



BASIN PLAN IMPLEMENTATION

NSW Murray and Lower Darling Regulated Rivers Prerequisite Policy Measures: Procedures Manual

Appendix D

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Glossary

Abbreviation	Description
BOC	Basin Officials Committee
CEWH	Commonwealth Environmental Water Holder
CEWO	Commonwealth Environmental Water Office
EWAG	Environmental Water Advisory Group
HEW	Held Environmental Water
IRORG	Independent River Operations Review Group
MDB	Murray-Darling Basin
MDBA	Murray-Darling Basin Authority
O&O document	Objectives and outcomes for river operations in the River Murray System document.
OEH	NSW Office of Environment and Heritage (now NSW Department of Planning, Industry and Environment – Biodiversity and Conservation)
PPM	Prerequisite Policy Measure
PPM IP	NSW Prerequisite Policy Measure Implementation Plan
SO&Os	Specific Objectives and Outcomes for River Operations in the River Murray System
SCBEWC	Southern Connected Basin Environmental Watering Committee
SDL	Sustainable Diversion Limit
TLM	The Living Murray
WLWG	Water Liaison Working Group
WMA	<i>Water Management Act 2000</i>
WRP	Water Resource Plan
WSP	Water sharing plan

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1. Introduction

Pre-requisite Policy Measures (PPMs) seek to maximise the beneficial outcomes of water recovered for the environment under the Basin Plan. In developing the Basin Plan, the Murray-Darling Basin Authority (MDBA) assumed that rivers will be managed to maximise environmental outcomes with the water available without impacting on the reliability of other water users. This concept was being explored by Basin States for the multi-site environmental watering trials in the River Murray. The intended outcomes were for:

- Environmental water flows throughout the length of the river, and between rivers; and protected from extraction, re-regulation or substitution, and
- To allow the release of environmental water on top of other in-stream flows, including unregulated flow events.

These outcomes were intended to be achieved through the unimplemented policy measures described under 7.15 of the Basin Plan, and are now referred to as PPMs:

- Credit environmental return flows for downstream environmental use,
- Allow the call of held environmental water (HEW) from storage during unregulated flow events.

Implementing PPMs is critical to achieving the environmental outcomes of the Basin Plan with the water identified for recovery. The implementation of PPMs will assist to minimise the volume of water recovered by allowing for more efficient and effective use of HEW to maximise environmental outcomes under the Basin Plan, without impacting on the reliability of other water users.

PPMs are applied during the operation of the SDL Adjustment Mechanism in the Basin Plan. Any increase to the SDL resulting from supply measures will be calculated by adding notified supply measures and removing any unimplemented PPMs from the benchmark conditions of development, while maintaining equivalent environmental outcomes and no detrimental impacts on reliability of supply of water to the holders of water access rights that are not offset or negated.

In developing the PPMs, the NSW government is discharging its obligations to implement water reform and deliver on the Basin Plan. PPMs are supported by the NSW *Water Management Act 2000* and will enable the effective and efficient delivery of environmental water for beneficial outcomes.

1.1. Background

PPMs allow the use of HEW at multiple sites along the length of the river, and between rivers (environmental flow reuse), and provides for HEW to be ordered from a headwater storage during unregulated flow events (piggybacking). These measures are significant changes to the way that water is managed and accounted for in the Murray-Darling Basin. In NSW, HEW is environmental water that is held as part of a licensed volumetric entitlement (see Appendix B).

Under the *Intergovernmental Agreement on Implementing Water Reform in the Murray-Darling Basin 2013*, NSW agreed to deliver a Prerequisite Policy Measures Implementation Plan by June 2017 to the Murray-Darling Basin Authority (MDBA).

The NSW Prerequisite Policy Measures Implementation Plan (PPM IP) was endorsed by the MDBA in May 2017.

1.2. Principles underpinning NSW PPM implementation

The NSW PPM IP sets out four guiding principles for the implementation of PPMs:

1. NSW will only implement PPMs to the extent that detrimental impacts on the access rights of licence holders can be mitigated or offset, whilst also enabling optimum environmental outcomes.
2. NSW will develop operational tools that are simple, practical to implement and cost effective.
3. Reliability and access characteristics of licensed entitlements held for environmental water purposes are the same as other licensed entitlements.
4. Adaptive management is required.

The development of this Manual has been based on these principles. The application of the processes in this manual will be guided by these principles to seek to maximise the beneficial outcomes of water recovered for the environment under the Basin Plan while maintaining reliability to other licence holders. Where there is uncertainty, NSW will adopt a precautionary approach to minimise potential detrimental impacts.

It is recognised that there are also benefits stemming from the implementation of PPMs. In some instances, these benefits may offset any impacts over the longer term. However, until the benefits and impacts can be determined, NSW will continue to implement PPMs based on the above principles.

PPM Assessment Guidelines were provided by the MDBA to inform the content and format of states' implementation plans for PPMs. The Guidelines require the arrangements for the implementation of PPMs by the states' to meeting the following criteria:

- Are secure and enduring,
- Are fully operable,
- Are transparent,
- Identify and mitigate risks,
- Provide for releases of Held Environmental Water from storages on top of other in-stream flows, including unregulated events, and
- Allow environmental water to flow throughout the length of the river, and between rivers; and be protected from extraction, re-regulation or substitution.

These criteria will be used by the MDBA to assess the implementation of PPMs.

1.3. Relationship to other plans and legislation

The management of environmental water in accordance with PPMs occurs within the NSW water management framework, guided by the *Water Management Act 2000*.

PPMs are implemented within NSW through the NSW PPM IP and this Manual, together with supporting changes to Water Sharing Plans (WSPs) in each water source and the WaterNSW water supply Works Approval.

This Manual provides more detailed codification of the operation of PPMs in the NSW Murray and Lower Darling regulated river water sources, consistent with the higher level principles and approaches set out in the NSW PPM IP.

To establish statutory support for the process set out in the NSW PPM IP and the Manual, amendments will be made to the *Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2016*. These changes will go on public exhibition and be gazetted along with other plan amendments being made as part of the NSW water resource plan development process. Amendments to the water sharing plan require concurrence from the NSW Minister for Environment.

The roles and obligations of the river operator to implement PPMs are also recognised through the inclusion of specific conditions to the NSW Murray and Lower Darling water supply works approval.

For the Murray and Lower Darling regulated rivers, this Manual also relies upon the “river operations framework” for the River Murray System (RMS) (including the Lower Darling River), including:

- The Commonwealth *Water Act 2007* (of which the MDB Agreement is a schedule to),
- The ‘Objectives and Outcomes for River Operations in the River Murray System’ document approved by the Basin Officials Committee (BOC) from time to time,
- Any approvals made by the Basin Officials Committee (BOC) for additional actions that are available to be used.

The RMS framework will set out the operation of PPMs for shared resources in the Murray system that will be delivered by the River Murray System operator (MDBA River Operations), in accordance with the arrangements agreed to by the joint governments.

The Objectives and Outcomes for River Operations in the River Murray System’ document includes a specific objective and outcomes (SO&Os) that provides for directed releases from Hume Dam and applies to HEW as well as planned environmental water such as the Barmah-Millewa Environmental Water Allowance and the River Murray Increased Flows (RMIF) account. It is noted that the RMIF licence is currently under review as part of the RMIF rules-based supply side measure confirmed under the Sustainable Diversion Limit Adjustment Mechanism.

There is a separate SO&O that provides for assumed use for directed releases of HEW from Hume Dam to recognise the estimated return flow downstream of HEW only. Other SO&Os provide for directed releases from Lake Victoria during unregulated flow conditions and directed releases from Menindee Lakes.

A table demonstrating how PPMs relate to Commonwealth and State plans and legislation is provided in Appendix A.

1.4. Overview of the PPM Procedures Manual

This Procedures Manual (this Manual) has been prepared to provide a detailed framework for the operation and continual improvement of Prerequisite Policy Measures (PPMs) in the NSW Murray and Lower Darling regulated river water sources. The implementation of PPMs will maximise the efficient use and beneficial outcomes from the use of held environmental water (HEW).

The objective of this Manual is to sufficiently codify the operational process of delivering PPMs in the NSW Murray and Lower Darling regulated river water sources to achieve an appropriate balance between providing protection for other water licence holders, and allowing for the efficient and effective use of environmental water licences to achieve the environmental outcomes envisaged under the Basin Plan.

This Manual document is part of NSW’s commitment to implement PPMs by June 2019.

This Manual will be made publicly available by Department of Planning, Industry and Environment – Water, and will be reviewed annually via the process set out in this Manual. Changes may arise from the annual review, or as a result of proposals brought forward for consideration. The publicly available Manual will be kept updated as changes are approved.

This Manual is set out as described in Table 1.

Table 1. Overview of the Manual.

Section	Content
Section 1	<p>Introduction</p> <ul style="list-style-type: none"> • Background to PPMs • NSW principles and objectives for PPMs • Relationship of the Manual to other plans and legislation • Overview of the NSW PPM Procedures Manuals
Section 2	<p>Overview of PPMs in NSW</p> <ul style="list-style-type: none"> • Call of water from storage • Environmental flow reuse • Operability of PPMs in NSW
Section 3	<p>Framework for the operation of PPMs</p> <ul style="list-style-type: none"> • Key framework components • Roles and responsibilities • Consultation
Section 4	<p>The NSW Murray and Lower Darling system:</p> <ul style="list-style-type: none"> • Environmental water sites • Delivery pathways • NSW Murray and Lower Darling actions • Risk mitigation
Section 5	<p>Adaptive management:</p> <ul style="list-style-type: none"> • Annual reporting • Annual evaluation and review for continuous improvement

2. Overview of PPMs in NSW

This section describes how the PPM requirements to call water from storage and recognise environmental flows that are returned to the water source for downstream environmental benefits are enabled in current NSW legislative and policy settings. This NSW overview includes arrangements for both the Murrumbidgee and NSW Murray and Lower Darling regulated rivers. These NSW arrangements will be strengthened and refined through the processes described in this Manual.

2.1. Call water from storage

PPMs enable HEW to be ordered from a headwater storage during unregulated flow events (piggybacking). Piggybacking allows the environmental water holders to target flows to nominated delivery points along the river.

The Department of Planning, Industry and Environment – Biodiversity and Conservation, as the NSW environmental water manager works with WaterNSW to develop a water order including the target flow and location. This process is an extension of the consultation already undertaken via the EWAGs. The water order can request that the order be met from a headwater storage. Piggybacking allows such a water order to be placed during delivery of other system demands, including during unregulated flow events, with agreement from WaterNSW on matters such as the rates of releases, accounting arrangements, and flood/water quality risk mitigation measures. The planning, ordering and delivery process for HEW orders is set out in more detail in Section 2.3.

As the river operator, in the Murrumbidgee WaterNSW is required to meet system orders subject to operating constraints of the system. Flows that result from water orders made using piggybacking cannot be used to meet other access licence water orders, planned environmental water rules or general system operational rules. HEW is recognised as it moves through the system through the delivery of target volumes according to the agreed water order and requires ongoing monitoring of flows along the river reach.

For shared resources in the Murray and Lower Darling, when water is called from storage, WaterNSW approves orders placed by the Department of Planning, Industry and Environment – Biodiversity and Conservation, following consultation with MDBA where necessary. WaterNSW then directs the MDBA to release orders in accordance with the Murray-Darling Basin Agreement and the 'Objectives and Outcomes for River Operations in the River Murray System' document.

The methodology adopted in the Murrumbidgee and NSW Murray and Lower Darling for calculating the volume to be debited from an environmental account is to determine the difference between releases made with the environmental water holder's order and the releases that would have been made without the environmental water holder's order.

2.2. Environmental flow reuse

This section describes how the PPM requirement to recognise environmental flows that are returned to the water source for downstream environmental benefits is implemented in NSW.

Environmental flow reuse recognises the return flow of water downstream of an environmental watering event, allowing that water to be used for downstream environmental benefits and use at multiple sites. These return flows are protected from extraction and re-regulation, including in the downstream system.

The procedures for environmental flow reuse of HEW in the Murrumbidgee are provided in the PPM Procedures Manual for the Murrumbidgee:

- A delivery pathway is nominated to describe the intended environmental watering event. The nominated delivery pathway allows a water order using HEW to nominate multiple environmental use sites along the length of a river, subject to delivery capacity and operating constraints.

- For environmental sites that are not considered accurate, an assumed use method is required. The assumed use method is used to estimate the delivery of environmental water and the downstream return flows.
- For each order using an assumed use method, an Assumed Use Statement is required for the purposes of debiting accounts of HEW licences.
- Flows that result from water orders made using environmental flow reuse cannot be used to meet other access licence water orders, planned environmental water rules or other general system operational rules. HEW is recognised as it moves through the system in line with the assumed use method.

Environmental flow reuse also applies when HEW is delivered into a downstream river system, such as inflow from the Murrumbidgee to the River Murray).

HEW inflows from the Murrumbidgee River into the River Murray are managed under the bulk entitlement delivery arrangement provided under the Murray Darling Basin Agreement (Clause 98 MDBA's Role in the Operation of Storages). NSW advises the MDBA that any flows passing beyond the point of delivery (Balranald) not be re-regulated for any use. Under this arrangement, NSW instructs the MDBA to recognise the volume of (HEW) flows being delivered to the SA border without reregulation into Lake Victoria. NSW will provide appropriate loss factors for the MDBA to apply for deliveries from NSW tributaries, including the Murrumbidgee. These accounting arrangements are outlined in Section 2.3.3 of this Manual.

For shared resources in the Murray system, to recognise and protect downstream environmental flows in the River Murray, NSW also uses Clause 98 of the Murray Darling Basin Agreement to direct the MDBA to deliver a bulk volume of NSW HEW to South Australia. These instructions reflect the assumed uses specified in the relevant Specific Objective and Outcome (SO&O).

Inter-state environmental flow reuse will be facilitated by 'in-stream' adjustments. Endorsed by BOC (BOC 65), the 'in-stream' adjustment trial allows for the adjustment of environmental return flows between NSW and Victoria and provides an enabling mechanism to allow return flows in Victoria to be traded for immediate delivery in NSW and vice versa. Existing provisions can facilitate these actions, through allocation trade of returned flows for immediate delivery, and where necessary reallocation of resources between Victoria and NSW under clause 113 of the Murray-Darling Basin Agreement.

The 'in-stream' adjustment trial allows the use of HEW in an efficient manner. This option is available for use, on a trial basis, at any time(s) in the three years from 1 July 2019 to 30 June 2022. BOC will consider the permanent adoption of the arrangements following a review of the results.

If an individual watering action is proposed to use inter-state trade of return flows between NSW and Victoria, it will be assessed by State Constructing Authorities in collaboration with MDBA River Operators. The State Constructing Authorities (WaterNSW in the case of NSW) provides written approval for the action to MDBA, recognising that the in-stream accounting option is used to make the trade adjustment. MDBA's monthly accounts model is revised as necessary to document the volume of trade which was adjusted in-stream, the month(s) of delivery and the river reaches involved. In addition, the volumes of trade adjustment in Hume that are reversed are also documented. The operation of the in-stream adjustments for inter-state trades are also reported as part of River Murray Operations' Annual Summary of River Operations, and be reviewed by the Independent River Operations Review Group in September of the year following any individual trial.

2.3. Operability of PPMs in NSW

PPMs are operationalised through the valley-specific Procedures Manuals and supporting conditions in the NSW Water Supply Work Approvals. This Manual codifies the operational process of delivering PPMs in the water source so that an appropriate balance is achieved between allowing for the efficient and effective use of environmental water licences to achieve the environmental outcomes envisaged under the Basin Plan and providing protection for water licence holders.

Relevant NSW agencies (Department of Planning, Industry and Environment – Water as the regulator, WaterNSW as the river operator and the Department of Planning, Industry and Environment – Biodiversity and Conservation as the environmental water manager) have provided a joint letter of commitment to MDBA confirming that PPMs will continue to be implemented as per the arrangements described in the Procedures Manuals from 1 July 2019. This letter remains in effect until the new clauses in the relevant WSPs are gazetted and amendments to the Water Supply Work Approvals are finalised.

The sections set out below detail the requirements and responsibilities to develop and agree on operating arrangements for the delivery of HEW using PPMs, including event planning, water ordering, delivery, accounting, reporting and review processes.

2.3.1. Planning

Environmental watering events are complex and require a process for developing and placing water orders. This process includes a requirement for river operators to be involved in the development process to ensure that events can be managed over a range of climatic and operational conditions. Existing forums such as the environmental water advisory groups (EWAGs) are used by the environmental water managers for consultation required at various stages in the development of environmental watering events. Environmental water holders (CEWO and Department of Planning, Industry and Environment – Biodiversity and Conservation) also work together to develop watering schedules which outline the purpose, conditions and arrangements for environmental watering events in NSW that use Commonwealth environmental water. Environmental water holders develop annual environmental watering priorities and plans which consider a range of weather and water availability scenarios.

The environmental water holders will work with WaterNSW to develop a proposal including the target flow and location.

An iterative process may be required during this planning phase and requires cooperation between the regulator, the river operator and the environmental water holders, including agreement on any assumed use rates, consideration of impacts (both positive and negative) and risks, and any mitigation measures to be applied.

For significant environmental watering events, development of water orders must commence well in advance of the target release period to allow sufficient time for collaboration between environmental water managers and WaterNSW.

2.3.2. Ordering and release of water

Following the above process for planning and consultation, the NSW environmental water manager (Department of Planning, Industry and Environment – Biodiversity and Conservation) prepares an initial proposal for the delivery of any environmental watering events that relies on the use of PPMs. These watering proposals contain:

- A general description of the proposed event, including the environmental objectives of the event,
- The PPM actions intended to be used, including target flow and/or diversion rates and locations,
- An initial estimate of the likely volume of licensed account water that will be required, and the licences that are proposed to be debited,

- The proposed delivery path, including the debiting points and expected timing and delivery of any return flows and
- The decision making process proposed to manage any potential variation in weather conditions or other relevant factors.

Water orders must be sufficiently detailed to provide guidance for river operators over a range of potential climatic conditions and may also require protocols for within-event decision making.

The river operator is required under their water supply Works Approval to provide timely advice regarding system flow limits, any matters that might vary the volume of water that would be required, and risks in delivery of the proposed order. An iterative process may be required to settle complex water orders and will require cooperation between the river operator and the environmental water manager.

Environmental water holders are responsible for estimating the volume of water required to meet their environmental objectives in their water orders, having regard to advice from WaterNSW.

The river operator is responsible for operating the river including approving a water order. Operational risks and the available mitigation measures are to be considered by WaterNSW when considering water orders that require the release of water using PPMs. This will be undertaken in consultation with the environmental water manager prior to approval (or rejection) of an order using PPMs. Any orders that are refused/rejected will be documented in the annual environmental release river operations report, together with supporting explanations and rationale.

When an order that relies on the use of PPMs is accepted by the river operator, the release of water to meet that order should be incorporated into delivery planning for the valley, and included in any advice regarding operation of the regulated river system to licensed water users and publicly for the community. The environmental water manager, in placing a water order relying on PPMs, is required to undertake appropriate communication actions to ensure that potentially affected landholders and the general community are aware of the proposed watering event.

The river operator is required to provide operational reporting on release of held environmental water, including regular environmental water use accounting during events.

2.3.3. Accounting

WaterNSW maintains water allocation accounts that record water allocation announcements, water ordered, water taken and carry over for each water access licence, including those licences owned by environmental water holders. They are responsible for determining and debiting volumes of held environmental water as a result of environmental watering actions using PPMs.

As accounting methods become established through the application of the Procedures manual, the site and event-specific arrangements will be codified in the Manual (see Section 4).

Where there is accurate measurement of take and return, the net take of water is debited from the account. The net take for an environmental site is the difference between the water leaving the water source at the relevant extraction point minus the amount of water returning to the water source from that extraction point. These points are nominated on the water order.

For environmental sites where measurement is not considered accurate, an assumed use method is used to estimate the delivery of held environmental water:

1. WaterNSW will provide an assumed use statement to the environmental water manager that sets out the calculation of the volumes of water to be debited from water access licence accounts.
2. Where relevant, the volume of water accounted as held environmental water that is to be passed into the Murray.
3. Summary information for each element of the assumed use method, including loss rates.
4. The source of data used, any assumptions, and a summary of the calculations used.

5. The volumes of water of water to be debited from water access licence based on the above.

These statements capture the decisions made during the planning and ordering phases between the regulator, the river operator and the environmental water holders, including agreement on any assumed use rates and mitigation measures to be applied. Existing dispute resolution procedures are to be applied in the event of a dispute.

Bulk accounting arrangements for the shared resources in the River Murray System are detailed in the Specific Objective and Outcomes for directed release and assumed use in the Objectives and Outcomes for River Operations in the River Murray System document.

Murrumbidgee end-of-system flows will be recognised in the Murray. Additional flows arriving at Balranald are calculated as the difference between actual flows at Balranald and those that are estimated would have occurred without the environmental water order. The volume of additional flow at Balranald will be managed as a Bulk Entitlement Delivery in the NSW Murray Valley. WaterNSW will provide the River Murray Operator (MDBA) with the daily flow volume of HEW passing Balranald, which will be adjusted by RMO for travel time to the SA border and reduced proportionally for transmission loss conditions. A proportional loss rate in the NSW Murray is currently used, and is assessed based on being commensurate with the prevailing conditions, outlook and level of risk. Incremental loss will be reviewed as more data becomes available and potentially deemed appropriate and implementable.

As much as practicably possible, losses applied to environmental water will be based on the 'incremental loss' resulting from the additional flow created by environmental water (i.e. the difference between the actual transmission losses and those that would have occurred without the environmental releases that rely on PPMs occurring). For example, where environmental water makes up a large portion of flow in the river the environment bears most of the system losses and a high percentage of loss is applied to the delivery. Conversely where only a small proportion of environmental water is added to the river flow a much smaller loss rate is applied.

Determining loss rates is based on best available information, and will become more accurate through experience and use of PPMs. In the early stages, a more conservative or higher loss rate is applied to ensure no detrimental impacts to reliability for licensed water users. This method will become more refined and accurate through application in successive years.

Assumed use methods and accounting arrangements must be consistent with legal instruments, including bulk entitlements and the Murray-Darling Basin Agreement. As much as practicably possible, assumed used methods are to:

- Use accurate metering and measurement where and when available (as nominated in the Manual)
- Fit-for-purpose with appropriate balance between rigour and practicality of implementation
- Balance the delivery of HEW using PPMS for its efficient and effective use without generating unacceptable adverse impacts to licensed water holders
- The level of conservatism is proportional to the confidence in the assumed use method and risks
- Be reviewed over time and improved as experience and knowledge grows.

2.3.4. Reporting

The river operator provides operational reporting on releases of environmental water during events.

An Annual Environmental River Operations Report is to be prepared by the River Operator that documents the application of the specific PPM watering actions used in that water year, including the accounting of river flows, transmission losses, and water delivery that occurred. Where information is available, the report includes comparisons of assumed use with actual/estimated river transmission losses and use, associated with watering actions that rely on that assumed use methods.

The environmental water manager will prepare an Annual Environmental Watering Statement that documents any issues that arose in the ordering or delivery and accounting of environmental water using PPMs. The environmental water manager consults with other environmental water holders and stakeholders including the CEWO and EWAGs when preparing these reports.

These annual reports form the basis for the annual review process.

2.3.5. Review

The NSW PPM framework includes an adaptive management process to provide for the continuous improvement of the PPM processes set out above, for improved environmental water management.

The Department of Planning, Industry and Environment – Water as the regulator will conduct an annual review of the implementation of PPMs that considers the outcomes of undertaking PPM watering actions. The review will be guided by the principles set out in the NSW PPM IP, this Manual and the assessment guidelines set out by the MDBA. The Department of Planning, Industry and Environment – Water is responsible for ensuring that appropriate changes to the regulatory framework are made to give effect to any recommendations arising from this review, in consultation with key stakeholders including the Department of Planning, Industry and Environment – Biodiversity and Conservation and WaterNSW.

The PPM Working Group will consider the review and any recommendations. The Department of Planning, Industry and Environment – Water will prepare and publish a report on the review each year, including any findings of the review and recommendations.

This framework provides the necessary flexibility to enable the regulator, the environmental water holders and river operators to learn, adapt and refine as environmental watering evolves. A structured review process is provided to allow for refinement and improvement to the framework for PPM operation, to capture learnings from environmental watering actions as they are carried out and to facilitate continuous improvement for effective and efficient delivery of water for the environment.

3. Framework for operation of PPMs

3.1. Key framework components

The operational framework for PPMs consists of the following components:

- PPM actions agreed and approved for use
- Operational processes for ordering and delivering PPMs (as set out in Section 2 of this Manual),
- Accounting methods for managing environmental water and debiting accounts.
- An annual review process to provide transparency regarding use of PPMs in that year, and inform consideration of any changes or new measures that may be appropriate.

The annual process involving these elements is shown in Figure 1. Roles and responsibilities are detailed in Section 3.2.

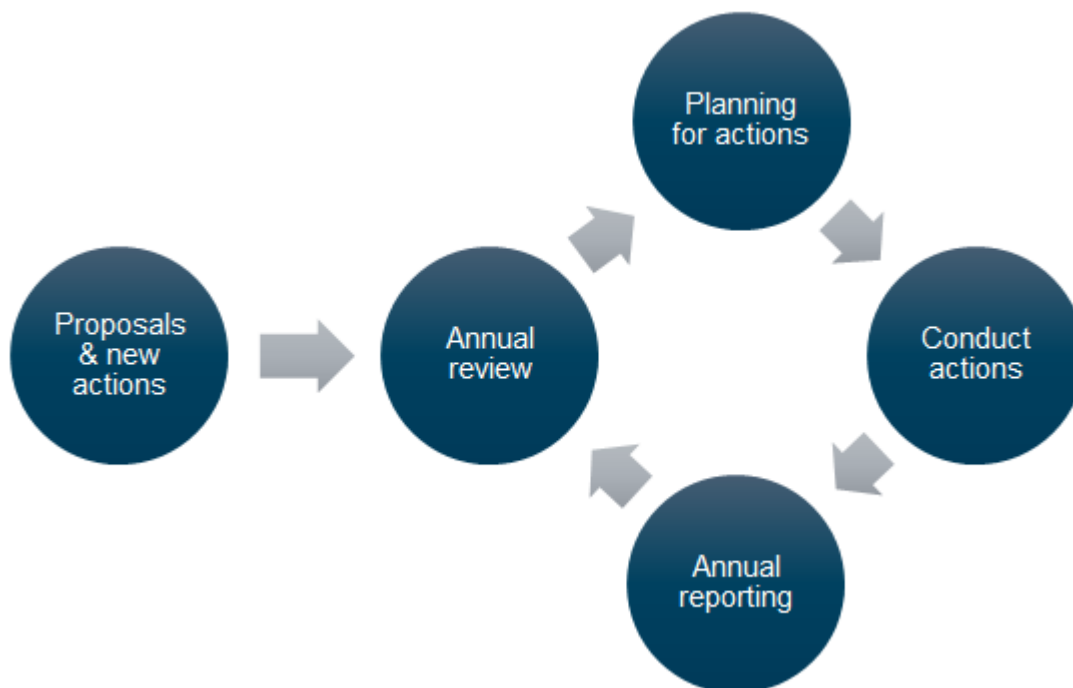


Figure 1. An overview of the PPM process.

The process set out in Figure 1 only applies to those agreed and trial actions on the NSW side of the Murray River, or in the Lower Darling River, that are undertaken by WaterNSW. This would include management of take into environmental sites and debiting of Water Access Licence accounts.

Actions in the Murray and Lower Darling Rivers involving the shared resources between NSW, Victoria, and South Australia are managed under the Murray-Darling Basin Agreement by the MDBA (on behalf of the States). These actions are undertaken in accordance with an over-arching arrangement between NSW, Victoria, South Australia and the MDBA to implement PPMs that is similar to Figure 1, but with different roles and responsibilities, as described in Section 3.3.

3.1.1. Actions

To allow HEW to be managed in new ways the NSW Government, as a member of the Basin Officials Committee (BOC) that oversees the MDBA's operation of the Murray River, has approved variations each year to the river operations framework for the RMS. These variations have supported environmental watering trials that have been conducted since 2010-11.

Amendments to the 'Objectives and Outcomes for River Operations in the River Murray System' document to implement joint venture aspects of PPMs have been approved by BOC. Revisions include new definitions for 'directed release' and 'directed release water order', adding new SO&Os for specific storages under Clause 98 of the Murray-Darling Basin Agreement (directed releases from Hume Dam, directed releases from Lake Victoria, directed releases from Menindee Lakes) and adding a new SO&O for assumed use for directed releases of HEW from Hume Dam. The SO&Os include a structured annual review process to enable ongoing refinement of the operational delivery of PPMs.

In consultation with WaterNSW and environmental water holders, the Department of Planning, Industry and Environment – Water can agree to actions within NSW that will allow HEW to be managed in new ways to improve delivery of PPMs. Actions must operate in conjunction with a number of supporting measures of the NSW PPM framework, including:

- A delivery pathway,
- An assumed use method,
- Linked mitigation measures.

Similar supporting measures are also agreed within the over-arching arrangements to implement PPMs between the states.

Actions and their supporting measures will be considered to mitigate or offset any detrimental impacts on the access rights of licensed water holders and any impacts to the efficient use of held environmental water. Actions can include mitigation measures to offset these risks as necessary. The Department of Planning, Industry and Environment – Water in its role as the regulator is responsible for approving actions and any subsequent variations following review.

Recognising that environmental watering actions will require ongoing development over time, an adaptive management approach is required. To provide for changes over time, the actions can be modified or new actions agreed, by Department of Planning, Industry and Environment – Water in its role as the regulator or the BOC in relation to shared water resources. Changes will be made after consultation with the environmental water managers, WaterNSW and key stakeholders, as set out in Section 3.3.

While each of the PPMs can be implemented separately, it is important to note that at times both PPMs (i.e. piggybacking and environmental flow reuse) will operate together. For example, when the environmental licence holder makes an order from a nominated water storage (piggybacking), whether during a regulated or unregulated flow event, it will likely request the use of "environment flow reuse" to move that order through different environmental sites and between river systems.

In recognition that actions and their supporting measures will need to be tested to build a body of knowledge, particular actions and supporting measures may be trialled initially. These trials will ensure that material risks are appropriately identified and mitigated and that the actions are operable. Trials will also operate in conjunction with supporting measures including a delivery pathway, an assumed use method and linked mitigation measures. Trials and their supporting measures must be reviewed and re-approved annually. If the application of a trial action proves successful, then it may be determined as an (ongoing) action following the annual review of the operation of PPMs.

3.1.2. Supporting measures

Watering actions rely on a number of supporting measures of the framework in order to operate. These are:

- **Delivery pathways:** describe the intended environmental watering event, and show how the watering actions, assumed use methods and mitigation measures link together.
- **Assumed use methods:** a method of estimating the delivery of environmental water is required whenever that use cannot be accurately measured. These methods will be used to produce Assumed Use Statements for the purposes of debiting accounts of HEW licences.

- **Mitigation measures:** any measures that must be taken to ensure that detrimental impacts on the access rights of licensed water holders are mitigated or offset.

3.2. Roles and responsibilities

The key roles and their responsibilities within the framework for the operation of PPMs within NSW are set out in Table 2.

Table 2. Roles and Responsibilities for the implementation of PPMs.

Role	Organisation	Responsibilities
Regulator (shared resources) for actions under the Murray PPM IP that are administered by MDBA River Operations	Basin Officials Committee	<ul style="list-style-type: none"> • Agree any changes to the “Objectives and Outcomes for River Operations in the River Murray System” document • Approve those aspects of any large scale environmental watering event trials which deviate from past river practice
Regulator (within NSW) for actions under the NSW PPM IP and actions within NSW required to support BOC agreements	NSW Department of Planning, Industry and Environment – Water	<ul style="list-style-type: none"> • The effective implementation of PPMs via NSW’s policy and regulatory framework • Adhere to the principles of the NSW PPM IP • Review and approve actions and any subsequent variations following the review phase of PPM operations including trials • Ensure the required statutory instruments are in place to give effect to agreed actions • Undertake annual review of the implementation of PPMs • Assess assumed use/in-stream loss rates/methods as per principles and rules in this Manual • Consult with WaterNSW, Department of Planning, Industry and Environment – Biodiversity and Conservation, MDBA, SCBEWC and CEWO when conducting each annual review • Approve proposed trials if suitable conditions and mitigation measures are demonstrated • Undertake consultation with water users following any determination to trial or agree a new action or supporting measure • Classification of take/return measurement at recognised environmental watering sites
River Operator (shared resources)	MDBA River Operations	<ul style="list-style-type: none"> • Manage release of environmental water at the wholesale level to meet NSW orders

Role	Organisation	Responsibilities
River Operator (within NSW)	WaterNSW	<ul style="list-style-type: none"> • Work collaboratively with Department of Planning, Industry and Environment – Biodiversity and Conservation to develop orders for environmental water action and recommend appropriate mitigation strategies • Develop assumed use/in-stream loss rates/methods as per principles and rules in this Manual • Undertake risk assessment of proposed actions and recommended mitigation strategies in collaboration with Department of Planning, Industry and Environment – Biodiversity and Conservation prior to approval or rejection of water orders that rely on actions based on assessments of proposed actions and their mitigation strategies • Operate the river to give effect to agreed and trial actions for the delivery of PPMs, including advice and action on events (e.g. rain/inflows) that trigger changes to the action • Prepare an assumed use statement for an environmental watering event that relies on an assumed use method • Provide operational reporting on release of environmental water, including regular environmental water use accounting during events • Submit an annual Environmental Releases River Operations Report on river operations involving actions • Consult with licensed water users or their representative groups prior to submitting the annual Environmental River Operations Report • Support the development of new proposals and trials for the operation of PPMs • Classification of take/return measurement at recognised environmental watering sites
Environmental Water Managers	NSW Department of Planning, Industry and Environment – Biodiversity and Conservation	<ul style="list-style-type: none"> • Work collaboratively with other environmental water holders (i.e. CEWO and through the Southern Connected Basin Environmental Watering Committee - SCBEWC) in the planning and coordinated use of environmental water in consultation with river operators, including risk assessments and mitigation measures • Work collaboratively with the river operator when developing orders for environmental water that rely on actions • In collaboration with other environmental water managers, submit an annual environmental watering statement to Department of Planning, Industry and Environment – Water that reports on the delivery / accounting issues for environmental watering relying on the use of PPMs • Development of new proposals for the operation of PPMs • As the environmental water manager for NSW, responsible for placing water orders with WaterNSW

Role	Organisation	Responsibilities
	Commonwealth Environmental Water Office	<ul style="list-style-type: none"> • Work collaboratively with Department of Planning, Industry and Environment – Biodiversity and Conservation and other environmental water managers through SCBEWC in the planning and coordinated use of environmental water in consultation with river operators, including risk assessments and mitigation measures • Work collaboratively with Department of Planning, Industry and Environment – Biodiversity and Conservation for developing orders for environmental water that rely on actions and their mitigation measures • Provide input into the annual environmental watering statement prepared by Department of Planning, Industry and Environment – Biodiversity and Conservation • Work collaboratively with Department of Planning, Industry and Environment – Biodiversity and Conservation to contribute to and develop new proposals for the operation of PPMs
	MDBA via The Living Murray Initiative	<ul style="list-style-type: none"> • Work collaboratively with Department of Planning, Industry and Environment – Biodiversity and Conservation and where appropriate the CEWO and other environmental water managers through SCBEWC in the planning and coordinated use of environmental water in consultation with river operators • Work collaboratively with Department of Planning, Industry and Environment – Biodiversity and Conservation and where appropriate the CEWO when developing orders for environmental water that rely on actions • Work collaboratively with Department of Planning, Industry and Environment – Biodiversity and Conservation and the CEWO to support the annual environmental watering statement prepared by Department of Planning, Industry and Environment – Biodiversity and Conservation • Work collaboratively with Department of Planning, Industry and Environment – Biodiversity and Conservation and where appropriate the CEWO to contribute to and develop new proposals for the operation of PPMs

3.3. Consultation

Consultation is an important element in the annual delivery of environmental water that relies on trial or agreed actions, as it provides transparency regarding the operation of the agreed actions, and the performance of any mitigation measures.

The minimum consultation requirements associated with the operation of the trial and agreed actions within NSW are:

- The regulator (Department of Planning, Industry and Environment – Water) will consult with WaterNSW, NRAR, Department of Planning, Industry and Environment – Biodiversity and Conservation, SCBEWC, MDBA (River Operations and TLM) and the CEWO when conducting each annual review,
- The regulator (Department of Planning, Industry and Environment – Water) will consult with licensed water users or their representative groups regarding any proposal for change to the agreed actions, or to implement any new trial actions.

- The river operator (WaterNSW) will consult with licensed water users or their representative groups prior to submitting the Annual Environmental Releases River Operations Report, and
- The environmental water manager (Department of Planning, Industry and Environment – Biodiversity and Conservation) will consult with:
 - The river operator (WaterNSW) regarding proposed watering actions before placing an order,
 - Stakeholders when developing, and the community more generally when delivering, environmental water orders relying on the use of actions as appropriate, and
 - Other environmental water managers and stakeholders (including environmental water advisory groups (EWAGs),) when preparing annual environmental watering statement reporting on environmental outcomes from delivering environmental water orders relying on the use of PPMs.

A NSW PPM Working Group will be established and will include relevant NSW and Commonwealth agencies to provide a forum regarding the operation, implementation and review of PPMs.

For the operation of actions involving shared water resources, the minimum consultation requirements are:

- The regulator (Department of Planning, Industry and Environment – Water as the BOC member for NSW) will require that IRORG continue to consult with other NSW agencies when conducting their annual review of environmental water delivery, including WaterNSW and Department of Planning, Industry and Environment – Biodiversity and Conservation. TLM and the CEWO should also be consulted.
- The regulator (Department of Planning, Industry and Environment – Water as the BOC member for NSW) will consult with licensed water users or their representative groups regarding any proposal for change to the agreed actions, or to implement new trial actions.
- The river operator (WaterNSW and/or MDBA) will consult with licensed water users or their representative groups following preparation of its annual report on river operations, and
- The environmental water managers will consult with:
 - The river operator (WaterNSW) regarding proposed watering actions before placing an order,
 - Affected stakeholders when developing, and the community more generally when delivering, environmental water orders relying on the use of Agreed Actions as appropriate, and
 - Other environmental water managers and stakeholders (including environmental water advisory groups (EWAGs),) when preparing annual environmental watering statement reporting on environmental outcomes from delivering environmental water orders relying on the use of PPMs within NSW.

4. NSW Murray and Lower Darling system

4.1. Environmental sites

The assessment of the accuracy of take and return at environmental sites is intended to provide transparency and support the development of appropriate mitigation measures.

4.1.1. Classifications

All take and return of flows by sites within NSW (including instream use of NSW shares of water in the Murray and Lower Darling Rivers) must be assessed for accuracy, and be categorised as described in Table 3. Individual classifications are to be based on a supporting assessment report prepared by a suitably qualified professional. The assessment approach will be dependent on the measurement method used. The classification will be undertaken between Department of Planning, Industry and Environment – Water and WaterNSW.

Table 3. Classification of take and return measurement at recognised environmental watering sites.

Classification	Description
Category 1 Accurate (+/-5%)	Take is metered or accurately measured, meeting the requirements of the National Framework for Non-Urban Water Metering, and is suitable for water account debiting.
Category 2	Does not meet requirements for Category 1: take is measured or estimated, but requires mitigation measures to address uncertainty.

Examples of methods of take measurement that could be used include:

- Meters (including direct measurement devices using ultra-sonic or infra-red sensors at major canal offtakes),
- Hydrographic flow measurement (rating table),
- Extrapolation from single, point-in-time flow gaugings,
- Estimation method (including operationally estimated loss rates; calculations based on areas of inundation, seepage and evapotranspiration; simplified rules based on modelling results),
- Models (including hydro-dynamic models, or hydrologic such as IQQM/Source).

If no site classification is provided, then a site will be deemed to be Category 2.

Environmental sites that receive water via agreed actions under this Manual must:

- Be recognised in Table 4, and
- Have their point(s) of take and return assessed for accuracy.

Table 4. Recognised environmental sites for PPMs.

Environmental site	Description	Measurement method	Classification
All wetlands, creeks and floodplains along the Upper River Murray between Yarrowonga and the SA Border, including the Barmah-Millewa Forest and the Edward-Wakool Systems and TLM sites (except where TML structures are used to enhance floodplain inundation or other structures are operated outside of routine arrangements to enhance floodplain inundation).	Floodplain wetlands and forest between Yarrowonga and the SA Border along the Upper Murray River, and along the Edward River and Gulpa Creek system, that are progressively inundated as flows increase. These measurement methods (assumed used) do not include any additional losses along the River Murray associated with environmental inflows from tributaries downstream of the Barmah-Millewa Forest including the Murrumbidgee River.	Assumed use method as agreed by BOC and detailed in the SO&O 2.5: <ul style="list-style-type: none"> • <i>An initial loss of up to 50 GL, plus</i> • <i>0% to the component of the directed release which is intended to be delivered within the maximum planned regulated release downstream of Yarrowonga Weir (as described in SO&O 3.1b)</i> • <i>20% to that component of the directed release that occurs after the initial use has been determined and which is intended to effect a flow greater than the maximum regulated release downstream of Yarrowonga Weir (as described in SO&O 3.1b)</i> 	Category 2
Edward–Wakool System	When the intended flow at Yarrowonga is less than the maximum planned release as described in SO&O 3.1b, environmental water deliveries made under PPMs into the Wakool System are subject to an additional assumed use.	TBD	Category 2
Koondrook-Perricoota Forest	Wetlands and forest to the North of the Murray River downstream of the Torrumbarry Weir pool.	<u>Take:</u> Rating tables at flow gauge d/s of Torrumbarry regulator regulators. Also potential modelling required for some larger events <u>Return flows:</u> Four regulators controlling outflows to the Barbers Creek system: <ul style="list-style-type: none"> • Barbers overflow • Barbers Creek • Cow Creek • Calf Creek Crooked Creek regulator Thule Creek regulator, and Swan Lagoon upstream and downstream regulators.	TBD

Environmental site	Description	Measurement method	Classification
Great Darling Anabranh in-channel delivery	Effluent Creek with numerous lakes, including Lake Neary nature reserve.	Hydraulic discharge relationship at Cawndilla outlet regulator. Wycott flow gauge (TBC) for flows passing through natural offtake point. <u>Return flows to River Murray:</u> Bulpunga site, Tara Downs, D/S Dam 183 site	Category 2 Category 1
Lower Darling in-channel delivery (via directed releases from Menindee Lakes when a shared resource)	Lower Darling River channel.	No assumed use method as is currently applied. The volume of water to be delivered to South Australia should be determined as the approximate additional flow that reaches Burtundy due to the additional release from Menindee Lakes, allowing for travel time (SO&O 10.4 <i>Directed releases from Menindee Lakes</i>)	Category 2
Lower Darling in-channel delivery (via directed releases from Menindee Lakes when not a shared resource)	Lower Darling River channel.	TBD	TBD
River Murray in-channel delivery (via directed releases from Lake Victoria during unregulated flow conditions)	River Murray channel.	Estimate the volume of State water entitlements released from Lake Victoria based on the volume of airspace in the storage at the end of the unregulated flow event as agreed by BOC and detailed in the SO&O 9.4 <i>Directed releases from Lake Victoria</i>	Category 2
Ability to receive and and/or deliver return flows to Victorian environmental sites	See Section 3.1.3		
River Murray in-channel delivery to South Australia	Deliver return flows to South Australia (rather than capture in Lake Victoria) from Lower Darling, Great Darling Anabranh and Murrumbidgee	See Table 6	Category 2
Note: <i>Italics represent SO&Os of the O&O document, approved by BOC and available on MDBA website.</i>			

4.1.2. Recognition of environmental inflows from the Northern Basin

Agreement on mechanisms to protect environmental water inflows from the Northern Basin is a key element of the Menindee Interjurisdictional Working Group forward work plan (approved November 2018, BOC 63). This element will focus on the management of environmental water entering Menindee Lakes and is dependent on the work of Department of Planning, Industry and Environment – Water under the Water Reform Action Plan in protecting environmental flows in the Northern Basin. This reform package is focused on a ‘first flush’ rule, individual daily extraction limits in the Barwon-Darling, active management of HEW and gaining a better understanding of Northern connectivity (as per BOC 65).

4.1.3. In-river trade adjustments for return flows between NSW & Victoria

Inter-state environmental flow reuse will be facilitated by ‘in-stream’ adjustments. Endorsed by BOC (BOC 65), the ‘in-stream’ adjustment trial allows for the adjustment of environmental return flows between NSW and Victoria and provides an enabling mechanism to allow return flows in Victoria to be traded for immediate delivery in NSW and vice versa. Existing provisions can facilitate these actions, through allocation trade of returned flows for immediate delivery, and where necessary reallocation of resources between Victoria and NSW under clause 113 of the Murray-Darling Basin Agreement.

The ‘in-stream’ adjustment trial allows the use of HEW in an efficient manner. This option is available for use, on a trial basis, at any time(s) in the three years from 1 July 2019 to 30 June 2022. BOC will consider the permanent adoption of the arrangements following a review of the results.

If an individual watering action is proposed to use inter-state trade of return flows between NSW and Victoria, it will be assessed by State Constructing Authorities in collaboration with MDBA River Operators. The State Constructing Authorities (WaterNSW in the case of NSW) provides written approval for the action to MDBA, recognising that the in-stream accounting option is used to make the trade adjustment. MDBA’s monthly accounts model is revised as necessary to document the volume of trade which was adjusted in-stream, the month(s) of delivery and the river reaches involved. In addition, the volumes of trade adjustment in Hume that are reversed are also documented. The operation of the in-stream adjustments for inter-state trades are also reported as part of River Murray Operations’ Annual Summary of River Operations, and be reviewed by the Independent River Operations Review Group in September of the year following any individual trial.

4.2. Water delivery pathways

Water delivery pathways describe the intended environmental watering event, and show how the watering actions, assumed use methods, and mitigation measures link together. An example is the release of environmental water from the major storage (Hume Dams) to coincide with downstream tributary inflows, often referred to as a “piggybacking” release, with the intent of:

- Creating a peak flow of sufficient duration to inundate the Barmah-Millewa forest,
- Watering wetlands and forests in the Koondrook-Pericoota area, and/or
- Flow through the Murray River to the South Australian border.

The following are general environmental watering pathways that rely on NSW actions only (Table 5) for delivering PPMs, subject to approval of appropriate supporting measures. Watering pathways for the application of PPMs in the NSW Murray and Lower Darling regulated river water sources will continue to be reviewed and refined in accordance with this Procedures manual.

Table 5. General delivery pathways for the Murray and Lower Darling Valleys for NSW.

Pathway Reference	Description
Edward–Wakool System	Directed release from Hume Dam to provide flows within the normal operating limits to achieve outcomes within the Edward-Wakool system, and then to be delivered to the Murray River.
Murrumbidgee tributary inflows	Recognising residual held environmental water from a Murrumbidgee watering action that continues from Balranald to the South Australian border without regulation in Lake Victoria

4.3. Murray and Lower Darling actions

PPMs allow HEW to be managed in new ways. The actions described in this manual include agreed actions which have been approved for ongoing use, as well as trial actions which are to be approved annually. These watering actions are developed in consultation with WaterNSW and environmental water holders (see Section 2 and Section 3.3).

Actions are shown in Table 6, together with their linked delivery pathways, relevant assumed use methods and mitigation measures.

The trialling of new actions is also expected to be important to balance the effective implementation of PPMs with ensuring that there are no detrimental impacts to the reliability of licensed entitlements. The regulator (Department of Planning, Industry and Environment – Water) may agree to trial an action for a period, with additional conditions applied where appropriate and developed according to the processes described in Section 2 of this Manual. Trials and supporting measures, including mitigation measures, will be considered by Department of Planning, Industry and Environment – Water, WaterNSW, environmental water holders and the PPM Working Group. Trials must be re-assessed each year as part of the annual review process. Similarly, BOC may also approve trials where actions deviate from the standard O&O rules.

All actions and the supporting measures have been considered to minimise or offset, where necessary, potential detrimental impacts to the reliability of licensed water users.

Recognising that environmental watering actions using PPMs will require ongoing development over time, the adaptive management approach in Section 5 provides a process for including further actions or variations to existing actions and their supporting measures.

Table 6. Actions and supporting measures for the NSW Murray and Lower Darling Valleys.

Action	Delivery Pathway	Assumed Use method	Mitigation measures
<p>O&O document: SO&O 2.4 Directed released from Hume Dam SO&O 2.5 Assumed use for directed releases of HEW from Hume Dam</p>	<p>Hume Dam to South Australian border via Barmah-Millewa and potentially other wetlands. Note that when the intended flow at Yarrowonga is less than the maximum planned release as describe in SO&O 3.1b, environmental water deliveries into the Wakool system are subject to an additional use</p>	<p>Water orders will be managed under Bulk Entitlement Delivery arrangements. NSW environmental water licences will be debited the volume of environmental release calculated according to SO&Os 2.4 and 2.5, as advised each month by the MDBA. The volume of that order, and any amendments, will be placed in the WaterNSW accounting system at the time they are placed with the MDBA by WaterNSW.</p>	<p>See SO&O 2.4 and 2.5</p> <ul style="list-style-type: none"> Water orders will be developed collaboratively by e-water holders, the MDBA, GMW and WaterNSW
<p>O&O document: SO&O 9.4 Directed releases from Lake Victoria during unregulated flow conditions</p>	<p>Lake Victoria to SA border</p>	<p>Water orders will be managed under Bulk Entitlement Delivery arrangements. NSW environmental water licences will be debited the volume of environmental release calculated according to SO&O 9.4, as advised each month by the MDBA. The volume of that order, and any amendments, will be placed in the WaterNSW accounting system at the time they are placed with the MDBA by WaterNSW.</p>	<p>See SO&O 9.4</p> <ul style="list-style-type: none"> Water orders will be developed collaboratively by e-water holders, the MDBA, GMW and WaterNSW.

Action	Delivery Pathway	Assumed Use method	Mitigation measures
<p>O&O document: SO&O 10.4 Directed releases from Menindee Lakes</p>	<p>Menindee Lakes to the Murray River, and then to the South Australian border.</p>	<p>Water orders will be managed under Bulk Entitlement Delivery arrangements.</p> <p>NSW environmental water licences will be debited the volume of environmental release calculated according to SO&O 10.4, as advised each month by the MDBA.</p> <p>The volume of that order, and any amendments, will be placed in the WaterNSW accounting system at the time they are placed with the MDBA by WaterNSW.</p>	<p>See SO&O 10.4</p> <p>Directed releases from Menindee Lakes permitted:</p> <ul style="list-style-type: none"> Up to 400 GL each water year, ending May, when releases are able to be directed by the Authority; If storage volumes in Menindee Lakes are forecast to be greater than 640 GL after the directed release; When Menindee Lakes are reducing from 640 GL to 480 GL, if the release can be supplied solely from Lake Menindee and/or Lake Cawndilla or as otherwise agreed between NSW and the Authority. A water order will be developed collaboratively by e-water holders, the MDBA, GMW and WaterNSW. Orders for directed releases are restricted to Lakes Menindee and Cawndilla only, when the combined Lakes' storage is falling from below 640 GL or as otherwise agreed between NSW and the MDBA.
		<p>Where an order for environmental releases requires a rate less than would otherwise be the case, and therefore water in storage is subject to additional evaporation, the use shall be taken as:</p> <ul style="list-style-type: none"> Accounting processes as approved by WLWG. 	<ul style="list-style-type: none"> Water resource offsets to be underwritten by the environmental water holder, as agreed by WLWG.

Action	Delivery Pathway	Assumed Use method	Mitigation measures
Recognition of HEW inflows from the Murrumbidgee River	Balranald to the South Australian border without regulation in Lake Victoria and not for consumptive use	<p><i>Water orders will be managed under Bulk Entitlement Delivery arrangements.</i></p> <p><i>Murray River in regulated conditions*: Proportional loss rate</i></p> <p><i>*While proportional loss is currently applied, incremental loss will be reviewed as more data becomes available and potentially deemed appropriate in the future</i></p>	<p>Proportional loss rate will be assessed based on being commensurate with the prevailing conditions, outlook and level of risk.</p> <p>WaterNSW will provide RMO with the daily flow volume of HEW passing Balranald which will be adjusted by RMO for travel time to the SA border and reduced proportionally for transmission loss conditions*.</p>
<p><i>O&O document: SO&O 2.5 Assumed use for directed releases of HEW from Hume Dam</i></p> <p>Return flows from the Wakool System</p>	When the intended flow at Yarrawonga is less than the maximum planned release as describe in SO&O 3.1b, environmental water deliveries into the Wakool system are subject to an additional use rate	<p>NSW is current in the process of undertaking consultation with river operations (WaterNSW and MDBA) and environmental water holders to determine a suitable accounting arrangement for return flows in the Edward-Wakool. These arrangements will be considered by the PPM Working Group.</p> <p>Protocols for adaptive management, as described in this Manual, will be applied.</p>	
Darling Anabranh	Return flows from Darling Anabranh to SA border	To be determined, noting that arrangements will be required with Victoria to facilitate delivery of outflows to the SA border.	
Directed releases from Menindee Lakes (under NSW control)	<p>Once the total volume of Menindee Lakes falls below 480 GL, the water held is no longer considered a shared resource of the RMS. Water in Menindee Lakes is then managed by NSW to meet local demands. At such time, the Lakes are managed to extend supplies for local critical needs as long as possible until an inflow recovery event occurs.</p> <p>A PPM proposal initiated by environmental water holders when Menindee Lakes in under NSW would be considered and assessed by the Department of Planning, Industry and Environment – Water but depending on the local circumstances and risks at the time, may not be deliverable. The Department of Planning, Industry and Environment – Water will work with river operators and environmental water holders under such constrained conditions to get the best balance of outcomes, consistent with legislated priorities and obligations.</p>		
<p>Note: <i>Italics represent SO&Os of the O&O document, approved by BOC and available on MDBA website.</i></p> <p>Note: These supporting measures are additional mitigation measures proposed for states to implement in addition to mitigation measures provided for under the O&O document.</p>			

4.3.1. Additional mitigation measures between the States

A memorandum of understanding between Victoria and NSW is required in addition to and parallel to the SO&Os enabling PPMs. This MoU is required to cover off on those additional mitigation measures that are not within MDBA's power to enforce as the River Operator under the joint venture.

4.4. Risk mitigation

The release and use of held environmental water using PPMs is a change to the way that water has traditionally been managed and accounted for in the NSW Murray and Lower Darling. Managing environmental water in different ways can potentially result in positive or negative impacts to water users. Possible risks include impacts on the reliability of allocations due to directed releases and impacts to the efficient use of held environmental water. Both positive and detrimental effects of PPMs will be taken into account when considering any potential impacts and their mitigation measures to achieve an appropriate balance between allowing for the efficient and effective use of held environmental water licences to achieve the environmental outcomes and providing protection for other water licence holders.

Where there is uncertainty, initially conservative estimates of environmental water use will be applied. These methods and approaches will be improved over time as a body of knowledge is developed and more accurate measurement and modelling becomes available. These estimates will be based on best available information and subject to review, refinement and improvement. The level of conservatism applied will be proportional to the confidence in the assumed use and level of risk. Over time, new and more innovative approaches to environmental watering will likely be developed and there needs to be flexibility in the way that rules are applied.

A description of possible risks and the mitigation measures that could be applied is shown below in Table 7. Mitigation measures will be considered in collaboration with the environmental water holders and the river operator.

Environmental watering is still relatively new in the NSW Murray and Lower Darling. New environmental watering actions are being developed and implemented every year, and additional implications may become evident over time. Clear processes for review are described in Section 6 to provide an opportunity to review and reassess risks over time.

Work undertaken by the MDBA to support BOC approvals for the large-scale environmental watering trials and the SO&Os describe possible risks and mitigation measures approved by BOC.

Table 7. Potential risks and mitigation measures associated with the operation of PPMs.

Risk	Relevant Action / supporting measure	Mitigation measure
Lower reliability of allocations due to lower utilisation of tributary inflows below major dams through directed releases from dams.	<i>Directed releases from Hume Dam</i>	<p>See SO&Os 2.4 & 2.5</p> <ul style="list-style-type: none"> • Ensure that each upper State is made aware of the other's orders for directed releases from Hume Dam and, if requested, provide an opportunity for WLWG to discuss potential mitigation measures or for States to amend their order. • Monitor the volume of directed releases and advise the WLWG and SCBEWC when the total volume of directed release from Hume Dam is approaching 600 GL in any water year. • Make directed releases greater than 700 GL during a water year if ordered by the upper States and if the WLWG assesses risks to water entitlements to be low. • Monitor the relative totals of directed releases ordered by each State and provide regular updates to WLWG. • Advise the WLWG of any risks to State water entitlements associated with directed releases. • Water orders will be developed collaboratively by e-water holders, the MDBA, GMW and WaterNSW.
	<i>Directed releases from Menindee Lakes</i>	<p>See SO&O 10.4</p> <p><i>Directed releases from Menindee Lakes permitted:</i></p> <ul style="list-style-type: none"> • Up to 400 GL each water year, ending May, when releases are able to be directed by the Authority; • If storage volumes in Menindee Lakes are forecast to be greater than 640 GL after the directed release; • When Menindee Lakes are reducing from 640 GL to 480 GL, if the release can be supplied solely from Lake Menindee and/or Lake Cawndilla or as otherwise agreed between NSW and the Authority.
	<i>Directed release from Lake Victoria during unregulated flow conditions</i>	<p>See SO&O 9.4</p> <ul style="list-style-type: none"> • The Authority should plan to have a maximum target airspace of 100 GL, or a volume as otherwise advised by the WLWG and considering any input from the SCBEWC, at the end of the unregulated flow event. This volume of airspace should not exceed the volume ordered by an upper State.

Risk	Relevant Action / supporting measure	Mitigation measure
Under/over-estimating the volume of environmental water used: <ul style="list-style-type: none"> • Measurement inaccuracies. • Environmental water use estimated based on averages (for example, with conditions then resulting in greater actual use). 	Protection of flows along the river.	Assumed use/river transmission loss estimates when: <ul style="list-style-type: none"> • Sharing access to flows with consumptive water users, and • Environmental flows exceed normal operating levels. Post event accounting Improved management of supplementary Water use based on total volume of water released for directed releases
Increased river transmission losses, as a larger proportion of licensed water is required to be released for the end of the river system	Protection of flows along the river	Possible mitigation measures for this potential risks will be considered as PPMs are implemented and there is better understand of environmental watering use under PPMs
Mitigation measures are unduly conservative that impacts the efficient and/or effective use of HEW	Directed releases from dams Protection of flows along the river	Mitigation measures are evidence based and proportionate to actual risks Post event accounting Assumed use methods reviewed and refined Documentation of procedures and methods Consultation with environmental water holders Annual review process Assessments based on best available information/science
Over-estimating the proportion of flows that are environmental along the river system, resulting in unduly restricted access for consumptive water users	Protection of flows along the river	Conservative assumed use estimates. Closer management of supplementary access
Under-estimating the proportion of flows that are environmental water in the river system resulting in excessive consumptive use	Protection of flows along the river	Regular assessment and review of assumed use Post event reconciliation
Unwanted inundation	Directed releases from dams for environmental watering	Release rates limit to ensure flow remains within channel capacity limits as nominated in WSP Evidence of consultation with potentially impacted landholders
Note: <i>Italics represent SO&Os of the O&O document, approved by BOC and available on MDBA website.</i>		

4.4.1. Consideration of impacts

Some impacts to licensed water users are a result of existing operations and practices within the NSW water management framework. For example, water users can purchase and activate or trade previously unused water access licences, subject to rules within in the relevant water sharing plan. Alternatively, a large irrigator may change their water ordering behaviour which may impact the amount of water available in the dam for other water users.

However, there are other impacts that may arise which are not permitted under the current framework. These kinds of impacts would include allowing one licence holder to request priority of delivery over other water users during times when the amount of water that can be delivered is constrained. Priority of delivery is determined by the category of access licence that is being used to make the order.

NSW has and will continue to develop and implement PPMs in a way that achieves the objective of maximising environmental outcomes through the efficient and effective use of HEW without impacting on the reliability to other water users or by negating or offsetting unacceptable impacts. Where there is uncertainty, NSW will adopt a precautionary approach to minimise detrimental impacts.

5. Adaptive management

5.1. Reporting

Recognising that the environmental watering actions provided by PPMs are different to traditional regulated river system operations and will require ongoing development over time, an adaptive management approach is required. To allow arrangements to evolve and improve over time, an adaptive approach will be adopted, requiring a rigorous process of review and evaluation. It is also recognised that environmental watering actions will evolve and improve over time, and that there are benefits to ensuring that environmental watering actions using PPMs are conducted openly and transparently. To inform the ongoing development of environmental watering actions, and to provide transparency about the management of these watering actions, the adaptive management starts with an annual reporting process that documents the environmental watering actions that have been conducted under the provisions of this Manual. The annual reporting provides the necessary basis to inform an annual analysis and evaluation of the PPM operations.

There are two main reporting elements that are inputs to the annual review process:

- An Annual Environmental Release River Operations Report that documents the application of specific agreed actions, trial actions, and associated supporting measures, including the accounting of river flows, transmission losses, and water delivery that occurred.
- An Annual Environmental Watering statement that documents any issues that arose in the ordering or delivery and accounting of environmental water using the agreed and trial actions.

Both reports must document:

- Any issues encountered in undertaking agreed actions, and any recommendations to address those issues or improve the operation of PPMs, and
- Any feedback from consultation with stakeholders on the actions undertaken.

Submissions may also be invited from other key stakeholders such as the CEWO.

The MDBA prepares an annual report on River Murray operations that includes the use of actions approved by BOC to implement PPMs.

5.1.1. Annual environmental release river operations report

The Annual Environmental River Operations Report shall be prepared by the River Operator (WaterNSW), and be submitted to the regulator (Department of Planning, Industry and Environment – Water) within three months of the end of each water year.

This report will include the following:

- A description of environmental watering actions undertaken during the relevant water year,
- The performance in delivering the environmental water to meet the target flows and volumes requested in the orders,
- The accounting undertaken for these actions, including:
 - a general description of the environmental flow events undertaken that rely on the use of agreed and trial actions,
 - the water orders placed by the environmental water holders,
 - accounts of environmental water use according to agreed methods for Assumed Use Statements,
 - comparisons of assumed use with actual river transmission losses associated with watering actions that rely on that assumed use,

- the volumes of water delivered to the Murray Valley that have been accounted as environmental, and
- Documentation of any issues that arose in the ordering or delivery and accounting of environmental water using the agreed and trial actions and details of how any issues were resolved,
- Documentation of any orders that were refused/rejected and supporting rationale.

The regulator may request additional content that is related to the delivery of environmental water using the agreed and trial actions, following consultation with WaterNSW and other stakeholders.

5.1.2. Annual environmental watering statement

The annual environmental watering statement shall be prepared by the Department of Planning, Industry and Environment – Biodiversity and Conservation, and be submitted to the regulator (Department of Planning, Industry and Environment – Water) within three months of the end of each water year. As the NSW environmental water manager, the Department of Planning, Industry and Environment – Biodiversity and Conservation will consult with other environmental water holders and stakeholders including the CEWO and EWAGs as necessary.

This report shall include the following:

- A brief description of environmental outcomes of the watering actions undertaken during the relevant water year, and the degree to which those environmental objectives were able to be satisfied, and
- Documentation of any issues that arose in the ordering or delivery and accounting of environmental water using the agreed and trial actions.

The regulator may request additional content that is related to the delivery of environmental water using the agreed or trial actions, following consultation with the Department of Planning, Industry and Environment – Biodiversity and Conservation and other stakeholders.

5.2. Annual evaluation and review of PPM operations

The Department of Planning, Industry and Environment – Water will conduct an annual evaluation and review of the implementation of PPMs that will consider the outcomes of undertaking PPMs actions, based on the two reporting elements described above. This annual review report is to include:

- Whether the current PPM actions and the associated supporting measures provide for the effective and efficient use of held environmental water,
- Whether there are sufficient mitigation measures in place, and whether they have been effective,
- 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,
- Any issues relating to PPMs raised through consultation with stakeholders in the valley,
- The results and recommendations of the reporting elements provided by the river operation and environmental water manager,
- Whether the actions and associated supporting measures should be expanded, modified, or remain unchanged,
- Reporting on the implementation of improvements from previous review, including consideration of recommendations provided by the PPM Working Group,
- Whether general operational procedures were followed for the delivery of HEW via PPMs.

The review will be guided by the principles set out in the NSW PPM IP, and the assessment guidelines set out by the MDBA. The review may be undertaken by an independent body.

The Department of Planning, Industry and Environment – Water is responsible for ensuring that appropriate changes to the regulatory framework are made to give effect to any recommendations

arising from this review, in consultation with key stakeholders including the Department of Planning, Industry and Environment – Biodiversity and Conservation and WaterNSW.

The Department of Planning, Industry and Environment – Water will prepare and publish a report on the review each year, including any findings of the review and recommendations

Proposals to support changes or improvements to the operation of PPMs may be brought forward by either the river operator (WaterNSW) or the environmental water holders (Department of Planning, Industry and Environment – Biodiversity and Conservation and CEWO) for consideration in the review, or at any other time. Any such proposals must be supported by appropriate evidence and analysis and should be developed in collaboration with both the regulator and river operator

It is proposed that the annual review will operate to a two to three-year cycle (Table 8) to adequately allow for reporting, consultation and review, including any consequential amendments that made be required to this Manual. A three-month period has been provided for each review element (e.g. reporting, consultation, review).

Table 8. Annual PPM review cycle.

	Review Activity					
	Watering Actions	Reporting	Consultation	Review	Consultation	Amendments
	Department of Planning, Industry and Environment – Biodiversity and Conservation / CEWO, WaterNSW	WaterNSW, Department of Planning, Industry and Environment – Biodiversity and Conservation	WaterNSW, Department of Planning, Industry and Environment – Biodiversity and Conservation	Department of Planning, Industry and Environment – Water		
July						
August						
September						
October						
November						
December						
January						
February						
March						
April						
May						
June						



Figure 2. An overview of the annual PPM review cycle.

References

MDBA, 2015. *Pre-requisite Policy Measures Assessment Guidelines*. 9 April 2015.

Appendix A. Relationship of NSW PPMs to other plans and legislation

Table A. Relationship of NSW PPMs to other plans and legislation

Legislation or Plan	Overview and relationship to Procedures Manual
Commonwealth	
Water Act 2007 (Commonwealth Government)	Makes provision for the management of water resources of the Murray-Darling Basin.
Basin Plan	<p>A legislative instrument developed as a requirement of the Water Act 2007.</p> <p>Aims to protect and restore key water-dependent ecosystems.</p> <p>Determines the amount of water that can be extracted annually from the Basin for consumptive use.</p> <p>PPMs are a requirement of the Plan.</p>
Basin-wide Environmental Watering Strategy (MDBA)	<p>Sets out the expected outcomes at a whole-of-basin scale that should be achievable with the environmental water available, and efficient and effective strategies to achieve them.</p> <p>This document guides the work of governments, water holders and environmental managers.</p> <p>PPMs will assist in achieving expected outcomes.</p>
Environmental Watering Plan (MDBA)	<p>The purposes of the environmental watering plan are to safeguard existing environmental water; plan for the recovery of additional environmental water; and coordinate the management of existing environmental water.</p> <p>PPMs will assist in meeting the purposes of the Environmental Watering Plan.</p>
Environmental Watering Schedule (CEWO)	<p>Developed periodically for the purposes of the Environmental Watering Plan to identify environmental watering priorities.</p> <p>PPMs will assist in meeting environmental watering priorities.</p>
Basin Annual Environmental Watering Priorities (MDBA)	<p>Guide the annual planning and prioritisation of environmental watering across the Basin. They represent annual steps toward the long-term outcomes in the Basin-wide Environmental Watering Strategy.</p> <p>They aim to achieve the most effective use of water for the environment; promote better environmental outcomes across the Basin; and coordinate watering between environmental water holders and water managers.</p> <p>PPMs will assist in achieving the aims of the Basin Annual Environmental Watering Priorities.</p>
Portfolio Management Plan (CEWO)	<p>Sets out plans for managing the Commonwealth environmental water portfolio in the NSW Murray and Lower Darling Regulated Rivers for each water year.</p> <p>PPMs will assist in managing Commonwealth environmental water portfolio</p>

Legislation or Plan	Overview and relationship to Procedures Manual
NSW	
Water Management Act 2000	<p>The WMA provides the legislative framework for the sharing of water between industry, communities and the environment in NSW.</p> <p>PPMs must be implemented in accordance with the WMA.</p>
Water Management Regulation 2011	<p>The Regulation is a supporting instrument to the WMA. It provides the administrative direction for the management of NSW's water resources and specifies how issues are to be dealt with at a local level.</p> <p>PPMs must be implemented in accordance with the Regulation.</p>
Protection of the Environment Operations Act 1997	<p>The POEO Act enables the NSW Government to set out explicit protection of the environment policies and adopt more innovative approaches to reducing pollution. The POEO Act includes prohibition of pollution of waters.</p> <p>PPMs must be implemented in such a way as to avoid pollution of waters (e.g. triggering of blackwater events)</p>
Murray Lower Darling Water Resource Plan	<p>The WRP outlines how water resources will be managed to be consistent with the Murray-Darling Basin Plan.</p> <p>PPMs must be implemented in accordance with the WRP.</p>
Murray Lower Darling Water Sharing Plan	<p>The WSP is a legislative tool under the WMA that sets out rules for access licences and water supply works approvals. The WSP contains rules which specify how water is shared between the environment and water users in a water source.</p> <p>PPMs must be implemented in accordance with the WSP.</p>
Annual Watering Plan (Department of Planning, Industry and Environment – Biodiversity and Conservation)	<p>Outlines the priorities for environmental water use in the coming year, depending on climatic factors and water availability.</p> <p>PPMs will assist in meeting the priorities of the Annual Watering Plan.</p>
Works Approval (WaterNSW)	<p>Water Supply Works Approvals manage river operations and are controlled by Department of Planning, Industry and Environment – Water.</p> <p>PPM Procedures Manuals will translate how these approval conditions are to be managed in day-to-day river operations.</p>
NSW PPM Implementation Plan	<p>The PPM Implementation Plan sets out high level principles to guide PPM development and implementation. It identifies preferred implementation options and associated processes required to incorporate PPMs into the regulatory and operational frameworks that guide water management and operation in NSW.</p> <p>PPM Implementation Plan and review of this plan by MDBA informs the development of the PPM Procedures Manual.</p>

Appendix B. Access licences

Access licences that are either licensed environmental water under section 8 of the *Water Management Act 2000*, held by the Commonwealth Environmental Water Holder, or are specified in the table below may order water under the Environmental Flow Reuse Rules or the Piggybacking Rules set out in this PPM Procedures Manual for the NSW Murray and Lower Darling Regulated River Water Source.

WAL No	Environmental Holder Group
13721	NSW OFFICE OF ENVIRONMENT AND HERITAGE
9422	NSW OFFICE OF ENVIRONMENT AND HERITAGE
9423	NSW OFFICE OF ENVIRONMENT AND HERITAGE
11377	CROWN LANDS AND WATER DIVISION
11065	CROWN LANDS AND WATER DIVISION
11066	CROWN LANDS AND WATER DIVISION
12990	CROWN LANDS AND WATER DIVISION
14585	CROWN LANDS AND WATER DIVISION
14998	MURRAY DARLING BASIN AUTHORITY
14999	MURRAY DARLING BASIN AUTHORITY
30638	CROWN LANDS AND WATER DIVISION
30640	CROWN LANDS AND WATER DIVISION
30639	CROWN LANDS AND WATER DIVISION
35610	MURRAY DARLING BASIN AUTHORITY
35937	MURRAY DARLING BASIN AUTHORITY
36350	CROWN LANDS AND WATER DIVISION
41359	NSW OFFICE OF ENVIRONMENT AND HERITAGE
8718	CROWN LANDS AND WATER DIVISION
11277	PRIVATE
15421	MURRAY DARLING BASIN AUTHORITY
15422	MURRAY DARLING BASIN AUTHORITY
15937	CROWN LANDS AND WATER DIVISION
16383	CROWN LANDS AND WATER DIVISION
20264	NSW OFFICE OF ENVIRONMENT AND HERITAGE
37272	CROWN LANDS AND WATER DIVISION
37273	CROWN LANDS AND WATER DIVISION
41715	NSW OFFICE OF ENVIRONMENT AND HERITAGE