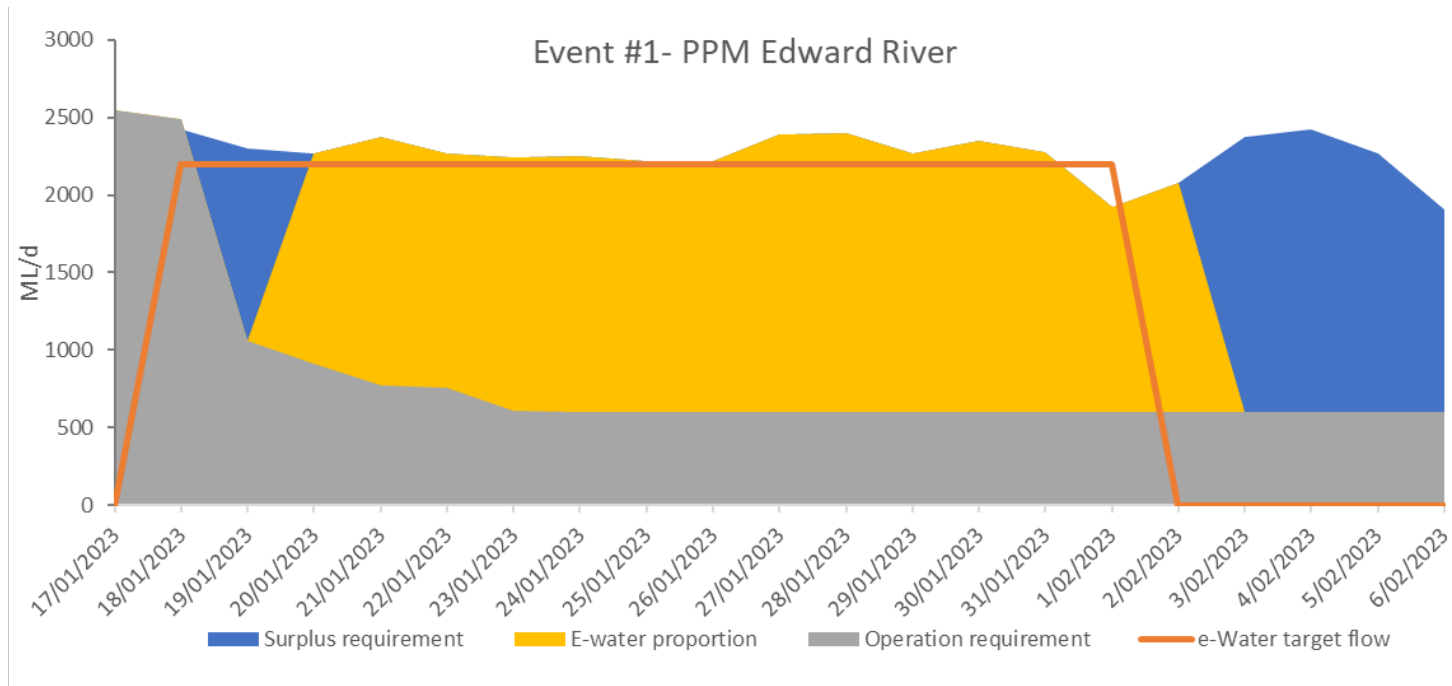
- target daily flow rates and volumes.
 - Averaging 1,800 ML/day for 14 days requiring 25,200 ML.
- actual daily flow rates and volumes
 - Averaging 1,682 ML/day (vary from 1,324 to 2,082 ML/day) for 14 days delivering 23,553.4 ML.
- forecast losses and actual losses (at an appropriate temporal scale for the event)
 - There was a 30% loss factor on the 30% take on the Niemur River as per accounting methods. There were no additional loss for the Edward River and the Murray through to the South Australian border due to unregulated conditions for the period of this flow. Loss was calculated at 2,768.4 ML for this event.
- volume of environmental water debited (with licence corresponding licence numbers)
 - A total of 23,553.4 ML was debited from HEW licences.

Table 40: Comparison of forecast and actual environmental water use

Licence #	Orders	Usage
50AL503537	23,553.4 ML	23,553.4 ML

- volume of water delivered to the Edward River downstream of Stevens Weir that will be recognised as environmental water.
 - 23,553.4 ML was delivered to Edward River downstream of Stevens Weir
 - Out of which 2,768.4 ML is deemed to be lost downstream and hence 20,785 ML will be recognised at SA Border

Figure 12: Event #1 PPM Edward River



Stakeholder consultation

Table 41 provides a summary of stakeholder consultation. Supporting documents are included in Attachment C.

WaterNSW do not undertake stakeholder consultation as part of environmental water delivery. WaterNSW role is operational and is a key stakeholder of the environmental water holders. All stakeholder consultation regarding delivery of environmental water is undertaken by the environmental water holders.

Table 41: Summary of stakeholder consultation.

Date	Stakeholder forum/name	Environmental watering action/s discussed	Type of consultation (eg. Workshop, webinar, phonecall, letter, survey, public exhibition)	Summary of feedback	Stakeholder requests	List of supporting documents
Weekly / fortnightly online meetings	Edward–Wakool Operations Advisory Group	Operational updates	Online meetings	HEW actions	River ops and forecast update	

Recommendations to improve future environmental watering actions

Table 42 provides a summary of key issues encountered in 2022–23 and recommendations for addressing these. Supporting documents are included in Attachment D.

Table 42: Summary of issues and recommendations.

Environmental watering action	Issue	Agencies involved	Stakeholders involved	Recommendations	List of supporting documents
All events	Water order process requires improvement	DPI	DPI EES, CEWO, TLM, DPE	Ordering process needs to use WaterNSW water ordering system and be applied prior to start of events.	
All events	Planning	DPI	DPI EES, CEWO, TLM, DPE	Clear annual planning foresight required by e-water holders (under different scenarios) to provide operators an opportunity to look at long-term forecasting. Planning needs to be less reactive.	

Attachments

Attachment A – Water orders

- D2023-165320 RE_ Edward–Wakool flows

Attachment B – Assumed Use Statements and evidence of other calculations used

- D2023-165308 DS Stevens Weir- HEW use - 2022 2023 Final_DW

Attachment C – Details of stakeholder consultation and feedback

Attachment D – Supporting documents for key issues encountered and recommendations to address these

Annual Environmental Release River Operations Report – Niemur River

This report was prepared by WaterNSW in accordance with the reporting requirements described under Section 5.1 of the Prerequisite Policy Measures Procedures Manual for the Murrumbidgee Regulated River and the Prerequisite Policy Measures Procedures Manual for the NSW Murray and Lower Darling Regulated Rivers.

Report prepared by:	David Wood	Report approved by:	Jonathan Belej
Position:	Water Planning and Delivery Specialist South	Position:	Manager Water Planning and Delivery South
Contact number:	0429310422	Contact number:	0436 950 529
Date prepared:	25/01/2024	Date approved:	25/01/2024

Environmental watering actions

Table 43 provides an overview of the environmental water actions undertaken using PPMs in the 2022–23 water year.

Table 43: Summary of PPM watering actions in 2022–23.

Name of environmental watering action	Event#1 PPM-Niemur River
River system	Niemur River
Type of PPM event	Return Flows
General description of watering action	Niemur River Offtake opened prior to declaration of Uncontrolled flow.
Start date	22/06/2023
End date	22/06/2023
Was this an agreed or interim action?	Agreed
Delivery pathway	Niemur River Offtake
Environmental site/s watered	Niemur River
Total volume of water delivered (ML)	206
Accounting method used	Per email conversation between WaterNSW, DPE – OEH and eWater Registrar (27/6/2023)- Attached

Water orders

Table 44 provides an overview of the environmental water orders received for Prerequisite Policy Measures in the 2022–23 water year (including any order that was subsequently refused/rejected).

Further detail is provided in Attachment A as needed, including water orders and assumed use statements. If any water order using PPMs was refused, documentation and rationale supporting this decision are provided.

Table 44: Water orders received by WaterNSW in 2022–23 (excluding orders for RMIF, MAA and BM-EWA)- Event #1- PPM Niemur River.

Order	River Murray Water Order Amendment 9 (Winter Flow)
Organisation submitting order	DPE - Biodiversity and Conservation Division
Date order was submitted	26/05/2023
Volume of order (ML)	30,700 ML
Organisation delivering order	MDBA/WaterNSW
Release date	22/06/2023 – 22/06/2023
Form of water order submitted (e.g. Form A, email, verbal, other)	Standard PPM Form – via email
List of supporting documents	WM-8323

Comparison of forecast and actual environmental water use

- target daily flow rates and volumes.
 - Averaging 432.3 ML/day for 71 days (at Hume dam) requiring 30,700 ML.
- actual daily flow rates and volumes
 - Averaging 206 ML/day for 1 day delivering 206 ML (at Niemur River Offtake, as a flow component of the Hume Dam Multisite).
- forecast losses and actual losses (at an appropriate temporal scale for the event)
 - There were no losses through to the South Australian border due to unregulated conditions for the period of this flow.
- volume of environmental water debited (with licence corresponding licence numbers)
 - A total of 206 ML was debited from eWater licences.

Table 45: Comparison of forecast and actual environmental water use

Licence #	Orders	Usage
50AL503537	30,700 ML	206 ML

- volume of water delivered to the Edward River downstream of Stevens Weir that will be recognised as environmental water.
 - 206 ML was delivered to Edward River downstream of Stevens Weir
 - Out of which 0 ML is deemed to be lost downstream and hence 206 ML will be recognised at SA Border

Stakeholder consultation

Table 46 provides a summary of stakeholder consultation. Supporting documents are included in Attachment C.

WaterNSW do not undertake stakeholder consultation as part of environmental water delivery. WaterNSW role is operational and is a key stakeholder of the environmental water holders. All stakeholder consultation regarding delivery of environmental water is undertaken by the environmental water holders.

Table 46: Summary of stakeholder consultation.

Date	Stakeholder forum/name	Environmental watering action/s discussed	Type of consultation (e.g. Workshop, webinar, phone call, letter, survey, public exhibition)	Summary of feedback	Stakeholder requests	List of supporting documents
Weekly / fortnightly online meetings	Edward–Wakool Operations Advisory Group	Operational updates	Online meetings	Ewater actions	River ops and forecast update	

Recommendations to improve future environmental watering actions

Table 47 provides a summary of key issues encountered in 2022–23 and recommendations for addressing these. Supporting documents are included in Attachment D.

Table 47: Summary of issues and recommendations.

Environmental watering action	Issue	Agencies involved	Stakeholders involved	Recommendations	List of supporting documents
All events	Water order process requires improvement	DPI	DPI EES, CEWO, TLM, DPE	Ordering process needs to use WaterNSW water ordering system and be applied prior to start of events.	

Environmental watering action	Issue	Agencies involved	Stakeholders involved	Recommendations	List of supporting documents
All events	Planning	DPI	DPI EES, CEWO, TLM, DPE	Clear annual planning foresight required by e-water holders (under different scenarios) to provide operators an opportunity to look at long-term forecasting. Planning needs to be less reactive.	
Niemur	No accounting method available prior to event.	DPI WNSW	DPI, DPE, WNSW	Event triggered requirement for determination of accounting arrangements. Review and modelling of accounting arrangements to determine future use/accounting (completed).	

Attachments

Attachment A – Water orders

- D2023-005446 2023-05-26 Email - NSW River Murray Multi-Site - Amendment No. 9 - Winter Flow Water Order – Neimur

Attachment B – Assumed Use Statements and evidence of other calculations used

- D2023-060035- 023-06-23 Niemur winter Base Flow Accounting 2022–23 – amended
- D2024-005448 2023-06-27 Niemur Winter Baseflow accounting Confirmation by eWater registrar

Attachment C – Details of stakeholder consultation and feedback

Attachment D – Supporting documents for key issues encountered and recommendations to address these

Annual Environmental Release River Operations Report – Murrumbidgee River 2022–23

This report was prepared by WaterNSW in accordance with the reporting requirements described under Section 5.1 of the Prerequisite Policy Measures Procedures Manual for the Murrumbidgee Regulated River and the Prerequisite Policy Measures Procedures Manual for the NSW Murray and Lower Darling Regulated Rivers.

Report prepared by:	Shaun Gleeson	Report reviewed by:	David Wood	Report approved by:	Col Hood
Position:	WPD Specialist	Position:	WPD Specialist	Position:	WPD Team Leader
Contact number:	N/A	Contact number:	N/A	Contact number:	N/A
Date prepared:	13/12/2023	Date reviewed:	14/12/2023	Date approved:	14/12/2023

Environmental watering actions

Table 48 provides an overview of the environmental water actions undertaken using PPMs in the 2022–23 water year.

Table 48: Summary of PPM watering actions in 2022–23.

Name of environmental watering action	PPM Event #1a	PPM Event #1b	PPM Event #2
River system	Murrumbidgee	Murrumbidgee	Murrumbidgee
Type of PPM event	Directed releases from storages/s to meet a target flow at downstream Maude Weir.	Directed releases from storages/s to meet a target flow at downstream Balranald.	Directed releases from storages/s to meet a target flow at downstream Balranald
General description of watering action	To dilute low dissolved oxygen in return flows back to the river from the Lower Murrumbidgee and Lower Lachlan floodplains.	To dilute low dissolved oxygen floodplain, return flows coming back in the river from the Lower Murrumbidgee and Lower Lachlan floodplains.	Supplement a small rainfall event/airspace release resulting in connection with Lowbidgee wetland assets providing native fish with connectivity and movement cues back to the main river channel.
Release start date	10th Dec 2022	20th February 2023	15th June 2023
End date	15th February 2023	31st March 2023	30th June 2023
Was this an agreed or interim action?	Agreed	Agreed	Agreed

Name of environmental watering action	PPM Event #1a	PPM Event #1b	PPM Event #2
Delivery pathway	Upper storage/s to nominated downstream site/s. Estimated return flows are to be protected downstream, including for delivery to the Murray River.	Upper storage/s to nominated downstream site/s. Estimated return flows are to be protected downstream, including for delivery to the Murray River.	Upper storage/s to nominated downstream site/s. Estimated return flows are to be protected downstream, including for delivery to the Murray River.
Environmental site/s watered	Murrumbidgee river D/s Maude Weir	Murrumbidgee river D/s Balranald Weir	Murrumbidgee river D/s Balranald Weir
Total volume of environmental water delivered (ML)	96,268 ML	139,000 ML	13,044 ML
Accounting method used	Assumed use method: Debit additional releases from storage calculated as the difference between the actual releases from storage and those that are estimated would have been made without the environmental water order.	Assumed use method: Debit additional releases from storage calculated as the difference between the actual releases from storage and those that are estimated would have been made without the environmental water order.	Assumed use method: Debit additional releases from storage calculated as the difference between the actual releases from storage and those that are estimated would have been made without the environmental water order.

Risk assessment and mitigation

Table 49 details any risks identified during the planning and release of the environmental water orders received which use Prerequisite Policy Measures, including deliverability risks, operational risks and other risks considered. Supporting information is included in Attachment A.

Table 49: Risks considering during event planning.

#	Description of risk	Mitigation measure/s applied
1	Under/over-estimating the volume of environment water used: inaccurate measurement.	Used appropriate estimates of unaccounted differences and operational decisions when estimating the 'without environmental order' when calculated additional release from storage.
2	Under-use/overuse of environmental water allocated for individual events resulting in potential forfeit of Held Environmental Water (HEW) from Licenced accounts.	Regular reporting of estimated water uses to the environmental water managers with uncertainties in the usage forecasts. Educating the environmental water managers on water ordering and use debit procedures by WaterNSW for all licenced users to effectively manage HEW portfolio under the NSW rules.

Water orders

Table 50 provides an overview of the environmental water orders received for Prerequisite Policy Measures in the 2022–23 water year (including any order that was subsequently refused/rejected).

Further detail is included in Attachment B as needed, including water orders and assumed use statements. If any water order using PPMs was refused, documentation and rationale supporting this decision are provided.

Table 50: Water orders received by WaterNSW in 2022–23.

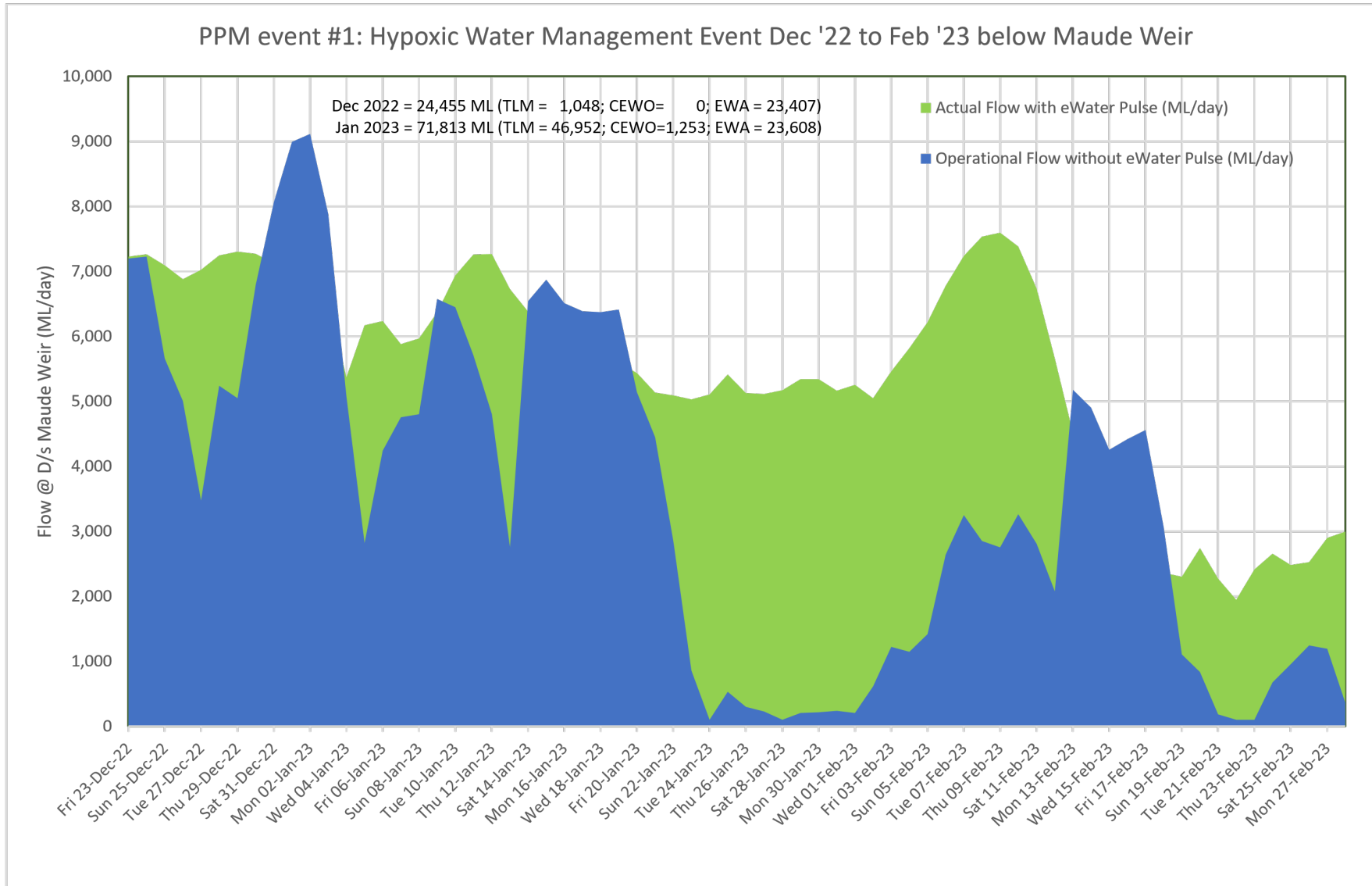
Order number	Event #1	Event #1	Event #1	Event #1	Event #1	Event #1	Event #1	Event #1	Event #2	Event #1	Event #1	Event #1	Event #1	Event #1
Organisation submitting order.	EHG	EHG	EHG on behalf of CEWO	EHG on behalf of CEWO	EHG on behalf of TLM	EHG on behalf of TLM	EHG - EWA	EHG on behalf of CEWH-GS	EHG-on behalf of CEWO	EHG- on behalf of TLM	EHG on behalf of CEWH - GS	EHG on behalf of CEWO	EHG on behalf of CEWO	EHG on behalf of CEWH
Date order was submitted	23/12/2022	23/12/2022	23/12/2022	09/01/2023	09/01/2023	21/02/2023	21/02/2023	21/02/2023	9/03/2023	09/03/2023	28/03/2023	18/05/2023	31/05/2023	21/06/2023
Volume of order (ML)	72,254 ML	21,746 ML	23,000 ML	26,000 ML	48,000 ML	60,000 ML	50,000 ML	100,000 ML	80,775 ML	12,000 ML	43,916 ML	24,017 ML	21,449 ML	12,000 ML
Organisation delivering order.	Water NSW	Water NSW	Water NSW	Water NSW	Water NSW	Water NSW	Water NSW	Water NSW	Water NSW	Water NSW	Water NSW	Water NSW	Water NSW	Water NSW
Release date (days)	29/12/2022-10/01/2023	25/12/2022-29/12/2022	22/12/2022-25/12/2022	11/01/2023-14/01/2023	15/01/2023-22/01/2023	10/12/2022-31/01/2023	10/12/2022-28/02/2023	01/03/2023-31/03/2023	05/02/2023-03/03/2023	01/02/2023-04/02/2023	01/04/2023-01/06/2023	15/04/2023-16/05/2023	01/04/2023-30/04/2023	15/06/2023-30/06/2023
Form of water order submitted (e.g. Form A, email, verbal, other)	Email	Email	Email	Email	Email	Email	Email	Email	Email	Email	Email	Email	Email	Email

Comparison of Forecast and Actual Environmental Water Use

PPM event #1a Hypoxic Water Management Event December 2022 below Maude Weir –

- Target daily flow rates and volumes
 - 7000 ML/d for 5 days
 - 6000 ML/d for 29 days
 - 5000 ML/d for 8 days
 - 4000 ML/d for 5 days
 - 3000 ML/d for 8 days
- Forecast losses and actual losses (at an appropriate temporal scale for the event)
 - Loss were applied 1.1
- Volume of environmental water debited (with licence corresponding licence numbers)
 - 47,015 ML (EWA -40MA412242 & 40MA412243)
 - 48,000 ML (TLM-40AL405811)
 - 1,253 ML (CEWO- 40AL40AL415740)
- **Supporting Document:** D2023-073818 – Murrumbidgee PPM – DS Maude with and without targets Dec 2022 – May 2023_Assessment – 10
Murrumbidgee PPM order Native fish flows 2022–23

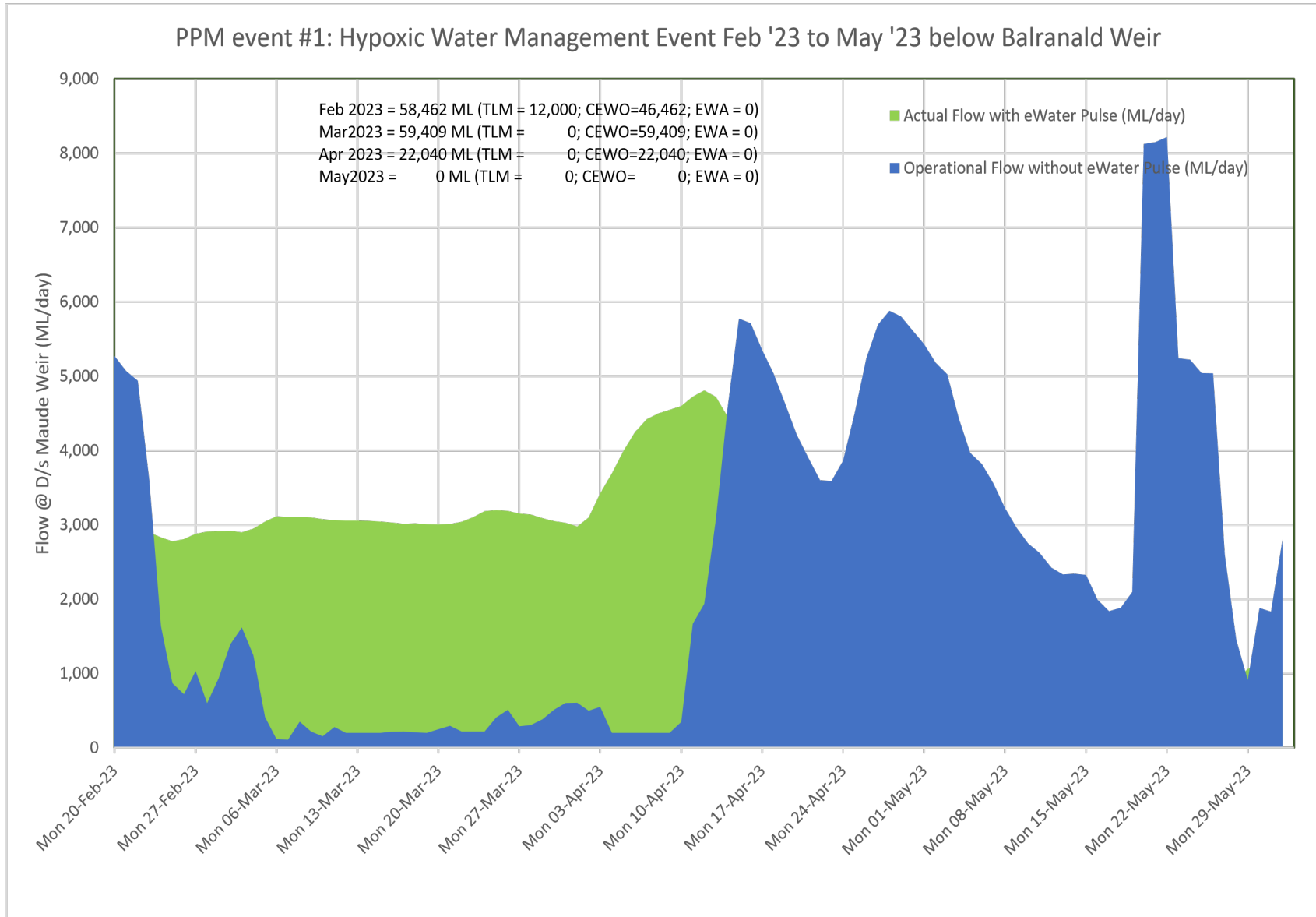
Figure 13: PPM event #1a: Hypoxic Water Management Event December 2022 below Maude Weir



PPM event #1b: Hypoxic Water Management Event December 2022 below Balranald Weir –

- Target daily flow rates and volumes
 - 3000 ML/d for 40 days
 - 2500 ML/d for 13 days
 - 1000 ML/d for 12 days
- Forecast losses and actual losses (at an appropriate temporal scale for the event)
 - Loss were applied 1.1 unless there was unregulated flow
- Volume of environmental water debited (with licence corresponding licence numbers)
 - 12,000 ML (TLM-40AL405811)
 - 112,670 ML (CEWO- 40AL40AL415740)
 - 15,241 ML (NSW EHG)
- Volume of water delivered to the Murray Valley that will be recognised as environmental water for 1a and 1b event.
 - 189,164 ML (TLM and CEWO Licence)
- **Supporting Document:** D2023-073818 – Murrumbidgee PPM – DS Maude with and without targets Dec 2022 – May 2023_Assessment – 10

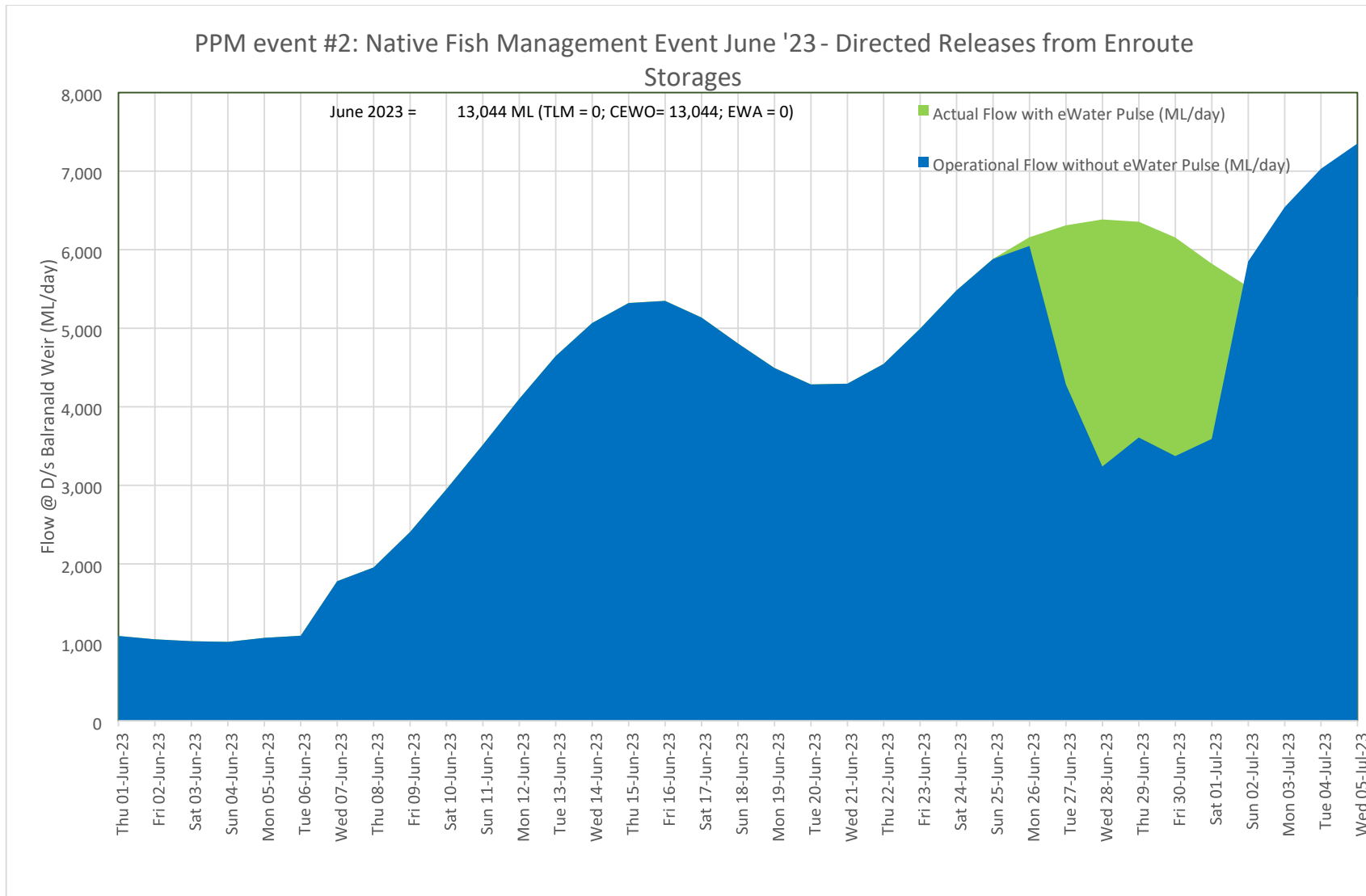
Figure 14: PPM event #1b: Hypoxic Water Management Event December 2022 below Balranald Weir



PPM event #2: Native Fish Management Event June 2023

- Volume of environmental water debited (with Licence corresponding licence numbers)
 - 13,044 ML (CEWO-40AL415740)
- Volume released from storages.
 - Tombullen = 5,886 ML
 - Hay Weir = 4,001 ML
 - Maude Weir = 3,165 ML
- Volume of water delivered to the Murray Valley that will be recognised as environmental water.
 - 13,044 ML (CEWO-40AL415740)
- **Supporting Document:** D2023-057811-Murrumbidgee PPM – Directed release from enroute storages – June 2023_Assessment – 2

Figure 15: PPM Event #2: Native Fish Management Event June 2023 – Directed Releases from Enroute Storages



Stakeholder Consultation

Table 51 provides a summary of stakeholder consultation. Supporting documents are included in Attachment D.

Table 51: Summary of stakeholder consultation

Date	Stakeholder forum/name	Environmental watering action/s discussed	Type of consultation	Summary of feedback	Stakeholder requests
12/12/2022	DPE	Environmental flows start for Native fish base flow,	Email	22 nd December start	DPE-EHG
24/01/2023	DPE-EHG	Ordering and Release of Water	Email	<p>A general description of the proposed event, including its environmental objectives.</p> <p>*Delivery details – including – target flow and or diversion rates and locations.</p> <p>*Start and end dates *Return flows (if applicable)</p> <p>*When delivery should cease</p> <p>*Delivery pathways (if more than one site) *Accounting arrangements</p> <p>*Nominate the entitlements- and split across access licence. *The decision-making process proposed to manage any potential variation in the weather or other relevant factors.</p>	DPE-EHG

Date	Stakeholder forum/name	Environmental watering action/s discussed	Type of consultation	Summary of feedback	Stakeholder requests
01/02/2023	DPE-EHG	Assessed usage with and without E-water scenarios shows that the preliminary usage volume is likely to be about 124GL to end of February.	Email	Dec 2022 = 1,048 ML (TLM = 1,048; CEWO=0) Jan 2023 = 84,577 ML (TLM = 46,952; CEWO=35,625) Feb 2023 = 37,556 ML (TLM = 0; CEWO=37,556)	Confirm if the assumptions on usage split is correct.
15/02/2023 Updated accounts sent on 7/02/2023	DPE-EHG accounts and PPM update	Draft PPM Order doc as discussed for feedback	Email	Total usage for DS Maude hypoxic event -98.1GL Debited 48GL against TLM and the rest against EWA2 and EWA1-EWA2 is fully used up and EWA1 has got 12GL remaining as unused carryover (potential forfeit) or Warriston figures haven't been finalised.	Usage has been confirmed/amend our order retrospectively or just leave as re over order. The 1000ML/d for March will be ordered to be in lead order time.
22/02/2023	DPE-EHG	DPE requests approval for the Murrumbidgee PPM Native fish flows water event.	Email	Approved. Up to 50GL of TLM water to be used first, EWA account water which is subject to forfeit is to be used next, then General Security water.	DPE-EHG
28/03/2023	DPE-EHG	Amendment 2: Additional objective is to build on existing surplus flows in the system to create a pulse flow into the Murray promoting fish movement and connectivity with low lying wetland and creek assets.	Email	Target a flow rate of 3,000ML/d downstream of Balranald Weir from 20 th Feb to 31 st March. Target a flow rate of 2,500ML/d from 1 st April to the 12 th of April.	DPE

Date	Stakeholder forum/name	Environmental watering action/s discussed	Type of consultation	Summary of feedback	Stakeholder requests
5/04/2023	DPE	Action: if the Tombullen water should be released have they missed the timing on this.	Email	With more rain on the forecast and depending how this event usage under and overs pans out we could still use Tombullen, Hay and Maude weirs and have a round 2 effort after Easter	DPE
6/04/2023	DPE	Authorise the planned releases from Hay and Maude weirs. Also agree to the releases from Tombullen but these should come delayed from original timing (6 th April) to manage recession at Balranald or the 500ML base flow as shown in the hydrograph	Email		DPE
09/05/2023	DPE-EHG	DPE requests approval for amendment #1 to the Murrumbidgee PPM native fish flows	Email	Flow rates at downstream Maude weir, "Debit at Dam" releases from Burrinjuck and Blowering dam and any other instream weirs and Tombullen storages.	DPE
14/06/2023	DPE-EHG	Timing of releases from Tombullen, Hay and Maude weirs and the likely flow peaks (ideally hydrograph)	Email	Hydrograph sent from Operations team in Water NSW	DPE
21/06/2023	DPE-EHG	Water Order No.2	Email	The new format of PPM orders/instructions	DPE
		Approval of new look to orders		New event	
29/06/2023	DPE-EHG	Amendment #2 Murrumbidgee PPM	Email	Debit at Dam- releases from Tombullen storage, Hay and Maude Weirs in	Desired flow rate and regulator settings, return

Date	Stakeholder forum/name	Environmental watering action/s discussed	Type of consultation	Summary of feedback	Stakeholder requests
		Native Fish flows watering event.		addition to releases required for other demands and that of inflows from the tributaries below the dams.	flows, cessation of the delivery-if unregulated or operation flows increase.
2023-24	DPE-EHG	Various post Water Year cost splitting meetings and email confirmation	Var.		

Recommendations to Improve Future Environmental Watering Actions

Table 52 provides a summary of key issues encountered in 2022–23 and recommendations for addressing these. Supporting documents are included in Attachment E.

Table 52: Summary of issues and recommendations

Environmental watering action	Issue	Agencies involved	Stakeholders involved	Recommendations
All	Water order process continued to frustrate all parties with the availability of water for delivery, the timeliness of amendments and the necessary feedback of actual use to the customers so that orders can be managed in real time.	EHG and WaterNSW	EHG, CEWO, TLM, DPE	The water orders must have all the elements as outlined in the PPM Procedures manual. (Section 2.4.2 of NSW PPM Procedures Manual for the Murrumbidgee Regulated River (Nov 2022))
All	Directions for flow and accounting splits need to be delivered to the entire South Operations team. Direct emails to individuals of specific directions makes post event accounting and reporting difficult.	EHG and WaterNSW	EHG, CEWO, TLM, DPE	Include southoperations.team@waterNSW.com.au in all correspondence. Possibility of creating a SharePoint page/folder to track history, changes and final decisions made for each event.
All	Use of iWas ordering system rather than manual order placing	EHG and WaterNSW	EHG, CEWO, TLM, DPE	iWas would assist with tracking and final order placing rather than back and forth email tracking post event
All	Planning	DPI	DPI EES, CEWO, TLM, DPE	Clear annual planning foresight required by e-water holders (under different scenarios) to provide operators an opportunity to look at long-term forecasting. Planning needs to be less reactive

Attachments

Attachment A – Risk assessments

Attachment B – Water orders

- Murrumbidgee PPM order Native fish flows 2022–23
- Murrumbidgee Native fish flow – Event No.MBG-22/23-05
- Murrumbidgee Native fish flow – E-Flo Event No. MBG-22/23-05 – Water Order No.2

Attachment C – Assumed Use Statements and evidence of other calculations used

- D2023-073818 -Murrumbidgee PPM -DS Maude with and without targets Dec 2022 -May 2023_Assessment – 10
- D2023-057811-Murrumbidgee PPM – Directed release from enroute storages -June 2023_Assessment -2

Attachment D – Details of stakeholder consultation and feedback

Attachment E – Supporting documents for key issues encountered and recommendations to address these issues

Appendix B BCS Group Annual Environmental Watering Statement

Prerequisite Policy Measures: Annual environmental watering statement 2022–23

This statement was prepared by DPE-Environment and Heritage in accordance with the reporting requirements described under Section 5.1 of the Prerequisite Policy Measures Procedures Manual for the Murrumbidgee Regulated River and the Prerequisite Policy Measures Procedures Manual for the NSW Murray and Lower Darling Regulated Rivers ('the PPMs Procedures Manuals').

Report prepared by:	James Dyer
Position:	DPE – EHG
Contact number:	0459898828
Date prepared:	08/12/2023

This statement has been considered and reviewed by other relevant environmental water holders as appropriate, including the Commonwealth Environmental Water Holder and the MDBA.

List of environmental watering actions

Table 53 provides a list of the environmental water actions undertaken using Prerequisite Policy Measures (PPMs) in the 2022–23 water year. Attachment A includes relevant supporting documentation for each event, including:

- Water Event Plan (Form A – Request to Deliver Environmental Water)
- Water Event Outcome (Form B – Environmental Water Delivery Report)
- Water Orders (including email orders)

Table 53: List of environmental watering actions using PPMs in 2022-23

Event number (From Form A)	LOD22/23-01	LOD22/23-02	MUR22/23-01	MUR22/23-08	MBG22/23-05
Name of environmental watering action	Darling Anabranh	Lower Darling/Baaka flows	Murray River Multi-site 2022–23	Edward/Kolety-Wakool river system 2022–23	Murrumbidgee Fish Flow 2022–23
River system/target valley	Lower Darling	Lower Darling	Murray	Murray	Murrumbidgee
Overview of environmental watering action	DPE EHG will manage NSW and Commonwealth Environmental Water to extend the duration of this flow connecting the Anabranh with the Murray River. This connection flow will provide an opportunity for thousands of juvenile native fish to migrate to the Murray River from Lake Cawndilla	The primary aim of the event is to maintain and improve large bodied native fish populations. There have been several reported fish kills in the Lower Darling over the past 6 months. Initially it is planned to deliver a small priming pulse of 1400 ML/day followed by 550ML/day baseflows (rather than the 200ML/day water sharing plan baseflow minimum). These flows will aim to improve Murray cod breeding and recruitment success and also aid the dispersal of Golden Perch juveniles which are in relatively good numbers following three years of high flows. The extra flow will also provide habitat for other	This event will deliver flows along the Murray from Hume Dam to the South Australian border, including the Millewa forest and a number of anabranhcs along the way including the Edward–Wakool system.	Water use will contribute to in-channel flows that maintain native fish condition, encourage native fish movement, reproduction, and recruitment, provide hydrological variability and connectivity and maintain water quality. This event will aim to build on past watering outcomes to maintain ecosystem resilience. The flows will have a particular focus on native fish population recovery given recent hypoxic water conditions.	This event will provide elevated base flows in the Murrumbidgee River and Yanco–Billabong Creeks to protect native fish from poor water quality caused from sharp falls in water level as flows return from unregulated to regulated conditions.

Event number (From Form A)	LOD22/23-01	LOD22/23-02	MUR22/23-01	MUR22/23-08	MBG22/23-05
		aquatic dependent species such as mussels and yabbies'.			
Environmental site/s targeted	Darling anabranch (Lake Cawndilla to the Murray river)	Lower Darling (Baaka) channel (Weir 32)	Millewa Group - Ramsar site Wetland, Werai Forest - Tumudgery Creek & Reed Bed - Ramsar site Wetland, Yallakool-Wakool, Colligen-Niemur. Murray River channel.	Wetland, Werai Forest - Tumudgery Creek & Reed Bed - Ramsar site Wetland, Yallakool-Wakool, Colligen-Niemur.	Murrumbidgee River channel
Type of PPM event					Return flows
Delivery start date	16/02/2023	25/02/2023	13/07/2022	13/01/2023	November 30, 2022
End date	30/06/2023	30/06/2023	30/06/2023	17/04/2023	May 16, 2023
PPM action					
Total volume of environmental water ordered (ML)	60,225.0	143,456.0	100,422.0	32,876.0	249,223.0
Total volume of environmental water debited (ML) <i>Include break up of state and Commonwealth</i>	CEWH GS/HS/Convey 60,033.0 NSW GS/HS/Convey 192.0	CEWH GS/HS/Convey 43,399.0 EWA Planned 30,000.0 NSW GS/HS/Convey 2,016.0 TLM GS/HS/Convey 68,041.0	BED Planned CEWH GS/HS/Convey 80,102.0 EWA Planned 5,691.0 TLM GS/HS/Convey 14,425.0	CEWH GS/HS/Convey 9,322.0 NSW GS/HS/Convey 23,554.0	CEWH GS/HS/Convey 126,967.4 EWA Planned 47,015.0 NSW GS/HS/Convey 15,240.6 TLM GS/HS/Convey 60,000.0

Event number (From Form A)	LOD22/23-01	LOD22/23-02	MUR22/23-01	MUR22/23-08	MBG22/23-05
<i>entitlement if available</i>					
Volume of return flows recognised at end of system <i>(if applicable)</i>					
Volume of return flows recognised at South Australian border <i>(if applicable)</i>	-	-	-	-	-

Risk assessment and mitigation

Table 54 details any risks identified during the planning of environmental water events which relied on Prerequisite Policy Measures, including deliverability risks, operational risks and other risks considered. The mitigation measures applied are also included in Table 51. Supporting information is included in Attachment B.

Table 54: Risks considered during event planning e.g. Lower Darling Baaka flows

#	Description of risk	Mitigation measure/s applied
1	Poor water quality impedes desired ecological responses - There is potential for blue algae events and/or hypoxic water events in the Lower Darling this summer	Discussion of flows and water quality issues through the TAG
2	Event fails to achieve desired ecological response - Targeted flow rates may not be enough to maintain connectivity for Golden perch dispersal	Monitoring of Golden perch dispersal to help inform future flow rates, timing etc

Environmental outcomes

Table 55 provides a summary of the objectives of the environmental watering event and the extent to which these objectives were met. It also provides information on the environmental outcomes observed to date, any ongoing monitoring of these outcomes. Supporting documents are included in Attachment C.

Table 55: Summary of environmental outcomes

Event number	Event name	Environmental objectives	Degree to which environmental objectives were satisfied	Environmental outcomes observed or being monitored
LOD22/23-01	Darling Anabranh	Fish	Objectives were satisfied, ongoing success of the event still being monitored.	HEW use for this event provided habitat connectivity for native fish and other water dependant biota such as yabbies.
LOD22/23-02	Lower Darling/Baaka flows	Fish	Objectives were satisfied, ongoing success of the event still being monitored.	HEW use for this event was critical for maintaining water quality for native fish in the Menindee town weir pool following mass fish kills in March 2023. The additional flows also provided connectivity throughout the length of the Lower Darling.
MUR22/23-01	Murray River Multi-site 2022-23	Native Fish; Connectivity (flows and flooding)	Objectives were satisfied, ongoing success of the event still being monitored.	The Multisite deliveries-maintained connectivity for native fish between unregulated events through the entire length of the Murray River from Hume to SA and maintained connectivity with key floodplain areas such as Millewa and Weraï.
MUR22/23-08	Edward/Kolety-Wakool river system 2022-23	Longitudinal connectivity; Fish	Objectives were satisfied, ongoing success of the event still being monitored.	
MBG22/23-05	Murrumbidgee Fish Flow 2022-23	Fish	Objectives were satisfied, ongoing success of the event still being monitored.	Prevented fish kills due to hypoxic water after floods.

Stakeholder consultation

Section 5.1 of the PPMs Procedures Manuals states that the Annual Environmental Watering Statement must document “any feedback from consultation with stakeholders on the actions undertaken”.

Table 56 provides a summary of stakeholder consultation. Supporting documents are included in Attachment D.

Table 56: Summary of stakeholder consultation

Date	Stakeholder forum/name	Environmental watering action/s discussed
June 2022	MLD EWAG	Darling Anabranch
		Lower Darling/Baaka flows
		Murray River Multi-site 2022–23
		Edward/Kolety–Wakool river system 2022–23
June 2022	Murrumbidgee EWAG	Murrumbidgee Fish Flow 2022–23

Attachments

Attachment A – Environmental watering event – supporting information

- Water Event Plan (Form A – Request to Deliver Environmental Water),
- Water Event Outcome (Form B – Environmental Water Delivery Report)
- Water Orders (including email orders)

Attachment B – Environmental outcomes supporting information

Attachment C – Risk assessments

Attachment D – Details of stakeholder consultation and feedback

Attachment E – Supporting documents for key issues encountered and recommendations to address these issues

Appendix C Downstream Edwards Weir loss method

Niemur offtake –

- What is the agreed travel time from Stevens?
 - MDBA has advised they use a travel time of 10 days for Stoney Crossing to SA border. The WAKSYST model assumes a travel time of 14 days to Stoney Crossing from the Colligen regulator, and 10 days from the Niemur syphon so could we assume a travel time of 24 days from Stevens Weir to SA via Niemur offtake (noting that tt of 28 days for Stevens Weir to SA border is used by MDBA).
- Is 30% loss correct? Summer loss rate for Wakool is 80% (<450 ML)
 - The 30% summer loss rate is an interim loss rate to be used for this event based on the wet antecedent conditions in the system. The 80% summer loss rate (as typically used for the Edward–Wakool e-water accounting for flows > 450 ML) is based on a risk profile similar to that used for NSW resource assessments (between the 95th percentile and the maximum monthly loss). Given the wet conditions of the system over summer, a 25th percentile risk profile was selected (aligning with the resource assessment approach of using a 1 in 4 chance for wet conditions). A simple 30% of D/S Stevens flow and 30% of this is lost was used to calculate return flows through the Niemur. Note that return flows can only be calculated and applied for those flows that are e-water (i.e. not the entire flow in the system)

Edward River –

- Assessed on Murray Flows at Boundary Bend plus travel time. What is the agreed travel time from Stevens?
 - MDBA has advised they use a travel time of 28 days for Stevens Weir to SA border (inc 7 days from Boundary Bend to SA).
- Flows are still at around 35,000ML/d and out of the bounds of the loss lookup table. At 21,500ML/d delivering 1,500ML/d losses are 308ML/d or 20.5% does this look right?
 - There is a second loss table for flows over 20,000ML/d. Using the flows you've provided (21,500 delivering 1500 of HEW) losses around 50 ML (2.5%). At flows of 35,000, loss increases to 8.4%.
- Review and approve loss lookup table
 - 70% of D/S Stevens was used to calculate assumed e-water flow through Edward (assuming 30% is through the Niemur o/t). The losses require further review as per above.

Appendix D Niemur River loss method

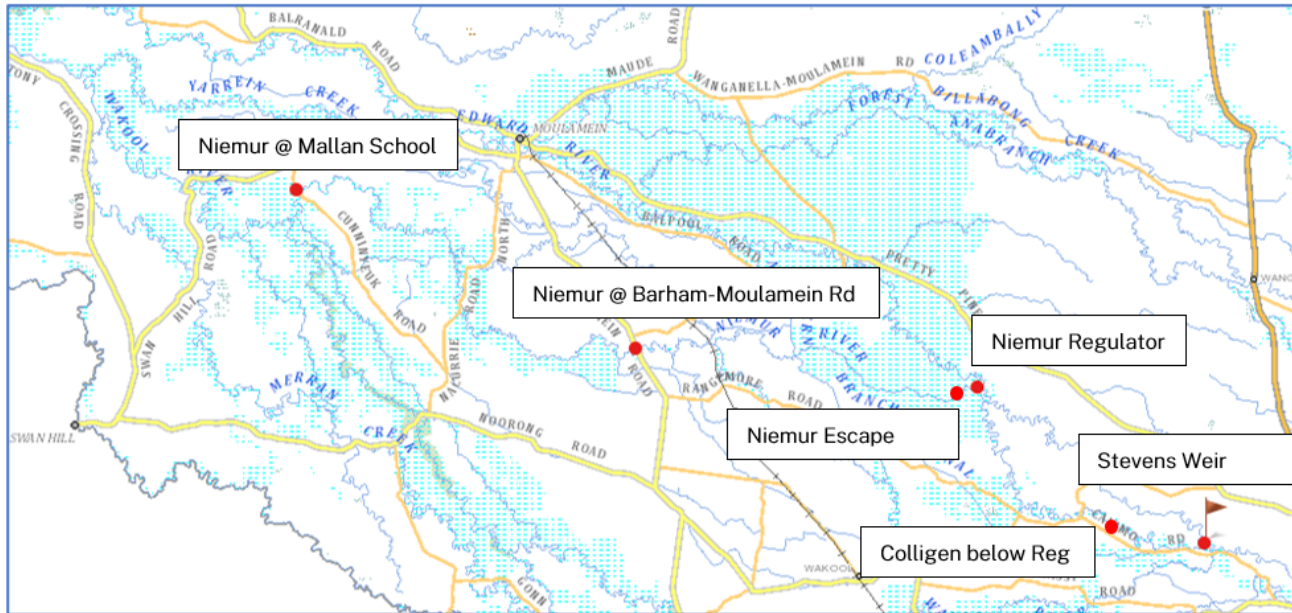
Niemur River interim assumed use accounting

There are several ways that the 'assumed use' incurred by opening of the Niemur Regulator could be calculated. As this is the first Niemur environmental delivery made on top of the Murray winter baseflows directed release using PPMs and there are several key data gaps, it is proposed that the winter baseflow event will be undertaken as on a 'trial, no regrets' basis.

It is recommended that the EWHs coordinate additional gauging during the event to further the understanding of the hydrology of the system and assist with the development of accounting arrangements in the future.

The proposed method is to apply a loss percentage to the additional inflow to the Niemur River, as measured at the Barham–Moulamein Road gauge (409048), noting that the Niemur regulator is not gauged (Figure 16).

Figure 16: Stevens Weir, Niemur Regulator, Barham–Moulamein and Mallan gauge locations



System losses were derived by comparing flows at the Barham–Moulamein Rd gauge (409048) with the Mallan School gauge (409086). The methodology used was as follows:

- Flows at Mallan School were adjusted for a +4 day travel time
- The data set was filtered for flows between 30 ML/d and 2000 ML/d, the predicted flow range expected through the Niemur regulator as a result of the winter baseflows directed release
- Flows were filtered for ‘losing’ days, excluding days when flows at Mallan School were greater than 100% of flows at Barham–Moulamein Road (i.e. considered a ‘gaining’ system). An initial review of data indicated that localised rainfall drove up system losses due to the time lag in flows increasing at the upstream and downstream gauges
- The system loss was calculated on daily timestep, whereby flow at Mallan School gauge was divided by the flow at Barham–Moulamein Rd
- The system loss rates for different percentiles are shown in Table 57

- Further review of data indicated that losses were fairly consistent between seasons, with the bigger impact on losses being the impact of rainfall on the upstream gauges
- It is proposed the 75th percentile loss rate of 21% is adopted to calculate the assumed use. Adopting a higher loss percentile than this would encompass periods when losses were ‘artificially’ being driven up by localised rainfall
- It is also noted the data and loss calculations do not consider consumptive take, which may also inflate the losses determined.

Table 57: Niemur loss rate for e-water accounting

Percentile	Loss (%)
90%	34%
75%	21%
50%	13%
25%	7%
10%	3%

The proposed methodology to determine the Niemur River 'assumed use' is:

1. After adjusting for travel time, when the daily average flow passing the Mallan gauge is equal to or exceeds the daily average flow passing the Barham–Moulamein gauge, no losses are to be applied and where a directed release has been made, the full volume of the environmental debit is to be recognised at the South Australian border
2. After adjusting for travel time, when the daily average flow passing the Mallan gauge is less than the daily average flow passing the Barham–Moulamein gauge, calculate the additional flow in the Niemur due to the opening of the regulator by using the formula: the daily average flow at the Barham–Moulamein gauge, minus the inflow at Colligen Creek (409024) minus inflow at the Niemur Escape.
3. Apply the loss rate 21%, to the additional flow in the Niemur River as per Step 2.

$$\begin{array}{l} \text{Loss} \\ \text{between} \\ \text{Barham-} \\ \text{Moulamein} \\ \text{and} \\ \text{Mallan} \end{array} = \left(\begin{array}{l} \text{Flow at} \\ \text{Barham-} \\ \text{Moulamein} \\ \text{Rd (ML/d)} \\ 409086 \end{array} - \begin{array}{l} \text{Colligen} \\ \text{Creek} \\ \text{Below} \\ \text{Regulator} \\ \text{(ML/d)} \\ 409024 \end{array} - \begin{array}{l} \text{Niemur} \\ \text{Escape} \\ \text{(ML/d)} \end{array} \right) \times \begin{array}{l} \text{Loss} \\ 21\% \end{array}$$

4. To account for the additional loss that occurs between the Niemur Regulator and the Barham–Moulamein gauge the above loss is converted to a loss rate of ML/km. To calculate the loss rate the loss between Barham–Moulamein and Mallan is divided by the length of river between the gauges, approximately 52 km. To calculate the upstream loss this rate is then multiplied by the length of river between the Niemur regulator and the Barham–Moulamein gauge 39 km. To calculate the assumed use the loss between Barham–Moulamein and Mallan is added to the upstream loss as per the equation below:

$$\begin{array}{l} \text{Assumed} \\ \text{use} \end{array} = \left(\begin{array}{l} \text{Loss} \\ \text{between} \\ \text{Barham-} \\ \text{Moulamein} \\ \text{and} \\ \text{Mallan} \end{array} \div 52 \times 39 \right) + \begin{array}{l} \text{Loss} \\ \text{between} \\ \text{Barham-} \\ \text{Moulamein} \\ \text{and} \\ \text{Mallan} \end{array}$$

The assumed use will then be:

- in the case of directed releases, applied to the NSW portion to estimate the return flows to be protected downstream and recognised at the SA border, or
- if there is no directed release (i.e. when the environmental water order is met by system flows), then the volume of assumed use will be debited from the appropriate NSW EWHs licence, or
- If there is a mix of direct release and operational water supporting the delivery down the Niemur, then the assumed use will be applied first to the direct release component, and if this is insufficient to cover the assumed use, then to an appropriate NSW EWHs licence.

Appendix E Key evaluation questions

Table 58: Assigned performance indicators for KEQs

Key evaluation questions (KEQs)	Performance indicators	Reason for indicator inclusion, use of indicator
KEQ 1 How consistently were PPMs implemented during the last water year and how did that compare to previous years?	PI 1a Extent to which agencies fulfilled their roles as set out in the Procedures manuals during each stage of the process	Demonstrate whether each agency fulfilled their key obligations through each phase of PPMs i.e., planning, ordering, accounting, reporting phases. Assessed for each event relying on the implementation of PPMs.
	PI 1b Level of agency understanding of their roles and responsibilities	Determine how well each key agency understands of their obligations (activate if PI 1a assessment falls below acceptable benchmark level)
	PI 2a Extent to which reports and supporting information were provided (including annual reports, event forecasts and post-event accounting)	This indicator assesses the quality and comprehensiveness of the information provided by implementing agencies. The provision of data and reporting elements is a key element of successful PPMs implementation. Good indicator performance demonstrates NSW compliance with the PPMs procedure; ongoing identification of issues and recommendations and areas for improvements; building of data sets; building basis for future reviews.
KEQ 2 Was the PPMs process implemented efficiently during the last water year and how did that compare to previous years?	PI 2b Extent to which reports, and supporting information were submitted on time (including annual reports, event forecasts and post-event accounting)	This indicator assesses timeliness of information provided by implementing agencies. The timely provision of data and reporting elements is a key element of PPMs implementation and an Environmental Watering Plan commitment; delay may indicate onerous or inappropriate reporting requirements or lack of understanding. Delay in post-event accounting may also limit the efficient and effective use of HEW.

Key evaluation questions (KEQs)	Performance indicators	Reason for indicator inclusion, use of indicator
KEQ 3 How effective are PPMs in improving the use and accounting of environmental water?	PI 6 Extent to which accounting arrangements demonstrated improved efficiencies for environmental water use	Demonstrate from an accounting perspective where and how there have been ongoing improvements and efficiencies for how environmental water is accounted for and used.
KEQ 4 Are adaptive management processes effective in improving PPMs implementation?	PI 5 Extent to which recommendations from previous reviews were actioned	Determine if NSW making good on our commitment for review and continuous improvement.
	PI 7 Extent to which the level of conservatism in arrangements was commensurate with risk to other water users	Determine if the level of conservatism changes (i.e., decreases) as our knowledge, understanding and management of the real risk improves (e.g., ensure that the EWHs are not 'paying' for unnecessary conservatism to enable optimisation of e-water use).
KEQ 5 How can the implementation of PPMs be improved?	PI 3 Extent to which the process cannot be implemented as intended	Addresses consistency aspects. Identifies which elements of the process cannot be implemented by a particular agency (or agencies) and why not (impediments or barriers).
	PI 4 Extent to which risks were well managed	Addresses efficiency aspects. Management of risks, including risk to other water users, is important given that PPMs provide a new way of managing water requiring effective processes to be established and followed. New and emerging risks should be assessed, mitigated and documented as they arise. The mitigation of risks to other licence holders is also a key principle of PPMs implementation.

Appendix F Evaluation results

Table 59: Evaluation results

Indicator	Annual performance	Evidence to support performance assessment	Trend since PPMs started
<p>PI 1a Extent to which agencies fulfilled their roles as set out in the Procedures Manual during each stage of the process</p>	<p>Moderate: Agencies generally fulfilled nominated responsibilities. When not met, explanation of when, why and circumstances are identified and documented. Reports submitted in full. Activates assessment of PI 1b.</p>	<p>At a broader level, all agencies made a genuine attempt to make good on their PPMs responsibilities; this level of adhere to roles and processes is generally consistent with previous years. Obligations around the collaborative development of water orders, seeking departmental review of orders using PPMs and regular e-water reporting are areas which have not been fully subscribed to both in this water year and earlier; however, it is noted that the PPMs process possibly is not prescriptive enough around seeking the department’s review of an PPMs proposal.</p>	<p>Neutral: Retention of low or moderate performance</p>
<p>PI 1b Level of agency understanding of their roles and responsibilities</p>	<p>Moderate: Agencies generally understand nominated responsibilities. Most areas of poor understanding are identified and there are plans to address them.</p>	<p>Consistent to previous years, all agencies have a general understanding of their nominated responsibilities as set out under PPMs. The day-to-day busyness of staff across all agencies and the resource-intensive nature of the planning and reporting of events using PPMs (as opposed to say consumptive water orders) are the sticking point. However, this is generally fully articulated or captured in any reporting or meeting minutes.</p>	<p>Neutral: Retention of low or moderate performance</p>

Indicator	Annual performance	Evidence to support performance assessment	Trend since PPMs started
<p>PI 2a Extent to which reports and supporting information were provided, including annual reports, event forecasts and post-event accounting</p>	<p>Moderate: Most agencies submitted reporting elements with relevant supporting information</p>	<p>The annual reports provided were generally complete in that all sections of the reports were generally filled in. Relevant supporting information was provided, such as accounting spreadsheets and Form As.</p> <p>In both reporting elements (i.e. the river operations report and the environmental watering statements), both the risk assessment and issues/recommendations sections of the respective report would benefit from more complete documentation to provide meaningful input into the PPMs review process, including agency perspectives on recommendations as to how these risks or issues could be overcome.</p>	<p>Neutral: Retention of low or moderate performance</p>
<p>PI 2b Extent to which reports, and supporting information was provided, including annual reports, event forecasts and post-event accounting, were submitted on time</p>	<p>Moderate: 50% - 75% submitted within agreed timeframes or by submission dates</p>	<p>The timely provision of reporting elements by partner agencies significantly improved from the previous year; annual report submission for the 2022–23 water year was on time and reporting of events has improved however not reliably meeting being reported within one month of the event.</p>	<p>Positive: Increasing performance or retention of high performance</p>
<p>PI 3 Extent to which the process cannot be implemented as intended</p>	<p>Moderate: Process in generally implemented; where there have been deviations or departures from process, there is a documented reason including identifying any possible risk or implications; barriers have been identified but not addressed.</p>	<p>While the overall PPMs process was generally implemented as intended; barriers to implementing the procedures that were not completed for the 2022–23 have been identified however further work is required to address them.</p>	<p>Neutral: Retention of low or moderate performance</p>

Indicator	Annual performance	Evidence to support performance assessment	Trend since PPMs started
PI 4 Extent to which risks were managed	Moderate: Some evidence that consideration has been given to risks during PPMs implementation with documentation indicating how risks were managed.	There is little documentation to support any assessment of how risks were identified and managed. Failure to capture these risks and how they were mitigated means that opportunities to learn from these planning discussions may be missed and they cannot be 'built' into subsequent events or any supporting measures (such as assumed use methods or accounting arrangements). Further work is required to document the risk assessment process.	Neutral: Retention of low or moderate performance
PI 5 Extent to which recommendations from previous reviews have been actioned	Moderate: Prior review recommendations are included in this year's workplan; PPMs Working Group are generally satisfied with this year's progress on high priority actions.	Less than half of the recommendations made in the previous year's annual review (2021-22) were completed, however significant progress has been made including one new accounting arrangement for a watering action and progress on another three. The PPMs WG has been positive about this progress that has enabled new watering events. It is expected that the number of items on the workplan will reduce over time, as key tasks (such as those required under FAA and IPART) are completed.	Neutral: Retention of low or moderate performance

Indicator	Annual performance	Evidence to support performance assessment	Trend since PPMs started
PI 6 Extent to which accounting arrangements demonstrated improved efficiencies	Low: No accounting arrangements in place or no post-event accounting undertaken.	Environmental water accounting demonstrates the efficiencies provided by PPMs in the southern NSW Basin. Without PPMs in place, the 213,000 ML of residual flows reaching the River Murray would otherwise have been re-socialised/reallocated to NSW resources. Similarly, a large portion of these return flows were then able to be recognised at the SA border, providing opportunities for downstream environmental benefits. However no work to do post-event accounting has been undertaken. This is because the priority has been to fill the gaps by developing new arrangements rather than reviewing the ones in place. This will be addressed as PPMs implementation matures.	Negative: Declining performance level
PI 7 Extent to which the level of conservatism in arrangements were commensurate with risk to other water users	Moderate: Level of conservatism in discretionary decision making is somewhat commensurate with risks to other water users; new knowledge, understanding and data partially incorporated; not all arrangements have been subject to review of actual versus estimated losses.	NSW PPMs implementation principles state that they will be implemented to the extent that impacts on other licence holders can be mitigated or offset; where there is uncertainty, NSW adopts a precautionary approach to minimise potential detrimental impacts. For example, the new Niemur River looked to balance risk to water users by adopting a 75 th percentile for losses.	Neutral: Retention of low or moderate performance
PI 8 Extent to which PPMs are being adaptively implemented	Moderate: Any barriers to implementation are identified and discussed by the PPMs WG; supporting documentation (including procedures manuals) are updated as needed.	PPMs are being adaptively implemented, as demonstrated by both the types of events using PPMs for more efficient environmental water delivery, and also through (gradual) improvement of arrangements that are in place.	Positive: Increasing performance or retention of high performance

Appendix G Fulfillment of roles and responsibilities

Table 60: Fulfillment of roles and responsibilities

Requirement	DCCEEW Water	WaterNSW	EHG	MDBA (TLM)	CEWO	NSW PPMs WG	Further details (as needed)
<i>Planning</i>							
Environmental water holders develop annual environmental watering priorities, strategies, and plans and inform the department			✓ somewhat				Water priorities for the upcoming year were provided at the July 2023 PPM WG meeting. It is recommended that there is process where this is shared with river operators as part of annual planning.
EHG to work collaboratively with other environmental water holders (i.e. CEWO and through the Southern Connected Basin Environmental Watering Committee - SCBEWC if appropriate) in the planning and coordinated use of environmental water			✓	✓	✓		
NSW PPMs workplan maintained, and incorporates annual environmental watering priorities as provided by EWHs	✓						Workplan reviewed at July 2023 PPMs WG meeting.
Assist in developing assumed use/in-stream loss rates/methods as per principles and rules in this Manual	✓	✓	✓	✓	✓		All agencies participated in the development of the Niemur River accounting method.
Assess assumed use/in-stream loss rates/methods as per principles and rules in this Manual	✓						Niemur River accounting method assessed as per principles in Procedures manuals

Requirement	DCCEEW Water	WaterNSW	EHG	MDBA (TLM)	CEWO	NSW PPMs WG	Further details (as needed)
Approve proposed interim arrangements or trials if suitable conditions and mitigation measures are demonstrated	✓ some-what						Interim arrangements approved for: - Niemur River - releases from Lake Cawndilla down the Anabranche - revised
Consult with the PPM Working Group on any new or revised actions or supporting measures	✓					✓	
Classification of take / return measurement at recognised environmental watering sites	N/A	N/A					No additional sites used
Work collaboratively to develop orders for environmental water actions and recommend appropriate risk mitigation strategies	✓	✓	✓	✓	✓		General collaboration; however, further collaboration during the planning stage would assist in risk identification and contingency planning.
Environmental water holders work with WaterNSW to develop a watering proposal, including target flow and location		✓	✓	✓	✓		
Review and approval environmental watering proposal/plan using PPMs	✓						Events using PPMs are not always provided to the department; for example, watering the Edward–Wakool and some of the Murrumbidgee events.
<i>Implementation (ordering & release & accounting)</i>							
EHG submits Water Order to WaterNSW			✓				In their annual reports, WaterNSW raised that sometime the order is placed within the WaterNSW ordering system after the event has commenced.

Requirement	DCCEEW Water	WaterNSW	EHG	MDBA (TLM)	CEWO	NSW PPMs WG	Further details (as needed)
WaterNSW to consider operational risks and mitigation measures when considering water orders		✓					Risks documented in the Environmental Release River Operations reports largely consider under/over estimates and accounting. Operational risks are considered as per WaterNSW internal procedures.
WaterNSW to collaborate with EHG on risk and mitigation strategies as they relate to the use of PPMs prior to approval or rejection of water orders		✓ somewhat	✓ somewhat	✓ somewhat	✓ somewhat		No documentation of this provided.
For approved Water Orders, WaterNSW is to operate the river accordingly		✓					
For Water Orders that are refused or rejected, WaterNSW is to document the supporting explanations in the Annual Environmental Release River Operations Report		N/A					No reports indicated that any order was refused or rejected.
Environmental water managers are required to undertake appropriate communication actions to ensure that potentially affected landholders and the general community are aware of the proposed watering event			✓				Annual Environmental Watering Statement listed consultation with Murrumbidgee and Murray Lower Darling EWAGs.
WaterNSW to provide operational reporting on release of environmental water, including regular environmental water use accounting during events		✓					Reporting provided to EWHs during events.
Accounting							

Requirement	DCCEEW Water	WaterNSW	EHG	MDBA (TLM)	CEWO	NSW PPMs WG	Further details (as needed)
WaterNSW to provide monthly reporting to environmental water holders on water usage and return flows, split by licence holder		✓					Monthly reporting not provided to EWHs.
WaterNSW determines and debits volume of held environmental water as a result of environmental watering actions using PPMs via an assumed use statement (including supporting information such as loss rates, source of data and assumptions)		✓					Assumed use statements are not provided. WaterNSW provide volumes of debit and return flows by way of email with supporting spreadsheets that set out the calculations based on the assumed use method (and also included in their PPMs annual environmental release statement).
<i>Adaptive management (reporting & evaluation)</i>							
WaterNSW will provide an Annual Environmental River Operations Report and relevant supporting information		✓					Yes, provided 15 Dec 2023
EHG to provide an Annual Environmental Watering Statement and relevant supporting information			✓				Yes, provided 15 Dec 2023
EHG to provide the CEWO and MDBA (TLM) with the Annual Environmental Watering Statement for their review			✓	✓	✓		Confirm if this has taken place

Requirement	DCCEEW Water	WaterNSW	EHG	MDBA (TLM)	CEWO	NSW PPMs WG	Further details (as needed)
DPE Water to complete Annual Evaluation & Review Report	✓						Completed for 2021–22. Draft submitted to PPM WG by 30/06/23. This assessment forms part of the 2022–23 report.
Consult with WaterNSW, EHG, MDBA and CEWO via the PPMs Working Group when conducting each annual review, including the annual evaluation and review report and its recommendations	✓ somewhat					✓ somewhat	Consultation and opportunity for review provided to the WG on the 2021–22 report, however at the July 23 meeting (not during 2022–23 water year). Report discussed at meeting and opportunity for written comment given. Most agencies provide feedback.
Developing and documenting accounting arrangements for new or interim actions	✓						Niemur method developed
Building and expanding data sets	✗	✗					Not formally undertaken as an action; however, data received from PPMs actions are collated and stored.
Hindcasting and review	✗	✗					None undertaken to date. Review and refinement of existing arrangements are considered in light of broader work plan and priorities.
Refining/improving accounting arrangements	✓ somewhat						<ul style="list-style-type: none"> - GDA method revised to include when Tara Downs backwater effected - Lower Darling method revised to include unregulated conditions in the Murray

Requirement	DCCEEW Water	WaterNSW	EHG	MDBA (TLM)	CEWO	NSW PPMs WG	Further details (as needed)
Updates to Procedures manuals published	✓						Updates were made in Dec 2022, further updates are required based on the recommendations of this report
Approved and documented accounting methods	✓ somewhat						New arrangements are documented and shared with the PPMs Working Group. New accounting arrangements e.g. Niemur not included in PPMs manual - previous ones made prior to Dec 22 were included.
Review and approve PPMs arrangements and any subsequent variations following the review phase of PPM operations	✗						This doesn't occur post-event.
Consultation							
DPE Water to consult with WaterNSW, EHG, MDBA via the NSW PPM WG on the annual review, developing new or existing actions and supporting measures	✓ somewhat						Only one PPM working group meeting was held during 2022–23 (Mar 23), communication plan is in development (as of Mar 24)
WaterNSW will consult with water users or their representative groups via existing forums and provide a summary as part of the requirements of the Annual Environmental Releases River Operations Report		✗					Consultation summary completed for all water actions. Consultation with Edward–Wakool Operations Advisory Group.
EHG will consult with the river operator regarding proposed watering actions using PPMs before placing the order							

Appendix H PPMs Working Group Work Plan as of April 2024

The PPMs Working Group Work Plan is maintained by the Water Group. The PPMs Working Group is provided the opportunity to review the work plan at each meeting to identify and prioritise tasks. The tasks for PPMs implementation are distributed between members of the working group based on the roles and responsibilities of each agency, availability of resources, and the priority identified in the work plan.

Meetings and administration

Table 61: Meetings and administration

Task ID	Action
0.1	PPM Working Group meetings
0.2	PPM technical working group/s meetings
0.3	Update NSW PPM workplan. To be reviewed each WG meeting
0.4	Update priorities for 2023–24 following November WG meeting.
0.5	Review of work approval conditions to reflected gazetted WSP rules.

Reporting and communication

Table 62: Reporting and communication

Task ID	Action
1.1	PPMs Communications and Consultation Plan
1.5	Annual Environmental Watering Statement 2022–23
1.6	Annual Environmental River Operations Report 2022–23
1.7	Annual PPM evaluation and review report 2022–23
1.7a	Draft annual review report
1.7b	Internal review
1.7c	Share with PPM WG for comment
1.7d	Finalise report
1.7e	Publish report on HEW Hub

Watering priorities and technical tasks (by valley)

Murrumbidgee

Table 63: Watering priorities and technical tasks - Murrumbidgee

Task ID	Action
2.1	<p>Develop loss lookup tables for reaches in the Murrumbidgee for return flow recognition. WaterNSW Modelling team to do modelling work and DPE Water to guide methodology development, analysis and write up of accounting arrangement.</p> <p>Accounting arrangement for Mid-Murrumbidgee wetlands reconnection event (multi-site) – up to 45,000ML/d event. This needs to encompass the accounting for any over-bank delivery including up to the future lifted constraints.</p> <p>Accounting treatment of environmental flow reuse from Mid-Murrumbidgee wetlands to Balranald – this should also include from Wagga if that is a delivery location also.</p> <p>EWHs propose dam wall debit accounting of releases from storage.</p>
2.2	<p>Lowbidgee weir pool filling</p> <p>Previously EWHs have been charged to fill weir pools when conditions are dry/maintenance mode (e.g. if WaterNSW delivering to only one or two customers). Consider if EWH have ownership of the water d/s of the weir/event (i.e. similar to a multi-site arrangement) e.g. consider accounting treatment of return flows to fill Lowbidgee weir pools to enable delivery of e-water into GNC, Yanga or Redbank.</p>
2.3	<p>Protection of HEW deliveries in unregulated rivers. CEWO and DPE EHG to provide DPE Water with specific examples of unreg e-watering for PPMs.</p>
2.4	<p>Lowbidgee return flows (Yanga, Gayini Nimmie Caira and Redbank)</p> <p>Progress assumed use method for losses through Yanga, Gayini Nimmie Caira and Redbank.</p>
2.6	<p>Yanco Creek post-event accounting review</p>
2.7	<p>Review of the BED approach</p>
2.9	<p>Develop procedures and or policies in relation to the accounting of environmental water events when rainfall rejection occurs and also for the management of small supplementary events in the Lowbidgee in relation to PPMs.</p>

Task ID	Action
3.0	Murrumbidgee dam/s recession rates, investigate changes to the WSP to address this issue e.g. amendment to allow piggybacking on translucency releases
3.1	Mid-Murrumbidgee and Lowbidgee wetlands/forests – are there any watering events where you need to open an ungauged regulator to water a site during regulated conditions where there are no current accounting arrangements in place?

Lower Darling and Great Darling Anabranh

Table 64: Watering priorities and technical tasks - Lower Darling and Great Darling Anabranh

Task ID	Action
3.2	NSW to develop position paper on return flows from MLS when the system is in NSW control
3.4	TLM licence review, noting that discussion of CEWH holdings is out of scope.
3.5	Confirm and document how losses are shared/reallocated between the states during MDBA control – some deliveries have been made, needs to be documented.
3.6	Review of Lower Darling losses (W32 to Burtundy)
3.7	Review of GDA accounting arrangements

NSW Murray

Table 65: Watering priorities and technical tasks – NSW Murray

Task ID	Action
4.1	Review of Edward–Wakool River accounting arrangement (including ordering from un-accredited escapes)
4.3	Millewa Forest accounting – review of MDBA accounting method

One-off tasks

Table 66: Watering priorities and technical tasks – One-off tasks

Task ID	Action
5.2	Streamline PPMs process including fit-for-purpose water ordering (improve and better document planning and ordering process including mapping out contingencies prior to e-water events)
5.3	Developed assume use template (or link with above task)
5.4	Develop catalogue for e-water events in the Murray, Lower Darling and Murrumbidgee
5.5	Revised Procedures Manual to capture additional work done on accounting methodologies, principles and position papers
5.6	Use of a consistent identifier across agencies
5.7	Review debiting methodology for piggybacking

Related work strands

Table 67: Watering priorities and technical tasks – Related work strands

Task ID	Action
	Review related work strands, including: <ul style="list-style-type: none"> - Can return flows be applied in the Lachlan from season to season - Tantangara releases for unregulated protection (upper Murray) - Use of s324s in Murray unreg
	EEWD-PPM linkages to be explored, with EEWD contribution to PPM workplan to be confirmed in EEWD Stage 1B, for delivery in EEWD Stage 2. EEWD Stage 1B is complete June 2024, with Stage 2 June 2024 to Dec 2026.

Completed tasks

Table 68: Watering priorities and technical tasks – Completed tasks

Task ID	Action
	NSW Murray -River Murray Increased Flows (RMIF) o Proposed new PEW account in WSP to “permanently recognise NSW’s share of RMIF water”. o Recognition PPMs will apply to RMIF
	Murrumbidgee - Agreement on accounting for return flows from Murrumbidgee into River Murray (Balranald to SA border)
Task 0.5	WSP gazettal for MBG and MLD with enabling provisions for PPMs
1.5	Update Procedures Manual - Murrumbidgee
1.6	Update Procedures Manual - NSW Murray & Lower Darling
2.5	2017-18 BED trial review publication
2.7	Incremental loss look up table expanded for flows > 20,000 ML/day at Boundary Bend
3.1	Lower Darling directed releases & return flows
3.3	Great Darling Anabranh releases – return flows arrangements
3.5	Great Darling Anabranh - audit of structures and works approvals, commitments for environmental flows
1.2	Annual Environmental Watering Statement 2021–22
1.3	Annual Environmental River Operations Report 2021–22
1.4a	Draft annual review report

Task ID	Action
1.4b	Internal review
1.4c	Share with PPM WG for comment
1.4	Annual PPM evaluation and review report 2021–22
1.4d	Finalise report
1.4e	Publish report on HEW Hub
4.6	Niemur Offtake return flows and management of water events
4.7	Murray–Edward–Niemur winter base flows (trial for 2023)
2.5	<p>Return flows for Yanco/Billabong/Forest Creek system</p> <p>E-water can be used to maintain stable water level to provide nesting habitat cod; historically would have variable water levels through this period of the year; target 600 ML/d @ Yanco offtake.</p> <p>Accounting treatment for in-channel deliveries and possible return flows into the River Murray; consider Wanganella Swamp levels and also SDLAM.</p>
4.2	Werai Forest accounting for return flows
5.1	Evaluation Framework
4.4	Bulk trade adjustment trial – BOC approved trial period has now ended. Recommend any future work on instream trade adjustment trial is co-ordinated through EWIG as it is an interjurisdictional body.
4.5	Use of MIL escapes for e-water delivery (the use of the ERE has been included in the accounting for the Niemur, Werai and Yanco methods)