INDEPENDENT ASSESSMENT OF THE INITIAL IMPLEMENTATION OF THE RESUMPTION OF FLOWS RULE, IDECS AND ACTIVE MANAGEMENT IN THE BARWON-DARLING: 01 DECEMBER 2020 TO 31 MARCH 2021

FINAL REPORT

BY

THE INDEPENDENT REVIEWER

GREG CLAYDON

14 SEPTEMBER 2021

Acknowledgements

The Barwon-Darling is long and the country of many Aboriginal Nations including the Barkandji, Murrawarri, Ngemba, Ngiyampaa, Yuwaalaraay and Gomeroi. I acknowledge and pay respect to the Traditional Owners and their Nations of the Barwon–Darling who have a deep and enduring cultural, social, environmental, spiritual, physical, emotional and economic connection to the river, their lands and waters.

I would also like to acknowledge the contributions of and thank all of the staff from NSW and Commonwealth agencies, members of the Barwon-Darling ROSCCo, and representatives of community, environmental and industry groups and Indigenous people who have provided their time and insights into assisting me with the assessment.

EXECUTIVE SUMMARY

From 1 July 2020, the NSW water sharing plan for unregulated water sources in the Barwon–Darling included new rules for individual daily extraction components (IDECs), resumption of flows and active management of environmental water. Among other initiatives, the new rules aimed to improve protection of critical low flows and connectivity through the Barwon–Darling.

This is the final report of an independent assessment of the initial implementation of the resumption of flows rule, IDECs and active management in the Barwon–Darling from 1 December 2020 to 31 March 2021.

1.1 Objectives of the Assessment

The objectives of the assessment are to:

1. Review and provide transparency about the processes that were used to manage implementation of the resumption of flows rule, IDECs and active management
2. Review the communication with stakeholders undertaken during the implementation of the resumption of flows rule, IDECs and active management to determine its adequacy
3. Provide recommendations to improve implementation of the resumption of flows rule, IDECs and active management in the future, including:
   (a) system and process changes which would improve operational implementation of the resumption of flow rule, IDECS and active management by the NSW Department of Planning, Industry and Environment (DPIE)-Water, WaterNSW and the Natural Resources Access Regulator (NRAR), and
   (b) potential clarifications in the water sharing plan that would improve implementation of the resumption of flows rule, IDECs and active management.

1.2 Key Findings

A relatively Complex event to apply the new rules for the first time

- The resumption of flows period during January 2021 in the Barwon–Darling was a relatively complex event to manage as there was rainfall and further inflows (including ungauged inflows) and the presence of active environmental water (AEW) just before, during and after the resumption of flows period.
- This made flow forecasting by WaterNSW more difficult. The volumes and daily rates of the flows were very close to the relaxation trigger values that would allow licensed take in the resumption of flows rule after the rule was activated, meaning than flow forecasting and operational decisions were under close scrutiny by all involved during that period.
- The changing inflows didn't easily allow for later checking of observed flows against previously forecast flows. Substantially larger inflows after the resumption of flows period have further masked evaluations of the benefits of the resumption of flows rule and the protection of AEW, especially any of those benefits from the resumption of flows period.

Overall, the operational and administrative arrangements worked reasonably well for the first time with new rules

- Nevertheless, overall, the operational and administrative arrangements for determining and announcing when licensees could and could not take water, and how much could be taken (or protected from take) in what location/s, over the period 1 December 2020 to 31 March 2021 worked reasonably well, considering the relatively widespread introduction and use for the first time of new rules and the changes that were required.
- This result was variously in part due to the existence of and adherence to recently developed procedures manual/guidance documents, the availability of information on the WaterNSW Water Insights Portal, the information and communications technology and systems in place, and the high numbers of meetings with engaged Barwon–Darling stakeholders through the Barwon–Darling River Operations Stakeholder Consultation Committee (BD ROSCCo).
- In addition, a number of lessons for 'event management', including agency processes, roles and responsibilities, and avenues for communication were learned from the 'first flush' flows of 2020 and the recommendations of the independent report on their management are progressively being taken on board.
- Treating the resumption of flows event akin to an 'incident' to be managed informs the attention that needs to be given to it and also the need for ready availability of agency staff for timely intelligence gathering, advice, coordination, decision-making and communications. From stakeholders' viewpoints, there is a need for one agency 'point of contact', recognising the roles of DPIE-Water as the policy maker/rule setter and WaterNSW as the operator and rule follower.
- Holders of environmental water appreciated the 7-day forecasts being placed on the WaterNSW Water Insights Portal as it assisted them in their management of environmental water allocations. This could be augmented by having greater transparency in the listing of volumes of active environmental water in play throughout the river system.

However, several areas of concern for stakeholders emerged and require attention

- Despite this, several areas of significant concern have been identified by stakeholders. Perhaps the biggest call for improvement has been in the measurement, modelling and forecasting of river flows – notably in terms of their accuracy, timeliness and impacts on announcements of access/no access to taking water. Included in this was a call for better information on flows out of Queensland.
- Some of these concerns with flow forecasting may be better mitigated if stakeholders had a greater understanding of the modelling framework and approach, assumptions used and their bases and implications.
- Another major concern with some licensees has been how IDECs have been determined and apportioned, noting a mis-match in some instances of actual pump capacities and IDECs, and the absence of timely ways to re-apportion or trade IDECs. Advice has been that IDECs were designed to limit extraction during flow events, recognising the potential impacts of licensed take on flows, and were distributed based on the entitlement shares held at the time, not on the maximum capacity that individuals could physically pump. This has caused

considerable operational problems to a relatively small number of mostly smaller licence holders and options to overcome the problems do need to be considered as a priority.

- While active management may have general support as a concept, there were major concerns from irrigators that announcements of available water for extraction were too conservative, with unfair and significant adverse impacts on their access and businesses at a critical time in the crop cycle. This support, therefore, would be further enhanced with better and more accurate flow forecasting and clearer identification of and accounting for environmental water volumes in and through the river system. There is no support from irrigators or others to access water below trigger thresholds to 'catch up' on access foregone through earlier conservative forecasts.
- Inequities in access opportunities at different locations up and down the river system, both within the Barwon–Darling itself and upstream and downstream of it, especially around the time slightly before, during and slightly after a resumption of flows period is activated, were also raised. Examples cited included that some water users in the same licence class apparently had opportunities to take water in certain locations, while those in other areas considered they 'should' have had access to water but didn't.
- Several points of clarification of the rules emerged during the period, though some remain contested and/or misunderstood. These include whether and how AEW is accounted for and included/not included in target/trigger flows and volumes, the timing with respect to trigger volumes (including the 'start' day for accounting for the volume/s and for recommencing the next low flows period) and what constitutes an 'event', especially for the 30 GL at Bourke relaxation of the resumption of flows rule. How these are defined has implications for evaluation of the effectiveness of the rules against the objectives of the Water Sharing Plan for the Barwon-Darling Unregulated River Water Source 2012 (BD WSP 2012) and are matters for consideration for the review/remake of the BD WSP in 2023.
- Adequate resourcing of the 'event management team' over the challenging summer period (including Christmas, early New Year and leave periods) places pressures on available staff and stakeholders too who may be looking for information or explanations that impact their businesses.

Operational improvements and the water reform journey need to continue

- Compliance checking and the measurement of actual take will be further improved with the rollout of improved metering systems and more reliable technology in the future, so the efforts to improve the metering and reporting of take need to continue. This will also assist improved flow forecasting.
- Requirements persist to increase people's understanding of how water management in the Barwon–Darling 'works' and to increase knowledge exchange between and among stakeholders and agencies about water management and use. Efforts over the recent period have helped and are generally in the right direction, despite the relative technical complexity of the rules and the procedures to implement them.
- An increasing scarcity of the available water resource generally means that more

precise management will be needed, and it is important for that management to be transparent and open to continuous improvement.

- First Nations people, including Barkandji, Murrawarri, Ngemba, Ngiyampaa, Yuwaalaraay and Gomeroi people, were not actively engaged with or informed about the management of the flows over the period and so opportunities for positive cultural outcomes and other important factors were likely missed. Continuing reforms and efforts are needed to develop and support meaningful ongoing relationships with First Nations people and to recognise that appropriate engagement and involvement of First Nations people are fundamental.
- During this assessment, comments have been made that the rules in the Barwon–Darling and likely upstream water sharing plans do not adequately provide for their own objectives, nor for important matters like connectivity through the river system. While this assessment is about the implementation of the rules, rather than the rules themselves, these comments have been captured at the end of this report so that they may provide a record for future reviews/remaking of respective water sharing plans including the Barwon–Darling.

1.3 Key Recommendations

Based on the above key findings, the following key recommendations are made (with the lead agency shown in brackets).

Operational improvements

1. Use the results from this review and others to upgrade and fill gaps in the real-time or near-real-time flow measurement network within the Barwon–Darling itself and the upstream inflowing tributaries, including those in Queensland (with cooperation from Queensland), to assist and improve flow forecasting (WaterNSW).
2. Use the results from the recent flow events and others to improve flow forecasting modelling, including allowances for initial and continuing losses and travel times through the river system (WaterNSW).
3. Further investigate and describe operational arrangements to manage forecast and observed flows mismatches during an event and add these to a revised Active Management Procedures Manual as part of the adaptive management approach (initially WaterNSW, then DPIE-Water).
4. Investigate procedures and systems required to enable sub-daily flow and access announcements, particularly in cases where relative changes in daily inflows would be important to operations and management responses, for practicality and cost/benefit, and amend the procedures manual accordingly (initially WaterNSW, then DPIE-Water).
5. Undertake a review and checking of the data used to determine initial IDECs and make amendments to any incorrectly derived IDECs accordingly and/or consider options to distribute IDECs with less adverse impacts on particular licensees while maintaining the overall intent of the policy and the new rules (DPIE-Water).
6. Develop policies, procedures and systems to enable short-term and timely trading of IDECs without adverse impacts to third parties or the environment (initially DPIE-Water, then WaterNSW).

Documentation

7. Update the January 2021 resumption of flows report with any additional data and information now available, especially with respect to forecast and observed flows, volumes and rates of AEW in the system, and water balances (e.g. inflows, outflows, volumes of take, volumes protected, losses) just before, during and after the resumptions of flows period, and make it publicly available (WaterNSW).
8. Amend the procedures manual so that a report is to be produced and made publicly available after every resumption of flows period (i.e. don't wait until the annual report on active management before summary information about a resumption of flows period is available) (DPIE-Water).
9. Publish remaining documents as required under the Active Management Procedures Manual (WaterNSW). These include requirements to:

    - document procedures to forecast flow within the tributaries for both total daily inflows and the proportion of AEW
    - document procedures for forecasting flows in the Barwon–Darling and place it on the website
    - document the method for determining "initial" river transmission losses and make it public
    - provide details of how to submit an EoI on the website
    - document adjustments for mismatches and reasons for them
    - document water allocation account debiting procedures
    - record, archive and make available data used in active management
    - document the forecasting and accounting of river flows, river losses, AEW, licensed water use, management responses and recommendations.

10. Update the procedures manual and all relevant fact sheets based on clarifications provided during the management of the recent events, including the resumption of flows period, this review and the annual review and close the communication loop by presenting the findings to the licence holders and peak stakeholder groups (DPIE-Water).

11. Reconcile the language used under Procedure 11 of the procedures manual (e.g. on page 19 of the procedures manual, it states that "*Flow advice will be based on: conservative estimates of inflows and river transmission losses that are at the upper end of what could be expected to be consistent with similar past events, and the maximum volume of unregulated water likely to be extracted or protected taking into account the current EoI numbers and likely water available*.")

    with the language used in the Active Management Policy (e.g. on page 21 of the Policy, it states that "*An initial conservative access announcement that provides a higher Commence to Pump threshold or lower volume of water available to licence holders until river losses are better understood will not be used because it has potential to affect the reliability of access for unregulated river access licence holders. Announcements are made based on the best available information at the time*.") (DPIE-Water).

12. Publish the results of investigations and compliance activities undertaken relevant to the recent events, especially those just before, during and shortly after the resumption of flows period (NRAR).

Communications and Engagement

13. Undertake all of the recommended operational improvements in consultation with stakeholders (WaterNSW and DPIE-Water).
14. Work with stakeholders to co-develop and deliver an information and education program about the flow modelling and flow forecasting procedures (WaterNSW).
15. Work with stakeholders to co-develop and deliver a program that takes people through the operations used during the recent events, including the resumption of flows period, to increase stakeholder understanding, better identify implications for stakeholders and agencies and agree opportunities for improvement, building on an updated resumption of flows report and materials being prepared for the annual review of the procedures manual (WaterNSW and DPIE-Water).
16. Progress conversations with First Nations people in relation to information needs and engagement protocols, as well as values, uses and objectives for water, including those impacted by resumption of flows and active management of flows. It is important that this work is progressed in a culturally appropriate way, including respecting the need to take adequate time for effective knowledge exchange. Consideration could be given to using/adapting the approaches being adopted for the Wilcannia Weir Project to inform better ways to undertake meaningful conversations about management of flows. Consideration should also be given to notification of and engagement with the Barkandji Native Title Group concerning relevant pending flow events (DPIE-Water and WaterNSW).
17. Form a multi-stakeholder Environmental Water Advisory Group (EWAG) for the Barwon–Darling to bring together a range of knowledge and experience from all sectors and relevant geographical locations to specifically advise on both planned and held environmental water from policy, planning and operational perspectives and to provide further opportunities for information exchange and co-learning (DPIE-EES).

Water Reform Rollout

18. Continue the rollout of the reforms for non-urban water metering and telemetry, not only for reasons of achieving better water management generally, but also because they will help improve management of future resumption of flows and active management events. Communicating progress of the reform agenda will also help to keep water users and the community informed, with a view to building understanding and trust (DPIE-Water).
19. Consider the comments about policy and planning matters made during this assessment (and captured in summary form in **Appendix 6** at the end of this report) in future reviews of water sharing plans and the rules within them (DPIE-Water).

1 INTRODUCTION

As requested by the New South Wales Department of Planning, Industry and Environment – Water (DPIE-Water), this is the final report of my independent assessment of the initial implementation of the resumption of flows rule, IDECs and active management in the Barwon–Darling from 1 December 2020 to 31 March 2021.

2 BACKGROUND

The Barwon–Darling Unregulated River Water Source extends from Mungindi on the NSW-Queensland border to Menindee Lakes in south-west NSW (Figure 1). It is a part of the Murray–Darling Basin. (The Barwon–Darling is often referred to as 'unregulated' as it does not have large storage dams 'regulating' or controlling river flows. Without large storages, water managers have less physical control over river flows within seasons and between years.)

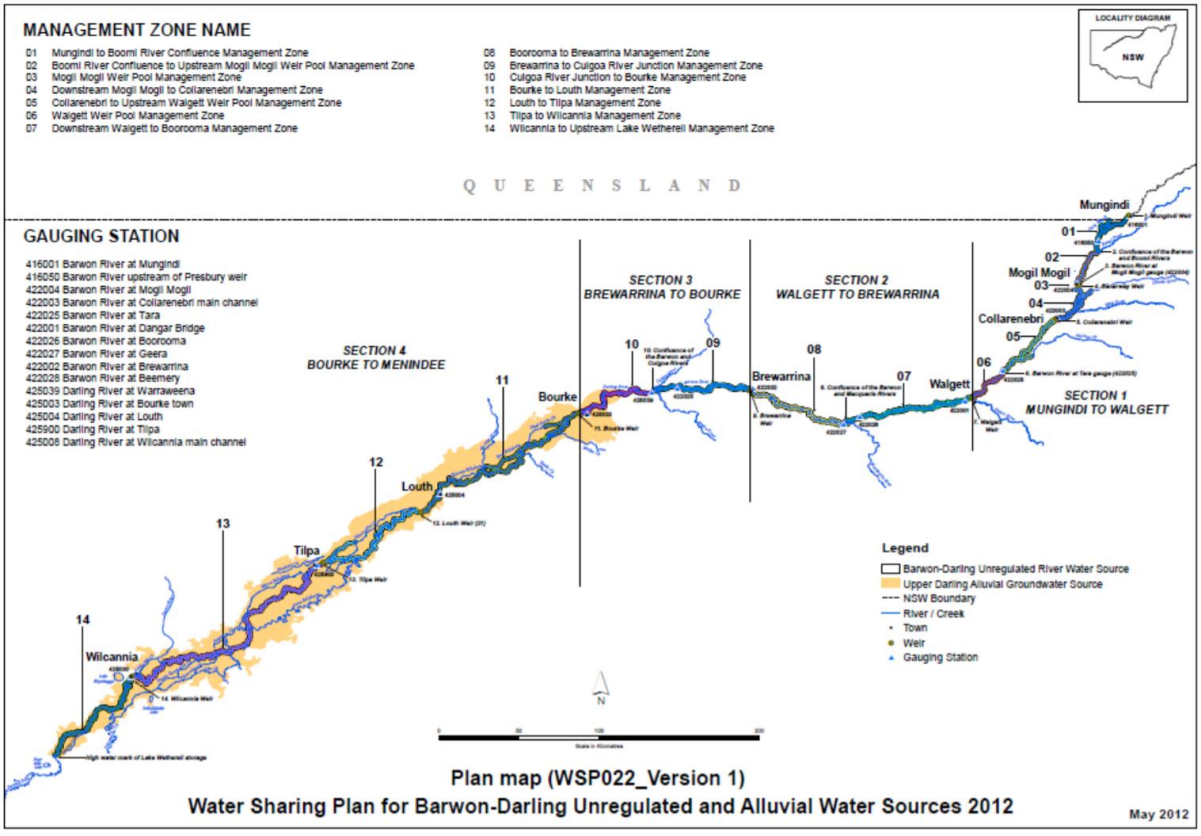

Figure 1. Map of the Barwon–Darling Unregulated River Water Source (Source: DPIE-Water)

Upstream of Bourke, inflows are received from all of the major river valleys in the Northern Murray–Darling Basin, including from the Qld/NSW Intersecting Streams, Qld/NSW Border Rivers, Gwydir, Namoi and Macquarie and Castlereagh Rivers. Downstream of Bourke, tributaries include the Paroo and Warrego Rivers. The Barwon–Darling Unregulated River Water Source is split into four river sections developed for water entitlement trading purposes and 14 management zones where rules apply for the taking of water. Management zones are generally based on the occurrence of a weir or the confluence of a major tributary.

Clause 50 of the Amended Water Sharing Plan for the Barwon–Darling Unregulated River Water Source 2012 (BD WSP 2012) commenced on 1 July 2020. It introduced a new

'resumption of flows' rule which prohibits take from initial flows in the Barwon–Darling after an extended dry period. The rule is designed to help to provide connectivity along the Barwon–Darling after dry periods.

On 12 January 2021, the resumption of flows rule was triggered for the first time as flows at Wilcannia were forecast to be below the threshold level of 200 ML/day for 90 days. The pumping restriction was relaxed once flows were forecast at Wilcannia of above the threshold level of 400 ML/day for 10 days, (the other trigger being 30 GL cumulative flow past Bourke).

The BD WSP 2012 also required, from 01 July 2020, the application and announcement of individual daily extraction components (IDECs), which limit the daily amount of water that can be extracted under unregulated river Class A, B and C access licences.

In addition to the above, new rules, commencing 01 December 2020 in the BD WSP 2012, changed several other access arrangements for licence holders, including during times when environmental water is present. Under the 'active management' (of environmental water) rules, announcements are made by WaterNSW about flow classes and adjustments to commence-to-pump/cease-to-pump (CtP) thresholds. Licence holders must only take water in accordance with an announcement. Active management allows environmental water used in-stream for environmental purposes, referred to as active environmental water (AEW), to be protected from extraction.

In response to the first activation of the new 'resumption of flows' rule in the Barwon-Darling, stakeholders asked for an examination of the implementation of the rule and also the application of IDECs and active management. DPIE-Water commissioned an independent assessment of the extent to which the resumption of flows rule, IDECs and active management were implemented according to the BD WSP 2012, and what improvements can be made in the future.

3 TERMS OF REFERENCE

Objectives of the Assessment

The objectives of the assessment are to:

1. Review and provide transparency about the processes that were used to manage implementation of the resumption of flows rule, IDECs and active management
2. Review the communication with stakeholders undertaken during the implementation of the resumption of flows rule, IDECs and active management to determine its adequacy
3. Provide recommendations to improve implementation of the resumption of flows rule, IDECs and active management in the future, including:
   (a) system and process changes which would improve operational implementation of the resumption of flows rule, IDECS and active management by DPIE-Water, WaterNSW and the Natural Resources Access Regulator (NRAR), and
   (b) potential clarifications in the water sharing plan that would improve implementation of the resumption of flows rule, IDECs and active

management.

Key Elements of the Assessment

The assessment requires review and consideration of:

1. the DPIE-Water and WaterNSW planning, systems and processes that were used to manage the rules, with particular regard to:
    (a) decision making processes, and availability and adequacy of procedures to guide management of the event
    (b) communication with water users, the general public and between agencies
2. the extent to which management of the resumption of flows event satisfied the water sharing plan rules (including those that trigger a resumption of flows event; and those that allow access to water for consumptive use once the 'relaxation' triggers in the rule have been met)
3. the extent to which active management satisfied the water sharing plan rules from initial implementation on 1 December 2020 through to March 2021, including during the resumption of flows event
4. the extent to which IDEC application (including daily flow share limits through active management) satisfied the water sharing plan rules from 1 December 2020 through to March 2021, including during the resumption of flows event
5. any other matters the independent reviewer considers relevant to achieving the objectives of the assessment.

The assessment required me to:

1. conduct interviews with relevant DPIE Water, WaterNSW and Commonwealth environmental water staff
2. obtain the advice of key industry, environmental, Indigenous and local government stakeholders via a water user reference group from the Barwon-Darling
3. provide a draft report to the Deputy Secretary, Water of the Department of Planning, Industry and Environment during July 2021
4. Following feedback, provide a final report to the Deputy Secretary, Water of the Department of Planning, Industry and Environment during September 2021.

4 PROCESS TO UNDERTAKE THE ASSESSMENT

To conduct the assessment, I have undertaken the following:

1. Held an inception meeting with relevant project management and administration staff in DPIE-Water to outline and discuss the assessment requirements and process, confirm communication and liaison lines, agree stakeholder engagement arrangements, and identify a preliminary list of relevant documents
2. Held video conference discussions with relevant staff in DPIE-Water, WaterNSW, NRAR, DPIE-Environment, Energy and Science (DPIE-EES) and the Commonwealth Environmental Water Office (CEWO) and reviewed follow-up documentation provided
3. Held video conference discussions with members and observers on the Barwon-Darling River Operations Stakeholder Consultation Committee (BD ROSCCo) and reviewed notes from ROSCCo and Customer Advisory Group (CAG) meetings held

during the period 01 December 2020 to 31 March 2021

4. Held video-conference discussions with relevant Indigenous stakeholder liaison staff and contacted relevant First Nations
5. Held video-conference discussions with representatives of environmental groups with an interest in the Barwon–Darling
6. Held follow up phone discussions with stakeholders upon request
7. Communicated regularly with the DPIE-Water project officer and manager for the assessment to confirm processes and/or obtain additional information
8. Accessed and reviewed several publicly available DPIE-Water, WaterNSW and CEWO documents relevant to the BD WSP 2012, the resumption of flows rule, IDECs and active management
9. Prepared a draft report with draft key findings and draft key recommendations, which was provided to DPIE-Water on 27 July 2021 and subsequently distributed to all stakeholders with whom I have had discussions with a request for feedback by 31 August 2021
10. Considered all written and verbal feedback received up to 10 September 2021 to amend the earlier draft report and subsequently prepared this final report.

Prior to each video conference discussion, participants were asked to provide any information and/or views they may have regarding:

- the DPIE Water and WaterNSW planning, systems and processes that were used to manage the rules, with particular regard to:
    - decision making processes, and availability and adequacy of procedures to guide management of the event – what worked well, what could be changed
    - communication with water users, the general public and between agencies – what worked well, what could be changed
- the extent to which management of the resumption of flows event satisfied the water sharing plan rules (including those that trigger a resumption of flows event; and those that allow access to water for consumptive use once the 'relaxation' triggers in the rule have been met)
- the extent to which active management satisfied the water sharing plan rules from initial implementation on 1 December 2020 through to March 2021, including during the resumption of flows event
- the extent to which IDEC application (including daily flow share limits through active management) satisfied the water sharing plan rules from 1 December 2020 through to March 2021, including during the resumption of flows event
- any other matters considered relevant to achieving the objectives of the assessment.

5 AGENCIES INVOLVED IN WATER MANAGEMENT IN NSW

Water in NSW is managed by both State and Commonwealth legislation.

At the state level, in simple terms, water is managed by three separate agencies:

- DPIE makes the rules,
- WaterNSW implements the rules, and
- NRAR enforces the rules.

Further, there are two separate groups within DPIE with functions related to water management in NSW, being DPIE-Water, and DPIE-EES.

DPIE-Water supports the NSW Minister for Water in the administration of the NSW *Water Management Act 2000* (WM Act). This means that DPIE-Water, for example:

- administers the WM Act, including to exercise Ministerial functions under that Act by delegation. This includes:
  - development of policy frameworks such as the Active (Environmental Water) Management Policy and the preparation of Active Management Procedures Manuals,
  - development of water sharing plans and regulations, and
  - the making of available water determinations and temporary water restrictions, and
- leads negotiations with the Commonwealth, including the Murray–Darling Basin Authority (MDBA) and other jurisdictions in relation to water management in NSW.

DPIE-EES has a specialised role in NSW water management. For example, it:

- is involved in planning and delivery of environmental watering events,
- develops long term water plans that guide the management of water for the environment over the longer term, as required under the Commonwealth Basin Plan 2012,
- manages the state's environmental water holdings, and
- provides advice to WaterNSW and DPIE-Water on the management of planned environmental water and environmental watering requirements in water planning processes.

WaterNSW is the NSW bulk water supplier and operational manager of surface water and groundwater resources. This means that WaterNSW:

- supplies water from the State's regulated surface water systems to water users
- operates the State's river systems and bulk water supply systems
- measures, monitors and records quality and quantity of water in NSW
- manages customer relationships in NSW and the provision of information and communications
- carries out forecasting and operational modelling associated with the management of surface water systems
- conducts customer facing functions such as the delivery of water, billing, water allocation and licence trades and providing water resource and metering information.

NRAR is an independent regulator established under the *Natural Resources Access Regulator Act 2017* (NSW). Specifically, NRAR:

- is responsible for enforcing NSW water laws,
- consistent with its regulatory priorities, undertakes compliance and enforcement activities to maintain public confidence in the water enforcement regime, through a combination of proactive, intelligence led monitoring and audit operations and reactive compliance responses to reports of suspicious water activity made by the public.

Some Commonwealth agencies also have a strong interest in NSW water management.

For example, the Commonwealth Department of Agriculture, Water and the Environment is responsible for administering the *Water Act 2007* (Commonwealth), which establishes the Murray-Darling Basin Plan. The MDBA plays a key role in implementing the Basin Plan, including advising the Commonwealth Minister for Water Resources on the accreditation of NSW water resource plans, and operates Menindee Lakes when the storage volume in the lakes exceeds specified levels. The CEWO manages a large portfolio of licences for environmental water, having regard to annual priorities and longer-term targets set under the Basin Plan.

6 LEGISLATIVE AND REGULATORY FRAMEWORK

This section provides a brief summary of the legislative and regulatory framework for water management in NSW, including for active management of environmental water. Additional detail is available in the references listed in Section 12 of this Final Report.

6.1 The NSW Water Management Act 2000

In NSW, the take of water is managed through the NSW *Water Management Act 2000* (WM Act). Section 3 of the WM Act lists its objects as '*to provide for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations.*'

The WM Act broadly provides that water may only be taken from a water source pursuant to:

- an access licence;
- a basic landholder right (being a stock and domestic, harvestable or native title right); or
- an exemption from the requirement to hold an access licence conferred by regulations.

Section 5 of the WM Act sets out water management principles, which states in relation to water sharing (ss 3):

(a) sharing of water from a water source must protect the water source and its dependent ecosystems; and
(b) sharing of water from a water source must protect basic landholder rights; and
(c) sharing or extraction of water under any other right must not prejudice the principles set out in paragraphs (a) and (b).

6.2 Water sharing plans

Water sharing plans made under the WM Act establish the rules for how water in a particular water source is allocated and managed for the duration of the plan (typically 10 years). Most relevantly, a water sharing plan:

(a) protects a proportion of all water available for fundamental ecosystem health and/or including specific environmental rules
(b) protects the water required to meet basic landholder rights
(c) sets annual limits on water extractions, to ensure that extractions do not increase and therefore erode the water for the environment or the security of supply to water users
(d) may set different priorities of supply between access licences (distinct from the

priorities established by the WM Act)

(e) may include rules that provide licence holders flexibility in the way they manage their water accounts (e.g. enabling unused water to carry-over between water years)
(f) may specify rules for water trading and dealings
(g) sets out the mandatory conditions that apply to licence and approval holders (which may include conditions which restrict when water may be taken), and
(h) establishes monitoring and reporting requirements.

6.3 Active Management in Unregulated Rivers Policy

The Active Management in Unregulated Rivers Policy outlines the NSW Government's policy positions for active management of environmental water. These positions were used to develop specific rules in water sharing plans for active management and the active management procedures manual (procedures manual) for each water sharing plan area where active management applies.

Water sharing plans with active management have provisions to:

- define AEW to be protected from extraction
- adjust access by the amount necessary to protect AEW that is present
- allow access licence holders to leave in the water source some or all the water they are permitted to take, and
- prepare and publish a procedures manual.

Rules in the water sharing plan change access for licence holders when environmental water is present. The Minister will make announcements about flow classes and adjustments to CtP thresholds. Licence holders must only take water in accordance with an announcement. Relevantly, the Policy states that '*An initial conservative access announcement that provides a higher CtP threshold or lower volume of water available to licence holders until river losses are better understood will not be used because it has potential to affect the reliability of access for unregulated river access licence holders. Announcements are (to be) made based on the best available information at the time*.'

6.4 Active management procedures manuals

The procedures manual for each water sharing plan area (where active management applies) provides the operational details that WaterNSW is to use to implement active management. It also outlines:

- the water sources or management zones the procedures manual covers
- the water that is defined as AEW that is protected from extraction in each water source or management zone
- how flows are forecast
- how losses are calculated and shared
- how operational uncertainty is managed (for example, adjustments to flow forecasts)
- how the volume of AEW is determined
- how the adjusted flow class, CtP threshold and volumetric limit are determined
- the form an access announcement will take and the information it must contain
- what access licence holders will need to do if they want to leave their water within the water source and how their water allocation account will be debited for

water remaining in the water source
- reporting requirements
- timeframes, circumstances, procedures and responsibilities relating to reviews of the procedures manual, and
- who approved the procedures manual and when it was approved.

Each procedures manual outlines management methods for responding to the circumstances of each flow event while showing how active management is implemented. **Figure 2** illustrates the concept based on 150 ML/day of AEW occurring in scenarios 2–5, and the base CtP threshold in the water sharing plan being 200 ML/day.

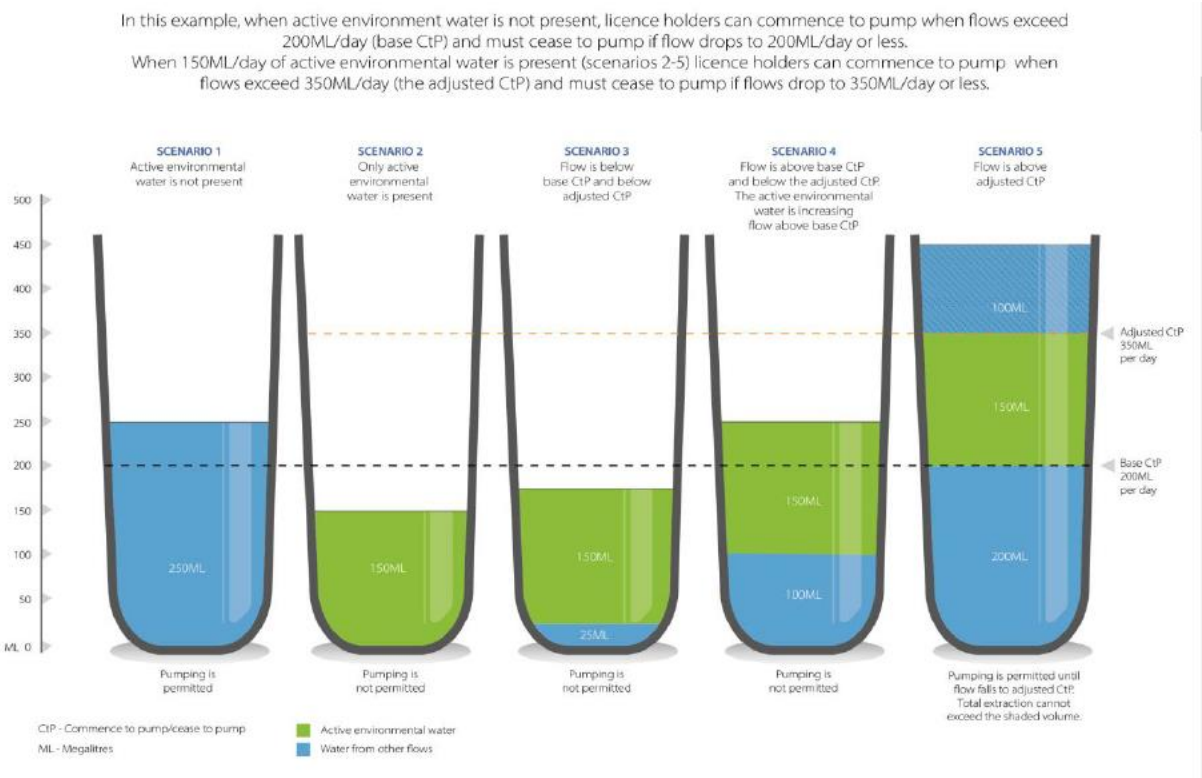

Figure 2. Active management concept (Source: DPIE-Water)

The scenarios in **Figure 2** show that, if all other access conditions and account management requirements are met, access will be permitted when flows are above the:

- base CtP threshold when there is no AEW present (Scenario 1), or
- adjusted CtP threshold when there is AEW present (Scenario 5).

Access will be prohibited if:

- only AEW is present (Scenario 2)
- flow is below the base CtP threshold (Scenario 3), or
- flow is above the base CtP threshold (due to the presence of AEW) but below the adjusted CtP thresholds (Scenario 4).

The procedures manual outlines how WaterNSW will calculate the volume of AEW to be protected and the adjusted CtPs. How this works in an unregulated river system is illustrated in **Figure 3**.

Figure 3. How active management works in an unregulated river system (Source: DPIE-Water)

To actively manage AEW in an unregulated river, a procedures manual outlines that WaterNSW will:

- forecast the inflows expected to enter the unregulated river and identify the volume of AEW entering the unregulated river
- forecast the flows along the river including estimating expected losses to evaporation, seepage and evapotranspiration
- determine if flows are above CtP thresholds
- determine the volume of AEW in the water source
- adjust CtP thresholds by the amount necessary to protect the AEW
- determine the volume available for unregulated river access licences, based on EoIs and relevant CtP thresholds
- announce flow classes, adjusted CtP thresholds, pumping restrictions and volumetric limits for unregulated river access licences, and
- derive the volume of AEW that reaches the next management zone or water source that is protected from extraction, based on transmission losses in the current zone.

DPIE-Water consulted with stakeholders to develop each procedures manual. WaterNSW is responsible for implementing active management and communicating with licence holders in each water source. Each procedures manual is to be regularly reviewed and refined to respond to new information or insights (adaptive management) and manage risks.

7 APPLICATION OF THE REGULATORY FRAMEWORK IN THE BARWON–DARLING

This section provides a brief summary of the specific regulatory framework for the initial implementation of the resumption of flows rule, IDECS and active management in the Barwon–Darling from 1 December 2020 through to 31 March, 2021. Additional detail is available in the references listed in Section 12 of this final report.

7.1 The Water Sharing Plan for the Barwon-Darling Unregulated River Water Source 2012 (BD WSP 2012)

The BD WSP 2012 sets out objectives and strategies and the rules for sharing water between water users and the environment. Restricting the water take to protect AEW is identified as a strategy to meet the targeted environmental objectives of the plan (refer to clause 10 (3)(b)). The following rules in the water sharing plan enable water take to be restricted to protect AEW (Note that where the 'Minister' is mentioned below, WaterNSW undertakes that function):

- Clause 42A (3) limits the maximum volume of water that is permitted to be taken on any day under a licence with an individual daily extraction component (IDEC)
- Clause 42A (2) before setting a limit under clause 42A (3), this clause requires the Minister to invite interested parties to lodge an expression of interest (EoI) in taking water from relevant access licence holders in accordance with the procedures manual before setting a limit under clause 43A (3)
- Clause 43 allows a licence holder to notify the Minister that they intend to protect water from extraction that would otherwise be permitted to be taken and their account debited by an amount determined by the Minister in accordance with the procedures manual
- Clause 47 (4) allows adjustment to access rules for specified licences in schedules 2 and 2A of the BD WSP 2012 by the amount necessary to protect AEW
- Clauses 46 (1) and 47 (5) prohibit water take under an unregulated river, A Class, B Class or C Class access licence or specified licences under schedules 2 and 2A during any period that the Minister has made an announcement under clause 42A (3), unless the licence holder has lodged an EoI to take that water in accordance with the procedures manual and the water take is in accordance with the announcement
- Clause 49A (1) allows the Minister to announce the flow class that applies at any time
- Clause 49A (4) allows adjustments to flow class thresholds for unregulated river, A Class, B Class and C Class access licences by the amount necessary to protect AEW
- Clause 52A requires that a procedures manual is prepared and published on the department's website.

The dictionary of the WM Act defines AEW that requires protection from extraction.

7.1.1 The Resumption of Flows Rule in the BD WSP 2012

All rules under Part 8 of the BD WSP 2012 for managing access must be considered in implementing active management.

Specifically, clause 50 outlines rules to protect the resumption of flows after a dry period. The resumption-of-flows rule prevents water take when the first flows happen after an extended low-flow or dry period. The Minister will announce a 'no flow class', which stays in place until downstream flow triggers are reached and river connectivity is re-established. **Figure 4** outlines the concept for the resumption of flows rule.

Figure 4. Concept of resumption of flows rule (Source: DPIE-Water)

If access is suspended in a river section, access in all sections upstream within the BD WSP 2012 area will also be suspended. This is to protect flows that could contribute to the downstream section.

The activation triggers for suspending access are unique to each river section. They are a flow target combined with a number of consecutive days. So, when flows in a particular river section are below the listed volume for the corresponding number of days, WaterNSW bans access in the river section and all downstream river sections. For each section, these values are equivalent to 200 ML/day and 90 days at Wilcannia. (In addition to improved environmental outcomes, the intent of the resumption of flows rule was partly for improved social and cultural outcomes at Wilcannia.)

Table 1 shows which triggers can contribute to suspension of access for each section. If **one or more** of the criteria is met, the resumption of flows rule is activated for that section and the take of water under licences is banned.

Table 1. Triggers for activating the resumption of flows rule (Source: DPIE-Water)

Activation trigger	Section 1 Mungindi to Walgett	Section 2 Walgett to Brewarrina	Section 3 Brewarrina to Bourke	Section 4 Bourke to Wilcannia
below 326 ML/day for 150 days at Dangar Bridge (Walgett)	Any	n/a	n/a	n/a
below 468 ML/day for 150 days at Brewarrina		Any	n/a	n/a
below 450 ML/day for 120 days at Bourke Town			Any	n/a
below 200 ML/day for 90 days at Wilcannia				

If access is reinstated (that is, the rule is relaxed) in a downstream river section because of a tributary inflow to that section, access to the upper sections remains suspended if the flows still meet the conditions for suspension.

To relax the rule, a forecast flow of 400 ML/day must pass Wilcannia for 10 consecutive days, or the forecast total flow passing Bourke during the event must exceed 30 GL. If there are tributary inflows into the lower river sections the criteria can also be relaxed, which is the reason for the multi-sectional rule design. The triggers for relaxing the rule for river sections 1, 2 and 3 are equivalent to the trigger at Wilcannia. **Table 2** shows the triggers for relaxing the rule.

Table 2. Triggers for relaxing the resumption of flows rule in each river section in the BD WSP 2012 (Source: DPIE-Water)

Relaxation trigger	Section 1 Mungindi to Walgett	Section 2 Walgett to Brewarrina	Section 3 Brewarrina to Bourke	Section 4 Bourke to Wilcannia
706 ML/day for 10 days at Walgett	All	n/a	n/a	n/a
1,008 ML/day for 10 days at Brewarrina	All	All	n/a	n/a
972 ML/day for 10 days at Bourke	All	All	All	n/a
400 ML/day for 10 days at Wilcannia	All	All	All	All
OR				
Cumulative flow past Bourke (since activation began) greater than 30,000 ML	All	All	All	All

An illustration of the application of the resumption of flows rule is shown in **Figure 5**.

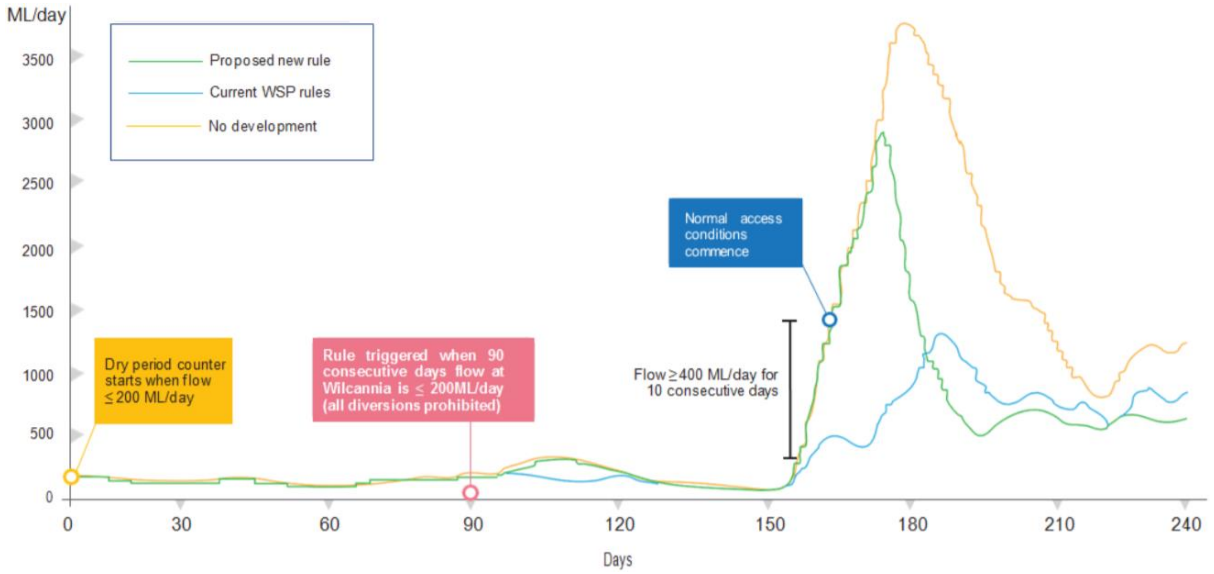

Figure 5. Example of flows with resumption of flows rule at Wilcannia (Source: DPIE-Water)

7.1.2 IDECs and the BD WSP 2012

An individual daily extraction component (IDEC) is the daily volume of water that may be extracted under an individual water access licence after commence-to-pump (CtP) thresholds have been reached. As noted above, these CtP thresholds may be adjusted and the daily extraction volume reduced to protect environmental water.

A water access licence allows the right to take water from a particular water source. A water access licence includes the share the owner has available to them (called the share component) and the times, rates, circumstances and locations the water can be taken (called an extraction component). IDECs are part of the extraction component on a licence. They are referred to in the BD WSP 2012 and on the licence.

Part 10 of the BD WSP 2012 allows permanent trading (dealings) of a licence's IDEC within a river section but not between river sections. A permanent trade will result in a change to the extraction component on a water access licence. Short-term temporary trading of an IDEC is currently not allowed. The implications of short-term trades will need to be further assessed and specific operating systems developed to support these trades. It is intended the short-term trading of daily flow shares in an IDEC will be considered as part of the remake of the BD WSP.

An IDEC is made up of three elements:

- the management zone where water can be taken
- the number of 'daily flow shares' (determined using a formula described below)
- the water permitted to be taken.

Up to 1 ML per day per daily flow share or a lower amount of water can be taken if announced by the Minister. IDECs work with other active management rules to allow the Minister to announce that licence holders can only access a proportion of their full IDEC. The Minister may make an announcement to reduce the maximum volume of water permitted to be taken per daily flow share under subclause 42A (3) (b) of the BD WSP 2012 if the sum of IDECs for licence holders that have expressed interest to take water exceeds the water available to be taken under those licences for the relevant flow class. In this situation, the available water must be shared between licence holders that have expressed an interest in taking the water. This clause, including the need for licensees to lodge EoIs, commenced on 1 December 2020.

IDECs limit total daily extraction for A, B and C Class access licences across the Barwon–Darling water source. Daily extraction limits restrict the impact of rapid removal of water during peak irrigation periods. This mitigates localised and downstream impacts.

The total daily extraction allowed for the water source is the sum of authorised pump capacities for all authorised pumps attached to a *Water Act 1912* (WA 1912) entitlement, or the sum of agreed pumping rates for any installed pumps attached to the WA 1912 entitlement, on commencement of the BD WSP 2012.

There will be no overall growth in daily extraction permitted for each river section above these levels for A, B and C Class licences. If available flows above the CtP thresholds are greater than the sum of the IDECs on that day, there will be additional flow downstream.

The Barwon–Darling Active Management Procedures Manual defines how WaterNSW determines if a daily flow share less than 1 ML/daily flow share (full IDEC) should be announced. An illustration of the decision process is shown in **Figure 6**.

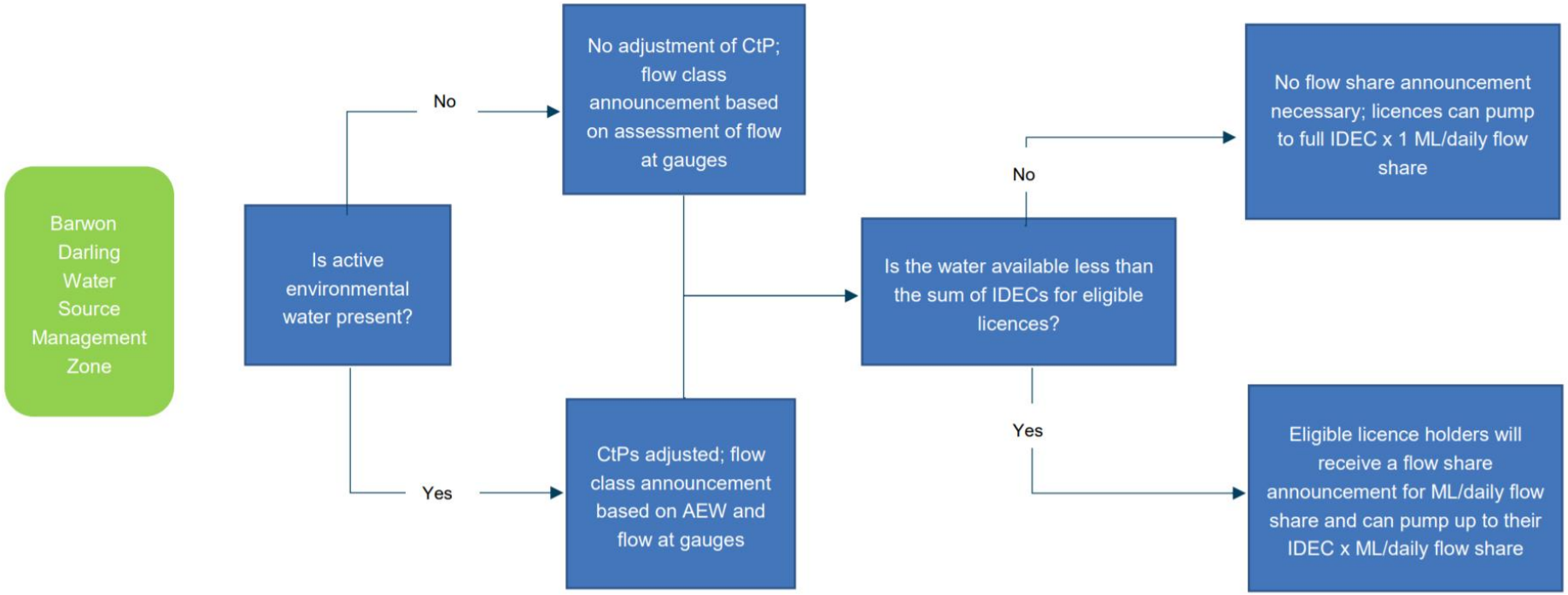

Figure 6. Decision diagram for access announcement process (Source: DPIE-Water)

As mentioned previously, in July 2020, the BD WSP 2012 was amended to include the resumption of flows rule (starting from 01 July 2020), IDECs (starting from 01 July 2020 although these were originally contemplated in 2012 but not implemented at the time because the systems were not in place to operationalise them), and active management (starting from 01 December 2020, which was also the starting date for EoIs). Under these new arrangements, periods of time when licensees could extract water from the river had to be 'announced' by WaterNSW, whereas previously licensees could essentially 'self-assess' times for their extractions based on river gauge levels and the 'commence to pump' and 'cease to pump' clauses contained on their respective licences.

7.2 The Active Management Procedures Manual for the Barwon–Darling Unregulated Rivers Water Source

This procedures manual outlines in some considerable detail over 54 pages how the NSW Government implements the resumption of flows rule and active management to protect AEW in the Barwon–Darling. The procedures manual was established under clause 52A of the BD WSP 2012 and approved by DPIE-Water on 30 November 2020. It was published on the department's website on 1 December 2020.

Clause 43 of the BD WSP 2012 allows unregulated, A Class, B Class and C Class access licence holders to protect water from extraction that is otherwise permitted to be taken. This allows environmental water holders (such as the CEWO and DPIE-EES) to protect unregulated water from extraction. Other licence holders can also protect unregulated water if they choose to.

Active management is to be implemented in accordance with the procedures manual and the objectives and principles of active management set out in the Active Management in Unregulated Rivers Policy.

The procedures manual outlines requirements for 32 procedures under the headings of:

- Forecasting flows and river transmission losses
- Identifying, determining and monitoring active environmental water
- Issuing flow advice
- Expressions of interest
- Adjusting access thresholds
- Determining the water available and maximum volume permitted to be taken
- Determining the flow class
- Access announcements
- Monitoring the intended sharing of river flows
- Debiting water allocations accounts
- Monitoring, evaluation, reporting and improvement.

The full list of procedures is listed in **Appendix 1** and the procedures to be undertaken daily and their purpose are listed in **Appendix 2**. The specific roles and responsibilities of agencies under the procedures manual are listed in **Appendix 3**.

8 LEAD UP TO 01 DECEMBER 2020

Useful information about river conditions leading up to 01 December 2020 is contained in WaterNSW's 11 page report 'Barwon–Darling Resumption of Flow Event – January, 2021'

available on its website. Some pertinent points are made below.

The Northern Murray–Darling Basin experienced drought conditions during the second half of 2020. Many of the northern tributaries had ceased to flow after a short respite of improved rainfall during February to April 2020 that brought some much-needed relief to communities in this area. (This period is described in more detail in the independent panel's report which reviewed 'first flush' management in the Northern Basin, available on the DPIE website. The three years leading up to early 2020 were the driest on record for many locations in the Northern Murray–Darling Basin, with very low water availability and record periods of no flows, leading to considerable stress to the environment and to industries and communities in the area.)

Figure 7 shows the flows along the Barwon–Darling during 2020 at the gauging points relevant to the resumption of flows rule. There were good flows along the system from February to May 2020, which resulted in over 672 GL flowing past Wilcannia and into the Menindee Lakes. This was the first good flow in the system since 2016. After this initial event in 2020, a smaller flow event occurred in June and August 2020 with flows through to Wilcannia of approximately 47 GL during August to October 2020. The flows from this last event dropped below 200 ML/d at Wilcannia on 15 October 2020 and the system stayed dry through to 01 December 2020 (and beyond).

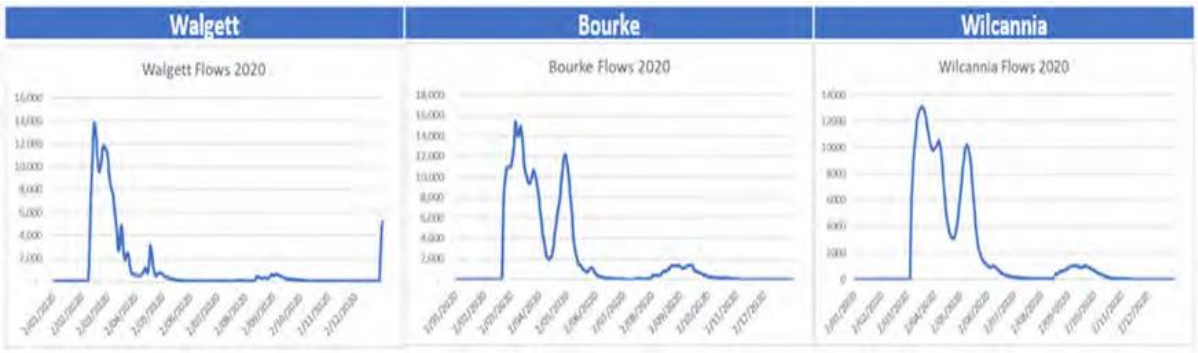

Figure 7. Flows along the Barwon–Darling at key gauges during 2020 (Source: WaterNSW)

At this time, the CEWO was also monitoring the system and observed that many Northern Basin rivers including the Barwon–Darling ceased to flow or had very low flows in October 2020. November 2020 was extremely hot and dry with maximum temperatures in the Northern Basin about 5^{o} C above average. Waterholes were at risk of drying out or the dissolved oxygen becoming too low for native fish health. The MDBA had also nominated connectivity in the Barwon–Darling and Lower Darling as an environmental water priority in 2020-21 which gave extra impetus behind the CEWO considering action.

To manage these risks, the environmental water holders (CEWO and DPIE-EES) decided to activate 8 GL of environmental water in the 'Northern Waterhole Top-Up' event. Original plans for this delivery targeted about 230 km of the Barwon River from Mungindi to Walgett. Water was sourced from dams in two different systems to support this flow—Pindari Dam in the Border Rivers (3 GL), and Copeton Dam on the Gwydir River (5 GL). Of this water, 6 GL was supplied by the Commonwealth and 2 GL from NSW. To get the most benefits out of this water for the environment, the releases were piggybacked on releases for other purposes.

Together with any opportunities to activate any other water entitlements, such as unregulated system access entitlements, it may have, the CEWO had watering priorities for the:

- protection of dry spell breaking low flows to refresh refuge pools should conditions become dry, and
- enhancement of fresh pulses to maintain or improve water quality, enhance native fish condition, and support fish movement should conditions be moderate.

Meeting these priorities would support the survival of native fish populations and the river ecosystem by providing base flows to protect refugial in-stream habitat and mitigate declining water quality. This would also contribute to the health of in-stream habitat by maintaining ecological function and nutrient cycling. Depending on antecedent conditions, this may also contribute additional flows to the Menindee Lakes, enhancing nursery habitat for native fish within the Lakes.

9 RIVER CONDITIONS AND MANAGEMENT OF THE INITIAL IMPLEMENTATION OF THE RESUMPTION OF FLOWS RULE, IDECS AND ACTIVE MANAGEMENT FROM 1 DECEMBER 2020 TO 31 MARCH 2021

9.1 Period from 1 December 2020 to the activation of the resumption of flows rule on 12 January 2021

In mid-December 2020 isolated storms resulted in small flows into some northern rivers and parts of the Barwon–Darling. Initial flows entered the Barwon upstream of Tara from the Thalaba Creek and reached Walgett on 29 December 2020. Further inflows arrived at Walgett from the Namoi on 1 January 2021 with a short peak in the event. About 25 GL entered the system over the period from 29 December 2020 to 5 January 2021. Further rainfall across the catchments after this event resulted in additional flows past Walgett from 5 January 2021.

These and other flows enabled take of water to be announced by WaterNSW in accordance with the BD WSP 2012, the Active Management Procedures Manual and licence conditions up until 11 January 2021. **Table 3** shows the access that licence holders received in the Barwon–Darling during this time. Initially the flows met CtP thresholds for water users at Walgett and, as the water flowed down the system, access was announced to downstream sections. Flows had also increased in the Barwon at Mungindi allowing access from 06 January 2021 for a short period.

Information about daily flow class announcements and flow share arrangements, along with flow forecasting information and likely flow conditions, was made available on the WaterNSW Water Insights Portal. Licence holders were also able to see announcements relevant to them individually on the internet Water Accounting System (iWAS).

At the same time as flow access was being announced, flows in the Barwon–Darling and at Wilcannia in particular were being watched as those flows at Wilcannia had remained below the resumption of flows rule level of 200 ML/day continuously since 15 October 2020. **Figure 8** shows the flows at Wilcannia during 2020. The 90-day trigger duration was forecast to be reached on 12 January 2021.
Recognising this, WaterNSW issued a media release on 6 January 2021 alerting Barwon–Darling customers that the new resumption of flows rule would likely come into effect on

Tuesday, 12 January 2021. This was accompanied by a series of radio advertisements in the Northern Basin, and discussions about the operation of the new rule on ABC Western Plains, ABC Broken Hill and Bourke radio 2WEB.

In addition, WaterNSW held a meeting of the Barwon-Darling ROSCCo on 8 January 2021 (though no meeting notes are on the website) and again on 12 January 2021 to provide further information about the implementation arrangements, forecast flows and to answer questions. Attendees at ROSCCo meetings are generally from Bourke, Brewarrina and Walgett councils, farmers and irrigators from Bourke down to Menindee and the Lower Darling as well as State and Commonwealth government environmental water agencies. The meeting of 12 January 2021 raised some questions of interpretation of the rules in the BD WSP 2012 and the Active Management Procedures Manual which required further advice and commentary from DPIE-Water.

WaterNSW published a regional water update on its website for the week ending 12 January 2021. An extract relevant to the Barwon–Darling is shown in **Appendix 4**.

Table 3. Flow class access announced by WaterNSW from 29 December 2020 to 11 January 2021 (Source: WaterNSW).

River Management Zone	29 Dec	30 Dec	31 Dec	1 Jan	2 Jan	3 Jan	4 Jan	5 Jan	6 Jan	7 Jan	8 Jan	9 Jan	10 Jan	11 Jan
Mungindi to Boomi (zone 1)									B	B	B	B	B	
Boomi to Mogil (zone 2)											B	B	A	
Mogil Mogil weir pool (zone 3)											A	A	A	
Mogil to Collarenebri (zone 4)												A	A	B
Collarenebri to Walgett (zone 5)												A	B	B
Walgett weir pool (zone 6)	B	B	B	B	B	B	B	B	A	A	A	B	B	B
Walgett to Boorooma (zone 7)				B	B	B	B	B	A	A	A	B	A	A
Boorooma to Brewarrina (zone 8)						B	B	B	B	B	B	B	B	B
Brewarrina to Culgoa (zone 9)									B	B	B	B	B	B
Culgoa to Bourke (zone 10)										B	B	B	B	B
Bourke to Louth (zone 11)														A
Louth to Tilpa (zone 12)														
Tilpa to Wilcannia (zone 13)														
Wilcannia to upstream of Lake Wetherell (zone 14)														

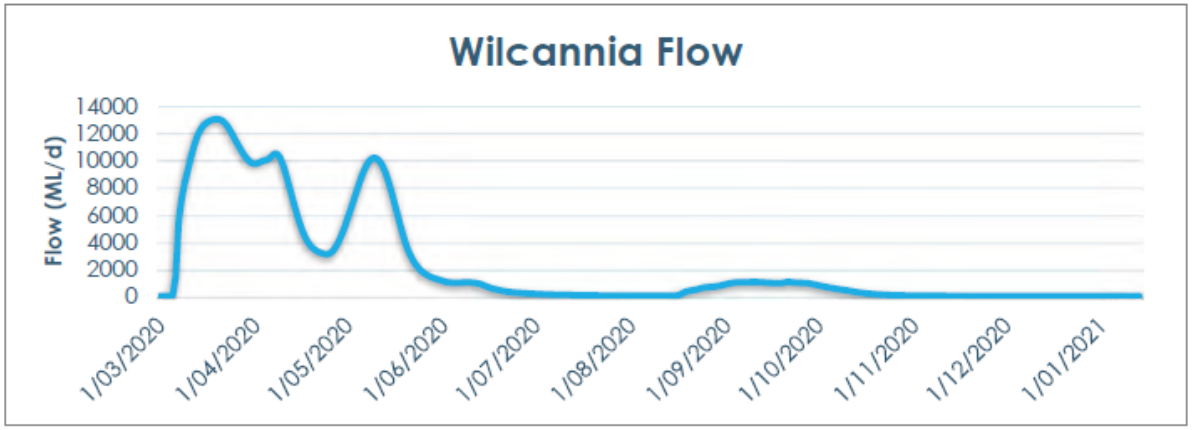

Figure 8. Flows at Wilcannia, noting they fell below 200 ML/day on 15 October 2020 (Source: WaterNSW)

9.2 Period from the activation of the resumption of flows rule on 12 January 2021 until its total relaxation on 29 January 2021

Licensed access to taking water from the Barwon–Darling was banned from 12 January 2021 as the resumption of flows rule under clause 50 of the BD WSP 20102 was triggered. WaterNSW made an announcement of this on its Water Insights Portal on 11 January 2021 (for commencing from 9 am on 12 January 2021).

WaterNSW was undertaking daily modelling of flow and flow forecasting for the Barwon–Darling from late December 2020, using its modelling system, the computer-aided river management system or CARMS. This continued from 12 January 2021. Reportedly, up until 23 January 2021, the flow forecasting modelling indicated there was insufficient water in the river to confidently reach the Bourke target of 10 consecutive days of flows above 972 ML/day.

For example, the river flows update from WaterNSW presented to the BD ROSCCo meeting held early during the afternoon of 21 January 2021 is shown in **Table 4**. That presentation indicated that it was very tight for there to be 10 continuous days of flows forecast to be above the 972 ML/day relaxation threshold at Bourke. The forecast for flows at the other necessary sites was not as tight, being 11 days or more at each of Walgett, Brewarrina and Wilcannia since the triggering of the resumption of flows rule on 12 January 2021.

During the presentation, WaterNSW stated that these forecasts were very sensitive to losses with relatively low losses assumed to Wilcannia. At that time the total forecast flow for Bourke was reported to be 34 GL over the whole event and 26 GL from 12 January 2021. Menindee inflows of up to 5 GL were forecast. All of these forecasts were based on zero extractions of water from 9am on 12 January 2021.

Table 4. River flows update presented by WaterNSW to the BD ROSCCo on 21 January 2021 (Flows from 20-Jan-21 are forecast in ML/day. Flows in yellow highlight are above the target for relaxing the resumption of flows rule.)

	Walgett	Brewarrina	Bourke	Louth147	Tilpa	Wilcannia	
08-Jan-21	964	1752	1800	147		2	
09-Jan-21	1319	1315	1554	60		0	
10-Jan-21	1366	999	1288	18		0	
11-Jan-21	1367	781	1108	294		0	
12-Jan-21	1244	802	1495	1012		0	Start of RoF
13-Jan-21	1109	919	1338	1171		0	
14-Jan-21	1011	1029	1073	1228		0	
15-Jan-21	879	1186	887	1296	9	0	
16-Jan-21	744	1486	839	1250	563	0	
17-Jan-21	731	1790	851	1129	994	0	
18-Jan-21	817	1919	933	989	1102	0	
19-Jan-21	874	1885	1086	884	1096	0	
20-Jan-21	868	1895	1335	821	1004	0	
21-Jan-21	896	1725	1466	833	859	0	
22-Jan-21	912	1457	1528	981	750	0	
23-Jan-21	1148	1269	1522	1135	684	0	
24-Jan-21	889	1133	1620	1271	693	0	
25-Jan-21	553	939	1508	1338	839	0	
26-Jan-21	476	918	1286	1335	885	0	
27-Jan-21	522	897	1132	1438	1041	0	
28-Jan-21	439	910	1017	1329	1124	0	
29-Jan-21	267	682	837	1110	1134	243	
30-Jan-21	200	365	826	958	1247	529	
31-Jan-21	103	321	810	846	1146	659	
01-Feb-21	53	386	828	668	934	865	
02-Feb-21	45	303	602	658	787	978	
03-Feb-21	86	133	286	645	679	1007	
04-Feb-21	577	72	242	663	504	1130	
05-Feb-21	274	0	308	439	498	1036	
06-Feb-21	143	11	225	125	486	828	
07-Feb-21	111	49	55	82	507	683	
08-Feb-21	0	96	0	149	283	577	
09-Feb-21	0	328	0	67	75	403	
10-Feb-21	0	79	0	0	32	397	

By 23 January 2021, the flow forecast modelling was forecasting 12 days of flow above the target, since the resumption of flows rule was activated. WaterNSW then allowed from 24 January 2021 a small volume of access to A-Class licences (234 ML/day) without preventing the necessary flow target and duration being met. The flow forecasts at Bourke are shown in **Figure 9**.

Similar to the flow forecast for Bourke, the flow forecast for Wilcannia on 23 January 2021 indicated that flows would be above the Wilcannia target of 400 ML/day for a period of 10 days or more. The flow forecasts at Wilcannia are shown in **Figure 10**. The forecast was difficult for WaterNSW to predict in this section of the Barwon–Darling because a comparison of observed flows to modelled flows was not able to be

undertaken until flows reached Tilpa on 17 January 2021. WaterNSW found that the actual flows at Tilpa were slightly higher than the modelled (forecast) flows which provided improved confidence that the forecast flows for Wilcannia would be achieved.

Access arrangements with the resumption of flows rule relaxed as stipulated in the BD WSP 2012 were fully reinstated on 29 January 2021. Flows reached Wilcannia on 30 January 2021 and then provided more than 10 consecutive days of flow above the 400 ML/day resumption of flows rule relaxation target.

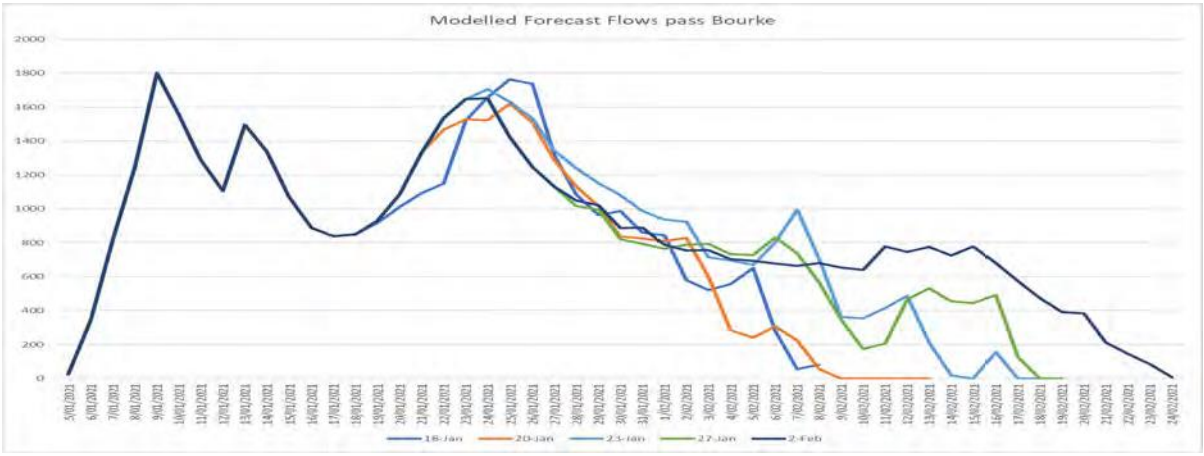

Figure 9. Modelled forecast flows at Bourke (Source: WaterNSW)

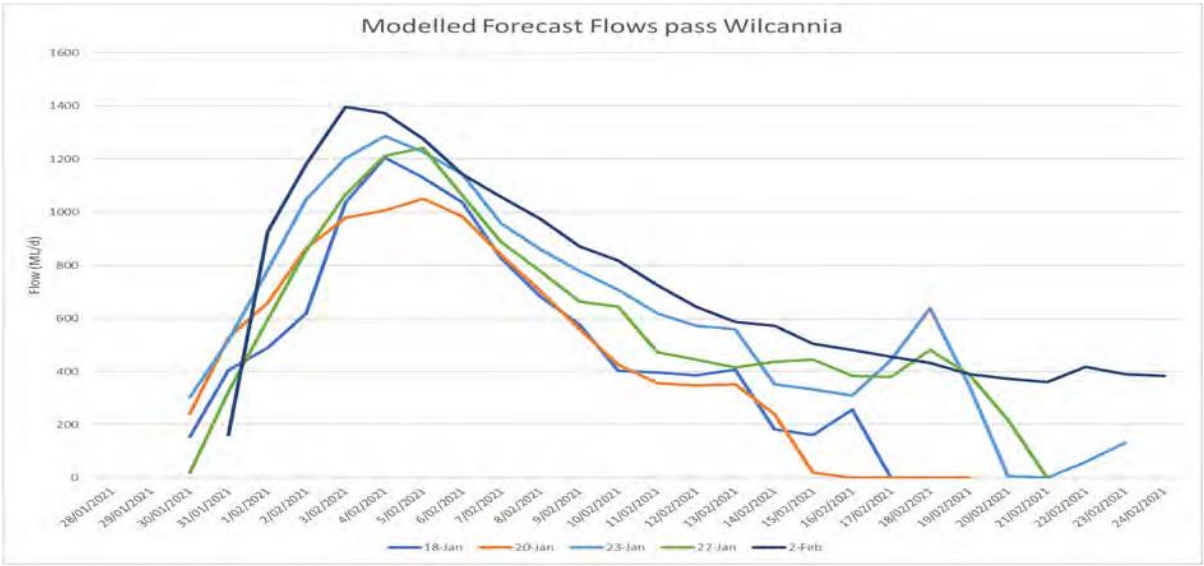

Figure 10. Modelled forecast flows at Wilcannia (Source: WaterNSW)

The CEWO flows update for the 'Northern Waterhole Top-Up' event published on 21 January 2021 included a map as shown in **Figure 11**. This 'mixing' of the environmental and unregulated flows caused some clarifications about what constitutes trigger volumes to be sought by stakeholders at the Barwon–Darling ROSSCo meetings over January 2021, i.e. is AEW included in the volumes or not?

DPIE-Water provided advice on this matter to WaterNSW and the ROSCCo meetings, noting that Table 4 in the procedures manual (referring to Procedure 21 – Determining if a No Flow Class is to be announced) has footnotes on page 33 which state (underline added):

1. *Observed flows arising from <u>all</u> sources are to be considered when assessing if a no flow class announcement is triggered under the resumption of flow rule (clauses 50 (1), (3), (5) and (7).*
2. *Forecast flows arising from <u>all</u> sources are to be considered when assessing whether a resumption of flow rule is to be relaxed in accordance with clauses 50 (2), (4), (6) and (8) and a flow class other than a No Flow Class is to be announced*.

ROSCCo meetings were held on 12, 15, 21 ,22, 23, 24, 25 ,27, 28 and 29 January 2021. Daily flow and flow forecasting modelling updates were discussed at each meeting. From the meeting notes, forecast flow volumes at Bourke since 12 January 2021 were hovering around the 30 GL figure and the 972 ML/day threshold over 10 days for a number of days, requiring caution in considering any relaxation of the rule, even though the irrigation water demands were very high. This also put the flow forecasting under close scrutiny, with the results of the modelling being reported to being very sensitive to assumptions for river transmission losses as mentioned above.

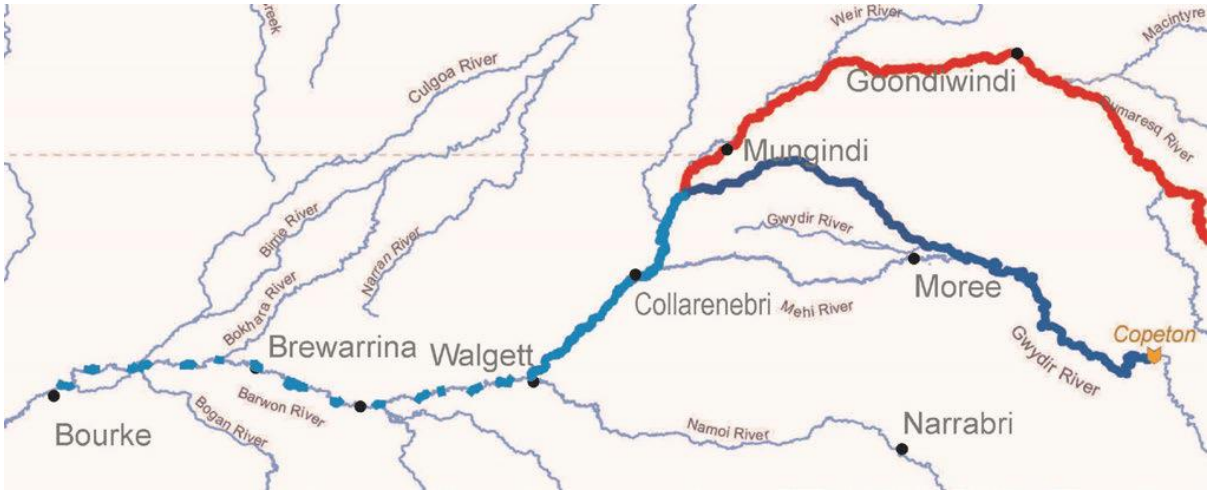

Figure 11. Map showing flows from the 'Northern Waterhole top-up' event linking together. (Source: CEWO 21 January 2021)

The red line in Figure 11 shows water for the environment from the Macintyre River following the release from Pindari Dam, and the dark blue line shows Gil Gil Creek following the release into the Gwydir River from Copeton Dam. The light blue line shows flows connecting along the Barwon River to Bourke. The broken line shows the mixing of 'top-up' flows with unregulated flows.

WaterNSW published a regional water update on its website for the week ending 25 January 2021. An extract relevant to the Barwon-Darling is shown in **Appendix 5**.

WaterNSW provided further information about various types of flow volumes in its January 2021 report on the resumption of flows, published on its website in February 2021. In the period between 6 and 12 January 2021, water in the system flowing past Bourke involved 4,002 ML of planned environmental water (PEW - at Bourke all flows below 605 ML/day are protected to meet basic landholder rights, native title rights and town water supply needs downstream) and 81 ML of HEW and water above access thresholds was 4,102 ML. Not all of the water above the access thresholds was available for extraction because IDECs and actual pump capacity limit the volume of water that can be taken on any single day.

While the resumption of flows rule was restricting access after 12 January 2021, a mix of water also made up the flow passing Bourke. During this period WaterNSW determined that the volume of PEW that passed Bourke was 10,285 ML; HEW 1,919 ML and water above the normal access thresholds (without the resumption of flows rule) was 8,340 ML. While there was 8,340 ML of flow over the period from 12 January to 29 January 2021 available above the normal access triggers for licence holders, not all of this water would have been able to be extracted. Based on the volume of EoIs and available IDECs, WaterNSW has estimated that approximately 6,000 ML could have been extracted if the resumption to flows rule had not been prohibiting access. **Figure 12** shows the distribution of flow components at Bourke for the period.

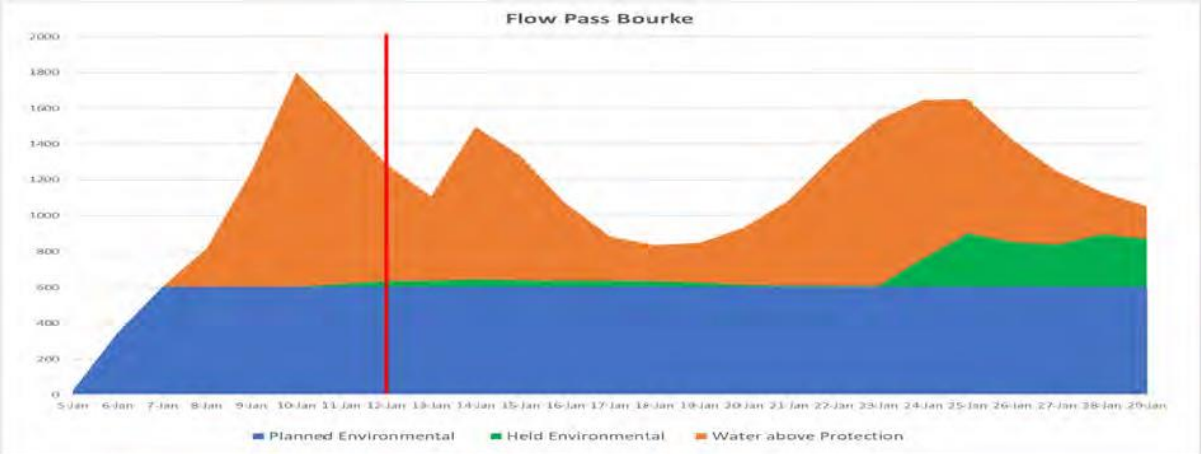

Figure 12. Composition of flows past Bourke to 29 January 2021 (Source: WaterNSW)

(Note that 'water above protection' was not available to water access licensees from 12-29 January 2021 due to the activation of the resumption of flows rule.)

Media releases were made by WaterNSW on 29 January 2021 to cover the relaxation of the resumption of flows rule, how the flows and access to them were managed and communications undertaken during the period, including with the CEWO.

9.3 Period from the total relaxation of the resumption of flows rule on 29 January 2021 until 31 March 2021

Following the relaxation of the resumption of flows rule, further rainfall across the catchment resulted in further inflows to the Barwon–Darling and eventually to the Menindee Lakes ('Minandichee' in Barkandji language).

While early plans for the 'Northern Waterhole top-up' event were focussed on the section from Mungindi to Walgett (around 230 km), additional unregulated flows meant that flows reached over six times further, all the way to the Menindee Lakes (see **Figure 13**). This also meant that the active management procedures raised access thresholds to protect AEW after 29 January 2021, noting also that the CEWO has water licences in the Barwon–Darling that can be activated (with EoIs and IDECs and access thresholds as for other licence holders) to keep water in the river for environmental purposes.

For example, in its flow update of 12 February 2021, the CEWO reported that active management meant that an additional 137 ML/day of water for the environment flowed past Wilcannia that day. As shown in **Figure 14**, about a sixth of the flow passing

Wilcannia was Commonwealth water for the environment then. The CEWO estimates that between 04 January and 07 April 2021, about 40 GL of water had been protected in the Barwon-Darling for the environment under active management.

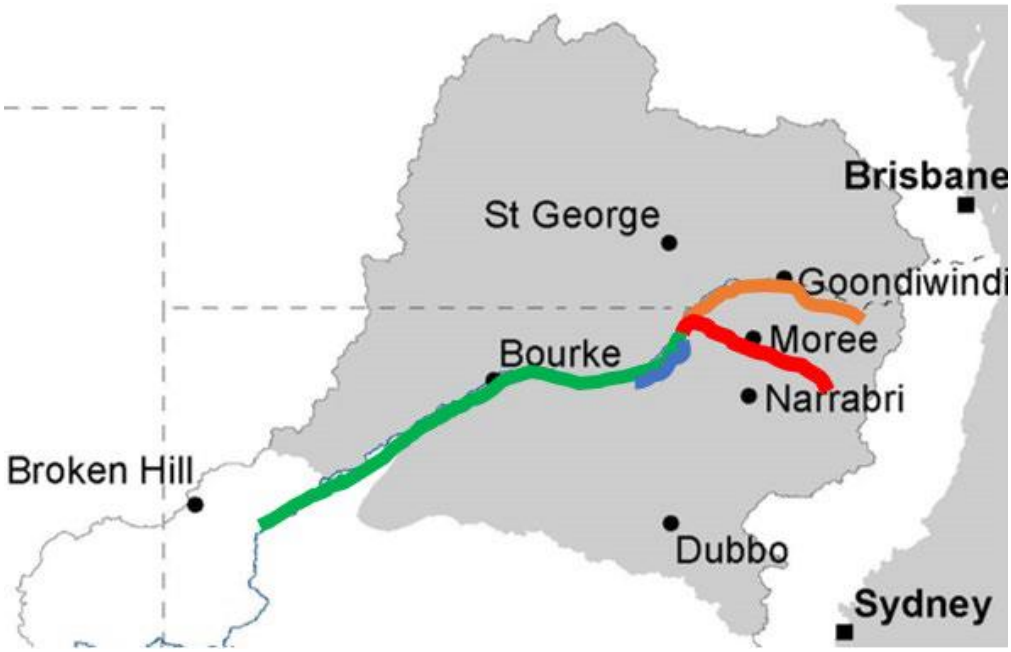

Figure 13. Map showing the source of all flows that supported the 'Northern Waterhole top-up' event and unregulated flows (Source: CEWO)

The orange line in Figure 13 shows the Macintyre River with water released from Pindari Dam and the red line shows the Gwydir River and Gil Gil Creek with water released from Copeton Dam. The blue line shows where the 'top-up' water was focussed originally. The green line shows part of the flow reached Menindee Lakes.

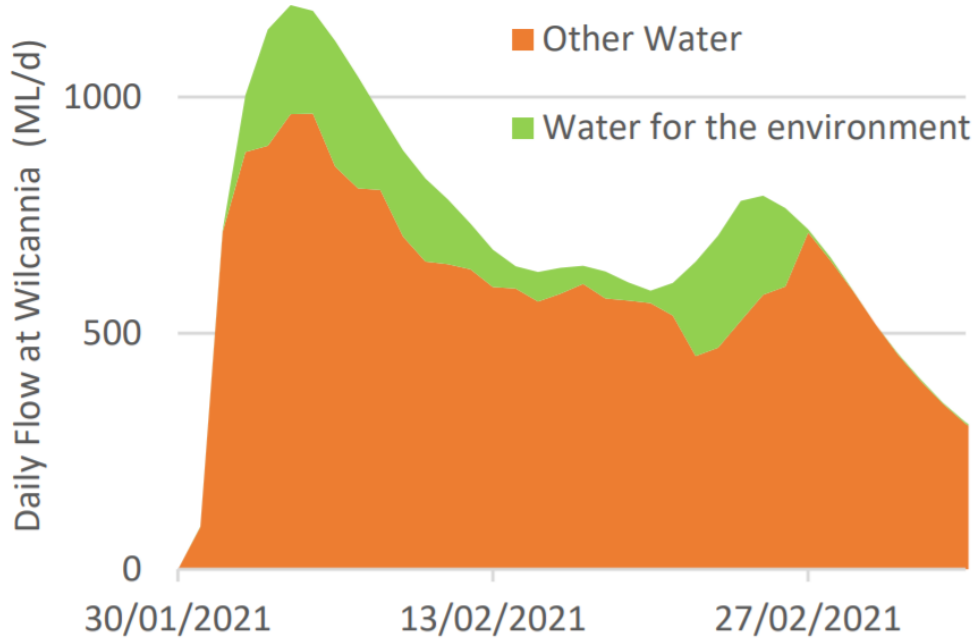

Figure 14. Components of flows at Wilcannia in late January through to early March 2021 (Source: CEWO)

WaterNSW convened a BD ROSCCo meeting on 3 February 2021 (though the meeting notes are not on the website). Some flow updates were provided, including a forecast flow in excess of 36 GL past Bourke since 12 January 2021. Flows for 10 continuous days or more above the relaxation thresholds for the resumption of flows rule were confirmed to have been observed/forecast at each of Walgett, Brewarrina, Bourke and Wilcannia.

A range of issues about management of the event and policy matters were reportedly raised, including flow forecasting, IDECs, connectivity to the Menindee Lakes and the Lower Darling, coordination of management of AEW, and the protection or otherwise of AEW once it entered Menindee Lakes (since it is not protected then).

WaterNSW convened another ROSCCo meeting on 24 February 2021 that enabled some further review and discussion of the initial implementation of the resumption of flows rule, IDECs and active management. Considerable concerns were raised by licensees about IDECs and DPIE-Water and WaterNSW undertook to conduct a survey to explore the range of IDECs issues and better understand them. Issues around the modelling and gauging station locations and data were also discussed.

A river flows update at that meeting outlined a total forecast flow for Bourke of 49 GL over the whole event and 41 GL from 12 January 2021, with a Wilcannia forecast of 22-26 GL and a Lake Wetherell inflow of up to 15-19 GL.

The flow forecast comparisons presented and shown in **Figure 15** for Bourke and **Figure 16** for Wilcannia respectively, indicate the difficulty in back-casting and checking the accuracy of the forecasts against later observed flows because of the additional rainfall and inflows that occurred during the period.

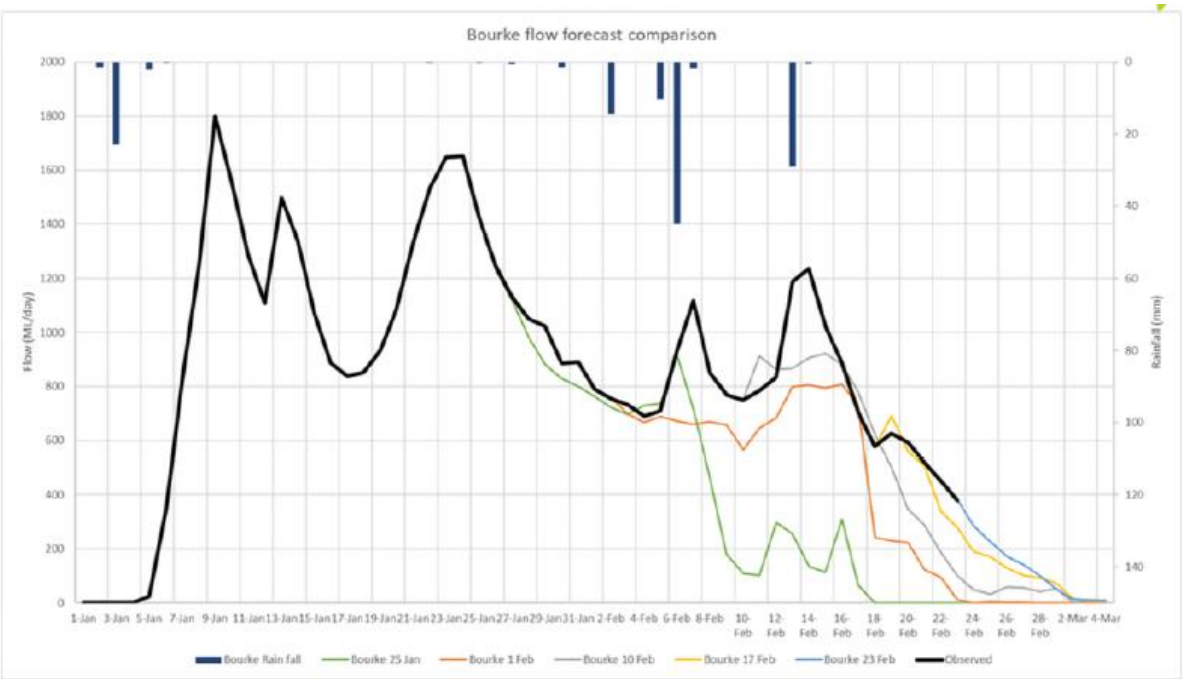

Figure 15. Flow forecast comparison for Bourke presented to the 24 February 2021 ROSCCo meeting (Source: WaterNSW)

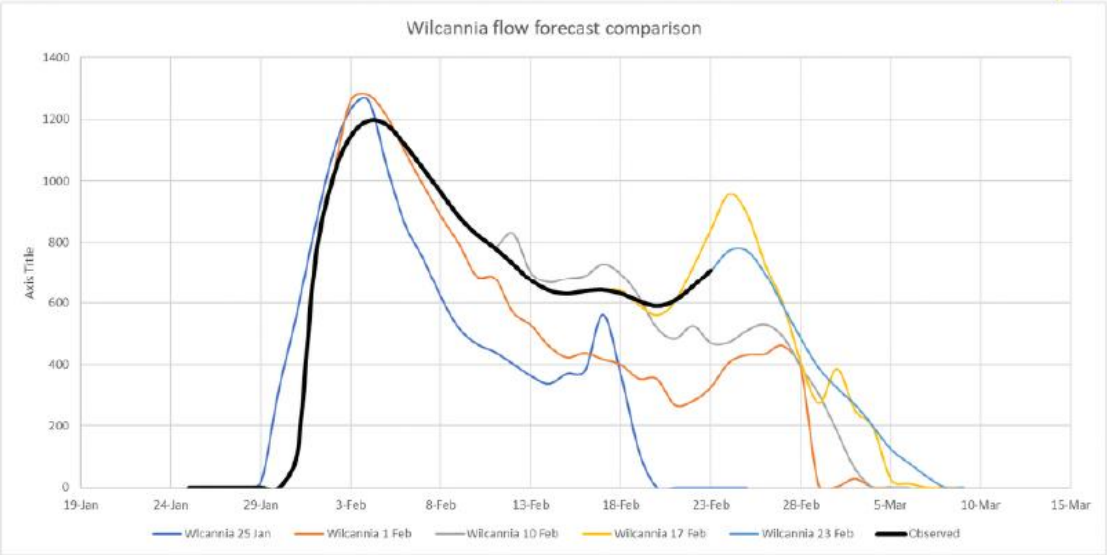

Figure 16. Flow forecast comparison for Wilcannia presented to the 24 February 2021 BD ROSCCo meeting (Source: WaterNSW)

During the 24 February 2021 BD ROSCCo meeting, WaterNSW also presented the information shown in **Figure 17**, outlining how much of the total flow at Bourke was comprised of AEW up until that date and what was forecast for the immediate future.

Regional water updates for this period have recently been removed from the WaterNSW website following the end of the 2020/2021 water year. WaterNSW is currently investigating approaches to archive these reports.

In the meantime, it would be helpful for the January 2021 resumption of flows report to be updated with any new data and information that is now available and for that updated report to be published, rather than waiting for the annual review report of active management (which is not due to be published until March 2022). This would provide more contemporary information to and provide further transparency to stakeholders, who have a keen interest in resumption of flows events and would be in keeping with the recommendations from the 2020 'first flush' assessment report.

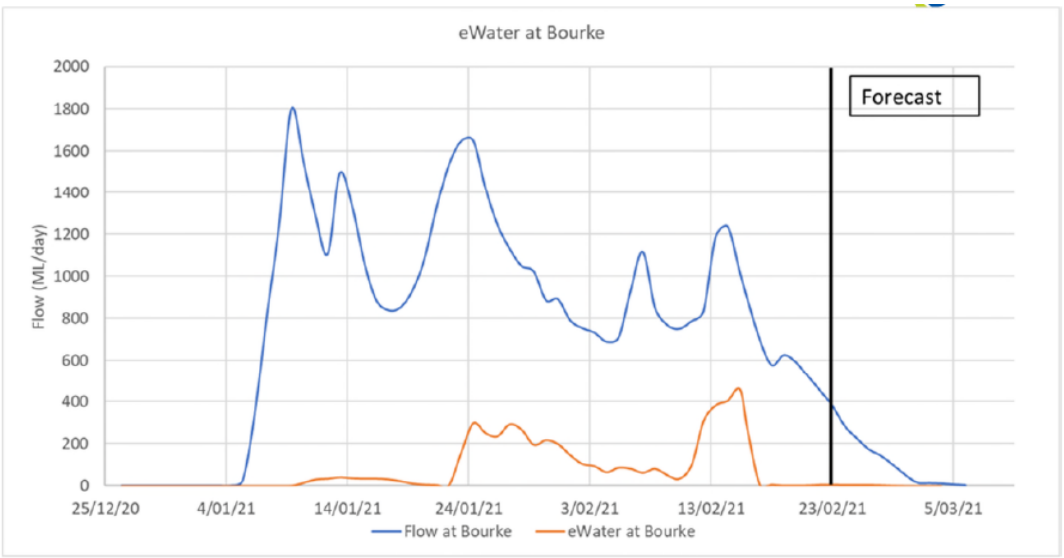

Figure 17. Environmental water at Bourke presented to 24 February 2021 BD ROSCCo meeting (Source: WaterNSW)

10 PERSPECTIVES ABOUT THE INITIAL IMPLEMENTATION OF THE RESUMPTION OF FLOWS RULE, IDECS AND ACTIVE MANAGEMENT

This section summarises 'what I heard' from my many discussions, any written comments provided, a review of documentation available and independent analyses.

It is important to note that my assessment is about the management and implementation of the rule/s, not about the rules themselves e.g. whether a rule is a 'good' rule or a 'bad' rule for achieving the objectives of the BD WSP 2012 or some other results. Where comments have been made about the rules themselves, I have captured those comments and included them in **Appendix 6**. This information may be helpful when the BD WSP is reviewed/remade, as proposed in 2023.

Invariably, there is some interpretation on my part about comments made.

10.1 Decision making processes and the availability and adequacy of information and procedures used to guide management

What worked well

Having the Barwon–Darling Active Management Procedures Manual in place (since December 2020) greatly assisted management of the events during the period from 1 December 2020 to 31 March 2021 (and beyond). This period was the first time that the procedures manual had been put to 'real use'.

That DPIE-Water coordinated the writing of the document with WaterNSW closely involved also greatly assisted understanding of what had to be done by whom and when. So, roles and responsibilities were clear, especially with respect to DPIE-Water making the rules and WaterNSW following and implementing the rules. The procedures manual is essentially 'owned' by DPIE-Water and WaterNSW has to follow it (or document why they had to deviate from it if at all).

WaterNSW also reportedly has a manual of daily operational procedures which not only informs actions, but also aids training of new staff and succession planning. This document is also reportedly routinely reviewed and updated based on experience and lessons learned.

Overall, agency people directly involved in the management of the flows during the period thought that the procedures manual worked well, especially in view of it being the first time that the procedures manual was fully applied and the relatively complex nature of the initial flows and the technical nature of the rules themselves. There were instances where clarifications and interpretations of some words in the procedures manual (and arguably the BD WSP 2012) were required (see details in subsequent sub-sections), but the communication between DPIE-Water and WaterNSW during those instances was also described as working reasonably well. Such communications also reinforced the roles of DPIE-Water as the policy maker/rule setter and WaterNSW as the operator and rule follower.

NRAR also reportedly had documented monitoring and compliance procedures relevant to resumption of flows and active management of environmental water, so relatively rapid deployment was possible to access satellite imagery and telemetered water take. However, no on-ground presence happened during the initial resumption of flows period. The longer the prior notice of such an event is always the better preferred, especially

when a number of staff may be offline over the Christmas/New Year period.

Some of the surveillance technology worked well and some didn't, with IT and communications issues with some telemetry. In addition, the metering of take program is still rolling out, so not all water takes were measured by systems that yet meet the future required standards. As it was also peak irrigation season, water levels in on-farm storages were changing relatively rapidly and that made discernment of storage volumes using remote sensing challenging in some cases. However, potential anomalies were able to be identified and appropriate investigations have been able to be undertaken. NRAR will publicly report further on that in due course through its quarterly activity reports and its 'close-out' report for the event.

Advice from agencies, industry and the community has been that there was no 'rampant' non-compliance during the period.

Recognising that new CARMS models for the tributaries were being used to feed into the Barwon–Darling CARMS model, and the full extent of daily data (gauged flows, EoIs, AEW, and the like) being collected and analysed for multiple river management zones, the information management and announcement systems worked very well for an initial implementation. This is a credit to the developers and operators of the information and communications technology system.

Being able to run the flow forecasting models through the entire river system assisted analyses, recognising that this will further improve with better data and information.

However, data limitations and other challenges meant that the accuracy of flow forecasts during critical times fell well short of expectations for many licensees and downstream stakeholders. More details are provided in following sub-sections.

On the other hand, holders of environmental water appreciated the 7-day forecasts being placed on the WaterNSW Water Insights Portal as it assisted them in their management of environmental water allocations. Such management can be technically challenging with the range and extent of environmental water entitlements held in multiple flow classes in multiple locations.

Agencies felt that the conservative approach to flow forecasts and the inclination to 'under-announce' volumes and opportunities for take was appropriate for this initial implementation to ensure that downstream targets were met and commitment to them demonstrated. However, this was of significant concern to licensees with opportunities for take being seen as having been 'lost' at very considerable economic cost, given the timing during the main cropping and watering season. While the procedures manual may allow for 'make good' on missed opportunities for take, no one was keen to go down that path given the potential implications for ecological outcomes and industry reputation.

This matter could also be helped if some apparent incoherence in the language in the Active Management in Unregulated Rivers Policy and the Barwon–Darling Active Management Procedures Manual is reconciled and clarified. For example, under Procedure 11 on page 19 of the procedures manual, it states that '*Flow advice will be based on:*

- *conservative estimates of inflows and river transmission losses that are at the upper end of what could be expected to be consistent with similar past events,*

and

- *the maximum volume of unregulated water likely to be extracted or protected taking into account the current EoI numbers and likely water available*.'

However, on page 21 of the Active Management Policy, it states that '*An initial conservative access announcement that provides a higher CtP threshold or lower volume of water available to licence holders until river losses are better understood will not be used because it has potential to affect the reliability of access for unregulated river access licence holders. Announcements are made based on the best available information at the time*.'

What could be changed

While overs and unders in forecast flows are tracked in the WaterNSW model, and a stated aim is for 90% certainty in those forecasts, and mismatches are reconciled each day, it is not yet possible to determine what volumes are actually pumped on a daily basis as the telemetered rollout is still underway. (Rather, at the moment, it is assumed that the volume, announced as available to be taken, is actually taken.) After the proposed telemetered meters are fully operational, daily forecasts will be able to be updated for actual metered take.

Nevertheless, the accuracy, or otherwise, of the forecast flows and volumes available for extraction, especially just before, during, and just after the resumption of flows rule was triggered and relaxed, and while active management was in play, was of most concern to most stakeholders.

Many questions were asked about how allowances for river transmission volumes and travel times were calculated and there was a general lack of clarity and some scepticism about that. This should be outlined in more detail in the flow forecasting model applications manuals and perhaps in the procedures manual. Interagency and stakeholder discussions about this should occur to hopefully reach an agreed approach and to increase understanding and transparency.

In addition, during January 2021, for example, there were times when water was coming off floodplains and other locations where those flows were not directly gauged. That adversely impacted the quantity and timing of some forecast flows. Additional flow gauging stations are required to pick up more of the bigger inflows, including in the Castlereagh and Bogan.

While WaterNSW gets daily access and flow announcements from specific locations in Queensland, it is difficult to forecast flows coming out of Queensland into the Barwon–Darling under the current arrangements. There is ongoing work by Queensland and NSW to improve this and that work needs to continue.

While forecasts are generally easier for in-channel flows, travel times and volumes are harder to forecast when there are long distances between flow gauging stations. This is particularly the case in the more downstream sections of the Barwon–Darling where the installation of additional flow gauges would assist management. More use could also be made of local information and knowledge as flows progress down the river system.

In addition, the flow forecasting models currently assume that pumping takes place evenly along a management zone. However, in reality, there are travel times involved

between specific (and not evenly-spaced) pumping locations. Completion of the rollout of the telemetered metering program will enable improvements to be made to the models in this area.

When the inflow situation is changing relatively rapidly and those changes have implications for operations and management responses, it may be prudent to consider sub-daily flow forecasts (and potentially announcements). The resourcing and systems implications of doing this need to be considered carefully, the relative costs and benefits assessed, and future directions decided accordingly.

All of the above matters suggest that it would again be timely to have the latest flow forecasting models peer reviewed and the results of that review published and used to inform priorities for the next round of enhancements. Indeed, this should be a part of the approach to continuous improvement.

The procedures manual provides for an annual report, conversation and review rather than an event-by-event review at this stage. The latter may be useful if there are any 'show-stoppers'. Nevertheless, others like the CEWO have noted that a report after each event does significantly help communications with stakeholders, transparency and relationships, records keeping, lessons learned and adaptive and responsive management. It was noted that WaterNSW has published a report of the January 2021 resumptions of flows event and that initiative is supported.

Some licence holders' installed pumping capacity exceeds their IDECs, which can make for challenging and potentially higher risk on-farm operations with essentially daily pump starting and stopping. 'Real-time' nor temporary trading of IDECs is not possible in the systems approvals processes at the moment, and this should be a consideration for the future. It was reported that there is excess IDEC in each river management zone, so operations could improve as long as licensees trade. However, it will be important to check that changes to IDECs do not adversely affect hydrograph shape of important flow events for the environment.

There were also concerns that the initial determination of IDECs was not based on correct data and information, so this and other issues with IDECs needs to be transparently investigated and assessed, in consultation with stakeholders, as a matter of priority.

Where clarifications and/or interpretations of some words and/or processes in the procedures manual were required, those details should be added to the procedures manual. Examples include:

- Being very specific when (and under what conditions) the 90-day trigger period at Wilcannia commences
- Being clearer about what volumes (e.g. those associated with AEW) are to be/not to be included in the 30 GL trigger volume at Bourke
- Being clearer about whether AEW is included or not in the trigger flow rates
- Being clearer about the consecutive nature of the days required at those trigger flow rates
- Being clearer about what constitutes an 'event', including its start and end conditions and dates, for example for the purposes of accumulating the 30 GL trigger volume at Bourke (e.g. do three periods of, say, 10 GL flow volume each separated by, say, one day, one week or one month satisfy the relaxation

criteria?), or for describing the next period for considering flows below the low flow trigger (e.g. do, say, two days of flows just above 200 ML/day at Wilcannia at day 69 and 70 since the flow fell below 200 ML/day there, reset the start date for the low flow period back to zero?).

These would be more easily facilitated if DPIE-Water routinely kept a log of issues, its decisions and communications during resumption of flows and active management events. Indeed, all agencies should do so to assist the assessment and review processes.

From an operational sense, it would also be more transparent if environmental water volumes (and not just flow rates) were clearly identified and reported daily for all parts of the river system. This could be included in the information on the WaterNSW Water Insights Portal in the future.

Instances were reported where approvals of works installations did not fully reflect actual works on the ground. Further investigations of these instances are underway. However, it would seem better to have some notifications and/or census processes in place so that any changes of works (and even changes of contact details) are required to be advised to the relevant agencies.

10.2 Communication with water users, the general public and between agencies

What worked well

In the main, communications around the impending triggering of the resumption of flows rule in early January were satisfactory for agencies, licensees and most key stakeholders. This was certainly aided by the holding of ROSCCo meetings on 8 and 12 January 2021 and the opportunity for additional stakeholders to call into those meetings (provided they knew about them). Media releases, interview and information sessions on local radio stations, and notices on the Water NSW Water Insights Portal were also helpful for openness and transparency, especially for engaged stakeholders. However, it is likely that the general public was not at all fully attuned to these activities and the associated issues at that time.

Earlier rather than later advice is always helpful for agencies and businesses to properly plan their activities. It is recognised that it takes time to earn and build trust in these circumstances.

Nevertheless, the announcement of take access for a few days just before the resumption of flows rule was triggered, and hence take was forbidden, was somewhat unexpected, confusing and seemed incongruent to some downstream stakeholders, given the objectives of triggering the rule. In the end, it was just the way the flows unfolded, together with the strict application of the rules in the BD WSP 2012.

Holding ROSCCo meetings regularly during the resumption of flows period (e.g. 12, 15, 21, 22, 23, 24, 25, 27, 28, 29 January 2021) assisted communications and recognised a desire for transparency. There were varying levels of frustration voiced with the need to clarify the intent of the policies and rules in the BD WSP 2012 and the procedures manual, given the words in the documents and the objectives for water management being pursued by different stakeholders.

In holding meetings in this way, however, it is important to ensure that all stakeholders have and are seen to have a fair voice in the discussions and the opportunity to properly

understand the information being provided and its implications. Some concerns were raised about that, recognising that many people involved at the time were under pressure and that further reinforces the need for equity of access to information and influence.

While notes from BD ROSCCo meetings were published on WaterNSW's website (with the exception of meetings held on 8 January and 3 February 2021), some stakeholders commented that they thought the notes could have been clearer on reporting the main issues discussed, details about flow volumes, and key decisions made. It is anticipated that the need for such a very high frequency of meetings will be less in future, given knowledge gained from this initial implementation, and not all future events will necessarily be as complex and close to trigger volumes in execution.

However, treating the resumption of flows event akin to an 'incident' to be managed informs the attention that needs to be given to it and also the need for ready availability of agency staff for timely intelligence gathering, advice, coordination, decision-making and communications. From stakeholders' viewpoints, there is a need for one agency 'point of contact'.

It was reported that the EoI process generally worked well, though there could have been some additional explanation to assist understanding and also to assist licensees with multiple licences to keep track of announcements.

Generally, it was believed that the 'announcements' were pretty straightforward. Compliance people were pleased that announcements around the 'no take' rules were clear. The active management rules and IDECs and associated announcements were also clear but it is more challenging to check compliance, noting adjustments to CtP levels and the needs for individual data and information and real-time or near-real-time compliance assessments. Consequently, retrospective reviews were generally needed. More active surveillance and assessments will be possible as the telemetered metering program rolls out.

The WaterNSW report on the initial resumption of flows event was considered a worthwhile initiative, while not yet being formally required under the procedures manual. It was also noted that its preparation and publication also met one of the recommendations in the report about the 2020 'first flush' event.

As mentioned above, there were instances where clarifications and interpretations of some words in the procedures manual (and arguably the BD WSP 2012) were required (see details in subsequent sub-sections), but the communication between DPIE-Water and WaterNSW during those instances was also described as working reasonably well, recognising respective policy making and operational roles.

What could be changed

While the enabling technology for WaterNSW-licensee communications generally worked well, WaterNSW has advised that they will be doing better 'push' notifications following a further technological enhancement. In any event, the WaterNSW Water Insights Portal will continue to provide a single point for flow forecasting and access announcements information to be accessed.

Stakeholders widely reported that they had not been taken through the flow forecasting

models, for example, how they work, what inputs and assumptions are used and how, what are the uncertainties and how are they handled, what types of results are produced, and what they all mean. Using models in this 'black box' way does not give confidence to stakeholders who are impacted by decisions informed by their use. WaterNSW should work with stakeholders to ensure there is a clear understanding of the models, including the assumptions incorporated into them, to build trust and transparency in water management and regulation.

It would also aid transparency and understanding if WaterNSW took their stakeholders through their management of the flows during the period. This could be in the form of a webinar with presentations and a question-and-answer session. This should be done before WaterNSW provides its annual report to DPIE-Water in accordance with the procedures manual. This could outline the balancing acts required in flows forecasting and the requirements for evidence to be sufficient for a reasonable person to make a decision with.

More broadly, improved education and understanding about how the whole water management and regulation system works in the Barwon–Darling would help everyone involved or with an interest. Some specific comments were made about the desirability of more explanation about how IDECs were put together and how they work. It is also worth explaining how it is or is not possible, depending on the circumstances, and whether it is equitable for people to be pumping upstream in the river system when thresholds for downstream targets have not yet been met. As many other reviews and assessments have noted, building water literacy and improving knowledge exchange between and among stakeholders and agencies about water management and use remains a need and a work-in-progress.

While the opportunity was open for any stakeholders to be involved with any ROSCCo meeting, this opportunity was not taken up by any First Nations people, Traditional Owners or Indigenous communities, nor were sufficient, specific or culturally appropriate communications undertaken with them. ROSSCos have traditionally focused on water user access issues and rules, and therefore some stakeholders have considered that they are of limited benefit to them. In this case, the lack of engagement prevented First Nations people, Traditional Owners and Indigenous communities from maximising the social and cultural benefits from the additional flows in the river that application of the rules otherwise provides.

From a compliance perspective, it was suggested that it would be helpful for a routine part of the event management process to include a campaign of information reminding licensees what their obligations are just prior to each event.

The formation of a multi-stakeholder Environmental Watering Advisory Group for the Barwon–Darling, flagged for later in 2021, will also assist communications and understanding about management of environmental water in the river system. It will also help ensure that the possible activation of the resumption of flows rule is on the radar of holders of environmental water as this may influence their consideration of risks, options and management actions during an event. This will be important as more environmental water from upstream of the Barwon–Darling comes under active management in the future. The Group needs broad representation, including from all sectors and relevant geographical locations.

10.3 The extent to which the initial implementation of the resumption of flows rule, IDECs and active management satisfied the water sharing plan rules

It was agreed by all agencies that, based on the information available and their understandings, the initial implementation of the resumption of flows rule, IDECs and active management did satisfy the BD WSP 2012 rules. This did require some clarification and interpretation of some rules and some aspects of the procedures manual as outlined previously.

For example, as noted above, several people made comments about the initial lack of clarity as to whether the volumes associated with AEW should or should not be included as a component of the volumes that trigger the imposition or the relaxation of the resumption of flows rule. With the interpretation that the AEW volume should be included, the flow thresholds for the relaxation of the resumption of flows rule were met for the required durations at all of the required locations set out in the BD WSP 2012.

On that matter, page 32 (Procedure 21) of the procedures manual, which explains the procedure for determining if a no flow class is to be announced, states that the resumption of flows triggers are to be assessed first and that observed flows arising from *all* (emphasis added) sources are to be considered when assessing if a no flow class announcement is triggered under the resumption of flows rule clauses outlined in the BD WSP 2012. Similarly, forecast flows arising from *all* (emphasis added) sources are to be considered when assessing whether a resumption of flows rule is to be relaxed in accordance with relevant clauses in the BD WSP 2012 and a flow class other than a no flow class is to be announced.

This would seem to support the interpretation outlined above and taken during the event.

Nevertheless, page 26 (Procedure 15) of the procedures manual, which further explains determining adjusted flow class thresholds, states that the no flow class is *not* (emphasis added) to be adjusted for AEW to ensure that the presence of AEW does not affect access by domestic and stock and local water utility access licence holders.

Though these procedures may be different for different purposes (and timescales), it would seem pertinent to further explain the rationale for the approach taken with Procedure 21 in the procedures manual and give consideration to the coherence of the objectives of these procedures and the associated rules when next reviewing/remaking the BD WSP. For example, it would seem somewhat bizarre if a circumstance arose where all the water for the trigger volume at Bourke was HEW and that triggered the relaxation of the resumption of flow rule and take was allowed. While very unlikely (and perhaps impossible under current arrangements), such a result would not be in accordance with the intent of the management objectives.

Additional rainfalls and inflows during and shortly after the resumption of flows period has meant that it has not been possible to properly compare the accuracy of forecast flows to later observed flows and so assess factors such as allowances for losses. It would be useful to update the report of the January 2021 resumption of flows period with any additional data and information now available to provide further transparency and to further build understanding.

Another factor to consider here is the importance of having the forecasts sufficiently

accurate to properly evaluate the extent to which the BD WSP 2012 rules have been met, especially for those rules reliant on forecasts and not actual flows. While measurements of actual flows have their inherent inaccuracies (with agreed standards and procedures in place for them), and that must be considered in the management arrangements, uncertainty in flow forecasts arguably should also be subject to some agreed standards and procedures. This is a matter for further analysis and consideration.

11 CONCLUSIONS

Based on the foregoing descriptions of available-to-date data, information, requirements, results, comments and feedback on the earlier draft report, I have made the following findings.

11.1 Findings

A relatively complex event to apply the new rules for the first time

The resumption of flows period during January 2021 in the Barwon–Darling was a relatively complex event to manage as there was rainfall and further inflows (including ungauged inflows) and the presence of active environmental water (AEW) just before, during and after the resumption of flows period.

Therefore, this was a relatively difficult, yet salient, first test of the new rules in the BD WSP 2012, including the circumstances leading up to the January 2021 flows. The CEWO had decided to release some of its allocations in HEW because of the hot and dry November and December 2020 period and concerns about risks to the downstream water-related environment, including water quality risks. Releases of HEW were made from the Border and Gwydir systems with the intent of achieving connectivity into at least the more upstream sections of the Barwon. DPIE-EES did not activate their HEW during the period as the volumes available were relatively small. However, circumstances may be different for future events.

Subsequently, rain was received in the catchments and the environmental water allocations and rainfall-runoff waters mixed. However, this was still not sufficient to avoid the resumption of flows rule trigger at Wilcannia of flows less than 200 ML/day for 90 days.

All of this made flow forecasting by WaterNSW more difficult. The forecast volumes (e.g. 30 GL at Bourke) and daily rates of the flows (e.g. at least 972 ML/day at Bourke for 10 continuous days) were very close to the relaxation threshold values which allow licensed take in the resumption of flows rule after the rule was activated, meaning than flow forecasting and operational decisions were under close scrutiny by all involved during that period.

The changing inflows during and after the resumption of flows period didn't easily allow for later checking of observed flows against previously forecast flows. Significantly larger inflows after the resumption of flows period have further masked evaluations of the benefits of the resumption of flows and the protection of AEW. More data and analyses of that data would have to be made available to properly undertake those assessments. This should occur through the inputs to the annual report for monitoring and evaluation of active management, as required under the procedures manual. DPIE-Water and WaterNSW should also close the communication loop by presenting the findings to the

licence holders and peak stakeholder groups.

Overall, the operational and administrative arrangements worked reasonably well for the first time with new rules

Nevertheless, overall, the operational and administrative arrangements for determining and announcing when licensees could and could not take water, and how much could be taken (or protected from take) in what location/s, over the period 1 December 2020 to 31 March 2021 worked reasonably well, considering the relatively widespread introduction and use for the first time of new rules and the changes that were required. This was a substantial test for not only the agencies directly involved, but also the licensees who had to make decisions based on the new rules, including flow and access announcements, and for stakeholders who have an interest in transparency and credibility in water management, and outcomes from it.

This result was in various ways due to the existence of and adherence to the recently developed Barwon–Darling Active Management Procedures Manual and related guidance documents. The availability of data and information on the WaterNSW Water Insights Portal as a 'single point of information' was also a key initiative, together with the supporting information and communications technology and systems in place. The frequent meetings with engaged Barwon–Darling stakeholders through the BD ROSCCo assisted information sharing and increased understanding.

In addition, a number of lessons for 'event management', including documented agency processes, clear roles and responsibilities, and appropriate avenues for communication were learned from the 'first flush' flows of 2020. It is apparent that the recommendations of the independent report on 'first flush' management are progressively being taken on board.

Treating the resumption of flows event akin to an 'incident' to be managed informs the attention that needs to be given to it and also the need for ready availability of agency staff for timely intelligence gathering, advice, coordination, decision-making and communications. From stakeholders' viewpoints, there is a need for one agency 'point of contact', recognising the roles of DPIE-Water as the policy maker/rule setter and WaterNSW as the operator and rule follower.

Holders of environmental water appreciated the 7-day forecasts being placed on the WaterNSW Water Insights Portal as it assisted them in their management of environmental water allocations. Such management can be technically challenging with the range and extent of environmental water entitlements held in multiple flow classes in multiple locations. This could be augmented by having greater transparency in the listing of volumes of active environmental water in play throughout the river system.

However, several areas of concern for stakeholders emerged and require attention

Despite this, several areas of significant concern for stakeholders have been identified.

Perhaps the biggest call for improvement has been in the measurement, modelling and forecasting of river flows – notably in terms of their accuracy, timeliness and impacts on announcements of access/no access to taking water. Included in this was a call for better information on flows out of Queensland. While stakeholders recognise that a balance must be struck in managing uncertainties in flow forecasts, and that it is impossible to

totally eliminate mismatches between forecast and observed flows, they expressed a strong need for improving information to reduce flow forecasting uncertainty, including by reviewing existing flow and rainfall measurements and loss assumptions and increasing the measurement points for inflow locations and travel times.

Some of these concerns with flow forecasting may be better mitigated if stakeholders had a greater understanding of the modelling framework and approach, assumptions used and their bases and implications. Included in this should be additional information on the evidence for loss calculations and explanations about how and when ongoing loss forecasts are adjusted based on observed unaccounted differences so that mismatches arising from uncertainty in loss forecasts don't compound as an event proceeds.

Another major concern with some licensees has been how IDECs have been determined and apportioned, noting a mismatch in some instances of actual pump capacities and IDECs, and the absence of timely ways to re-apportion or trade IDECs. Advice has been that IDECs were designed to limit extraction during flow events, recognising the potential impacts of licensed take on flows, and were distributed based on the entitlement shares held at the time, not on the maximum capacity that individuals could physically pump. Consequently, some licensees have pump capacities in excess of IDECs causing operational and safety concerns, while others have IDECs in excess of pump capacities, causing equity issues. Commitments by DPIE-Water and WaterNSW to investigate these issues and options to resolve them require attention as a matter of priority.

While active management may have general support as a concept, there were major concerns from irrigators that announcements of available water for extraction were too conservative, with unfair and significant adverse impacts on their access and businesses at a critical stage of the cropping cycle. This support, therefore, would be further enhanced with better and more accurate flow forecasting and clearer identification of and accounting for environmental water volumes in and through the river system. There is no support from irrigators or others to access water below trigger thresholds to 'catch up' on access foregone through earlier conservative forecasts. The language used in the Active Management Policy and the procedures manual about the use (or not) of conservative approaches also needs to be reconciled and better explained.

Inequities in access opportunities at different locations up and down the river system, both within the Barwon–Darling itself and upstream and downstream of it, especially around the time slightly before, during and slightly after a resumption of flows period is activated, were also raised. Examples cited included that some water users in the same licence class apparently had opportunities to take water in certain locations, while those in other areas considered they 'should' have had access to water but didn't.

A number of points of clarification of the rules emerged during the period, though some remain contested and/or misunderstood. These include:

- whether and how AEW is accounted for and included/not included in target/trigger flows and volumes
- the timing with respect to trigger volumes (including the 'start' day for accounting for the volume/s to enable relaxation of the resumption of flows rule and the 'start day' for the next resumption of flows period), and
- what constitutes an 'event', especially for the 30 GL at Bourke relaxation of the resumption of flows rule.

How these are defined has implications for evaluation of the effectiveness of the rules against the objectives of the BD WSP 2012 and are matters for consideration for the review/remake of the BD WSP in 2023.

Adequate resourcing of the 'event management team' over the challenging summer period (including Christmas, early New Year and leave periods) places pressures on available staff and stakeholders too who may be looking for information or explanations that impact their businesses. Where a resumption of flows event may be imminent, it would be helpful for agencies to treat it as akin to an 'incident' and have resourcing and other management protocols in place accordingly.

Operational improvements and the water reform journey need to continue

Compliance checking and the measurement of actual take will be further improved with the roll-out of improved metering systems and more reliable technology in the future, so the efforts to improve the metering and reporting of take need to continue. This will also assist improved flow forecasting.

Requirements persist to increase people's understanding of how water management in the Barwon–Darling 'works' and to increase knowledge exchange between and among stakeholders and agencies about water management and use. Efforts over the recent period have helped and are generally in the right direction, despite the relative technical complexity of the rules and the procedures to implement them.

An increasing scarcity of the available water resource generally means that more precise management will be needed, and it is important for that management to be transparent and open to continuous improvement. This includes ensuring implementation of resumption of flows rules and active management continuously improves and is responsive to improved information, insights, infrastructure, tools and systems, including giving effect, and being seen to give effect, to recommendations arising from reviews of their implementation.

First Nations people were not actively engaged in or informed about the management of the flows over the period and so opportunities for positive cultural outcomes and other important factors were likely missed. Continuing reforms and efforts are needed to develop and support meaningful ongoing relationships with First Nations people and to recognise that appropriate engagement and involvement of First Nations people are fundamental.

During this assessment, comments have been made that the rules in the Barwon–Darling and likely upstream water sharing plans do not adequately provide for their own objectives, nor for important matters like connectivity through the river system. While this assessment is about the implementation of the rules, rather than the rules themselves, these comments have been captured at the end of this report so that they may provide a record for future reviews/remaking of respective water sharing plans including the Barwon–Darling.

11.2 Recommendations

Based on the above findings, the following recommendations are proposed (with the lead agency shown in brackets).

Operational improvements

Use the results from this review and others to upgrade and fill gaps in the real-time or near-real-time flow measurement network withing the Barwon–Darling itself and the upstream inflowing tributaries, including those in Queensland (with cooperation from Queensland), to assist and improve flow forecasting (WaterNSW).

Use the results from the recent flow events and others to improve flow forecasting modelling, including allowances for initial and continuing losses and travel times through the river system (WaterNSW).

Further investigate and describe operational arrangements to manage forecast and observed flows mismatches during an event and add these to a revised Active Management Procedures Manual as part of the adaptive management approach (initially WaterNSW, then DPIE-Water).

Investigate procedures and systems required to enable sub-daily flow and access announcements, particularly in cases where relative changes in daily inflows would be important to operations and management responses, for practicality and cost/benefit, and amend the procedures manual accordingly (initially WaterNSW, then DPIE-Water).

Undertake a review and checking of the data used to determine initial IDECs and make amendments to any incorrectly derived IDECs accordingly and/or consider options to distribute IDECs with less adverse impacts on particular licensees while maintaining the overall intent of the policy and the new rules (DPIE-Water).

Develop policies, procedures and systems to enable short-term and timely trading of IDECs without adverse impacts to third parties or the environment (initially DPIE-Water, then WaterNSW).

Documentation

Update the January 2021 resumption of flows report with any additional data and information now available, especially with respect to forecast and observed flows, volumes and rates of AEW in the system, and water balances (e.g. inflows, outflows, volumes of take, volumes protected, losses) just before, during and after the resumptions of flows period, and make it publicly available (WaterNSW).

Amend the procedures manual so that a report is to be produced and made publicly available after every resumption of flows period (i.e. don't wait until the annual report on active management before summary information about a resumption of flows period is available) (DPIE-Water).

Publish remaining documents as required under the Active Management Procedures Manual (WaterNSW). These include requirements to:

- document procedures to forecast flow within the tributaries for both total daily inflows and the proportion of AEW

- document procedures for forecasting flows in the Barwon–Darling and place it on the website
- document the method for determining "initial" river transmission losses and make it public
- provide details of how to submit an EoI on the website
- document adjustments for mismatches and reasons for them
- document water allocation account debiting procedures
- record, archive and make available data used in active management
- document the forecasting and accounting of river flows, river losses, AEW, licensed water use, management responses and recommendations.

Update the procedures manual and all relevant fact sheets based on clarifications provided during the management of the recent events, including the resumption of flows period, this review and the annual review and close the communication loop by presenting the findings to the licence holders and peak stakeholder groups (DPIE-Water).

Reconcile the language used under Procedure 11 of the procedures manual (e.g. on page 19 of the procedures manual, it states that '*Flow advice will be based on:*

- *conservative estimates of inflows and river transmission losses that are at the upper end of what could be expected to be consistent with similar past events, and*
- *the maximum volume of unregulated water likely to be extracted or protected taking into account the current EoI numbers and likely water available*.')

with the language used in the Active Management Policy (e.g. on page 21 of the policy, it states that '*An initial conservative access announcement that provides a higher CtP threshold or lower volume of water available to licence holders until river losses are better understood will not be used because it has potential to affect the reliability of access for unregulated river access licence holders. Announcements are made based on the best available information at the time*.') (DPIE-Water).

Publish the results of investigations and compliance activities undertaken relevant to the recent events, especially those just before, during and shortly after the resumption of flows period (NRAR).

Communications and engagement

Undertake all of the recommended operational improvements in consultation with stakeholders (WaterNSW and DPIE-Water).

Work with stakeholders to co-develop and deliver an information and education program about the flow modelling and flow forecasting procedures (WaterNSW).

Work with stakeholders to co-develop and deliver a program that takes people through the operations used during the recent events, including the resumption of flows period, to increase stakeholder understanding, better identify implications for stakeholders and agencies and agree opportunities for improvement, building on an updated resumption of flows report and materials being prepared for the annual review of the procedures manual (WaterNSW and DPIE-Water).

Progress conversations with First Nations people in relation to information needs and engagement protocols, as well as values, uses and objectives for water, including those impacted by resumption of flows and active management. It is important that this work is progressed in a culturally appropriate way, including respecting the need to take adequate time for effective knowledge exchange. Consideration could be given to using/adapting the approaches being adopted for the Wilcannia Weir Project to inform better ways to undertake meaningful conversations about management of flows. Consideration should also be given to notification of and engagement with the Barkandji Native Title Group concerning relevant pending flow events (WaterNSW and DPIE-Water).

Form a multi-stakeholder Environmental Water Advisory Group (EWAG) for the Barwon–Darling to bring together a range of knowledge and experience from all sectors and relevant geographical locations to specifically advise on both planned and held environmental water from policy, planning and operational perspectives and to provide further opportunities for information exchange and co-learning (DPIE-EES). (In making this recommendation, it is recognised that, at the moment, there are no decisions for the NSW Minister to make regarding held environmental water management directly under the provisions of the BD WSP 2012. Unlike other WSP areas with EWAGs, the environmental water in the Barwon–Darling is currently exclusively held by the CEWO, and currently there is no planned discretionary environmental water. DPIE-EES can choose to create an EWAG for the Barwon-Darling, recognising it would have an advisory role only. Alternatively, the CEWO could establish its own EWAG style forum for the Barwon–Darling.)

Water reform rollout

Continue the rollout of the reforms for non-urban water metering and telemetry, not only for reasons of achieving better water management generally, but also because they will help improve management of future resumption of flows and active management events. Communicating progress of the reform agenda will also help to keep water users and the community informed, with a view to building understanding and trust (DPIE-Water).

Consider the comments about policy and planning matters made during this assessment (and captured in summary form in Appendix 6 of this final report) in future reviews of water sharing plans and the rules within them (DPIE-Water).

12 REFERENCES

Active Management in Unregulated Rivers Policy - Protecting environmental water from extraction in New South Wales, February 2021, NSW Department of Planning, Industry and Environment

Active Management Procedures Manual for the Barwon–Darling Unregulated Rivers Water Source, November 2020, NSW Department of Planning, Industry and Environment, Department reference number: INT20/32976

Barwon-Darling Flow 2021 –Update #1, May 2021, Commonwealth Environmental Water Office

Barwon-Darling: how to comply with new rules - How to comply with new water sharing

plan rules in the Barwon-Darling, Fact sheet 6, NSW Department of Planning, Industry and Environment, Department reference number: INT20/57053

Barwon-Darling Watercourse Water Resource Plan – Active Management, Fact sheet, September 2019, NSW Department of Planning, Industry and Environment, Department reference number PUB19/427

Commonwealth Environmental Water Office Water Management Plan 2020-21, Chapter3.7, Barwon-Darling River, Commonwealth of Australia, 2020

Final Report - Independent Panel Assessment of the Management of the 2020 Northern Basin First Flush Event, September 2020, NSW Department of Planning, Industry and Environment

Individual Daily Extraction Components - Implementation of Individual Daily Extraction Components (IDECs) in the Barwon-Darling unregulated river water sharing plan, Fact sheet 10, NSW Department of Planning, Industry and Environment, Department reference number PUB21/309

Lodge an expression of interest (EOI) for active management, WaterNSW website

New rules to manage water for the environment –rule summary, Fact sheet 8, NSW Department of Planning, Industry and Environment, Department reference number PUB21/313

Northern Waterhole Top-Up – Flow Updates 1 (22 December 2020), 2 (05 January 2021), 3 (21 January 2021) and 4 (12 February 2021) – Commonwealth Environmental Water Office

Resumption of flows rule in the Barwon– Darling Unregulated River Water Source, Fact sheet, March 2021, NSW Department of Planning, Industry and Environment

Water Sharing Plan for the Barwon-Darling Unregulated River Water Source 2012 [NSW], NSW Department of Planning, Industry and Environment

What's new in the Barwon-Darling - New water sharing plan rules in the Barwon-Darling, Fact sheet 3, NSW Department of Planning, Industry and Environment, Department reference number INT20/68059

APPENDIX 1 – LIST OF PROCEDURES IN THE BARWON-DARLING ACTIVE MANAGEMENT PROCEDURES MANUAL

Forecasting flows and river transmission losses

- Procedure 1 – Forecasting flows from upstream gauged tributaries
- Procedure 2 – Forecasting flows from upstream ungauged tributaries
- Procedure 3 – Forecasting flows along the Barwon–Darling River
- Procedure 4 – Forecasting river transmission losses

Identifying, determining and monitoring active environmental water

- Procedure 5 – Identifying active environmental water
- Procedure 6 – Determining the rate of active environmental water arising from HEW flowing from a water source that is upstream of the Barwon–Darling Unregulated River Water Source (Categories A to E)
- Procedure 7 – Determining the rate of active environmental water arising from a licence holder's notification to the Minister of their intention to protect the water from extraction under clause 43 of the Barwon–Darling WSP (Category F)
- Procedure 8 – Determining the rate of active environmental water flowing into a management zone
- Procedure 9 – Determining the rate of active environmental water flowing out of the Barwon–Darling Unregulated River Water Source
- Procedure 10 – Determining the rate of active environmental water used in-stream for environmental purposes (assigning losses to active environmental water)

Issuing flow advice

- Procedure 11 – Issuing flow advice

Expressions of interest

- Procedure 12 – Establishing an expression of interest process under clause 42A (2)
- Procedure 13 – Requirements for licence holders to lodge an expression of interest under clause 46 (1)
- Procedure 14 – Requirements for licence holders intending to protect water from extraction by lodging a notification under clause 43

Adjusting access thresholds

- Procedure 15 – Determining adjusted flow class thresholds under clause 49A (4) and adjusted access rules for licences listed in schedules 2 and 2A under clause 47 (4)

Determining the water available and maximum volume permitted to be taken

- Procedure 16 – Determining the water available to each flow class
- Procedure 17 – Determining which licence holders are eligible for a share of the water available

Procedure 18 – Adjusting for mismatches in the water available

Procedure 19 – Determining if a flow share announcement under clause 42A (3) is required

Procedure 20 – Determining the maximum volume permitted to be taken under clause 42A (3)

Determining the flow class

Procedure 21 – Determining if a No Flow Class is to be announced under clause 50 to protect the resumption of flows after an extended dry period

Procedure 22 – Determining the flow class

Access announcements

Procedure 23 – Announcing adjusted access rules for licences listed under schedules 2 and 2A

Procedure 24 – Announcing flow classes)

Procedure 25 – Announcing the maximum daily volume of water that is permitted to be taken (otherwise called a flow share announcement) under clause 42A (3)

Monitoring the intended sharing of river flows

Procedure 26 – Monitoring mismatches between forecast and observed flows and intended sharing of flow

Debiting water allocations accounts

Procedure 27 – Determining the amount to be debited from access licence water allocation accounts under clause 43 (when unregulated water has been identified as active environmental water)

Procedure 28 – Debiting unregulated water allocation accounts when water is extracted

Monitoring, evaluation, reporting and improvement

Procedure 29 – Data capture, archiving and record-keeping requirements

Procedure 30 – Annual reporting requirements

Procedure 31 – Annual evaluation and review of active management

Procedure 32 – Amendments to the manual

APPENDIX 2 – PROCEDURES TO BE UNDERTAKEN ON A DAILY BASIS UNDER THE BARWON-DARLING ACTIVE MANAGEMENT PROCEDURES MANUAL AND THEIR PURPOSE

Procedure	**Purpose of procedure**
Forecast flows in upstream tributaries and along the Barwon–Darling Procedure 1 – Forecasting flows from upstream gauged tributaries	To determine for each management zone a) total flows b) AEW entering the zone, leaving the zone, and contributing environmental purposes in each management zone (that is, the volume of AEW that seeped into the riverbed and banks, evaporated or was taken up by vegetation), and c) water available
Issue flow advice Procedure 11	To inform water users and the public on likely flows along the river, potential for AEW to be in the river, the likelihood of access and progress of river flows
Invite unregulated access licence holders to lodge an EoI Procedure 12 – Procedure 14	To establish who wants to receive a share of the water available to either extract or protect In submitting an EoI to protect water, a licence holder is notifying the Minister under BD WSP 20102 clause 43 of their intent to protect water
Determine the volume of AEW entering each management zone Procedure 5 – Identifying AEW Procedure 10 – Determining the rate of AEW used instream for environmental purposes (assigning losses to AEW)	To determine the amount necessary to adjust flow class thresholds and access rules for Schedule 2 and 2A licences under the BD WSP 2012 to protect AEW and water below the base flow class thresholds
Determine the water available for unregulated river access licences Procedure 16 – Determining the water available to each flow class	To determine whether the water available must be shared between licence holders who have expressed an interest to protect the AEW and flows below the flow class thresholds
Determine the maximum volume permitted to be extracted on a given day (ML/daily flow shares) Procedure 20 – Determining the maximum volume permitted to be taken under clause 42A (3) of the BD WSP 2012	To distribute the water available between licence holders who have expressed an interest when the water available is not enough for all licences to extract a 1 ML/daily flow share

Announce flow classes, access conditions for schedules 2 and 2A licences and, if necessary, volumetric limits (flow shares) Procedure 23 – Announcing adjusted access rules for licences listed under schedules 2 and 2A Procedure 25 – Announcing the maximum daily volume of water that is permitted to be taken (otherwise called a flow share announcement) under clause 42A (3)	To inform licence holders whether they can take water and, if necessary, the maximum volume they can take on any given day
Determine the volume of AEW arising from a notification by an unregulated licence holder to protect water from extraction (under clause 43 of the BD WSP 2012) Procedure 27 – Determining the amount to be debited from access licence water allocation accounts under clause 43 (when unregulated water has been identified as AEW)	To determine the volume of additional AEW that flows into the next management zone and the volume of water that is to be debited from the water allocation accounts of the licence holder who wanted water protected from extraction
Assign losses to the AEW at the end of the management zone Procedure 10 – Determining the rate of AEW used in-stream for environmental purposes (assigning losses to AEW)	To determine the volume of AEW entering the management zone that reaches the next management zone or water source
Assess cumulative mismatches between forecast losses and actual unaccounted differences during a flow event Procedure 26 – Monitoring mismatches between forecast and observed flows and intended sharing of flow	To determine if an operational response is required to more closely achieve the desired sharing between AEW and unregulated river access licences
Data capture, archiving and accessibility Procedure 29 – Data capture, archiving and record-keeping requirements	To support reporting, adaptive management and compliance monitoring and enforcement

APPENDIX 3 - RESPONSIBILITIES AND ACCOUNTABILITIES FOR IMPLEMENTING ACTIVE MANAGEMENT UNDER THE BARWON–DARLING ACTIVE MANAGEMENT PROCEDURES MANUAL

Organisation	Responsibilities
DPIE – Water	Prepare, review and amend the Active Management Policy and regulatory framework where required following the annual review process Evaluate and recommend changes to water sharing rules to support active management On behalf of the Minister: • prepare and publish the manual under clause 52A, and • amend the manual as necessary following the annual review and publish revisions Annually review and evaluate the implementation of the manual against the objectives and principles of the policy Consult with WaterNSW, DPIE-EES, NRAR and the MDBA when conducting each annual review Consult with licence holders and peak stakeholder groups when conducting each annual review Consult with licence holders and peak stakeholder groups following any determination to vary the operation of active management including the policy, regulatory framework and the manual Draft and impose mandatory conditions to effect water sharing rules relevant to active management
WaterNSW	Forecast river flows Maintain flow forecasting tools Keep an account of AEW through each management zone Issue flow advice for water users and the public On behalf of Minister: • announce the maximum volume of water that can be taken under clause 42A (3), adjustments to access rules for schedules 2 and 2A licences under clause 47 (4) and flow classes under clause 49A (4) of the BD WSP 2012 • invite interested parties to lodge an EoI to take water from relevant access licence holders under clause 42A (2) • receive notifications from licence holders who want to protect water otherwise permitted to be taken under clause 43, and • announce a No Flow Class under clause 50 when access is to be restricted to protect the resumption of flow after an

	extended dry period and determine relaxation triggers that are likely to be met if a No Flow Class ceases to apply Establish and operate systems to enable EoI lodgement and analysis of EoIs Provide operational reporting on active management, including regular environmental water use accounting during events Provide access to data to NRAR to enable compliance monitoring and enforcement with active management Submit an Annual River Operations Report on the management of access to water to protect AEW Consult with unregulated river access licence holders or their representative groups prior to submitting the Annual River Operations Report Contribute to the annual review of the manual Contribute to the review of the Active Management Policy
DPIE-EES	Work collaboratively with other environmental water holders (that is, the CEWO) in the planning and coordinated use of HEW to improve flows in the Barwon–Darling River Work collaboratively with WaterNSW when planning and using HEW to improve flows in the Barwon–Darling River Submit an annual active management statement to DPIE-Water Contribute to the annual review of the manual Contribute to the review of the Active Management Policy
NRAR	Monitor compliance with water sharing rules and licence conditions Undertake inspections to ensure water use is occurring in accordance with announcements by applying risk-based strategies, policies and procedures Conduct compliance investigations and take enforcement actions where appropriate Submit an annual active management statement to DPIE-Water Contribute to the annual review of the manual Contribute to the review of the Active Management Policy

APPENDIX 4 – EXTRACT FROM THE WATERNSW REGIONAL UPDATE FOR THE WEEK ENDING 12 JANUARY 2021

6.4 Barwon-Darling River system

River flow status

River system is currently flowing from Mungindi to Louth. Flow first arrived from Thalaba Creek upstream of Walgett on 26 December 2020 and further inflow arrived later from Namoi, Moonie, Border, Gwydir and Culgoa. Local rainfall also contributed to this event. Further inflow is expected from the Castlereagh/Macquarie, Namoi, Gwydir and Border Rivers. A significant part of Border and Gwydir inflow is active environmental water.

Based on current forecast, water is likely to reach Wilcannia, but no significant inflow is expected to reach Menindee lakes.

Environmental water operations

Environmental water delivery is currently in progress. Around 2.9GL will be delivered at Mungindi from the Border Rivers and 5.1GL at Galloway from the Gwydir system. Some of this water is already arriving in the Barwon Darling system. Planned Environmental Water (PEW) is water in the system that is below the Commence to Pump conditions for access licences.

From 9am 12th January 2021, access will not be available in all Management Zones because of the activation of the Resumption of Flow rule.

Barwon Darling full Active management has commenced. First announcement for 1 December 2020 has been published on Water Insights Portal on 30 November2020. The flow class announcements indicate the amount of Active Environmental Water at each location.

Water availability

The latest WAS, published by DPIE-Water (dated 1 July 2020) confirmed 100 percent allocation for all licence classes in the Barwon Darling Unregulated River water source. According to the amended WAS, published 1 July 2020, flow class announcements will be made every day when the flow class availability is A class or above. Please refer to the Water Insights Portal for recent flow class announcements.

From 9am 12th January 2021, access will not be available in all Management Zones because of the activation of the Resumption of Flow rule. Access will not be available until the conditions enabling the relaxation of the Resumption of Flow rule have been met.

Drought operation measures

The Barwon Darling unregulated river water source is assessed to be in Drought Stage 2.

APPENDIX 5 – EXTRACT FROM THE WATERNSW REGIONAL UPDATE FOR THE WEEK ENDING 25 JANUARY 2021

6.4 Barwon-Darling River system

River flow status

River system is currently flowing from Mungindi to Tilpa. Flow first arrived from Thalaba Creek upstream of Walgett on 26 December 2020 and further inflow arrived later from Namoi, Moonie, Border, Gwydir and Culgoa. Local rainfall also contributed to this event. A significant part of Border and Gwydir inflow is active environmental water. While inflows from Border, Namoi and Gwydir is continuing at lower rates, additional inflow has arrived from the Castlereagh and Moonie Rivers. Due to additional inflow from the Castlereagh River, water is now expected to reach Menindee Lakes.

Based on current forecast, around 13 GL is expected at Wilcannia. Around 5 GL is forecast to reach Lake Wetherell from this event.

Environmental water operations

Environmental water delivery is currently in progress. Around 2.9GL at Mungindi from the Border Rivers and 5.1GL at Galloway from Gwydir system was ordered. Most of that water is now in the Barwon-Darling system. Planned Environmental Water (PEW) is water in the system that is below the Commence to Pump conditions for access licences.

From 9am 12th January 2021 to 24 January, access was not be available in all Management Zones because of the activation of the Resumption of Flow rule.

Barwon Darling full Active management has commenced. The flow class announcements indicate the amount of Active Environmental Water at each location.

Water Availability

The latest WAS, published by DPIE-Water (dated 1 July 2020) confirmed 100 percent allocation for all licence classes in the Barwon Darling Unregulated River water source. According to the amended WAS, published 1 July 2020, flow class announcements will be made every day when the flow class availability is A class or above. Please refer to the Water Insights Portal for recent flow class announcements.

From 9am 12th January 2021, access was not available in all Management Zones because of the activation of the Resumption of Flow rule. The Resumption of Flow rule is relaxed from 9:00AM 24 January 2021 which is currently allowing limited access to A-Class only. The relaxation of the Resumption of Flow rule is based on the current forecast exceeding the flow requirements under the Water Sharing Plan.

Drought operation measures

The Barwon Darling unregulated river water source is assessed to be in Drought Stage 2.

APPENDIX 6 – COMMENTS ABOUT THE RULES IN THE BD WSP 2012 (I.E. THE RULES THEMSELVES RATHER THAN THEIR IMPLEMENTATION)

A number of comments were received about the resumption of flows rule, particularly with respect to the 30 GL volume at Bourke and 400 ML/day for 10 days at Wilcannia not being sufficient to ensure connectivity to Menindee Lakes (nor the Lower Darling). This will be a matter for the review/remake of the BD WSP in 2023 and consideration of the evidence to underpin those numbers. A related matter would be how to consider flow volumes, if any, in the system at Bourke (for example) for the period immediately before the resumption of flows rule is triggered – those volumes are not considered in the accounting under the current rule. If they were, presumably the volume figure would need to change.

Another related matter is to consider and more clearly explain how or if HEW is protected and is 'over and above' PEW if a volume of HEW contributes to the relaxing of the resumption of flows rule and enables licensed take to resume. This was reported as a major issue of discussion among stakeholders during the resumption of flows period and has implications for the value and use of HEW, including leading up to and during resumption of flows events.

There were a few comments about the use of flow forecasts to inform relaxation of the resumption of flows rule with suggestions that what constitutes a forecast and what constitutes official notification of a forecast could be clarified in the BD WSP and/or the procedures manual. In addition, it was noted that there is nothing in the rule or the procedures which clearly says what happens if a forecast is made and relaxation of the rule happens based on that forecast, but the actual downstream flows don't reach the forecast (or the trigger for the relaxation).

Another matter raised for the next water sharing plans in the Barwon–Darling and the tributaries upstream in the Northern Murray–Darling Basin was how does the resumption of flows rule integrate with other rules in other water sharing plans to promote connectivity through the river system? This is also an issue for Lower Darling stakeholders, especially when Menindee Lakes are dry. There were suggestions that what are needed are storage targets at Menindee, complimented with flow targets upstream throughout the Barwon–Darling and all Northern Basin tributaries. These need to contribute to connectivity throughout the river system, while being reflective of and responsive to the ephemeral and intermittent flow nature of the rivers in the Northern Basin.

Some stakeholders raised issues of equity of access to flows up and down the river system, including during times when active management is in play, or when a resumption of flows rule is triggered in one location but not another location upstream. They stated that this matter needs to be handled better in future water sharing plans.

Another comment was that future water sharing plans should better recognise the need for water quality targets and thresholds with flow rules to enable better management of water quality in the river system and weir pools.

Equity and environmental concerns were also raised that, under the current rules, after AEW gets to Menindee Lakes, it is no longer protected, but rather is 'socialised' and may be reallocated to consumptive use.