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Prerequisite policy measures assessment:

River Murray System

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Acknowledgement of the Traditional Owners of the Murray–Darling Basin

The Murray−Darling Basin Authority pays respect to the Traditional Owners and their Nations of the Murray−Darling Basin. We acknowledge their deep cultural, social, environmental, spiritual and economic connection to their lands and waters.

The guidance and support received from the Murray Lower Darling Rivers Indigenous Nations, the Northern Basin Aboriginal Nations and our many Traditional Owner friends and colleagues is very much valued and appreciated.

Aboriginal people should be aware that this publication may contain images, names or quotations of deceased persons.

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Introduction

This report sets out the Murray-Darling Basin Authority's (MDBA) assessment of whether Prerequisite Policy Measures (PPMs) were in effect in the River Murray System by 30 June 2019, in accordance with section 7.15 of the Basin Plan. The two PPMs in section 7.15 are:

- **PPM1** - credit environmental return flows for downstream environmental use; and
- **PPM 2** - allow the call of held environmental water from storage during unregulated flow events.

The Authority must establish whether the PPMs are in effect by this date in order to retain these policy settings when calculating a SDL reconciliation for the Bain Plan SDL Adjustment Mechanism.

The implementation of PPMs is an important mechanism to enable the environmental outcomes in the Basin Plan to be met with the water identified for recovery, as was anticipated in the benchmark SDL modelling. Without the PPMs in place, more environmental water is needed to achieve the outcomes.

The PPMs are one mechanism set out in the Basin Plan to ensure that environmental outcomes are achieved. Other mechanisms include the protection of planned environmental water and environmental watering requirements through water resource plans, ensuring compliance with the SDL to protect environmental water from extraction, and providing for an adaptive management approach to the use of environmental water through reporting, evaluation and risk management.

While these other mechanisms will support the operation of PPMs, the MDBA has considered the issues specific to the PPMs in the assessment of whether the measures are in effect by 30 June 2019. The full implementation of the Basin Plan and associated compliance and adaptive management will ensure the other mechanisms, along with further refinement of the PPMs, enable the efficient and effective use of environmental water to achieve the Basin Plan environmental outcomes.

Assessment approach

To establish whether the PPMs are in effect, the MDBA has developed criteria and assessment questions using principles set out in guidelines[1] developed by the MDBA in 2015. These guidelines were developed to assist states to implement PPMs. The criteria and assessment question are designed to test whether the PPMs are in effect according to these principles, and are set out in Table 1, with the key principles in bold.

[1] MDBA, 2015. Pre-requisite Policy Measures: Assessment Guidelines. April 2015.

Table 1: PPM Assessment criteria

Criteria	Assessment questions
1. Are PPMs enabled in a **secure and enduring** arrangement?	*How are PPMs enabled through legislative/statutory instruments? What other mechanisms are used to implement PPMs?* *What is required to change mechanisms that enable or implement PPMs?* *Given the above assessment findings, will the proposed arrangements enable PPMs in a way that ensure they will remain in effect from 30 June 2019?*
2. Can PPMs be **fully operated** from 1 July 2019?	*Are there sufficient obligations to implement PPMs?* *How is environmental water called from storage during unregulated flow events?* *How is environmental water accounted for?* *Given the above, are PPMs given effect through appropriate mechanism(s) within the relevant water management framework?*
3. Are operational arrangements sufficiently detailed and **transparent**?	*Do operational arrangements include:* *1. A process for ordering and delivering environmental releases that:* – *Enables all environmental water holders to target the use of their entitlements, within operational requirements* – *Includes processes for advising environmental managers of the estimated environmental releases and providing other information needed for event planning* – *Requires proposed flow descriptions (rates, volumes, timing, locations, intended targets etc.)* – *Describes accounting arrangements, including inter-valley accounting, where applicable* – *Requires disclosure of explanations for refusing or altering orders* – *Includes a process for resolving disputes* *2. A process for accounting environmental water that:* – *Clarifies roles and responsibilities for estimating releases, losses and credits* – *Requires disclosure of the assumptions/information used in the estimations* – *Includes processes for adjusting the estimation during and post-event, where applicable* – *Applies the principle of incremental losses* – *Improves estimates as knowledge improves* – *Considers detrimental and beneficial impacts of environmental releases when considering potential third party risks* *Given the above, do the operational arrangements provide for a process enabling PPM operation?*

MDBA River operators have developed arrangements to give effect to the PPMs in the River Murray System on behalf of the joint venture states. MDBA staff with appropriate technical knowledge were also required to assess these arrangements. These two roles have been separated by a Chinese wall arrangement, where staff involved in developing the River Murray PPMs, and also those with current operational roles in relation to the use of environmental water entitlements, have not been appointed to the MDBA assessment panel. A number of protocols were implemented to establish this arrangement, including:

- Probity advice was sought in relation to members of the assessment panel with previous roles in River Murray operations.
- The assessment panel's feedback on River Murray documentation was recorded and provided to the MDBA PPM developers through an assessment coordination team. The same structure was also used to facilitate feedback to relevant state PPM developers to ensure a consistent approach.
- Question logs were maintained by the assessment coordination team to document specific requests for further information from MDBA and state PPM developers. The responses that were received provided additional documentation to support the assessment.
- Access to assessment documentation was restricted to the assessment panel and coordination team.

These mechanisms recorded information flow between the assessment panel and the MDBA PPM developers, to ensure:

- the evidence of River Murray PPMs that the MDBA assessment panel used as a basis for their assessment was clearly documented,
- the MDBA PPM developers did not have inappropriate access to information or input into the assessment, and
- engagement with MDBA PPM developers was consistent with state PPM developers.

The Independent River Operations Group (IRORG) were also appointed to review the MDBA's assessments to ensure the assessment process was consistently applied, the potential conflicts of interest were appropriated managed, and the assessment conclusions were robust and evidence-based.

Background

This report assesses PPMs for the River Murray System in the context of the joint venture arrangements under the Murray-Darling Basin Agreement (MDB Agreement). The documentation was prepared by the MDBA River Operations Improvement team, on behalf of the joint venture states, to give effect to those aspects of PPMs requiring joint venture decisions. Joint venture decisions are made by the four governments involved (the Australian, New South Wales, Victorian and South Australian) through the Basin Officials Committee (BOC) and implemented by MDBA River operators on behalf of the states.

The MDB Agreement established the joint venture arrangements and appointed the MDBA as the statutory agency with delegated responsibilities to direct River Murray operations and coordinate the delivery of consumptive and environmental water from the headwater storages (Dartmouth and

Hume) to the South Australian Border (near Lake Victoria). Under certain conditions, the MDBA also directs river operations in the Lower Darling through controlling releases from the Menindee Lakes. Although no specific PPM actions occur downstream of the South Australian border under the River Murray PPMs administered by the MDBA, South Australia has a material interest in such operations and is engaged through consultative groups and decision making bodies such as the Basin Officials Committee (BOC).

A fundamental role of MDBA River operators is to operate the River Murray System in accordance with the arrangements agreed to by the joint venture governments through BOC. These arrangements are set out in the Objectives and Outcomes document (the O&O document) and Special Objectives and Outcomes (SO&Os). In exercising this function, MDBA River operators consult with and report to a number of committees and working groups, including the Southern Connected Basin Environmental Watering Committee (SCBEWC), the River Murray Operations Committee (RMOC), and the Water Liaison Working Group (WLWG).

Each of the joint venture states have their own PPM arrangements which will influence outcomes on the River Murray System. Assessment of whether the PPMs are in effect under these state arrangements, including compatibility with the River Murray PPM arrangements, is considered in the individual state PPM assessment reports.

Documents assessed

The joint venture components of the River Murray System PPMs are described in the following documentation provided for assessment:

- BOC 65 draft Minutes
- Consistency Review
- Criteria document
- Overview and approved SO&Os and definitions

This assessment of whether the PPMs for the River Murray System were in effect by 30 June 2019 was based on consideration of the above documents.

During the assessment of this documentation, a number of questions were raised by the Assessment panel. These were provided to the MDBA PPM developers for a response in a Questions log. These responses log also informed the assessment. The Questions log also included a request for the following additional documents to be provided to support the assessment:

- River Murray System: Summary of River Operations 2017-18
- IRORG Review of River Operations 2017-18
- River Murray System: Summary of River Operations 2016-17
- IRORG Review of River Operations 2016-17
- River Murray System: Summary of River Operations 2015-16
- IRORG Review of River Operations 2015-16

Summary assessment statement

Has the MDBA demonstrated that the PPMs are in effect by 30 June 2019 for the River Murray System?

The MDBA River operations improvement team, on behalf of the states involved in the River Murray joint venture, have clearly documented the legal instruments that give effect to PPMs in the River Murray System. The new definitions and SO&Os that are included in the O&O document have adequate legal standing under the Murray-Darling Basin Agreement and require the agreement of the Commonwealth, New South Wales, Victorian and South Australian Governments to amend. The Assessment panel considers these arrangements provide secure and enduring implementation of PPMs.

Furthermore, the River operations improvement team has logically documented their reasoning for recommending the changes to the O&O document to BOC, including outlining how issues have been considered and risks mitigated. The SO&O amendments include an accounting estimation method and outline the roles and responsibilities of each organisation in estimating environmental releases. They provide sufficient flexibility to accommodate new information and changing conditions which is important for adaptive management. There is evidence of robust review mechanisms which include relevant stakeholder input and independent oversight.

The PPMs for the River Murray System are assessed as being in effect under current conditions. The BOC has established four new SO&Os that enable MDBA River operators to make directed releases from headwater storages and appropriately account for environmental water in the management of the River Murray system. The PPMs for the River Murray System are consistent with state PPMs that apply to the River Murray System tributaries.

The underpinning detail around planning, liaison, coordination, water accounting, reporting and all other aspects of day-to-day river operations has been clearly established. Practically all aspects have been progressively tested through the conduct of environmental watering trials over many years.

The Assessment panel considers that the information provided demonstrates that the PPMs are in effect in the River Murray System.

Prerequisite policy measure assessment

Criterion 1: Securing and enduring arrangements

1.1. How are PPMs enabled through legislative/statutory instruments? What other mechanisms are used to implement PPMs?

The River Murray PPM implementation documentation demonstrates that PPMs are legally in effect in the River Murray through:

- Existing provisions and associated protocols in the MDB Agreement, which is Schedule 1 of the *Water Act 2007* (Cwlth);
- Amendments to the Objectives & Outcomes document for river operations in the River Murray System, including amendments to the Specific Objectives & Outcomes, approved by BOC to have effect from 1 June2019.

The Assessment panel notes that each of the joint venture states have their own PPM arrangements which will influence outcomes on the River Murray System. Assessment of whether the PPMs are in effect under these state arrangements, and whether they are compatible with the arrangements in the River Murray, is considered in the individual state PPM assessment reports.

The documentation justifies why existing clauses of the MDB Agreement were considered adequate to meet the requirement to enable PPM implementation, and notes the future potential for amendments to the Agreement if the need is identified in review mechanisms.

The O&O document is a requirement under the MDB Agreement, and directs the MDBA in their river operations by providing five themes of objectives and outcomes. The SO&Os are included as an appendix in the O&O document and detail rules for river operations that relate to the general objectives and outcomes. It is therefore appropriate that amendments to the O&O document included four new SO&Os to enable PPM implementation.

At meeting 65 on February 28 2019, BOC approved the following four new SO&Os and two definitions to be included in the O&O document:

- 2.4 – directed releases from Hume Dam
- 2.5 – assumed use for directed releases of Held Environmental Water from Hume Dam
- 9.4 – directed releases from Lake Victoria during unregulated flow conditions
- 10.4 – directed releases from Menindee Lakes
- Definitions (under section 3(1)):
    - Directed release
    - Directed release water order

1.2. What is required to change mechanisms that enable or implement PPMs?

Amendments to the MDBA Agreement and O&O document (including the SO&Os) requires approval by BOC. Such approval requires the agreement of the Commonwealth, New South Wales, Victorian and South Australian Governments. Amendment to the MDB Agreement also requires final approval by the Ministerial Council. These are strong forums of consensus that determine changes to implementation mechanisms, and this process ensures the legal mechanisms enabling PPM implementation are secure and enduring.

MDBA River operators are also guided by the RMOC and WLWG. The operational decisions, including the operation of PPMs, are subject to an annual review by IRORG. These structures and processes provide multiple avenues of input for relevant stakeholders into any amendment process.

1.3. Given the above assessment findings, will the proposed arrangements enable PPMs in a way that ensure they will remain in effect from 30 June 2019?

The Assessment panel is satisfied that the documentation demonstrates that adequate instruments have been used to give effect to PPMs in the River Murray system and ensure they are implemented in secure and enduring way.

Criterion 2: Fully operable arrangements

2.1 Are there sufficient obligations to implement PPMs?

The environment theme in the O&O document obligates the MDBA to facilitate environmental watering activities for environmental water holders. The new SO&Os are river operations rules that outline the MDBA's role in assisting States to implement PPMs in the River Murray, including:

- Directing releases from storages;
- Assisting states to manage environmental water accounting responsibilities and;
- Minimise risks of material impacts on state water entitlements.

These arrangements provide adequate operational obligations on MDBA River operators to implement PPMs.

Furthermore, the O&O document is subject to the annual review of the RMOC and the Independent River Operations Review Group (IRORG). Review of the new SO&Os requires consultation with SCBEWC, which provides an important avenue for environmental water holders to have input into the refinement of PPM operations.

The SCBEWC has representatives from the five environmental water holders in the southern basin: The Living Murray (TLM), Commonwealth Environmental Water Office (CEWO), Victorian Environmental Water Holder (VEWH), NSW Office of Environment and Heritage (OEH) and South Australia. Input from environmental water holders would largely be expected to come through SCBEWC, however this does not limit and environmental water holder from providing feedback outside the committee process.

These river operations rules and review processes demonstrate that MDBA River Murray operators are obligated to implement PPMs, and are subject to annual independent evaluation of their river operation decisions.

2.2 How is environmental water called from storage during unregulated flow events?

Environmental water can currently be called from storage by the MDBA on behalf of the states using three of the four new SO&Os. These enable the MDBA to make a directed release from Hume Dam and/or Menindee Lakes during periods of both regulated and unregulated flow (SO&O paragraphs 2.4 and 10.4) and/or from Lake Victoria only during periods of unregulated flow (SO&O paragraph 9.4).

These three new SO&Os are supported by a fourth new SO&O (paragraph 2.5) which defines the assumed use along the River Murray and its floodplains associated with directed releases from Hume Dam. Also, the newly amended O&O document defines a directed release and a directed release order (section 3(1)).

The SO&Os detail the requirements and role of MDBA River operators in facilitating directed releases of environmental water entitlements consistent with the MDB Agreement, the Basin Plan and relevant state legislation and policies. The arrangements also have considerable ownership across stakeholders as they were developed with extensive consultation with state agencies through a number of river management and advisory committees including the WLWG, RMOC, and SCBEWC. The SO&Os detail the role of each of these groups and committees for the directed release from each

storage, including to advise the MDBA or provide input for consideration. The SO&O also include responsibilities for the MDBA to advise and report to the groups and committees.

Directed releases made to date from Hume Dam have been undertaken as a series of trials since 2010-11. The Assessment panel notes that further refinement of the current arrangements will be needed within an adaptive management framework, particularly when existing flow constraints are addressed as required under the Basin Plan. In addition, further mitigation measures may be required to manage any potential impacts on reliability and deliverability of state water entitlements and third parties. Based on the experience of trials to date, the collaborative engagement with SCBEWC and WLWG and commitment to using the best available information for determining loss rates, there is a high degree of confidence that any mitigation measures will be transparent and unlikely to be unnecessarily conservative.

Directed release trials have also been undertaken at Menindee Lakes and at Lake Victoria. In relation to Menindee Lakes, the PPM documentation indicates that further detailed technical information will be provided in an environmental water manual by the end of June 2019. Given that directed releases have been successfully delivered in 2016-17 and 2017-18, and the rules to enable these releases have been codified in the new SO&Os, the Assessment panel considers that the current documentation demonstrates that PPMs are in effect for the Menindee Lakes, when operated by the MDBA.

MDBA River operators apply a decision making process to issue a direction to release water from a major storage, including the release of environmental water as a directed release. This process is set out in the SO&Os includes consideration of:

- Minimum flow requirements at downstream gauges,
- All estimated diversions (both consumptive and environmental),
- Allowance for river transmission losses (or gains from rainfall) and minor diversions
- Transfers to Lake Victoria (if required) and supply to South Australia.

When a directed release of environmental water is ordered, the above flow components are included in the hypothetical “without” scenario. The volume of the directed release is added to this “without” scenario to either meet a downstream gauge height or flow target, or to deliver an additional volume of water, as requested in the water order. The “with” scenario therefore includes the release volume in the “without” scenario plus the volume of the directed release.

For Hume Dam, the SO&O 2.4 requires that the volume of directed release is calculated by MDBA River operators on a daily basis using two operational spreadsheets, one for a ‘with’ a directed release scenario and the other for a hypothetical ‘without’ scenario. The SO&Os also require MDBA to maintain close liaison with the states through the WLWG in view of the uncertainty associated with the methodology adopted, particularly regarding the assumed use calculation.

For Menindee Lakes, the SO&O 10.4 requires MDBA River operators to calculate the volume of directed release as the difference between the actual release and the hypothetical ‘without’ the directed release scenario. The details for this calculation have not been provided in the documents for assessment. However, documentation indicates that this detail will be included in an environmental watering manual with a first draft available by the end of June 2019.

As the previous trials for Menindee Lakes have demonstrated an acceptable methodology to manage environmental water releases and to account for losses and use, and a protocol for accounting for

these losses is included in the SO&O, the Assessment panel is satisfied that the PPMs are in effect, noting that further work to refine and document the method will continue post-June 2019. Further, the Assessment panel notes that the governance arrangements within the adaptive management processes outlined in the PPM documentation ensures that any further development of these methodologies over time will include input from all key parties involved, including environmental water holders.

For Lake Victoria the SO&O 9.4 outlines how the volume of directed release is to be calculated. This SO&O appropriately recognizes that operations at Lake Victoria differ from other River Murray System storages. MDBA River operators are required to calculate the volume of directed releases from Lake Victoria using the method provided in the SO&O; calculated as the volume that the lake level is below 99% of capacity on the date that unregulated flows were forecast to cease if the directed releases had not been made.

The current SO&O 9.4 was developed after the first directed release from Lake Victoria was trialed in 2016–17, and as an improvement based on this trial, SO&O 9.4 does not require Lake Victoria to be filled prior to commencing the directed release. The Assessment panel note that, to date, there have not been appropriate conditions to implement the new arrangement.

2.3 How is environmental water accounted for?

For directed releases from Hume Dam SO&O 2.5 details the method to be used for calculating the assumed use. The assumed use calculation applies to the volume of directed release at Yarrawonga Weir. Yarrawonga Weir is the appropriate accounting point as it is upriver of the Barmah-Millewa Forest where a large proportion of the loss occurs when flows are high enough to enter the forest. The methodology applied enables the estimation of the incremental loss[2] (i.e. the assumed use) from Hume Dam to the SA border, which is the preferred method of calculating environmental water losses.

For Menindee Lakes, SO&O 9.4 requires MDBA River operators to determine and deliver to South Australia the additional flow that reaches Burtundy due to the additional release from Menindee Lakes, allowing for travel time. The difference in the volume of directed release from Menindee Lakes and the additional flow at Burtundy is the assumed use. The new SO&O 9.4 notes that this estimation of return flow is an interim measure to be used until a better method is developed and agreed.

The Assessment panel note that the interim method was successfully used in the 2017-18 environmental watering trial, and are therefore satisfied that the PPM is in effect. The assumed use calculation is documented in the report *River Murray System Summary of River Operations for 2017/18*, and the Assessment panel considers this calculation is currently acceptable to use for the purpose indicated.

For Lake Victoria there is no assumed use to be calculated as releases from Lake Victoria to the River Murray are very close to the water delivery point at the SA border, and so no losses are expected to

[2] Incremental loss is the additional loss associated with the release of environmental water on top of existing river system release requirements.

occur before the water is delivered to SA. Also, directed releases can only occur under unregulated flow conditions when losses are borne by the unregulated flows.

Operationally, the volumes of directed release from storages and the assumed use is determined by state River operators, who direct MDBA to make releases. The volumes of water to deliver to downstream sites is determined in conjunction with daily data supplied weekly by Goulburn-Murray Water and with data supplied as required from WaterNSW. These water accounts consider not only the bulk volumes of environmental water, but also apportion these volumes to the appropriate retail account holder.

The *Criteria document* provided for assessment notes that in addition to the need to account for return flows from directed releases, environmental flows emanating from tributaries or environmental watering sites along the river (page 14-7). This document notes that crediting return flows and inflows is already a feature of the bulk water accounting undertaken by the MDBA.

MDBA maintains these environmental water accounts on a daily basis in conjunction with the daily river operations spreadsheets for the River Murray System. This daily information is collated into monthly accounts detailing volumes of directed release, usage and return flows. These monthly environmental water accounts are provided to State agencies and environmental water holders at the beginning of each subsequent month. The Assessment panel notes that this arrangement has worked effectively for many years.

The *Criteria document* submitted for assessment notes that an Environmental Watering Manual to support the day to day delivery of environmental water consistent with PPMs is being prepared, which will provide operational detail on environmental water ordering, accounting and delivery. The Assessment panel note that information submitted for assessment adequately demonstrates that the PPMs are fully operable, and the series of environmental watering trials conducted since 2010 and documented in the *River Murray System: Summary of River Operations* reports provide further evidence to support this conclusion. Production of the Environmental Watering Manual will increase transparency, and this is considered against Criterion 3.

2.4 Given the above, are PPMs given effect through appropriate mechanism(s) within the relevant water management framework?

The Assessment panel is satisfied that the new SO&Os and relevant definitions in the O&O document give effect to PPMs in the River Murray System.

The Assessment panel also notes that to be fully operable, the River Murray PPMs must be compatible with PPM arrangements in relevant states. In this regard the Assessment panel notes that:

- the changes to give effect to PPMs were made by BOC, which has representation from relevant states
- the changes were based on the environmental watering trials which were conducted collaboratively with relevant state delivery partners, to ensure PPMs could be operated in the River Murray consistent with state water management rules
- the changes were developed with input from the WLWG and SCBEWC, which have representatives from relevant states

- the documentation provided for assessment notes that MDBA River operators have a role to provide information and advice to states on the implementation of PPMs when requested.

The *Criteria document* notes that the development of the Environmental Watering Manual will be developed with advice from the relevant states through the WLWG and SCBEWC. The Assessment panel notes this will ensure PPM arrangements are consistent with the MDB Agreement, the O&O document and state legislation and PPM policies, and that the collaborative review and adaptive management processes described in the documentation will assist in maintaining this consistency.

Criterion 3: Transparent arrangements

3.1. Do operational arrangements include a process for ordering and delivering environmental releases that:

- ***Enables all environmental water holders to target the use of their entitlements, within operational requirements***
- ***Includes processes for advising environmental managers of the estimated environmental releases and providing other information needed for event planning***
- ***Requires proposed flow descriptions (rates, volumes, timing, locations, intended targets etc.)***
- ***Describes accounting arrangements, including inter-valley accounting, where applicable***
- ***Requires disclosure of explanations for refusing or altering orders***
- ***Includes a process for resolving disputes***

The River Murray System is operated by the MDBA on behalf of the three joint venture states. The MDBA's role in assisting the states to implement directed releases from storages and credit environmental return flows is predominantly a bulk delivery, accounting, and information provision role, rather than a role to assess and approve detailed environmental water orders such as occurs at the retail scale. The retail processes for ordering and delivery of environmental water are detailed in state water management arrangements, and will be detailed in the PPM documentation provided by the individual states. As such some of the assessment questions under this criterion are not relevant to the MDBA's role in operating the River Murray System.

River Murray System operating requirements are clearly provided in the O&O document, covering processes for seasonal planning (Annual Operating Plan), environmental watering planning, ordering, delivery, accounting, reporting and reviews. The MDBA River operators carry out these activities at the level of bulk deliveries. Individual environmental watering actions are developed by the various environmental water holders through existing state water planning processes. The planning includes estimates of the volumes of environmental water required for release, flow event rates, volumes, timing, locations, intended targets etc. and an evaluation of possible risks. The MDBA receives these environmental water orders through the relevant state agencies, who direct MDBA to release water to meet these orders.

In terms of the delivery of environmental water, MDBA River operators apply a decision-making process set out in the SO&Os (as described in the assessment against question 2.2) to issue a direction to release water from a major storage, including the release of environmental water as a directed release. MDBA River operators consider the needs of the environmental release along with whole of River Murray System operational requirements, such as bulk water transfers between major storages. Operational Advisory Groups assist MDBA River operators with the coordination of environmental water delivery, field reports, reporting on current and forecast environmental water use, and active management over time as conditions change.

MDBA River operators assist the states and relevant entitlement holders by providing information on specific retail components of bulk water release and availability for downstream use. For consumptive water, the states undertake all the accounting for retail water orders and delivery.

MDBA River operators report monthly to the states and environmental water holders on:

- the monthly volumes of directed release from headwater storages, from environmental (retail) water accounts, as per orders provided by OEH via WaterNSW and VEWH via GMW;
- the monthly volumes of assumed use from environmental (retail) water accounts, as calculated using SO&O 2.5; and
- the monthly volumes of return flows and directed trades of environmental water, categorised by the state of origin and the water holder, to be delivered to SA. These volumes are calculated using the information determined in the previous dot points in conjunction with information provided by the upper states on environmental (retail) tributary (inter-valley) return flows less any subsequent use in watering actions at downstream sites along the River Murray, such as Gunbower Creek and Hattah Lakes. All volumes are lagged by the relevant in-channel travel time.

MDBA has a robust dispute resolution processes, involving detailed liaison and discussions with the various water management entities involved. All parties having the ability to have input into this process through the annual IRORG review of river operations and PPM's. These discussions are strongly evidence based, using river system modelling as appropriate to inform decisions. Typically any disputes or issues would first be raised with the WLWG or through the stated MDBA PPM review process which includes 'sufficient time to seek and consider input from the SCBEWC'. Where necessary, matters may then be referred to higher level groups for decision, such as RMOC and BOC.

3.2. Do operational arrangements include a process for estimating environmental releases that:

- ***Clarifies roles and responsibilities for estimating releases, losses and credits***
- ***Requires disclosure of the assumptions/information used in the estimations***
- ***Includes processes for adjusting the estimation during and post-event, where applicable***
- ***Applies the principle of incremental losses***
- ***Improves estimates as knowledge improves***
- ***Considers detrimental and beneficial impacts of environmental releases when considering potential third party risks***

In terms of accounting for environmental releases, MDBA River operators incorporate the volumes of additional environmental releases into the monthly water accounts which are provided to the states (as outlined in the assessment against question 3.1). Regular updates are also provided to the WLWG and, as required, to environmental entitlement holders, to assist them in the day-to-day management and accounting at the state and retail scale.

The SO&Os also require MDBA River operators to provide advice and data to the WLWG and SCBEWC to enhance opportunities for environmental water delivery while minimising risks to state water entitlements. MDBA River operators also present to joint WLWG/SCBEWC meetings each year on forecast operations for the forthcoming water year, based on a range of potential inflow scenarios. These meetings provide the opportunity for information sharing and informal dispute resolution. MDBA River Operators also co-ordinate and/or participate in many operational advisory group teleconferences, where information on environmental water use and/or delivery to date and forecast use and/or delivery is provided to stakeholders.

As described in the assessment against question 2.3, incremental loss accounting is used.

Review processes are in place to improve river operations, including improving accounting methods when new data and knowledge becomes available.

The SO&Os are reviewed annually as part of the annual O&O document review process. The annual Summary of River Operations report and the effectiveness of the environmental SO&Os are also independently reviewed by the IRORG as part of this process. The SO&Os state that these reviews should allow sufficient time to seek and consider input from SCBEWC.

The specific inclusion of SCBEWC in the review process provides assurance that environmental water managers have a clear and transparent pathway for ideas and concerns to be considered by the MDBA and Joint governments. However, the Assessment panel note that SCBEWC is the decision maker only for water entitlements held by TLM and RMIF. Therefore, feedback on the reviews of the SO&Os should also be able to be provided by environmental water holders outside of the SCBEWC.

The accounting methods for directed release of environmental water from storage, and for the assumed use of directed releases from Hume Dam, have been developed and revised over many years of environmental watering trials, commencing in 2010-11. Preparation of the environmental watering trials documentation each year has included consultation with WLWG and SCBEWC, with support from the RMOC, and approval from BOC. In addition, IRORG's annual review of the environmental SO&O trials has provided further opportunity for environmental water holders and the states to give feedback on the accounting methods used and to propose new ideas. Changes to the accounting methods over time are evidence of this ongoing review and adaptation.

In this regard, the Assessment panel notes operational details for environmental water ordering, accounting and delivery in the context of the MDBA's River operation functions will be further documented in an Environmental Watering Manual. The Assessment panel is satisfied that the documentation provided to date demonstrates that sufficient and transparent operational details are provided to environmental water holders to enable the day-to-day delivery of environmental water consistent with PPMs. The key documents including the MDB Agreement, O&Os document and SO&Os are also publically available on the MDBA's website, which adds further transparency to these arrangements.

The Assessment panel also note that the *Criteria document* submitted for assessment includes a commitment to further develop the detailed arrangements with advice from the four jurisdictions via the WLWG and SCBEWC. The Assessment panel considers that engagement with all environmental water holders through these advisory committees or other appropriate channels

Potential impacts on reliability and deliverability have been appropriately addressed, with mitigation measures for consideration set out in the SO&Os where necessary.

3.3. Given the above, do the operational arrangements provide for a transparent process enabling PPM operation?

The Assessment panel considers that the information in the SO&Os provides sufficient detail to ensure that PPMs are implemented in the River Murray System, as appropriate to the MDBA's River Murray operations role.

The documentation provided identifies that the operation of PPMs in the River Murray System relies on consistent and complementary PPM policies in the States. These policies are assessed for

compatibility with River Murray PPM arrangements in the individual assessment reports for each state.

The documentation demonstrates MDBA's processes to consistently engage with states throughout the ongoing refinement of PPM implementation to achieve optimal environmental outcomes under current conditions. Flexibility to improve the processes around environmental water delivery in the River Murray system is provided by the annual reviews of the SO&Os.

The key documents that give effect to PPMs are also publically available.

The Assessment panel considers that the proposed future work to document operational details in an Environmental Watering Manual, in consultation with environmental water holders and delivery partners, will add to the transparency of the existing arrangements.

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