NSW GOVERNMENT

Natural Resources Commission

Final report

Review of the Water Sharing Plan for the Murrumbidgee Unregulated River Water Sources 2012

January 2023

Enquiries

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Acknowledgement of Country

The Natural Resources Commission acknowledges and pays respect to traditional owners and Aboriginal peoples. The Commission recognises and acknowledges that Aboriginal peoples have a deep cultural, social, environmental, spiritual and economic connection to their lands and waters. We value and respect their knowledge in natural resource management and the contributions of many generations, including Elders, to this understanding and connection.

In the Murrumbidgee Plan area, the Commission pays its respects to Barapa Barapa, Mutthi Mutthi, Nari Nari, Ngunnawal/Ngunawal, Ngambri, Ngarigu, Nyeri Nyeri, Wadi Wadi, Wolgalu, Wemba Wemba, Weki Weki and Wiradjuri peoples who are the Traditional Owners past, present and future, as well as other Aboriginal peoples for whom the lands and waterways are significant.

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Acronyms, abbreviations and units of measurement

Act	the *Water Management Act 2000* (NSW)
ACT	Australian Capital Territory
AWD	Available water determination
Basin Plan	*Murray-Darling Basin Plan 2012*
BDL	Baseline diversion limit
CEWO	Commonwealth Environmental Water Office
Commission	the Natural Resources Commission
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DPI-Fisheries	Department of Primary Industries – Fisheries
DPE-EHG	Department of Planning and Environment – Environment and Heritage (the former Office of Environment and Heritage, subsequently Energy, Environment and Science)
DPE-Water	Department of Planning and Environment – Water
DPI	Department of Primary Industries
DPIE	Former Department of Planning, Industry and Environment
EWA	Environmental water allowance
GDE	Groundwater dependent ecosystem
HEVAE	High Ecological Value Aquatic Ecosystems
LALC	Local Aboriginal Land Council
LGA	Local government area
LTAAEL	Long term annual average extraction limit
MER	Monitoring, evaluation and reporting
MDBA	Murray-Darling Basin Authority
ML	Megalitre (unit of volume equivalent to one million (1×10^6) litres
The Murrumbidgee Regulated Plan	The *Water Sharing Plan for the Murrumbidgee Regulated River Water Source 2016*
NARCliM	NSW and ACT Regional Climate Modelling Project
NRAR	The Natural Resources Access Regulator

NSW	New South Wales
The Plan	The *Water Sharing Plan for the Murrumbidgee Unregulated River Water Sources 2012*
Pools Policy	*Macro Water Sharing Plans Approach for Unregulated Rivers Access and Trading Rules for Pools Policy*
R	Recommendation
SDL	Sustainable diversion limit
SMART	Specific, measurable, achievable, relevant and time-bound
Snowy Hydro	Snowy Hydro Limited
SWIOID	Snowy Water Inquiry Outcomes Implementation Deed

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Executive summary

The Natural Resources Commission (the Commission) has reviewed the *Water Sharing Plan for the Murrumbidgee Unregulated River Water Sources 2012* (the Plan) as required under Section 43A of the *Water Management Act 2000* (the Act). The Plan area is one of the more diverse in NSW – including 43 water sources, ranging from alpine streams to expansive floodplains and wetlands.

The Commission has assessed the extent to which Plan provisions have contributed to achieving environmental, social, cultural, and economic outcomes, and identified where changes to provisions are warranted. The issues identified in this review indicate a material risk that the Plan is not adequately contributing to the achievement of these outcomes. The Commission considers that the changes needed warrant extending the Plan for up to two years and then replacing it.

The Plan's unregulated river water sources are highly connected to the regulated Murrumbidgee River, which is covered by a separate water sharing plan. The Plan provides for limited protection of environmental releases from the regulated river, while water intended for Aboriginal cultural use under the regulated water sharing plan is not protected if it enters unregulated river water sources.

There are several dams in the Plan area, contributing to highly altered flow regimes, particularly in the unregulated Upper Murrumbidgee (where Tantangara Dam is located). Environmental releases from Tantangara Dam intended to support critical environmental values are insufficient and not adequately protected by the Plan.

The Plan's water sources are also closely linked to those in the Australian Capital Territory (ACT), as the upper Murrumbidgee River flows through the ACT from NSW and back into NSW. Inadequate protection of environmental flows in the NSW Upper Murrumbidgee can impact on flows through the ACT and inflows into Burrinjuck Dam. Population growth in the Yass region and Canberra growth corridor is also expected to drive increased demand for water, including in towns reliant on the Plan's unregulated river water sources.

The Murrumbidgee catchment is one of the more vulnerable to climate change in NSW. Flows are heavily influenced by snowmelt, which is expected to decline in the future, reducing the availability of water for the environment and other priority needs. Impacts from climate change will not occur in isolation, coinciding with potential increases in demand and competition for water resources.

The Murrumbidgee catchment has many wetlands, several of which have nationally and internationally recognised environmental values, as well as significant Aboriginal cultural values. The Plan's provisions to protect these features are currently not commensurate with their important values.

Although these issues are significant, considerable work is being undertaken in the Plan area to understand environmental and town water needs and risks, and there is an existing gauge network that can be referenced in the Plan to better manage water access and use. This information can be drawn upon to quantify sustainable extraction and strengthen rules in a replacement Plan.

Overall finding on Plan extension and replacement

The Commission has identified several opportunities to improve outcomes that justify replacing the Plan. The Commission recommends an extension of up to two years to the existing Plan to allow time to undertake required data collection and analysis, consultation, and development of amended provisions (see **Table 1**).

A summary of key areas to improve the Plan are outlined in **Figure 1**. To ensure clarity, the Commission has developed a detailed set of 14 recommendations (**Table 1**).

Figure 1: Key areas to improve Plan performance

Ensuring sustainable extraction

The Commission continues to identify significant issues related to the establishment and management of extraction through Long Term Average Annual Extraction Limits (LTAAELs). Having a separate LTAAEL for each of the Plan's four extraction management unit provides a good foundation for management given the Plan area's size and variability. However, these are not specified numerically and there is limited data available on current water use. As a result, no assessment of compliance with the Plan limits has been undertaken, despite the Plan requiring this.

As LTAAEL assessment and compliance has not been undertaken, available water determinations (AWDs) have continued to be set at 100 percent for all users. This creates a risk that extraction is exceeding Plan limits and planned environmental water is being extracted. This is not aligned with the priorities and principles of the Act or the precautionary principle.

Several LTAAEL components may not be accurate, including outdated information on basic landholder rights extraction and commercial forestry plantations. It is also unclear if floodplain harvesting is occurring in the Plan area, or if it is reflected in the LTAAELs.

The Murrumbidgee catchment is highly vulnerable to climate change, with a high likelihood of significant impacts on water availability in the future. Plan provisions – including LTAAELs – have the potential to support the resilience of the Plan's water sources if strengthened and implemented.

Protecting upper Murrumbidgee flows

The upper Murrumbidgee River has a highly altered flow regime, primarily due to the Snowy Scheme's Tantangara Dam, which impacts environmental, social and Aboriginal cultural values. The Snowy Water Licence held by Snowy Hydro Limited (Snowy Hydro) requires minimum base passing flow targets be met at Mittagang Crossing. Environmental releases must also be made in accordance with annual planning by the Department of Planning and Environment – Water (DPE-Water) consistent with the Snowy Water Inquiry Outcomes Implementation Deed (SWIOID), but they can contribute to meeting the base passing flow targets. The SWIOID and Snowy Water Licence are established under separate legislation from the Plan.

There is evidence that these releases are not adequate to support outcomes. While the Tantangara environmental releases are managed outside the Plan, the Plan's access rules do not currently protect these releases, potentially limiting environmental benefits. Addressing this issue is critical given pressures from climate change, the energy market and potential population growth.

Licence holders can currently extract environmental releases, despite amendment provisions allowing for the Plan to be modified to prevent this. Further, provisions to protect base passing flows for Cooma's town water and domestic and stock use are not based on best available evidence. The Plan also introduced carryover provisions for unregulated river access licences that may not be appropriate for the upper Murrumbidgee River, applying greater pressure to an already stressed river system.

The lack of protection of environmental releases is inconsistent with the Act and protection of environmental releases from Tantangara Dam should be a priority over extractive use. Actions to protect values may require a reduction in entitlement for irrigators in the Murrumbidgee I and II water sources, which will need to be considered and consulted on as part of the plan replacement process.

Given the Murrumbidgee River passes through the ACT, these issues also have potential to impact in the ACT, where policy exists to protect environmental flows. There is a need for consistency in the protection of the environmental releases in NSW and the ACT, and consensus on intended outcomes.

Strengthening environmental protections

The Plan area includes anabranches, effluent creeks, floodplain lagoons, billabongs and wetlands with significant environmental and cultural values that are dependent on flows from the regulated Murrumbidgee River (which is subject to a separate water sharing plan). The Plan does not clearly reflect these values or adequately protect them. Plan rules also do not adequately support the Plan's new connectivity objective.

Current provisions allowing pool drawdown across much of the Plan area are less stringent than the default position of the *NSW Pools Policy* and do not align with the Act. They pose a risk to environmental water and provide limited protection of environmental water releases originating from the regulated river, where lagoons in unregulated river water sources are the intended recipients

There is little transparency around works on off-river pools, making it difficult to quantify the extent of extraction and implement access rules. While environmental water requirements for some wetlands are documented, others are yet to be defined and provided for, including the nationally significant Lower Mirrool Creek Floodplain wetlands.

Around half of the Plan's 43 water sources have flow classes and flow-based access rules. While this is a positive foundation for management, rules are not based on current knowledge of environmental water requirements. Further, three gauges referenced in the Plan appear no longer operational. There may also be opportunities to merge water sources if water sharing arrangements can be managed at the appropriate scale.

Supporting Aboriginal water rights, values and uses

There was limited engagement and collaboration with Aboriginal stakeholders during Plan development. As a result, Aboriginal water-dependent cultural values and assets are not adequately identified and protected, and watering needs are not provided for under current provisions. This is inconsistent with the *NSW Water Strategy*'s priority to '*Recognise First Nations/Aboriginal People's rights and values and increase access to and ownership of water for cultural and economic purposes*', particularly regarding ownership of water.

Additional shares have been offered under controlled allocations without evidence that Aboriginal water rights were considered before this took place. The Plan does not adequately protect cultural flows that may originate from the regulated Murrumbidgee River under the cultural access license for that water

source. Aboriginal communities in the upper Murrumbidgee are not given access to the cultural flows of the regulated Murrumbidgee River but could be involved in co-design of initiatives to provide for cultural flows with the ACT and NSW governments and Snowy Hydro.

Critical state-wide barriers to Aboriginal water rights, and the protection of cultural values remain.

Securing town water supply to meet future needs

Despite town water needs being largely met over the life of the Plan, utility managers raised concerns about potential reduced water availability under climate change, particularly for towns in the upper catchment relying on unregulated surface water. There are also concerns around increasing demand for water supply from population growth. More work is needed to understand population impacts on water security, but risks appear largely associated with the Canberra growth corridor.

Some access rules may not adequately protect town water, including inflows to town water supply dams, and there is uncertainty around the extent that licenced extraction affects dam inflows given a lack of metering and river gauges. Growing subdivisions may also increase take under stock and domestic rights in some areas.

There are several risks to water quality that impact town water supply and amenity values, including land management practices, altered flow regimes and limited protection of releases from Tantangara Dam. The 2019-20 bushfires also had impacts on water quality.

Improving outcomes through trade

Trade restrictions between the Plan's water sources are based on information available when the Plan was developed, which may make them overly restrictive. There may be potential to remove some barriers to trade based on new information, where it can improve environmental, economic, and social outcomes. While the Plan allows for trade into high flows in some water sources – which aims to reduce hydrological stress and environmental impact – there has been limited uptake of these provisions, indicating potential barriers that need to be addressed.

The Plan currently limits interstate trade and does not recognise the role that trade could play in delivering environmental and social outcomes, with the Murray-Darling Basin Authority (MDBA) raising concerns around the lack of trading arrangements between NSW and the ACT.

Table 1: Recommendations (R)

Overall recommendation	
R 1	The Plan should be: a) extended for up to two years until 30 June 2025, to allow time to complete data collection and analysis, consultation, and development of amended provisions b) replaced by 1 July 2025 at the latest, supported by the completion of the recommendations of this review.
Ensuring sustainable extraction	
R 2	To support sustainable extraction and improve transparency, DPE-Water should as soon as possible in the next two years: a) establish and include numeric values for LTAAELs in the replacement Plan, based on up-to-date information on all forms of extraction (including updated estimates of basic landholder rights and area under plantation forestry) b) determine whether floodplain harvesting works have been constructed in the Plan area, measure floodplain harvesting (if it is occurring), and assess if this form of extraction has increased over the Plan period, as well as possible implications for the Plan LTAAELs and sustainable diversion limit (SDL) c) prioritise LTAAEL compliance assessment against numeric LTAAELs using best available estimates of extraction, and make this publicly available d) determine the rate of growth in interception activities and the impact of this estimated growth on licenced users.
R 3	Until DPE-Water develops and implements a method for LTAAEL compliance, it should ensure the replacement Plan includes a requirement for AWDs to be set conservatively if DPE-Water does not annually make and publish a reasonable estimate of extraction and assess compliance with the LTAAELs.
R 4	To support adaptive management during the term of the replacement Plan, the Plan should include a provision requiring DPE-Water to determine the sustainable level of extraction by Year 5 based on best available ecological requirements, hydrological and climate information and that these levels are used to define and amend the Plan's LTAAELs for each extraction management unit.
Protecting upper Murrumbidgee flows	
R 5	To ensure the upper Murrumbidgee River between Tantangara and Burrinjuck dams is managed consistently with the priorities of the Act and environmental objectives of existing instruments and agreements, as part of the Plan replacement, DPE-Water should: a) ensure provisions in the Plan adequately protect Tantangara Dam environmental releases (made under the Snowy Montane Rivers Increased Flows Initiative) from extraction b) considering the known pressures on the upper Murrumbidgee River, revise access rules to adequately protect basic landholder rights and town water needs

	During the term of the replacement Plan: c) if access rules from 5(a) and 5(b) are determined insufficient to protect environmental, basic landholder rights and town water needs, investigate opportunities to reduce Plan entitlement via licence retirement and reduce the LTAAEL for Unregulated Murrumbidgee Above Burrinjuck Dam Extraction Management Unit accordingly d) investigate risks to the environment associated with carryover provisions for unregulated river access licences in the Murrumbidgee I, II and III water sources and consider removing carryover provisions from the Plan if the risk is significant.
Strengthening environmental protections	
R 6	To protect water for the environment in unregulated river water sources, as part of the replacement Plan, DPE-Water should work with DPE-Environment and Heritage (DPE-EHG) and the Commonwealth Environmental Water Office (CEWO) to: a) identify priority wetlands where extraction is currently permitted, add these to Plan schedules, quantify the number of licences and works and extent of extraction and strengthen provisions to ensure no drawdown below full capacity b) for all wetlands and unregulated streams that are the recipients of planned or held environmental water from the regulated river, include rules to protect this water from extraction in the unregulated system c) introduce dealing rules to ensure that any pool drawdown allowance is not transferable to another person or entity. During the term of the replacement Plan, DPE-Water should: d) support 6(a) by prioritising installation of water infrastructure to monitor pool water levels in priority lagoons to help manage these environmental assets and support compliance e) engage with unregulated river access licence holders to consider the option of voluntary retirement of licenced entitlement in perpetuity to reduce pressure on off-river pools in the Plan area. Plan LTAAELs should then be adjusted to avoid the risk of this water being made available through controlled allocations where this does not preclude use of this water for improving Aboriginal outcomes.
R 7	To improve environmental outcomes for Mirrool Creek and the nationally significant Lower Mirrool Creek Floodplain wetlands, engage with DPE-EHG to: a) install new infrastructure for monitoring flows in Lower Mirrool Creek and onto the floodplain and develop appropriate access and trade rules based on better understanding of the environmental values and water requirements of Mirrool Creek and Lower Mirrool Creek Floodplain wetlands b) review operating rules for releases from Barren Box storage to Lower Mirrool Creek to ensure they reflect the latest knowledge regarding environmental water requirements and ensure these operating rules are codified in the replacement Plan and the relevant works approval.

R 8	As part of Plan replacement, to address issues with current access rules and the complexity of rules given the number of water sources, DPE-Water should: a) review the current hydrometric network to identify where the Plan can reference operational gauges for establishing flow classes and flow-based access rules for water sources that currently have a no visible flow rule b) ensure all high environmental value water sources at medium to high risk from extraction have flow-based access rules that support connectivity and adequately protect water sources and their dependent ecosystems c) ensure any changes to access rules from 8(a) and 8(b) are reflected in water access licence/works approval conditions d) revisit the Plan's water source boundaries to determine where they can be merged while still supporting water sharing arrangements at the appropriate scale.
Supporting Aboriginal rights, values and uses	
R 9	As part of the replacement Plan, to deliver better outcomes for Aboriginal peoples through water management, DPE-Water should: a) ensure Plan objectives and corresponding provisions are consistent with the *NSW Water Strategy* relating to Aboriginal peoples' rights and values and increase access to, and ownership of, water for cultural and economic purposes b) ensure that the Plan includes provisions that provide for the protection of the existing 2,150 megalitres (ML) of Murrumbidgee Valley high-security water for Aboriginal cultural purposes when it is used in streams and off-river pools located in unregulated river water sources adjacent to the regulated river c) undertake culturally appropriate consultation with all nations in the Plan area and engage these nations in co-designing rules that can protect water-dependent Aboriginal cultural values and assets in the Murrumbidgee catchment d) review the appropriateness and adequacy of the maximum 10 ML allowance available for cultural access licences e) support the initiatives sought by Ngunnawal people as part of the Ngunnawal Ngadjung Water Initiative to provide for cultural flows and the protection of those flows through the upper Murrumbidgee River f) include a provision that requires Aboriginal rights and access are prioritised first in line with meeting Closing the Gap targets and the *NSW Water Strategy* before annual controlled allocations are announced (controlled allocations cannot occur without demonstrating that doing so does not further impact on Aboriginal access to water rights for cultural and economic needs).

Securing town water supply to meet future needs	
R 10	As part of Plan replacement, to ensure town water supply needs are provided for, and ensure accountability and transparency of cross border management, DPE-Water should: a) strengthen access rules where appropriate based on latest available evidence to ensure town water is adequately protected for high-risk towns b) review the adequacy of Lower Yass Water Source access rules to protect town water supply, basic rights and environmental flows and strengthen if required c) determine if projected population growth in the Yass region and Canberra growth corridor warrants adjusting share components for local utility access licences alongside other strategies to augment supply d) assess the extent to which projected population growth will impact on inflows to Burrinjuck Dam e) reflect any interjurisdictional governance agreements between NSW and the ACT in Plan provisions f) ensure the Plan includes provisions to adequately support the achievement of the Plan's water quality objectives.
Improving outcomes through trade	
R 11	As part of Plan replacement, DPE-Water should draw on the latest information to determine where there is scope to update trade rules to facilitate trade across more water sources where such changes do not compromise environmental values or increase hydrological stress.
R 12	As part of Plan replacement, to reduce pressure on low flows, address future risks from climate change and enhance economic opportunities, DPE-Water should: a) review the lack of uptake of the high flow licence category in Murrumbidgee water sources b) allow trade into high flows in additional water sources where it does not impact on high flow dependent environmental values c) clarify potential relative AWD reductions between unregulated access and unregulated access (high flow) licence categories in the replacement Plan.
R 13	As part of Plan replacement, to facilitate interstate trading, DPE-Water should: a) include provisions to ensure flows will be protected through Murrumbidgee III Water Source to the Murrumbidgee regulated system b) determine key risks to existing water users and the environment from interstate trade based on modelling and other analysis underway to inform the interstate trade agreement c) provide greater clarity regarding dealings between the regulated and unregulated river water sources d) collaborate with the ACT Government to finalise the interstate trade arrangements by 2024 so they comply with Basin Plan requirements and include Plan provisions regarding interstate trade arrangements in the replacement Plan.

Monitoring, evaluation and reporting (MER)	
R 14	By June 2025, to improve Plan-specific MER, DPE-Water should: a) include equity objectives and corresponding performance indicators in the replacement Plan b) articulate how MER will be undertaken for the replacement Plan and ensure there is multi-agency support and oversight of MER activities c) ensure the replacement Plan specifies timely reporting requirements of the results of MER activities (public reporting of available MER every 5 years) to support transparency and adaptive management d) identify and address critical knowledge gaps to support adaptive management e) use the recently developed prioritisation framework to prioritise MER activities based on values and risk.

1 Review background

1.1 Water sharing plans and the Commission's role

Water sharing plans are statutory instruments under the Act. They prescribe how water is managed to support sustainable environmental, social, cultural and economic outcomes. They intend to provide certainty for water users regarding how available water will be shared over the life of the water sharing plan, which is typically 10 years, unless extended.

The Plan commenced on 1 October 2011 and is due for extension or replacement on 1 July 2023. The Plan was amended in 2016 to incorporate the Tarcutta, Adelong and Upper Billabong water sources and again in 2020 when alluvial water sources were removed as part of Basin Plan processes.

The Commission has a role under Section 43A of the Act to review water sharing plans within five years of expiry and report to the Minister on:

- the extent that a plan's water sharing provisions have materially contributed to the achievement of, or failure to achieve, environmental, social, and economic outcomes
- if changes to plan provisions are warranted.

The Commission may recommend extending or replacing plans depending on its review findings. Section 43A(3A) of the Act requires the Commission to consider potential compensation requirements resulting from recommended changes to a plan.[1] Under the Act, compensation is payable by the state to access licence holders only in certain circumstances[2] where water allocations under a water sharing plan are reduced.

The Commission must also consider the water management principles,[3] including the water sharing principles, when reviewing plans. The Act is clear that water sharing is not about balancing uses and values – it is about first providing for the environment and second recognising basic landholder rights above other uses. It specifies that the:

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).[4]

1 If a Commission report recommends changes to a plan that will reduce water allocations in relation to which compensation might be payable under Section 87AA of the Act, the Commission is to state in the report if the purpose of the proposed changes is: (a) to restore water to the environment because of natural reductions in inflow to the relevant water source, including changes from climate change or drought or (b) to provide additional water to the environment because of more accurate scientific knowledge demonstrating the amount previously allocated to the environment is inadequate.

2 As set out in sections 87 and 87AA of the Act. Section 87 states that compensation applies for certain reductions in water allocations arising during the initial (10-year) period of a water sharing plan, only where amendments are not already contemplated in that plan. Section 87AA makes clear that compensation applies to amendments to the plan after its 10-year term. In addition, the Minister has an overriding discretion under Section 87 (but not under Section 87AA) to determine if compensation should be paid and, if so, the amount of any such compensation and the manner and timing of any payments.

3 Section 5 of the Act.

4 Section 5(3) of the Act.

Further, the water management principles should be prioritised in the order that they are set out above.[5] Water sharing plans must be evidence-based to achieve these outcomes.

1.2 Review approach

The Commission's review approach for water sharing plans is outlined on its website.[6] The Commission's review was informed by a range of evidence, including:

- **Consultation** – targeted engagement with government agencies, community, Aboriginal and industry organisations.[7]
- **Document review** – the Commission reviewed the Plan and background documents as well as public reports and unpublished information from water management agencies, including DPE-Water. As required, the Commission considered other relevant state-wide and regional government policies and agreements.
- **Technical advice** – consultants provided peer review.
- **Submissions** – the Commission called for and considered public submissions via letters and calls to key stakeholders and advertising on the Commission's website. Stakeholders were asked to respond to the following questions:
  - To what extent do you feel the Plan has contributed to social outcomes?
  - To what extent do you feel the Plan has contributed to environmental outcomes?
  - To what extent do you feel the Plan has contributed to economic outcomes?
  - To what extent do you feel the Plan has contributed to meeting its objectives?
  - What changes do you feel are needed to the Plan to improve outcomes?

The Commission received twelve submissions which are published on the Commission's website.

The Commission used this evidence to evaluate the Plan's performance against its stated objectives, strategies and performance indicators. These were linked to environmental, social, cultural and economic outcomes as required for this review.

The Commission would like to thank the community members from the Plan area and ACT who gave up their valuable time to provide input to this review. We suggest DPE-Water engage with depth and intent to further understand issues facing communities, particularly Aboriginal peoples, in the Plan area.

The Commission also acknowledges that the Plan area was significantly affected by severe drought and flooding during the Plan period. It was evident from engagement during the water sharing plan review that the impacts of these events are far reaching and ongoing for communities of the Murrumbidgee. The Commission would like to thank stakeholders for their input, particularly given the significant hardships they have faced.

5 Section 9(1) of the Act.
6 Natural Resources Commission (2022) *WSP Reviews - Review approach*
7 Interviews carried out as part of targeted consultation were documented but not recorded and transcribed, hence quotes are reported as 'indirect' rather than "direct" quotes.

1.2.1 Relevant regional plans, policies and agreements

In reviewing the Plan, the project team considered the following plans, policies and agreements in accordance with Clause 43A(4)(b) of the Act:

- *NSW Water Strategy* – priority areas under the strategy that are relevant to the Murrumbidgee region
- Draft *Murrumbidgee Regional Water Strategy* (including the long list of options)
- Snowy Water Inquiry Outcomes Implementation Deed 2002 – which sets out the commitments and objectives for Snowy Montane Rivers Increased Flows (releases from Tantangara Dam into the upper Murrumbidgee River). The SWIOID and Snowy Water Licence are established under separate legislation from the Plan.
- Better Bidgee Program – a relatively new program launched by the NSW Government that includes a rescoped approach for achieving water savings through the Yanco Creek Offtake Sustainable Diversion Limits Adjustment Mechanism (SDLAM) Project and a range of other measures for improving the health of the Murrumbidgee system. Of note in the unregulated water sources is the business case for Gooragool and Mantangary lagoons.[8]
- ACT and NSW Memorandum of Understanding for Regional Collaboration and the Queanbeyan Water Supply Agreement 2008 between the Commonwealth of Australia, State of New South Wales and Australian Capital Territory
- Aboriginal Water Strategy – currently under development, noting the Commission did not have access to the draft strategy.

The Commission has also considered the *Murray-Darling Basin Plan 2012* (the Basin Plan) and the requirement under this plan to develop the *Murrumbidgee Surface Water Resource Plan*. The Plan forms a component of the water resource plan.

1.3 Parallel processes

The Commission notes that in parallel with its water sharing plan review, DPE-Water has resubmitted the *Murrumbidgee Surface Water Resource Plan* to the MDBA for accreditation and is finalising changes to the Snowy Hydro Licence following its 10-year review. Findings from the Commission's review may have implications for the water resource plan when the replacement water sharing plan is developed and future management and protection of releases from Snowy Hydro infrastructure, namely Tantangara Dam.

The Reconnecting River Country Program is also to be rolled out in the Murrumbidgee and Murray river systems, aiming to improve wetland and floodplain connectivity.[9] There is an opportunity to align the replacement Plan with this program and associated environmental, social and cultural outcomes for the Murrumbidgee River system.

[8] Department of Planning, Industry and Environment (DPIE) (2021) *Better Bidgee program: Gooragool and Mantangary Lagoons*

[9] NSW Government (2022) *Reconnecting River Country Program*

2 About the Plan area

The Plan area is one of the more diverse water sharing plan areas in NSW, ranging from alpine streams with headwaters originating in Kosciuszko National Park to expansive floodplain wetlands. It comprises 43 water sources across four extraction management units[10] (see **Appendix A**) and covers many local government areas (**Figure 2**).

The Murrumbidgee catchment spans the traditional lands of the Wiradjuri, Nari Nari, Barapa Barapa, Wemba Wemba, Yita Yita, Mutthi Mutthi, Wadi Wadi, Nyeri Nyeri, Ngunnawal/Ngunawal, Wolgalu and Ngarigu peoples. Each nation has strong cultural and spiritual connections with the rivers and wetlands of the Plan area.

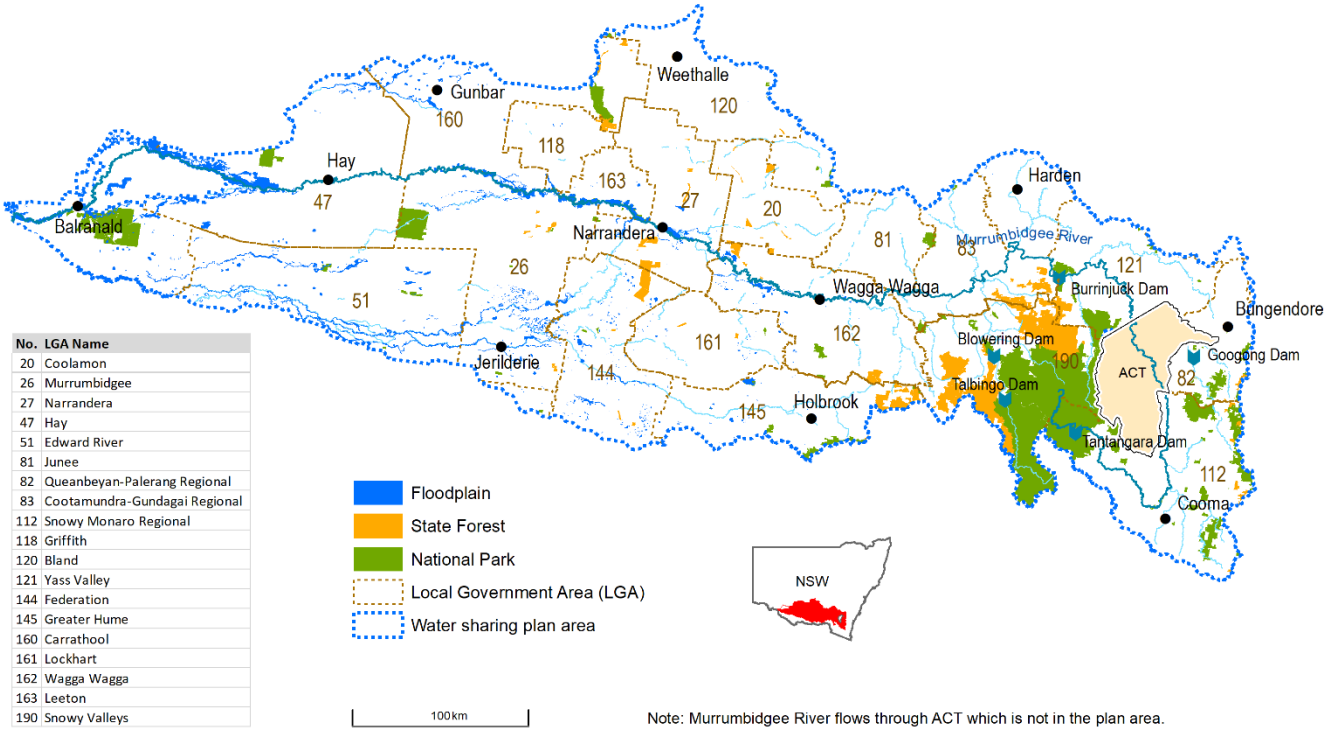

Figure 2: The Plan area, including local government areas (LGAs)

The Murrumbidgee catchment includes several large dams, including some in the Plan area:

- Snowy Hydro operates Tantangara Dam on the upper Murrumbidgee River and Talbingo Dam on the upper Tumut River for hydroelectric power generation as part of the Snowy Scheme and, as part of this Scheme, move large volumes from the Upper Murrumbidgee and Snowy River to the upper Tumut.
- Burrinjuck and Blowering dams are operated by WaterNSW to supply water to water access licence holders in the regulated Murrumbidgee River. Operating rules for these dams are included in the Murrumbidgee Regulated Plan, which the Commission will review in 2023-24.

10 These water sources are split into four extraction management units: Unregulated Billabong; Unregulated Murrumbidgee Above Burrinjuck Dam; Unregulated Murrumbidgee Below Burrinjuck Dam to Gogeldrie; Unregulated Murrumbidgee Gogeldrie to Weimby.

- Googong Dam is located in the Plan area on the Queanbeyan River but is operated by Icon Water and subject to Commonwealth and ACT jurisdiction. Icon Water also operate the Cotter, Bendora and Corin dams, which are in the ACT.

As a result of these large dams and some smaller town water supply dams, many water sources have highly altered flow regimes.

Several water sources in the Above Burrinjuck Dam Extraction Management Unit are influenced by Snowy Hydro operations and the Tantangara Water Source in this extraction management unit will become part of the Snowy Hydro 2.0 Scheme, which is expected to be operational in 2028.[11] Under this scheme, water will be cycled between Tantangara and Talbingo dams for power generation. The Snowy Scheme and Snowy Hydro's operations are regulated by the Snowy Water Licence established under separate legislation from the Plan and the Act.[12]

There is a strong connection and interaction between the Plan's unregulated river water sources and the regulated Murrumbidgee River, which is covered by the Murrumbidgee Regulated Plan. This has become increasingly important with the management and use of environmental water downstream of Burrinjuck Dam.

The headwater streams of the upper Murrumbidgee catchment provide inflows to Burrinjuck Dam. Downstream of the dam, water from the regulated river is used to provide water for the environment, notably the wetlands along the effluent streams and anabranches of the Murrumbidgee River. Except for the Lowbidgee, these wetlands and anabranches have been declared as part of the unregulated river water sources, while being hydrologically connected to the regulated Murrumbidgee River.[13]

There is also connectivity between the Plan's water sources and water sources in the ACT. The upper Murrumbidgee River flows through the ACT, before returning to NSW downstream. While the ACT is a separate jurisdiction, some of its cities and towns, including Canberra and Tharwa village rely on the upper Murrumbidgee River for town water. The management of flows from the upper Murrumbidgee section of the Plan has implications for the ACT. Similarly, management approaches in the ACT can impact on Plan water sources downstream of the ACT (see **Chapter 4**).

The Murrumbidgee catchment supports a diversity of water dependent ecosystems, including instream aquatic habitats, river red gum forests and floodplain wetlands. There are 26 nationally significant wetlands in the NSW portion of the Murrumbidgee, including the Lower Mirrool Creek Floodplain wetlands and the Mid Murrumbidgee and Lowbidgee wetlands (the Lowbidgee is part of the Murrumbidgee regulated river water source), as well as internationally significant wetlands (Fivebough and Tuckerbil Swamps).[14] Iconic, flow-dependent vegetation communities include black box, river red gum, lignum and spike rush communities.

The regulated Murrumbidgee River and its tributaries and anabranches, including Billabong Creek, Yanco Creek, Colombo Creek and their tributaries, are listed as part of the Lower

11 During the term of the replacement Plan.
12 Under the *Snowy Hydro Corporatisation Act 1997* and the SWIOID.
13 The Lowbidgee area is part of the Murrumbidgee Regulated Plan. It includes all water occurring naturally on the surface of the ground or in rivers, lakes and wetlands, except water contained in Pee Vee Creek (previously Talpa Creek), Lake Tala and Five Mile Lagoon.
14 There are also 13 nationally significant wetlands in the ACT portion of the Murrumbidgee (Taylor, I.R., Murray, C.A. and Taylor, S.G. (Eds.) (2006) *Wetlands of the Murrumbidgee River Catchment: Practical Management in an Altered Environment*)

Murray River aquatic ecological community.[15] All native fish and other aquatic biota within this endangered ecological community are given endangered status. The catchment supports several flow-dependent threatened and iconic species, including native fish (such as trout cod [*Maccullochella macquariensis*], Murray cod [*Maccullochella peelii*], silver perch [*Bidyanus bidyanus*] and Macquarie perch [*Macquaria australasica*] and waterbirds (such as the Australasian bittern [*Botaurus poiciloptilus*], Australian painted snipe [*Rostratula australis*] and freckled duck [*Stictonetta naevosa*]).[16]

The Plan area's diversity extends to its towns, with towns relying on water under the Plan ranging from the large regional centres of Cooma (population just over 7,500[17]) and Yass (population just over 2,900[18]), to small villages with less than 500 people such as Bredbo, Adaminaby and Cabramurra.[19] Towns reliant on water supply managed by the Plan are mostly found upstream of Burrinjuck Dam, with remaining towns below the dam relying on regulated river supply[20] and groundwater. Population projections vary across the Plan area, with projected growth largest in the Queanbeyan-Palerang, Yass Valley and Snowy Monaro Regional council areas.[21] This population growth and urban development is associated with the 'Canberra growth corridor'.[22]

The proportion of Aboriginal and Torres Strait Islander peoples is larger in several LGAs compared with the average NSW population (2.9 percent).[23] The Plan area includes three active native title applications,[24] 16 Local Aboriginal Land Councils (LALCs), an Indigenous Protected Area and an Indigenous Land Use Agreement (**Figure 3**).

15 Department of Primary Industries (DPI) (2007) *Prime fact: Lower Murray River aquatic ecological community*
16 DPE-Water (2020) *Murrumbidgee Long Term Water Plan Part A: Murrumbidgee catchment*
17 Id Demographic Resources (2021) *Snowy Monaro Regional Council community profile - Cooma*
18 Id Demographic Resources (2021) Yass Valley *community profile - Yass*
19 DPI-Water (2016) *Water Sharing Plan for the Murrumbidgee River Unregulated and Alluvial Water Sources - Background document for amended plan 2016*
20 *Ibid.*
21 Australian Government (2022) *Fastest Growing Local Government Areas*
22 DPE-Water (2022) Draft Regional Water Strategy, Murrumbidgee: Strategy
23 Australian Bureau of Statistics (2022) *New South Wales 2016 All Persons Quick Stats*
24 National Native Title Tribunal, accessed August 2022.

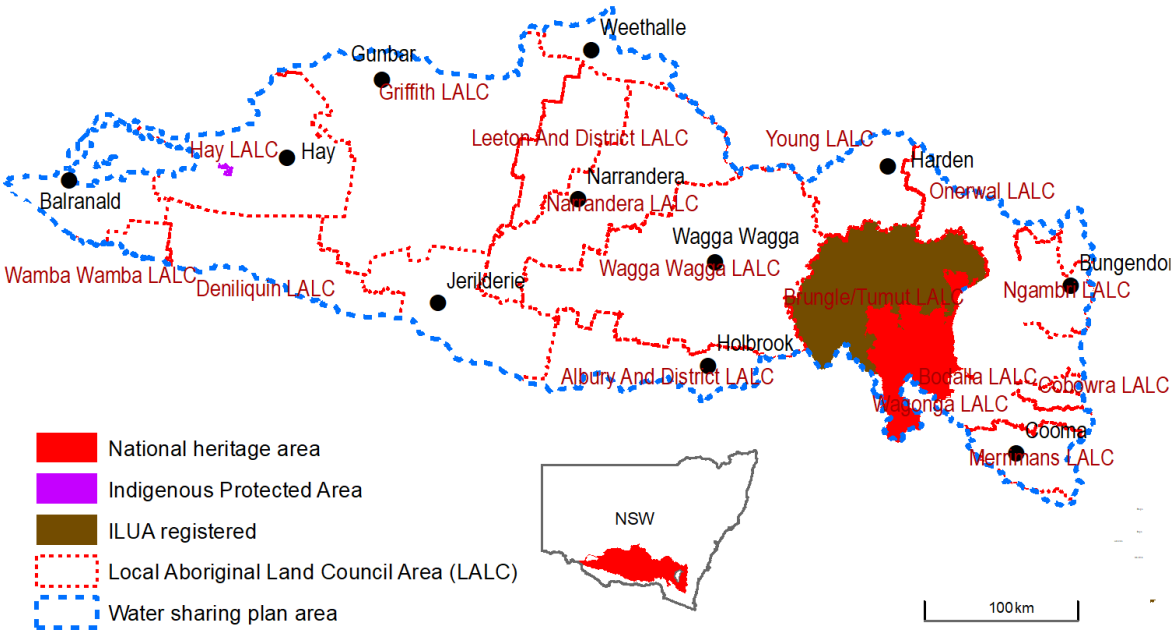

Figure 3: The Plan area, including LALCs and Indigenous Protected Area

The Murrumbidgee region has a diverse economy and is NSW's fourth largest in terms of economic output, population and employment. In 2018/19, the regions' economic output was $15.9 billion and accounted for 2.7 percent of NSW's output as measured by gross value added.[25] Key sectors include tourism, power generation, agriculture, and manufacturing. Key industries that rely on the region's water resources include:[26]

- water-dependent agriculture, including grazing, forestry, dryland cropping, fruit and vegetable production, rice, cotton and intensive poultry and pigs. During the Plan period there was significant growth in cotton and almond production.[27] In 2018/19, agriculture, forestry and fishing industries in the Murrumbidgee contributed $1.8 billion in economic output as measured by gross value added.[28]
- renewable energy operations, including the Snowy Hydro scheme and several large windfarms on the southern tablelands (including in Yass, Bungendore)
- plantation forestry, particularly in the upper Murrumbidgee (although a large area was impacted by the 2019-20 bushfires)
- a thriving tourism industry that relies on water resources and a healthy environment for recreation water-based activities.

The broader region is anticipating growth in several key industries, including agribusiness and advanced value-added manufacturing, health care and social assistance, freight and logistics, tourism, education and training, forestry, and renewable energy.[29]

Like the landscape, the region's climate varies considerably, ranging from alpine in the east to warm and persistently dry in the west.[30] The Murrumbidgee catchment is one of the more vulnerable to climate change in NSW. The climate in the Murrumbidgee region has already shifted over the last 20 years, with declines in rainfall and wet days in south-east Australia

25 DPE-Water (2022) *Draft Regional Water Strategy: Murrumbidgee Strategy*
26 *Ibid.*
27 *Ibid.*
28 REMPLAN (2022) *Economy, Jobs and Business Insights*
29 DPE-Water (2022) *Draft Regional Water Strategy: Murrumbidgee Strategy*
30 Bureau of Meteorology (2001) *Map of Climate Zones of Australia*

since the mid-1990s.[31] During the Plan period, the Plan area was significantly impacted by drought, recording some of the region's lowest flows and cease to flow periods.

Large parts of the upper Murrumbidgee catchment were also impacted by bushfires following the drought, impacting 80 percent of Namadgi National Park and over a third of Kosciuszko National Park, as well as heavily impacting waterway health in the Cooma region.[32] These events were followed by significant rainfall and extensive flooding between 2020 and 2022 associated with three consecutive *La Niña* events.[33]

Future climate scenarios indicate a high likelihood of significant impacts on water availability. Flows in the region are influenced by snowmelt. Less rainfall and snowfall in key runoff areas like the Snowy Mountains, coupled with higher evapotranspiration, higher temperatures, and more severe fire conditions, will likely change the volume of water available across the Plan area (see **Section 3.5** for more discussion on climate change risks).[34]

31 DPE-Water (2022) *Draft Regional Water Strategy: Murrumbidgee Strategy*
32 O'Reilly, W., Brademann, A., Ferronato, B., Kellock, D., Lind, M., and Ubrihien, R. (2021) *Catchment Health Indicator Program: Report Card 2020*
33 Bureau of Meteorology (2022) *Flood Warning- Murrumbidgee River*
34 DPE-Water (2022) *Draft Regional Water Strategy: Murrumbidgee Strategy*; Office of Environment and Heritage (2014) *Murray Murrumbidgee climate change snapshot and South East and Tablelands climate change snapshot*

3 Ensuring sustainable extraction

A fundamental role of a water sharing plan is to define how much water can be extracted by licensed users, ensuring the remaining water is adequate to protect the water sources and their dependent ecosystems and basic landholder rights. The regular assessment of LTAAEL compliance and response to any exceedance is an important part of protecting the environment, basic rights and the sharing of water as intended by the Act and Plan. The Plan establishes rules to manage extraction at three scales:

- **Long term**: LTAAELs control the maximum amount of water that can be extracted over the long term in each extraction management unit.[35] Setting these limits is critical; a limit that is too high will reduce the amount of water remaining for the environment and downstream water users, while a limit that is too low reduces economic and social opportunities. LTAAEL assessment should include all extraction for consumptive (non-environmental) use, including basic landholder rights. The Plan has descriptive LTAAELs for each of its four extraction management units. The Plan also includes provisions referring to the Basin Plan for calculating the SDL and assessing SDL compliance in the Plan area.[36]
- **Medium term**: AWDs allocate the volume of water that can be extracted under access licences each year. The Plan requires AWDs to be used to retrospectively reduce extraction if the LTAAEL is exceeded. To date, AWDs have not been used to reduce risks to the Plan's water sources.
- **Short term**: daily access rules define when licensees can extract water. They are intended to protect the needs of the environment, basic landholder rights and water utilities on a daily basis (see **Section 5.5**).

This chapter focuses on the use of LTAAELs and AWDs to manage extraction. The Commission continues to identify significant issues related to the establishment and management of extraction through LTAAELs across its reviews, including several in this Plan area:

- the Plan lacks sustainable, numeric extraction limits and compliance assessments have not been undertaken despite the Plan requiring them annually (**Section 3.1**). In the absence of these assessments, the Plan should require a precautionary AWD to be implemented to address the risk of overextraction and safeguard the priorities under the Act (**Section 3.2**)
- components of extraction limits for the Plan and Basin Plan do not align (**Section 3.3**)
- several components of the LTAAEL do not reflect best available information (**Section 3.4**)
- future climate change risks are not reflected (**Section 3.5**).

3.1 The Plan lacks sustainable, numeric extraction limits

Establishing fixed, numeric LTAAELs that are assessed regularly is important to:

- provide clarity and transparency to stakeholders of overextraction risks
- support efficient LTAAEL compliance monitoring
- allow compliance action to be taken through AWDs if extraction limits are exceeded

35 Part 6 of the Plan.
36 Divisions 3 and 4 of Part 6 of the Plan.

- protect environmental and community needs, including giving effect to the water management principles and water sharing principles of the Act
- manage extraction and development impacts on connected water sources
- underpin an effective water market and the valuing of water as a limited resource.

The Plan establishes four LTAAELs – one for each extraction management unit – which are descriptive and based on historic levels of extraction for water sources in each extraction management unit.[37] Having separate LTAAELs corresponding to each extraction management unit provides a strong foundation for extraction management, as it allows for management to better reflect and respond to geographic-specific issues and extraction patterns. This is important given the size and variability of the Plan area.

However, as with many water sharing plans reviewed by the Commission, LTAAEL limits are not specified numerically (in ML per year) or based on an assessment of sustainability. Instead, the LTAAELs are described as being based on historic use averaged over the period 1 July 1993 to 30 June 1999 (plus basic landholder rights and plantation forestry take that existed as at 30 June 2009). This level of extraction has not been assessed to consider if it can support the Plan's water sources and their water dependent ecosystems and, without a numeric value extraction, cannot be effectively managed.

As part of the replacement Plan, DPE-Water should include a numeric estimate of the LTAAEL for each extraction management unit. This will require assumptions to be defined as there is incomplete information on environmental water requirements and most extraction is not metered. Despite incomplete data, the Commission's view is that a specified numerical LTAAEL, with transparent documentation of available information, incomplete information and assumptions, provides for a robust and transparent basis to manage sustainable long-term sustainable extraction. This will provide an indicative figure to assess and manage risk of exceedance and provide transparency for stakeholders regarding the extraction limit.

LTAAEL compliance assessment requires a reasonable estimate of actual annual extraction and the establishment of numeric LTAAELs. In the absence of these factors, LTAAEL compliance assessments have not been undertaken[38] and management of growth in use cannot occur effectively as intended under Part 6 of the Plan. While the Plan provides for calculation of AWDs to manage growth in use[39], AWDs have been set at 100 percent regardless of the system's ability to provide water.

The Plan audit conducted in 2018-19 found compliance with LTAAELs was not given effect to because water use data are not available, and the lack of implementation of clauses relating to LTAAEL assessment and compliance gives a very high likelihood that the Plan is not meeting its intended objectives.[40] This review identified that this issue remains. The Commission considers that a lack of perfect information regarding extraction should not prevent DPE-Water from making the best estimates of a sustainable extraction limit possible based on available information.

37 See Part 6, Division 2, Clause 30 of the Plan.
38 Alluvium (2019) *Audit of the Water Sharing Plan for the Murrumbidgee Unregulated and Alluvial Water Sources 2012*
39 See Part 6, Division 5, Clauses 38-42 of the Plan.
40 Alluvium (2019) *Audit of the Water Sharing Plan for the Murrumbidgee Unregulated and Alluvial Water Sources 2012*

The current Plan's LTAAEL is not based on an assessment of sustainability.[41] The level of extraction has not been assessed to consider if it can maintain the Plan's water sources and their water dependent ecosystems. It is therefore unclear if the Act's water management principles and priorities are being given effect.[42] DPE-Water should determine sustainable levels of extraction based on the needs of water dependent ecosystems, including the potential impacts of climate change to inform the replacement Plan.

The Commission considers establishing sustainable numeric LTAAELs for the Plan's four extraction management units and assessing LTAAEL compliance is a high priority. Resources should be aligned to address this priority. To support adaptive management during the term of the replacement Plan, DPE-Water should include a provision requiring that the sustainable level of extraction be determined by Year 5 of the Plan.

In establishing sustainable numeric LTAAELs, DPE-Water should review LTAAELs to ensure they are based on best available information regarding ecological requirements, and the latest hydrological and climate information and use these levels to define LTAAELs for each extraction management unit. This may result in new extraction limits. Once fixed, sustainable numeric LTAAELs are established, these should be included in tables in the Plan to increase transparency and support compliance.

3.2 A conservative approach to AWDs is needed

Until numeric LTAAELs are established and DPE-Water develops and implements a method for LTAAEL compliance, the Plan should require a conservative approach to provision of AWDs. These compliance assessments are a requirement of the Plan, but have not yet been implemented, despite the Plan approaching expiry. Lack of LTAAEL compliances poses a risk to the environment, domestic and stock use and town water supply – a risk that can be mitigated through AWDs. A conservative approach is in line with the precautionary principle.

In recent reviews of the water sharing plans for the Castlereagh and NSW Border Rivers unregulated river water sources, the Commission recommended the reduced AWD could be based on the ratio of the LTAAEL to entitlement across an extraction management unit. If that cannot be calculated, this should be the ratio of the unregulated baseline diversion limit (BDL) to the unregulated river access entitlement. This would ensure that water intended to be planned environmental water in the Plan area is not being extracted, giving effect to the priorities of the Act. It would also highlight for stakeholders the risks of the current AWD approach to the Plan's water sources and provides an incentive to landholders to report their actual take and encourage the development of sustainable, numeric LTAAELs and LTAAEL assessment in the Plan area.

This reduction should not be applied to town water supply, local water utility or domestic and stock access licences. If the ratio of BDL to total entitlement must be used (because individual numeric LTAAELs are not established), DPE-Water should consider apportioning AWD reductions based on extraction management units, to more fairly reflect where take is likely to exceed the LTAAEL.

The Commission recognises the risk that AWDs may need to be reduced to meet LTAAEL compliance is not transparent to most water users, and that a shift to full LTAAEL

41 The LTAAELs are described as being based on historic use averaged over the period 1 July 1993 to 30 June 1999 (plus basic landholder rights and plantation forestry take that existed as at 30 June 2009)

42 The water management principles as they relate to water sharing are established under Section 5(3) of the Act.

compliance, or setting a conservative AWD until compliance can be demonstrated may have significant impact on users. It is important to note that the distribution of risk from interception varies across the Plan's extraction management units. For example:

- population growth along the Canberra growth corridor may potentially drive growth in basic landholder rights, particularly in the Unregulated Murrumbidgee Above Burrinjuck Dam Extraction Management Unit (see **Section 3.4.1**)
- risks from potential floodplain harvesting (see **Section 3.4.2**) would be focused in the lower catchment, including the Unregulated Murrumbidgee Gogeldrie to Weimby Extraction Management Unit.

Under current Plan rules, social and economic risk to licence holders are greatest for users in extraction management units that would bear the impact of any reductions necessary to accommodate such growth. If this growth exceeds a sustainable limit for the extraction management unit, the reduction must occur within that extraction management unit.

Once extraction is adequately estimated, DPE-Water should assess the impacts and equity of various options for mitigating the risk of reduced allocations. Following assessment of options, the Plan rules should be revised to ensure equitable sharing of any necessary reductions, consistent with the priorities under the Act.

It is critical that the risks of a reduced AWD are made transparent to licence holders and that this approach only apply to water sources that are at risk of serious or irreversible harm from over-extraction. It is essential that DPE-Water inform licence holders of these risks as soon as possible. This may allow DPE-Water to focus its compliance assessment activities and develop more nuanced adjustments to AWDs that adequately protect the environment in a manner that has the least impact on users.

3.3 Components of extraction limits in the Plan and Basin Plan do not align

The Plan area comprises part of the Murray-Darling Basin and water management in the area must comply with Basin Plan requirements. The Basin Plan sets extraction limits called SDLs that apply to various geographic areas.[43] The SDL for the Murrumbidgee Surface Water SDL Resource Unit covers extraction from the unregulated river water sources in the Plan area, as well as the Murrumbidgee Regulated Plan. The SDL must be met based on estimates of the amount of extraction allowed prior to the Basin Plan, called the BDL, less reduction achieved by water purchase programs and other works and measures set out in the Basin Plan.[44]

The Plan was amended in 2020 to meet Basin Plan requirements,[45] including provisions referring to the Basin Plan for calculating the SDL and assessing its compliance in the Plan

43 MDBA (2020) *Sustainable diversion limit (SDL) accounting framework improvement strategy 2020 – 2025*

44 Turner, G., Vanderbyl, T. and Kumar, S. (2019) *Final Report of the Independent Panel's Review of the Sustainable Diversion Limit (SDL) Water Accounting Framework*; MDBA (2020) *Sustainable diversion limit (SDL) accounting framework improvement strategy 2020 – 2025*

45 The Basin Plan sets sustainable extraction limits called the SDLs, which are estimates of the historic volume of extraction before the Basin Plan (the baseline diversion limit), less reductions from water purchase programs and other works and measures set out in the Basin Plan. As per Turner, G., Vanderbyl, T. and Kumar, S. (2019) *Final Report of the Independent Panel's Review of the Sustainable Diversion Limit (SDL) Water Accounting Framework*; MDBA (2020) *Sustainable diversion limit (SDL) accounting framework improvement strategy 2020 – 2025*

area.[46] The Plan specifies that the long-term average SDL for the Plan area is the BDL (i.e., the historic extraction) attributable to the Plan's water sources.[47]

The Plan's LTAAELs and long-term average SDL are based on different descriptive components, however the total should have the same value if calculated numerically (noting the SDL is for unregulated and regulated river water sources). There are reasons for differences between figures in the Basin Plan and the water sharing plan. Nonetheless, any changes to the Plan's LTAAELs based on sustainability criteria would likely have implications for the Basin Plan's Murrumbidgee Surface Water SDL.

The Plan's background document notes that the Plan's extraction limits were developed to ensure consistency with the Murray-Darling Basin Cap,[48] meaning that the LTAAELs for unregulated river water sources must be equal to or less than the unregulated components of the Cap.[49] The Cap for unregulated river water sources is based on average levels of extraction from the volumetric conversion process for the period 1 July 1993 to 30 June 1999.[50] The SDL replaces the Cap.

For the Plan, the LTAAELs must be equal to or less than the BDL. The estimated BDL components for the Murrumbidgee include 42.4 gigalitres of take per year from watercourses (unregulated extraction excluding licenced farm dams), and a portion of:

- 41 gigalitres per year from basic rights dams
- 344 gigalitres per year from take by runoff dams
- 116 gigalitres per year net take by plantation forestry.[51]

The Plan's unregulated river access licence entitlement is more than double the current estimate of the BDL component of take from a watercourse (88.7 compared to an estimated 42.4 gigalitres per year).

Further, the Commission understands that estimates of the relevant BDL components of historic extraction were incomplete when included in the Basin Plan in 2012, and these estimates have not been updated since to reflect all take from unregulated river water sources. For example, the take from a water course under basic landholder rights and town water supply were not included in the Murrumbidgee BDL estimates.

Having an inaccurately low BDL has the potential to disadvantage license holders, as this could result in reductions in the amount of water available for take. Once DPE-Water establishes numeric LTAAELs based on the latest available information, the Commission encourages DPE-Water to provide revised figures to the MDBA to ensure the BDL can be updated to reflect current information as soon as possible.

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46 The valley-scale SDL under the Basin Plan applies to the Murrumbidgee surface water resource unit and includes all forms of take including regulated and unregulated diversions. The SDL surface water resource unit covers the same catchment area as the Plan.

47 Clause 33(1) of the Plan.

48 The long-term cap on water diversions from the Murray-Darling Basin was introduced in 1996 under the Murray-Darling Basin Agreement. The cap on diversions requires the NSW Government to ensure that diversions within each designated river valley in NSW do not exceed diversions under baseline conditions as at 30 June 1994.

49 DPI (2012, updated in 2016) *Water Sharing Plan for the NSW Border Rivers Unregulated and Alluvial Water Sources 2012 – Background document*, p. 23.

50 *Water Act 2007* (Cth), Schedule 1 Murray-Darling Basin Agreement, Schedule E Cap on diversions, Clause 5.

51 MDBA (2019) *Sustainable Diversion Limits (SDLs) as at 1 July 2019 - surface water*

3.4 Several LTAAEL components are not based on best available information

3.4.1 Growth in basic landholder rights extraction should be reflected

The Plan provides for basic landholder rights, which are given priority under the Act and do not require water licences:

- **domestic and stock rights** – owners or occupiers of land that has river or lake frontage can take water without a licence for domestic (household) purposes or to water stock
- **harvestable rights – dams** – landholders in most rural areas can collect a proportion of the runoff on their property and store it in one or more farm dams up to a certain size
- **native title rights** – native title holders (as determined under the Commonwealth *Native Title Act 1993*) can take and use water for a range of domestic and traditional purposes.[52]

The Plan recognises all basic landholder rights extraction. Currently, the Plan includes an estimate for the domestic and stock component of 4,385 ML per year.[53] However, DPE-Water advised the Commission that the latest estimate of basic landholder rights is 7,595 ML per year – a73 percent increase on the current estimate. This estimated growth, which is based on a refined methodology, could result in the need to reduce licensed usage through AWDs. This should be made transparent to water users during consultation on the draft replacement Plan.

Population and development patterns can provide an indication of potential growth in demand for water, including under basic landholder rights. The Commission's stakeholder engagement process indicates there may be growth in the Canberra Growth Corridor and Yass (see **Section 7.4**).[54] These growth areas coincide with the Unregulated Murrumbidgee Above Burrinjuck Dam Extraction Management Unit and will need to be considered as part of Plan replacement. Given the projected growth, there is merit in revisiting BLR estimates at intervals more frequently than every ten years (around the time a Plan is due to expire), ideally every five years. This is particularly important for the Unregulated Murrumbidgee Above Burrinjuck Dam Extraction Management Unit.

3.4.2 The occurrence of floodplain harvesting in the Plan area is unclear

Unlike water sharing plans in the northern Basin, the Plan does not refer to floodplain harvesting in the determination of LTAAELs. The *NSW Floodplain Harvesting Policy*[55] does not apply in the unregulated river water sources of the Murrumbidgee Valley as it is not part of a designated floodplain.[56] However, anecdotal evidence from stakeholders suggests that floodplain engineering works have been undertaken to capture flood flows. In its submission to the water sharing plan review, the MDBA raised the need to address whether floodplain harvesting is currently occurring and, if so, determine how it is accounted for under the LTAAELs.[57]

52 Sections 52-55 of the Act.
53 See Part 5, Division 2, Clause 19 of the Plan.
54 Snowy Valleys Council (2021) *Snowy Valleys Council Local Strategic Planning Statement June 2020*
55 DPE-Water (2022) *NSW Floodplain Harvesting Policy - Water in New South Wales*
56 Policy implementation is initially focused on valleys in the northern Basin including the Border Rivers, Gwydir, Namoi, Barwon–Darling and Macquarie.
57 Submission: MDBA, received 28 January 2022.

The *Select Committee Report on Floodplain Harvesting*[58] did not make specific findings in relation to floodplain harvesting in the southern valleys of the Murray-Darling Basin. However, the Committee was divided on the occurrence of floodplain harvesting in this area, with one member moving to acknowledge that floodplain harvesting is occurring in the southern valleys, but this did not gain majority support of the Committee.

A submission to the draft *Murrumbidgee Surface Water Resource Plan* also notes the risks of floodplain harvesting to the environment and supports an assessment of this risk.[59] The Commission notes that amendment provisions were included in the Plan that allow for rules to manage floodplain harvesting within the Plan's water sources,[60] but is unclear on whether this indicates that floodplain harvesting will be allowed in the future. DPE-Water should determine if floodplain harvesting works have been constructed in the Plan area and assess possible implications for the Plan LTAAELs. The Commission also encourages DPE-Water to transparently report on this when developing the replacement Plan.

In 2021, DPE-Water published a review of ten southern Basin floodplain management plans undertaken in accordance with Section 43 of the Act.[61] This included plans for Billabong Creek (Walbundie to Jerilderi) and Hay (Hay to Maude) areas. The review recommended the development of valley scale floodplain management plans, including a plan for the Murrumbidgee Valley. This would comprise a newly declared floodplain area that includes the Lowbidgee floodplain, which is part of the Murrumbidgee Regulated Plan. However, it is unclear the extent that the area of the proposed Murrumbidgee Valley floodplain management plan would overlap with the boundaries of the unregulated river water sources covered by the Plan.[62] This should be determined during the development of the replacement Plan.

3.4.3 Changes in commercial forestry plantation area should be reflected

The Murrumbidgee catchment includes areas of plantation forestry.[63] The Plan's background document recognised significant areas of commercial forestry plantations are associated with interception within the Burrinjuck to Gogeldrie Extraction Management Unit.[64] When the Plan was developed, commercial plantation forestry was expected to increase by 12 percent (17,000 hectares) by 2030.[65] Coinciding with Plan development, there was a research focus on the effects of plantations on local hydrology, with interception of water by plantations considered to impact on surface water flows, as well as research into groundwater impacts.[66]

58 Parliament of NSW (2021) *Legislative Council – Select Committee on Floodplain Harvesting*
59 CEWO (2019) *Submission: Murrumbidgee Surface Water Resource Plan*
60 Clause 94(1)(b) under Part 12 of the Plan.
61 Alluvium (2021) *Section 43 Review of 10 Southern Floodplain Management Plans*
62 The floodplain management plan area is relevant to the Plan in terms of:
1. defining the floodplain area and the regulated area for flood works
2. defining flood flow paths
3. informing consideration of whether, when and where environmental flows should be protected from access
4. informing identification of whether floodplain harvesting is occurring, the legality or associated works, and if it is occurring, its management and regulation under the water sharing plan.
63 DPI (2021) *NSW Plantations Authorisations Snapshot 2020-21*
64 DPI (2012, updated in 2016) *Water Sharing Plan for the NSW Border Rivers Unregulated and Alluvial Water Sources 2012 – Background document*, p. 23.
65 *Ibid*.
66 Polglase, P. and Benyon, R. (2009) *The impacts of plantations and native forests on water security: Review and scientific assessment of regional issues and research needs*

DPE-Water recognised these potential impacts and the need to develop a policy for managing the impacts of forestry on hydrology.[67] In relation to this issue, DPE-Water included Clause 30 in the Plan, which required that the LTAAEL include '*the estimated annual take of water from the respective extraction management unit by plantation forestry that existed on 30 June 2009*'. Any increased extraction through interception by any plantations established since 2009 does not result in an increase to the LTAAEL. This means that if the LTAAEL were exceeded, implementation of LTAAEL compliance may result in reductions to AWDs for licence holders. This could be avoided by plantation operators obtaining (through dealings) a water access licence and the applicable volume of shares. The Plan does not provide specific rules addressing dealings for purposes of licensing interception by plantation forestry. However, Clause 94(1)(e) enables amendments for this purpose.

During this review, stakeholders raised concerns regarding growth in commercial forestry plantations in the Unregulated Murrumbidgee Below Burrinjuck Dam to Gogeldrie Extraction Management Unit, with some considering that growth should be considered in the Plan replacement.[68]

While recognising these concerns, DPI's Forest Science Unit advised that there has been little growth in plantations since 2012, (just over 1,600 hectares, well below predicted growth).[69] It is likely that the 2019-20 bushfires also affected the area of plantation forests.

DPE-Water has also reviewed the issue of interception by plantation forestry and its current position is that plantations do not pose a significant threat to water availability in NSW, and it does not consider it a form of water take that should be licensed.[70] While growth is small, the figures underpinning the original Plan should still be updated as part of Plan replacement to reflect changes in the area under plantation. Specifically, the LTAAEL for the Burrinjuck to Gogeldrie Extraction Management Unit and potentially the Unregulated Murrumbidgee River Above Burrinjuck Dam Extraction Management Unit should be updated to include the latest commercial plantation projection figures.

3.5 LTAAELs should consider potential risks from climate change

The Plan's LTAAELs are based on estimates of extraction during the 1990s and – in addition to not considering sustainable volumes to protect water-dependent ecosystems – do not consider the full climatic record or climate change projections, including potential decreases in streamflow that could occur during the term of the replacement Plan and beyond. Although potential reductions in surface water availability associated with climate change were recognised when the Plan was developed,[71] provisions to manage this risk were not explicitly part of the Plan. If the LTAAELs are based on data from a period with greater water availability than is likely in future, there is a risk that less water will be available for the environment.

Data analysis and modelling undertaken to date indicate that the Murrumbidgee catchment is highly vulnerable to climate change. The Murrumbidgee region's climate has already

67 DPI (2012, updated in 2016) *Water Sharing Plan for the NSW Border Rivers Unregulated and Alluvial Water Sources 2012 – Background document*, p. 23.
68 Interview: Riverina Local Land Services, 26 May 2022.
69 Change in area of plantations is the Murrumbidgee Catchment Management Authority boundary (see NSW Government (2019) *Plantation Plantable Area*)
70 DPE-Water (2022) *Replacement water sharing plan manual*
71 DPI (2012, updated in 2016) *Water Sharing Plan for the NSW Border Rivers Unregulated and Alluvial Water Sources 2012 – Background document*

shifted in the last 20 years,[72] with a 10-20 percent decrease in rainfall in autumn and winter and a reduced number of wet days in southeast Australia since the mid-1990s.[73]

During the Plan period, the Plan area was significantly impacted by drought, recording some of the region's lowest flows and cease to flow periods. The 24 months from January 2018 to February 2020 saw well below average rainfall and some of the lowest two years of inflow on record for Burrinjuck Dam. However, from 2020 to 2022, above average rainfall and dam inflows increased the region's storages to above 90 percent and led to spills of Burrinjuck Dam and Blowering Dam in mid-2021 and late 2022. This pattern of extended drought followed by intense wet conditions is not uncommon in the Murrumbidgee region.[74]

Future climate scenarios indicate a high likelihood of significant impacts on water availability. Less rainfall and snowfall in key runoff areas like the Snowy Mountains, higher evapotranspiration, higher temperatures, and more severe fire conditions will likely change the volume of water available across the Plan area. This will in turn increase pressures on water users and the environment to share water if water availability is impacted.

The NSW Government is investing in new climate datasets and modelling to develop a more sophisticated depiction of past and future climate conditions. The preliminary outputs from these were used to consider options in the draft *Murrumbidgee Regional Water Strategy*,[75] including conservative estimates from NARCliM 1.0, which represents the greatest reduction in average rainfall[76] and a pilot of new climate data sets by Adelaide University to assist with more accurately assess current and future drought risks (stochastic modelling).[77] These models are being further refined and used to inform the final regional water strategy.

The preliminary modelling suggests that there will be:

- **shifts in seasonal rainfall patterns with a tendency for lower annual rainfall in the upper Murrumbidgee:** preliminary modelling indicates that by 2079, average winter rainfall may drop by 20 percent, average autumn rainfall by 11 percent, with very little reduction in summer and spring rainfall
- **higher evapotranspiration:** average evapotranspiration could increase by up to 2 percent by 2039 and up to 4 percent by 2079 compared to levels between 1990 and 2009.[78]

In addition to this newer data, previous NSW Government modelling indicate the Murrumbidgee region could experience more hot days and less cold nights.[79] The expected

72 Devanand, A., Leonard, M. and Westra, S. (2020) *Implications of Non-Stationarity for Stochastic Time Series Generation in the Southern Basin*, pilot study undertaken by Adelaide University.
73 *Ibid*.
74 DPE-Water (2022) *Draft Regional Water Strategy, Murrumbidgee: Strategy*
75 *Ibid*.
76 This is the global climate model result that represents the greatest reduction in the mean of the three regional climate models' monthly rainfall for the 2060-2079 period compared to the 1990-2009 period (Office of Environment and Heritage (2014) *Murray Murrumbidgee climate change snapshot and South East and Tablelands climate change snapshot*)
77 Devanand, A., Leonard, M. and Westra, S. (2020) *Implications of Non-Stationarity for Stochastic Time Series Generation in the Southern Basin*, pilot study undertaken by Adelaide University.
78 DPE-Water (2022) *Draft Regional Water Strategy: Murrumbidgee Strategy*
79 The region is likely to experience 5 to 10 hot additional days in the near future and 20 to 30 additional hot days each year by 2070 (with the exception of the Snowy Mountains). The Snowy Mountains will have the greatest decrease with 10 to 20 fewer cold nights in the near future and 20 to 30 fewer cold nights in the long term. This temperature change will impact on conditions for snowfall. The rest of the region is likely to experience 5 to 10 fewer cold nights in the near future and 14 to 27 fewer cold nights in the long term. The largest decreases are expected in winter and spring (Office of Environment and Heritage

temperature increases and reduced number of cold nights in the Australian Alps is expected to substantially decrease snowfall. Snowpack is expected to decrease by about 15 percent by 2030, and 60 percent by 2070.[80] The expected decrease in snowfall will likely lead to reduced snowmelt and late winter-spring stream flows.

Climate projections indicate further fluctuations in streamflow in unregulated rivers and creeks in the upper Murrumbidgee, which already experiences variability in rainfall and temperature, and is more susceptible to short intense droughts. The upper Murrumbidgee is also impacted by river regulation, including from Tantangara Dam (see **Chapter 4** and **Figure 4**). Sites along the upper Murrumbidgee show a trend of declining annual streamflow over the historical record. Since 1960, the upper Murrumbidgee has experienced less frequent large flows and more frequent low flows.

At Mittagang Crossing near Cooma, streamflow was below the low flow threshold (95th percentile) for around 25 percent of the time before 1960, approximately 50 percent of the time between 1960 and 2000, and around 86 percent of the time since 2000 (see **Figure 4**). There has also been an increase in the occurrence of cease-to-flow conditions.[81]

2014 NSW Government modelling indicates the potential for more variable inflows to Burrinjuck Dam. The dam has had highly variable inflows over the observed historical record (average monthly inflows can vary from 43 gigalitres in February to 174 gigalitres in July, with a strong bias towards winter and spring inflows). Inflows could be even more variable under a worst-case dry climate change scenario.[82]

Further variability in this system may result in reduced water availability, which poses risks to water users, particularly those reliant on the unregulated rivers as a sole source of water supply.[83] This also presents risks to river, wetland and floodplain health and town water security if there are reduced flows into storages.

The current flow management arrangements may not be as effective under a hotter and drier climate with more frequent drought periods (see **Chapter 4**). Further, the release of environmental water that is tied to flow thresholds may not be possible with prolonged periods of low or no inflow. This presents a long-term risk to water sources and their water dependent ecosystems. The Inland Rivers Network highlighted reductions upstream are also likely to have implications for downstream users and the environment.[84]

Under a wet climate change scenario, the flood projections may also change. For example, significant increases in summer and autumn rainfall could lead to corresponding increases in the frequency and magnitude of large flow events and flooding.

The impacts of climate change on water availability were a key concern for many stakeholders:

> '*Climate change is influencing water flows. New research has found the height of the Murrumbidgee River has dropped by about 30% during the growing season. This is a loss of approximately 300 million litres per day that would normally flow past Wagga.*

(2014) *Murray Murrumbidgee climate change snapshot and South East and Tablelands climate change snapshot*).

80 Di Luca, A., Evans, J.P. and Fei J. (2017) 'Australian snowpack in the NARCliM ensemble: evaluation, bias correction and future projections', *Climate Dynamics* 51(11).

81 DPE-Water (2022) *Draft Regional Water Strategy: Murrumbidgee Strategy*

82 Office of Environment and Heritage (2014) *Murray Murrumbidgee climate change snapshot and South East and Tablelands climate change snapshot*

83 DPE-Water (2022) *Draft Regional Water Strategy: Murrumbidgee Strategy*

84 Interview: Inland Rivers Network, 19 May 2022.

> *Continued drying and warming in Australia will cause water availability to decline even further, deepening the hurt for communities, businesses, animals, and the environment. Any decisions about the changes to the water plan to address competing interests of agriculture and the environment, must keep these long-term global warming impacts front of mind.'*[85]

Stakeholders also raised concerns about relying on historical figures for determining extraction limits considering recent droughts and climate change predictions:

> '*Re-evaluate the implications for determining extraction limits based on figures from 1993-1999 – especially in light of the Millennium drought and recent drought from 2017-2020 – and what the implications are for continuing to use the 1993- 1999 figures.*'[86]

Towns reliant on unregulated rivers and heavily dependent on surface water may be exposed to water security risks. The draft *Murrumbidgee Regional Water Strategy* highlights that towns reliant on the unregulated surface water system classified at very high water security risk in light of climate change projections are Cooma, Batlow and Yass, Binalong and Bowning.[87]

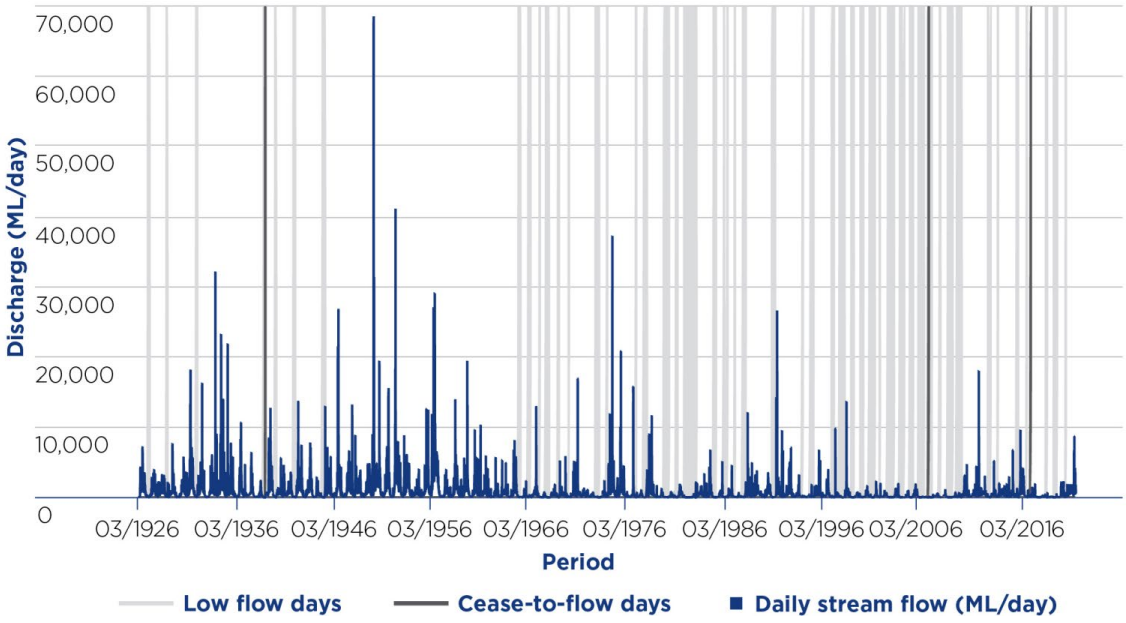

Figure 4: Observed daily streamflow in upper Murrumbidgee River at Mittagang Crossing[88]

Importantly, climate change will not occur in isolation, it will coincide with potential increases in demand and competition for water resources, which could leave both town water and water for amenity more vulnerable (**Chapter 7**). Both Yass Council and Snowy Monaro Regional Council raised concerns that climate change and regional population pressures are expected to impact on water availability in the term of the replacement Plan.[89]

85 Submission: Inland Rivers Network, received 21 February 2022.
86 Submission: Individual, received 30 January 2022.
87 DPE-Water (2022) *Draft Regional Water Strategy: Murrumbidgee Strategy*
88 WaterNSW (2022) *Real-time Data*
89 Interviews: Yass Council, 1 August 2022; Snowy Monaro Regional Council, 2 June 2022.

Water availability also impacts on licenced users, which can have economic implications for farmers and other water dependent industries. The NSW Government is undertaking a vulnerability assessment of the impact of climate change on the state's agricultural industries and potential opportunities for these industries to adapt, which would provide important insights for DPE-Water in the Plan replacement process.[90]

The 2019-20 bushfires saw significant areas of the Snowy Valleys and Snowy Monaro LGAs and parts of the ACT burnt, creating risks to town water supplies and negatively impacting on ecosystems due to reduced water quality. Bushfires removed vegetation and when the vegetation does recover their water demands increase, which could potentially impact on water yield. Climate change could also result in an increase in bushfire incidences, with 2014 NSW Government modelling suggesting a potential increase in severe fire weather days.

The draft *Murrumbidgee Regional Water Strategy* highlights the importance of increasing resilience to natural hazards like bushfires. The Plan replacement should consider the implications of increased hazards on water availability and water sharing arrangements.

In the context of a changing climate, Plan provisions have the potential to support the resilience of the water sources covered by the Plan and associated water dependent ecosystems.

Given the significant risks that climate change poses to water availability in the Murrumbidgee catchment, the replacement Plan must consider the latest climate data and modelling to ensure that these risks are considered and managed under the replacement Plan.

3.6 Recommendations

R 2	To support sustainable extraction and improve transparency, DPE-Water should as soon as possible in the next two years: a) establish and include numeric values for LTAAELs in the replacement Plan, based on up-to-date information on all forms of extraction (including updated estimates of basic landholder rights and area under plantation forestry) b) determine whether floodplain harvesting works have been constructed in the Plan area, measure floodplain harvesting (if it is occurring), and assess if this form of extraction has increased over the Plan period, as well as possible implications for the Plan LTAAELs and SDL c) prioritise LTAAEL compliance assessment against numeric LTAAELs using best available estimates of extraction, and make this publicly available d) determine the rate of growth in interception activities and the impact of this estimated growth on licenced users.
R 3	Until DPE-Water develops and implements a method for LTAAEL compliance, it should ensure the replacement Plan includes a requirement for AWDs to be set conservatively if DPE-Water does not annually make and publish a reasonable estimate of extraction and assess compliance with the LTAAELs.

90 DPI (2022) *Climate Change Research Strategy 2021*

R 4	To support adaptive management during the term of the replacement Plan, the Plan should include a provision requiring DPE-Water to determine the sustainable level of extraction by Year 5 based on best available ecological requirements, hydrological and climate information and that these levels are used to define and amend the Plan's LTAAELs for each extraction management unit.

4 Protecting upper Murrumbidgee flows

This chapter outlines issues related to the need to protect flows to support environmental values in the upper Murrumbidgee River above Burrinjuck Dam, which represent key risks to environmental values in the Plan area. The upper Murrumbidgee River, which traverses NSW and the ACT, has a highly altered flow regime, in part attributed to the construction and operation of Tantangara Dam as part of the Snowy Hydro Scheme (commissioning of the dam significantly altered the flow regime). Canberra's water supply dams[91] may also impact on flows between the ACT and Burrinjuck Dam. They sit outside of the Plan and have environmental flow requirements specified in Environmental Flow Guidelines, an instrument under the ACT *Water Resources Act 2007*. These guidelines also help to protect environmental flows entering the ACT region.

Alteration of the flow regime has had implications for environmental, social, and Aboriginal cultural values in the upper Murrumbidgee River, including:

- significant impacts to hydrological and geomorphological processes and native fish species[92]
- a reduction in water quality, resulting in multiple sites along the river being unsuitable for recreation at different points in time
- declines in flow cues important for Aboriginal cultural practices and values.[93]

Under the Snowy Water Licence, Snowy Hydro is required to provide the following from Tantangara Dam:

- environmental releases as part of the Snowy Montane Rivers Increased Flows initiative
- base passing flows for domestic and stock use and town water supply for Cooma.

However, the Snowy Scientific Committee does not consider the environmental releases to the Murrumbidgee River are adequate to support environmental outcomes (see **Section 4.1**).

While Snowy Hydro operations under the Snowy Water Licence, including releases from Tantangara Dam, sit outside of the Plan,[94] the need to protect these releases was recognised when the Plan was developed. Despite this, they are not adequately protected by the Plan. Key issues discussed in this chapter include:

- while the Plan includes an amendment provision to allow for changes to be made during its term to protect environmental releases from Tantangara Dam,[95] it has not been implemented (**Section 4.2**)
- daily access rules do not adequately align with the intended outcomes from Snowy Montane Rivers Increased Flows releases – they do not consider flow variability, seasonality or desired outcomes (**Section 4.3**)

91 In the ACT Corin, Bendora, Cotter Dams and in NSW, the Googong Dam.
92 Snowy Scientific Committee (2010) *The adequacy of environmental releases to the upper Murrumbidgee*
93 The upper Murrumbidgee River is of cultural significance to the Ngarigo and Ngunnawal people.
94 The Snowy Water Licence is issued under the *Snowy Hydro Corporatisation Act 1997*. The Licence is administered by DPE-Water on behalf of the Water Administration Ministerial Corporation. The Licence is held by Snowy Hydro. DPE-Water set the required releases from Tantangara annually, on advice from DPE-EHG. These releases are then incorporated into an Annual Water Operations Plan by Snowy Hydro.
95 DPI-Water (2016) *Water Sharing Plan for the Murrumbidgee Unregulated and Alluvial Water Sources: Background document for amended plan 2016*

- the plan includes provisions to protect base passing flows for Cooma's town water supply and domestic and stock use, but these flows are not based on best available evidence and potentially impact on outcomes that can be achieved from environmental releases and require review (**Section 4.4**)
- the Plan introduced carryover provisions that apply greater pressure to an already stressed river system (see **Section 4.5**).

The lack of protection of environmental releases is inconsistent with the Act and protection of environmental releases from Tantangara Dam should be a priority over extractive use. It is also inconsistent with the approach adopted by the ACT Government that seeks to protect environmental flows through the ACT, given a portion of the upper Murrumbidgee River passes through the ACT (**Sections 4.6**).

While there are factors impacting on outcomes that sit outside the Plan, improvements can be made within the Plan to address the above issues and enhance outcomes. Addressing these issues is critical, given pressures on the upper Murrumbidgee will increase with climate change, continuing demands from the energy market and population growth, potentially within the term of the replacement Plan.

Changes that are required to mitigate the impacts of a highly altered flow regime and subsequent erosion of environmental, social and Aboriginal cultural values will most likely adversely impact irrigators in the upper Murrumbidgee I and II water sources. Entitlement may need to be reduced for these users, and these impacts will need to be considered and stakeholders consulted as part of the plan replacement process (**Section 4.7**). Temporary water restrictions may be a necessary interim measure for protecting environmental releases from Tantangara Dam until more effective rules for protecting flows are codified in the replacement plan.

4.1 Environmental releases to the upper Murrumbidgee are insufficient

The Snowy Scheme straddles several catchments, including the Murray, Snowy and Murrumbidgee. Its primary purpose is to produce electricity, while also delivering water for downstream rivers. In 2018, the Australian Government took full ownership of Snowy Hydro to progress expansion of the Snowy Scheme (Snowy 2.0).

The management of water through the Snowy Scheme is outside the control of the Plan, as well as the Basin Plan.[96] The Snowy Scheme operates under the *Snowy Hydro Corporatisation Act 1997* (NSW) through the Snowy Water Licence and supporting instruments and agreements, including the SWIOID. The licence was approved in 2002 and has been amended three times, most recently in 2020 and is likely to undergo further changes following a recent ten-year review of the licence.[97] It sets out the licensee's (Snowy Hydro) water rights and obligations, including implementation of annual water operations plans, licence review requirements, water management works and systems for maintaining water accounts and analytical models.

Flows in the montane rivers of the upper Murrumbidgee catchment are significantly affected by the operation of the Snowy Scheme, including the construction and operation of Tantangara Dam. This was recognised in the Snowy Water Inquiry 1998,[98] subsequent

96 Section 1.08 requires that the Basin Plan is not to be inconsistent with the Snowy Water Licence.
97 DPE-Water (2022) *Reviews of the Snowy Water Licence*
98 Snowy Water Inquiry (1998) *Snowy Water Inquiry final report*

Snowy Water Initiative and the SWIOID. The hydrology of the upper Murrumbidgee River was significantly altered as a result of the construction of Tantangara Dam, with only 1 percent of mean annual natural flows released to the river between 1958-60 to 2005-06.[99]

The SWIOID requires Snowy Hydro and other government parties to provide three increased environmental flow regimes for the Snowy River, snowy montane rivers (high altitude rivers including the upper Murrumbidgee and Goodradigbee rivers) and Murray River. The objectives for Snowy Montane Rivers Increased Flows releases are set out in the SWIOID and are, in priority order, to:[100]

- protect endangered/ threatened species
- maintain natural habitats
- maintain wilderness and national parks values.

Water sources in the Plan area affected by the Snowy Montane Rivers Increased Flows initiative include Murrumbidgee I and II (Murrumbidgee River below Tantangara Dam)[101] and Goodradigbee River. These water sources are part of the Unregulated Murrumbidgee Above Burrinjuck Dam Extraction Management Unit established under the Plan.

Increased releases to the Murrumbidgee River as part of the Snowy Montane Rivers Increased Flows initiative represent only around 10 percent of predicted inflows into Tantangara Dam.[102] The dam required modification to support the delivery of increased flows, including an outlet for releasing water from above the thermocline to mitigate thermal pollution. These works have been completed and are operational.

Montane releases from Goodradigbee Weir are based on catchment inflows into the weir pool rather than a daily flow target. A proportion of the daily inflows are released as translucent flows.[103] These flows are intended to mimic natural flow variability important for a range of ecological processes.

The Commission has seen evidence that warrants review of the adequacy of Snowy Montane Rivers Increased Flows releases from Tantangara Dam and their protection. Some of this evidence predates the Plan period and includes advice from the Snowy Scientific Committee, which concluded that the lack of protection of these releases constrains their effectiveness:[104]

> '*Environmental releases are just one management strategy for improving the poor condition of the upper Murrumbidgee River but any benefits from environmental releases can only be realised if these are protected, and if the flow regime of the river is also protected.*'

99 DPI-Water (2017) *Ecological process: the basis for flow based river rehabilitation in the Snowy Montane Rivers, 2017-18*
100 SWIOID, Annexure two: Snowy montane rivers increased flows.
101 The Murrumbidgee I Water Source encompasses the Murrumbidgee River from downstream Tantangara Dam to Mittagang Crossing (410033) near Cooma. The Murrumbidgee II Water Source encompasses Murrumbidgee River from Mittagang Crossing to Murrumbidgee at Billilingra (410050).
102 ACT Government Environment, Planning and Sustainable Development Directorate (2019) *ACT State of the Environment Report 2019*
103 DPIE-Environment, Energy and Science (2019) *Annual Plan for the Snowy and Montane River Increased Flows 2019–20*
104 Snowy Scientific Committee (2010) *Adequacy of environmental releases to the upper Murrumbidgee River*

The Snowy Scientific Committee also acknowledged that the maximum volume for environmental releases to the upper Murrumbidgee was inadequate.[105] It emphasised the need to protect releases from extraction by accelerating the development of water sharing plans and strategies to protect environmental releases from consumptive use.[106]

Hydrological and geomorphological processes and native fish species are heavily impacted by the altered flow regime.[107] Only six of nine native fish species historically known to occur in the upper Murrumbidgee have been recorded, with silver perch now considered extinct in the river reach.[108] Fish monitoring undertaken by the ACT Government has not recorded trout cod since 2016.[109] These marked declines in native fish reinforce the importance of protecting environmental releases from Tantangara Dam.

Although the adequacy of environmental releases is outside of the scope of this review, it is important to recognise that changes to Plan rules to protect these flows, while essential, may not fully achieve the desired outcomes for the river and its dependent ecosystems without further intervention outside of the Plan. Several successful initiatives are already underway to restore riparian corridors and improve fish habitat, including community-based projects undertaken through the Upper Murrumbidgee Demonstration Reach partnership. However, the Commission notes that environmental releases under the Snowy Water Licence and SWIOID and related provisions would need to be revisited and increased if environmental outcomes sought by the Plan and the Act are to be achieved.

The Commission also understands that the SWIOID requires the NSW Government to measure the environmental benefits of the Snowy Montane Rivers Increased Flows initiative. However, a recent annual watering plan indicates that further work is required to '*refine an enduring monitoring regime for the Snowy montane rivers*'.[110] The environmental outcomes sought by the Plan would benefit from DPE-Water addressing the lack of an ongoing monitoring program as required by the SWIOID as a priority.[111] This will be particularly important if the environmental releases are protected under the Plan so that their effectiveness can be determined without the influence of extraction for irrigation.

4.2 Amendment provisions to protect the environment have not been used

The Plan includes an amendment provision for the Murrumbidgee I, II and Goodradigbee water sources to update provisions to protect flows from the Snowy Montane Rivers Increased Flows initiative when new data is available, but this has not been enacted. Clause 88(d) of the Plan allows for the establishment of a variable cease to pump access rule in the Murrumbidgee I, Murrumbidgee II or Goodradigbee water sources that:

- reflects seasonal variations

105 Snowy Scientific Committee (2010) *The adequacy of environmental releases to the upper Murrumbidgee*
106 *Ibid*.
107 *Ibid*.
108 Malam, C., Brawata, R., McLean, N., Stevenson, B., and Seddon, J. (2021) *Conservation Effectiveness Monitoring Program: Aquatic and Riparian Ecosystem Condition Assessment and Monitoring Plan*. Technical Report for the Environment, Planning and Sustainable Development Directorate, ACT Government, Canberra; Lintermans, M. (2002) *Fish in the Upper Murrumbidgee Catchment: A review of current knowledge*; MDBA (2020) *The Basin Plan 2020 Evaluation*.
109 Submission: ACT and Region Catchment Management Coordination Group, received 23 February 2022.
110 DPIE-Water (2020) *Annual plan for the Snowy and montane rivers increased flows 2020–21*
111 It is noted that the ACT Government has been undertaking its own monitoring activities in both the ACT and NSW portion of the Upper Murrumbidgee.

- protects Snowy Montane Rivers Increased Flow releases as established in the SWIOID
- protects releases made from Tantangara Dam for the ACT.

It is unclear why the amendment provision has not been enacted. The delay puts environmental, social and cultural values at risk, as existing cease to pump rules are not adequate for protecting environmental releases from Tantangara Dam for their intended purpose (the existing cease to pump rules only help to protect base passing flows).

By not enacting this amendment provision, the only legal protection of environmental releases is through the use of Section 324 orders under the Act, which establish temporary water restrictions restricting access to environmental releases. The Commission understands that DPE-Water intends to use temporary water restrictions to protect environmental releases prior to the Plan being replaced, with a temporary water restriction proposed for October 2022.[112] However, DPE-Water advised this did not proceed as the river was in flood and it was not considered appropriate to make releases during these conditions. Further, rules to protect environmental releases should be codified in the Plan to provide certainty for stakeholders and ensure releases are protected at all times.

4.3 Snowy Montane Rivers Increased Flow releases are not protected

Currently, unregulated river access licences have no daily extraction limit, allowing licence holders to potentially extract a significant portion of releases, subject to existing cease to pump rules. Licence holders in the Murrumbidgee I Water Source can extract water where there is visible flow past their pump and a minimum flow of 33 ML per day at Mittagang Crossing (410033),[113] while licence holders in Murrumbidgee II Water Source can extract water when there is a minimum flow of 27 ML per day at Billilingra (410050). These rules may help to protect the base passing flows (see **Section 4.4**), but they are inadequate to protect flows from the Snowy Montane Rivers Increased Flows initiative. They also do not consider flows reaching and entering the ACT, as the Plan does not reference gauges within the ACT, despite the Murrumbidgee River flowing through the ACT.

There is currently no seasonal or daily variation in the cease to pump rules included in the Plan. The rules do not recognise the variable nature of environmental releases from Tantangara Dam and their purpose (to mimic key flow components of a montane river), and do not recognise the annual planning and associated montane release targets for Tantangara Dam. This is despite the planning for releases to the Murrumbidgee River being based on a modified 'flow scaling' approach to help provide natural seasonality and daily variability.[114]

Further, the Commission was advised that the cease to pump rules appear to be based on flows after the construction of Tantangara Dam. Specifically, the minimum flow to be maintained at Mittagang Crossing. The current access rules ignore that pre-construction flows were much more variable and had strong seasonal patterns with winter-spring peaks.[115] In addition, low flows (such as 95th percentile flows at Mittagang Crossing) would be far greater and vary by more than an order of magnitude during the year than the current 33 ML per day cease to pump rule. This reinforces the need for a variable cease to

112 DPE-Water (2022) *Protecting environmental flows – Upper Murrumbidgee River*
113 The exception is the local water utility access licence that services Cooma, which is exempt from the cease to pump rule.
114 DPE-Water (2022) *Upper Murrumbidgee River Increased Flows*
115 Snowy Scientific Committee (2010) *The adequacy of environmental releases to the upper Murrumbidgee*

pump rule that better reflects daily and seasonal environmental water requirements of a montane river, for example, spring freshes to provide upstream fish movement.[116]

In 2019, the ACT Government's Environment, Planning and Sustainable Development Directorate modelled the flows predicted to occur in the upper Murrumbidgee River in the absence of river regulation (Tantangara Dam) and extraction downstream of the dam. This was compared against actual flow data for three sites along the Murrumbidgee River in NSW (Mittagang Crossing near Cooma) and the ACT (Lobbs Hole and Halls Crossing). There was a significant difference between modelled and actual flow at all three sites,[117] attributed to the impacts of the dam and extraction downstream. These impacts are most pronounced at Mittagang Crossing in NSW,[118] where actual monthly mean flows are significantly less than expected, particularly in winter and early spring (see **Figure 5**). For example, modelled mean August flows are four to five times greater than actual flows, indicating that flow seasonality and flow volumes have been significantly affected.

To support flow variability and seasonality downstream of Tantangara Dam, DPE-Water should determine if the inclusion of variable cease to pump rules can adequately protect environmental releases. As noted in **Section 4.1**, there is also a need to revisit the adequacy of environmental releases from Tantangara Dam. Any changes to cease to pump rules would need to align with and protect key components of the flow regime and flow seasonality consistent with annual planned releases made under the Snowy Montane Rivers Increased Flows initiative. Changes to plan rules should also consider the protection of flows into, through and downstream of the ACT.

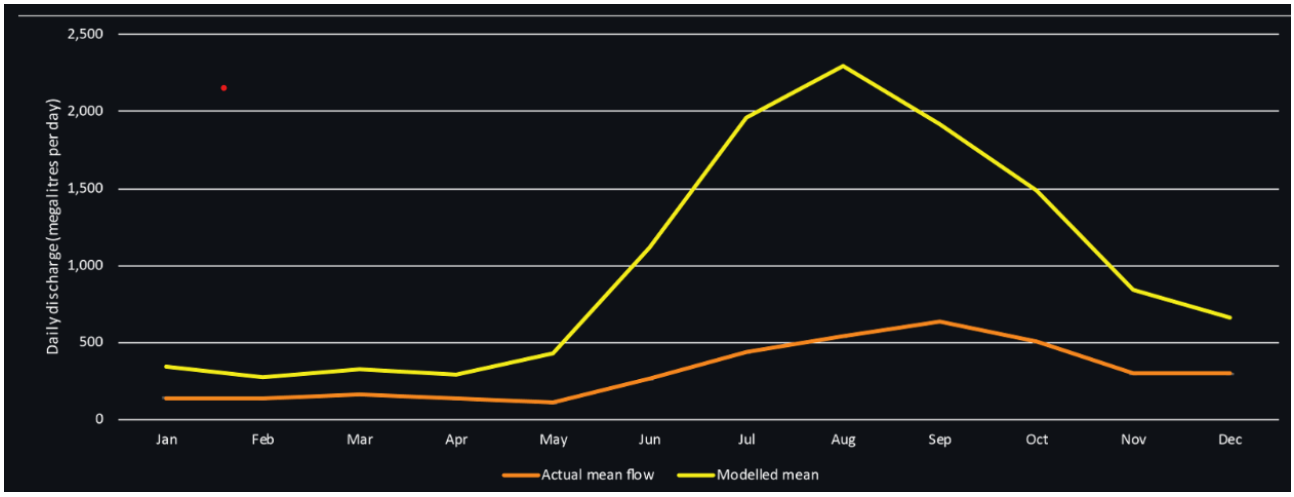

Figure 5: Modelled and actual flows in the Murrumbidgee River downstream of Tantangara Dam at Mittagang crossing near Cooma NSW[119]

116 Snowy Scientific Committee (2010) *The adequacy of environmental releases to the upper Murrumbidgee*
117 ACT Government Environment, Planning and Sustainable Development Directorate (2019) *ACT State of the Environment Report 2019*
118 *Ibid.*
119 Graph sourced from the ACT Government Environment, Planning and Sustainable Development Directorate (2020) *Impacts of the Snowy Mountains Scheme on the Murrumbidgee*

4.4 Base passing flows and their protection require review

Snowy Hydro is required to deliver an annual base passing flow comprising:

- 32 ML per day minimum river discharge maintained at Mittagang Crossing, near Cooma
- 2,000 ML per year volume on average is targeted over the longer term
- A maximum of 3,500 ML for any one year.

The base passing flows are intended to only provide for water for domestic and stock use and town water supply for Cooma (2,134 ML of local water utility entitlement).[120] The target at Mittagang Crossing can be met through releases from Tantangara Dam, environmental releases made as part of the Snowy Montane River Increased Flows initiative and catchment run-off, meaning there is no additionality of environmental releases to the base passing flow target. During this review, DPE-EHG raised concerns regarding the effectiveness of the environmental releases to provide for the environment, as well as the inflexibility of annual planning that underpins when releases occur.

The base passing flows released from Tantangara Dam are also intended to maintain a minimum flow of 17.1 ML per day at Cotter Crossing in the ACT.[121] However, this target at Cotter Crossing is not reflected in the Snowy Water Licence. The current cease to pump rules would help to protect the target minimum flow of 32 ML at Mittagang Crossing, but the Plan rules may not effectively provide for the minimum flow at Cotter Crossing in the ACT, as they do not reference the appropriate ACT gauge.

Given the Murrumbidgee River passes through the ACT, the Plan should consider protecting, at a minimum, the minimum flows through to the ACT and through to Burrinjuck Dam. Ideally, there would be a consistent approach across jurisdictions to protecting releases made from Tantangara Dam for environmental, town water supply and domestic and stock purposes.

Further, as there is no additionality of environmental releases to the base passing flow under current operating arrangements (as noted in **Section 4.1**), there is a risk that increased demand for town water or domestic and stock purposes could extract water intended for the environment.

The annual base passing flow should be revisited given it has been in place for 20 years and the needs that these flows are intended to provide for (Cooma's town water supply and domestic and stock purposes) have likely increased with population growth in NSW and the ACT. Without protection of these flows under the Plan, their intended outcomes would not be achieved. Therefore, plan provisions to protect these flows should also be revisited.

4.5 Risks from carryover to the environment should be assessed

The pressure on the water sources and water dependent ecosystems of the upper Murrumbidgee River is potentially exacerbated by rules in the Plan allowing water to be carried over from one water year to the next.[122] Prior to the Plan coming into effect, water users were limited to their entitlement in any one year. The Plan's background document indicates that carryover was introduced in recognition of the significant variability in flows

120 Snowy Scientific Committee (2010) *The adequacy of environmental releases to the upper Murrumbidgee*
121 *Ibid.*
122 Clause 48(5) of the Plan.

in unregulated rivers.[123] While the upper Murrumbidgee River water sources are categorised as unregulated river water sources, they are 'regulated' (that is, impacted) by Tantangara Dam and there is annual planning of releases meaning that this part of the Murrumbidgee River is effectively regulated and does not experience the level of flow variability that occurred pre-construction of the dam. Inflows from tributaries such as Yaouk Creek do provide for some variability further downstream of the dam.

The Plan specifies that the maximum water allocation that can be carried over from one water year to the next in the water allocation account for an unregulated river access licence or an unregulated river (high flow) access licence is equal to 1 ML per unit share of the access licence share component. This potentially increases the stress on the river, particularly during drought when the river, towns and irrigators require water.

Even if extraction was reduced using the current AWD settings, the 3-year rolling average rule would allow high levels of extraction from this highly modified river reach that is already under pressure from the demands of water for energy generation, town water supply, domestic and stock purposes and irrigation.

While most water users in the Murrumbidgee I and II water sources are unmetered – making it difficult to determine the actual volume of extraction occurring – DPE-EHG has sought to understand what take might be possible with existing works by examining the works associated with unregulated river access licences (50 ML or greater entitlement) in the Murrumbidgee I Water Source. It was estimated that existing works could have a total daily pumping capacity of around 40 ML based on many pumps operating at once, while works associated with the same category of licence in the Murrumbidgee II Water Source could have a total daily pumping capacity of around 50 ML.[124] Across the two water sources downstream of the Tantangara Dam, it is estimated that around 90 ML could be extracted per day before flow reaches the ACT.

With around 74 percent of entitlement in the upper Murrumbidgee water sources being for irrigation (10,179 ML),[125] unregulated river access licence holders can potentially take more than this volume per water year with carryover. During the term of the replacement Plan, DPE-Water is encouraged to assess the risks that carryover poses to the water sources and the environment of the upper Murrumbidgee.[126] If the risk is considered significant, particularly given known pressures in the upper Murrumbidgee, DPE-Water should consider revising the carryover provisions during the term of the replacement Plan.

123 DPI-Water (2016) *Water Sharing Plan for the Murrumbidgee River Unregulated and Alluvial Water Sources - Background document for amended plan 2016*

124 DPE–EHG (2022) *Murrumbidgee Montane Rivers Licencing Analysis: Murrumbidgee River Unregulated Water Sharing Plan – Murrumbidgee I and Murrumbidgee II*, unpublished internal paper.

125 Based on share components for the 2021/22 water year from the WaterNSW *NSW Water Register* for Murrumbidgee I, II and III water sources.

126 Noting this assessment should include the Murrumbidgee I, II and II water sources, but preliminary work by DPE-EHG to date on pump capacity has focused on the Murrumbidgee I and II water sources.

4.6 Alignment with the ACT is needed to protect environmental releases

The ACT Government has adopted environmental flow guidelines, which under ACT law are a statutory instrument to manage water extraction and protect environmental releases from Tantangara Dam to ensure that the releases '*that reach the ACT fully pass through the ACT'*.[127] Under these guidelines, the ecological objective of protecting these flows is to:

- maintain healthy aquatic ecosystems in terms of biota
- prevent degradation of riverine habitat through sediment deposition
- maintain the extent of water dependent riparian and in-channel native vegetation
- enhance the native fish community, including Murray cod and Murray crayfish
- maintain diversity and increase abundance of waterbirds.

The guidelines acknowledge and seek to accommodate variation in these releases. They expect that flows protected through the ACT will be protected in NSW from extraction[128] (along Murrumbidgee III Water Source through to Burrinjuck Dam).

There should be consistency in the protection of these releases and recognition of the variability of these releases in both NSW and the ACT, and consensus on intended outcomes. This would require:

- a coordinated approach and institutional arrangements for the protection of environmental releases through NSW and the ACT
- alignment of planning instruments including objectives and provisions for protecting environmental releases from Tantangara Dam
- inclusion of suitable ACT flow reference points in the Plan to help protect flows into the ACT (noting that the 1997 Expert Panel Environmental Flow Assessment of the Upper Murrumbidgee recommended a flow target of 17.1 ML per day at the Cotter Crossing sourced from Tantangara Dam)
- formal governance arrangements where all responsible organisations including representatives from the NSW and ACT governments, and Snowy Hydro can discuss and plan for the coordinated protection of releases from Tantangara Dam
- coordinated MER programs.

4.7 Revised access rules should be assessed in the next Plan period

Given climate change (**Section 3.5**) and population growth, including potential growth in demand for town water supply (see **Section 7.4**), will likely place further pressure on this already stressed river reach, there is a need to assess the adequacy of current releases and their protection during the term of the replacement Plan. Ideally this assessment would occur by Year 5 of the replacement Plan and inform adaptive management of access rules if required.

If an assessment in Year 5 determines access rules established in the replacement Plan to protect environmental releases and base passing flows are insufficient for delivering intended outcomes, DPE-Water should investigate increasing releases from Tantangara

127 ACT Government (2019) *Water Resources Environmental Flow Guidelines 2019 (No 2)*
128 *Ibid.*

Dam or opportunities to reduce Plan entitlement. For example, by investigating licence holders' interest in retiring their licence entitlement. The LTAAEL for the relevant extraction management unit (Unregulated Murrumbidgee Above Burrinjuck Dam Extraction Management Unit) should be reduced by the equivalent amount of any reductions in entitlement associated with licence retirement where this does not preclude this water from achieving Aboriginal outcomes.

4.8 Recommendations

R 5	To ensure the upper Murrumbidgee River between Tantangara and Burrinjuck dams is managed consistently with the priorities and principles of the Act and environmental objectives of existing instruments and agreements, including objectives of the Plan, as part of the Plan replacement, DPE-Water should: a) ensure provisions in the Plan adequately protect Tantangara Dam environmental releases (made under the Snowy Montane Rivers Increased Flows Initiative) from extraction b) considering the known pressures on the upper Murrumbidgee River, revise access rules to adequately protect basic landholder rights and town water needs During the term of the replacement Plan: c) if access rules from 5(a) and 5(b) are determined insufficient to protect environmental, basic landholder rights and town water needs, investigate opportunities to reduce Plan entitlement via licence retirement and reduce the LTAAEL for Unregulated Murrumbidgee Above Burrinjuck Dam Extraction Management Unit accordingly d) investigate risks to the environment associated with carryover provisions for unregulated river access licences in the Murrumbidgee I, II and III water sources and consider removing carryover provisions from the Plan if the risk is significant.

5 Strengthening environmental protections

Chapter 4 made recommendations around the protection of flows to support environmental values in the upper Murrumbidgee River. In addition, the Commission identified several issues related to the protection of other environmental values throughout the Plan area.

Many of these relate to the protection of wetlands and off-river pools. The Murrumbidgee catchment has over 2,000 wetlands,[129] many of which are in water sources designated as unregulated river water sources, but that are adjacent to and dependent upon flows from the regulated Murrumbidgee River. Indeed, these wetlands in unregulated river water sources are an integral part of the Murrumbidgee River floodplain ecosystem and hydrology.

Some of these sites are the focus of targeted environmental watering and have significant environmental values such as Gooragool and Mantangary lagoons. There are also several sites of cultural significance. However, the Plan provisions to protect these sites are not commensurate with their values. Key issues include that:

- Plan provisions are not consistent with the intent of the NSW Pools Policy or the requirements of the Act (**Section 5.1**)
- there is a lack of transparency regarding the number of works on off-river pools and existing infrastructure, making it difficult to quantify the extent of extraction from off-river pools and implement sustainable access rules (**Section 5.2**)
- current rules do not fully support the Plan's new connectivity or other environmental objectives and do not adequately protect planned and held environmental water from extraction (**Section 5.3**)
- flows are not adequately protected for significant wetlands (**Section 5.4**).

In addition to issues related to wetlands and off-river pools, the Commission found that:

- flow-based access rules, while providing a strong foundation for management, may not be based on best available evidence in some water sources, and are not always reflected in licence or work approval conditions (**Section 5.5**)
- accounting rules may create a barrier to optimising environmental outcomes by double-debiting the re-use of environmental water (**Section 5.6**).

It is relevant to note that both NSW (through 'Riverbank') and Commonwealth governments have invested significantly in water recovery for the environment in the regulated Murrumbidgee River, through buyback and water efficiency projects. This 'held environmental water' is delivered to support connected floodplain ecosystems dependent on the regulated river but located in the unregulated river water sources. Where this water is delivered for this purpose, both Commonwealth and NSW governments have committed to protect this water, through intergovernmental agreements and other measures. For example, 'prerequisite policy measures' to protect this water and maximise environmental outcomes from this water have been introduced in the Murrumbidgee Regulated River.[130] Strengthening protection in the Plan area of these held environmental water deliveries

[129] Taylor, I.R., Murray, C.A. and Taylor, S.G. (Eds.) (2006) *Wetlands of the Murrumbidgee River Catchment: Practical Management in an Altered Environment*. Leeton, New South Wales, Fivebough and Tuckerbil Wetlands Trust.

[130] ..... NSW Department of Industry (2019) *Pre-requisite Policy Measures in the Murrumbidgee fact sheet*.

from the regulated Murrumbidgee River would provide for a consistent approach to protection of the investment and the environmental values targeted for support from this water.

In addition, the Commission notes that NSW is currently investigating and consulting on potential changes in river operational constraints that affect the delivery of environmental water, through the Reconnecting River Country Program.[131] If implemented, achievement of this Program's objectives would require protection of environmental water that enters the adjacent unregulated river water sources.

5.1 Provisions are not aligned with the Pools Policy or the Act

When the Plan was developed, the default policy position for natural pools under the *Macro Water Sharing Plans Approach for Unregulated Rivers Access and Trading Rules for Pools Policy* (Pools Policy) was no draw down below full pool capacity for most pools.[132] This was designed to protect the natural water level of pools during periods of no flow. The Commission has reviewed several water sharing plans where this default policy position was applied, with a small number of pools having different drawdown provisions based on historical access of licence holders.

The purpose of the Pools Policy is '*to ensure that water sharing plans contain rules that meet the requirements of the Act, adequately protect and restore the environmental values of pools and share water equitably among water users*'.[133] The Pools Policy sets out a process for interagency regional panels responsible for the development of water sharing plans to consider implementing less restrictive rules based on a number of considerations, including an assessment of:

- instream values and hydrologic stress
- extraction value and community dependence on extraction.

In the unregulated river water sources of the Murrumbidgee, a blanket provision was adopted for the majority of off-river pools across the Plan area, which allows for drawdown to 80 percent capacity.[134] The Plan's background document indicates that the Interagency Regional Panel responsible for developing the Plan adopted this rule to recognise:

> *'These off-stream water bodies provide the only water available for much of the time in the water sources where this rule applies. All off-stream pools with no licences on them are fully protected from extraction as no licences can be transferred onto them under the water sharing plan trading rules.'*

In addition, the Plan schedules list a suite of licences that have specific drawdown rules for off-river pools. Some are less stringent than the rule that allows for drawdown to 80 percent capacity:

- Schedule 1 lists five lagoons that use a height on a structure such as a gauge board
- Schedule 1A lists five licenses that have specific drawdown allowances

131 DPE-Water (2022) *Reconnecting River Country Program*
132 Office of Water (2011) *Macro water sharing plans – the approach for unregulated rivers; access and trading rules for pools*
133 *Ibid.*
134 DPI (2012, updated in 2016) *Water Sharing Plan for the Murrumbidgee Unregulated and Alluvial Water Sources 2012 – Background document*

- Schedule 2 lists six licences that are allowed to draw down to 50 percent capacity in accordance with Clause 57(14) of the Plan.

The Plan seeks to protect off-river pools without limiting existing licences from extraction by restricting trade onto these pools.[135] The Plan also protects environmental flows in a small number of lagoons (see **Section 5.3**).

It is unclear how the development of the Plan considered the environmental values of natural off-stream pools in accordance with the Pools Policy, or how these values were prioritised in accordance with the Act. Changes in hydrology are recognised as having a major impact on the values and functions of wetlands in the Murrumbidgee catchment.[136] These impacts were known prior to the development of the Plan.

With the flow regime of the regulated Murrumbidgee River highly altered, the frequency of overbank flows important for connecting the river and the floodplain have significantly reduced, impacting on sediment, nutrient and carbon exchange.[137] It has also impacted on the frequency of filling of off-river pools and their role as drought refugia.[138] Billabongs, anabranches and other off-river wetland systems that can be connected by in-channel flows have also been impacted by river regulation and extraction.[139] With wetland health compromised, intervention is required to mitigate these impacts.

The Commission has previously suggested that DPE-Water review the Pools Policy to ensure that it requires that drawdown rules are assessed to determine whether they are adequately protective of the water sources and their water dependent ecosystems to be consistent with the Act. The rules adopted for the Plan area do not seem adequately protective of environmental values or consistent with the intent of the Pools Policy or the Act. There is also a lack of evidence on how cultural values were considered in the development of the off-river pool access rules in the Plan.

Without adequate rules in place to protect natural off-river pools and the functions they provide, DPE-EHG advised it has considered innovative ways to protect pool water levels for environmental outcomes in collaboration with licence holders. For example, through negotiations with licence holders and securing water from the regulated river to substitute for the protection of pool water levels in the unregulated river water sources. However, it is preferable that pool protection is codified in the Plan to provide certainty for all parties, to help realise the objectives of the Plan and uphold the requirements of the Act.

The Commission supports active management of environmental flows entering the unregulated river water sources from the regulated river as a possible mechanism for protecting water intended for the environment on an event basis. Such an approach could target specific water sources and the off-river pools and streams in those water sources that are the recipients of planned and held environmental water.

Although the Plan allows amendments to be made to pools listed in the Plan schedules and some changes to access rules for pools, the Commission understands that more stringent

135 Clauses 75 (1)(p) and 77(2)(q) of the Plan prohibit share component and allocation trade onto pools respectively.

136 Taylor, I.R., Murray, C.A. and Taylor, S.G. (Eds.) (2006) *Wetlands of the Murrumbidgee River Catchment: Practical Management in an Altered Environment*. Leeton, NSW, Fivebough and Tuckerbil Wetlands Trust.

137 Baldwin, D.S., Colloff, M.J., Mitrovic, S.M., Bond, N.R. and Wolfenden, B. (2016) 'Restoring dissolved organic carbon subsidies from floodplains to lowland river food webs: a role for environmental flows?' *Marine and Freshwater Research*, 67: 1387–1399.

138 DPIE-Water (2020) *Murrumbidgee Long Term Water Plan - Part A: Murrumbidgee catchment*

139 DPIE-Water (2020) *Murrumbidgee Long-Term Water Plan - Part B: planning units*

restrictions to pool access could be compensable for some licence holders (see **Chapter 10**). Further work would be required to determine the extent of compensation for changes in pool access given the uncertainty of the extent of extraction from natural off-river pools (see **Section 5.2**).

There is also scope for DPE-Water to engage with unregulated river access licence holders to consider the option of voluntary retirement of licenced entitlement in perpetuity to reduce pressure on off-river pools in the Plan area. Where this occurs, Plan LTAAELs should then be adjusted to avoid the risk of this water being made available through controlled allocations where this does not preclude use of this water for improving outcomes for Aboriginal people.

5.2 Works on off-river pools and existing infrastructure are not transparent

The Commission sought to determine the number of natural off-river pools where extraction is permitted under the Plan by identifying licenses and approvals associated with off-river pools. However, WaterNSW advised the Commission that this information cannot be readily determined from the water licensing system and spatial analysis would be required. Without this information, it is not possible to assess the extent of works and associated extraction from off-river pools, meaning the scale of the issue is unclear and requires further assessment to ensure that pools, lagoons, and lakes are adequately protected.

The Commission also considered what existing infrastructure is in place to manage pool access. Drawdown to 80 percent capacity (or 50 percent capacity in the case of licences listed in Schedule 2 of the Plan) would be arguably harder to enforce than the policy default of no drawdown or where a rule references the water level on a gauge board. Based on advice from DPE-EHG, it is likely that there are very few lagoons and pools that have the necessary infrastructure for managing pool drawdown. The Commission notes that Schedule 1 of the Plan lists five lagoons and Schedule 1A lists an additional five licences with specific height conditions, whereas most other off-river pools are based on a percentage drawdown.

DPE-EHG indicated that the lack of infrastructure to implement the Pools Policy and Plan provisions poses risks to the environment and challenges for compliance. On this basis, infrastructure such as gauge board or continuous water level monitoring must be considered in conjunction with changes to access rules for off-river pools. Priority should be given to installing infrastructure on pools with high environmental values where there are also multiple water users if the rules for those pools are not changed to no drawdown. In some cases, there may also be merit in modernising existing infrastructure such as at Currawanana Lagoon in the Murrumbidgee Central (Burrinjuck to Gogeldrie) Water Source with continuous water level monitoring.

5.3 Plan provisions do not fully support its connectivity objective

In 2020, the Plan was amended to include a connectivity objective:[140]

> *'Longitudinal and lateral connectivity within and between water sources to support target ecological processes, in particular to protect connectivity with the Murrumbidgee Regulated River Water Source to support environmental watering of off-river pools and off-river dam pools that may be the intended recipients of environmental water'.*

The Commission considers the inclusion of this objective as a positive step towards better managing connected water sources within and between unregulated and regulated river water sharing plans. However, the ability of Plan provisions to support this objective is currently limited because the Plan does not adequately protect the environmental water allowance (EWA)[141] or held environmental water from the regulated Murrumbidgee River when it enters unregulated streams and wetlands. Further, Plan provisions were not updated in 2020 to align with the new connectivity objective.

A small number of lagoons are afforded some protection under the Plan, consistent with the Plan's connectivity and other environmental objectives. They are listed in Schedule 4 of the Plan and identified as the recipients of environmental water releases from the regulated river. They include:

- Mantangry Lagoon
- Gooragool Lagoon
- Euwarderry Lagoon
- MIA National Park Lagoon
- Sandy Creek
- Lake Tala
- Yanga Lake
- Goobbagumbalin Lagoon.

These lagoons are located across three of the Plan's water sources.[142] Clause 57(11) of the Plan seeks to restrict the take of water from these off-river pools when they are the designated recipient of an environmental water release from Burrinjuck or Blowering dams. The rule only applies to release made from EWAs under the Murrumbidgee Regulated Plan, not held environmental water. Extraction can only occur when the water level in the off-river pool or off-river dam pool increases due to water that is not from an environmental water release made under the provisions of the regulated river plan.[143]

Both DPE-EHG and CEWO indicated that the access rules allowing for pool drawdown across much of the Plan area are a disincentive to use planned and held environmental water for watering floodplain pools and billabongs. In addition, the Plan does not adequately protect held environmental water and the EWA once these water releases from

140 Clause 10(2)(b) of the Plan.
141 Discretionary planned environmental water that accrues in water accounts under rules outlined in the Murrumbidgee Regulated Plan.
142 Murrumbidgee (Gogeldrie to Waldaira) Water Source, Murrumbidgee Central (Burrinjuck to Gogeldrie) Water Source and Murrumbidgee Western Water Source.
143 Clause 57 (11)(b) states that '*For the purposes of this paragraph, an environmental water release means a release made from an environmental water allowance under the Water Sharing Plan for the Murrumbidgee Regulated Rivers Water Source 2016*.' The definition therefore does not currently include held environmental water releases.

the regulated river enter the connected unregulated streams, such as anabranches and billabongs. This means there are circumstances where the opportunity to restore some wetlands and support ecological functions and processes is foregone given the risk of extraction unless agreements can be negotiated with licence holders not to take water.

> *'The water sharing plan has made provisions that allow for the partial or complete protection of Planned Environmental Water in unregulated waterbodies. However, in the instance where regulated environmental flows (for example water that has been ordered in a high flow pulse) enters unregulated waterbodies (for example an off-river pool or lagoon), water for the environment is not adequately recognised or protected'.*[144]

Since the Plan was developed, knowledge about environmental assets and their watering requirements has increased and the number of lagoons and billabongs that are targeted for environmental watering has expanded. DPE-EHG in consultation with CEWO is developing a list of priority wetlands for watering. An initial list of wetlands was included in the *Murrumbidgee Long Term Watering Plan: Part B.*[145] This list spans off-river pools in several unregulated river water sources, in addition to those already listed in Schedule 4 of the Plan and includes wetlands where there is existing entitlement and thus the potential for extraction.

Prerequisite policy measures offer protection of held environmental water in the regulated river and have been given effect under the Murrumbidgee Regulated Plan. However, they do not apply in unregulated river water sources. CEWO supports expanding prerequisite policy measures into unregulated river water sources. This is supported by the Commission. Further, any such policy measures would need to be supported by clear accountability for their implementation being included in the replacement Plan.

DPE-EHG is considering a range of options to protect flows from the regulated river into priority wetlands, including:[146]

- purchase of licences from willing sellers with works on off-river pools or the negotiation of enduring agreements with licence holders
- reducing take from the peak of wetland connecting events through negotiations with licence holders so that extraction occurs at other times
- introducing cease to pump and commence to pump rules to protect held environmental water and water from the EWAs entering unregulated streams and off-channel pools (wetlands).

Agreements with landholders could face some risks given the potential for land transfers or changes in water user behaviour. However, the replacement Plan could feasibly include more stringent access rules to protect planned and held environmental water being delivered to priority lagoons within unregulated river water sources. DPE-Water will need to work closely with DPE-EHG and CEWO on appropriate access rules that restrict the take of water from unregulated streams when they are used for delivering environmental water to off-river pools.

Work is already progressing to improve outcomes for three of the lakes listed in Schedule 4 of the Plan as part of the Better Bidgee Program, including investigation of options to augment flow into Yanga Lake and improve connection with the Murrumbidgee River.[147] As noted earlier in this chapter, the NSW Government is also progressing the Reconnecting

144 Submission: CEWO, received 7 February 2022.
145 DPIE-Water (2020) *Murrumbidgee Long-Term Water Plan - Part B: planning units*
146 *Ibid.*
147 NSW Government (2022) *Better Bidgee Program*

River Country program. Any changes to access rules should complement these initiatives given they seek to improve environmental outcomes.

The Plan also includes rules that appear to limit trades into off river pools where there is no existing licence to take water. Clauses 75 (1)(p) and 77(2)(q) prohibit share component and allocation trade onto pools respectively. This is commended as it affords protection of pools that are not currently used by unregulated river access licence holders.

Trade restrictions for off-river pools could be expanded to ensure that drawdown allowances are not transferable to water access licences and works approval holders through a trade. This will ensure that, where current water users potentially move out of the industry, new owners will be subject to a more stringent 'no drawdown' rule, so that there will be less extraction from pools and billabongs over time.

5.4 Flows are not adequately protected for significant wetlands

The Murrumbidgee catchment is home to several nationally and internationally significant wetlands, mainly situated in the central and lower catchment. Some of these wetlands are within the boundaries of the Murrumbidgee Regulated Plan, including the nationally significant Lower Murrumbidgee (Lowbidgee) Floodplain Wetlands. Others are in water sources covered by the Plan, such as the Lake George, Murrumbidgee Western and Lower Billabong Anabranch water sources. Several wetlands are dependent on infrastructure for watering, including the Ramsar-listed Fivebough and Tuckerbil swamps. Environmental water requirements for some of these wetlands are documented, but for others are yet to be defined, such as for the nationally significant Lower Mirrool Creek Floodplain wetlands.

The wetlands of the Lower Mirrool Creek Floodplain are located within the Plan area's Murrumbidgee Western Water Source downstream of Barren Box Storage and Swamp. Mirrool Creek is an ephemeral stream that joins the Lachlan River near Booligal. The upper reaches of Mirrool Creek are part of the Murrumbidgee Irrigation Area and appear to be within the Plan's Murrumbidgee North Water Source. The eastern part of the catchment has been significantly modified for agriculture. The western part of Mirrool Creek, while developed, still has some remnant vegetation and has a floodplain 85 kilometres long and up to four kilometres wide.[148] Floodplain wetlands comprise Narrabri, Five Oaks, Highway, Berangerine, Little Berangerine and Belaley swamps.

Prior to the Plan coming into effect, Barren Box Swamp was split into three cells for operational efficiency as a water storage for Murrumbidgee Irrigation Limited and to restore a section of the Barren Box Swamp wetlands. Murrumbidgee Irrigation Limited is required to make releases under its works approval and licence conditions from Barren Box Storage to lower Mirrool Creek and report on the environmental health of the wetlands, including vegetation condition, duration and extent of inundation and quality of the water discharged. At the time of this review, Murrumbidgee Irrigation Limited was seeking changes to these environmental reporting requirements and removal of a role in assessing the water requirements of Lower Mirrool Creek floodway via modification of its development application for the Barren Box Swamp Project.[149] The Commission has not assessed the proposed changes in detail, but supports inclusion of operating rules for Barren Box Storage in the Plan to ensure there is transparency in providing water for the environment downstream of the storage, which is ultimately a water sharing issue.

148 Sinclair Knight Merz (2011) *Environmental Water Delivery: Murrumbidgee Valley*. Prepared for Commonwealth Environmental Water, Department of Sustainability, Environment, Water, Population and Communities.

149 *Ibid*.

The Plan does not specifically refer to the Lower Mirrool Creek Floodplain wetlands or establish flow classes for the Murrumbidgee Western Water Source or the Murrumbidgee North Water Source. Clause 57(3) of the Plan requires a visible flow prior to pumping, which is inadequate to protect flows along Mirrool Creek and onto the Lower Mirrool Creek Floodplain wetlands. As noted above, the Plan also makes no reference to the management of releases from Barren Box Storage into Lower Mirrool Creek and does not recognise the interconnection with the regulated Murrumbidgee River or Lachlan River via Mirrool Creek.

Knowledge gaps around the volumes required to generate an end of system flow and flows onto the Lower Mirrool Creek Floodplain were recognised in 2011.[150] DPE-EHG has commissioned a project to better understand environmental water requirements of Mirrool Creek and the floodplain wetlands. Outcomes of this project should inform the development of rules to provide for and protect flows down Mirrool Creek and planned releases from Barren Box Swamp. Currently, the access rules do not adequately protect environmental needs, while the operating rules for Murrumbidgee Irrigation Limited to release water downstream into Mirrool Creek sit outside of the Plan and there is a lack of evidence that these releases are based on environmental water requirements.

New water infrastructure would likely be needed to monitor flows in Lower Mirrool Creek downstream of Barren Box storage and onto the floodplain. There are existing gauges in the upper catchment (gauges 41000282 and 41000283), but not the lower catchment. A flow reference point for the lower catchment is needed for monitoring and managing flows. If new Plan provisions are introduced, such as a cease or commence to pump or a first flush rule, it will most likely be necessary to consider establishing a new management zone within the Murrumbidgee Western Water Source and considering the merits of prohibiting trade into this area of high environmental value.

5.5 Access rules are not based on best available information

There are 43 water sources in the Plan area, with around half of these having flow classes and associated flow-based access rules (24 water sources have flow-based rules referencing a river gauge). This is a substantial proportion of water sources compared with most other unregulated river water sharing plans in the NSW Murray-Darling Basin. For example, the *Water Sharing Plan for the Gwydir Unregulated River Water Sources 2012* only has four of 28 water sources with flow-based access rules.

Flow-based access rules are a good foundation for management of flows and modelling undertaken by DPE-Water indicates cease to pump rules are an important strategy for protecting low and base flows.[151] However, there is evidence that:

- some rules predate the water sharing plan (under the *Water Act 1912*) and do not reflect current knowledge regarding risks and environmental water requirements[152]
- three gauges referenced in the Plan are no longer operational
- some rules are not reflected in conditions on water access licences or works approvals.

Given the large number of water sources in the Plan area, the review did not examine each access rule in detail, instead focussing on high value water sources.[153] During Plan

150 *Ibid.*
151 DPE-Water (2022) *Evaluating cease to pump rules in the unregulated tributaries of the Murrumbidgee and Tumut rivers*
152 Including the development of the *Murrumbidgee Long Term Water Plan.*
153 Department of Industry (2019) *Risk assessment for the Murrumbidgee Water Resource Plan Area (SW9)*

development, eight water sources were assessed as having high instream values.[154] They were mostly water sources in the upper Murrumbidgee catchment. A recent assessment of High Ecological Value Aquatic Ecosystems (HEVAE) for unregulated river water sources in the Plan area determined that eight water sources have high or very high consequence scores,[155] including three that were previously identified as having high instream values (Goodradigbee, Queanbeyan and Murrumbidgee II water sources).

Most of these water sources have flow classes with flow-based access rules, but they do not reflect current knowledge regarding environmental water requirements, and warrant review to ensure that, as a minimum, low flows are adequately protected from extraction.

The Commission acknowledges that DPE-Water has undertaken work to evaluate existing cease to pump rules in seven water sources in the Plan area.[156] However, this study did not indicate whether the rules need to be strengthened to better align with environmental needs and did not cover all high value water sources.

In particular, for water sources that have long established access rules unchanged for several years, such as Tarcutta Creek Water Source, there is merit in revisiting the adequacy of the access rules. A hydrological risk assessment of Tarcutta Creek Water Source found that cease to flows and low and base flows are moderately to high altered, with risks to low flows not considered tolerable in the Murrumbidgee Surface Water Resource Plan risk assessment,[157] indicating that the current access rules for this water source require review.

The Commission also notes that the *Murrumbidgee Long Term Water Plan* identifies water sources with medium HEVAE consequence scores that require action in the next five years to reduce extraction pressure on flows. For example, the Upper Yass Water Source, where key components of the flow regime are highly altered. This includes revisiting the current cease to pump rule,[158] which would ideally occur as part of the development of the replacement Plan.

There are also issues with the gauges referenced in the Plan. Some do not appear to be operational, meaning it would be difficult to comply with and enforce access rules and licence conditions and monitor flows at these locations. These include gauges referenced for:

- Numeralla East Water Source - gauge Numeralla River, Rose Valley (41000206)
- Bembowlee Creek Management Zone in the Adjungbilly /Bombowlee /Brungle Water Source - gauge Bombowlee Creek at Bombowlee (410070)
- Billabong Water Source - gauge Billabung Creek at Nangus Road (41010705).

There are more than 100 operational gauges in the Murrumbidgee catchment, twenty of which are referenced in the Plan, mostly located in the eastern part of the Plan area. It is unclear why other WaterNSW gauges located in unregulated river water sources have not

154 During Plan development Adelong Creek, Burrinjuck Dam Catchment, Goodradigbee, Murrumbidgee I, Murrumbidgee II, Murrumbidgee III, Queanbeyan and Upper Tumut water sources were identified as having high instream values.
155 Goodradigbee, Queanbeyan, Murrumbidgee II, Murrumbidgee Central (Burrinjuck to Gogeldrie), Murrumbidgee Western (Ramsar-listed Fivebough and Tuckerbil swamps are situated in Murrumbidgee Western water source, contributing to the high consequence score), Tarcutta Creek, Lower Billabong Creek, Lower Billabong Anabranch,
156 DPE-Water (2022) *Evaluating cease to pump rules in the unregulated tributaries of the Murrumbidgee and Tumut rivers*
157 Department of Industry (2019) *Risk assessment for the Murrumbidgee Water Resource Plan Area (SW9)*
158 DPIE (2020) *Murrumbidgee Long Term Water Plan – Part B: Murrumbidgee planning units*

been used as reference locations in the Plan. A comprehensive review should be completed to ensure effective gauge coverage and to develop flow-based cease to pump rules where they do not currently exist, particularly where there is a high risk to environmental values and connectivity. GPS coordinates should also be added for referenced gauges in the Plan and under water access licence conditions. Lack of a hydrometric network/gauge should not be used as justification for maintaining current no visible flow rules in medium to high risk water sources, with best available knowledge and data used to determine relevant flow based access rules.

When reviewing the gauge network, there is also a need to examine rules for water sources that have a no visible flow rule.[159] These rules are not based on an assessment of environmental needs and do not support the Plan's connectivity objective.[160] Licences subsequently issued with no visible flow conditions at the pump site do not contribute to realising this objective as they are likely inadequate to protect the water sources and their ecosystems. Any gaps in the gauge network should also be identified and addressed. There is also a need to ensure that conditions on works approvals and access licences are consistent with the Plan rules and unambiguous to support compliance.

The Plan replacement also provides an opportunity to revisit water source boundaries to simplify arrangements by merging some water sources. There could also be scope to rationalise some water sources, for example, the Numeralla River catchment is broken into separate east and west water sources. The large number of water sources in the Plan contribute to a complex and lengthy instrument, but the finer scale also provides the opportunity to tailor water sharing rules to local conditions.

5.6 Re-use of environmental water may be double debited

Environmental water managers seek to maximise the environmental outcomes that can be gained from water for the environment. However, accounting rules create a barrier to optimising environmental outcomes by double debiting the re-use of environmental water. This was raised in submissions to the water sharing plan review:

> *'When attempting to re-use water for the environment for additional environmental purposes (that is, pumping of water for the environment allocations previously delivered to an unregulated lake to an adjacent, downstream wetland) was attempted, this could not be achieved due to a lack of flexibility in the unregulated licence conditions without re-debiting the volume – effectively charging twice for the volume required.'*[161]

This is an accounting issue that sits in the Act and regulations, largely outside of the Plan but is a barrier to achieving environmental outcomes. It could be argued that accounting for environmental water should be consistent with the priorities of the Act to provide for environmental needs and deliver environmental outcomes. However, the accounting system and charges are not necessarily designed in this way and such changes could lead to equity issues. Nonetheless, if double debiting is resulting in decisions that mean environmental outcomes may not be realised, then current accounting and billing arrangements should be reviewed and updated.

A review is warranted into account debiting arrangements for held environmental water to avoid double counting and to recognise that there should be greater flexibility in using

159 Under the macro water planning approach for unregulated river water sharing plans, the DPE's policy position was where there was not a gauge suitable to measure the 95th percentile flow, a visible flow rule was adopted.
160 Clause 10(1)(2)(b) of the Plan
161 Submission: CEWO, received 7 February 2022.

water from the regulated Murrumbidgee River for sites in connected unregulated river water sources. While this issue presents a particular risk in the Murrumbidgee region, it also has implications for outcomes across the state and for the Basin Plan.

5.7 Recommendations

R 6	To protect water for the environment in unregulated river water sources, as part of the replacement Plan, DPE-Water should work with DPE-EHG and CEWO to: a) identify priority wetlands where extraction is currently permitted, add these to Plan schedules, quantify the number of licences and works and extent of extraction and strengthen provisions to ensure no drawdown below full capacity b) for all wetlands and unregulated streams that are the recipients of planned or held environmental water from the regulated river, include rules to protect this water from extraction in the unregulated system c) introduce dealing rules to ensure that any pool drawdown allowance is not transferable to another person or entity. During the term of the replacement Plan, DPE-Water should: d) support 6(a) by prioritising installation of water infrastructure to monitor pool water levels in priority lagoons to help manage these environmental assets and support compliance e) engage with unregulated river access licence holders to consider the option of voluntary retirement of licenced entitlement in perpetuity to reduce pressure on off-river pools in the Plan area. Plan LTAAELs should then be adjusted to avoid the risk of this water being made available through controlled allocations where this does not preclude use of this water for improving Aboriginal outcomes.
R 7	To improve environmental outcomes for Mirrool Creek and the nationally significant Lower Mirrool Creek Floodplain wetlands, engage with DPE-EHG to: a) install new infrastructure for monitoring flows in Lower Mirrool Creek and onto the floodplain and develop appropriate access and trade rules based on better understanding of the environmental values and water requirements of Mirrool Creek and Lower Mirrool Creek Floodplain wetlands b) review operating rules for releases from Barren Box storage to Lower Mirrool Creek to ensure they reflect the latest knowledge regarding environmental water requirements and ensure these operating rules are codified in the replacement Plan and the relevant works approval.
R 8	As part of Plan replacement, to address issues with current access rules and the complexity of rules given the number of water sources, DPE-Water should: a) review the current hydrometric network to identify where the Plan can reference operational gauges for establishing flow classes and flow-based access rules for water sources that currently have a no visible flow rule b) ensure all high environmental value water sources at medium to high risk from extraction have flow-based access rules that

	support connectivity and adequately protect water sources and their dependent ecosystems c) ensure any changes to access rules from 8(a) and 8(b) are reflected in water access licence/works approval conditions d) revisit the Plan's water source boundaries to determine where they can be merged while still supporting water sharing arrangements at the appropriate scale.

6 Supporting Aboriginal rights, values and uses

The Murrumbidgee catchment area spans the country of the Barapa Barapa, Mutthi Mutthi, Nari Nari, Ngunnawal/Ngunawal, Ngambri, Ngarigu, Nyeri Nyeri, Wadi Wadi, Wolgalu, Wemba Wemba, Weki Weki and Wiradjuri nations. The Commission understands there was limited engagement with these nations in the development of the Plan. As a result, Aboriginal water-dependent cultural assets are not adequately identified and protected, and watering needs are not provided for under current water sharing plan provisions.

The Commission continues to identify critical state-wide issues in water sharing plans relating to native title, Aboriginal water rights, and the protection of cultural values across all water sharing plan reviews in the 2020-22 period.[162]

In addition, this review highlights several specific issues for Aboriginal water in the Plan area, including that:

- there are inconsistencies with the *NSW Water Strategy* (**Section 6.1**)
- additional shares have been offered under controlled allocations without evidence that Aboriginal water rights were considered before this took place (**Section 6.2**)
- the Plan does not adequately protect cultural flows that may originate from the regulated Murrumbidgee River under the cultural access license (2,150 ML of share component of Murrumbidgee Valley high-security water) (**Section 6.3**)
- given limited engagement with Aboriginal stakeholders, there have been few opportunities to co-design strategies to deliver better outcomes for Aboriginal people in the unregulated river water sources. Aboriginal communities in the upper Murrumbidgee are not given access to the cultural flows of the regulated Murrumbidgee River but could be involved in co-design of initiatives to provide for cultural flows with the ACT and NSW governments and Snowy Hydro (**Section 6.4**).

6.1 Commitments under the *NSW Water Strategy* must be met

The Commission's recent reviews have acknowledged DPE-Water's steps to improve stakeholder engagement with Aboriginal peoples and the commitments made in the *NSW Water Strategy* to address inequality in Aboriginal water rights and access.[163] The *NSW Water Strategy* sets out actions to '*recognise First Nations/ Aboriginal People's rights and values and increase access to, and ownership of, water for cultural and economic purposes*', including:[164]

- strengthening the role of Aboriginal peoples in water planning and management
- developing a state-wide Aboriginal water strategy and groundwater strategy
- providing Aboriginal ownership of and access to water for cultural and economic purposes
- working with Aboriginal peoples to improve shared water knowledge

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162 Natural Resources Commission (2021) *Murray Unregulated Water Sharing Plan Review* (draft provided to agencies); Natural Resources Commission (2021); *Review of Intersecting Streams and Lower Murray-Darling Unregulated Water Sharing Plans* (draft provided to agencies).

163 For example, Natural Resources Commission (2022) *Review of Intersecting Streams and Lower Murray-Darling Unregulated Water Sharing Plans*; Natural Resources Commission (2021) *Review of water sharing plans for the Bega and Brogo Rivers Area, Murrah-Wallaga Area, and Towamba River water sources*

164 DPIE-Water (2021) *NSW State Water Strategy*

- working with Aboriginal peoples to maintain and preserve water-related cultural sites and landscapes.

If implemented in a culturally appropriate manner, these commitments will lead to better outcomes for Aboriginal peoples, be consistent with commitments Australia has made as a signatory to the *United Nations Declaration on the Rights of Indigenous People,*[165] and contribute to Closing the Gap targets:[166]

> *'NSWALC seeks to ensure that the NSW Government meets its commitments outlined in the National Agreement on Closing the Gap (CtG). The CtG provides an important framework for governments to work in partnership with Aboriginal people to ensure we maintain distinctive cultural, spiritual, physical and economic relationships with water, and advance our rights and interests in water.'*[167]

However, as highlighted by the Productivity Commission inquiry on national water reform, there is still much work to do to secure Aboriginal peoples' interests in water.[168] The challenge now is to embed these commitments and actions in the NSW water planning and water licensing framework. Water sharing plans are one of the ways that Aboriginal rights and interests in water can be recognised, quantified and actioned in ways that support cultural and economic needs.

However, the NSW Aboriginal Lands Council indicates that the Plan is not consistent with the *NSW Water Strategy*:

> *'The current Plan, at Part 2, 12 Aboriginal cultural objectives, attempts to reflect DPIE's commitment to work with Aboriginal communities however does not reflect DPIE's priority in the NSW Water Strategy to 'Recognise First Nations/Aboriginal People's rights and values and increase access to and ownership of water for cultural and economic purposes', particularly regarding ownership of water.'* [169]

The NSW Aboriginal Lands Council recommends aligning the Plan with the strategy by updating the Plan objectives to include increasing Aboriginal ownership of water for cultural and economic purposes (as noted in **Section 6.3**, less than 1 percent of entitlement in the Murrumbidgee is under Aboriginal ownership[170]). The Commission supports these changes but also acknowledges the need to ensure that Plan provisions can give effect to these objectives and Closing the Gap targets.

While it is noted the Murrumbidgee Regulated Plan provides for 2,150 ML of Murrumbidgee Valley high-security water for Aboriginal cultural purposes, there are no cultural access licences in the unregulated Murrumbidgee River water sources. The Plan provides for

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165 See for example, '*Article 25 Indigenous peoples have the right to maintain and strengthen their distinctive spiritual relationship with their traditionally owned or otherwise occupied and used lands, territories, waters and coastal seas and other resources and to uphold their responsibilities to future generations in this regard.*' In: United Nations (2007) *United Nations Declaration on the Rights of Indigenous Peoples*

166 The *National Agreement on Closing the Gap* (July 2020) includes an additional outcome area '*Aboriginal and Torres Strait Islander people maintain a distinctive cultural, spiritual, physical and economic relationship with their land and waters*' and two associated targets for land and water: *a) Target 15a: By 2030, a 15 percent increase in Australia's landmass subject to Aboriginal and Torres Strait Islander people's legal rights or interests; b) Target 15b: By 2030, a 15 percent increase in areas covered by Aboriginal and Torres Strait Islander people's legal rights or interests in the sea.*

167 Submission: NSW Aboriginal Land Council, received 21 February 2022.

168 Productivity Commission (2021) *National Water Reform 2020, Productivity Commission Inquiry Report No. 96*

169 Submission: NSW Aboriginal Land Council, received 22 February 2022.

170 Murray Lower Darling Rivers Indigenous Nations (MLDRIN) and Northern Basin Aboriginal Nations (NBAN) (2021) *Research into how much water is held by First Nations in and Traditional Owner Organisations in the Murray-Darling Basin in 2020: A First Nations Summary*

applications for specific purpose access licence (Aboriginal cultural), but these are limited to a maximum of 10 ML, which may not be sufficient for its intended purpose and the desired outcomes. The Commission has not seen evidence of the licence category being issued in the unregulated river water sources covered by the Plan.

6.2 Consider Aboriginal water rights before controlled allocations

Controlled allocations can occur where a water source is not fully committed and there is unassigned water.[171] The Commission understands that this can occur in circumstances where a licence holder surrenders their licence or entitlement to the Minister for Lands and Water, such as where they no longer intend to use the water for irrigation. The licence or entitlement may be cancelled or held by the Minister. Licences that are retained can be reissued to other licence holders via controlled allocation. However, before this occurs risks associated with this action and a prioritisation of needs must be considered, consistent with the principles of the Act.[172]

In previous reviews, the Commission has recommended that DPE-Water considers Aboriginal rights before announcing controlled allocations.[173] However, in March 2022 the NSW Government published controlled allocations in six of the unregulated river water sources that form part of the Plan area.[174]

It is unclear if and how Aboriginal water rights and values were considered when making this controlled allocation order. DPE-Water is encouraged to codify this process and ensure there is greater transparency around what is considered as part of the risk assessment and assessment of high priority needs before making any future controlled allocations during the term of the replacement Plan. For example, DPE-Water could develop, consult on and publish guidelines for how the water management principles and *NSW Water Strategy* commitments[175] are considered in developing decisions about controlled allocations or as a minimum address this in the list of frequently asked questions on controlled allocations on the DPE website.

6.3 Cultural flows from the regulated river are not protected

As of 2020, Aboriginal cultural water entitlement in the Murrumbidgee catchment accounted for a very small percentage of entitlement (3954 ML, less than 1 percent).[176] A large portion of this is held by Riverina Local Land Services in the Murrumbidgee Regulated River Water Source,[177] specifically 2,150 ML of Murrumbidgee Valley high-security water for Aboriginal cultural purposes. Riverina Local Land Services seek expressions of interest annually for the use of this water for cultural purposes.[178]

Riverina cultural water can only be used in certain locations (shown in **Figure 6**) and cannot be used for commercial purposes. The regulated river water is not protected by rules in the

171 DPE-Water (2022) *Controlled allocations*
172 Section 5 of the Act.
173 NSW Natural Resources Commission (2021) *Review of water sharing plans for the Bega and Brogo Rivers Area, Murrah-Wallaga Area, and Towamba River water sources*
174 NSW Government (2022) *Government Gazette of the State of NSW, Number 83 - Electricity and Water*
175 Particularly Priority 2 of the *NSW Water Strategy*: Recognise First Nations/Aboriginal people's rights and values and increase access to and ownership of water for cultural and economic purposes
176 MLDRIN and NBAN (2021) *Research into how much water is held by First Nations in and Traditional Owner Organisations in the Murray-Darling Basin in 2020: A First Nations Summary*
177 The Murrumbidgee Regulated Plan applies to this water source.
178 Riverina Local Land Services (2022) *Riverina Aboriginal communities invited to flag interest in cultural water*

Plan if it enters unregulated river water sources. As such, this water risks being extracted if used for cultural purposes in unregulated streams and off-river pools, which could potentially discourage its use in some locations.

The Commission supports including provisions in the replacement Plan that provide for the protection of the 2,150 ML of Murrumbidgee Valley high-security water for Aboriginal cultural purposes[179] when it is used in streams and off-river pools located in unregulated river water sources adjacent to and connected to the regulated river. This could encourage use of this entitlement across a greater area of the Murrumbidgee. One possible way of codifying the protection of sites that receive cultural water is to list these sites in the Plan schedules and have a corresponding provision, similar to the rule for protecting pools that are the recipients of environmental water releases.[180] Aboriginal stakeholders should be engaged in co-designing such a rule to ensure it is appropriate and effective.

Under current arrangements, some Aboriginal communities may miss the opportunity to use this water depending on the location of cultural places in the catchment or if there is no infrastructure to deliver the water to these locations. For example, Ngunnawal Country is situated upstream of Burrinjuck Dam and includes the upper Murrumbidgee River. Given its location upstream of the major NSW storages, there is currently no opportunity to use allocations from the cultural access licence held by Riverina Local Land Services in the regulated river. Other opportunities should be considered to provide for cultural flows in the upper Murrumbidgee (see **Section 6.4**).

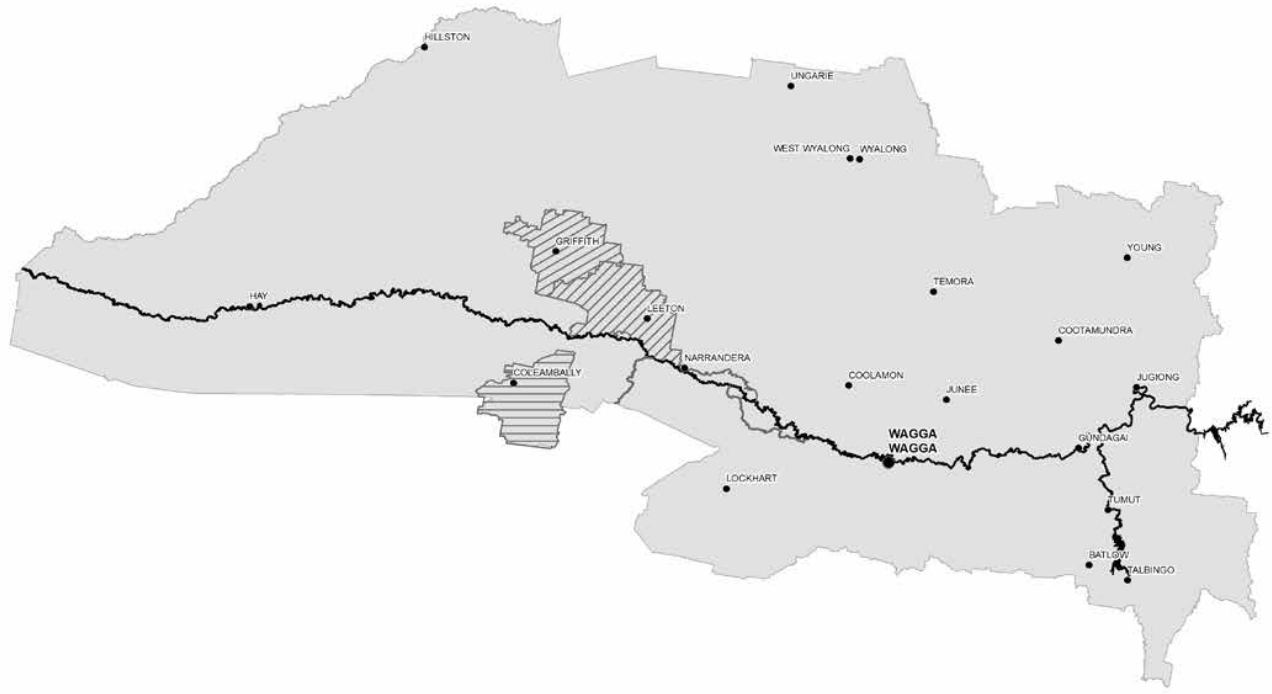

Figure 6: Locations in the Murrumbidgee catchment where the cultural access licence can be used[181]

179 Regulated river (high security) (Aboriginal cultural) access licence.
180 Clause 57(11) and Schedule 4 of the Plan.
181 Riverina Local Land Services (2022) *Riverina Aboriginal cultural water allocation*

6.4 Co-design would improve outcomes for Aboriginal people

As noted in previous reviews, Aboriginal engagement in water planning, monitoring and management has been inconsistent and inadequate across NSW, limiting knowledge and support of Aboriginal water values and uses and preventing genuine co-design approaches.[182] DPE-Water should establish meaningful, appropriate, and integrated processes for Aboriginal peoples with relevant knowledge of water management to have input at all levels and stages of water planning, management and monitoring. DPE-Water should consider co-design opportunities, including those adopted by the ACT Government to improve outcomes for Aboriginal people of the Murrumbidgee.

The Commission notes that key barriers to Aboriginal water rights and interests are systemic and institutional and require state-wide legislative, policy and practice change, significant increases in Aboriginal staff and resourcing – as acknowledged in the *NSW Water Strategy*. The Aboriginal Water Strategy will be a key step in addressing these issues.

The Commission acknowledges that DPE-Water has been working with key Aboriginal stakeholders to identify and guide actions to recognise Aboriginal peoples' rights and values associated with water for cultural purposes. This work has been largely focused on the regulated Murrumbidgee River given the cultural access licence existing in this water source. There has also been increased resourcing for Aboriginal liaison staff in DPE-Water to support a range of planning activities including the Reconnecting River Country program.[183] While these steps are positive, there is still much to be done in this area and the Commission considers improved engagement and focus on co-design of measures to improve outcomes for Aboriginal people as a high priority. This is critical to ensure that:

- the needs of Aboriginal stakeholders are met
- critical barriers to water use and access are addressed
- Aboriginal peoples are empowered and valued as knowledge holders and leaders for implementing actions to restore Aboriginal water rights and interests in NSW.

The ACT Government is co-designing a Ngunnawal Ngadjung Water Initiative with Traditional Owners for the upper Murrumbidgee. It is also embarking on a project of Aboriginal waterway assessments to document Aboriginal water values and uses. These assessments span the ACT portion of the Murrumbidgee but also extend into NSW (the upper Murrumbidgee). The ACT Government advised that these assessments could inform the replacement Plan if it is extended for two years before being replaced, with the assessments due for completion in 2024. Ngunnawal values and uses could inform Plan objectives and potentially changes to Plan provisions to improve outcomes for Aboriginal people.

Given Ngunnawal Country spans both the ACT and NSW portion of the upper Murrumbidgee, there is scope to consider issuing entitlement and enabling Ngunnawal peoples to participate in trade including potentially interstate trade.

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182 The Commission notes that DPE-Water had initially been working with key Aboriginal stakeholders as part of a state-wide Aboriginal Water Coalition to develop the Aboriginal Water Strategy and to improve engagement across NSW. However, there were delays and significant barriers, and the group has been disbanded.

183 This included funding for representative groups MLDRIN and NBAN as part of developing water resource plans and regional water strategies. Source: Interview conducted during recent reviews of water sharing plans for the Intersecting Streams and Lower Murray-Darling unregulated water sources.

Importantly, based on experience in the Snowy Mountains, there is also scope for provision of and protection of cultural flows from Tantangara Dam through the NSW Murrumbidgee I, II and III water sources and the ACT portion of the Murrumbidgee. Interim cultural objectives were set for 2014-15 Snowy River Increased Flows.[184] Releases were designed with Aboriginal people of the Snowy mountains. The managed events were also named in recognition of the traditional knowledge system and cultural connection to waterways of the Snowy Mountains.[185]

Subsequently, the *Snowy Hydro Corporatisation Act 1997* was amended to enable greater Aboriginal representation in environmental water management via the Snowy Advisory Committee.[186] The committee provides advice on environmental releases associated with the Snowy River Increased Flows (SRIF) and Snowy Montane Rivers Increased Flows (SMRIF), including releases to the upper Murrumbidgee River from Tantangara Dam. As noted in **Chapter 4**, there is scope for the replacement Plan to include provisions that provide for the protection of these releases through to Burrinjuck Dam. There is also scope to engage more broadly with Aboriginal nations about the cultural outcomes they wish to achieve through improved water management and look at opportunities to co-design releases and provisions for cultural flows, including their protection.

184 DPI-Water (2014) *Defining cultural water requirements for the Snowy River*

185 Williams, S., Connolly, D. and Williams,A. (2019) The recognition of cultural water requirements in the montane rivers of the Snowy Mountains, Australia, *Australasian Journal of Environmental Management*, 26:3, 255-272

186 ..... Clause 57(4)(d) of the *Snowy Hydro Corporations Act 1997*

6.5 Recommendations

R 9	As part of the replacement Plan, to deliver better outcomes for Aboriginal peoples through water management, DPE-Water should: a) ensure Plan objectives and corresponding provisions are consistent with the NSW Water Strategy relating to Aboriginal peoples' rights and values and increase access to, and ownership of, water for cultural and economic purposes b) ensure that the Plan includes provisions that provide for the protection of the existing 2,150 ML of Murrumbidgee Valley high-security water for Aboriginal cultural purposes when it is used in streams and off-river pools located in unregulated river water sources adjacent to the regulated river c) undertake culturally appropriate consultation with all nations in the Plan area and engage these nations in co-designing rules that can protect water-dependent Aboriginal cultural values and assets in the Murrumbidgee catchment d) review the appropriateness and adequacy of the maximum 10 ML allowance available for cultural access licences e) support the initiatives sought by Ngunnawal people as part of the Ngunnawal Ngadjung Water Initiative to provide for cultural flows and the protection of those flows through the upper Murrumbidgee River f) include a provision that requires Aboriginal rights and access are prioritised first in line with meeting Closing the Gap targets and the *NSW Water Strategy* before annual controlled allocations are announced (controlled allocations cannot occur without demonstrating that doing so does not further impact on Aboriginal access to water rights for cultural and economic needs).

7 Securing town water supply to meet future needs

The Murrumbidgee River and its tributaries provide water to several town water supply schemes within and outside the Plan area, servicing several regional centres and towns. Most towns and communities in the Murrumbidgee region rely on regulated water sources and groundwater (for example, towns below Burrinjuck and Blowering dams).[187] Towns reliant on unregulated river water sources covered by the Plan are largely located in the upper Murrumbidgee. This chapter focuses on communities in the upper Murrumbidgee region that predominantly rely on unregulated river local water utility access licences.

Town water supply needs were mostly met over the life of the Plan (**Section 7.1**), but there are some areas for improvement and future risks that should be managed, including:

- some access rules may not protect town water, which is inconsistent with the priorities of the Act (**Section 7.2**)
- projected climate change places town water security at risk (**Section 7.3**)
- projected population growth may also increase town water security risks and further analysis is required to understand the relative impact of future population on water security risks (**Section 7.4**)
- there are several risks to water quality, impacting town water supply and amenity values (**Section 7.5**).

7.1 Town water needs were mostly met during Plan period

When the Plan commenced, there were 4,930 ML local water utility share components (6 percent of total share) from eight of the 43 unregulated river water sources.[188] The upper Murrumbidgee townships of Cooma town water supply rely on releases from Tantangara Dam managed by Snowy Hydro.[189] Downstream of Burrinjuck and Blowering dams, most towns are supplied from the regulated Murrumbidgee River. Most of the town water that is not extracted from the river is in the form of groundwater extracted from the Mid Murrumbidgee and Billabong Creek alluvial aquifers.[190]

Town water needs are a significant proportion of entitlement in some unregulated river water sources, particularly in the Snowy Monaro Regional Shire (55 percent of total share of the Murrumbidgee I Water Source), and Yass Valley Council (79 percent of the entitlement share of the Lower Yass Water Source Water Source).[191]

Table 2 provides a summary of town water entitlements and outcomes during the Plan period.[192] Local water utility managers in the Plan area advised that local water utility entitlements were adequately provided for over the life of the Plan, although some water restrictions were put in place over this period. This is in line with the Plan's objective to

187 Some communities below the region's major water storages are supplied by the region's major water utilities (Riverina Water and Goldenfields Water) or by irrigation corporations (for example, Griffith).
188 See Clause 23 of the Plan.
189 DPIE (2022) *Draft Regional Water Strategy: Murrumbidgee Strategy*
190 DPI (2016) *Water Sharing Plan for the Murrumbidgee River Unregulated and Alluvial Water Sources - Background document for amended plan 2016*
191 *Ibid.*
192 Interviews: Snowy Monaro Regional Council, 24 May 2022; Icon Water, 24 May 2022; Riverina Water, 23 August 2022; Snowy Valleys Council, 2 August 2022; Yass Valley Council, 1 August 2022.

maintain and improve access to water for basic landholder rights, town water supply and licensed domestic and stock purposes.[193]

While the ACT is a separate jurisdiction[194] and water extracted from the Murrumbidgee River is managed under ACT legislation and associated planning instruments, the management of flows upstream in NSW (specifically in the Murrumbidgee I and II water sources) have implications for town water supply in the ACT.[195] Icon Water is responsible for town water supply to the Canberra, Queanbeyan and Tharwa communities and has a 71 gigalitres licence to draw water from three water sources in NSW, including the Murrumbidgee River (via the Googong pipeline) as a supplementary water source during drought.[196]

Icon Water extracts raw water from the upper Murrumbidgee as the river travels through the ACT under the *ACT–NSW Memorandum of Understanding for Regional Collaboration*).[197] Consequently, its local water utility entitlement is not listed in the Plan. Icon Water advised that town water needs for ACT townships were largely met by the ACT town water entitlement because ACT town water systems were augmented prior to 2019/20, with the upper Murrumbidgee being a supplementary supply that was not required.[198] One exception is the village of Tharwa in the ACT, where water was carted in during the 2019-20 drought (**Section 7.3**).[199]

For the development of the draft *Murrumbidgee Regional Water Strategy*, DPE-Water developed a new hydrologic model for the upper Murrumbidgee to better understand the hydrology of the upper catchment and analyse water security risks. The Commission understands that DPE-Water worked with the ACT Government, Icon Water and Snowy Hydro to ensure that all systems are fully integrated. The NSW Government also committed to share this work and the model with the ACT to inform more integrated and strategic water security risk assessments.

Despite town water needs being largely met over the life of the Plan, most utility managers (including Icon Water) raised concerns about the potential of reduced water availability in the near future as a result of climate change (see **Section 3.5**), as well as increasing water security risks from population growth in some areas (see **Section 7.4**).

The Commission notes that Riverina Water advised that, while the surface water entitlement for town water is a supplementary supply to groundwater and is yet to be used, there are concerns about the lack of understanding about the connectivity between surface and groundwater in the Lower Billabong Water Source.[200]

193 See Clause 12A 2(a) of the Plan.
194 As outlined in **Chapter 2**, the ACT relies on other dams outside of the Plan area for a large proportion of their town water supply.
195 The ACT also has its own water supply dams, including Corrin, Cotter, Bendora and Googong Dams, which help manage water security risks in the ACT and for towns reliant on ACT water supply.
196 Interview: Icon Water, 24 May 2022.
197 In 2008 the ACT, NSW and Australian governments entered into an agreement to ensure integrated water supply to the ACT/NSW cross-border regions. Under this agreement, the ACT agreed to supply water to Queanbeyan from Googong Dam. In 2016, the ACT, NSW and Australian governments entered the ACT–NSW Memorandum of Understanding for Regional Collaboration, which includes fostering an integrated water supply management approach to the ACT/NSW cross-border regions (*Queanbeyan Water Supply Agreement 2008 between the Commonwealth of Australia, State of New South Wales and Australian Capital Territory*; Regional NSW (2020) *ACT–NSW Memorandum of Understanding for Regional Collaboration*)
198 Interview: Icon Water, 24 May 2022.
199 *Ibid*.
200 Interview: Riverina Water, 23 August 2022.

Table 2: Summary of town water needs and outcomes over the life of the Plan

Local water utility manager	Townships and water source	Town water needs met over life of Plan	Entitlement at Plan commencement[201]
Yass Valley Council[202]	Yass and Bowning, Murrumbateman and Binallong provided for by Lower Yass Water Source Yass dam upgraded in 2013, Murrumbateman added in last 18 months – Jugiong Water Source	Entitlement was adequate, with restrictions during the drought[203] Level 1 restrictions 2019/20	1,700 ML per year from the Yass Lower Water Source 30 ML per year from the Jugiong Water Source
Snowy Monaro Regional Council[204]	Cooma, Bredbo, Adaminaby	Entitlement adequate and with restrictions during the drought[205] Level 3 water restrictions in Cooma and Bredbo in 2019/20 Experienced significant water quality issues	2,236 ML per year from the Murrumbidgee I Water Source 5 ML per year from the Murrumbidgee II water source
Snowy Valleys Council[206]	Batlow	Entitlement adequate, town water needs constrained by dam capacity Water security is classified as high risk because the consumptive need is much greater than headworks to secure yield basis[207]	516 ML per year from the Gilmore / Sandy Water Source
Riverina Water	Surface water as a secondary source for Rant and Walbundrie[208]	Entitlement is adequate Entitlement not used over the life of the Plan	40 ML per year from the Lower Billabong Water Source

201 See Clause 23 of the Plan.
202 DPI (2016) *Water Sharing Plan for the Murrumbidgee River Unregulated and Alluvial Water Sources - Background document for amended plan 2016*
203 Interview: Yass Valley Council, 1 August 2022.
204 In 2016, councils covering the areas of Bombala, Cooma-Monaro Shire, Snowy River were amalgamated under the Local Government Proclamation to become the Snowy Monaro Regional Council (Snowy Valleys Council (n.d.) *History & Amalgamation*)
205 Interview: Snowy Monaro Regional Council, 2 June 2022.
206 Note: the Tumut Shire Council and the Tumbarumba Council were amalgamated in 2016 under the Local Government Council Amalgamation Proclamation to become Snowy Valleys Council (Snowy Valleys Council (n.d.) *History & Amalgamation*)
207 DPIE (2020) *Safe and Secure Water Program, Risk Prioritisation Advice, Batlow Water Quality, Risk ID 2226*, document received by Snowy Valleys Council.
208 Interview: Riverina Water, 23 August 2022; Note: the Background document lists the towns of Ralvoa and Walla Walla, interviewees clarified the towns that rely on the licence (DPI (2016) *Water Sharing Plan for the Murrumbidgee River Unregulated and Alluvial Water Sources - Background document for amended plan 2016*)

Local water utility manager	Townships and water source	Town water needs met over life of Plan	Entitlement at Plan commencement[201]
		as reliant on groundwater	
Queanbeyan and Palerang Council – Icon Water	Captains Flat	Entitlement adequate needs met for dry years[209]	250 ML per year from the Molonglo Water Source
Snowy Hydro Limited[210]	Cabramurra	Significant water quality issues and damage to water infrastructure due to the 2019-20 bushfires, requiring an additional water treatment plant	153 ML per year from the Upper Tumut Water Source
Icon Water	ACT upper Murrumbidgee (not listed in the Plan)	Entitlement adequate, needs met as ACT augmented system, upper Murrumbidgee a secondary supply[211]	Not applicable

7.2 Not all access rules protect and prioritise town water needs

The Act prioritises the protection of the water source and its dependent ecosystems over licensed water usage.[212] Within licensed usage, the Act prioritises local water utility access licences (which provide town water supply) over other licence classes. **Table 3** summarises the Plan provisions relevant to town water supply. Depending on the location of storages used for town water supply, provisions may impact on dam inflows (for example, Yass Dam) or releases from dams (for example, Tantangara Dam).

Table 3: Summary of Plan provisions relevant to town water supply

Local water utility manager	Plan provisions to protect flows[213]
Yass Valley Council	Lower Yass Water Source: ▪ *Very Low Flow Class*: No visible flow over the weir ▪ *A Class*: Visible flow over the weir
Snowy Monaro Regional Council	Murrumbidgee I Water Source: ▪ *Very Low Flow Class*: Less than or equal to 33 ML per day ▪ *A Class*: More than 33 ML per day Murrumbidgee II Water Source: ▪ *Very Low Flow Class*: Less than or equal to 27 ML per day ▪ *A Class*: More than 27 ML per day
Snowy Valleys Council	Gilmore/Sandy Water Source: ▪ *Very Low Flow Class:* Less than or equal to 10 ML per day

209 NSW Public Works Advisory (2018) *Queanbeyan-Palerang Regional Council Integrated Water Cycle Management Strategy Palerang Communities*
210 DPI (2016) *Water Sharing Plan for the Murrumbidgee River Unregulated and Alluvial Water Sources - Background document for amended plan 2016*
211 Interview: Icon Water, 24 May 2022.
212 Section 5(3) of the Act.
213 See Flow Classes Table B of the Plan.

Local water utility manager	Plan provisions to protect flows[213]
	▪ *A Class:* More than 10 ML per day and less than or equal to 218 ML per day ▪ *B Class:* More than 218 ML per day
Riverina Water	Lower Billabong Water Source: ▪ *Very Low Flow Class*: From 1 January to 30 June: Less than or equal to 80 ML per day on a rising river and less than or equal to 49 ML per day on a falling river. From 1 July to 31 December: Less than or equal to 66 ML per day on a rising river and less than or equal to 49 ML per day on a falling river. ▪ *A Class:* From 1 January to 30 June: more than 80 ML per day on a rising river and more than 49 ML per day on a falling river. From 1 July to 31 December: more than 66 ML per day on a rising river and more than 49 ML per day on a falling river.
Queanbeyan and Palerang Council – Icon Water	Mongolgo Water Source: ▪ *Very Low Flow Class* Less than or equal to 1.6 ML per day
Snowy Hydro	Upper Tumut Water Source: ▪ No flow classes in the Plan may be on the licence
Icon Water	Not available

Consistent with the Act, access rules for the Murrumbidgee I and II water sources[214] have helped protect flows for Cooma's town water supply and domestic and stock rights provided for as part of base passing flows released from Tantangara Dam. However, the base passing flows do not account for additional demands created by population growth in the region in the past two decades and require review (see **Section 4.4**). The Commission understands that modelling for the draft *Murrumbidgee Regional Water Strategy* tested flows under different population projections. This information should be used to assess the adequacy of base passing flows and inform access rules to protect and prioritise town water in the replacement Plan. Any changes in base passing flows should also be reflected in corresponding changes in access rules ensure these flows are protected.

There are areas where the Plan could be more consistent with the priorities of the Act. In advice to the Commission, Yass Valley Council raised concerns about the impacts of irrigators extracting upstream of Yass Dam, which is situated in the Lower Yass Water Source.[215] Currently, there is a visible flow rule over the Yass Weir for unregulated river licence holders upstream of Yass Dam (see **Table 3**). However, the impacts of licenced use on dam inflows are unknown as there is no gauge immediately upstream of the dam. Given the lack of a gauge and the less stringent no visible flow access rule, protection for the water source and its ecosystems and town water needs may be inadequate.

214 Water users in Murrumbidgee I water source can only pump when there is a visible flow past their pump and a minimum flow of 33 ML per day at Mittagang Crossing (410033). Water users in the Murrumbidgee II Water Source can only an only pump when there is a visible flow past their pump and a minimum flow of 27 ML per day at Billilingra (410050).

215 See Clause 23(h) of the Plan.

Yass Valley Council advised there is a recent trend of farms being subdivided into smaller commercial and residential properties, which may put pressure on both town water and basic rights for river frontage properties:

> *'A lot of growth is happening in the non-water supply area. For example, the subdivision along Iceton Place. This area currently has one farm, which will be subdivided to 71 2 to 4 hectare lots. These lots are located on land that flows directly into Yass dam.'*[216]

Basic rights have priority access in the order of the Act, and the Plan currently allows for 87 ML per year stock and domestic rights from the Yass Lower Water Source.[217] Significant growth in subdivisions on river frontage properties could result in an increased take under stock and domestic rights, which could put further pressure on flows important for aquatic ecosystems and town water requirements.

During Plan replacement process, DPE-Water should review the adequacy of the access rules on the Lower Yass Water Source to protect flows for the environment, basic land holder rights and town water needs. Appropriate access rules should be established based on an assessment of environmental flow requirements, and volumes needed to fulfill basic landholder rights and town water needs. In this assessment, any economic dependence for the water source should also include the economic and social value of town water. Town water should be given priority over other unregulated river licensed use in establishing access rules, consistent with the priorities under the Act. Rules should support local water utility access licences to continue to extract where environmental outcomes are not compromised, and before other licensed water users.

DPE-Water should also consider any growth in basic rights extraction and the implications for access rules to ensure that water sharing is within sustainable limits. Further, any growth in basic rights will need to be factored into managing extraction to the LTAAEL (see **Section 3.4.1**). Given Yass' projected population growth (see **Section 7.4**), reviewing growth in subdivisions every five years may be warranted.

7.3 Town water security is at risk from climate change

The Murrumbidgee region is already experiencing the impacts of climate change (see **Section 3.5**).[218] Climate change is expected to drive changed rainfall patterns in the Murrumbidgee region, a decline in average annual rainfall, increased evapotranspiration, and more frequent and prolonged droughts with extreme low rainfall periods.[219] Climate change may also result in further fluctuations in streamflow in unregulated rivers and creeks in the upper Murrumbidgee, which already experiences variability in rainfall and temperature and is more susceptible to short intense droughts (see **Section 3.5**).

Despite advising that entitlements for most towns in the Plan area are adequate, local water utility managers and stakeholders raised concerns about water security in times of drought and changing conditions caused by climate change:

> *'In the recent drought, what caught us unprepared was the change in rainfall-runoff relationship – we don't get as much runoff anymore from the same rainfall. In the Cotter Catchment, which is relatively pristine, the changes being observed are very concerning.*

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216 Interview: Yass Council, 1 August 2022.
217 See Clause 19(al) of the Plan.
218 Devanand, A., Leonard, M. and Westra, S. (2020) *Implications of Non-Stationarity for Stochastic Time Series Generation in the Southern Basin*. Pilot Study undertaken by The University of Adelaide.
219 DPIE (2022) *Draft Regional Water Strategy: Murrumbidgee Strategy*

> *We're really worried about the change in runoff. This is the biggest learning from the recent drought.'*[220]
>
> '*Future pressures are likely to exacerbate the situation. Climate change will lead to an overall reduction in flows, coupled with an increase in water demand as our region continues to grow.'*[221]

Risks to water security under climate change are particularly high for Cooma, which relies on unregulated surface water – already altered by river regulation (Tantangara Dam) – as a sole source of water supply. Further, it is challenging to access groundwater supply due to difficulties in obtaining works approvals given bore setback distance requirements. The draft *Murrumbidgee Regional Water Strategy* lists Cooma, Batlow, Yass, Binalong and Bowning as towns reliant on the unregulated surface water system that have very high water security risk based on the ratings developed by the Safe and Secure Water Program.[222]

Prolonged dry conditions in 2018 and 2019 resulted in flows in the upper Murrumbidgee River and releases from Tantangara Dam decreasing significantly, with streamflow below the 95th percentile for 54 days between January 2019 and January 2020. This prompted Level 3 water restrictions in Cooma and Bredbo. There have also been periodic water restrictions throughout the Snowy Monaro Regional, Snowy Valleys, Yass Valley and Queanbeyan-Palerang local government areas since 2002.[223] Reduction in flows in the upper catchments will have implications for flows downstream, including inflows to Burrinjuck Dam.[224]

Town water shortages in the ACT town of Tharwa, although not covered by the Plan, provide an indication of the potential impacts of climate change for towns in the Murrumbidgee region. The town is not connected to Canberra's mains water supply, is heavily reliant on the Murrumbidgee River for town water supply, in addition to rainwater tanks. The town experienced severe water shortages in the 2019-20 drought when the river ceased to flow at Angle Crossing in December 2019, causing substantial water supply stress to Tharwa village (see **Figure 7**).[225] Water shortages in Tharwa were further exacerbated by extraction from upstream users during low flows.

220 Interview: Icon Water, 24 May 2022.
221 Submission: Upper Murray Demonstration Reach, received 6 February 2022.
222 DPIE (2022) *Draft Regional Water Strategy: Murrumbidgee Strategy*; Note: the Safe and Secure Water Program considered climate change projections, among other factors.
223 DPIE (2022) *Draft Regional Water Strategy: Murrumbidgee Strategy*
224 *Ibid.*
225 Alvaro, A. (2019) 'Tharwa residents are digging in mud to access water as bushfire anxiety grows', *ABC News*, 14 December.

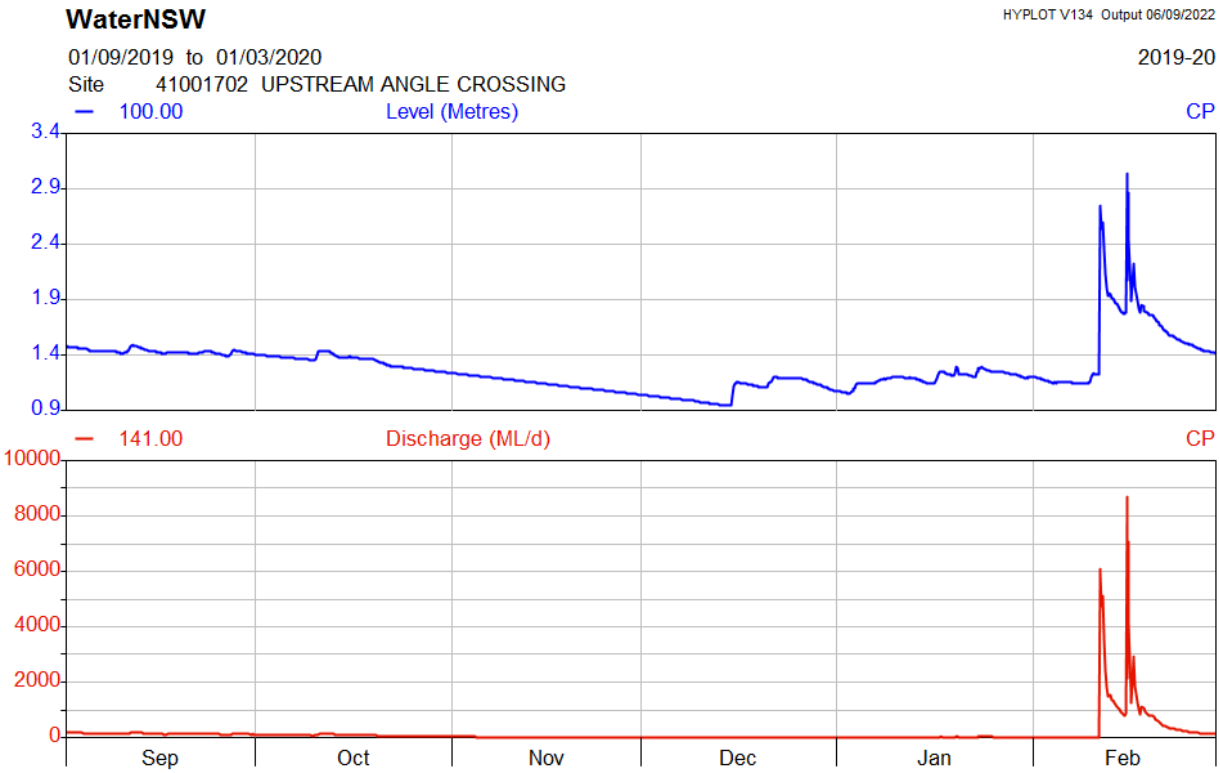

Figure 7: Streamflow data from Angle Crossing 2019-2020[226]

Significant resourcing has gone into strategic planning and investigation of options to improve the reliability and access to town water supply for users in the Murrumbidgee. In partnership with local government, the NSW Government has a range of strategies in place such as the Town Water Risk Reduction Program,[227] the Safe and Secure Water Program,[228] and the draft *Murrumbidgee Regional Water Strategy,*[229] which identify long-term solutions to challenges and risks in providing water supply and sewerage services in regional NSW. Riverina Water also advised it has undertaken local studies and planning that can inform the adequate protection of town water.[230] Alongside these initiatives, it is important that water sharing plans adequately protect the town water needs of communities and take into consideration information about vulnerable town water supplies and amenity.

As part of Plan replacement, DPE-Water should consider the latest hydrological data and climate change studies undertaken as part of the development of the draft *Murrumbidgee Regional Water Strategy*, and local planning initiatives to ensure that any risks to town water security are fully considered. Provisions to protect town water supply in water sources with towns deemed high risk or vulnerable, should be strengthened. For example, more stringent cease to pump rules for unregulated river access licence holders should be implemented where necessary. This would ensure town water needs are protected in line with the priorities of the Act. This is particularly important for low flow periods and the impacts of extra demands caused by population growth.

226 WaterNSW (2022) Real-time data – upstream Angle Crossing (gauge) 41001702
227 NSW Government (2022) *Town Water Risk Reduction Program Fact Sheet*
228 DPE (2022) *Safe and Secure Water Program*
229 DPIE (2022) *Draft Regional Water Strategy: Murrumbidgee Strategy*
230 Interview: Riverina Water, 23 August 2022.

7.4 Population growth may put town water needs at risk

Population growth in parts of the Plan area and neighbouring ACT is likely to place pressure on town water needs in the term of the replacement Plan. The draft *Murrumbidgee Regional Water Strategy* highlights significant population growth in some towns where surface water and groundwater sources are fully allocated and heavily used, particularly the upper Murrumbidgee area.[231] The strongest predicted growth from 2021 to 2041 in local government areas that rely on unregulated surface water are: [232]

- Queanbeyan-Palerang Council: an annual increase of 1.4 percent (20,714 people overall)
- Yass Valley Council: an annual increase of 0.9 percent (3,242 people overall)
- Snowy Monaro Regional Council: an annual increase of 0.6 percent (2,810 people overall)
- the ACT: annual increase from 0.8-1.7 percent annual increase (92,830-202,438 people overall).[233]

Although the ACT is only partially supplied by the upper Murrumbidgee River, the ACT and Region Catchment Management Coordination Group considered that projected growth warrants careful consideration in the replacement Plan:

> *'The upper Murrumbidgee catchment provides run-of-river water supply for Cooma and Tharwa, as well as Canberra and Queanbeyan, both directly and via the Murrumbidgee to Googong transfer pipeline. Regional development in the ACT-NSW border region is increasing demand for water supply, with the Murrumbidgee River regarded as a key water source.'* [234]

For towns in the Canberra growth corridor, accessible town water to meet population growth needs is a primary limiting factor. For example, the *Michelago Master Plan* highlighted that if population growth occurs, the preferred supply is the unregulated Murrumbidgee River but this may not be sustainable. Any consideration of further town water needs from the unregulated Murrumbidgee River within NSW or the ACT as a result of this growth must consider the ecological and social risks and impacts on entitlement and access rules to protect town water.

Yass Valley LGA's population in 2021 was 17,442 and is expected to grow to 20,684 by 2041, an 18 percent increase.[235] Yass Valley Council advised this growth is largely driven by expansion from the ACT to provide more affordable housing and water supply has been identified as the primary constraint for future growth. This is despite Yass Dam wall being raised in 2013 to increase storage capacity.[236] Once the population of Yass and neighbouring towns rise above 15,500, alternative sources of water may be required.[237] The Council's preferred option for an additional secure town water supply to meet this demand involves extending ACT water infrastructure to the north-west. The Commission understands that to mitigate risks to the ACT's Surface Diversion Limit from meeting these town water supply needs, NSW would trade entitlement to the ACT to cover use of the ACT resource. This would require appropriate interstate trade rules in the Plan (**Section 8.3**).

231 DPIE (2022) *Draft Regional Water Strategy: Murrumbidgee Strategy*
232 DPE (2022) *Population Projections*
233 ABS (2017) *Population projections, Australia, states and territories and capital cities*
234 Submission: ACT and Region Catchment Management Coordination Group, received 23 February 2022.
235 DPE (2022) *Population Projections*
236 Interview: Yass Council, 1 August 2022.
237 Yass Valley Council (2019) *Yass Valley Settlement Strategy 2036*

The *ACT–NSW Memorandum of Understanding for Regional Collaboration* recognises the complexity of managing population pressures in the upper Murrumbidgee and the challenges associated with water accessibility. It also commits NSW and ACT to establish a cross-border issues steering committee:

> *'Recognising the need for focussed and strategic multilateral coordination on cross-border water issues, including regulatory compliance, water trading, SDL adjustments commercial requirements for relevant entities, and a strategy to specifically address issues in Yass Valley and Queanbeyan/Palerang, the ACT and NSW agree to establish a Cross-Border Water Issue Steering Committee.'*[238]

The draft *Murrumbidgee Regional Water Strategy* also highlights the importance of considering both land use change and population growth impacts on water sources and strengthening inter-jurisdictional water management between NSW and the ACT.[239]

The Commission understands that DPE-Water are already consulting with the ACT Government on some aspects of cross-border water management, including the development of a trade framework (**Section 8.3**). The Commission encourages ongoing consultation with the ACT Government, as well as relevant local councils to ensure town water supply needs can be met, particularly under future climate scenarios. These arrangements should be reflected in the Plan to ensure there is clear accountability for the sustainable management of the cross-border water resource.

In particular, DPE-Water should collaborate with Snowy Monaro Regional Council, Yass Council and the ACT Government to determine the material risks to the available water resources for town water generated by population growth. Agencies involved in this collaboration should consider implications for existing local utility access entitlements in the Plan area from Yass and the Canberra growth corridor. Alongside system augmentation and interstate trade, DPE-Water should determine if the share components for local utility access licences need to be adjusted to meet future town water demand as a result of population growth but also ensure that access rules prioritise town water needs. Any adjustments would need to be considered in maintaining a sustainable LTAAEL for the Plan area and related LTAAEL compliance.

7.5 There are water quality issues in the Plan area

Water quality issues can pose risks to environmental values, as well as water uses such as town water supply and recreation. The Plan has targeted objectives outlining water quality target ranges to support:[240]

- water-dependent ecosystems and ecosystem functions
- town water and amenity
- agriculture and other water dependent businesses
- Aboriginal cultural use.

The draft *Murrumbidgee Regional Water Strategy* acknowledges that a range of factors are affecting water quality in the Murrumbidgee catchment, ranging from salinity, elevated nutrient levels, blue-green algae, hypoxic blackwater and cold water pollution.[241] These

238 Regional NSW (2020) *ACT–NSW Memorandum of Understanding for Regional Collaboration*
239 See option 14 and 15 of DPIE (2022) *Draft Regional Water Strategy: Murrumbidgee Strategy*
240 See Clauses 10, 11, 12 and 12A of the Plan.
241 DPIE (2022) *Draft Regional Water Strategy: Murrumbidgee Strategy*

issues require a suite of interventions, with some being influenced by flows, hence it is important that the Plan and the water sharing plan for the regulated Murrumbidgee River include provisions that contribute to achieving water quality objectives in the water sharing plan.

The *Water quality technical report for the Murrumbidgee surface water resource plan area* indicates there are water quality issues at sites in the upper and lower Murrumbidgee catchment. For example, in the lower Murrumbidgee sites along Billabong Creek had elevated turbidity, total phosphorus and high nitrogen levels and also low dissolved oxygen that pose a high risk to the health of water dependent ecosystems.[242] Billabong Creek is identified as a priority area for developing local water quality targets and improving water quality.[243]

During the Plan review, local water utility managers and community groups raised concerns that water quality has been an issue in the upper Murrumbidgee, where elevated turbidity, faecal coliform counts and algal blooms have resulted in water quality alerts. Water quality, including for recreational purposes, was a key concern raised by survey respondents in the water quality and security survey undertaken by the Upper Murrumbidgee Catchment Network.[244]

Representatives from the Upper Murrumbidgee Demonstration Reach raised concerns about '*episodes of high bacterial contamination in the upper Murrumbidgee resulting in the river being closed off for recreational use in the ACT, as well as algal blooms affecting riparian water users*'.[245] Several of these alerts appear to have been in recent years following the assessment period for the water quality risk assessment that informed the water quality management plan for the Murrumbidgee water resource plan area.[246]

The ACT Government has collected data on the number of days that recreational use along the ACT reach of the Murrumbidgee has been restricted due to water quality concerns (see **Figure 8**). Snowy Monaro Regional Council indicated that increasing tourist visitation may be impacted by water quality issues.[247]

242 DPIE (2020) *Water quality technical report for the Murrumbidgee surface water resource plan area (SW9)*
243 *Ibid*.
244 Upper Murrumbidgee Catchment Network (2021) *Water Quality and Security Survey Summary*
245 Submission: Upper Murrumbidgee Demonstration Reach submission, received 6 February 2022.
246 DPIE-Water (2018) *Water quality management plan for the Murrumbidgee water resource plan area*
247 Interview: Snowy Monaro Regional Council, 2 June 2022.

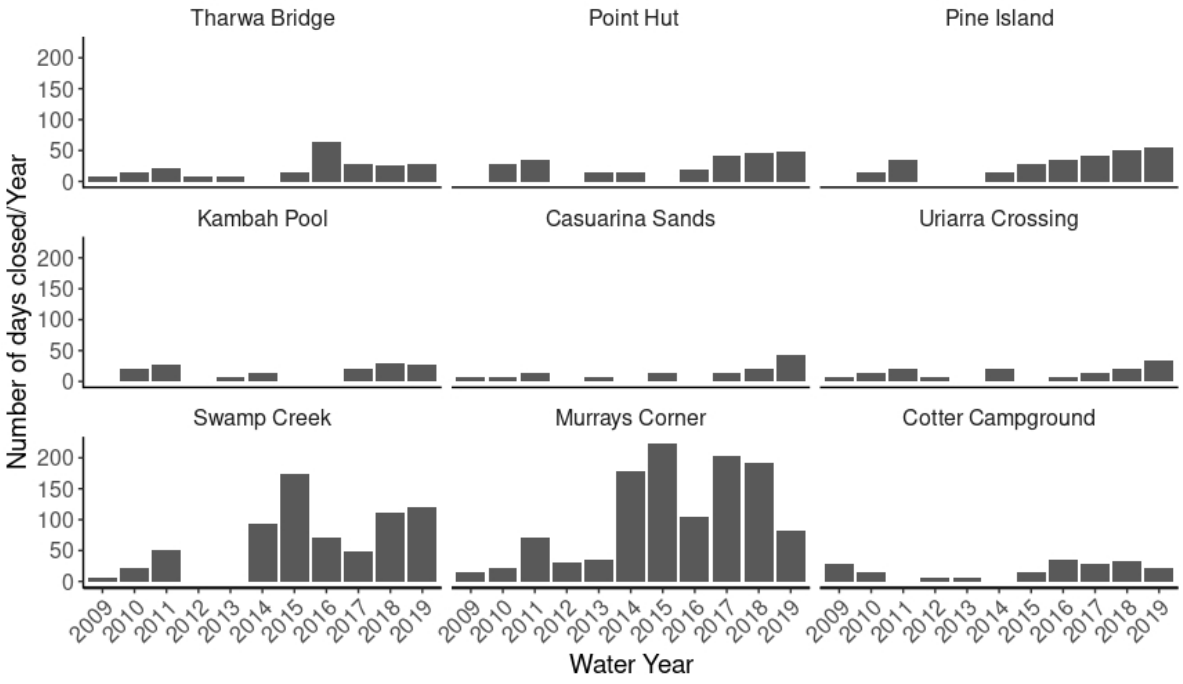

Figure 8: The number of days swimming holes along the ACT reach of the Murrumbidgee have been closed due to water quality concerns

As noted above, a range of factors contribute to water quality issues, including land management practices and altered flow regimes. Limited protection of releases from Tantangara Dam is likely contributing to water quality issues observed in the upper Murrumbidgee (see **Section 4.2**).

The 2019-20 bushfire season also resulted in water quality impacts. Shortly after intense bushfire, loose soil, ash, debris and nutrients often wash into watercourses and can cause short-term but serious impacts such as fish deaths and contamination of town water supplies.[248] The bushfires impacted over 450,000 hectares across the Snowy Valleys and Snowy Monaro local government areas, leading to declines in water quality and conditions for native fish.[249]

Nearly the entire Badja River catchment and the headwaters of the Bredbo and Cowra Creek catchments were burnt in the Badja Forest and Good Good fires, which began in December 2019. Bushfires continued throughout January and February 2020, with 80 percent of Namadgi National Park and over a third of Kosciuszko National Park burned, and impacts on communities surrounding Tharwa, Bredbo, and Numeralla. Waterway health in the Cooma region was heavily impacted, affecting 10 of 23 reaches, either directly or due to flood waters carrying ash and sediment downstream. Most reaches directly impacted by fires declined in health.[250] The impacts of drought and bushfire are likely to be exacerbated by climate change in the future.[251] Climate change predictions indicate intense bushfires could increase in frequency which would further increase the likelihood of risks to town water and water for amenity.

248 DPIE (2022) *Draft Regional Water Strategy: Murrumbidgee Strategy*
249 *Ibid.*
250 O'Reilly, W., Brademann, A., Ferronato, B., Kellock, D., Lind, M., and Ubrihien, R. (2021) *Catchment Health Indicator Program: Report Card 2020*
251 DPIE (2022) *Draft Regional Water Strategy: Murrumbidgee Strategy*

During the Plan review, stakeholders raised the criticality of improving policy and planning to reduce the vulnerability of town water supply and amenity and raised the option of investigating opportunities to maintain water-related amenity, including town lakes, local parks and recreational areas during droughts or extended dry periods.

Initiatives under the Upper Murrumbidgee Demonstration Reach seek to address some factors contributing to the decline in water quality. The Commission notes that maintaining amenity is generally the responsibility of local water utilities and councils as part of their integrated water cycle management strategies.[252] However, where possible, DPE-Water should consider how the Plan can adequately prioritise and protect flows to help meet water quality targets.

7.6 Recommendations

R 10	As part of Plan replacement, to ensure town water supply needs are provided for, and ensure accountability and transparency of cross border management, DPE-Water should: a) strengthen access rules where appropriate based on latest available evidence to ensure town water is adequately protected for high-risk towns b) review the adequacy of Lower Yass Water Source access rules to protect town water supply, basic rights and environmental flows and strengthen if required c) determine if projected population growth in the Yass region and Canberra growth corridor warrants adjusting share components for local utility access licences alongside other strategies to augment supply d) assess the extent to which projected population growth will impact on inflows to Burrinjuck Dam e) reflect any interjurisdictional governance agreements between NSW and the ACT in Plan provisions f) ensure the Plan includes provisions to adequately support the achievement of the Plan's water quality objectives.

252 DPIE (2022) *Strategic Planning assurance- Integrated Water Cycle Management (IWCM) strategies*

8 Improving outcomes through trade

The Plan includes an economic objective '*to maintain, and where possible improve, water trading opportunities for surface water dependent businesses*'.[253] There are also opportunities for trade to facilitate environmental and social outcomes and give effect to Basin Plan commitments, including through enabling interstate trade between NSW and the ACT.

The Commission found several areas where reviewing and revising trade rules could result in improved outcomes, including:

- using latest information to better support trade between Plan water sources (**Section 8.1**)
- expanding the use of trade into high flows to reduce pressure on low flows (**Section 8.2**)
- including provisions for interstate trade between NSW and the ACT (**Section 8.3**).

8.1 Trading rules between water sources are restrictive

Several restrictions on trade between the Plan's water sources were put in place when the Plan came into effect. This was based on information available at the time of Plan development regarding environmental values and hydrologic stress and assumptions where there was a paucity of information. The Plan's dealing rules were required to be consistent with the *Access Licence Dealing Principles Order 2004* and the principles adopted for the macro water sharing process.[254]

During this review, some unregulated access licence holders indicated that the Plan's trading rules are restrictive, and that they would like to sell their entitlement to other water users. However, the trading rules limit their capacity to find buyers:

> *'We've had big issues with people wanting to surrender unregulated water access licences, as the trading rules are so limiting. No one wants to buy them, and the cost-benefit of maintaining the licence doesn't work … A lot of people have built up quite a large debt in relation to these water access licences – the water users want to surrender their water access licences and, until a recent change to the process, couldn't surrender their water access licence until they paid their bills. (As you) don't get access to water every year in the unregulated system.'*[255]

Improving trade rules is supported by the National Water Initiative, which promotes the progressive removal of barriers to trade in water and facilitate the broadening and deepening of the water market, with an open trading market to be in place.[256]

Recognising that many issues associated with trade are state-wide, DPE-Water advised that it is currently reviewing trade rules for unregulated rivers (coastal and inland). In developing the replacement Plans, DPE-Water should draw on the findings of this work to

253 Clause 11(2)(a) of the Plan.
254 DPI-Water (2016) *Water Sharing Plan for the Murrumbidgee Unregulated and Alluvial Water Sources Background document for amended plan 2016*
255 Interview: WaterNSW, 23 March 2022.
256 Australian Government Department of Agriculture, Water and the Environment (n.d.) *National Water Initiative*

determine the most appropriate dealing rules and trading zones in the Plan and explore opportunities to minimise restrictions generated by trading rules that may have unintended negative impacts. Provisions should be designed at the appropriate geographic scale and clearly stated in the Plan to support trade within environmental and system constraints. The Commission supports inclusion of updated trade rules where it is demonstrated that this supports improved environmental, economic and social outcomes.[257]

8.2 Trade into high flows may reduce pressure on low flows

There are allowances to adjust the LTAAELs to account for licence conversions. The Plan includes high flow conversions for nine water sources.[258] Trades into high flow are intended to reduce hydrological stress and therefore environmental impact. Clause 25 of the Plan works in tandem with Clause 73 by providing for the establishment of high flow licences in these water sources and providing opportunities to trade into high flows.

High flow conversions encourage a shift of extraction of low flows into higher flows[259] by issuing two shares for each cancelled share in Year 1 of the Plan and one share for each cancellation year post Year 1. This conversion intends to reduce competition for water between users and the environment but relies on the use of farm dams or storages to hold the water for later use.

There does not appear to be any update to the provision allowing for trade into high flows. When the Plan commenced, there were no high flow licences and there are currently no unregulated river (high flow) access licences in the Plan area, indicating no trade into high flows.[260] The reasons for a lack of uptake are unclear but past water sharing plan reviews have indicated that the conversion rate can be a factor.

The Commission also identified that the Plan lacks clarity around relative AWD reductions between unregulated river access licences and unregulated river (high flow) access licences if there is a growth in use, which may also be a disincentive for conversion to high flow licences. Clause 36(1) of the Plan requires if there is non-compliance with either a LTAAEL for an extraction management unit or the long-term average sustainable diversion limit, the Minister is to take one or both of the following actions:

- make AWDs for unregulated river access licences of less than 1 ML per unit share
- make AWD for unregulated river (high flow) access licences of less than 1 ML per unit share.

The Plan currently does not specify how relative AWD reductions may be applied to each of these licence types. It does not specify whether the relative reductions to address growth in one category of licence could be offset by a reduction in another category. Potential relative reductions between these licence categories should be clarified in the replacement Plan to improve confidence for those wishing to convert to high flow licences.

The Commission understands that DPE-Water is reviewing high flow conversions, including barriers to their uptake. Given the pressures on the Murrumbidgee system (particularly in the mid and lower catchment), including from projected climate change, the Commission considers there is merit in reviewing and expanding the Murrumbidgee water sources that

257 If the trade review is complete prior to plan updates, revisions to trade rules should be included in the replacement Plan. Where this is not possible, amendment provisions may be required to facilitate inclusion of trade rule updates during the life of the new Plan.
258 Clause 73(b) of the Plan.
259 Those flows occurring 50 percent of the time.
260 WaterNSW (2022) *NSW Water Register*

can convert to high flows. Any additional water sources would require DPE-Water to assess potential impacts of high flow conversions on the flow regime and environmental values. For those water sources deemed able to accommodate greater extraction in higher flows and with hydrological stress in low flows, DPE-Water should encourage the adoption of high flow conversions.

8.3 The Plan should support interstate trade

The Plan currently limits interstate trade and does not recognise the role that trade could play in delivering environmental and social outcomes. Specifically, Clause 78(2) prohibits interstate trade in 23 of the Plan's water sources.[261] Since the Plan came into effect the water market has evolved, with the Commonwealth Environmental Water Holder becoming an active participant in the water market, having its own trade framework that seeks to identify trading opportunities to enhance the Commonwealth's capacity to support environmental objectives.[262] Supporting interstate trade as part of Plan replacement could provide greater opportunities for trade to support environmental outcomes, as well as alleviating town water supply pressures in growth areas around the ACT.

ACT stakeholders are seeking inclusion of rules in the Murrumbidgee water sharing plans to allow for interstate trade between the ACT and NSW.[263] Currently, most diversions in the ACT are for urban water supply. Icon Water, the ACT's major water utility, has water entitlements and a licence for this purpose, but this right is not currently tradeable. Given entitlement currently exceeds demand, there is an opportunity through interstate trade to support the ACT to meet its Basin Plan commitments.

As of May 2022, the ACT needs to take further steps to meet shared water recovery targets.[264] Section 6.05 of the Basin Plan requires the ACT to make a 4.9 GL (4,900 ML) contribution to the SDL resource unit shared reduction amount.[265]

The Commission recognises that interstate trade is encouraged in line with the Basin Plan and the Australian Government has raised concerns with the delays in establishing these arrangements:

> '*The MDBA considers that the lack of trading arrangements between the ACT and NSW is inconsistent with the Basin Plan water trading rules. The MDBA considers the ACT Murrumbidgee to be the start of the regulated system and that trade arrangements need to be enabled, including with Victoria and South Australia… The department has been advised that some progress has been made, with options to operationalise trade under consideration through an interjurisdictional working group chaired by the MDBA. … The ACT has agreed with New South Wales (NSW) to enable trade between the ACT and NSW Murrumbidgee; however, this was not achieved by June 2019.*' [266]

Establishing interstate trade arrangements also has the potential to help meet town water supply needs in Yass Valley and other growth areas around the region, where population

261 Including prohibition of interstate trade in Murrumbidgee III water source, which is immediately downstream of the ACT and upstream of Burrinjuck Dam.
262 CEWO (2016) *Commonwealth Environmental Water Trading Framework – November 2016*
263 Interviews: Icon Water, 24 May 2022; ACT Government, 6 July 2022.
264 DAWE (2022) *Surface water recovery required under the Basin Plan including the Sustainable Diversion Limit Adjustment Mechanism (1) as at 31 May 2022*
265 ACT Government (2016) *Draft ACT Water Resource Plan for surface water and groundwater summary June 2016*
266 Australian Government Department of Agriculture Water and Environment (2020) *National Partnership Agreement on Implementing Water Reform in the Murray–Darling Basin Milestone assessments for the year ending 30 June 2019*

growth will result in additional demand for town water supply that cannot currently be provided under current entitlement (see **Chapter 7**). Yass Valley Council indicated that its preferred option to meet projected town water demand is to extend ACT water infrastructure to the north-west into NSW. However, to mitigate risks to the ACT's SDL from meeting these needs, NSW would have to trade entitlement to the ACT to cover use of the ACT resource. This would require appropriate interstate trade rules in the Plan.

The Commission recognises that establishing interstate trade is inherently complex because access dealing rules are generally specific to a plan area and Basin State legislation. Further, interstate trades should not erode the rights of existing users in NSW. However, the *Access Licence Dealing Principles Order 2004*[267] does allow for interstate trade where water sources are hydrologically connected.[268] Given the upper Murrumbidgee is hydrologically connected through NSW, the ACT proposed interstate trade would be consistent with this requirement. Plan provisions should be reviewed to allow for interstate trade but must ensure continued protection of environmental objectives for the Plan area.

Transferring flows from the ACT through to Burrinjuck Dam and the regulated Murrumbidgee River requires interstate trade and protection of flows through the Plan's Murrumbidgee III Water Source and greater clarity regarding dealings between the regulated and unregulated river water sources. This also applies if in the future trade was to occur from the regulated Murrumbidgee River to the ACT. The ACT Government is currently overseeing the development of a trade framework in consultation with DPE-Water to enable this to occur.[269] The replacement Plan would require additional provisions to ensure flows are protected as they pass through the Murrumbidgee III Water Source to the Murrumbidgee regulated system.

Interstate trading will need clear principles and processes that consider risks to the environment and downstream users, similar to trade arrangements in place within NSW. It could also require considerable administrative effort to assess third party impacts and the conditions for these trades.

Tagging of licences sold downstream of Murrumbidgee unregulated water sources would ensure that any restrictions that would have been placed on upstream users apply to the downstream users who purchase the licence. However, the Commission notes that the MDBA rules currently only allow for tagging within regulated rivers. Therefore, rules would need to be established to ensure there are no unacceptable impacts on NSW water sources from any trades downstream. DPE-Water and the ACT Government would also need to work with the MDBA and WaterNSW to enable tagging in the unregulated system. There could also be implications for water sharing arrangements in the regulated Murrumbidgee River that need to be considered when finalising the interstate trade framework.

267 NSW Government (2022) *Access Dealing Principles Order 2004*
268 Clause 17 of the *Access Dealing Principles Order 2004*
269 Interview: ACT Government, 6 July 2022.

8.4 Recommendations

R 11	As part of Plan replacement, DPE-Water should draw on the latest information to determine where there is scope to update trade rules to facilitate trade across more water sources where such changes do not compromise environmental values or increase hydrological stress.
R 12	As part of Plan replacement, to reduce pressure on low flows, address future risks from climate change and enhance economic opportunities, DPE-Water should: a) review the lack of uptake of the high flow licence category in Murrumbidgee water sources b) allow trade into high flows in additional water sources where it does not impact on high flow dependent environmental values c) clarify potential relative AWD reductions between unregulated access and unregulated access (high flow) licence categories in the replacement Plan.
R 13	As part of Plan replacement, to facilitate interstate trading, DPE-Water should: a) include provisions to ensure flows will be protected through Murrumbidgee III Water Source to the Murrumbidgee regulated system b) determine key risks to existing water users and the environment from interstate trade based on modelling and other analysis underway to inform the interstate trade agreement c) provide greater clarity regarding dealings between the regulated and unregulated river water sources d) collaborate with the ACT Government to finalise the interstate trade arrangements by 2024 so they comply with Basin Plan requirements and include Plan provisions regarding interstate trade arrangements in the replacement Plan.

9 Monitoring, evaluation and reporting

A lack of MER is a consistent theme raised in the Commission's reviews of water sharing plans. This is largely due to a lack of plan-specific MER programs, as well as limited resources dedicated to MER.

This review has found a similar lack of plan-specific MER over the life of the Plan. However, the Commission recognises there are several existing or historical monitoring programs in place that support an understanding of the condition of water sources in the Plan area, and how environmental assets respond to changes in flow (**Section 9.1**).

The Commission also recognises that DPE-Water is working to improve MER arrangements for water sharing plans (**Section 9.2**). However, this work will be subject to available funding. The Commission notes the *NSW Water Strategy* includes an action under Priority 3 to '*invest in long term and effective monitoring, evaluation, reporting and research.*'[270] It is unclear what future funding will be made available for water sharing plan evaluations. The Commission considers that DPE-Water receiving adequate funding to undertake this function is a priority. Funding should be commensurate with the importance of MER for assessing water sharing plan effectiveness and will support adaptive management.

Section 9.3 outlines key knowledge gaps that should be addressed.

9.1 Existing monitoring programs in the Plan area

Although there is a lack of monitoring and reporting against the Plan's performance indicators, there are other existing monitoring programs that provide some insight into environmental condition and outcomes being achieved in the Murrumbidgee catchment. However, they cannot be directly attributed to the Plan provisions given they are largely associated with the use of environmental water holdings and environmental water allocations from the regulated river. Nonetheless, the Commission recognised that provisions that are intended to protect these environmental releases can contribute to realising these outcomes.

Much of the monitoring that has occurred to date has focused on the regulated Murrumbidgee River and sites that are the recipients of environmental water releases from the regulated river. This includes programs funded by the Australian Government such as the Flow-MER Program (which continues the Long Term Intervention Monitoring Project for the Murrumbidgee River system)[271] and the NSW Water for the Environment MER Program (which includes sites in the Lowbidgee).

In the upper Murrumbidgee catchment, monitoring has largely been undertaken by the ACT Government. For example, the ACT Murrumbidgee Fishery Survey Program surveys sites in and upstream of the ACT on a biannual basis. The most recent sampling (2021) undertaken as part of this program found native fish biomass captured at sites in NSW was very low.[272] Since 2011 there is a general trend of increasing native biomass, but the fish population has been degraded. This monitoring program provides an important baseline if DPE-Water includes provisions in the replacement Plan to protect environmental releases from Tantangara Dam as recommended by this Plan review (see **Chapter 4**).

270 DPIE-Water (2021) *NSW Water Strategy*
271 CEWO (2021) *FLOW Monitoring, Evaluation and Research: Selected Area: Murrumbidgee*
272 Beitzel, M., Jekabsons, and Evans, L. (2021) *2021 ACT Murrumbidgee fishery survey: conservation research survey of the Murrumbidgee fish community 2021*

There are also existing hydrologic and water quality monitoring sites in the catchment, including unregulated river water sources that were considered as part of this review. In addition, DPE-Water undertook modelling to evaluate the cease to pump rules of seven water sources in the Plan area that the Commission has referred to in its water sharing plan review (see **Section 5.5**).

The Commission understands that DPE-Water will draw upon existing programs and link them back to Plan objectives and monitoring themes as part of its integrated MER plan.

9.2 Pathways towards improved MER

DPE-Water is taking steps to improve MER and support efficient and effective use of available resources. This includes:

- updates to water sharing plan objectives as part of Plan amendments in 2020 to make them measurable and more meaningful
- the development of the NSW MER Framework and customised environmental MER plans as part of the development of water resource plans
- establishment of the DPE-Water Water Planning Implementation Unit including a Water Evaluation and Reporting Team focused on improving MER through the development of DPE-Water's NSW Water Sharing Plan Evaluation Framework, which intends to inform future water sharing plan reviews
- investment in projects to strengthen MER and help target resources, including development of a framework for prioritising water sources for MER activities and development of a transferability model.

The NSW MER framework and MER plans seek to integrate MER activities across agencies and map out monitoring effort by research theme. The intent was to then develop theme-based methods manuals which set out monitoring sites, arrangements for cooperative research, sampling methods and data management and analysis techniques.

The Commission has considered the *Murrumbidgee Surface Water Resource Plan*'s MER plan, which was designed to meet Basin Plan reporting requirements.[273] The environmental MER plan is based on program logic developed for the water sharing plan objectives, but also objectives from the *Murrumbidgee Long Term Water Plan* and *Water Quality and Salinity Management Plan*. The program logic is intended to guide monitoring activities, while risk assessments undertaken as part of the water resource planning process are intended to inform areas for further research.[274] The MER plan also maps out existing monitoring programs by research theme.

However, there is room for improvement:

- while the amended Plan includes clearer, measurable objectives, Plan provisions have not been updated to support the achievement of the revised objectives, meaning that in some respects, these objectives risk not being met

[273] Department of Industry (2019) *Murrumbidgee Surface Water Resource Plan Monitoring, Evaluation and Reporting Plan: Schedule J*
[274] *Ibid.*

- the Plan lacks equity[275] objective/s and corresponding performance indicators – without these, the Plan's effectiveness and alignment with the Act[276] with respect to how it manages equitable sharing of water between and within licence categories and the Plan's treatment of different users lacks transparency and is difficult to assess
- the MER plan does not explicitly identify areas for further research based on risk and value
- the MER plan does not specify where real-time gauging or water level monitoring is required to support MER
- there do not appear to be clear roles and responsibilities or adequate resources for overseeing and implementing the MER plan, which generates risks to implementation
- methods manuals referred to in the MER plan do not appear to have been finalised
- NSW Government does not appear to have fulfilled its commitments with respect to monitoring the response of the Murrumbidgee River to Snowy Montane Rivers Increased Flows program, despite the NSW Government agreeing to do so as part of the SWIOID 2002.[277] Given the Plan has a role in protecting these releases, the effectiveness of the rules in the replacement Plan for protecting these flows as well as the outcomes associated with the environmental releases should be monitored.

Given limited resources, it will be critical for DPE-Water to continue to identify efficiencies, focus on the most critical MER needs and continue to work collaboratively with other government agencies and academic institutions to coordinate monitoring activities that support water sharing plan evaluation. MER activities should be prioritised based on value and risk. Water source prioritisation and transferability studies currently underway by DPE-Water will help to target MER effort and resourcing.

Public reporting of MER priorities, findings and how they were considered in Plan amendments is needed to improve transparency and public awareness around Plan outcomes. It is preferable that public reporting of available MER occur every 5 years and that this requirement be stipulated in the replacement Plan.

9.3 Knowledge gaps

As noted above, much of the focus for existing monitoring programs has been in the regulated Murrumbidgee River water source and the Lowbidgee wetlands, which form part of the regulated river plan area. Further monitoring and research of the unregulated river water sources is required to improve system knowledge, refine Plan provisions and support whole of catchment planning. They include, but are not limited to:

- quantifying historic levels of extraction and estimating current levels of extraction (where not metered), including for LTAAEL compliance assessment (**Chapter 3**)

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275 Equitable sharing of water is required by the Act and is a critical component of water sharing plans to support community trust and cohesion, effective water market operation and the fair distribution of benefits and cost from water sharing rules. Equitable sharing does not mean equal amounts of water supplied for all uses, rather:
- a fair distribution of available water consistent with the priorities under the Act
- consistent application of access rules for licences in the same licence category and the same water source or management zone
- fair and transparent consideration of relative reductions to meet extraction limits.

276 Section 3(e) and Clause 2(d) of Section 5 of the Act set a clear expectation that water sharing plans should '*provide for the orderly, efficient and equitable sharing of water*' and seek to minimise cumulative impacts on water sources.

277 DPI (2020) *Murrumbidgee Long term Water Plan – Part A: Murrumbidgee catchment*

- cultural flow needs for water-dependent Aboriginal cultural assets, noting that the ACT Government is progressing Aboriginal cultural waterways assessments that could help to better understand values in the NSW portion of the upper Murrumbidgee
- the location of high-quality drought refugia, and impacts of climate change and extended droughts on waterhole persistence, as well as their connectivity to and dependence on regulated river flows
- comprehensive identification of regionally significant wetlands and lagoons in the unregulated river water sources, their current condition, impacts associated with extraction and an altered flow regime, resilience to extended droughts and effectiveness of rules to protect them, as well as their connectivity to and dependence on regulated river flows
- expanding habitat mapping to refine environmental water requirements and water sharing provisions
- improved understanding of the habitat needs and functional flow requirements of native fish, particularly in the upper Murrumbidgee,[278] as well as better understanding barriers to fish movement and how they impact on connectivity to help prioritise where investment is most needed to improve connectivity
- degree of connectivity between regulated rivers and unregulated water sources as well as degree of surface-groundwater connectivity and condition of groundwater dependent ecosystems and options for Plan rules to reflect and protect connectivity, in accordance with the water management principles of the Act and the objectives of the Plan.

9.4 Recommendations

R 14	By June 2025, to improve Plan-specific MER, DPE-Water should: a) include equity objectives and corresponding performance indicators in the replacement Plan b) articulate how MER will be undertaken for the replacement Plan and ensure there is multi-agency support and oversight of MER activities c) ensure the replacement Plan specifies timely reporting requirements of the results of MER activities (public reporting of available MER every 5 years) to support transparency and adaptive management d) identify and address critical knowledge gaps to support adaptive management e) use the recently developed prioritisation framework to prioritise MER activities based on values and risk.

[278] Beitzel, M., Jekabsons, and Evans, L. (2021) *2021 ACT Murrumbidgee fishery survey: conservation research survey of the Murrumbidgee fish community 2021*

10 Compensation

Under the Act, compensation may be payable by the NSW Government to access licence holders – only in some circumstances where water allocations under a water sharing plan are reduced. Section 43A(3A) of the Act requires the Commission to consider some potential compensation requirements resulting from recommended changes to water sharing plans.

Specifically, the Act states:

> '*(3A) If a report of the Natural Resources Commission under subsection (3) recommends changes to a management plan that will result in a reduction of water allocations in relation to which compensation might be payable under section 87AA, the Commission is to state in the report whether the purpose of the proposed change is:*
>
> - *(a) to restore water to the environment because of natural reductions in inflow to the relevant water source, including but not limited to changes resulting from climate change, drought or bushfires, or*
> - *(b) to provide additional water to the environment because of more accurate scientific knowledge that demonstrates that the amount previously allocated to the environment is inadequate.*'

Many of the recommendations can be advanced without triggering compensation. The Commission notes that Section 87AA indicates for instance that compensation is not payable due to a reduction in water allocation if '*the reduction in water allocations is for the purpose of restoring water to the environment because of natural reductions in inflow to the water source, including but not limited to changes resulting from climate change, drought or bushfires*'.[279] Compensation may also not be payable where the water sharing plan includes an amendment provision.[280]

However, the Commission considers that compensation might be payable under Section 87AA in relation to some recommendations listed in **Table 4**.

279 Section 87AA(3)(c) of the Act.
280 Section 87AA(3)(b) of the Act.

Table 4: Recommendations that may trigger compensation

Relevant recommendations	
Ensuring sustainable extraction	
R 4	To support adaptive management during the term of the replacement Plan, the Plan should include a provision requiring DPE-Water to determine the sustainable level of extraction by Year 5 based on best available ecological requirements, hydrological and climate information and that these levels are used to define and amend the Plan's LTAAELs for each extraction management unit.
Strengthening environmental protections	
R 6	To protect water for the environment in unregulated river water sources, as part of the replacement Plan, DPE-Water should work with DPE-EHG and CEWO to: a) identify priority wetlands where extraction is currently permitted, add these to Plan schedules, quantify the number of licences and works and extent of extraction and strengthen provisions to ensure no drawdown below full capacity b) for all wetlands and unregulated streams that are the recipients of planned or held environmental water from the regulated river, include rules to protect this water from extraction in the unregulated system.
R 7	To improve environmental outcomes for Mirrool Creek and the nationally significant Lower Mirrool Creek Floodplain wetlands, engage with DPE-EHG to: a) install new infrastructure for monitoring flows in Lower Mirrool Creek and onto the floodplain and develop appropriate access and trade rules based on better understanding of the environmental values and water requirements of Mirrool Creek and Lower Mirrool Creek Floodplain wetlands b) review operating rules for releases from Barren Box storage to Lower Mirrool Creek to ensure they reflect the latest knowledge regarding environmental water requirements and ensure these operating rules are codified in the replacement Plan and the relevant works approval.
R 8	As part of Plan replacement, to address issues with current access rules and the complexity of rules given the number of water sources, DPE-Water should: a) review the current hydrometric network to identify where the Plan can reference operational gauges for establishing flow classes and flow-based access rules for water sources that currently have a no visible flow rule b) ensure all high environmental value water sources at medium to high risk from extraction have flow-based access rules that support connectivity and adequately protect water sources and their dependent ecosystems.

Recommendation 4 could require compensation if the analysis determines that the current LTAAELs based on historic extraction are too high to adequately protect the water sources and their ecosystems. In this case the compensation may be due to new scientific information about ecological requirements.

The Plan includes an amendment provision indicating an intent to provide for the protection of environmental releases from Tantangara Dam in the upper Murrumbidgee River water sources (Murrumbidgee I and II). Given the protection of these flows was foreshadowed in the amendment provision, it is unlikely that compensation would be provided for impacts to water users arising from **Recommendation 5a**.

While **Recommendation 5c** could lead to a reduction in entitlement and adjustment of the LTAAEL for the Unregulated Murrumbidgee Above Burrinjuck Dam Extraction Management Unit, the Commission understands that no additional compensation under Clause 87AA would be required if retirement of licence entitlement occurs.

Recommendations 6a and 6b, 7a and 7b, 8a and 8b may require compensation if changes to pool drawdown provisions, cease to pump rules or other restrictions materially affect overall long-term allocation available to users. Changes made under these recommendations would be necessary to provide additional water to the environment because of more accurate knowledge that demonstrates that the water currently allocated to the environment in the plan is inadequate to achieve objectives.

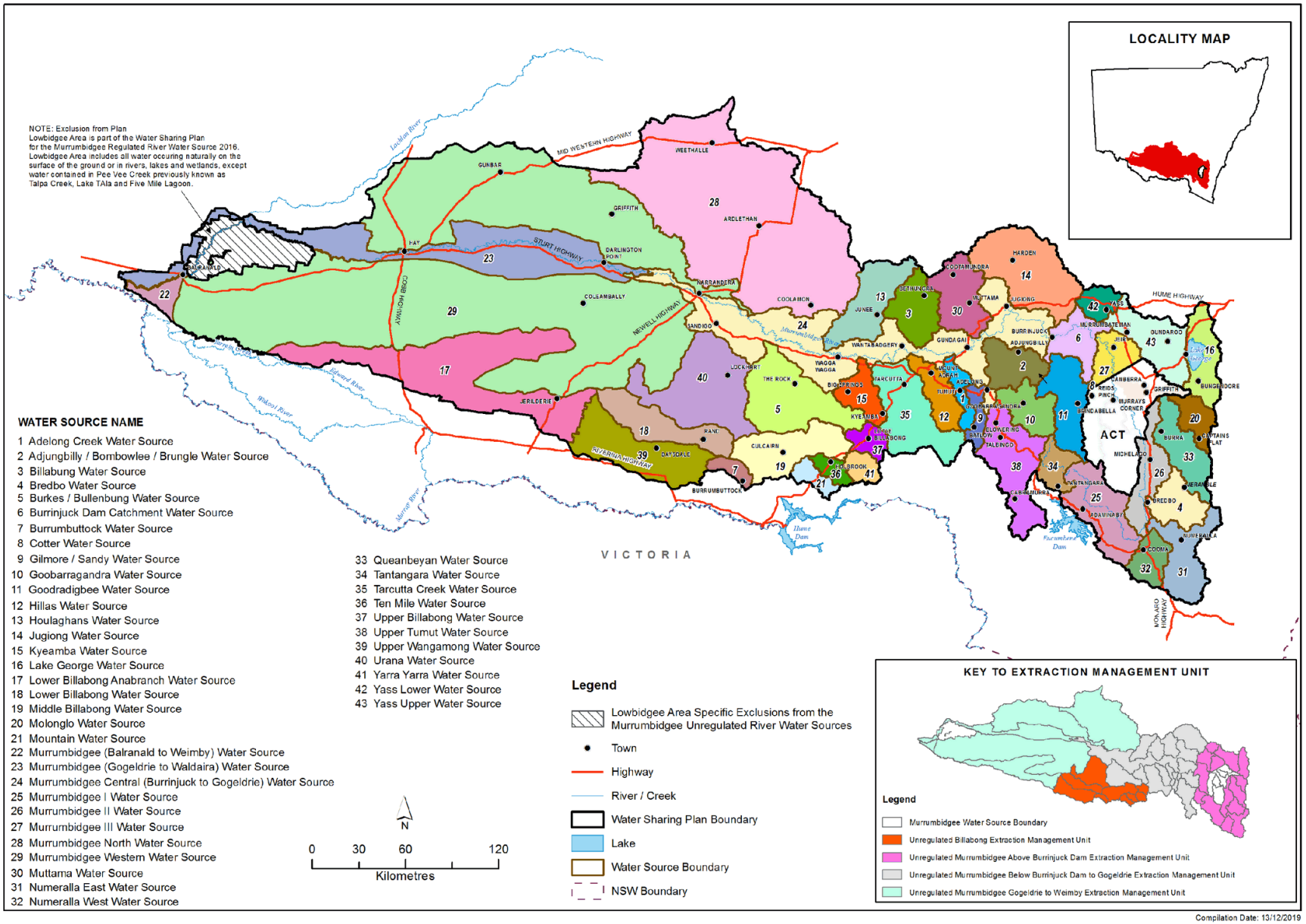
The Commission acknowledges that there are other recommendations that may affect water allocations. However, these changes are allowed through amendment provisions provided for in the Plan or in the Commission's view would not affect long-term allocation. In particular, the Commission acknowledges the **Recommendation 3** may well lead to a reduction to current AWDs. However, the Commission notes that the Act allows the Minister to set the AWD at their discretion. Further, this clause would only ensure that a precautionary approach is taken to setting the AWD to ensure the current LTAAEL is adhered to. As such the Commission does not anticipate that the compensation Clause 87AA would be triggered. However, DPE-Water should seek its own legal advice on this matter.

In considering these requirements, the Commission has not made any determination in relation to entitlements to or amount of compensation and does not provide legal advice in this report. DPE-Water and other parties should seek legal advice regarding any potential compensation implications of implementing the recommendations in this report.

Appendix A: Map of Plan water sources and extraction management units

Note: This Plan map[281] appends the *Water Sharing Plan for the Murrumbidgee Unregulated River Water Sources 2012*.

[281] Appendix 1 of the Plan.


LOCALITY MAP
NOTE: Exclusion from Plan
Lowbidgee Area is part of the Water Sharing Plan for the Murrumbidgee Regulated River Water Source 2016. Lowbidgee Area includes all water occuring naturally on the surface of the ground or in rivers, lakes and wetlands, except water contained in Pee Vee Creek previously known as Talpa Creek, Lake TAla and Five Mile Lagoon.
WATER SOURCE NAME
1 Adelong Creek Water Source
2 Adjungbilly / Bombowlee / Brungle Water Source
3 Billabung Water Source
4 Bredbo Water Source
5 Burkes / Bullenbung Water Source
6 Burrinjuck Dam Catchment Water Source
7 Burrumbuttock Water Source
8 Cotter Water Source
9 Gilmore / Sandy Water Source
10 Goobarragandra Water Source
11 Goodradigbee Water Source
12 Hillas Water Source
13 Houlaghans Water Source
14 Jugiong Water Source
15 Kyeamba Water Source
16 Lake George Water Source
17 Lower Billabong Anabranch Water Source
18 Lower Billabong Water Source
19 Middle Billabong Water Source
20 Molonglo Water Source
21 Mountain Water Source
22 Murrumbidgee (Balranald to Weimby) Water Source
23 Murrumbidgee (Gogeldrie to Waldaira) Water Source
24 Murrumbidgee Central (Burrinjuck to Gogeldrie) Water Source
25 Murrumbidgee I Water Source
26 Murrumbidgee II Water Source
27 Murrumbidgee III Water Source
28 Murrumbidgee North Water Source
29 Murrumbidgee Western Water Source
30 Muttama Water Source
31 Numeralla East Water Source
32 Numeralla West Water Source
33 Queanbeyan Water Source
34 Tantangara Water Source
35 Tarcutta Creek Water Source
36 Ten Mile Water Source
37 Upper Billabong Water Source
38 Upper Tumut Water Source
39 Upper Wangamong Water Source
40 Urana Water Source
41 Yarra Yarra Water Source
42 Yass Lower Water Source
43 Yass Upper Water Source
N
0 30 60 120
Kilometres
Legend
Lowbidgee Area Specific Exclusions from the Murrumbidgee Unregulated River Water Sources
Town
Highway
River / Creek
Water Sharing Plan Boundary
Lake
Water Source Boundary
NSW Boundary
KEY TO EXTRACTION MANAGEMENT UNIT
Legend
Murrumbidgee Water Source Boundary
Unregulated Billabong Extraction Management Unit
Unregulated Murrumbidgee Above Burrinjuck Dam Extraction Management Unit
Unregulated Murrumbidgee Below Burrinjuck Dam to Gogeldrie Extraction Management Unit
Unregulated Murrumbidgee Gogeldrie to Weimby Extraction Management Unit
VICTORIA
ACT
Compilation Date: 13/12/2019