

# Submission on preliminary Western Regional Water Strategy Flow Target Implementation Options

20 December 2021

## About the Commonwealth Environmental Water Holder

The Commonwealth Environmental Water Holder (CEWH) is a statutory position established under the Water Act 2007 (Cth). The Water Act gives effect to relevant international agreements on the environment, including the Ramsar Convention for wetlands of international significance, and conventions that protect endangered and migratory species. The CEWH is responsible for managing the Commonwealth holdings of environmental water to protect and restore the environmental assets of Murray-Darling Basin including rivers, lakes, wetlands and floodplains, in the national interest. The CEWH's function is a part of the sustainable management of the Basin's water resources over the long-term for environmental, social, cultural, and economic outcomes. The CEWH is supported by the Commonwealth Environmental Water Office (CEWO).

The CEWO appreciates the opportunity to provide feedback on the options for improving connectivity as presented over three meetings to the Connectivity Stakeholder Reference Group, in relation to the draft Western Regional Water Strategy being prepared by NSW. The CEWO recognises the significance of these regional water strategies in planning for, and balancing, the demands on river systems across NSW for future decades. The options presented to the Group, if implemented consistent with the priorities under the *Water Management Act 2000* and closely aligned to ecological outcomes, would represent a critically important step towards restoring connectivity to the rivers of the northern NSW Murray-Darling Basin.

Given the CEWO's interest and expertise across the Basin and the statutory responsibilities of the CEWH, we would appreciate the opportunity to be involved in future discussions to help test and refine the regional water strategies and any projects or programs that may arise from them. We note that the Connectivity Reference Group has not until now involved any other government representatives with an environmental or fisheries focus. We would welcome opportunities for further discussion with these and other stakeholders prior to completion of the Western Regional Water Strategies public consultation process.

## Connectivity

The CEWO considers multidimensional aspects of connectivity in our activities. These support how the flow, exchange and pathways that move organisms, energy, water and other materials throughout hydrologically interconnected systems. These interactions create complex, interdependent processes that vary over time, with different aspects varying in significance for various environmental outcomes. Management strategies prioritising connectivity are viewed through the lenses of:

- longitudinal – linear connectivity
- lateral – floodplain connectivity
- vertical – hyporheic (groundwater surface water interactions)
- temporal – time scales: seasonal, multiyear, generational.

The connectivity priorities in the northern Basin as set out in the Basin-wide environmental watering strategy are to:

- Provide water to areas suffering from extended cease to flow conditions, to connect and replenish drought refuge water holes and build ecosystem resilience.
- Support connectivity between the northern and southern Basin with flows in the lower Darling (Baaka).
- Enhance variability of flows to meet the needs of plants and animals in rivers, with focus areas of this priority to:
  - increase the frequency of flow types necessary to support native fish populations (e.g. base flows, freshes, bankfull and overbank flows)
  - protect natural recruitment flows to boost native fish populations
  - increase flow connections between the Barwon–Darling and its tributaries.

Connectivity should be considered across multiple regional water strategies in the northern basin. The CEWO supports efforts to align water sharing plan rules to achieve connectivity outcomes for the northern NSW Murray-Darling Basin. This will mean that water management agencies, including the CEWO, will be able to achieve more effective water resource management outcomes.

#### Principles for achieving river connectivity.

Improving river connectivity within the Barwon-Darling, between tributaries, and between the Barwon-Darling and Lower Darling, is important for achieving environmental outcomes. Water resource development and changing rainfall and inflow patterns have already impacted connectivity between these river systems. However, under future climate predictions, reduced water availability and inflows may exacerbate reductions in connectivity.

While it is not possible nor desirable to fully recreate historical natural conditions, we need to understand the interconnected ecological processes that are required for a healthy and resilient river, and support them where possible. For instance, the contribution of each tributary should have some proportionality to the natural distribution, and there should be enough flow in the Barwon-Darling and Lower Darling with an appropriate temporal distribution.

There will be no single mechanism that can solve the challenges of connectivity in the Northern Basin. Rather, we need a ‘toolbox’ approach that allows the optimised, harmonious use of planned environmental water, held environmental water and water management rules to deliver environmental and community connectivity outcomes. The principles governing the development and use of any mechanisms are that they should be:

- connected to environmental, cultural and community outcomes with best available information
- demonstrably hydrologically effective
- consistently, equitably and transparently applied to allow greater stakeholder confidence
- operationally practical and cost-effective
- investigated for secondary impacts using the priorities set out in the Water Management Act – i.e. water released or protected from extraction to meet downstream critical needs should be protected from extraction throughout the system and not used to increase access for other entitlement holders

- part of an adaptive management cycle where they are rigorously monitored, reported, and reviewed.

## Targets

Environmental flow targets and associated rule triggers that are based on good science and have clear, achievable water management pathways are an important step towards restoring the patterns of connectivity necessary for maintaining and improving river system health. Flow targets are reasonable surrogate outcomes provided they are closely related to environmental requirements through robust scientific study and ongoing environmental monitoring. To this end, targets should be linked to the best contemporary information available, and consideration should be given to alignment with best available evidence generally:

- Targets should align with long term watering plans, flow ranges and their associated objectives, and consistently apply targets for a specific purpose across management zones.
- Clear documentation and communication of peer-reviewed scientific literature upon which the targets are based should be referenced and available to the public.
- Targets should be subject to revision on a timely basis with new scientific developments and ongoing monitoring of key outcomes e.g. algal suppression.

The following section of the submission provides more specific comments on two of the target-based options presented:

1. Critical human and environmental needs dry conditions triggers (including the Menindee Lakes storage target); and
2. North West Flow Plan.

The CEWO then provides comments on other options presented more briefly to the Group, followed by some final remarks.

### 3. Critical Human and Environmental Needs Dry Condition Triggers

The CEWO is supportive of targets for the provision of water to high priority needs under the *Water Management Act 2000*. We believe the critical environmental triggers that take into consideration dissolved oxygen and algal concentration are based on the best available information and look forward to the evidence of this being publicised and clearly explained in relation to the triggers as part of the public consultation.

We also look forward to the results of modelling of a package of management options designed to meet and maintain these needs across the NSW portion of the northern Murray-Darling Basin, in particular the Menindee Lakes target.

## Principles

We support the general principles of simplicity and equity: opportunities to (i) simplify the ruleset; and (ii) consistently apply restrictions across equivalent licence types throughout the connected northern river system.

Where one rule could achieve near equivalent outcomes compared to multiple rules, this ought to be prioritised. This would assist with general understanding, reduced risks of unintended interactions with other rules, and simpler enforcement of compliance. However, the CEWO recognises that multiple rules may be required to achieve a range of ecological outcomes. In developing an appropriate ruleset, the interaction of rules across the full range of flows should be considered. This includes linking the size, duration and timing of flows to their intended ecological outcome (e.g. riparian targets, LTWP baseflow, A Class thresholds).

When restrictions on extraction are being applied during a severe water shortage, there should be equity between equivalent priorities of use in connected river systems. Under normal operating conditions, the *Water Management Act 2000*<sup>i</sup> (sections 5(3) and 9(1)) prioritises water for the riverine environment and basic landholder rights. During a severe water shortage and for the purposes of distributing allocations, critical human needs are prioritised, followed by the needs of the environment (sections 49A and 60(3)). In the northern Murray Darling Basin for example, if water levels fall below a Menindee Lakes storage target, this could be an appropriate measure of a severe water shortage. In those circumstances, the priorities under the Act ought to be applied consistently to the restrictions on use of connected river systems upstream.

The CEWO favours predictable, permanent solutions over temporary restrictions or interim measures, acknowledging the framework should be adaptive and flexible when better information emerges. However, the CEWO cautions against adopting the following principle, which was attempted during the 2020 first flush event: “If the nearest downstream targets are met or forecast to be met and the event will not meaningfully contribute to meeting any further downstream targets.” This is a very difficult principle to apply in practice, will create uncertainty for all water users, and is likely to be contested following each event. Alternatives to this should be explored that can achieve the critical needs downstream, provide improved certainty, while also recognising the importance of local considerations. The CEWO would welcome the opportunity to explore these principles further.

### 4. North West Flow Plan

DPIE Water has requested feedback on the suitability of targets specified under the North West Flow Plan (NWFP) (1992), or similar mechanisms and targets that achieve the objectives set out in the Plan. As an early response to the impact of development (through dams, weirs and diversions through the northern basin), the North West Flow Plan was released in 1992 (NSW, 2012). This plan coincided with the massive algal bloom in the Barwon-Darling in the summer of 1991 which covered over 1,000 km of the river (Donnelly et al. 1997). The primary objective of the interim plan was to better manage unregulated flows to provide water quality and fish passage outcomes for the Barwon-Darling (NSW, 2012). The interim plan established: target flows at key locations along the Barwon-Darling, priorities for river health and riparian flows, and a framework for sharing unregulated flows between irrigators.

## **Riparian Targets**

The defined outcome in the current long term watering plan (LTWP), which is equivalent to the goal of riparian targets defined in the NWFP, is:

*Maintain non-woody vegetation communities occurring within channels* (NV1) - Maintain the extent and viability of non-woody vegetation communities occurring within channels, and increase the cover of non-woody, inundation-dependent vegetation within or closely fringing river channels following inundation events

CEWO is supportive of continuing to prioritise this outcome. NV1 is associated with Baseflow and Small Fresh conditions in the LTWP. NWFP defined riparian targets range from Small Fresh in the top of the system (Mungindi and Collarenebri), through Baseflow level equivalents (Walgett and Brewarrina) to Very low flow equivalents (Bourke to Wilcannia). The targets should align with at least low Baseflow ranges to maintain non-woody vegetation. As channel fringing woody riparian vegetation is typically only served by Large Fresh flow ranges, we consider these to not be the focus of the NWFP riparian targets.

We acknowledge that there is no duration or seasonality specified for the riparian targets, and so it is assumed they are a fixed flow requirement, and any mechanism or combination of mechanisms should aim to deliver on the targets at all times unless other evidence can be cited.

## **Algal Suppression**

The NWFP algal suppression target was based on the best available science at time of publication<sup>ii</sup>, and has now been superseded by a new proposed flow rate and corresponding triggers.

The CEWO is supportive of the revised 3,000ML/day target, based on more recent work done by Simon Mitrovic et al (2011)<sup>iii</sup> in the Lower Darling, which is the flow required for 7 days to breakup and disperse an established algal bloom. We note that 3,000 ML/day was also used as the peak flow to design the hydrograph to successfully resume flow from Menindee Lakes to the lower Darling in 2020.

The CEWO is also supportive of the proposed restriction triggers, based on the earlier work by Mitrovic et al (2006)<sup>iv</sup> which has identified critical velocities and discharges required to mix the water column within weir pools to prevent stratification and suppress blooms from forming at Brewarrina (510 ML/d), Bourke (450 ML/d) and ecological needs of low flows in the Barwon-Darling, Wilcannia (350 ML/d). It is estimated that it takes 12 days with flows below this threshold for weir pools to stratify, so taking into consideration the system travel times it is appropriate that there is no specified duration that flows must be below the threshold for restrictions to be triggered. The CEWO notes that the triggers are generally below baseflow ranges specified in the LTWP that are associated with the objectives of providing a depth of 0.3 m to allow fish passage, and to manage water quality, prevent destratification and reduce the risk of blue green algal blooms. They are also below A class thresholds.

## Fish Flow

The CEWO is in favour of fish targets that support a flow regime for the recruitment, productivity and dispersal of fish populations. These outcomes are crucial for the Barwon-Darling, but also in the case of species like Golden Perch, imperative for maintaining the survival of the species throughout the Basin. These targets cannot be met consistently by relying on held environmental water alone.

Functioning fish passage is essential to the health of a river. Biological connectivity between river reaches and with Menindee Lakes and the Lower Darling and Murray River during critical spawning and migration periods will support native fish outcomes and contribute to improved outcomes in the Barwon–Darling and northern basin catchments. Maintaining the health of fish populations is not solely dependent on the capacity of fish to longitudinally move through the system. Other aspects of fish requirements need to be considered such as creating and maintaining sufficient channel depth at critical times for periods of their breeding cycle, or sufficient velocity to trigger spawning in the appropriate season. Fish flow requirements should be designed to increase the overall likelihood of successful recruitment of fish, productivity and dispersal. Although the NWFP fish target is framed around fish passage, it also states that further research should continue on flow requirements for fish health. The LTWP defines ‘large fresh’ flow ranges as most significant to stimulate breeding of pulse specialist fish such as native perch.<sup>1</sup>

Although the DPIE presentation noted the NWFP plan states “once the fishways are operational, the target flows for fish migration will be suspended”, it should be noted that the plan also states that “investigations should continue to determine the water quality and flow conditions required to maintain a healthy and sustainable fish population in the North-West River system”. Mechanisms that focus on and improve fish passage offer only a partial solution to fish population objectives.

Of the options presented, the CEWO supports the following proposed targets based on the best available science for fish population health.

- 15,000 ML/d at Bourke between July and September (dispersal and condition)
- 15,000 ML/d at Bourke between October and April (spawning)
- 14,000 ML/d for 15 days at Brewarrina between October and April (migration).

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<sup>1</sup> For reference, the following relevant details are from the LTWP:

Large Fresh – spawning (flow pulse specialist fish) Aiming to provide a depth of 2 m to cover in-stream features and trigger response from fish. Flow velocity ideally 0.3 to 0.4 m/s (depending on channel form). Temp preferably >17°C to maximise spawning outcomes.

Bourke Large Fresh Range 15,000 - 30,000 ML/d (NWFP target 10,000 ML/d)

Brewarrina Large Fresh Range 9,000 - 26,000 ML/d (NWFP target 14,000 ML/d)

## 5. Other options

The CEWO supports the following options as a high priority for further investigation

- End of system flow rules for all tributaries
- Extension of Resumption of Flow Rules from Barwon-Darling to tributaries, in conjunction with restriction of supplementary licences to meet riparian targets and restriction of A,B, C and supplementary licences to meet algal suppression and fish flow targets regardless of triggering of the RoF rule by extended dry periods
- Dam reserves – re-evaluating dam reserves for meeting critical human and environmental needs, end of system flows, and sufficient conveyance for delivery of entitlement water during extended dry periods

The CEWO supports the following options to be undertaken as a matter of course:

- Removing unapproved floodworks structures
- Formalising management arrangements for the Great Darling Anabranh

Table: Summary of CEWO comments on the major options presented

Option	Comments
<b>Riparian Targets: NWFP</b>	While supportive of the rule in principle, we do not support the size of the NWFP flow targets in the absence of contemporary evidence to suggest they are appropriate, particularly the lower targets that only protect water in the very low flow range of the LTWP.
<b>Riparian Targets: removal</b>	We do not support this option, as although A class thresholds protect an approximately appropriate amount of water from extraction by Barwon-Darling users, it does not restrict access in the tributaries where the bulk of flows originate.
<b>Riparian Targets: extending the Resumption of Flows Rule</b>	The resumption of flows rule is designed to protect first flows after extended dry periods. We support extending the RoF rule to restriction of supplementary access in upstream tributaries. The RoF rule cannot contribute to meeting riparian, algal suppression or fish flow targets except in fairly specific circumstances following an extended dry period. Therefore, we support another mechanism (see below) to apply restrictions to supplementary licences meet these targets when the RoF rule is not triggered, so that the targets are prioritised at all times.
<b>Riparian Targets: LTWP (new)</b>	We recommend that riparian targets be aligned with the in-stream non woody vegetation objective in the LTWP, which represents the best available contemporary evidence. The objective aligns with the baseflow range in each management unit. Targets should be set following the advice of the relevant EES expertise. Barwon-Darling and tributaries should be restricted to meet these targets.
<b>Algal suppression target: NWFP</b>	We do not support these targets based on the availability of better more contemporary information.
<b>Algal suppression target: contemporary</b>	We support these targets based on best contemporary evidence. We look forward to publication of any additional work undertaken by DPIE science team to support this. We also look

	forward to the provision of material that demonstrates alignment with the LTWP.
<b>Fish targets: NWFP</b>	We do not support this option as there is now better information available supporting the intention of this target, however it is preferred over the suspension of all fish targets because of infrastructure improvements (the below option).
<b>Fish targets: infrastructure solutions (fishways etc)</b>	We support infrastructure that improves the free movement of fish through the Barwon-Darling and tributaries. However in the absence of appropriately sized flows, fishways do not by themselves maintain healthy fish populations. Although the NWFP states that the fish passage flow could be suspended once all fishways were functional, it also states that research to improve fish health should be undertaken. The original fish passage target was focused on flooding weirs to promote temporary free movement. We now know that this flow is also of sufficient velocity and timing to promote recruitment, productivity and dispersal, which still require Large Fresh flows according to the LTWP. So although we support the implementation of this option, it should not justify abandoning a large fresh range fish target.
<b>Fish targets: contemporary</b>	We support this option on the basis that it is designed on best contemporary information and takes into consideration the full pattern of flow requirements for fish population health. It is consistent with the intentions of the NWFP, CEWO, and Basin-wide watering strategy priorities. The option presented does not specify a duration but assume it to be aligned to golden perch requirements. This mechanism should be combined with other fish health mechanisms to ensure optimum outcomes – such as fishway infrastructure solutions (option above) and mandatory fish screens on offtakes.
<b>Menindee Lakes Critical Human and Environmental Needs Storage Targets</b>	<p>The CEWO supports a Menindee Lakes storage target to prioritise critical needs during a severe water shortage throughout the northern Murray-Darling Basin. This should be applied consistent with the priorities of water access under the <i>Water Management Act 2000</i>.</p> <p>A single volume target (195 GL) could result in oscillation between restriction and access upstream. Consideration should be given to a higher target coming out of the restriction. If it were designed to be consistent with the 480/640 rule (33% more), then the easing target as the storage rises would be 260 GL coming out of drought.</p> <p>The storages to which the target applies should be clarified. If the storage target is just Lake Wetherell, the 195 GL target could be problematic because Lake Wetherell operating procedures require the operator to periodically draw down water levels to prevent drowning of floodplain vegetation. This could result in perverse outcomes whereby operating rules regularly trigger upstream restrictions.</p>



## Final remarks

The CEWO acknowledges the potential significant connections between the regional water strategies and the Basin Plan, particularly regarding the protection of planned environmental water. The Basin-wide environmental watering strategy prepared under the Basin Plan builds on the environmental objectives in the Plan. It sets out the priorities for river flows and connectivity, native vegetation, waterbirds and native fish with the water being recovered for the Basin environment and other measures to improve flows in the river system. For transparency and clarity, the community may appreciate a clear explanation of the relationship between the NSW regional water strategies, the Commonwealth Basin Plan, and Basin-wide environmental watering strategy which all set a forward agenda for how water is to be managed at a broad scale for multiple outcomes.

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<sup>i</sup> NSW *Water Management Act 2000* - <https://legislation.nsw.gov.au/view/html/inforce/current/act-2000-092>

<sup>ii</sup> Mitrovic, S and Gordon, A 1998, Barwon-Darling Riverwatch, Algae and Water Quality Report 1992– 1997, NSW Department of Land and Water Conservation, Sydney.

<sup>iii</sup> Simon M. Mitrovic, Lorraine Hardwick, Forugh Dorani, Use of flow management to mitigate cyanobacterial blooms in the Lower Darling River, Australia, *Journal of Plankton Research*, Volume 33, Issue 2, February 2011, Pages 229–241, <https://doi.org/10.1093/plankt/fbq094>

<sup>iv</sup> Mitrovic, S.M., Chessman, B.C., Bowling, L.C. and Cooke, R.H. (2006), Modelling suppression of cyanobacterial blooms by flow management in a lowland river, *River Research and Applications*, 22 109-114.