

SUBMISSION BY THE COMMONWEALTH ENVIRONMENTAL WATER OFFICE ON THE DRAFT MACQUARIE REGIONAL WATER STRATEGY

About the Commonwealth Environmental Water Holder

The Commonwealth Environmental Water Holder (CEWH) is a statutory position established under the *Water Act 2007* (Cth). The CEWH is responsible for managing the Commonwealth holdings of environmental water. These water holdings are managed to protect and restore the environmental assets of Murray-Darling Basin, including rivers, lakes, wetlands and floodplains, in the national interest. The CEWH manages the Commonwealth water holdings in accordance with the Basin Plan. The CEWH is supported by the Commonwealth Environmental Water Office (CEWO).

The Water Act gives effect to relevant international agreement on the environment, including the Ramsar Convention for wetlands of international significance, and conventions that protect endangered and migratory species. The CEWH's function is a part of the sustainable management of the Basin's water resources over the long-term for environmental, social and economic outcomes.

1. General comments

The CEWO appreciates the opportunity to provide feedback on the draft regional water strategies as part of the engagement being undertaken 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. There is considerable complexity in some of the individual options as well as the potential for packages of options to result in both environmental benefits and impacts. Therefore, given the CEWO's interest and expertise across the Basin, 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.

This submission focuses on the Macquarie regulated river where the CEWH holds entitlements. However, the arrangements for unregulated water sources, groundwater systems and interception activities in the Macquarie catchment are also important to the entire water balance and system health. The CEWO recognises how severe the recent drought has been for communities across the Basin, particularly in the north, and the challenges in achieving a balance under these circumstances.

Under normal operating conditions, the *NSW Water Management Act 2000*¹ prioritises water for the riverine environment and basic landholder rights (as noted in Table 3 of the strategy). During a severe water shortage, critical human needs are prioritised, followed by the needs of the environment. In the prioritisation process to develop a package of options, the priorities under the Act would be an important consideration – e.g. options that provide for lower priority needs at the expense of higher priority needs would need consideration of appropriate offsets. How the various options are prioritised and packaged will affect the outcomes.

The sequence in which the options are implemented is also an important determinant of the outcomes through time. We suggest that options are implemented in a sequence that is consistent with the *Water Management Act 2000*, with those options contributing to securing critical human water needs and critical environmental needs being implemented first. Provision for critical environmental needs should consider Matters of National Environmental Significance, including the needs of endangered

¹ NSW *Water Management Act 2000* - <https://legislation.nsw.gov.au/view/html/inforce/current/act-2000-092>

species, like silver perch and Murray cod, as well as the Macquarie Marshes. For transparency and to increase community confidence, independent bodies such as the Natural Resources Commission could be asked to publish advice on the packages and sequence of implementation that would be consistent with the *Water Management Act 2000*.

The CEWO also acknowledges the potential significant connections between the regional water strategies and the Basin Plan, particularly in regard to the protection of planned environmental water. For transparency and clarity, the community may appreciate a clear explanation of the relationship between the regional water strategies and the Basin Plan, which both set a forward agenda for how water is to be managed at a broad scale.

1.1. Managing the impacts of a highly variable climate

The draft Macquarie regional water strategy provides new information from NSW on likely climate and water availability changes in the region. This is a significant contribution and important when managing the Commonwealth holdings in a highly variable and changing climate.

Planning and adaptive management

The CEWO water management planning process considers how much water is expected to be available, the seasonal rainfall outlook and the needs of the environment. The planning process considers options for a range of weather scenarios (from dry to wet) so we can adapt to the seasonal conditions, changes in environmental demands and water availability. We work with the NSW environmental water manager and river operators to have water delivered, and to achieve environmental outcomes as efficiently and effectively as possible.

Carryover

Environmental demands and water availability vary between years. Commonwealth and NSW environmental water managers use carryover to help meet a range of environmental demands across multiple years. For example, environmental water has been carried over and managed over two to three years between wetter years to meet environmental demands in key assets such as the Macquarie River and Macquarie Marshes. The ability to access carryover is critical to meeting environmental demands in a variable climate, particularly in dry years where environmental damage can occur.

1.2. Current and future challenges

Carryover access uncertainty

As mentioned above, the use of carryover is an important tool for meeting environmental objectives and demands across multiple years. Other general security users also benefit from access to carryover for multi-year planning and management of water use and risk. However, water users need to have confidence they will be able to access water they have carried over when needed, including during dry times. During the recent drought, remaining general security water in carryover accounts was put in drought reserves in the Macquarie to meet critical human needs and was unavailable for general security users. Development of water resource availability scenarios and allocation processes need to ensure access to carryover of more conservative water users is not placed in drought reserves too often. If there are risks associated with the availability of carryover, these need to be clearly articulated months in advance to help water users make informed decisions when planning for the use of their allocated water.

Reduced water availability and ability to maintain environmental assets

The CEWO recognises that NSW is being forward looking by analysing future climate scenarios in a ground-breaking way. To increase community confidence in water planning, it is important that new climate data and updated modelling are shared with the community and with relevant agencies, including the MDBA. There should be an agreed consistent basis for the planning and management of water resources.

Higher temperatures, increased evaporation, changes to rainfall patterns and associated flows, and changes to the intensity and duration of dry and wet periods are all emerging risks. They have the potential to significantly impact water dependent ecosystems and the achievement of environmental water requirements as specified in the Macquarie Long-Term Watering Plan, the Basin Environmental Watering Strategy, and the Basin Plan. Some of the options in the regional water strategy that increase the regulation of water may exacerbate these impacts and may need to be packaged with offsets that would have counterbalancing environmental benefits.

The potential for reduced water availability due to climate change is concerning for many users of water, including environmental water managers. In Figure 9 of the draft Macquarie strategy, the catchment runoff to Burrendong Dam was significantly below average in every month in 2018 and 2019. Under the climate predictions in the draft regional water strategy, Burrendong Dam may fill and spill less often and may remain below 5% more of the time. The Macquarie River would cease-to-flow significantly more often. This has implications for the ability to maintain some environmental assets, including the Macquarie Marshes Ramsar site. Strategies for mitigating risks to the environment are required, with the baseline to at least maintain the current level of health and resilience or, ideally, to improve health and resilience.

Drought operations

During extreme dry conditions, river operators in northern valleys may use a range of practices such as ceasing deliveries beyond a certain point in the river (e.g. Warren in the Macquarie), block releases and dam wall debiting. These practices reduce connectivity, impacting upon aquatic animals and river and wetland health. They can also have profound social and cultural implications. These practices should only be used occasionally and during extreme circumstances and not become more standard operational practice in the pursuit of system efficiencies, particularly if they are implemented so that any savings are provided for lower priority uses under the *Water Management Act 2000*.

The process of re-starting rivers after dry times or cease-to-flow conditions needs to be carefully managed regardless of the water source. Protocols that guide the best way to re-start the river to minimize risks (e.g. water quality, fish death) and conditions (stratification, leaf litter) should be developed with advice from relevant agencies and experts (including DPIE-EES, DPI Fisheries, environmental water managers).

If the climate predictions eventuate, storage management (e.g. period and volume for essential supplies) and allocation processes may need to be reviewed and modified to reduce the risk of drought operation practices becoming implemented more often. Striking the balance between providing water allocations now and the risk of more frequent occurrence of stage 3 and stage 4 under the NSW Extreme Events policy in the future is important –all water users should be involved in this discussion.

Connectivity

Improving river connectivity within the Macquarie and to the Barwon-Darling is important and is consistent with the objectives of the Basin Plan. Water resource development and changing rainfall and inflow patterns have already impacted connectivity between the lower Macquarie and the Barwon rivers. However, under the climate predictions, reduced water availability and inflows may exacerbate reductions in connectivity. We would be concerned if “addressing inefficient delivery system management” resulted in a reduction of flows to the Macquarie Marshes or the end of system. This may reduce planned environmental water and be inconsistent with the Basin Plan. Investigating strategies such as Option 31 (Connectivity with downstream systems) will be important in maintaining and improving connectivity with the Barwon River, and it may be possible to package up options that provide an adequate level of river connectivity for resilience and health while achieving other benefits.

It is important that connectivity is a consideration across multiple regional water strategies in the northern basin. For the Barwon-Darling to also be healthy and resilient, the contribution of each tributary to the Barwon-Darling should have some proportionality to the natural distribution, and there should be enough flow in the Barwon-Darling with an appropriate temporal distribution.

Operation and maintenance of existing infrastructure

To maximise the effectiveness of all water sources to meet Environmental Water Requirements (EWRs) in the Long-Term Watering Plan (LTWP) and the outcomes in the Basin Plan, existing infrastructure such as fishways, regulators and cold water pollution mitigation measures (e.g. thermal curtain, multi-level offtakes) must be operated appropriately, regularly maintained and fixed in a timely manner. Operational protocols for infrastructure should be developed with input from relevant agencies such as DPIE-EES, DPI Fisheries, DPIE-Water, environmental water managers, and relevant experts. These protocols should be made publicly available to increase transparency. The effectiveness of the infrastructure and operation should be reviewed to ensure they are meeting their objectives (i.e. fish passage, mitigation of cold-water pollution) and identify whether improvements can be made.

2. Comments on options

Consistency with the Basin Plan

Management of water resources in the NSW part of the Murray Darling Basin must be consistent with the Basin Plan. We expect that any new option proposed under the regional water strategy would also be subject to the requirements of the Basin Plan. Options that involve changes to water resource plans are likely to require accreditation by the Murray-Darling Basin Authority. New infrastructure or rules will need to ensure extraction is kept within Sustainable Diversion Limits (SDL)² and protect the effectiveness of planned environmental water. Improvements in reliability of supply may need to be offset to be compliant with the SDLs. Packaging of options will likely be required to achieve the outcomes envisioned by the regional water strategy without compromising the overarching Basin Plan objectives.

Environmental benefits and impacts

Some options may result in environmental benefits, and some could result in impacts. In general, options that lead to changes or reductions in river flows may compromise the achievement of EWRs in

² MDBA submission on infrastructure.

<https://www.parliament.nsw.gov.au/lcdocs/submissions/69285/0125%20Murray%20Darling%20Basin%20Authority.pdf>

the LTWP, and outcomes in the Basin Environmental Watering Strategy. Potential impacts of the proposed options on Matters of National Environmental Significance such as threatened and migratory species and the ecological character of the Macquarie Marshes Ramsar site would need to be assessed in accordance with the *Environment Protection and Biodiversity Conservation Act 1999* in addition to any requirements under relevant NSW environmental legislation such as the *Biodiversity Conservation Act 2016*.

Options that result in increased reliance on groundwater may impact on groundwater levels, recharge rates and ongoing sustainability of groundwater resources. These impacts may be further exacerbated under climate change with predictions of less rainfall, runoff, and greater persistence of dry conditions. Increased use of groundwater may impact on groundwater dependent ecosystems, river flows and wetlands. This may increase environmental demands in river and wetland systems and the volume of water required to meet those demands. Further consideration of groundwater options should be informed by additional work on the sustainability of groundwater systems, such as options 25 to 28.

Comments on specific options

The CEWO supports the following options as a high priority for further investigation, particularly as they are expected to result in environmental benefits:

- 14. Address channel constraints to delivering environmental flows to the Macquarie Marshes
- 15. NSW fish passage strategy;
- 18. Undertake channel works to reinstate natural channel profiles in selected streams in the southern Macquarie Marshes;
- 19. Formalise channel sharing arrangements
- 20. Implement native fish restoration program
- 21. Diversion screens to prevent fish extraction at pump offtakes
- 22. Cold water pollution mitigation measures.
- 23. Modification and/ or removal of existing flood work structures causing adverse impacts
- 24. Relieve flow constraints on the Cudgegong River at Rocky Waterhole Bridge
- 31. Connectivity with downstream systems

The CEWO is particularly interested in, and concerned about, the potential environmental impacts of the following options:

- 1. A new mid system re-regulating weir on the Macquarie River; and
- 11. Increase Burrendong Dam's Full Supply Level.

While the CEWO does not reject these options outright, they will reduce the volume of water that reaches the most valuable environmental assets in the Macquarie River system and, depending on how they are operated, may not achieve the same or better environmental outcomes.

More detailed comments on specific options are provided in Attachment 1. While the comments in Attachment 1 are provided on individual options, when implemented together as a package the final suite of selected options may in combination provide a range of positive cultural, economic, social and environmental outcomes. The CEWO would appreciate being part of ongoing discussions regarding the options that are selected for implementation under the regional water strategy.

3. Other remarks

3.1. Accountability and transparency

Improved accountability and transparency would be supported by making the following information and documents publicly available:

- Explanation of resource availability scenarios and allocation processes and associated risks for different licence types, particularly under future climate scenarios.
- Any WaterNSW environmental water management plan(s) or procedures for river operations in each valley (management of rise and falls of releases; water quality risks; river restart procedures etc).
- Operational protocols and procedures for infrastructure such as various fishways, the mid-Macquarie re-regulating weir; cold water pollution mitigation measures.
- Reasonable use guidelines for the take of stock and domestic water and basic landholder rights.

3.2. Vision and emphasis on the environment in the regional water strategy

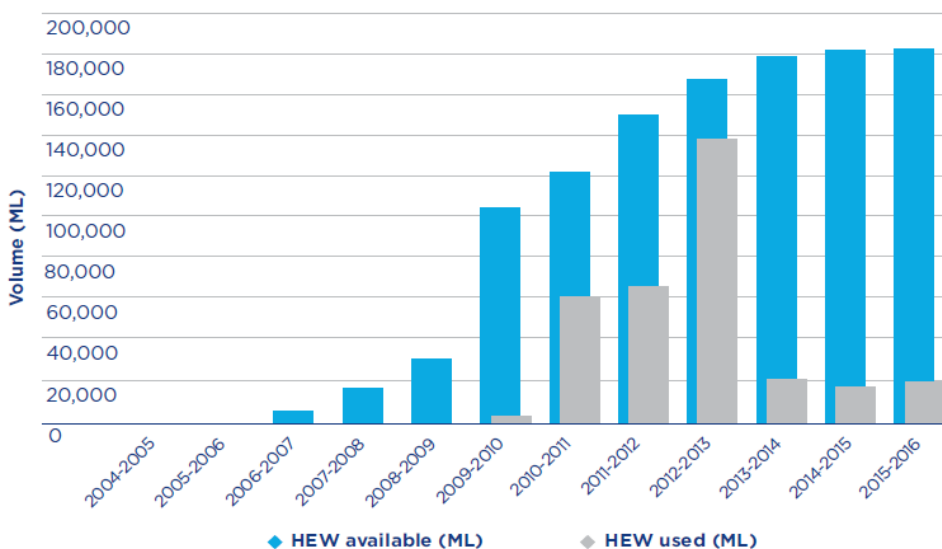
The vision for the regional water strategies includes the need for the delivery of ‘healthy, reliable and resilient water resources for a liveable and prosperous region’. Sustaining healthy rivers, wetlands and floodplains is necessary to have ‘liveable and prosperous region’. For example, a healthy fish community in rivers is important for social and cultural outcomes, and ecosystem function is important for maintaining good water quality. The CEWO has an important role in contributing to this vision by protecting and restoring some environmental assets.

There is a box of definitions in the regional strategy. We suggest that it is important to add a definition of a ‘healthy and resilient environment’. This would give more of a balanced emphasis on the environment in the regional water strategy, consistent with the *Water Management Act 2000 (NSW)*.

3.3. Other comments:

The key on Figure 22 ‘HEW available’ could be misinterpreted. The graph is showing volume of entitlements, not actual water availability against entitlements. The key should be corrected to indicate HEW entitlements or alternatively show what was available in those years as shown in Figure 23.

Figure 22. Held environmental water entitlement (ML) in the Macquarie-Cudgegong river system



Source: Macquarie-Castlereagh Water Resource Plan, surface water description 2017

Attachment 1. Comments on the long list of options (including government commitments) in the draft Macquarie Regional Water Strategy

Option	Comments
<p>1. A new mid system re-regulating weir on the Macquarie River</p>	<p>Depending on how the re-regulating weir is operated, this option could have a significant impact on the environment including Matters of National Environmental Significance. The weir may lead to a reduction in operational surpluses and changes to river flows in the Macquarie River. Reductions and changes in river flows may compromise the achievement of EWRs in the LTWP for the Macquarie River and the Macquarie Marshes, and alter the ecological character of the Ramsar site.</p> <p>We have been advised that tributary flows downstream of Burrendong will not be re-regulated by the weir. The river operations rules for the structure need to be documented prior to any approval to construct the structure, as the environmental impacts depend on these rules.</p> <p>The impacts of the weir will be assessed in the Environmental Impact Statement. Any impacts on planned environmental water, reliability and potential growth in use should be assessed. The distribution of any efficiency savings will be critical to this. Operation of the proposed weir may impact connectivity and fish passage. It is possible that fish passage could be improved through the construction and operation of a fishway. The proposed weir may impact on Murray cod breeding habitat upstream of the weir. The CEWO would welcome further opportunities to be involved on discussions on the proposed weir.</p>
<p>2. Access water from Burrendong Dam's deep storage</p>	<p>The environmental impacts within storage and downstream of the proposal should be assessed (e.g. water quality and impacts to fish habitat availability, including as a refuge for fish populations upstream of the dam). Assessment of the ability to use the water to provide for critical environmental needs downstream of the dam should also be considered.</p>
<p>6. Inter-regional connections project investigation</p>	<p>Our understanding is that this connections project would be an emergency measure only and involve relatively small volumes for town water supply. The economic and environmental costs and benefits of inter-regional pipelines to should be evaluated. Potential environmental impacts depend on the location and the scale of the water transferred via pipelines. Moving water between regions can be energy intensive.</p> <p>Flowing water in rivers provide a range of benefits for towns and basic landholder rights while also sustaining waterholes for drought refuges and meeting some of the core needs of the environment. Retaining the longevity of flows within the source river system must be a key criterion in assessing the risks and benefits of any project of this nature.</p>

Option	Comments
<p>8. Burrendong Dam to Nyngan pipeline (various sub-options)</p>	<p>The environmental impacts, including facilitated impacts, of this option need to be carefully considered. Facilitated impacts are those actions and impacts which are made possible by the action. There may be co-benefits realized if the flows to the river system and other connected water sources are maintained or improved because less water is needed to meet the needs of Nyngan and Cobar, and some of these water savings are used to meet EWRs. From an environmental perspective, assessment of the option individually or as part of a package should consider whether there would be changes to:</p> <ul style="list-style-type: none"> • flows in the Macquarie River, Macquarie Marshes, and other creeks and rivers; • planned environmental water; • groundwater recharge; • hydrological connectivity and increased periods of cease-to-flow; and • the volumes of water required to deliver water orders and run the river.
<p>9. Pipeline from the proposed new mid-system weir near Gin Gin to Nyngan</p>	<p>Piping water instead of using the Albert Priest Channel would reduce water loss from seepage and evaporation. The use of pipelines instead of artificial channels is beneficial where there may be limited environmental values in the channel. One suggestion is to use water savings as a drought reserve for shared benefit to improve the reliability of the whole river system during dry times.</p>
<p>10. Gunningbar Creek pipeline</p>	<p>Reducing the permanency of flows and introducing variability in Gunningbar Creek could be beneficial to the Gunningbar Creek system. However, provisions to provide water to meet the EWRs of the creek would still be required (e.g. provisions in the Macquarie-Cudgegong Water Sharing Plan).</p> <p>Without such provisions, the EWRs of the creek may not be met. These options should not rely on water currently held by environmental water managers alone to meet the additional environmental demands. The relative significance of environmental demands would warrant consideration.</p>

Option	Comments
<p>11. Increase Burrendong Dam's Full Supply Level</p>	<p>This rule change could result in significant changes to the downstream environment. This option may result in greater longevity of river flows in dry years (contingent on how additional water is shared) but there may be impacts in wetter years. Our experience is that moderate to high flows during wetter years are important for some key environmental responses. These include waterbird breeding in the Macquarie Marshes and connectivity with the Barwon River. This extensive inundation in the catchment downstream cannot be achieved by held environmental water alone. The reduction of beneficial inundation may compromise achievement of objectives under the Basin Plan, the EWRs in the LTWP and the maintenance of the ecological character of the Macquarie Marshes Ramsar site.</p> <p>Some of the climate change predictions provided in the regional water strategy indicate that the frequency of Burrendong Dam exceeding the existing full supply level may reduce. This would affect inundation in the Macquarie Marshes. Options to hold more water in the flood mitigation zone and increase the FSL are likely to exacerbate this impact.</p> <p>The use of Burrendong storage to provide additional volumes of water to increase allocations will need to be assessed against the SDL and the Basin Plan. Any changes to the volume of water held behind the FMZ or other operational releases may impact on the volume of planned environmental water (PEW).</p> <p>We would welcome further information on the resulting changes to the flow regime, such as hydrological modelling.</p>
<p>12. Increase outlet valve capacity at Burrendong Dam</p>	<p>This option is intended to support larger volumes of water released to meet a range of downstream needs, including for the environment. However, the full potential benefits may be limited by river channel capacities. Consideration of this option would require:</p> <ul style="list-style-type: none"> • evaluation of the costs and benefits of the option; • analysis of how frequently conflict in demand has been/could be an issue; • addressing other delivery constraints; • addressing cold water pollution; and • consideration of existing WSP rules and any limitations on delivery rates.
<p>14. Address channel constraints to delivering environmental flows to the Macquarie Marshes</p>	<p>We are supportive of further development of this option and consider it a high priority.</p> <p>Addressing these channel constraints would enable environmental water managers to increase flow rates to improve inundation of parts of the Macquarie Marshes and improve floodplain connection, potentially meeting some EWRs in the LTWP. This should be considered in conjunction with Option 12.</p>

Option	Comments
<p>15. NSW Fish Passage Strategy</p>	<p>We are supportive of further development of this option and consider it a high priority.</p> <p>Providing effective fish passage for all life stages is critically important to improve native fish populations in the Basin. Addressing barriers to fish passage through the Macquarie catchment would improve the ability to achieve outcomes for native fish from environmental water deliveries and other flows.</p> <p>We note that there has been little progress on fishways in the northern Basin in the last four years despite there being some outstanding obligations for NSW to construct fishways as part of several dam safety upgrades. Some of these obligations have existed for several years.</p> <p>Fishways need to be operated appropriately and maintained to ensure they are effective in providing fish passage. Across the northern Basin there are several examples of fishways not being used or where there have been significant delays in fixing them when infrastructure has failed.</p>
<p>16. Introduce flow variability in the tributary (effluent) creeks</p>	<p>We are supportive of further development of this option. Increased variability may improve aquatic ecology in these streams. Addressing barriers to fish passage in this system would also be beneficial. Gathering additional information on the EWRs of these streams to augment that in the LTWP may be required prior to implementing this option. This would help inform watering options.</p> <p>Consideration about provisions, potentially in the Water Sharing Plan to provide water to meet the EWRs of the creeks may be required. It cannot be assumed that Commonwealth environmental water would be available to meet these water demands alone.</p> <p>If the flows are primarily for domestic and stock replenishment purposes, then additional water may need to be set aside in recognition of the increased risks to these downstream rivers due to a drying climate.</p>
<p>17. Determine the feasibility of delivering water to the Talga Wetland/ Overflow of the Lower Crooked Creek</p>	<p>We are supportive of further development of this option.</p> <p>The Talga floodplain is reported to have a high diversity of floodplain and wetland plants, frogs, and waterbird and woodland bird species, particularly when more frequently inundated³. Additional investigations to develop EWRs for this system and the feasibility of different watering options would be beneficial. This would help inform environmental watering planning and priorities.</p>

³ Torrible, L., Wettin, P., Barma, D., Wilson, G., Hobcroft, D. and Ocock., J (2011) Post Flood Assessment and Determination of Environmental Water Requirements for Gunningbar Creek, Lower Crooked Creek, Marra Creek and the Lower Macquarie River. Prepared by IRPEC Pty For BWR on behalf of The Australian Government Department of Sustainability, Environment, Water, Population and Communities

Option	Comments
<p>18. Undertake channel works to reinstate natural channel profiles in selected streams in the southern Macquarie Marshes</p>	<p>We are supportive of further development of this option and consider it a high priority.</p> <p>Undertaking these works may improve the ability of environmental managers to achieve improved environmental outcomes in the Southern Marshes and ability to support the ecological character of the Ramsar site. The works may increase the effectiveness of deliveries across a range flow types and help reinstate some areas of the southern marshes. However, careful consideration of any downstream impacts to other parts of the Marshes is required. The long-term viability of the works and provision of fish passage should also be considered.</p>
<p>19. Formalise channel sharing arrangements</p>	<p>We are supportive of further development of this option and consider it a high priority.</p> <p>Formalising channel sharing arrangements would provide certainty for all users. Arrangements for channel capacity should be developed through a fully consultative and transparent process to ensure it is equitable and acceptable to all water users and doesn't undermine environmental outcomes. Channel capacity access for environmental water holders should not be undermined relative to other users. When channel capacity constraints are in place, water access licences managed by the environmental water holders (including planned environmental water) should have equal right to the delivery of water as other equivalent water access licenses.</p>
<p>20. Implement native fish restoration program</p>	<p>We are supportive of further development of this option and consider it a high priority.</p> <p>Implementing instream rehabilitation activities would improve the recovery of native fish populations, improve river health and complement the use of environmental water. These activities would improve the ability to achieve outcomes for native fish from environmental water deliveries and other flows.</p>
<p>21. Diversion screens to prevent fish extraction at pump offtakes</p>	<p>We are supportive of further development of this option and consider it a high priority.</p> <p>Diversion screens would reduce the loss of native fish from waterways and improve the ability to achieve environmental outcomes for native fish from environmental water deliveries and other flows.</p>

Option	Comments
<p>22. Cold water pollution mitigation measures</p>	<p>Options to ameliorate cold water pollution released in the Macquarie valley are a high priority. This would improve riverine productivity, and support population recovery of native fish and other aquatic animals. It would improve outcomes for native fish from all water deliveries including water for the environment.</p> <p>Mitigation measures and technologies need to be effective, reliable and reasonably easy to implement, adjust and maintain. Operational protocols need to be developed with input from relevant agencies (e.g. DPIE-EES and DPI Fisheries) and implemented.</p> <p>Ongoing infrastructure issues with the thermal curtain and challenges with recommissioning and operation have limited the period it has been working effectively to mitigate cold water pollution in the Macquarie River. Technologies that address a range of water quality risks, including cold water pollution, ought to be considered holistically for their multiple benefits (see Option 28).</p>
<p>23. Modification and/ or removal of existing flood work structures causing adverse impacts</p>	<p>We are supportive of further development of this option and consider it a high priority.</p> <p>Options to modify or remove identified priority floodplain structures and barriers that impede delivery of water to priority wetland and floodplain areas should be a priority.</p>
<p>24. Relieve flow constraints on the Cudgegong River at Rocky Waterhole Bridge</p>	<p>We are supportive of further development of this option as a high priority.</p> <p>Relieving constraints at Rocky Waterhole would improve the ability of planned environmental water and other releases and bulk water transfers to meet EWRs in the Cudgegong River.</p>
<p>25. Improved understanding of groundwater processes</p> <p>26. Sustainable access to groundwater</p> <p>27. Improved clarity in managing groundwater resources sustainably</p>	<p>Whilst our focus is mainly on surface water, we are supportive of further development of this suite of groundwater options.</p> <p>Improved understanding of groundwater processes and sustainable access to groundwater is essential to implement existing water sharing plans and options in the strategy (e.g. option 13) that increase reliance on groundwater resources. This is even more important under the climate change predictions.</p>
<p>28. Investigation of water quality mitigation measures</p>	<p>We are supportive of further development of this option.</p> <p>Real-time water quality monitoring of key parameters such as dissolved oxygen and temperature would be beneficial during both normal and drought operations and river re-start protocols.</p> <p>Options for improving water quality within storages (e.g. mixing, bubblers, or other options) and released from storages should be considered and may link with cold water pollution mitigation (Option 22).</p>

Option	Comments
<p>29. River Ranger Program</p>	<p>We are supportive of further development of this option.</p> <p>An Aboriginal River Ranger Program could provide numerous environmental and community benefits. For example, it could improve the health of rivers, lagoons and riparian areas, wetlands and floodplains and recovery of Country. An Aboriginal River Ranger Program is also likely to complement other river repair activities in the catchment and outcomes from the use of water for the environment. Ensuring the Program is sustainable with a source of funding will be important to continued implementation and success of the program.</p>
<p>30. Secure flows for Beemunnel Aboriginal Place</p>	<p>We are supportive of further development of this option.</p> <p>Securing flows for Beemunnel Aboriginal Place would benefit this significant Aboriginal site. The option may need to identify works, structure operation and river operations required in order to enable provision of cultural flows to Beemunnel. Providing cultural water under the control of Aboriginal people, that is not reliant on other sources of water to meet other priorities, is important.</p> <p>Commonwealth environmental water was acquired to protect and restore environmental assets. However, the Commonwealth Environmental Water Holder can have regard for Aboriginal cultural values where they are complementary.</p>
<p>31. Connectivity with downstream systems</p>	<p>We are supportive of further development of this option as a high priority.</p> <p>Restoring longitudinal connectivity throughout the catchment is critical for supporting many of the ecosystem functions in the Macquarie and Barwon river systems, including improving riverine productivity, water quality, native fish populations and other aquatic animals. Improved connectivity has significant cultural, social and recreational benefits.</p> <p>Protecting and restoring connectivity within and between water dependent ecosystems is an objective of the Basin Plan and an expected outcome of the Basin Wide Environmental Watering Strategy. Active management in the Macquarie unregulated system is an important step towards better connectivity with the Barwon.</p>
<p>32. End of system efficient stock and domestic water delivery options</p>	<p>Options that lead to reductions in river flows may compromise the achievement of EWRs for a suite of environmental assets depending on the location of the efficiency option. The EWRs of these systems should be considered when examining these options.</p> <p>The use of pipelines can mean that environmental demands previously met by water supplies and river operations may no longer be met. Provisions should be made to ensure EWRs of these systems are still met. These options should not rely on water currently held by environmental water managers alone to meet the outstanding environmental demands.</p>

Option	Comments
35. Investigation of licence conversions	<p>There is much to consider in progressing this option. Commonwealth holdings could be affected, or there could be additional options. Further consideration of this option would need to:</p> <ul style="list-style-type: none"> • ensure there is adequate and appropriate consultation on the option and conversion factor; • consider how to make it equitable while balancing the risks and implications of providing high security water to remote locations; • consider any implications for volumes in storage for conveyance; and • consider whether there are any impacts or implications of licence conversion for the Basin Plan, SDL and PEW.
36. New drought operational rules (Macquarie River)	<p>During extended dry sequences, adequate, transparent and timely management and sharing of water is critical in the Macquarie and other valleys. We would be concerned if drought operations became more standard practice, such as:</p> <ul style="list-style-type: none"> • ceasing deliveries beyond certain points of the river (e.g. Warren); • dam wall debiting; • block releases with rivers being stopped more often and the associated environmental risks of re-starting rivers (e.g. fish death events). <p>Options such as storage management and allocation processes may need to be reviewed and modified to reduce the risk of drought operation practices becoming more common under the climate predictions.</p> <p>Any new drought operational rules and procedures need to:</p> <ul style="list-style-type: none"> • clearly identify both critical human and environmental needs within the Macquarie; • identify how these needs will be addressed during extended dry sequences; • be clear and transparent; • assess the potential impacts to the environment; • address how tributary flows and first flush events will be managed; • address processes and strategies for restarting rivers; • ensure these practices are only used during extreme circumstances; • identify the impacts of the any new drought operation rules on the Basin Plan, SDLs, water sharing plans, planned environmental water and licence holders. <p>The recent extended dry sequence led to shutting off part of the Macquarie River, declining refuge pool water quality, fish rescues and fish deaths. The draft Macquarie regional water strategy includes many options to support critical human water needs but has limited regard to addressing critical environmental needs during extended dry times. The package of options implemented under the regional watering strategy should specifically identify measures to mitigate risks to the health and resilience of the environment during dry times.</p>

Option	Comments
<p>37. Review of regulated river water accounting and allocation process</p>	<p>We are supportive of further development of this option.</p> <p>With a changing climate, water allocation processes may need to be reviewed and adjusted. The review should consider:</p> <ul style="list-style-type: none"> • historic inflow sequences, trends and climate change/variability while balancing the risk to allocation reliability. Further consideration should be given to whether the worst sequence of record is used, or whether there are points at which the allocation process is adjusted if the climate is becoming progressively drier; • the volume required to cover essential supplies and conveyance and how long these supplies should be kept in storage; • ensuring adequate water has been set aside for conveyance prior to announcing allocations against licenses; • ensuring carry over volumes are secure and if not, be clear about any associated risks for carryover; • priorities in the <i>Water Management Act 2000</i>; • how to meet critical environmental and human needs; • the implications of any changes for the WSPs, Basin Plan, SDL, PEW and all licence holders.
<p>38. Improved data collection and storage</p>	<p>Improved groundwater and surface water data collection (water flows, levels and quality parameters) would be beneficial for river operation and environmental water management and implementation of surface and groundwater water sharing plans.</p>
<p>41. Land use change impact on water resources</p>	<p>We are supportive of further development of this option.</p> <p>Land use change can have a significant impact on water resources, demands, availability and in some cases can directly impact on water movement through the landscape. A strategic approach to land use planning and changes would be beneficial. Some stakeholders think that catchment changes may be as significant as climate change in affecting water availability.</p>

Option	Comments
<p>42. Culturally appropriate water knowledge program</p> <p>45. Regional Aboriginal Water Advisory Committee</p> <p>46. Water portfolio project for Aboriginal communities</p> <p>47. Aboriginal cultural water access licences review</p>	<p>We are supportive of further development of this suite of options to improve recognition of Aboriginal people’s water rights, involvement in and access to water.</p> <p>We acknowledge the Traditional Owners and their Nations have deep cultural, social, environmental, spiritual and economic connection to their lands and waters. Healthy rivers and full waterholes and weir pools also contribute significantly to the health and wellbeing of Aboriginal communities along the rivers. The CEWO supports improving recognition of Aboriginal people’s water rights, interests and access to water. The suite of proposed options would build capacity, support inclusion and real participation of Aboriginal people in water planning and management.</p> <p>Improved understanding of cultural values and traditional ecological knowledge would improve the ability of environmental water managers and river operators to support cultural values and sites with a range of water deliveries.</p> <p>Options that provide access to cultural licences would enable Aboriginal communities to directly manage water to support their values and sites.</p> <p>The Commonwealth holdings are to protect and restore environmental assets, particularly those subject to international agreements but can have regard for Aboriginal cultural values. The CEWO would be willing to work with a water advisory committee, should it be formed. This would enhance the ability of the CEWO to have regard for Aboriginal cultural values and achieve complementary cultural outcomes.</p> <p>This also links to option 30 (Secure flows for Beemunnel Aboriginal Place).</p>

Additional projects

<p>Removal of debris and river obstructions following floods</p>	<p>Following floods, rafts of debris can build up and obstruct river flows in different parts of the river, erode banks, cause barriers to fish movement and have the potential to change the distribution of flows to channels in the landscape. They may occur near public or private land. These barriers can impact the environmental outcomes and EWRs achievable by all flows. A recent example is the raft of debris that has ended up downstream of Warren near the Raby property. These structures should be removed promptly, and rivers rehabilitated to minimize the impact to the environment and the suite of flow deliveries.</p>
<p>Review water for replenishment and stock and domestic purposes in a variable climate</p>	<p>Higher temperatures, increased evaporation, changes to rainfall patterns and associated flows have the potential to impact on the ability or frequency to provide flows for replenishment and stock and domestic purposes. Reviewing these requirements should consider:</p> <ul style="list-style-type: none"> • the climate variability risks to the occurrence/provision of flows; • ensuring all replenishment/stock and domestic flows are captured in water sharing plan arrangements (e.g. Milmiland Creek); • ensuring these flows are not provided by PEW or held environmental water or compromise environmental deliveries; and • completion and publishing ‘reasonable use guidelines’ for the take of stock and domestic water and basic landholder rights as a matter of priority.