



Natural Resources Commission

Final report
**Review of the Intersecting Streams
and Lower Murray-Darling unregulated
water sharing plans**

March 2022



Acknowledgement of Country

The Natural Resources Commission acknowledges and pays respect to Aboriginal peoples the Traditional Owners of NSW. 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 *Water Sharing Plan Lower Murray-Darling Basin Unregulated and Alluvial Water Sources 2011* and the *Water Sharing Plan Intersecting Streams Unregulated River Water Sources 2011*, the Commission pays its respects to the Barkandji, Muthi Muthi, Yitha Yitha, Ngemba, Ngiyampaa, Wangaaypuwan, Wayilwan, Maraura, Budjiti, Euahlayi, Gomeroi / Kamilaroi, Guwamu, Kunja, and Murrawarri Traditional Owners past, present and future, as well as other Aboriginal peoples for whom these waterways are significant. The Commission hopes that the involvement of Aboriginal peoples, native title determinants and applicants, Nation groups and Local Aboriginal Land Councils throughout the review process will help to shape collaborative water planning and sharing that is beneficial to Aboriginal peoples and their Country.

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Acronyms and units of measurement

Act	the <i>Water Management Act 2000</i> (NSW)
AWD	Available water determination
BDL	Baseline Diversion Limit
CEWH	Commonwealth Environmental Water Holder
CEWO	Commonwealth Environmental Water Office
Commission	the Natural Resources Commission
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DPI	Department of Primary Industries
DPIE	Department of Planning, Industry and Environment
DPI-Fisheries	Department of Primary Industries – Fisheries
DPIE-EES	Department of Planning, Industry and Environment – Environment, Energy and Science (the former Office of Environment and Heritage)
DPIE-Water	Department of Planning, Industry and Environment – Water
GL	Gigalitre (unit of volume equivalent to one billion (1×10^9) litres)
HEVAE	High Ecological Values Aquatic Ecosystem
IQQM	Integrated Quantity Quality Model
LALC	Local Aboriginal Land Council
LGA	Local government area
LTADEL	Long-term annual average extraction limit
LTWP	Long term water plan
MDBA	Murray-Darling Basin Authority
MER	Monitoring, evaluation and reporting
ML	Megalitre (unit of volume equivalent to one million (1×10^6) litres)
MLDRIN	Murray Lower Darling Rivers Indigenous Nations
NBAN	Northern Basin Aboriginal Nations
NRAR	Natural Resources Access Regulator
NSW	New South Wales
Intersecting Streams Plan	<i>Water Sharing Plan for the Intersecting Streams Unregulated Water Sources 2011</i>
Lower Murray-Darling Plan	<i>Water Sharing Plan for the Lower Murray-Darling Unregulated Water Sources 2011</i>

R/ SA	Recommendation/ Suggested action
SDL	Sustainable Diversion Limits
WRP	Water Resource Plan

Table of Contents

Executive summary	1
1 Review background	8
1.1 Water sharing plans and the Commission's role	8
1.2 Review approach	9
2 The Plan areas	11
2.1 Intersecting Streams Plan area and water sources	12
2.2 Lower Murray-Darling Plan area and water source	15
2.3 Town water supply	17
2.4 Environmental context	18
2.5 Aboriginal people of the Plan areas	22
2.6 Socio-economic context	26
3 Cross-border water resource development significantly impacts Intersecting Streams	31
3.1 Development in Queensland significantly impacts flows in NSW	32
3.2 Upstream plans do not adequately protect low flows into NSW Intersecting Streams	37
3.3 Interstate trade could increase extraction in Queensland	39
3.4 Cross-border governance arrangements should support whole-of-catchment planning	40
3.5 Recommendations	42
4 Ensuring sustainable extraction	43
4.1 Current level of extraction needs to be determined	44
4.2 Interception and harvestable rights need to be accounted for	47
4.3 Interception should be consistently assessed across borders	50
4.4 LTAAEL compliance has not been assessed in both Plans	51
4.5 Recommendations	51
5 Strengthening environmental protections	52
5.1 Improving connectivity within the Plan areas	53
5.2 Important wetlands require integrated water planning	56
5.3 Improving management of environmental flows through Toorale	61
5.4 Protection of held environmental water	65
5.5 Review access rules for protecting lagoons	66
5.6 Recommendations	68
6 Accounting for town water supply	70
6.1 Town water supply needs should be fully reflected in the Lower Murray-Darling Plan	70
6.2 Town water supply needs for Intersecting Streams should be clarified	73
6.3 Recommendations	75
7 Delivering outcomes for Aboriginal people	76
7.1 Address key state-wide issues as part of the Aboriginal Water Strategy	76
7.2 Better understand and protect native title and Country	78

7.3	Identify Aboriginal water values and uses	81
7.4	Protect and provide for diverse Aboriginal water values and uses	83
7.5	Recommendations	87
8	Improving equitable sharing of water consistent with the Act	88
8.1	The Act requires Plans to manage equitable share	88
8.2	Risk of reductions in allocations needs to be considered	88
8.3	Opportunities due to reduced local water utility entitlement	90
8.4	Recommendations	90
9	Monitoring, evaluation and reporting	91
9.1	Existing monitoring programs in the plan areas	91
9.2	Pathway towards improved MER	92
9.3	Knowledge gaps	93
9.4	Recommendations	94
10	Compensation	95
	Appendix A – Policies, plans and strategies considered	1
	Appendix B – Plan objectives, strategies and indicators	2
	Appendix C – Water sources in the Plan areas	10
	Appendix D – Water dependent environmental assets	11

Executive summary

The Natural Resources Commission (the Commission) has reviewed the *Water Sharing Plan for the Intersecting Streams Unregulated River Water Sources 2011* (the Intersecting Streams Plan) and the *Water Sharing Plan for the Lower Murray-Darling Unregulated River Water Sources 2011* (the Lower Murray-Darling Plan) in the NSW Murray-Darling Basin region, as required under Section 43A of the *Water Management Act 2000* (the Act).

The Commission has assessed the extent to which provisions in the Intersecting Streams Plan and the Lower Murray-Darling Plan (the Plans) have contributed to achieving environmental, social, cultural and economic outcomes, and identified where changes to provisions are warranted. The Plans have been reviewed together to recognise and consider the importance of connectivity into and along the Barwon-Darling (Baaka) River. The Plan areas also sit in the Western Division of NSW, which has unique water rights (100 percent harvestable rights), as well as environmental values that are highly dependent on a healthy, connected river and floodplain system.

There is considerable new information available since the Plans were developed, which should be incorporated into the Plans. The Plans were amended in 2020 to remove the alluvial water sources to align them with the requirements under the Commonwealth's *Basin Plan 2012* (the Basin Plan) to develop water resource plans (WRPs). As part of the development of the WRPs, risk assessments and Long Term Water Plans (LTWPs) were developed that cover the Plan areas. When the Plans were amended, their objectives were updated, but there has not yet been material changes made to access rules to ensure that the revised objectives could be met, to address identified risks, or to incorporate the significant new information that is now available.

Since the Plans were amended in 2020, the NSW Government released the *NSW Water Strategy*, committing to, amongst other matters, improving river and floodplain health and connectivity, and recognising Aboriginal people's rights and values associated with water. The remake of these unregulated Plans provides opportunities for the NSW Government to deliver on its strategic commitments.

While water use covered by the Plans is a small percentage of the overall water volume in the broader catchments, the Plans contain substantial and unique environmental assets. There is evidence that the current rules in the Plans do not adequately protect these assets. In addition, the Commission has identified concerns around the cross-border management of flows and equitable sharing of water, which reinforce the need for whole-of-catchment planning and improved governance arrangements.

Overall finding on Plan extension and replacement

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

A summary of key areas to improve the Plans is provided in **Figure 1**. To ensure clarity, the Commission has developed a detailed set of 10 recommendations and four suggested actions (**Table 1**).

Figure 1: Key areas to improve Plan performance

	<p>Managing impacts from cross-border water use</p> <p>Development and water use in Queensland has considerable impacts on the NSW Intersecting Streams Plan area, as well as impacting the Barwon-Darling and the Lower Darling. This significantly affects the ability of the NSW Plans to deliver outcomes. There are no agreed, cross-border targets addressing critical flow needs for water users or the environment in the Intersecting Streams catchments. Water rules in Queensland focus on limiting extraction of high to medium flows and do not adequately protect low flows. While the current plan does not allow for any interstate trade, it may be considered in the future. The development of trade could further exacerbate impacts from upstream extraction. The current cross border governance arrangements should be expanded and strengthened to help resolve these issues.</p>
	<p>Ensuring sustainable extraction</p> <p>The current levels of extraction under the Plans are unknown, and the Plans lack sustainable, numerically defined long-term annual average extraction limits (LTAAELs). Sustainable limits are critical to adequately protect the water sources and their ecosystems at the Plan scale. The LTAAELs should account for all forms of interception, including diversion of overland flow. This significant form of take is not currently fully accounted for and is not covered by the <i>NSW Floodplain Harvesting Policy</i>. Any differences between the LTAAEL and baseline diversion limits under the Basin Plan should be transparently recorded for users.</p>
	<p>Strengthening environmental protections</p> <p>Environmental flow rules in the Intersecting Streams Plan do not adequately protect environmental assets, such as wetlands of national and international significance. The Plan should incorporate cross-border flow targets agreed with Queensland to protect these wetlands. The Plans were amended in 2020 and now include a connectivity objective, but rules need to be refined to deliver on these objectives. This includes rules to protect environmental flow releases made in the Queensland Intersecting Streams Plan area. The adoption of active management of environmental flows in the Intersecting Streams Plan would improve connectivity with the Barwon-Darling. Objectives and operating rules for water infrastructure at Toorale should be included in the Plan to improve transparency, particularly around minimum flows to the Darling and flows onto the Western Floodplain. In the Lower Murray-Darling Plan, rules for pumping from off-river pools and lagoons should be reviewed to ensure they adequately protect these features. The connection between the regulated and unregulated water sources should also be considered in remaking the Plan.</p>



Accounting for town water supply

During the term of the Lower Murray-Darling Plan, reliance on unregulated water sources for town water supply has reduced due to the installation of the Wentworth to Broken Hill pipeline, which extracts water from the regulated Murray system. The Plan's local water utility entitlement should be reviewed considering this change and updated to reflect the reduced reliance, while maintaining the unregulated water source as a town water contingency supply.



Delivering outcomes for Aboriginal people

Aboriginal water access and use is limited and requires proactive co-design of a range of water licencing, entitlement and custodianship solutions. The remake of the Plans provides the NSW Government with time and opportunity to deliver on its commitments to Aboriginal people's rights, values and access to water made under the *NSW Water Strategy*. Existing Aboriginal Nation groups, governance and Country-based plans should form the basis for engagement and incorporation of the values of individual Aboriginal Nations into water planning. The National Cultural Flows Methodology can be further used to determine and supply Aboriginal water requirements. There are several opportunities to prioritise and provide for Aboriginal water where additional entitlements may become available.



Improving equitable sharing of water consistent with the Act

The Plans lack an objective outlining how water will be shared equitably taking into consideration the priorities of the Act, creating uncertainty in how the Plans define and achieve fair distribution of water available for use. The lack of understanding of total water use, or the amount of use that is sustainable, means the level of risk that allocations may be reduced cannot be assessed. Once all forms of use are adequately assessed, Plan rules should be reviewed to ensure risks from growth in use are fairly distributed. In the Lower Murray-Darling Plan the likely reduction in town water needs may provide an opportunity to better address Plan objectives, such as Aboriginal cultural objectives.

Table 1: Recommendations and suggested actions

Overall recommendation	
R 1 – Both Plans	<p>The Plans should be:</p> <ul style="list-style-type: none"> a) extended for a further two years until July 2024, to allow time to complete data collection and analysis outlined in this report b) replaced by July 2024, supported by the completion of the recommendations of this review.
Impacts from cross-border water use	
R 2 – Intersecting Streams Plan	<p>When remaking the Plan, to enhance cross-border management of flows, the NSW Government should:</p> <ul style="list-style-type: none"> a) leverage existing governance arrangements between NSW, Australian and Queensland governments to establish agreed end of system flow targets to protect nationally significant and Ramsar wetlands and Barwon-Darling River water sources b) incorporate requirements for flow targets consistent with the Plan’s environmental objectives c) ensure that if allowed in the future, any upstream trading, including interstate trades, does not disadvantage the environment or water users in the section between where the water is traded from and where it is traded to.
Ensuring sustainable extraction	
R 3 – Both Plans	<p>When remaking the Plans, to ensure all extraction under the Plans is managed to protect, preserve, and maintain the water sources and dependant ecosystems, the Department of Planning, Industry and Environment – Water (DPIE-Water) should:</p> <ul style="list-style-type: none"> a) ensure interception on the floodplains for both Plans is assessed and accounted for within the LTAAEL b) ensure the total take is sustainable at the appropriate scales within the Plans and based on best available information, including current knowledge regarding ecological requirements c) ensure there is no growth in overall take by establishing and publishing sustainable, numeric LTAAELs, and undertaking the required compliance assessments against LTAAELs.
Strengthening environmental protections	
R 4 – Both Plans	<p>When remaking the Plans, to improve protection of the water sources and their water dependent ecosystems, DPIE-Water should:</p> <ul style="list-style-type: none"> a) ensure that the replacement Intersecting Streams Plan includes provisions requiring active management, including protection of licenced environmental water from Queensland entering the Intersecting Streams, and the Warrego River into and through the Barwon-Darling River b) update the Intersecting Streams Plan objectives to specifically refer to the maintenance of the ecological character of Ramsar-listed sites (Narran Lake and Paroo River Wetlands) c) verify the need to raise pumping thresholds for management zones in the Narran River Water Source to adequately protect ecosystems in line with the Intersecting Streams LTWP and revise the Intersecting Streams Plan rules as needed

	<ul style="list-style-type: none"> d) include rules coordinated with Queensland in the Intersecting Streams Plan for the protection of critical flows for sustaining water levels in Narran Lakes for waterbird breeding events. This should consider maximum interflow periods and the development of end of system flow targets (see Recommendation 2) e) ensure that the drawdown rules in the Lower Murray-Darling Plan adequately protect lagoon ecosystems and that Plan rules fully protect held environmental water released into Thegoa Lagoon near Wentworth.
R 5 – Intersecting Streams Plan	<p>When remaking the Plan, to clarify environmental flow management for the Toorale National Park and State Conservation Area (Toorale) property, DPIE-Water should:</p> <ul style="list-style-type: none"> a) Include flow targets that clearly state the minimum contribution of flows from the Warrego to the Darling River (at Louth) before releasing flow to the Western Floodplain. The flow target should be consistent with the operating strategy for Toorale water infrastructure. b) include environmental and cultural objectives associated with Toorale water management in the Plan c) recognise the difference in held environmental water from flows onto the Toorale Western Floodplain as planned environmental water, linking this environmental water provision to measurements at Boera Dam.
SA 1 – Both Plans	DPIE-Water should review the <i>Macro Water Sharing Plans Approach for Unregulated Rivers Access and Trading Rules for Pools Policy</i> 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.
SA 2 – Intersecting Streams Plan	<p>The Department of Planning, Industry and Environment – Environment, Energy and Science (DPIE-EES) should coordinate with the Commonwealth Environmental Water Office (CEWO) to ensure there is a flow event-based report for:</p> <ul style="list-style-type: none"> a) the progress of the Toorale Infrastructure Project b) flows through Toorale to provide transparency regarding how these flows are being managed and associated outcomes.
SA 3 – Intersecting Streams Plan	DPIE-Water should update the definition of active environmental water in the <i>Water Sharing Plan for the Barwon-Darling Unregulated River Water Source 2012</i> to include held environmental water from the Intersecting Streams (including from across the Queensland-NSW Border and from Toorale on the Warrego River).
SA 4 – Intersecting Streams Plan	DPIE-Water should update the Active Management Procedures Manual for the Barwon-Darling to include held environmental water from water sources in the Intersecting Streams Plan, including across the border from Queensland, as active environmental water.

Accounting for town water supply	
R 6 – Lower Murray-Darling Plan	<p>When remaking the Plan, to ensure town water supply needs are adequately accounted for, DPIE-Water should:</p> <ul style="list-style-type: none"> a) in consultation with Essential Energy (Essential Water), review the local water utility entitlement for the Lower Murray Darling Water Source that is required for security of town water supply given the NSW regulated Murray is now the main source of town water supply for Broken Hill and surrounding communities b) include the updated local water utility volumetric entitlement in the Plan remake to ensure that use is transparent and managed within sustainable limits c) update the Plan to make it clear that Umberumberka Reservoir, which has historically been used for town water supply, sits outside of the Plan area (in the <i>Water Sharing Plan for the North Western Unregulated and Fractured Rock Water Sources 2011</i>) and review the Lower Murray-Darling local water utility licence to ensure entitlement sits with the appropriate Plan d) if local water utility access licence entitlement is reduced, consider alternative uses of any remaining entitlement within sustainable limits, including the option to use the entitlement to improve outcomes for Aboriginal communities to achieve Aboriginal cultural plan objectives.
R 7 – Intersecting Streams Plan	<p>When remaking the Plan, to ensure town water supply needs are adequately accounted for, DPIE-Water should:</p> <ul style="list-style-type: none"> a) consult with local stakeholders regarding local water utility entitlements to determine if town water supply has been accurately provided for b) include all the town water supply entitlements in the Plan remake and ensure that operating arrangements are transparent.
Delivering outcomes for Aboriginal people	
R 8 – Both Plans	<p>When remaking the Plans, to better achieve the Aboriginal water objectives, DPIE-Water should:</p> <ul style="list-style-type: none"> a) ensure that consultation is undertaken to understand specific needs of the Aboriginal communities where there are native title determinations, applications and Indigenous Land Use Agreements (ILUAs) b) allow sufficient time and ongoing resourcing for meaningful engagement with a range of Aboriginal Traditional Owners, groups and knowledge holders, including Aboriginal women, to better understand the water values and uses, identify the rules to protect them, and support water access and use in Plan amendments c) use existing information to identify and protect known high value cultural sites in the replacement Plans d) use Country-based plans and governance models as a basis for engagement and management where available and ensure Country-based planning is supported by government e) use the National Cultural Flows Methodology to identify, prioritise and support Aboriginal water values – build on existing examples of cultural flows assessments available for the Plan areas f) ensure that, where cancelled or surrendered entitlements become available, that Aboriginal water needs are assessed and provided for as a priority – starting with the examples outlined in this review g) undertake detailed implementation planning for the <i>NSW Water Strategy</i> and <i>Aboriginal Water Strategy</i> that includes, at a minimum, state-wide actions identified by the Commission to better support Aboriginal values in water sharing plans.

Improving equitable sharing of water consistent with the Act	
R 9 – Both Plans	<p>When remaking the Plans, to ensure the Plans facilitate equitable sharing of water, DPIE-Water should:</p> <ul style="list-style-type: none"> a) include objectives to provide for equitable sharing of water in both Plans b) assess the risks associated with a reduction in water availability and potential for growth in use c) ensure that the Plan provisions clearly specify how any potential reductions will be fairly allocated consistent with the priorities under the Act d) include provisions to specify how any additional water that becomes available will be allocated.
Monitoring, evaluation and reporting (MER)	
R 10 – Both Plans	<p>By June 2024, to improve Plan-based MER for both Plans, DPIE-Water should:</p> <ul style="list-style-type: none"> a) expedite the finalisation and publication of DPIE-Water’s water sharing plan evaluation framework and methods manuals and ensure there is multi-agency support and oversight of their implementation b) identify feasible and appropriate resourcing to support ongoing MER activities in line with the <i>NSW Water Strategy</i> c) specify timely reporting requirements of the results of MER activities to support transparency, public awareness 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. Clearly communicate how this framework interacts with monitoring plans and publicly report on where and why effort is being targeted.

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 regarding rules for water sharing for water users over the life of the water sharing plan, which is typically 10 years, unless it is extended.

The Intersecting Streams Plan and the Lower Murray-Darling Plan commenced on 14 November 2011 and 30 January 2012, respectively. They are both due for extension or replacement on 1 July 2022.

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 the plans' 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 a plan depending on its review findings. Section 43A(3A) of the Act requires the Commission to consider some 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 circumstances² 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, of the Act 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

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

For reference, the roles of the various NSW water management agencies are summarised in **Figure 2**.

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.

⁵ Section 9(1) of the Act.

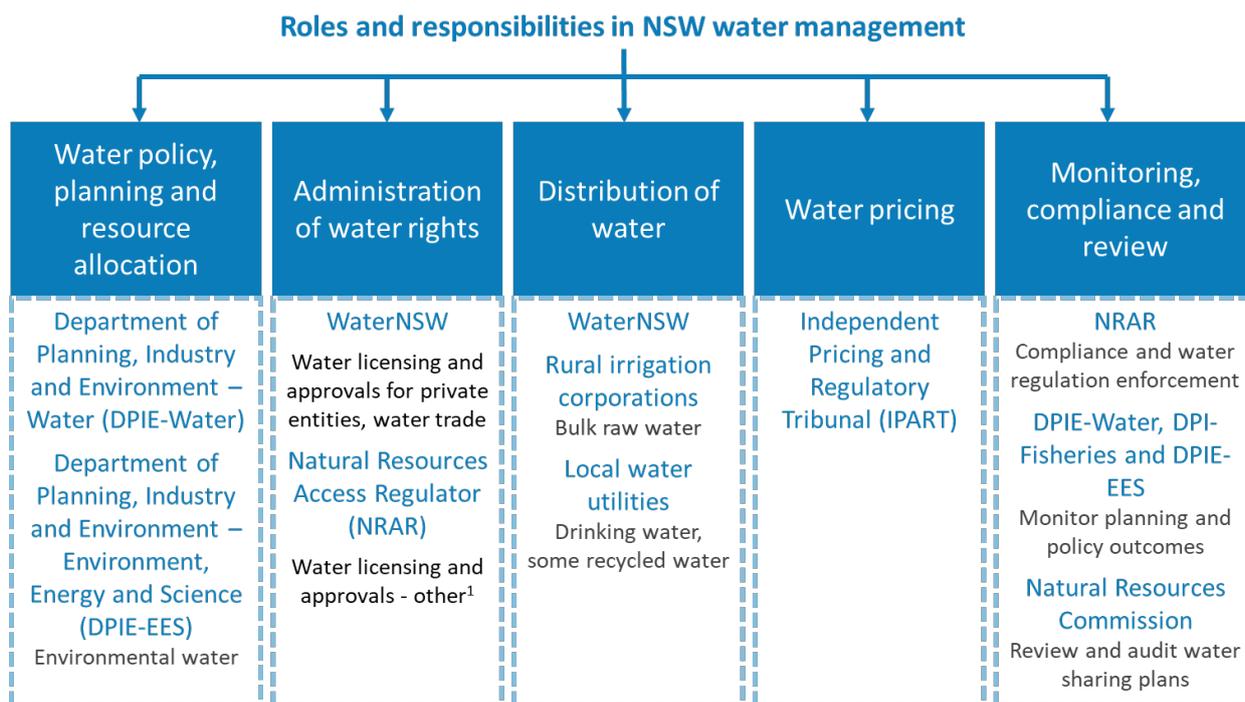


Figure 2: Roles and responsibilities in rural and regional water management⁶

Figure note (1): The Natural Resources Access Regulator (NRAR) has several licencing and approval responsibilities, including for major and local utilities, state agencies, irrigation corporations, entities operating under the *Mining Act 1992* and holders of specific purpose access licences with an Aboriginal subcategory.

1.2 Review approach

The Commission’s review was informed by a range of evidence, including:

- **Consultation** – with government agencies, community, and industry organisations. The Commission notes that during the review it did not receive submissions from local water utilities in the Intersecting Streams Plan area and, while the Commission endeavoured to engage with local councils as part of its stakeholder engagement process, it was unable to interview representatives from local councils. The Commission recognises the region is facing difficult circumstances due to the COVID-19 pandemic, which impacted on the ability of organisations to participate in the review.
- **Consultation with Aboriginal stakeholders** – due to critical COVID-19 outbreaks in Aboriginal communities across Western NSW at the time of these reviews, the Commission has generally relied on existing evidence and agency interviews to support its findings to compensate for a lack of direct engagement with Aboriginal communities in the Plan areas. The Commission will provide ongoing opportunities for Aboriginal peoples to give advice and input to the findings of these reviews.
- **Document review** – the Commission reviewed the Plans and their background documents.⁷ It also obtained publicly available information and reports from water management agencies, including DPIE-Water, DPIE-EES, Department of Primary

⁶ Revised from Department of Industry (DoI)-Water (2019) *NSW Regional Water Statement*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0019/218404/NSW-Regional-Water-Statement.pdf.

⁷ NSW Office of Water (2011) *Water Sharing Plan for the Intersecting Streams Unregulated and Alluvial Water Sources – Background document*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0008/166850/intersecting-streams-background.pdf; NSW Office of Water (2012) *Water Sharing Plan for the Lower Murray-Darling Unregulated and Alluvial Water Sources – Background document*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0010/166852/lower-murray-darling-unreg-alluvial-background.pdf.

Industries – Fisheries (DPI-Fisheries), WaterNSW and Essential Water. As required, the Commission considered other relevant state-wide and regional government policies and agreements that apply to the Plan areas (**Appendix A**).

- **Technical advice** – consultants provided expert analysis on key aspects of the Plans, including social and environmental objectives, the effectiveness of Plan provisions and opportunities for improvement.
- **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 five questions to assess the contribution of the Plans to environmental, social, cultural and economic outcomes:
 - 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 five submissions for the Intersecting Streams Plan and five submissions for the Lower Murray-Darling Plan. Non-confidential submissions are published on the Commission’s website.⁸

The Commission evaluated the performance of the Plans against their stated objectives, strategies and performance indicators, which were linked to each of the broader outcome categories required as part of the review (environmental, social, cultural and economic outcomes). These are provided in **Appendix B**.

The water sharing plan objectives changed over the period of the Plans. The Commission has assessed the Plans against the current objectives, strategies and indicators. The Commission recognises many of the objectives were not in place for the full period of the Plans.

⁸ Natural Resources Commission (2021) *Water sharing plan reviews*. Available at: <https://www.nrc.nsw.gov.au/wsp-reviews>.

2 The Plan areas

This chapter provides an overview of the Plan areas and their water-dependent environmental, social, and economic values.

The Plan areas are in the NSW Murray-Darling Basin. The water sources in both Plan areas are ephemeral and experience large fluctuations in flow, with both periods of large flows and then no flows. The geomorphology of both Plans is characterised by wide floodplains cut through with smaller flood runners diverting off the main river channels. Depending on the water source, the network of flood runners can be extensive and can have definable bed and banks. Many of these channels terminate in flood outs or in wetlands. Larger events that move across the floodplain are important for maintaining floodplain vegetation communities and floodplain wetlands, which provide critical habitat for a range of species and support the overall productivity of river floodplain systems.⁹

The systems and the water access arrangements in these Plan areas are very different from other unregulated systems in NSW. Both Plans are in the NSW Western Land Division,¹⁰ which allows 100 percent of run off to be captured in farm dams as harvestable rights, whereas in the Central and Eastern Land Divisions, 10 percent of runoff can be captured under harvestable rights.

The Plan areas operate within a complex water sharing framework under Commonwealth and NSW legislation, including the Act and the Basin Plan. The Intersecting Streams Plan is bordered to the north by Queensland water plans¹¹ and the Lower Murray-Darling to the south by Victoria's planning and entitlement framework.^{12,13} Intergovernmental agreements have been established to codify the sharing of water resources between Murray-Darling Basin states, such as Implementing Water Reform in the Murray-Darling Basin¹⁴ between the Commonwealth and Basin states and territories, and Border Rivers¹⁵ between NSW and Queensland.

In addition to water sharing plans, NSW is required to prepare WRPs, which are statutory instruments under the Basin Plan that set out arrangements for water sharing, meeting environmental and water quality objectives, and consider emerging risks. There are currently no accredited WRPs in NSW.¹⁶

The recently released *NSW Water Strategy* identifies the key challenges and opportunities for water management and service delivery in NSW and sets the strategic direction for water

⁹ Thoms, M., Quinn, G., Butcher, R., Phillips, B., Wilson, G., Brock, M. and Gawne, B. (2002) *Scoping study for the Narran Lakes and Lower Balonne floodplain management study*, Cooperative Research Centre for Freshwater Ecology, Canberra.

¹⁰ DPIE (n.d.) *Harvestable rights – dams*. Available at: <https://www.industry.nsw.gov.au/water/licencing-trade/landholder-rights/harvestable-rights-dams> (accessed 22 September 2021).

¹¹ Business Queensland (2017) *Water plan areas*. Available at: <https://www.business.qld.gov.au/industries/mining-energy-water/water/catchments-planning/water-plan-areas> (accessed 7 September 2021).

¹² Victorian Department of Environment, Land, Water and Planning (2021) *Planning and entitlements - Northern Region Sustainable Water Strategy*. Available at: <https://www.water.vic.gov.au/planning/long-term-assessments-and-strategies/sws/northern> (accessed 7 September 2021).

¹³ Victorian Department of Environment, Land, Water and Planning (2021) *Planning and entitlements - Victoria's Entitlement Framework*. Available at: <https://www.water.vic.gov.au/planning/victorias-entitlement-framework> (accessed 7 September 2021).

¹⁴ Intergovernmental Agreement on Implementing Water Reform in the Murray Darling Basin 2013, revised 2019. Available at: <https://federation.gov.au/sites/default/files/about/agreements/iga-on-implementing-water-reform-mbd-9-august-2019.pdf>.

¹⁵ New South Wales-Queensland Border Rivers Intergovernmental Agreement 2008. Available at: https://www.dnrm.qld.gov.au/_data/assets/pdf_file/0006/105963/intergovernment-agreement.pdf.

¹⁶ MDBA (2021) *Water resource plans*. Available at: <https://www.mdba.gov.au/basin-plan-roll-out/water-resource-plans> (accessed 8 September 2021).

service delivery and resource management in NSW over the long term.¹⁷ The strategy will work together with 12 place-based strategies. DPIE-Water is currently preparing these regional water strategies, which are non-statutory, long-term strategies to inform future policy, regulation, and planning instruments such as water sharing plans.¹⁸ When developed, the *Western Regional Water Strategy* will cover the areas for both Plans.

2.1 Intersecting Streams Plan area and water sources

The Intersecting Streams Plan area stretches along the NSW and Queensland border, between Mungindi in the east and Hungerford in the west. It extends from the border south to the Barwon River at Wilcannia (but does not include the Barwon River) and incorporates several small tributaries south of the Barwon River that enter between Bourke and downstream of Louth (**Figure 3**). This semi-arid area experiences hot, dry summers and mild, dry winters and is characterised by low relief with elevations from 100-300 metres above sea level.¹⁹

The Plan includes six surface water catchments with an area of just over 120,400 square kilometres, including the Yanda Creek catchment and the NSW portions of the Moonie River, Narran River, Culgoa River, Warrego River, and Paroo River catchments.²⁰ Within these water sources channels often dissipate into multiple smaller channels or flood runners that can terminate in flood outs or wetlands.

The Plan's six water sources are in the Western Water Management Area and are not grouped into extraction management units (**Appendix C**).

Prior to July 2020, the Intersecting Streams Plan included two alluvial aquifer systems, the Paroo and Warrego alluvial groundwater sources. However, these are now included in the *Water Sharing Plan for the Darling Alluvial Groundwater Sources 2020* (NSW).²¹

¹⁷ DPIE-Water (2021) *NSW Water Strategy*. Available at: https://water.nsw.gov.au/__data/assets/pdf_file/0007/409957/nsw-water-strategy.pdf.

¹⁸ DPIE-Water (2020) *Regional water strategies – fact sheet*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0008/314468/relationship-between-rws-and-wsp-fact-sheet.pdf.

¹⁹ NSW Office of Water (2011) *Water Sharing Plan for the Intersecting Streams Unregulated and Alluvial Water Sources – Background document*. Available at: <https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status/barwon-darling-west-region>.

²⁰ *Ibid.*

²¹ *Water Sharing Plan for the Intersecting Streams Unregulated and Alluvial Water Sources Amendment Order 2020* (NSW). Available at: <https://legislation.nsw.gov.au/view/pdf/asmade/sl-2020-358>.

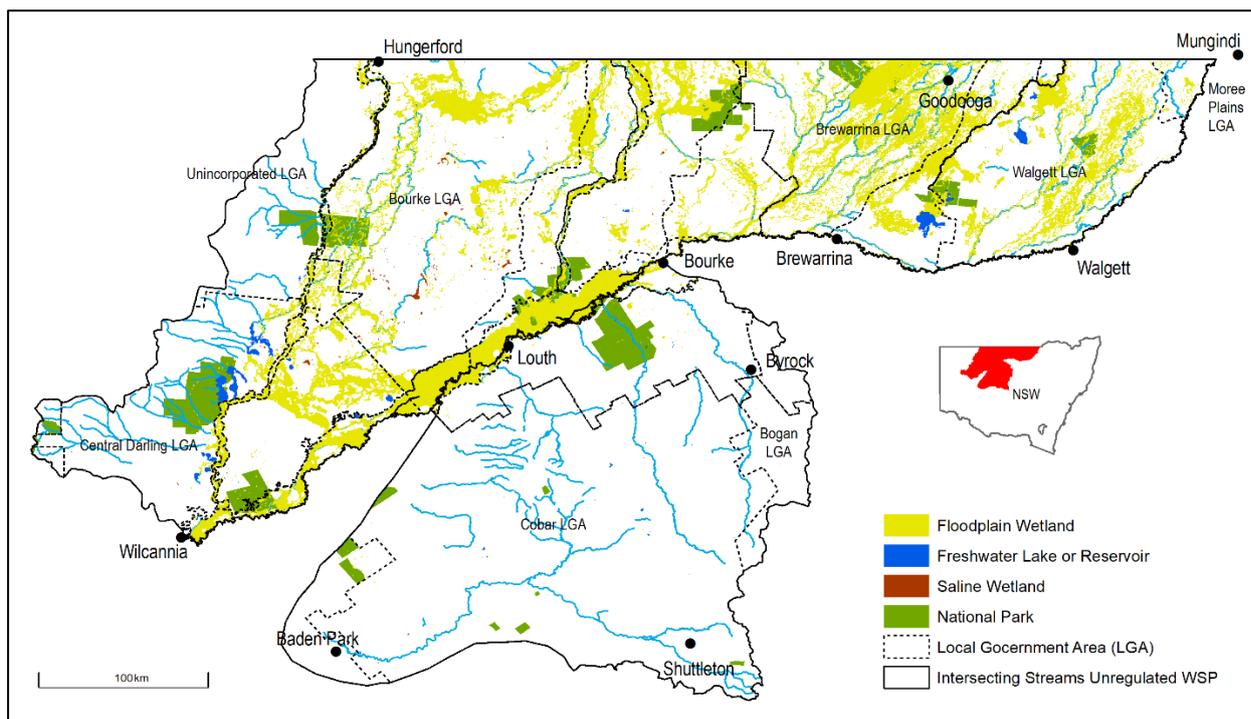


Figure 3: Map showing the Intersecting Stream Plan area, including local government areas (LGAs) and national parks

The Intersecting Streams Plan shares boundaries with the Lower Murray-Darling Plan, as well as the water sharing plans for the:

- regulated NSW Border Rivers, Gwydir, upper and lower Namoi
- unregulated Barwon-Darling, NSW Border Rivers, Gwydir, Namoi and Peel, Castlereagh, Macquarie-Bogan and North Western
- Queensland water plans for the Border Rivers and Moonie, Condamine and Balonne, and Warrego, Paroo, Bulloo and Nebine, where most of the Intersecting Streams (except Yanda Creek) originate.

Chapter 3 provides a discussion on cross-border issues.

The Plan area is underlain by water sharing plans for the Darling Alluvial, NSW Great Artesian Basin Groundwater and Shallow Groundwater, and NSW Murray Darling Basin Fractured Rock.

When accredited, the NSW Intersecting Streams Surface WRP will include the water sharing arrangements implemented through the Intersecting Streams Plan.

2.1.1 Water licences and entitlements

There are 76 water licences totalling 35,715 megalitres (ML) per year of entitlement in the Intersecting Streams Plan area, according to the WaterNSW Water Licencing System (**Table 2**). Unregulated river access licences have the largest entitlement at 65 percent of total entitlement, and unregulated river special high flow access licences make up 34 percent, and domestic and stock and local water utility make up 1 percent of total entitlement for the Plan area.

Licensed entitlement is greatest in the central and eastern water sources of Warrego River (21,625 units), Narran River (8,873 units) and Culgoa River (3,126 units).²² Water in the Yanda Creek Water Source is intermittent,²³ and the seven surface water licences have just eight units of entitlement.²⁴

Table 2 shows significant changes over time in entitlement listed in the Intersecting Streams Plan and differences in the entitlement listed in the WaterNSW Water Licencing System and the current Plan. The large increase in entitlement associated with the unregulated (special additional high flow) access licence is related to CEWO's acquisition of Toorale Station, which is discussed in **sections 4.2** and **5.2**. The difference in local water utility access licences is discussed in **Section 6.2**.

Table 2: Breakdown of entitlement by licence category for the Intersecting Streams Plan

Category*	Entitlement [^] (as listed at Plan commencement) ²⁵	Entitlement [^] (at Plan amendment) ²⁶	Entitlement (from WaterNSW Water Licencing System) ²⁷	Number of licences
Unregulated river access	23,596	23,083	23,083	46
Unregulated river (special additional high flow) access	0	12,150	12,150	2
Local water utility access	312	221	312	3
Domestic and stock access	244	482	170 [#]	25
Total entitlement	24,152	35,936	35,715	76

* The Water NSW Water Licencing System also records licences for joint water supply works, water supply works, and water supply works and water use. These have no entitlement as the water is not taken from the Plan area and have not been presented in **Table 2**.

[^] Entitlement is provided as ML for local water utility licences, and domestic and stock access licences. For unregulated river licences, entitlement is issued as a unit share with the volume provided per unit share impacted by the available water determination.

[#] The domestic and stock access figure from the NSW Water Licencing System figure includes local water utility access but separated for this purpose.

²² NSW Office of Water (2011) *Water Sharing Plan for the Intersecting Streams Unregulated and Alluvial Water Sources – Background document*. Available at <https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status/barwon-darling-west-region>.

²³ *Ibid.*

²⁴ *Ibid.*

²⁵ *Water Sharing Plan for the Intersecting Streams Unregulated and Alluvial Water Sources 2011*. Plan version as of 6 July 2012. Available at: <https://legislation.nsw.gov.au/view/html/inforce/2012-07-06/sl-2011-0573#sec.21>.

²⁶ *Water Sharing Plan for the Intersecting Streams Unregulated and Alluvial Water Sources 2011*. Plan version as of 1 July 2020. Available at: <https://legislation.nsw.gov.au/view/html/inforce/2020-07-01/sl-2011-0573>.

²⁷ Data provided by WaterNSW from its Water Licencing System, as at May 2021.

2.2 Lower Murray-Darling Plan area and water source

The Lower Murray-Darling Plan covers the catchments of the lower reaches of the Darling River from Tilpa to the junction with the Murray River; and the Murray River from the confluence with the Murrumbidgee River to the South Australian border (**Figure 4**).²⁸ The Great Anabranch of the Darling River and the associated ‘Anabranch Lakes’ are also included in the Lower Murray-Darling Plan.²⁹ It is a semi-arid area with hot summers and mild winters.

The Lower Murray-Darling Plan applies to a single water source, the Lower Murray-Darling Unregulated Water Source. It does not apply to the regulated rivers managed under the *Water Sharing Plan for the NSW Murray and Lower Darling Regulated Rivers Water Sources 2016*, or the waters of the Barwon-Darling Water Source which are managed under the *Water Sharing Plan for the Barwon-Darling Unregulated River Water Sources 2012*.

Prior to July 2020, the Lower Murray-Darling included the Lower Darling Alluvial Groundwater Source. However, this groundwater source is now included in the *Water Sharing Plan for the Darling Alluvial Groundwater Sources 2020* (NSW).³⁰

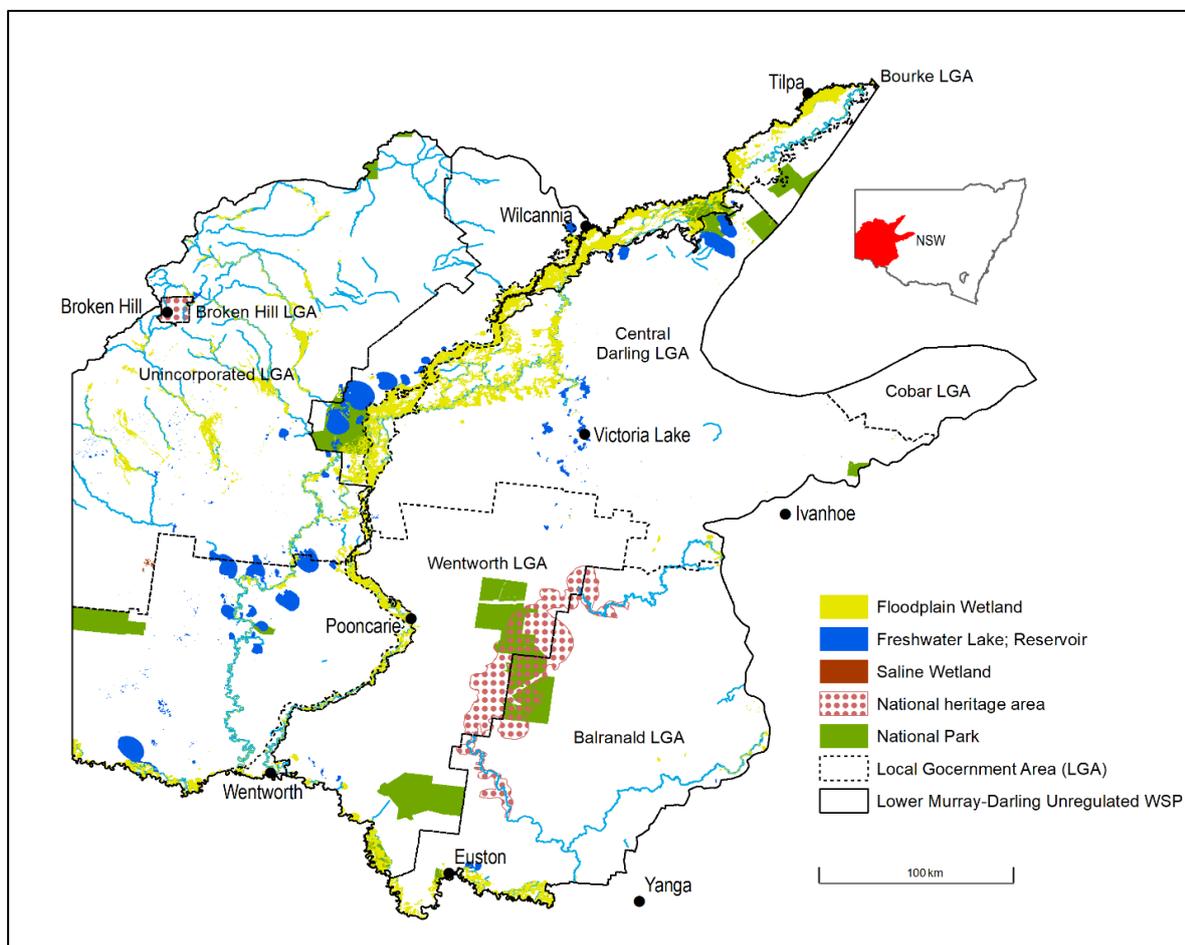


Figure 4: Map showing the Lower Murray-Darling Plan area, including LGAs and national parks

²⁸ NSW Office of Water (2012) *Water Sharing Plan for the Lower Murray-Darling Basin Unregulated and Alluvial Water Sources – Background document*. Available at: <https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status/barwon-darling-west-region>

²⁹ *Ibid.*

³⁰ *Water Sharing Plan for the Lower Murray-Darling Unregulated and Alluvial Water Sources Amendment Order 2020* (NSW). Available at: <https://legacy.legislation.nsw.gov.au/regulations/2020-360.pdf>.

The Lower Murray-Darling Plan shares boundaries with the Intersecting Streams Plan, as well as the water sharing plans for the:

- regulated Murray and Lower Darling, Murrumbidgee
- unregulated North Western, Barwon-Darling, Lachlan and the Murrumbidgee.³¹

The Plan area is underlain by the water sharing plans for the NSW Murray-Darling Basin Porous Rock, and the NSW Murray-Darling Basin Fractured Rock.³²

When accredited, the NSW Murray and Lower Darling Surface WRP will include the water sharing arrangements implemented through the Lower Murray-Darling Plan.

2.2.1 Water licences and entitlements

According to the WaterNSW Water Licencing System there are 20 licences totalling 9,730 ML of entitlement in the Plan area (**Table 3**). The WaterNSW Water Licencing System data record local water utility licences of 6,300 ML that are not currently included in the Plan (see **Section 6.1** for further discussion). Local water utility licences are the largest proportion of entitlements at 65 percent, followed by unregulated river access licences at 35 percent of total entitlement.

The Plan's background document indicates that, when the Plan commenced, most of the unregulated river access licences nominated works located on lagoons. There was one licenced water user on the Boeill, Neilpo and Peacock Lagoons; and seven licenced users on the Thegoa Lagoon,³³ which has reduced to five licenced users since Plan commencement.

³¹ DPIE-Water (n.d.) *Water Sharing Plan Status*. Webpage accessed 7 September 2021. Available at: <https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status>.

³² DPIE-Water (n.d.) *Water Sharing Plan Status*. Webpage accessed 7 September 2021. Available at: <https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status>.

³³ NSW Office of Water (2012) *Water Sharing Plan for the Lower Murray-Darling Basin Unregulated and Alluvial Water Sources – Background document*. Available at: <https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status/barwon-darling-west-region>.

Table 3: Breakdown of entitlement by licence category for the Lower Murray-Darling Plan

Category* #	Entitlement (as listed at Plan commencement Plan) ³⁴	Entitlement (at Plan amendment) ³⁵	Entitlement WaterNSW Water Licencing System ³⁶	Number of licences
Unregulated river access	2,424	2,424	3,387	12
Local water utility access	0 [^]	0 [^]	6,300 [^]	1
Domestic and stock access	71	29	43	7
Total entitlement	2,495	2,453	9,730	20

* The Water NSW Water Licencing System records licences for joint water supply works, water supply works, and water supply works and water use. These have no entitlement as the water is not taken from the Plan area, hence they have not been presented in **Table 3**. There are also aquifer access licences and salinity and water table management access licences in the original Plan have not been presented and have zero entitlement.

[^] WaterNSW Water Licencing System records local water utility entitlement as 6,300 ML. However, this is not included in the amended Plan.

Entitlement is provided as ML for local water utility licences and domestic and stock access licences. For unregulated river licences, entitlement is issued as a unit share with the volume provided per unit share impacted by the available water determination.

2.3 Town water supply

2.3.1 Intersecting Streams Plan town water supply

The original Plan provided for 312 ML per year of entitlement for local water utility access licences from the Culgoa River Water Source (91 ML per year) and the Paroo River Water Source (221 ML per year).³⁷

The Plan provides town water entitlements to several townships:

- Bourke Shire Council manages a 25 ML per year surface water licence on the Paroo River that supplies town water to Wanaaring
- Brewarrina Shire Council manages a 91 ML per year surface water licence on the Bokhara River that supplies town water to Enngonia
- Central Darling Shire manages a 196 ML per year surface water licence in the Paroo River that supplies town water to White Cliffs.³⁸

The 2020 Plan amendments indicate Brewarrina Shire's local water utility access licence was repealed, reducing the total local water utility entitlement for the Plan area to 221 ML per year.³⁹ DPIE-Water advised that the local water utility access license was converted to a domestic and stock (town water supply) license when the Plan was amended. The WaterNSW entitlement

³⁴ Plan version as of 6 July 2012. Available at: <https://legislation.nsw.gov.au/view/html/inforce/2012-07-06/sl-2012-0022>.

³⁵ Plan version as of 1 July 2020. Available at: <https://legislation.nsw.gov.au/view/html/inforce/2012-07-06/sl-2012-0022>.

³⁶ Data provided by WaterNSW from its Water Licencing System, as at May 2021.

³⁷ See Clause 22 of the Intersecting Streams Plan.

³⁸ NSW Office of Water (2011) *Water Sharing Plan for the Intersecting Streams Unregulated and Alluvial Water Sources – Background document*. Available at: <https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status/barwon-darling-west-region>.

³⁹ *Water Sharing Plan for the Intersecting Streams Unregulated and Alluvial Water Sources Amendment Order 2020 [Clause 22] (NSW)*. Available at: <https://legislation.nsw.gov.au/view/pdf/asmade/sl-2020-358>.

database lists no local water utility access licenses for the Intersecting Streams Plan, but rather lists the three entitlements outlined above each as domestic and stock (town water supply) licenses. DPIE-Water should review and address this discrepancy. The Plan should reflect all town water supply entitlement regardless of which type of license has been allocated to ensure that town water entitlement is transparent and adequately incorporated into the Plan.

2.3.2 Lower Murray-Darling town water supply

Essential Water (a subsidiary of Essential Energy) manages four local water utility licences to provide town water to approximately 18,498 customers in Broken Hill, Silverton, Menindee and Sunset Strip.^{40,41} These licences span the Lower Darling Regulated River Water Source, the NSW Murray Regulated River Water Source, the Western Murray Porous Rock Groundwater Source and the Lower Murray-Darling Unregulated Water Source.⁴² The latter comprises two reservoirs (Stephens Creek and Umberumberka), which are located near Broken Hill and fall within the Lower Murray-Darling Plan area.

At Plan commencement, a local water utility licence was allowed for; however, a volume was not included. The WaterNSW Water Licencing system records a 6,300 ML per year entitlement from the Lower Murray-Darling Unregulated Water Source. This was not included in the Plan when it was amended in 2020.

The NSW Government funded the Wentworth to Broken Hill pipeline, which became operational in 2019. This pipeline is owned and operated by WaterNSW and draws raw water from the Murray Regulated Plan area. A new local water utility access licence with 8,694 ML of entitlement was created and since operational, supplies the majority of town water supply to Broken Hill and Silverton (see **Section 6.1** for further discussion).

2.4 Environmental context

Environmental assets in the areas covered by the Plans are discussed in the following sections. A summary of water dependent environmental assets is provided in **Appendix D**.

2.4.1 Intersecting Streams Plan environmental assets

The Intersecting Streams Plan area contains several high-value, water-dependent environmental assets. Of note are wetlands listed under the Ramsar Convention, wetlands of national significance and the last free flowing river in the Murray-Darling Basin, the Paroo River.⁴³ The Plan area also includes Culgoa National Park and part of the adjoining Culgoa Floodplain National Park,⁴⁴ which protect a section of the Culgoa River and its floodplain.

Located in the Paroo catchment are two wetlands listed under the Ramsar Convention. These are the Nocolche Nature Reserve, covering 71,133 hectares near Wanaaring, and the Peery Lake section of Paroo-Darling National Park, covering 67,171 hectares near White Cliffs. The Paroo River is unique as it maintains a natural pattern of water flow due to no major diversions, dams or weirs.⁴⁵ It also provides a key drought refuge in arid NSW and supports waterbird

⁴⁰ Essential Water (2018) *Drought Management Plan for the water supply business in the Broken Hill Region*. Available at: <https://essentialwater.com.au/media/0tqgjjvd/ceop2288publicdroughtmanagementplan.pdf>.

⁴¹ Essential Water also have an entitlement for a high security licence used for recreational facilities.

⁴² Essential Water local water utility access licences as of 2 September 2021 provided by DPIE, unpublished data.

⁴³ MDBA (2021) *Paroo*. Available at: <https://www.mdba.gov.au/water-management/catchments/paroo> (accessed 20 September 2021).

⁴⁴ The Culgoa Floodplain National Park sits on the Queensland-NSW border.

⁴⁵ DPIE-Water (2018) *Paroo River Wetlands*. Available at: <https://www.environment.nsw.gov.au/topics/water/wetlands/internationally-significant-wetlands/paroo-river-wetlands>.

breeding, native fish populations (such as the golden perch (*Macquaria ambigua*)), threatened plants (such as the salt pipewort (*Eriocaulon carsonii*)), and the vegetation adapted to the rare artesian mound springs landforms.⁴⁶ This vegetation has been listed as a threatened ecological community. The Paroo River water source is protected through an intergovernmental agreement between NSW and Queensland.^{47,48}

The Narran Lakes (Dharriwaa) system is a floodplain wetland complex that consists of four lakes: Clear Lake, Back Lake and Long Arm forming the northern lakes; Narran Lake in the south; and a complex network of river channels that dissect the floodplain.⁴⁹ The lakes fill sequentially; first Clear Lake, followed by Back Lake and Long Arm, and then, if the event is sufficiently large, Narran Lake.^{50,51} Narran Lakes are culturally and ecologically significant. They continue to be an important meeting place for Aboriginal people. The 8,447-hectare Narran Lakes Ramsar site located in the Narran Lake Nature Reserve, is co-managed by the NSW National Parks and Wildlife Service and Youalaroi Traditional Owners.

The reserve represents a near-natural wetland and supports threatened species, such as the Australasian bittern (*Botaurus poiciloptilus*).⁵² It also supports 40 migratory bird species and waterbird breeding, including ibis, cormorants, egrets, and spoonbills. Threats to this site include upstream water extraction, especially the loss of small-to-medium sized floods that are needed to maintain waterbird breeding habitat including lignum shrublands.⁵³

The complex geomorphic nature of the Narran Lakes ecosystem means that the pattern of inundation is also complex and may differ over time. This is a result of different areas of the environment holding water for different lengths of time. Therefore, the total area inundated is not just a result of the amount of water in a single flow event, but of the volume of flows entering within the past several years, as well as antecedent conditions including any recent local rainfall.

The Western Floodplain located in Toorale National Park is another important water-dependent environmental asset located in the lower Warrego catchment. It comprises a large floodplain area that is dissected by small flood-runners. Floodwaters inundate the floodplain from overflows at Boera Dam and embankments that were built as part of the former Toorale Station divert overland flows onto the Western Floodplain. Given these structures have been in place

⁴⁶ DPIE-Water (2018) *Paroo River Wetlands*. Available at: <https://www.environment.nsw.gov.au/topics/water/wetlands/internationally-significant-wetlands/paroo-river-wetlands>.

⁴⁷ NSW Office of Water (2011) *Water Sharing Plan for the Intersecting Streams Unregulated and Alluvial Water Sources – Background document*. Available at <https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status/barwon-darling-west-region>.

⁴⁸ Intergovernmental Agreement for the Paroo River between New South Wales and Queensland 2003. Available at: <https://www.mdba.gov.au/sites/default/files/pubs/26-Intergovernmental-Agreement-Paroo-River-NSW-QLD-D16-40857.pdf>.

⁴⁹ MDBA (2012) *Assessment of environmental water requirements for the proposed Basin Plan: Narran Lakes*. Available at: <https://www.mdba.gov.au/sites/default/files/archived/proposed/EWR-Narran-Lakes.pdf>.

⁵⁰ *Ibid.*

⁵¹ Thoms, M., Capon, S., James, C., Padgham, M. and Rayburg, S. (2007) *The Narran Ecosystem Project: the response of a terminal wetland system to variable wetting and drying*. Final report to the Murray-Darling Basin Commission. Murray-Darling Basin Commission. Available at: https://www.researchgate.net/profile/Samantha-Capon/publication/268209599_The_Narran_ecosystem_project_the_response_of_a_terminal_wetland_system_to_variable_wetting_and_drying_Final_report_to_the_Murray-Darling_Basin_Commission_MDBC_publication_4008_200_300_400_500_600_700_/links/5464263e0cf2cb7e9da99f07/The-Narran-ecosystem-project-the-response-of-a-terminal-wetland-system-to-variable-wetting-and-drying-Final-report-to-the-Murray-Darling-Basin-Commission-MDBC-publication-40-08-200-300-400-500-600-7.pdf.

⁵² DPIE (2018) *Narran Lake Nature Reserve*. Available at: <https://www.environment.nsw.gov.au/topics/water/wetlands/internationally-significant-wetlands/narran-lake-nature-reserve>.

⁵³ *Ibid.*

for over 100 years, extensive wetland ecosystems have established spanning nearly 30,000 hectares.⁵⁴

The Western Floodplain supports a diverse assemblage of vegetation communities, many of which rely on flooding to maintain their condition. Inundation of the Western Floodplain provides habitat for a range of threatened and migratory waterbirds and other wildlife. During larger flood events the Western Floodplain also connects with the Darling River, or floodwaters return to the Warrego River.⁵⁵

Heavy grazing across significant parts of the Intersecting Streams Plan area has resulted in large areas covered by dense regrowth of woody shrubs.⁵⁶ Despite this, a range of native vegetation persists. Plant species in the north-eastern water sources of the Darling Riverine Plains bioregion include river red gum (*Eucalyptus camaldulensis*), river cooba (*Acacia stenophylla*), river paperbark (*Melaleuca trichostachya*) and coolabah (*Eucalyptus microtheca*).⁵⁷ Away from the river channels, the plains support shrubs such as saltbush (*Atriplex nummularia* and *Atriplex vesicaria*) and grasses such as Mitchell grass (*Astrebla* sp.). Species supported in the north-western water sources of the Mulga Lands bioregion include mulga (*Acacia aneura*), western bloodwood (*eucalyptus terminalis*), mallee (*Eucalyptus* sp.), white cypress pine (*Callitris glaucophylla*) and silver-leaf ironbark (*Eucalyptus melanopholia*).⁵⁸ Yanda Creek, located within the Cobar Penepplain bioregion, is in an undulating hilly region with open woodlands of poplar box (*Eucalyptus populnea*), red box (*Eucalyptus intertexta*) and white cypress pine (*Callitris glaucophylla*).⁵⁹

2.4.2 Lower Murray-Darling environmental assets

The background document for the Lower Murray-Darling Plan states much of the ecological data for the area relates to the regulated system, but that this is still relevant to the unregulated streams as they provide flows to the regulated system and contribute to the health of the riparian woodlands and plains.⁶⁰ Pools and lagoons in unregulated streams also provide habitat for fish, aquatic birds, and invertebrates.

The Lower Murray-Darling Plan area covers over 269,000 hectares of wetlands and floodplain woodlands, which include lignum swamps, black box woodlands and river red gums. There are 27 threatened bird species identified in the area, including the bush-curlew (*Burhinus grallarius*), malleefowl (*Leipoa ocellate*), Australian bustard (*Ardeotis australis*) and regent parrot (*Polytelis*

⁵⁴ NSW National Parks and Wildlife Service (2021) *Toorale National Park and Toorale State Conservation Area Plan of Management*. Available at: <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Parks-reserves-and-protected-areas/Parks-plans-of-management/toorale-national-park-state-conservation-area-plan-management-210082.pdf>.

⁵⁵ Cox, S., Thomas, R. and Lu, Y. (2012) *Flooding patterns of Toorale: the confluence of the Warrego and Darling rivers*. Office of Environment and Heritage, Sydney, Unpublished report

⁵⁶ NSW Office of Water (2011) *Water Sharing Plan for the Intersecting Streams Unregulated and Alluvial Water Sources – Background document*. Available at: <https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status/barwon-darling-west-region>.

⁵⁷ *Ibid.*

⁵⁸ NSW Office of Water (2011) *Water Sharing Plan for the Intersecting Streams Unregulated and Alluvial Water Sources – Background document*. Available at: <https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status/barwon-darling-west-region>.

⁵⁹ NSW Office of Water (2011) *Water Sharing Plan for the Intersecting Streams Unregulated and Alluvial Water Sources – Background document*. Available at: <https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status/barwon-darling-west-region>.

⁶⁰ NSW Office of Water (2012) *Water Sharing Plan for the Lower Murray-Darling Basin Unregulated and Alluvial Water Sources – Background document*. Available at: <https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status/barwon-darling-west-region>.

anthoepplus).⁶¹ Most of these species inhabit the riparian woodlands and plains along the Darling River and the Great Anabranh of the Darling River (Great Darling Anabranh).⁶²

The Plan area includes the Great Darling Anabranh, which is the ancestral channel of the Darling River. The anabranh is considered a crucial corridor for connecting Menindee Lakes with the Murray River system with environmental flows through the anabranh enabling dispersal of juvenile native fish such as golden perch and fish recruitment downstream.⁶³ Several ephemeral lakes are located along the Great Darling Anabranh (see list in **Appendix D**), the deepest being Nearie Lake in the Nearie Lake Nature Reserve.⁶⁴ These ephemeral lakes provide important refugia when river channels dry out. The plan of management for Nearie Lake lists several management actions relevant to the Plan, notably the need to protect and restore natural flows in the Great Darling Anabranh and maintain the natural flow regime of Nearie Lake to protect wetlands and waterbird breeding areas.⁶⁵

At the time the Lower Murray-Darling Plan was developed, there were six species of fish that had previously been common in the Lower Murray and Darling rivers, but had become less populous and listed as threatened, with statuses ranging from vulnerable to critically endangered in the NSW *Fisheries Management Act 1992*. These are the Murray hardyhead (*Craterocephalus fluviatilis*), trout cod (*Maccullochella macquariensis*), river snail (*Notopala sublineata*), silver perch (*Bidyanus bidyanus*), southern pygmy perch (*Nannoperca australis*) and southern purple spotted gudgeon (*Mogurnda adspersa*).⁶⁶

The Darling River Endangered Ecological Community (also known as the Aquatic ecological community in the natural drainage system of the lowland catchment of the Darling River) includes the aquatic community of the Lower Darling River. This endangered ecological community consists of 21 native fish species and many native invertebrates.⁶⁷

Thegoa Lagoon is an ephemeral (non-permanent) freshwater wetland that supports a healthy and diverse array of native flora and fauna. It is located immediately west of Wentworth at the junction of the Murray and Darling rivers and is the most significant lagoon in the Plan area with regards to environmental values and hydrologic stress from extractions.⁶⁸

It is an important cultural, social and economic resource to Wentworth and the Lower Murray-Darling area. Thegoa Lagoon has been a critical meeting place for Barkandji peoples and contains many significant sites.⁶⁹ The Barkindji Maraura rangers (Barkindji Maraura Elders

⁶¹ NSW Office of Water (2012) *Water Sharing Plan for the Lower Murray-Darling Basin Unregulated and Alluvial Water Sources – Background document*. Available at: <https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status/barwon-darling-west-region>.

⁶² NSW Office of Water (2012) *Water Sharing Plan for the Lower Murray-Darling Basin Unregulated and Alluvial Water Sources – Background document*. Available at: <https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status/barwon-darling-west-region>.

⁶³ D'Santos, P., Ellis, I., Wegner, I and Sluggett, A. (2018) Conserving crucial corridors. In Australian River Restoration Centre's *RipRap edition 40 – Thrive: nature, water and wellbeing*, pp. 43-45.

⁶⁴ NSW National Parks and Wildlife Service (2008) *Nearie Lake Nature Reserve Plan of Management*. Available at: <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Parks-reserves-and-protected-areas/Parks-plans-of-management/nearie-lake-nature-reserve-plan-of-management-090065.pdf>

⁶⁵ *Ibid.*

⁶⁶ NSW Office of Water (2012) *Water Sharing Plan for the Lower Murray-Darling Basin Unregulated and Alluvial Water Sources – Background document*. Available at: <https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status/barwon-darling-west-region>.

⁶⁷ *Ibid.*

⁶⁸ *Ibid.*

⁶⁹ Discover Murray (2021) *Thegoa Lagoon & Reserve, Wentworth, New South Wales*. Available at: <http://www.murrayriver.com.au/wentworth/thegoa-lagoon/#:~:text=%20%20%20%20Inlet%20This%20inlet%20regulator,support%20a%20diverse%20range%20of%20native...%20More%20> (accessed 22 September 2021).

Environment Team) team are now active in working to improve the management of the lower Darling River and Thegoa Lagoon and particularly its fish habitat.⁷⁰

Land use in the immediate environment includes irrigation, grazing, horticulture, public open space recreation, residential, commercial accommodation, cemetery, water treatment plant and Crown reserve. The lagoon provides water for irrigation, recreation, stock and domestic use, and environmental benefits.⁷¹

2.5 Aboriginal people of the Plan areas

The Traditional Owners of the Lower Murray-Darling Plan area are peoples of the Barkandji, Muthi Muthi, Yitha Yitha, Ngemba, Ngiyampaa, Wangaaypuwan, Wayilwan and Maraura Nations. In the Intersecting Streams Plan area, the Barkandji and Ngemba Nations are also represented together with the Budjiti, Euahlayi, Gomeroi / Kamilaroi, Guwamu, Kunja, and Murrawarri Nations.

There are eight Local Aboriginal Land Councils (LALCs) across the Lower Murray-Darling and 17 LALCs across the Intersecting Streams Plan area (**Figure 5** and **Figure 6**). The Plan areas include some of the largest native title determinations in the state, several ILUAs, Indigenous Protected Areas (IPAs), and land and water management ranger groups, with further native title claims in process (**Table 4**). The Commission reported on the details of Barkandji native title as part of its Barwon Darling water sharing plan review and made several recommendations to support these rights in relation to water sharing plans.⁷²

Rivers and their flows are critically valued for the ways in which they support cultural history and current connection and practices for Aboriginal peoples in the Plan areas: *'The river is our memory – we walk along it and remember our history and our ancestors by looking at the marks and places'*.⁷³ Aboriginal peoples' perspective on water is that it is sacred and living; as well as carrying other values and being necessary for survival.⁷⁴ These values are embedded within Country and waterways across a range of spatial and temporal scales and sites that are of importance to local Aboriginal Nations.⁷⁵

⁷⁰ In partnership with the Murray-Darling Freshwater Research Centre, the River Ranger team is involved in a cultural science research project that is bringing together science and cultural knowledge. See further information: Barkandji River Rangers (2015) *Barkindji River Rangers doing great things for fish*. Available at: <https://finterest.com.au/barkindji-river-rangers-doing-great-things-for-fish/>.

⁷¹ NSW Office of Water (2012) *Water Sharing Plan for the Lower Murray-Darling Unregulated and Alluvial Water Sources Background Document*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0005/166865/murray-unreg-alluvial-background.pdf.

⁷² Natural Resources Commission (2019) *Final report: Review of the Water Sharing Plan for the Barwon-Darling Unregulated and Alluvial Water Sources 2012*. Available online: <https://www.nrc.nsw.gov.au/wsp-reviews>.

⁷³ Badger Bates (2019) Submission to the South Australian Royal Commission on the Murray–Darling Basin, 13 February.

⁷⁴ Moggridge, B. J. & Ross M. Thompson (2021) Cultural value of water and western water management: an Australian indigenous perspective, *Australasian Journal of Water Resources*, DOI: 10.1080/13241583.2021.1897926.

⁷⁵ For example, Western Local Land Services have undertaken a series of 'Ecological Cultural Knowledge' projects throughout the area to record the traditional language and specific uses of native plant materials among other values. Western Local Land Services (2016) *Ecological Cultural Knowledge - Barkindji (north of Pooncarie) and Paakantyi (Barkindji); Mutthi Mutthi and Yitha Yitha; Ngiyampaa*. Available at: <https://western.lls.nsw.gov.au/>.

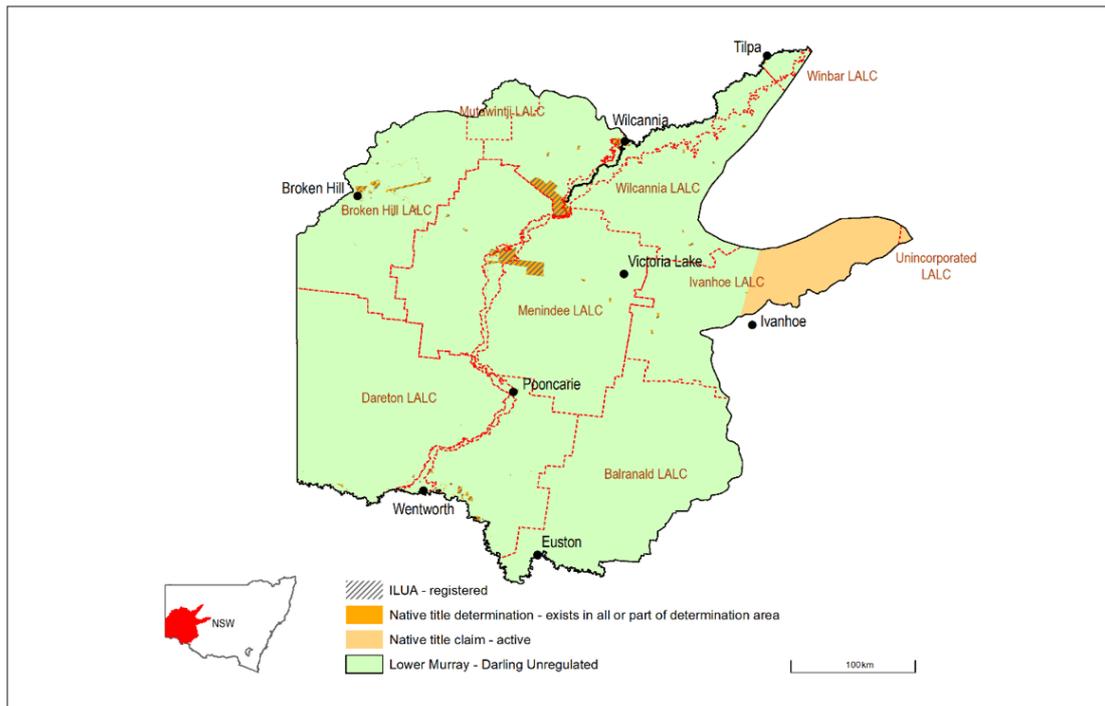


Figure 5: Cultural values in the Lower Murray-Darling Plan area

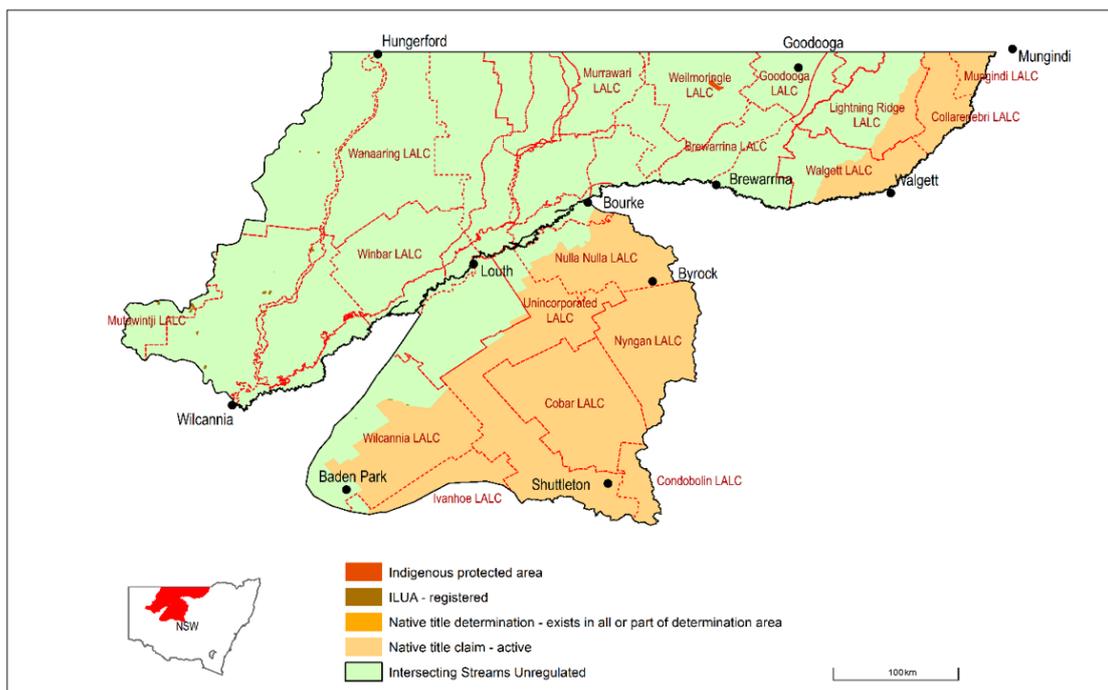


Figure 6: Cultural values in the Intersecting Streams Plan area

Table 4: Native title and other Aboriginal land agreements⁷⁶

Native title and ILUAS – Lower Murray-Darling	No.	Details
Native title claims		
Ngemba, Ngiyampaa, Wangaaypuwan and Wayilwan	1	NSD38/2019
Native title determinations		
Barkandji Traditional Owners #8 (Part A)	5	NSD6084/1998
ILUAs		
Barkandji Appin Station ILUA	2	NI2018/002
Barkandji Interim Licences ILUA	7	NI2018/007
Barkandji RNTBC Keltren ILUA	2	NI2019/002
Barkandji Single Dealings ILUA	2	NI2019/004
Barkandji Weinteriga and Yobel Station ILUA	2	NI2018/003
Native title, ILUAs and IPAs – Intersecting Streams	No.	Details
Native title claims		
Gomeri People	3	NSD37/2019
Ngemba, Ngiyampaa, Wangaaypuwan and Wayilwan	1	NSD38/2019
Native title determinations		
Barkandji Traditional Owners #8 (Part A)	5	NSD6084/1998
ILUAs		
Barkandji Interim Licences ILUA	2	NI2018/007
Barkandji Single Dealings ILUA	2	NI2019/004
IPAs		
Weilmoringle	1	NA
Brewarrina Ngemba Billabong	1	NA

For the Barkandji peoples of the region, the river (the Baaka) is at the heart of their culture and profoundly spiritual. The Baaka is home to Ngatji, the rainbow serpent, who created the lands and rivers, and it is the Barkandji who are responsible for Ngatji's health and wellbeing.⁷⁷

Willandra Lakes (including Lake Mungo), Menindee Lakes and Fletchers Lake and associated wetlands are all culturally significant. The Menindee Lakes are important to local Aboriginal people with cultural sites dating back over 13,000 years. To help protect these values, there has been a recent proposal to nominate Menindee Lakes for the Ramsar Convention's List of Wetlands of International significance from the Nature Conservation Council, the Barkandji Traditional Owners, local community, the region's councils, and environment groups.⁷⁸ The Willandra Lakes Region World Heritage Area is an ancient landscape where human habitation has been dated back to more than 40,000 years. Preserved in the environment are

⁷⁶ From the National Native Title Tribunal. Available at: <http://www.nntt.gov.au/>.

⁷⁷ Hartwig, L.D., Jackson, S. and Osborne, N. (2018) 'Recognition of Barkandji Water Rights in Australian Settler-Colonial Water Regimes'. *Resources*, 7: 16-32.

⁷⁸ Nature Conservation Council (2021) 'Menindee Lakes long overdue for listing under the Ramsar convention on international wetlands'. Media Release, 2 February. Available at: <https://www.nature.org.au/media-releases/2021/02/menindee-lakes-long-overdue-for-listing-under-the-ramsar-convention-on-international-wetlands/>.

fireplaces, calcified plants, stone tools, and animal bones.⁷⁹ Importantly, these culturally significant areas have benefited from the Aboriginal land and water management practices of local Ranger groups – the Barkandji Rangers, the Barkindji Maraura Rangers, and the Willandra Lakes Rangers who integrate traditional and contemporary ecological knowledge in conjunction with Elders and partners, to restore the health of country.

In the Intersecting Streams Plan area, Dharriwaa (the Narran Lakes) comprise highly significant cultural sites and meeting places for the local Yuwaalaraay and Euahlayi peoples as well as being a source of food and medicine. The origin story of Dharriwaa highlights its immense cultural significance and demonstrates the importance of the area, especially for waterbirds, as one of the most important waterbird nesting sites in Australia and internationally.⁸⁰ Traditional Owners from the Narran Lakes Joint Management Committee work to monitor the wildlife and plant life in Dharriwaa as part of their cultural custodianship of these lands and waters.

Murrawarri Country is located on the floodplain of the Ngarntu (Culgoa River) in northern NSW, southwest of the Culgoa National Park. There is a native title claim and IPA in the area (see **Table 4**).⁸¹ The Weilmoringle IPA covers an area of 3,500 hectares and is located on the floodplain of the Ngarntu. The Murrawarri people dedicated the area as an IPA in 2011 and it is administered by Murrawarri LALC. There are several traditional campsites, artefacts and scarred trees in the area, as well as Gooraman Swamp, a highly significant water place in Murrawarri Country with associated cultural practices, obligations and established cultural responsibilities to maintain the ecological health of the site. Gooraman Swamp was also one of two sites chosen for the National Cultural Flows Research Project⁸² in which cultural values were identified for Gooraman Swamp and its surrounds, including the Culgoa River, from discussions, meetings and field visits with the Murrawarri Nation (see also **Chapter 7** for further discussion).⁸³

Brewarrina Ngemba (Mission) Billabong and IPA covers 261 hectares and was dedicated in 2010. It is administered by the Brewarrina LALC and managed by the Ngemba Billabong Restoration and Landcare Group.⁸⁴ Located just off the Barwon River, its wetlands provide a refuge to wildlife, particularly in times of drought. The area is highly valued by Ngemba people as a place that links them to their ancestors and the past (see **Chapter 7**). Many of the older generation grew up at the Mission, as did their parents before them; and the younger generation have memories of spending time with their parents at the Mission site after it was closed in 1967.⁸⁵ In and around Brewarrina, there is evidence of the area being a key meeting place, with camp sites, scar trees and fish traps still visible.⁸⁶

⁷⁹ NSW National Parks and Wildlife Service (n.d.) *Willandra Lakes region*. Available at: <https://www.nationalparks.nsw.gov.au/conservation-and-heritage/willandra-lakes> (accessed 28 September 2021).

⁸⁰ Australian River Restoration Centre (2020) *Respectful relationships underpin the co-management of water for Dharriwaa*. Available at: <https://arrc.com.au/respectful-relationships-underpin-the-co-management-of-water-for-dharriwaa/>.

⁸¹ Murray Lower Darling Rivers Indigenous Nations (MLDRIN), Northern Basin Aboriginal Nations (NBAN) & North Australian Indigenous Land and Sea Management Alliance (2017) 'Cultural Flows: Fieldwork Results & Findings Report', *National Cultural Flows Research Project*.

⁸² National Cultural Flows Research Project (2014) *National Cultural Flows Research Project*. Available at: <http://culturalflows.com.au/about.html> (accessed 26 September 2021).

⁸³ National Indigenous Australians Agency (2021) *Indigenous Protected Areas 'Weilmoringle'*. Available at: <https://www.niaa.gov.au/weilmoringle-ipa>.

⁸⁴ National Indigenous Australians Agency (2021) *Indigenous Protected Areas 'Brewarrina Ngemba Billabong'*. Available at: <https://www.niaa.gov.au/brewarrina-ngemba-billabong-ipa>.

⁸⁵ Maclean, K., Bark R.H., Moggridge, B., Jackson, S., & Pollino, C. (2012) *Ngemba Water Values and Interests Ngemba Old Mission Billabong and Brewarrina Aboriginal Fish Traps (Baime's Nguunhu)*, CSIRO, p. 32.

⁸⁶ *Ibid.*

2.6 Socio-economic context

2.6.1 Intersecting Streams Plan area

There are seven LGAs⁸⁷ in the Intersecting Streams Plan area. Based on data available covering five of these LGAs,⁸⁸ the real gross regional product in 2019 was \$1.4 billion, ranging from \$81 million for Brewarrina LGA to \$540 million for Cobar LGA.^{89, 90}

Most of Australia's population lives in major cities, with only 2 percent living in remote and very remote regions.⁹¹ The LGAs in the Intersecting Streams Plan area are classified as very remote (three LGAs) and remote (four LGAs) (**Table 5**). Outer regional and remote areas are more likely to experience larger impacts from changes, such as water reform, drought, or agriculture because the local economy is often more dependent on agriculture than is the case in inner regional areas or in major cities.⁹²

Table 5: Remoteness classifications for LGAs in the intersecting streams Plan area in 2020⁹³

Category	LGA
Major Cities	None
Inner regional	None
Outer regional	None
Remote	Bourke, Bogan, Cobar, Walgett
Very remote	Brewarrina, Central Darling, Unincorporated NSW

Industries and employment

The key industries for employment in the area are mining, agriculture, forestry and fishing, healthcare and social assistance, and education and training.^{94, 95} In 2016, agriculture, forestry and fishing is the largest employer in the Unincorporated NSW (41 percent), Central Darling (41 percent), Walgett (27 percent) and Brewarrina (24 percent) LGAs.⁹⁶ Mining is the largest employer in Cobar (32 percent) and Bogan (13 percent) LGAs, with agriculture being the second largest employer in these LGAs.

Agriculture occupies a large area of the northwest region of NSW, with grazing being the main activity. Agricultural land occupies 306,900 square kilometres, or 90 percent of the region.⁹⁷ The Intersecting Streams Plan area includes large pastoral stations occupying the leasehold land

⁸⁷ Bogan, Bourke, Brewarrina, Central Darling, Cobar, Unincorporated NSW and Walgett LGAs.

⁸⁸ Bogan, Bourke, Brewarrina, Cobar and Walgett LGAs.

⁸⁹ Australian Bureau of Statistics (2021) *Quick Stats LGA*. Available at: <https://dbr.abs.gov.au/region.html?lyr=lga&rgn=17900>.

⁹⁰ Note the gross regional product figures for Unincorporated NSW and Central Darling LGAs were not available and if available would be higher.

⁹¹ Schirmer, L. and Mylek, M. (2020) *Thriving, surviving, or declining communities: socio-economic change in Murray-Darling Basin communities*, p. 13. A report prepared for the Panel for the Independent Assessment of Social and Economic Conditions in the Murray-Darling Basin. University of Canberra. Available at: <https://www.agriculture.gov.au/sites/default/files/documents/uc-socio-economic-change-mdb-communities.pdf>.

⁹² *Ibid.*

⁹³ *Ibid.*

⁹⁴ Australian Bureau of Statistics (2021) *Quick Stats by LGA*. Available at: <https://dbr.abs.gov.au/>.

⁹⁵ Australian Bureau of Statistics (2021) *Value of agricultural production*. Available at: <https://www.agriculture.gov.au/abares/research-topics/aboutmyregion/far-west-orana#agricultural-sector>.

⁹⁶ Australian Bureau of Statistics (2021) *Quick Stats by LGA* Available at: <https://dbr.abs.gov.au/>.

⁹⁷ Australian Bureau of Statistics (2021) *Far West and Orana Region overview* Available at: <https://www.agriculture.gov.au/abares/research-topics/aboutmyregion/far-west-orana#regional-overview>.

within the region.⁹⁸ While grazing occurs throughout the Plan area, there is limited broad scale crop and pasture production due to the sandy substrate characteristic of the catchments in the area although cotton farming has been relatively successful in the eastern water sources.⁹⁹

Water extraction is used for irrigation, stock, domestic, mining, and industrial purposes, as well as for town water supply and recreational purposes.¹⁰⁰

Tourism is a less significant industry in the Plan area, although it does bring economic benefits to the region. Destination NSW tourism data for the 'Outback NSW' region, which is larger than the Plan area, indicates that the region received over 611,000 visitors in the year ended September 2020. This was a reduction of about 38 percent from the year-on-year average and most likely was driven by the impacts of COVID-19.

Population and housing

Based on 2019 data, the Intersecting Streams Plan area has a population of 19,823, representing 0.7 percent of the total estimated population of regional NSW.¹⁰¹

There is low population density and negative population growth across the Plan area. Most of the LGAs in the Plan area have a population density of 0.1 persons per hectare, with Bogan and Walgett LGAs having 0.2 persons and 0.3 persons per hectare, respectively.¹⁰² All LGAs in the Plan area have been experiencing negative population growth, with a decline of 13 percent recorded from 2011 to 2019.¹⁰³

Aboriginal and Torres Strait Islander people comprise, on average between 14-60 percent of the population of the LGA areas (**Table 6**). This is much higher than the state average of 2.9 percent and even rural areas of NSW at 3.7 percent.¹⁰⁴

⁹⁸ NSW Office of Water (2011) *Water Sharing Plan for the Intersecting Streams Unregulated and Alluvial Water Sources – Background document*. Available at: <https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status/barwon-darling-west-region>

⁹⁹ *Ibid.*

¹⁰⁰ *Ibid.*

¹⁰¹ Australian Bureau of Statistics (2021) *Regional Summaries by LGA* Available at: <http://stat.data.abs.gov.au/> and <https://dbr.abs.gov.au/region.html?lga&rgn=10950>.

¹⁰² *Ibid.*

¹⁰³ Australian Bureau of Statistics (2021) *Estimated Resident Population by LGA 2001-2019* Available at: https://stat.data.abs.gov.au/Index.aspx?DataSetCode=ABS_REGIONAL_LGA2020

¹⁰⁴ Australian Bureau of Statistics (2016) *2016 Census QuickStats - Rural Balance*. Available at: https://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/SOS13?opendocument.

Table 6: Aboriginal and Torres Strait Islander percentage of total population, Intersecting Streams LGAs 2011 and 2016

LGA	Proportion of population who are Aboriginal and/or Torres Strait Islander (%) ¹⁰⁵	
	2011	2016
Unincorporated NSW	3.8	3.4
Bourke	30.2	31.3
Brewarrina	58.9	61.1
Walgett	28	28.9
Central Darling	38.1	39.6
Cobar	12.9	13.6
Bogan	14.5	16.7

The number of households in the Intersecting Streams Plan LGAs area has also been in decline, falling by 974 over the period from 2006 to 2016.¹⁰⁶ Around a quarter of private dwellings were unoccupied in 2016.¹⁰⁷

2.6.2 Lower Murray-Darling Plan area

There are nine LGAs¹⁰⁸ in the Lower Murray-Darling Plan area. The communities in four of these LGAs – Balranald, Broken Hill, Central Darling and Wentworth - are more likely to experience impacts from changes arising from water reform, drought or change in agriculture because they are classified as outer regional or very remote (**Table 7**).¹⁰⁹ The local economies of outer regional and remote areas are often more dependent on agriculture than inner regions or major cities.¹¹⁰

Table 7: Remoteness classifications for LGAs in the Lower Murray-Darling Plan area in 2020¹¹¹

Category	LGA
Major Cities	None
Inner regional	None
Outer regional	Balranald, City of Broken Hill, Wentworth
Remote	None
Very remote	Central Darling

¹⁰⁵ Australian Bureau of Statistics (2021) *Estimated Resident Population by LGA 2001-2019* Available at: https://stat.data.abs.gov.au/Index.aspx?DataSetCode=ABS_REGIONAL_LGA2020.

¹⁰⁶ Australian Bureau of Statistics (2021) *Census Time Series 2016, 2011, 2006: T23 Household Composition By Number Of Persons Usually Resident (LGA) and Census Time Series 2016, 2011, 2006: T24 Dwelling Structure by Dwelling Type (LGA)*. Available at: <http://stat.data.abs.gov.au/#>.

¹⁰⁷ *Ibid.*

¹⁰⁸ Balranald LGA, Bourke LGA, Broken Hill LGA, Central Darling LGA, Cobar LGA, Pooncarie LGA, Unincorporated NSW LGA, Wentworth LGA, and Wilcannia LGA.

¹⁰⁹ Schirmer, L. and Mylek, M. (2020) *Thriving, surviving, or declining communities: socio-economic change in Murray-Darling Basin communities*, p. 13. A report prepared for the Panel for the Independent Assessment of Social and Economic Conditions in the Murray-Darling Basin. University of Canberra. Available at: <https://www.agriculture.gov.au/sites/default/files/documents/uc-socio-economic-change-mdb-communities.pdf>.

¹¹⁰ *Ibid.*

¹¹¹ *Ibid.*

Industries and employment

Based on data available covering the four LGAs, mining contributes the largest value to the local economy, with much of this activity occurring in Broken Hill. Real gross regional product for the City of Broken Hill was \$1,043 million in 2020, with mining being most productive industry generating \$266 million.¹¹²

The mining sector is highly dependent on a wide range of other industries such as electricity transmission and distribution, professional and scientific services, structural manufacturing, automotive and repair sectors and the professional and scientific services sector. Mining therefore also supports other economic activity in the area.

Broken Hill also has the largest number of employees across the four LGAs, with around 60 percent of the 11,234 total persons employed in 2016 in the Plan area.¹¹³ Healthcare and social assistance was the largest employment category, followed by retail trade, and then mining.¹¹⁴ Agriculture is the dominant form of employment in the other LGAs of Balranald, Wentworth and Central Darling (25-35 percent of the jobs market).¹¹⁵

Outside of Broken Hill, the Lower Murray sub-region, which includes the LGAs of Wentworth and Balranald, supports a diverse range of agricultural production including production of grapes, fruit and nuts, broadacre crops, wool, sheep and lambs, and vegetables.^{116,117} The biggest employers are the fruit and nut industries (44 percent) followed by sheep, beef and grain farming (38 percent).¹¹⁸ Production of grapes and fruit are most likely to rely on regulated water sources. Goat meat production is a growing industry in the Far West.¹¹⁹ In the Far West subregion, which includes the Unincorporated NSW and Central Darling LGAs, agriculture is based on extensive grazing, predominantly on native pastures, as well as cropping on the western and southern margins of the region. Opportunistic cropping can occur on ephemeral lake beds when conditions are conducive. Irrigated cotton is the main broadacre crop grown primarily in the Unincorporated NSW and Central Darling Shire.¹²⁰

Tourism is a less significant industry in the Plan area, although it does bring economic benefits to the region. Data for the broader Murray NSW region, which is larger than the Lower Murray-Darling Plan area, indicate that the region received 1.9 million visitors in the year ending September 2020.¹²¹ This was 34 percent less than the year-on-year average, most likely due to impacts of COVID-19.

¹¹² Id Profiles (2021) *Id Profiles by LGA*. Available at: <https://economy.id.com.au>.

¹¹³ Australian Bureau of Statistics (2021) *Quick Stats by LGA* Available at: <https://dbr.abs.gov.au/>.

¹¹⁴ *Ibid.*

¹¹⁵ Australian Bureau of Statistics (2021) *Regional Statistics by LGA 2019, 2011-2019* Available at: https://stat.data.abs.gov.au/Index.aspx?DataSetCode=ABS_REGIONAL_LGA2019

¹¹⁵ Id Profiles (2021) *Employment profiles by LGA* Available at: <https://economy.id.com.au/broken-hill/industry-composition>.

¹¹⁶ DPI (2020) *Agriculture Industry Snapshot for Planning Lower Murray Sub Region*. Available at: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/1260490/Lower-Murray-Snapshot.pdf.

¹¹⁷ Note agriculture production values for the Lower Murray subregion were not broken down in regulated and unregulated Plan areas so are indicative.

¹¹⁸ Data includes people employed in the primary production of agriculture but not the vast workforce within the key secondary industries. They do not include employees that were hired on a seasonal basis but not working in the Lower Murray at the time of the census.

¹¹⁹ DPI (2020) *Agriculture Industry Snapshot for Planning Lower Murray Sub Region*. Available at: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/1260490/Lower-Murray-Snapshot.pdf.

¹²⁰ DPI (2020) *Agriculture Industry Snapshot for Planning Far West Sub Region*. Available at: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0008/1275380/Far-West-Snapshot.pdf.

¹²¹ Destination NSW (2021) *Murray NSW September 2020*. Available at: <https://www.destinationnsw.com.au/wp-content/uploads/2021/02/outback-nsw-visitor-profile-ye-sep-2020.pdf>.

Population and housing

Based on 2019 data, the four LGAs most relevant to the Lower Murray-Darling Plan (Balranald, Broken Hill, Central Darling and Wentworth) had a combined population of 28,499, representing 1.0 percent of the total estimated population of regional NSW.¹²² Since 2011, the population of the City of Broken Hill has declined by nine percent, while the populations of the other LGAs have remained fairly stable.¹²³

The *Far West Regional Economic Development Strategy* projects that populations for Broken Hill and the Central Darling will decline by 13.7 percent from 2011 to 2036, noting mining and extreme events can trigger fluctuations in population levels across years.¹²⁴

There is low population density across these LGAs, ranging from 0.001 to 0.003 persons per hectare in each LGA, except for the City of Broken Hill, which has 1.0 person per hectare.¹²⁵ There are also declining household numbers. There were 11,016 households across the four LGAs in 2016, about 750 fewer than there were ten years prior in 2006.¹²⁶

Aboriginal and Torres Strait Islander people comprise between 8-40 percent of the population of the LGA areas (**Table 8**). This is much higher than the state average of 2.9 percent or rural areas of NSW at 3.7 percent in 2016.¹²⁷

Table 8: Aboriginal and Torres Strait Islander percentage of total population, Lower Murray Darling LGAs 2011 and 2016

LGA	Proportion of population who are Aboriginal and/or Torres Strait Islander ¹²⁸	
	2011 (%)	2016 (%)
Balranald	6.8	8.7
City of Broken Hill	7.5	8.5
Central Darling	38.1	39.6
Wentworth	10.3	9.6

¹²² Australian Bureau of Statistics (2021) *Regional Summaries by LGA*. Available at: <http://stat.data.abs.gov.au/> and <https://dbr.abs.gov.au/region.html?lyr=lga&rgn=10950> and *idProfile (2021) Population Summaries*. Available at: <https://profile.id.com.au>.

¹²³ Australian Bureau of Statistics (2021) *Estimated Resident Population by LGA 2001-2019*. Available at: https://stat.data.abs.gov.au/Index.aspx?DataSetCode=ABS_ERP_LGA2019.

¹²⁴ Balmoral Group Australia (2018) *Far West Regional Economic Development Strategy*. Available at: <https://www.nsw.gov.au/sites/default/files/2020-06/Far%20West%20C2%A0REDS.pdf>.

¹²⁵ Australian Bureau of Statistics (2021) *Regional Summaries by LGA*. Available at: <http://stat.data.abs.gov.au/> and <https://dbr.abs.gov.au/region.html?lyr=lga&rgn=10950> and *idProfile (2021) Population Summaries*. Available at: <https://profile.id.com.au>.

¹²⁶ Australian Bureau of Statistics (2021) *Census Time Series 2016, 2011, 2006: T23 Household Composition by Number of Persons Usually Resident (LGA) and Census Time Series 2016, 2011, 2006: T24 Dwelling Structure by Dwelling Type (LGA)*. Available at: <http://stat.data.abs.gov.au/#>.

¹²⁷ Australian Bureau of Statistics (2021) *Estimated Resident Population by LGA 2001-2019*. Available at: https://stat.data.abs.gov.au/Index.aspx?DataSetCode=ABS_REGIONAL_LGA2020.

¹²⁸ Australian Bureau of Statistics (2021) *Estimated Resident Population by LGA 2001-2019*. Available at: https://stat.data.abs.gov.au/Index.aspx?DataSetCode=ABS_REGIONAL_LGA2020.

3 Cross-border water resource development significantly impacts Intersecting Streams

Five of the water sources in the Intersecting Streams Plan area originate in Queensland. They include the Paroo, Warrego, Culgoa, Narran and Moonie rivers. The amended Intersecting Streams Plan acknowledges the importance of connectivity by including a new targeted environmental objective to protect and contribute to the enhancement of 'longitudinal and lateral connectivity within and between water sources to support target ecological processes'.¹²⁹ It further indicates that connectivity encompasses flows reaching wetlands of national and international significance and notes that 'connectivity may be between water sources in this Plan and connected water sources in Queensland'.¹³⁰

Water resource development in some of the Queensland catchments has had significant impacts on downstream flows into NSW. While outside of the control of the Intersecting Streams Plan, upstream water extraction poses a significant risk to environmental, social and economic values in the NSW Intersecting Streams and downstream.

The Intersecting Streams Plan can still deliver some outcomes in the Plan area and contribute to outcomes in downstream plan areas such as the Barwon-Darling, but the extent to which these outcomes can be delivered is limited without adequate recognition of connectivity with and protection of flows from Queensland.

Key cross border issues include:

- water resource development in Queensland has considerable impacts on flows into the Intersecting Stream Plan area and the Barwon-Darling (**Section 3.1**)
- the Queensland water sharing rules are based on protecting a percentage of average annual flow and do not adequately protect low flows (**Section 3.2**)
- the potential development of interstate trade poses a risk that additional water could be traded upstream, further exacerbating current impacts on the NSW Intersecting Stream Plan area (**Section 3.3**)

A whole-of-catchment planning approach should be adopted to support Plan outcomes and recognise the importance of system scale connectivity. This should be supported by stronger governance arrangements for cross-boundary issues and improved coordination of relevant NSW, Queensland, and Australian government agencies (**Section 3.4**).

In addition to addressing cross-border issues to support system scale connectivity, there are several opportunities to improve the management of connected water sources within the Plan area. These issues are discussed in **Section 5.1**.

While this chapter focusses on the impacts of upstream extraction in Queensland on water availability in the NSW Intersecting Streams Plan, the Commission also recognises that the Intersecting Streams Plan does not currently protect held environmental water once it crosses the border from Queensland into NSW. This issue is discussed further in **Section 5.4**.

¹²⁹ Clause 9(2)(b) of the Intersecting Streams Plan.

¹³⁰ Notes under Clause 9(2)(b) of the *Water Sharing Plan for the Intersecting Streams Unregulated River Water Sources 2011*.

3.1 Development in Queensland significantly impacts flows in NSW

A significant factor influencing the flow regime (and connectivity) in the Intersecting Streams Plan area is the extent of water resource development that has occurred upstream in Queensland, most notably in the Culgoa, Narran and Condamine Balonne rivers over the last few decades.¹³¹ This was identified in the risk assessment undertaken to inform the development of the Water Resource Plan for the Intersecting Streams.¹³²

Queensland water sharing rules are designed to protect a certain percentage of long-term average annual flow into NSW under the Queensland Border Rivers and Moonie, Condamine and Balonne, and the Warrego, Paroo, Balloo and Nebine water plans and associated water management protocols. Several changes were made to these plans during the development of water resource plans required as part of the Basin Plan. All Queensland water resource plans have been accredited by the Commonwealth Water Minister.

While it is difficult to compare¹³³ the long-term average annual extraction without numeric LTAAELs in NSW, a comparison of water entitlements in the NSW Intersecting Streams water sources (which represents the maximum allowable extraction) against estimated upstream river extraction in Queensland provides insights into the relative scale of potential extraction between states (**Table 9**). Water extraction in NSW accounts for a relatively small proportion of total extraction, with overall NSW entitlements accounting for less than five percent of total extraction.

In most cases, the level of licensed entitlement in the NSW Intersecting Streams Plan is relatively small compared to extraction upstream in Queensland. The exception is the Warrego River, where up to one third of entitlement is held within NSW. Over 80 percent of the NSW Warrego entitlement is held by the CEWH, which is associated with environmental holdings at Toorale (see **Section 5.2**).¹³⁴ Usage in Queensland for the Paroo River was not estimated at the same time as the other figures.

¹³¹ MDBA (2016) *Lower Balonne Floodplain grazing model report*. Murray Darling Basin Authority, Canberra. MDBA publication no.: 38/16

¹³² DPIE-Water (2019) Risk Assessment for the Intersecting Streams Water Resource Plan Area (SW13): Part 1. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0011/236477/intersecting-streams-risk-assessment.pdf.

¹³³ Extraction in the NSW and Queensland portions of the Intersecting Streams catchments cannot be directly compared, as Queensland's management units don't align with NSW, and they use different methodologies for limiting use. Queensland focuses on measuring usage and adjusts entitlement as needed, whereas NSW focuses on fixing entitlement rather than measurement of usage. As a result, the Commission could not identify data allowing direct comparison of actual usage within both states.

¹³⁴ Total licenced entitlement in the NSW Warrego water source listed on the NSW Water Register is 21,624 ML per year (assuming available water determination of 100 percent for unit shares). Data available at: <https://waterregister.watarnsw.com.au/water-register-frame>.

Table 9: Comparison of licenced river extraction from Intersecting Streams water sources¹³⁵

Water Source**	Catchment	NSW plans' Entitlement ¹³⁶	Estimated extraction in Queensland ¹³⁷	Estimated percentage of total extraction in NSW (%) ¹³⁸
Moonie River	Moonie	1,047 unit shares 16 ML per year	33,000 ML/year	<3
Narran River	Condamine – Balonne (includes Narran and Culgoa)	8,834 unit shares 39 ML/year	713,000 ML/year	<1.6
Culgoa River (includes Nebine)	Nebine	2,979 unit shares 146.5 ML/year		
Warrego River	Warrego	9,432 unit shares 12,150 unit shares 42.5 ML/year	45,000 ML/year	32 ¹³⁹
Total		36,000 ML/year	797,000 ML/year	4.5

The level of water resource development upstream in Queensland in recent decades has substantially altered the flow regime of waterways in the NSW Intersecting Streams, including the volume, frequency and duration of flows.¹⁴⁰ The scale of development, combined with recent drought has resulted in a significant decrease in water passing downstream into NSW, with flow in some years likely to be under the long-term average flow.¹⁴¹ **Table 10** shows the estimated impacts of extraction in Queensland on water sources that form part of the Intersecting Streams Plan area.

¹³⁵ Paroo was not included as estimates were not made for this source with the other water sources.

¹³⁶ In NSW, unregulated licences are described as unit shares; unless the available water determination is changed from 100 percent, each share receives 1 ML per year. Town water supplies and domestic and stock licences are described in ML per year.

¹³⁷ Queensland extraction is estimated using the baseline diversion limit from Schedule 3 in the Basin Plan, which includes diversions from watercourses and floodplain harvesting (excluding basic rights) (see Schedule 3 *Basin Plan 2012*. Available at: <https://www.legislation.gov.au/Details/F2012L02240>).

¹³⁸ To make a comparison between NSW entitlements and estimated Queensland extraction, the AWD for unregulated licences was assumed as 100 percent. However, the Commission understands that for the unregulated take is normally below 100 percent.

¹³⁹ The majority of the entitlement in the NSW Warrego is environmental water holdings.

¹⁴⁰ DPIE EES (2020) *Intersecting Streams Long Term Water Plan Part A and B*. Available at: <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Water/Water-for-the-environment/long-term-water-plans/intersecting-streams-long-term-water-plan-parts-a-b-200015.pdf>

¹⁴¹ MDBA (2016) *Lower Balonne Floodplain grazing model report*. Murray Darling Basin Authority, Canberra. MDBA publication no: 38/16.

Table 10: Comparison of upstream impacts from flow diversion, protection of annual flow, and existence of flow targets by water source in the Intersecting Streams Plan

Intersecting Streams Plan Water Source	Type of upstream river	Percentage of annual flow diverted ¹⁴²	Percentage of annual flow protected
Moonie River	Unregulated		70% of the average pre-development flow ¹⁴³
Narran River	Regulated	53% of available surface water was extracted for use annually ¹⁴⁴	
Culgoa River	Regulated		
Warrego River	Unregulated	8% of total inflows ¹⁴⁵	87% of the average 'without development' flow ¹⁴⁶
Paroo River	Unregulated	1%	99%

Impacts from extraction in Queensland are largest in the Culgoa, Narran and Condamine Balonne rivers. A summary of issues for each key water source is outlined in **Table 11**. Given the Intersecting Streams are recognised as being connected with the Barwon-Darling, reduced inflows associated with a changing climate, as well as water resource development, also impact on this system.

Stakeholders raised concerns that water management in Queensland has a fundamental impact on environmental, social and economic outcomes in the Plan area and further downstream:

*'Biophysical processes and activities outside the boundaries of the plan's area can be influential to the health of both the natural and human community in the area.'*¹⁴⁷

*'The basic weakness of the Plan is that it is totally dependent on what water Queensland allows to come over the Border under Queensland Water Plans, now accredited by the Commonwealth Minister for Water.'*¹⁴⁸

DPIE-Water's Intersecting Streams water resource plan risk assessment also acknowledges these risks.¹⁴⁹ For example, the influence of water development in Queensland was explicitly identified as impacting the base flows of several water sources, including the Culgoa, Moonie, Narran and Warrego. These impacts were reported as outside the control of the NSW water sharing plan:

*'Base flows cannot be managed as the impact includes upstream extraction or water diversion in the Queensland portion of this water source.'*¹⁵⁰

¹⁴² MDBA (2011) *Water resource assessments for without-development and baseline conditions*. Murray-Darling Basin Authority Technical Report 2010/20. Available at: <https://www.mdba.gov.au/sites/default/files/pubs/1111-BPKId-water-resource-assessments-development-baseline.pdf>

¹⁴³ *Water Plan (Moonie) 2003* (Queensland). Available at: <https://www.legislation.qld.gov.au/view/pdf/inforce/2016-12-06/sl-2003-0319>

¹⁴⁴ CSIRO (2008) *Water availability in the Condamine-Balonne*. A report to the Australian Government from the CSIRO Murray-Darling Basin Sustainable Yields Project. CSIRO, Australia.

¹⁴⁵ Note: the Queensland WRP protects 87% of the annual average flow in the Warrego River, which means that it allows for growth in the upstream take from 8% up to a 13% diversion of annual average inflows

¹⁴⁶ *Warrego-Paroo-Nebine Water Resource Plan 2016*. Available at: <https://www.mdba.gov.au/publications/policies-guidelines/water-resource-plan-warrego-paroo-nebine>

¹⁴⁷ Submission: Individual, received 18 December 2020

¹⁴⁸ Submission: Individual, received 17 December 2020

¹⁴⁹ DPIE (2019) *Risk assessment for the Intersecting Streams Water Resource Plan (SW13)*. Available at: <https://www.mdba.gov.au/publications/mdba-reports/intersecting-streams-water-resource-plan>.

¹⁵⁰ DPIE (2019) *Risk assessment for the Intersecting Streams Water Resource Plan (SW13)*, p 92. Available at: <https://www.mdba.gov.au/publications/mdba-reports/intersecting-streams-water-resource-plan>

The risk assessment also indicated that the timing and duration of freshes and large flow events in the NSW portion of the Intersecting Streams Plan area had been altered due to water development in Queensland.

Table 11: Key impacts from upstream extraction for Intersecting Streams water sources

Intersecting Streams Plan Water Source	Key impacts
Moonie River	<p>The Moonie is unregulated both in Queensland and NSW. Most of the catchment (98 percent) is situated in Queensland. The volume of water that crosses the Queensland border was required under the <i>Water Plan (Moonie) 2003</i> to be not less than 70 percent of the predevelopment flow pattern value.¹⁵¹ The Queensland hydrologic model (IQQM) is used to check that this requirement was met on average. As this is an average, the extent of extraction during dry periods will be greater than the 30 percent average.</p> <p>The Moonie Water Resource Plan now has held environmental water (5,671 ML) in addition to the 70 percent of protected water, which is required to be passed through to NSW. This additional water for the environment should be protected through active management within NSW, which is allowed under the Plan rules. However, this currently only occurs through temporary water restrictions by order under Section 324 of the Act (see Section 5.4).</p>
Narran and Culgoa rivers	<p>The Narran and Culgoa Rivers are distributary streams¹⁵² of the Condamine-Balonne. A 2006 study in the Condamine-Balonne catchment estimated that development of irrigation enterprises and related water extraction had reduced flows crossing into NSW since 1993 by as much as 50 percent.¹⁵³ CSIRO¹⁵⁴ reported in 2008 that on average 53 percent of available surface water was extracted for use annually, which is extremely high compared with other catchments in the Basin. These flow changes are associated with small public regulated water schemes (such as the Condamine–Balonne) and in-stream weirs with diversions to private infrastructure. These developments have not only reduced the volume, but also the duration, magnitude, and frequency of flows that support in-stream and floodplain communities, and terminal wetlands such as Narran Lakes.^{155, 156} Low flow regimes have also been affected in some areas, including an increase in the percentage of time with no flow and the maximum period between events that refill waterholes and re-establish hydrological connectivity throughout the system.^{157, 158}</p>

¹⁵¹ *Water Plan (Moonie) 2003* (Queensland). Available at:

<https://www.legislation.qld.gov.au/view/pdf/inforce/2016-12-06/sl-2003-0319>

¹⁵² A distributary stream is a branch of a river that flows away from the main stream.

¹⁵³ SMEC (2006) *Lower Balonne Scoping Study – Hydrology Review*. Final report to the Western Catchment Management Authority, North Sydney. Available at:
http://archive.lis.nsw.gov.au/__data/assets/pdf_file/0009/496638/archive-lower-balonne-scoping-study-hydrology-component.pdf.

¹⁵⁴ CSIRO (2008) *Water availability in the Condamine-Balonne*. A report to the Australian Government from the CSIRO Murray-Darling Basin Sustainable Yields Project. CSIRO, Australia.

¹⁵⁵ CSIRO (2008) *Water availability in the Condamine-Balonne*. A report to the Australian Government from the CSIRO Murray-Darling Basin Sustainable Yields Project. CSIRO, Australia.

¹⁵⁶ NSW Office of Water (2011) *Water Sharing Plan for the Intersecting Streams Unregulated and Alluvial Water Sources – Background document*.

¹⁵⁷ DPIE (2018) *Intersecting Streams Long Term Water Plan Parts A and B*. Sydney. Available at:
<https://www.mdba.gov.au/publications/mdba-reports/intersecting-streams-water-resource-plan>

¹⁵⁸ Queensland Department of Science, Information Technology and Innovation (2015) *Waterhole refuge mapping and persistence analysis in the Lower Balonne and Barwon–Darling rivers*. Available at:
<https://www.mdba.gov.au/publications/independent-reports/waterhole-refuge-mapping-persistence-analysis-lower-balonne-barwon>.

Intersecting Streams Plan Water Source	Key impacts
Warrego River	The Warrego is unregulated both in Queensland and NSW. The Queensland <i>Warrego-Paroo-Nebine Water Resource Plan 2016</i> indicates that at least 87 percent of the average 'without development' flow into New South Wales is maintained. ¹⁵⁹ The level of entitlement in Queensland is twice that of NSW.
Paroo River	The Paroo is unregulated in both Queensland and NSW. According to the 2016 Queensland Water Resource Plan for the region, the Paroo catchment average end-of-system flow (assuming full usage of entitlements) is estimated to be just one per cent less than the flows experienced in the system prior to any water resource development.

3.1.1 Environmental impacts

Many stakeholders are concerned about the amount of extraction in Queensland and the implications this has in the NSW Intersecting Streams Plan area:

*'The rules need improving but the greater issue is what is coming across the border. We have no influence up there. No matter how good NSW rules are we are at the whim of what happens in Queensland.'*¹⁶⁰

Decreased hydrological connectivity, which may be attributed in part to upstream water resource development, threatens species and ecological processes where the period between refreshment increases beyond species' life-cycle capabilities, such as egg persistence in sediment or individual persistence in shallow water, mud or sediment. For example, the composition of fish communities in the Warrego River is strongly linked to hydrological connectivity. A 2006 study found that fish assemblages in isolated waterholes of the Warrego were differentiated at the end of a dry winter period but were relatively similar following high summer flows as a result of high hydrological connectivity.¹⁶¹

Reduced downstream extent of flows will limit species movement opportunities and could lead to community isolation and reduction in extent, threatening local or regional extinction. Studies into the movement, condition and recruitment success of fish in the Moonie, Narran, Culgoa and Warrego rivers suggest that small to large fresh events are important to stimulate fish to move through these river systems and access different habitats to feed and breed. A recent study identified a flow level of two metres above the cease-to-flow level in the mid reaches of the Moonie River as an important threshold for cueing the movement of both golden perch and eel-tailed catfish (*Tandanus tandanus*).¹⁶²

Interception activities, such as floodplain harvesting in Queensland, pose a risk to overbank flows in NSW. Reduced overbank flows are likely to have the greatest impacts on floodplain and wetland environments and the broader Barwon-Darling system, reducing:

- habitat quality
- floodplain vegetation community condition and extent

¹⁵⁹ *Warrego-Paroo-Nebine Water Resource Plan 2016*. Available at: <https://www.mdba.gov.au/publications/policies-guidelines/water-resource-plan-warrego-paroo-nebine>

¹⁶⁰ Interview: EES, 8 July 2021.

¹⁶¹ Balcombe, S., Arthington, A., Foster, N., Thoms, M., Wilson, G., and Bunn, S. (2006) Fish assemblages of an Australian dryland river: abundance, assemblage structure and recruitment patterns in the Warrego River, Murray–Darling Basin. *Marine and Freshwater Research*, 57(6), pp. 619-633.

¹⁶² Marshall, J., Menke, N., Crook, D., Lobegeiger, J., Balcombe, S., Huey, J., Fawcett J, Bond N, Starkey, A. and Sternberg, D. (2016) 'Go with the flow: the movement behaviour of fish from isolated waterhole refugia during connecting flow events in an intermittent dryland river'. *Freshwater Biology*, 61(8), pp. 1242-1258.

- boom opportunities for floodplain and wetland specialist species such as: micro- and macro-invertebrates, key fish species and water birds
- overall flows in the broader Barwon-Darling.

3.1.2 Social and economic impacts

The current water sharing arrangements have resulted in inequities between users in Queensland and NSW. The approved water resource plan rules in the Queensland plan leave a considerable lack of reliability for NSW users and are viewed as inequitable by many NSW stakeholders. These risks could be further exacerbated by trade upstream (discussed further in **Section 3.3** below).

Stakeholders indicated that licensees lack the confidence to invest because of the extent of Queensland development:

*'Anyone who had any intention of developing, once they saw what Queensland was allowing it was considered a poor investment to expand downstream. We did wait for the Basin Plan thinking it might change things around a bit. We have realised it won't change it enough.'*¹⁶³

The Commission recognises the complexity of transboundary river management. However, it is essential that equity between users is considered to ensure perverse outcomes aren't experienced by NSW users.

To address equity concerns, the NSW Government is encouraged to work with the Commonwealth to reclaim entitlement from any willing sellers within the NSW area of the catchment and remove that entitlement from the system and amend the extraction limit. This would provide an economic opportunity for NSW users impacted by the upstream rules, reduce risks from potential upstream trade in the future, and alleviate the CEWH concerns about protection of environmental water, by ensuring that there is no further erosion of reliability in NSW rivers due to upstream trade.

3.2 Upstream plans do not adequately protect low flows into NSW Intersecting Streams

The Queensland water sharing rules are based around ensuring an average annual percentage is allowed to be taken from the system and mainly focus on moderate to high flows. The upstream plans do not sufficiently protect low flows into NSW Intersecting Streams. For example, the Water Accounting Methods Report for the *Queensland Border Rivers – Moonie Water Resource Plan 2019*¹⁶⁴ states in the Moonie Water Management Area there are:¹⁶⁵

- 10 water licences (referred to as allocations in the Queensland plans) without flow conditions
- 26 licences with flow conditions
- 5 licences with maximum rate of take conditions

¹⁶³ Interview: Community Group, 13 July 2021.

¹⁶⁴ *Queensland Border Rivers – Moonie Water Resource Plan 2019*. Available at: <https://www.mdba.gov.au/publications/mdba-reports/queensland-border-rivers-moonie-water-resource-plan>.

¹⁶⁵ Queensland Department of Natural Resources, Mines and Energy (2019) *Water accounting methods report – Queensland Border Rivers-Moonie Water Resource Plan*. Available at: https://www.mdba.gov.au/sites/default/files/pubs/qlld-border-rivers-moonie-water-accounting-methods-report-2019_0.PDF.

- approximately 60 notified storages undertaking floodplain harvesting that are limited by specified works existing as of June 2001.

Licences without flow conditions typically allow the user to take water at low rates at any time. These are often located on natural water holes. Licences that do have flow conditions, have conditions that focus on placing limitations on extraction during moderate to high flows and do not generally place restrictions on low flow access. The Moonie Water Resource Plan therefore does not sufficiently protect low flows into NSW.

Queensland and NSW have separately developed LTWPs that cover portions of the Intersecting Streams. These plans have not been developed collaboratively to ensure that environmental flows are consistently and appropriately targeted at a catchment level. The relationship between planning instruments across the Intersecting Streams catchment is complex. **Figure 7** and **Figure 8** show the relationship of the NSW Intersecting Streams with the Queensland Water Resource Plans and Water Plans, noting the LTWPs have similar boundaries as the Water Resource Plans. The Intersecting Streams catchment area contains considerable environmental assets, including several nationally significant and Ramsar listed wetlands, which are at risk under current flow conditions (as discussed in **Section 2.4.1**). NSW should work with Queensland to agree upon appropriate flow targets, including for low flows, based on the latest available data and these should be incorporated into the water sharing plan.

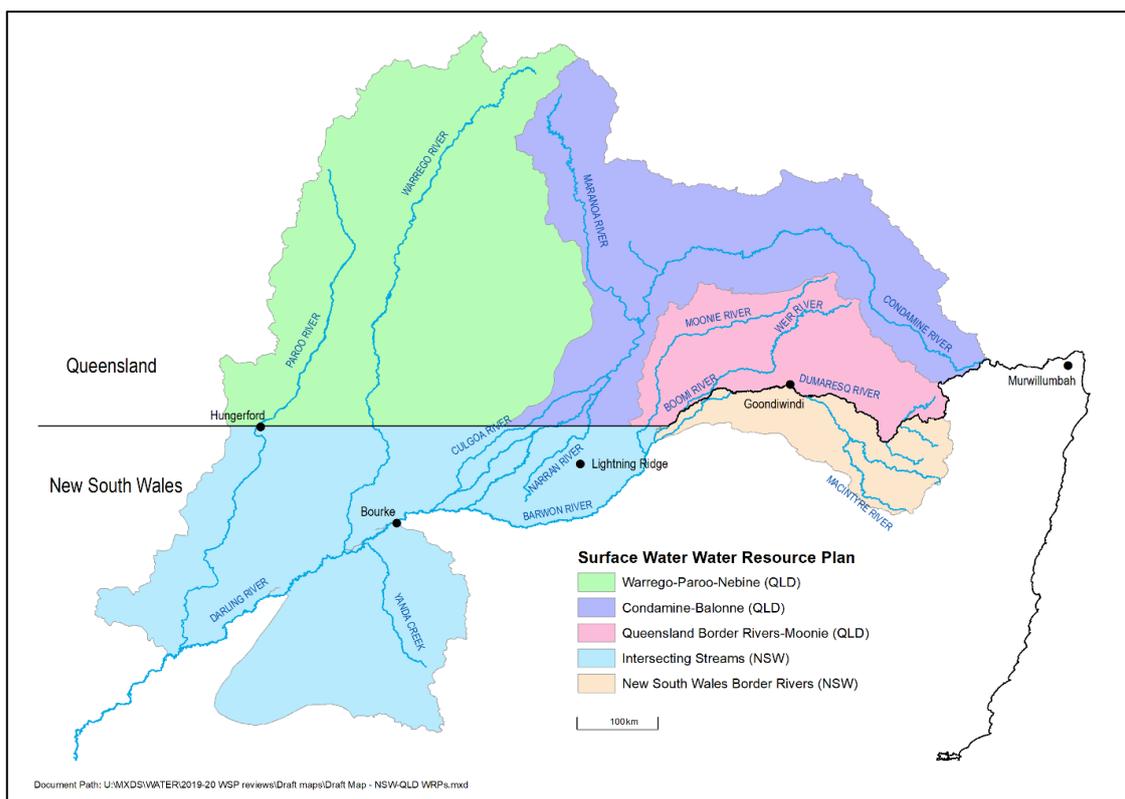


Figure 7: NSW Intersecting Streams water resource plan relationship with Queensland WRPs

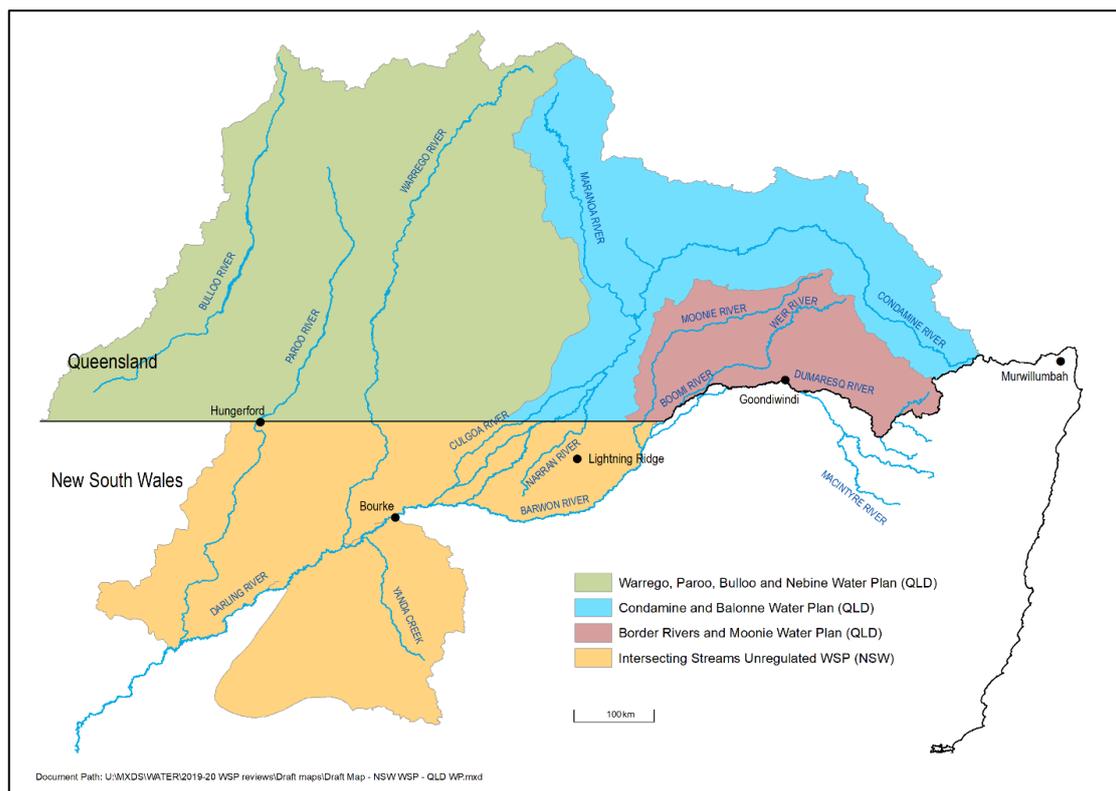


Figure 8: NSW Intersecting Streams Plan relationship with Queensland water plans

3.3 Interstate trade could increase extraction in Queensland

The Commission recognises that in line with the Basin Plan interstate trade is encouraged. However, for the Intersecting Streams Plan area, this could lead to perverse outcomes.

The Basin Plan sets out requirements for Basin States to support interstate trade and remove trade restrictions that are inconsistent with the Basin Plan. In its submission to the review of the Intersecting Streams Plan, the MDBA indicated that the current Plan is inconsistent with the Basin Plan because it doesn't allow for interstate trade:

*'The MDBA has raised issues with NSW since 2015 about the consistency of water trade arrangements in the Intersecting Streams WSP with the Basin Plan water trading rules. These issues should be addressed as a priority.'*¹⁶⁶

Unlike the Border Rivers, there are currently no interstate trade arrangements between NSW and Queensland for the Intersecting Streams. The amended Intersecting Streams Plan does not currently allow for interstate trade, but states that NSW and Queensland will consider introducing a cross border trading framework, if and when demand increases to a level that justifies the investment in administrative resources.¹⁶⁷ In its assessment of the Basin Plan, the Productivity Commission reported that the Queensland Government is monitoring demand for interstate trade and has a process for establishing an interstate market.¹⁶⁸ The Commission notes that DPIE-Water has indicated that at this time there is limited demand for interstate trade.

¹⁶⁶ Murray-Darling Basin Authority submission to the review of the Intersecting Streams Water Sharing Plan, December 2020.

¹⁶⁷ See note to Clause 63 of the Intersecting Streams Plan.

¹⁶⁸ Productivity Commission (2019) *Murray-Darling Basin Five year Assessment*, p. 254: Available at: <https://www.pc.gov.au/inquiries/completed/basin-plan/report>.

There are risks posed to the NSW Intersecting Streams if an interstate market were established largely due to the potential for water to trade upstream and potential risks this could pose for meeting environmental needs and access by other users. This concern was raised in stakeholder submissions and interviews. Stakeholders including the Commonwealth Environmental Water Holder are concerned that interstate trade will lead to increased diversions in upstream reaches in Queensland, further impacting flows downstream:¹⁶⁹

'The CEWH is concerned that trade of licences into Queensland may potentially lead to reduced water availability and reliability of unregulated access licences in the Intersecting Streams WRP area; this includes Commonwealth held licences on the Warrego River at Toorale.

*Any provisions introduced within the unregulated WSP to implement Basin Plan trade rules should include a mechanism for considering restrictions to protect the reliability of existing water licence holders and to ensure that the operation of the WSP does not compromise environmental watering requirements.'*¹⁷⁰

The water resource plan risk assessment did not assess risks associated with interstate trade. The Commission understands from stakeholder engagement for the review there is currently little to no appetite from licence holders in NSW Intersecting Streams Plan area for interstate trade.^{171, 172} However, this may change over time and associated risks need to be considered by DPIE-Water.

If an appetite for interstate trade emerged, there would need to be clear principles and processes that considered risks to the environment and downstream users, similar to trade arrangements in place within NSW. Tagging of licences sold upstream from NSW to Queensland would ensure that any restrictions that would have been placed on the downstream users under water sharing plan rules apply to the upstream user who purchases the licence. However, the Commission notes that the MDBA rules currently only allow for tagging within regulated rivers. Therefore, rules would need to somehow ensure that there are no unacceptable impacts on NSW water sources from any trades upstream. The Commission acknowledges that such rules would be difficult to establish and administratively complex. As such it is essential that Plan provisions are included that clearly indicate how any potential upstream trade will be assessed to ensure there are no unacceptable downstream outcomes.

3.4 Cross-border governance arrangements should support whole-of-catchment planning

A whole-of-catchment planning approach should be adopted to support Plan outcomes. While outside of the control of the Intersecting Streams Plan, the impacts of upstream extraction in Queensland pose a significant risk to environmental, social and economic values in the NSW Intersecting Streams. The extent to which outcomes with the Plan area and downstream plans can be delivered is limited without adequate protection of flows from Queensland.

The NSW Government should work collaboratively with the Queensland and Commonwealth governments to establish outcome-focused management strategies and water sharing rules, that protect critical flows for environmental purposes and essential community needs.

The Commission recognises the complexity of transboundary river management and governance arrangements in the Murray-Darling Basin. This was highlighted in a recent review

¹⁶⁹ CEWO submission, January 2021.

¹⁷⁰ CEWO submission, January 2021.

¹⁷¹ Submission: CEWH, received 11 January 2021.

¹⁷² Interviews: Industry group, 9 August 2021; Community group, 13 July 2021; Community Group, 26 July 2021.

of Murray-Darling Basin joint governance arrangements published in 2019.¹⁷³ The Murray-Darling Basin Ministerial Council instigated the review in 2018 to improve the efficiency and effectiveness of the governance arrangements for the Murray-Darling Basin. While the review did not look at the Intersecting Streams in detail, it highlighted the need at a strategic level to focus on outcomes, which is highly relevant to the transboundary rivers of the Intersecting Streams:

*'Have a framework with the ability to bring all relevant senior officials together efficiently to consider issues and to make decisions with a focus on outcomes and impact, while still being in line with their respective governance responsibilities.'*¹⁷⁴

For transboundary rivers like those in the Intersecting Streams, there is an opportunity for both New South Wales and Queensland governments to consider more holistically what are the shared environmental, social and economic outcomes to be achieved at the valley scale and further downstream. A coordinated approach is important for meeting Basin Plan requirements, but also other commitments such as obligations under the Ramsar Convention (see also **Section 5.2**).

Since the joint governance review was completed, the governance arrangements for environmental water management in the northern Basin have evolved as part of amendments to the *Intergovernmental Agreement on Implementing Water Reform in the Murray Darling Basin 2013* (the IGA).¹⁷⁵ Changes to the IGA in August 2019 aim to improve environmental outcomes for the northern Basin. Amendments relevant to the Intersecting Streams Plan include:

- agreement on a mechanism for coordinated planning and delivery of environmental water across the northern Murray-Darling Basin. The terms of reference for this group are to be consistent with the findings of the joint governance review.
- Queensland agreeing to implement rules in its water plans to protect environmental water that contributes to downstream environmental outcomes
- a requirement for Queensland to work with NSW in developing methods and protocols for cross-border accounting of held environmental water crossing the Queensland-NSW border by December 2024.¹⁷⁶

In accordance with the IGA, the Northern Basin Environmental Watering Group was established in November 2019.¹⁷⁷ The group is comprised of officials from the Commonwealth Environmental Water Office, the Murray-Darling Basin Authority, and NSW and Queensland agencies, and is responsible for coordinating the planning and delivery of environmental water. The Commission understands NSW agency representation is limited and should be expanded, for example, DPI-Fisheries is not currently a participant.

Formalising interim arrangements from previous coordinated environmental watering events,¹⁷⁸ it could be a forum for improving environmental outcomes in the transboundary rivers of the Intersecting Streams, including discussions regarding shared environmental targets. However, accountability for these shared targets would ideally be built into the respective state water planning instruments (water plans in Queensland and water sharing plans in NSW, and relevant

¹⁷³ Claydon, G (2019) *Independent review of Murray-Darling Basin joint governance arrangements*, p.42. Available at: <https://www.mdba.gov.au/sites/default/files/pubs/Review-of-MDB-joint-governance-arrangements-final-report.pdf>.

¹⁷⁴ *Ibid.*

¹⁷⁵ The IGA is referenced in the amended Intersecting Streams Plan, including an amendment provision to give effect to the agreement (Clause 78 (3)).

¹⁷⁶ This may require changes to the NSW water sharing plans as well as amendments to accredited Queensland Water Resources Plans and component water plans and water management protocols.

¹⁷⁷ MDBA (2020) *Northern Basin projects – coordinating water for the environment*. Available at: <https://www.mdba.gov.au/basin-plan/northern-basin-projects>.

¹⁷⁸ *Ibid.*

Water Resource Plans across the Basin), and not be left to being met solely through held environmental water.

In addition, further consideration should be given to the role of the Dumaresq-Border Rivers Commission. The operating area of the Commission includes the Intersecting Streams¹⁷⁹ and its statutory duties and functions include provision of recommendations regarding the sharing of water of the Intersecting Streams. On this basis, there is potential for the Dumaresq-Border Rivers Commission to also be used as a forum to facilitate the equitable sharing of water between NSW and Queensland and the coordinated protection of flows for environmental and social outcomes.

3.5 Recommendations

R 2 – Intersecting Streams Plan	<p>When remaking the Plan, to enhance cross-border management of flows, the NSW Government should:</p> <ul style="list-style-type: none">a) leverage existing governance arrangements between NSW, Australian and Queensland governments to establish agreed end of system flow targets to protect nationally significant and Ramsar wetlands and Barwon-Darling River water sourcesb) incorporate requirements for flow targets consistent with the Plan’s environmental objectivesc) ensure that if allowed in the future, any upstream trading, including interstate trades, does not disadvantage the environment or water users in the section between where the water is traded from and where it is traded to.
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¹⁷⁹ As defined in ‘Supplementary Schedule The Amending Agreement’ under the *New South Wales – Queensland Border Rivers Act 1947*. Intersecting Streams means the Moonie, Bokhara, Narran, Culgoa, Ballandool, Warrego and Paroo Rivers and the effluents and tributaries thereof and any stream or watercourse which forms part of the Darling River drainage system and crosses the New South Wales—Queensland border west of the town of Mungindi. Available at: <https://legislation.nsw.gov.au/view/html/inforce/current/act-1947-010#sec.4>.

4 Ensuring sustainable extraction

A central role of a water sharing plan is to specify the amount of water available for the environment and for extraction both by licensed users and under basic rights. Water sharing plans do this by establishing LTAAELs.

Setting appropriate LTAAELs is important for the proper functioning of water sharing plans. Limits that are too high will reduce the amount of water remaining for the environment and downstream water users, while limits that are too low reduce economic, social, and cultural opportunities from water use. The Basin Plan has adopted parts of the LTAAELs to establish the Baseline Extraction Limit. There are differences between these two estimates that need to be addressed. The most significant difference between the two estimates is the interception of overland flow particularly the unquantified take that is not considered as floodplain harvesting.

The Basin Plan sets sustainable extraction limits called the Sustainable Diversion Limits (SDLs) that apply to various geographic areas.¹⁸⁰ The SDLs must be met based on estimates of the amount of extraction prior to the Basin Plan, called the Baseline Diversion Limit (BDL), less reduction achieved by water purchase programs and other works and measures set out in the Basin Plan.^{181, 182}

The Commission is of the view that to meet the requirements of the Act, there is a need to consider sustainable levels of extraction at scales smaller than those considered for the SDL for both Plans. Water sharing plans are responsible for ensuring ecologically sustainable levels of extraction at appropriate scales for protecting water sources, their dependent ecosystems and landholder rights. This includes establishing LTAAELs at the sub-catchment scale and the establishment of a bulk access regime to manage water. For the Lower Murray-Darling Plan, the Murray-Darling Basin SDLs includes the both the Lower Murray-Darling regulated and unregulated plans, whereas the Plan LTAAEL is for the unregulated system only.¹⁸³ For the Intersecting Streams Plan, the SDL covers the same area as the Plan. However, LTAAELs are established for each water source within the Plan area.

Once LTAAELs have been established, compliance assessments of actual extractions against LTAAELs can be undertaken. The Plan provides that, in cases where the average annual extraction over the preceding three years exceeds the LTAAEL by five percent or more, future extractions can be managed through reductions in available water determinations (AWDs). The Commission notes that annual SDL compliance is required by the MDBA. However, it is understood that SDL compliance reports for the Plan areas are not based on actual annual usage, but rather on a historic estimate of take. Accurate estimate of actual usage against the LTAAEL is necessary to ensure protection of planned environmental water through adjustment of AWDs.

¹⁸⁰ MDBA (2020) *Sustainable diversion limit (SDL) accounting framework improvement strategy 2020 – 2025*. Available at: <https://www.mdba.gov.au/sites/default/files/pubs/Sustainable%20diversion%20limit%20accounting%20framework%20improvement%20strategy%202020-2025.pdf>.

¹⁸¹ 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*. Available at: https://www.mdba.gov.au/sites/default/files/pubs/Final-Report-Independent-Panels-Sustainable-Diversion-Limit_0.pdf.

¹⁸² MDBA (2020) *Sustainable diversion limit (SDL) accounting framework improvement strategy 2020 – 2025*. Available at: <https://www.mdba.gov.au/sites/default/files/pubs/Sustainable%20diversion%20limit%20accounting%20framework%20improvement%20strategy%202020-2025.pdf>.

¹⁸³ *Ibid.*

4.1 Current level of extraction needs to be determined

The Intersecting Streams Plan established an LTAAEL for each of its six water sources.¹⁸⁴ The Lower Murray-Darling Plan established an LTAAEL for its single water source.¹⁸⁵ However, as with many water sharing plans, these limits are not specified numerically (in ML per year) in the Plans, but are described as the sum of the estimated historic extractions as outlined in **Table 11** and **Table 12**. Historic extractions in the Plan areas were estimated under the Basin Plan for the BDL.¹⁸⁶

Establishing numeric LTAAELs is a recurring recommendation in the Commission's water sharing plan review reports and is important to provide clarity and transparency to stakeholders around extraction limits. It would also support more efficient compliance with extraction limits and allow remedial action to be taken, as well as help underpin an effective water market and the valuing of water as a limited resource.

The components of historic extraction used to estimate the BDL for the NSW Intersecting Streams and Lower Murray-Darling Plan areas are presented against the corresponding LTAAEL components in **Table 11** and **Table 12**.

The most significant difference is in the recognition of interception for the Intersecting Streams Plan, particularly the quantity of water that can be taken by runoff dams (including take under basic rights). The MDBA estimates that in 2019/20 the take of water by run off dams (not including harvestable rights) in the Plan area was 105,000 ML per year (see **Section 4.2**).¹⁸⁷ Schedule 3 of the Basin Plan also gives estimates for other forms of take. The quantities of take have changed since the Basin Plan commenced and these should be reflected in the Plan (see **Section 4.3**). The Commission notes that the area covered by the BDL for the Lower Murray-Darling is larger than the Plan area and includes both regulated and unregulated rivers.

These differences result in uncertainty for water users in how provisions of the Plan and requirements of the Basin Plan will affect them.

¹⁸⁴ See Clause 4 of the Intersecting Streams Plan.

¹⁸⁵ See Clause 4 of the Lower Murray-Darling Plan.

¹⁸⁶ See Schedule 3 of the *Basin Plan 2012*. Available at: <https://www.legislation.gov.au/Details/F2012L02240>.

¹⁸⁷ MDBA (2019) *Murray-Darling Basin Baseline Diversion Limits - estimate for 2019 / 2020 water year*. Available at: https://www.mdba.gov.au/sites/default/files/pubs/baseline-diversion-limit-2019_2020-water-year-surface-water-sept-19.pdf.

Table 12: LTAAEL and BDL extraction components for Intersecting Streams Plan

LTAAEL extraction components ¹⁸⁸	BDL extraction components as specified in Basin Plan ¹⁸⁹
The long-term average annual extraction limit covers the Plan area	The BDL extraction component covers the Plan area
<ul style="list-style-type: none"> ▪ Estimated average annual extraction from 1 July 1993 to 30 June 1999 under entitlements issued under Part 2 of the <i>Water Act 1912</i> 	<ul style="list-style-type: none"> ▪ Long-term annual average take of water, from July 1993 to June 1999, from watercourses other than from regulated rivers (excluding take under basic rights) Note to paragraph (a): The Authority estimates this to be 3 GL per year
<ul style="list-style-type: none"> ▪ Estimated annual water requirements pursuant to basic landholder rights in the respective water source at the commencement of this Plan 	<ul style="list-style-type: none"> ▪ Long-term annual average take of water from watercourses under basic rights calculated on the basis of the take under the level of development that existed on 30 June 2009 Note to paragraph (b): The Authority is yet to estimate this take.
<ul style="list-style-type: none"> ▪ Cl. 20 Harvestable rights The requirement for water under harvestable rights in these water sources is the total amount of water that owners or occupiers of landholdings are entitled to capture and store, pursuant to a harvestable rights order made under Part 1 of Chapter 3 of the Act 	<ul style="list-style-type: none"> ▪ Long-term annual average take of water by runoff dams under basic rights calculated on the basis of the take under the level of development that existed on 30 June 2009
<ul style="list-style-type: none"> ▪ Floodplain harvesting - not included in the Plan¹⁹⁰ 	<ul style="list-style-type: none"> ▪ Long-term annual average limit on the quantity of water that can be taken by runoff dams (excluding take under basic rights) calculated on the basis of the quantity of water that could be taken under State water management law as at 30 June 2009¹⁹¹
<ul style="list-style-type: none"> ▪ Estimated annual take of water from the respective water source by plantation forestry that existed on 30 June 2009 	<ul style="list-style-type: none"> ▪ Long-term annual average net take of water by commercial plantations calculated on the basis of the take under the level of development that existed on 30 June 2009 Note to paragraph (e): The Authority estimates this to be zero GL per year

¹⁸⁸ Clause 26 of the Intersecting Streams Plan.

¹⁸⁹ Schedule 3 of the *Basin Plan 2012*. Available at: <https://www.legislation.gov.au/Details/F2012L02240>.

¹⁹⁰ Note: Removed from previous Plan - Estimated annual extraction of water averaged over the period from July 1993 to July 1999 by floodplain harvesting activities for which floodplain harvesting access licences were later issued in the respective water source.

¹⁹¹ Note to paragraphs (c) and (d): The Authority estimates the sum of items (c) basic rights and (d) floodplain harvesting to be 111 GL per year.

Table 13: LTAAEL and BDL extraction components for Lower Murray-Darling Plan

LTAAEL extraction components ¹⁹²	BDL extraction components as specified in Basin Plan ¹⁹³
<p>The long-term average annual extraction limit for the water source is:</p>	<p>The BDL extraction component covers the Plan area</p>
<ul style="list-style-type: none"> ▪ Estimated average annual extraction from 1 July 1993 to 30 June 1999 under entitlements issued under Part 2 of the Water Act 1912¹⁹⁴ ▪ the annual extraction of water by the Broken Hill Water Board averaged over the period from July 1993 to June 1999 in the water source 	<ul style="list-style-type: none"> ▪ Long-term annual average take of water, averaged over the period from July 1993 to June 1999, from watercourses other than from regulated rivers (excluding take under basic rights)
<ul style="list-style-type: none"> ▪ the annual water requirements pursuant to basic landholder rights in the water source at the commencement of this Plan, ▪ Cl. 19 Harvestable rights The requirements for water under harvestable rights in the water source is the total amount of water that owners or occupiers of landholdings are entitled to capture and store pursuant to a harvestable rights order made under Part 1 of Chapter 3 of the Act 	<ul style="list-style-type: none"> ▪ Long-term annual average take of water from watercourses under basic rights calculated on the basis of the take under the level of development that existed on 30 June 2009 ▪ Long-term annual average take of water by runoff dams under basic rights calculated on the basis of the take under the level of development that existed on 30 June 2009
<ul style="list-style-type: none"> ▪ the annual extraction of water averaged over the period from July 1993 to July 1999 by floodplain harvesting activities for which floodplain harvesting (unregulated river) access licences are or will be issued in the water source 	<ul style="list-style-type: none"> ▪ Long term annual average limit on the quantity of water that can be taken by runoff dams (excluding take under basic rights) calculated on the basis of the quantity of water that could be taken under State water management law as at 30 June 2009
<ul style="list-style-type: none"> ▪ Estimated annual take of water by plantation forestry that existed on 30 June 2009 	<ul style="list-style-type: none"> ▪ Long-term annual average net take of water by commercial plantations calculated on the basis of the take under the level of development that existed on 30 June 2009

¹⁹² Clause 26 of the Lower Murray-Darling Plan.

¹⁹³ Schedule 3 of the *Basin Plan 2012*. Available at: <https://www.legislation.gov.au/Details/F2012L02240>,

¹⁹⁴ As part of a volumetric conversion process, irrigation licence holders were surveyed as to the area and types of crops that they had irrigated over the six-year period from 1993-1999, and conversion rates were developed to establish licenced entitlements and derive average levels of water use based on crop water requirements.

4.2 Interception and harvestable rights need to be accounted for

The MDBA baseline diversion limit estimate for the 2019/20 water year indicates that in the NSW Intersecting Streams, 6,000 ML was taken by run-off dams under basic rights and 105,000 ML was taken by run off dams that were not considered basic landholder rights.¹⁹⁵

There are interception activities in both Plan areas that are not accounted for or quantified in the Plans,¹⁹⁶ which has implications for the environment and other users. This includes harvestable rights¹⁹⁷ and interception of overland flows. This is partly attributed to neither of the Plan areas being part of the designated floodplain, and therefore not subject to the *NSW Floodplain Harvesting Policy*.

Under the Act, overland flow is defined as water, including floodwater, rainfall run-off and urban stormwater, that is flowing over or lying on the ground because of rain or other forms of precipitation, that rises to the surface from underground, or as prescribed by the regulations.¹⁹⁸ The interception of overland flows can occur via several means, including capture in a dam, via pumping from low lying land, or via diversion embankments that direct the flow into a storage structure or directly onto a parcel of land, such as where a crop is intended to grow.

Floodplain harvesting is one form of interception of overland flow, which is generally described as the capture and storage of flow across a floodplain.¹⁹⁹ However, in NSW this definition is restricted to floodplains that have been designated a floodplain under the *Water Management (General) Regulation 2018*.²⁰⁰ Neither the Intersecting Streams nor the Lower-Murray Darling Plan areas contain designated floodplains. This means that the interception and storage of overland flows in these areas is not covered by the *NSW Floodplain Harvesting Policy*. Although the Plans are not designated floodplains, even if they were, the interception of overland flow that is not then stored is not covered by the *NSW Floodplain Harvesting Policy*.²⁰¹ For example, where diversion banks direct overland flow directly onto a cropping area.

In its submission to this review, the MDBA raised concerns that both Plan areas do not adequately account for take of water on the floodplain in the LTAAEL:²⁰²

'Take by runoff dams is a form of take in this water source recognised under the Basin Plan [which is defined in Section 1.07 and has a volume estimated in Schedule 3, Item 7]. As such, NSW is required to consider take by runoff dams in any arrangements that ensure the sustainable diversion limit for the Intersecting Streams Water Resource Plan (WRP) area is not exceeded.'

'Consideration could be given for the WSP to be clearer about whether there is flood plain harvesting (FPH) occurring within the WSP area and how it is managed. In the Basin Plan

¹⁹⁵ MDBA (2019) *Murray-Darling Basin Baseline Diversion Limits - estimate for 2019 / 2020 water year*. Available at: https://www.mdba.gov.au/sites/default/files/pubs/baseline-diversion-limit-2019_2020-water-year-surface-water-sept-19.pdf,

¹⁹⁶ For the Murray and Lower Darling, Schedule 3 of the Basin Plan estimated licenced and unlicensed dams to be 80,000 ML per year.

¹⁹⁷ Clause 20 in the Intersecting Streams Plan and Clause 19 in the Lower Murray-Darling Plan provide for harvestable rights but do not quantify the amount. These clauses state: *'The requirement for water under harvestable rights in these water sources is the total amount of water that owners or occupiers of landholdings are entitled to capture and store, pursuant to a harvestable rights order made under Part 1 of Chapter 3 of the Act.'*

¹⁹⁸ Section 4A(1) of the Act.

¹⁹⁹ MDBA (2021) *Floodplain harvesting and overland flows*. Available at: <https://www.mdba.gov.au/basin-plan/sustainable-diversion-limits/floodplain-harvesting-overland-flows> (accessed 1 October 2021).

²⁰⁰ Designated floodplains in NSW are listed in Clause 252 of the *Water Management (General) Regulation 2018*. Available at: <https://legislation.nsw.gov.au/view/whole/html/inforce/current/sl-2018-0480#sec.252>.

²⁰¹ DoI (2018) *NSW Floodplain Harvesting Policy*, p. 4. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0017/143441/NSW-Floodplain-harvesting-policy.pdf.

²⁰² Submission: MDBA, received 17 December 2020.

2012 under Schedule 3, FPH is not a recognised form of take in the Intersecting Streams WRP. Consequently, FPH will need to be managed within the existing baseline diversion limit (BDL) and SDL under existing water access rights.'

Stakeholders also raised concerns about the impacts of unaccounted extraction in the Lower Murray-Darling:

'The WSP has a provision under Clause 26 (2) (d) that allows for the 'estimated annual extraction of water averaged over the period from July 1993 to July 1999 by floodplain harvesting activities for which floodplain harvesting access licences were later issued in the Lower Murray-Darling Unregulated Water Source.

We note that these licences have not yet been granted and that the assessment of the allocation of shares to FPH licences is still being undertaken.

While it is maintained that the volume of water extracted by FPH in this water source has already been included in the volumetric conversion of unregulated water access licences, there is the possibility that additional FPH licences will be granted.

It is imperative that the NRC review takes note of the environmental impact of FPH on the landscape, groundwater recharge and the health of rivers.

IRN is very concerned about the lack of consideration of the cumulative environmental impact of FPH...'²⁰³

DPIE-Water indicated the concerns raised about floodplain harvesting licences being allocated are unfounded because under their definition of floodplain harvesting there is no floodplain harvesting within these Plan areas. Only areas gazetted as a floodplain are covered by the floodplain harvesting policy, and these plans are not gazetted as floodplains. Therefore, the diversion banks (or any other floodplain capture in these Plan areas) are not being considered in the current healthy floodplain programme, and new floodplain harvesting licences will not be issued for these Plan areas. Despite this, the Commission notes that the Plan still includes a clause allowing for floodplain harvesting licences.

In addition, interception of overland flows does not fit with DPIE's current definition of floodplain harvesting and is not covered by the NSW Government's floodplain harvesting policy and procedures, which focus on the capture and storage of water.²⁰⁴

'Floodplain works that do not facilitate the collection, extraction or impoundment of water flowing across floodplains are not considered to be floodplain harvesting works, and as such do not require approval under the policy additional to an approval already required for other purposes under the WM Act.'²⁰⁵

The interception of overland flow is also not classified as harvestable rights, which only includes capture of rainfall runoff. There is a need to clarify the legal status of this water and quantify the volume being taken. Interception of water by diversion banks is a known issue in these areas. Predating the Plan, the *Murray Darling Basin Agreement* required annual reporting of taking of water from the floodplain, including for the NSW Intersecting Streams.²⁰⁶

This use of water predates water sharing arrangements (some take occurred as far back as 100 years ago) and has already been included in model calculations of flow. When the Basin Plan

²⁰³ Submission: Inland Rivers Network, received 18 December 2020.

²⁰⁴ DPI (2018) *NSW Floodplain Harvesting Policy*. Version published September 2018, PUB18/393. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0017/143441/NSW-Floodplain-harvesting-policy.pdf.

²⁰⁵ *Ibid*, p. 5.

²⁰⁶ Bewsher Consulting (2006) *Land surface diversions status report*, pp. 13-18. Final report to the Murray-Darling Basin Commission. Available at: https://www.mdba.gov.au/sites/default/files/archived/mdbc-SW-reports/96_Floodplain_Harvesting.pdf.

was developed, it was recognised that interception occurred in the Plan areas.²⁰⁷ However, except for the diversion of water onto the Western Floodplain at Toorale, which was licenced for the Australian Government to be used for environmental purposes, interception of overland flows is potentially unlicensed and not currently covered by the NSW floodplain harvesting framework. The Commission understands that overland flow interception should have been considered in the volumetric conversion process and included in volumes for the unregulated river access licenses. However, the Commission has not seen evidence that this is the case and understands that it is likely that the conversion process was not comprehensive in incorporating overland flow capture. DPIE-Water acknowledged during discussion with the NRC for this review that there is a need to better quantify and regulate overland flow in this area, and that the MDBA would likely require improvements in this regard.

While there are natural floodplain losses, interception prevents water from returning to the river channel. The LTWPs recognise that floodplain interception is a potential risk to meeting environmental water requirements. It includes a management strategy to '*quantify, licence and set limits on floodplain harvesting in the Intersecting Streams*' as a way to mitigate this risk.²⁰⁸

Consistent with the submission from the MDBA, all forms of interception should be accounted for within the Plan rules and under the LTAAEL. Once the extent of interception is quantified, the material risk of this historical interception should be assessed along with the future environmental, economic and social risks from further development. Plan rules should be revised as necessary to adequately manage these risks now and into the future, and equitably distribute risk of allocation reductions.

The Commission acknowledges that entitlement under the Lower Murray-Darling Plan is small compared with the *Water Sharing Plan for the NSW Murray and Lower Darling Regulated Rivers Water Sources 2016* or the plans in Queensland. However, the level of interception is likely significantly large within the Intersecting Streams and Lower Murray-Darling Plan areas and more accurate estimates may have implications for the SDL and sustainability within each water source. The SDL should be reviewed following any revision of the LTAAEL to ensure that it accurately reflects all forms of use.

To mitigate the risk from interception DPIE-Water need a comprehensive policy that covers:

- how to quantify the extent of interception of overland flows that is occurring
- how it will account for reduction in flow through interception in LTAAELs
- threshold for licencing interception activities
- how to manage interception to remain within sustainable LTAAELs and equitably distribute any risks.

²⁰⁷ *Ibid.*

²⁰⁸ DPIE-EES (2020) *Intersecting Streams Long Term Water Plan Part A: Intersecting Streams*, p. 43. Available at: <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Water/Water-for-the-environment/long-term-water-plans/intersecting-streams-long-term-water-plan-parts-a-b-200015.pdf>.

4.3 Interception should be consistently assessed across borders

Queensland adopted a similar process for accounting for floodplain water as NSW, except they do not require designation of floodplain to account for floodplain harvesting. In the adjoining parts of the catchments in Queensland, interception has only been recognised where water has been pumped into storages that are licenced as floodplain harvesting works.²⁰⁹ Like NSW, Queensland does not licence interception that is not stored, which includes diversion of overland flows that are not captured in storages.

Queensland has recently committed to the full measurement and licencing of floodplain harvesting in the Border Rivers and Moonie floodplains by 2022.²¹⁰ This will only include take consistent with their current definition of floodplain harvesting and will not account for interception that is not stored. Once floodplain harvesting is fully measured and licenced, water limits in Queensland will be revised to capture the best information. The MDBA state that new information on floodplain harvesting will need to be included in updated estimates of baseline diversion limits, which are outlined in WRPs. The Queensland WRPs will change over time, as the understanding of floodplain harvesting improves.²¹¹ Therefore, the full impact of floodplain harvesting on the NSW section of these rivers is still uncertain.

Quantification and management of overland flows remains a concern in Queensland. The MDBA estimated Queensland take by runoff dams to be 431,700 ML per year on average, consisting of:²¹²

- 51,000 ML per year in the Moonie catchment
- 264,000 ML per year in the Condamine-Balonne (includes Culgoa)
- 25,000 ML per year in the Nebine
- 83,000 ML per year in the Warrego
- 9,700 ML per year in the Paroo.

It is not clear how much of this water would be covered by the Queensland floodplain harvesting quantification and how much is overland flows not covered by floodplain harvesting policies. NSW should work with Queensland and the MDBA to ensure that management of this form of take is consistently managed across borders. There needs to be equitable consideration both within NSW and between NSW and Queensland on how interception is managed. Quantification of this type of interception is also needed to ensure that the full extent of risk is assessed, and this form of take can be regulated.

²⁰⁹ Note: *The Code for Assessable Development for Operational Works for Taking Overland Flow Water* (Queensland Government Natural Resources and Mines, 2005) includes 'Bunds or other structures can be used to hold or pond water to increase infiltration, as in the case of ponded pastures', which means this form of take could be licenced. Queensland use the term 'existing works' which is defined as those works legally constructed under a moratorium or as defined under a water plan, noting that the moratorium originally only covered dam size. Available at: <https://www.business.qld.gov.au/industries/mining-energy-water/water/authorisations/overland-flow#existing>.

²¹⁰ MDBA (2020) *Floodplain harvesting and overland flows*. Available at: <https://www.mdba.gov.au/sites/default/files/pubs/floodplain-harvesting-fact-sheet.pdf>.

²¹¹ MDBA (2021) *Floodplain harvesting and overland flows*. Available at: <https://www.mdba.gov.au/basin-plan/sustainable-diversion-limits/floodplain-harvesting-overland-flows> (accessed 22 September 2021).

²¹² Schedule 3 *Basin Plan 2012*. Available at: <https://www.legislation.gov.au/Details/F2012L02240>.

4.4 LTAAEL compliance has not been assessed in both Plans

Compliance assessments that involve comparing the actual average annual extractions for each extraction management unit against their LTAAELs have not been undertaken.²¹³ The Plans require the total annual extraction for each extraction management unit to be calculated at the end of each water year.²¹⁴ The average annual extraction over the preceding three years is to be compared against the respective LTAAELs. There is a non-compliance if this average extraction exceeds the LTAAEL by 5 percent or more.

An assessment of LTAAEL requires comprehensive annual extraction data and the establishment of numeric LTAAELs, which are not available. The volume of water taken from unregulated surface water sources has not been calculated in part because of a lack of water use data and a lack of broadscale metering,²¹⁵ although some metering has been rolled out through government-supported programs.²¹⁶

AWDs are meant to be used under the Plan rules to ensure compliance with LTAAELs. If water use exceeds the LTAAEL for an extraction management unit, AWDs can be reduced in subsequent years to retrospectively address this exceedance. As assessments of actual extractions against LTAAELs have not been undertaken, all categories of access licence have received AWDs of 1 ML per unit share or 100 percent per year, regardless of the past usage and actual availability of water in the river system.

DPIE-Water should ensure that the LTAAEL calculations for both Plans are undertaken as required and that adjustments to the AWD are implemented as per the Plan rules. This is critical for ensuring the protections intended by the Plans are realised.

4.5 Recommendations

R 3 – Both Plans	<p>When remaking the Plans, to ensure all extraction under the Plans is managed to protect, preserve, and maintain the water sources and dependant ecosystems, DPIE-Water should:</p> <ul style="list-style-type: none"> a) ensure interception on the floodplains for both Plans is assessed and accounted for within the LTAAEL b) ensure the total take is sustainable at the appropriate scales within the Plans and based on best available information, including current knowledge regarding ecological requirements c) ensure there is no growth in overall take by establishing and publishing sustainable, numeric LTAAELs, and undertaking the required compliance assessments against LTAAELs.
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²¹³ Alluvium (2019) *Audit Report: Audit of the Water Sharing Plan for the Murray Unregulated and Alluvial Water Sources 2011*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0011/289487/Murray-Unregulated-and-Alluvial-Water-Sources-2011.pdf.

²¹⁴ Clause 30 of the Intersecting Streams Plan and Clause 28 of the Lower Murray-Darling Plan.

²¹⁵ Alluvium (2019) *Audit Report: Audit of the Water Sharing Plan for the Murray Unregulated and Alluvial Water Sources 2011*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0011/289487/Murray-Unregulated-and-Alluvial-Water-Sources-2011.pdf.

²¹⁶ DPI (2012) *Water Sharing Plan for the Murray Unregulated and Alluvial Water Sources – Background document*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0005/166865/murray-unreg-alluvial-background.pdf.

5 Strengthening environmental protections

As discussed in **Section 2.4**, the plan areas contain significant water-dependent environmental assets such as creeks, wetlands, lakes and floodplains, including:

- Ramsar-listed wetlands, wetlands of national significance, the last free-flowing river in the Murray-Darling Basin (Paroo River)²¹⁷ and water dependent values associated with Toorale National Park and State Conservation Area (including the Warrego Western Floodplain), and Culgoa National Park and Culgoa Floodplain National Park²¹⁸ in the Intersecting Streams Plan area
- water-dependent cultural and environmental assets in the Lower Murray-Darling Plan area, such as the Great Darling Anabranch and associated ephemeral lakes, and wetlands (Thegoa Lagoon) and creeks (Peacock Creek) that have water access licences.

The Intersecting Streams and Lower Murray Darling Plans include broad and targeted objectives associated with protecting and contributing to the enhancement of the ecological condition of the water sources and associated water-dependent ecosystems in the plan areas. Provisions that provide for the environment include:

- providing for planned environmental water (the volume reserved above the LTAAEL)²¹⁹
- cease to pump rules, which generally take effect when there is no visible flow or when flow is at a level and flow specified at a gauge²²⁰
- pumping restrictions for in-river and off-river pools when the volume of water in those pools is less than full capacity of the pool²²¹ or less than 50 percent for some pools identified in the Lower Murray-Darling Plan²²²
- protections for environmental diversions into Thegoa Lagoon from extraction²²³
- amendment provisions for the shepherding of licensed environmental water (foreshadowing active management in the Intersecting Streams).²²⁴

However, these provisions do not adequately reflect the importance of lateral connectivity for riparian and floodplain ecosystems, which are extensive in both Plan areas.

The LTWPs developed for the Intersecting Streams²²⁵ and Murray-Lower Darling^{226, 227} have identified environmental water requirements for key water-dependent species and ecological functions based on best available information and input from a range of technical experts. All elements of flow are important, with environmental water requirements describing the minimum flow requirements needed to achieve ecological and biological objectives over the long term. Environmental water requirements identify the flow magnitude, duration, timing,

²¹⁷ MDBA (2021) *Paroo*. Available at: <https://www.mdba.gov.au/water-management/catchments/paroo>.

²¹⁸ Culgoa Floodplain National Park sits across the NSW and Queensland border.

²¹⁹ Clauses 15 and 16 of the Intersecting Streams Plan, and clauses 14 and 15 of the Lower Murray-Darling Plan.

²²⁰ Clause 46 of the Intersecting Streams Plan, and Clause 41 of the Lower Murray-Darling Plan.

²²¹ Subclauses 46(7) and 46(8) of the Intersecting Streams Plan.

²²² Subclause 41(8)(a) of the Lower Murray-Darling Plan.

²²³ Subclause 41(8)(b) of the Lower Murray-Darling Plan.

²²⁴ Subclause 78(1)(c) of the Intersecting Streams Plan.

²²⁵ DPIE-EES (2020) *Intersecting Streams Long Term Water Plan Part A and B*. Available at: <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Water/Water-for-the-environment/long-term-water-plans/intersecting-streams-long-term-water-plan-parts-a-b-200015.pdf>.

²²⁶ DPIE-EES (2020) *Murray-Lower Darling Long Term Water Plan. Part A: Murray-Lower Darling catchment*. Available at: <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Water/Water-for-the-environment/long-term-water-plans/murray-lower-darling-long-term-water-plan-part-a-catchment-200080.pdf>.

²²⁷ DPIE-EES (2020) *Murray-Lower Darling Long Term Water Plan. Part B: Murray-Lower Darling planning units*. Available at: <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Water/Water-for-the-environment/long-term-water-plans/murray-lower-darling-long-term-water-plan-part-b-planning-units-200081.pdf>.

frequency, and maximum inter-event period. The parameters of environmental water requirements should be considered and incorporated where appropriate in developing Plan rules.

For the Intersecting Streams Plan area, in channel flows are important for connecting instream pools, refreshing pool volumes, enhancing water quality and providing for longitudinal connectivity and are critical for specialist ephemeral aquatic species to migrate, disperse, feed and reproduce.²²⁸ In addition, overbank flows that recharge the entire system, connecting the channel networks and inundating floodplains and wetlands are critical for floodplain environments and lateral connectivity and movement opportunities.²²⁹

In the Lower Murray-Darling unregulated water source, there are knowledge gaps regarding hydrological changes that have occurred over time due to limited streamflow gauges.²³⁰ However, given the intermittent nature of the water source in-channel and overbank flows when they occur are important. There is also a high degree of interaction between the regulated and unregulated water sources, with flows diverted to off-river pools such as Thegoa lagoon, being important for ecosystem health.

Although licensed extractions from the Intersecting Streams Plan are relatively small, they still have the potential to increase the period between flow events or decrease the downstream range of the flow event.²³¹ Further, while the Plan's provisions mentioned above provide for some elements of flow to be protected, they do not adequately protect flows required to support the identified high value water dependent environmental assets. The limitations in the provisions are discussed in the following sections and include:

- Narran Water Source is the only water source in the Plan area with commence to pump rules based on a river gauge and the LTWP has raised where these access rules can be strengthened
- the LTWPs contain best available information that should be considered when remaking the Plans, but significant knowledge gaps remain, and further work is required
- active management to protect licenced environmental water is yet to be implemented in the Plan area
- there are exemptions that allow licenced water users to continue to take water for certain purposes below the 50 percent threshold²³²
- the pool drawdown rules in the Lower Murray-Darling Plan have not been reviewed to ensure that they are adequately protective of the environment.

5.1 Improving connectivity within the Plan areas

Connectivity is a key determinant for the health of water dependent environmental assets. A connected system is one where water moves freely from one place to the next, whether that is downstream, overbank onto the floodplain, into wetlands or lagoons, or between surface water and groundwater. From an aquatic ecological perspective, connectivity refers to an unimpeded, pathway (laterally or longitudinally) that allows the free movement of flow, biota such as fish,

²²⁸ 2rog Consulting (2021) *Technical review of the Water Sharing Plan for Intersecting Streams Unregulated River Water Sources 2011*. A report prepared for the Commission for this review.

²²⁹ *Ibid.*

²³⁰ DPIE-EES (2021) *Murray-Lower Darling Long Term Water Plan Part B: Murray-Lower Darling planning units*. Available at: <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Water/Water-for-the-environment/long-term-water-plans/murray-lower-darling-long-term-water-plan-part-b-planning-units-200081.pdf>.

²³¹ 2rog Consulting (2021) *Technical review of the Water Sharing Plan for Intersecting Streams Unregulated River Water Sources 2011*. A report prepared for the Commission for this review.

²³² Clause 41(9) of the Lower Murray-Darling Plan.

and ecological functions, with the magnitude, duration and timing of connectivity important to providing opportunities to related outcomes. Connectivity is important for the health of water dependent ecosystems and cultural values, maintaining water quality and for water users who rely on water for drinking, agriculture, recreation or other purposes. The following sections outline specific issues related to connectivity that can be addressed in each plan.

The hydrology of the Murray-Darling Basin is among the most variable in the world.²³³ In the Intersecting Streams, catchments are characterised by low relief (100-300 metres above sea level) and relatively low and seasonally confined rainfall. As a result, river flows are ephemeral, and the river and floodplain geomorphology is derived from low to very low energy systems with multiple anastomosing channels or indistinct channels that merge into flood ways and floodplains, and broad terminal floodplains and wetlands.

5.1.1 Connectivity in the Intersection Streams Plan area

Five of the water sources covered by the Intersecting Streams Plan originate in Queensland and connects downstream with the Barwon-Darling. The 2020 amended Plan acknowledges the importance of connectivity by including a new targeted environmental objective to protect and contribute to the enhancement of 'longitudinal and lateral connectivity within and between water sources to support target ecological processes.'²³⁴ The Plan specifies target ecological processes for water sources, including 'fish movement across significant barriers.' It also indicates that connectivity encompasses flows reaching wetlands of national and international significance.

The inclusion of a targeted environmental objective for connectivity is positive and is consistent with Priority 3 of the *NSW Water Strategy*.²³⁵ However, the Plan does not clearly specify how it will protect and contribute to connectivity, including how it will support overbank flows that are important for floodplain wetlands and ecological processes such as carbon transfer.

As outlined in **Chapter 3**, one of the most significant factors influencing connectivity is development upstream. As such, agreement on end of system flow targets and how they will be managed cross-border is critical to ensuring connectivity. However, there are steps that can be taken within the Plan area that could improve management of connectivity.

As discussed in **Chapter 4** ensuring that the diversion of overbank flows is assessed and accounted for is necessary to fully understand and manage water use within the Plan area. Overbank flows have larger volumes and tend to connect both across the channel-floodplain networks and downstream to the Barwon-Darling system. These larger flow events drive the boom-bust ecology of these systems providing abundant food sources for aquatic animals, which helps sustain them through the intervening low flow periods.²³⁶ Large flow events are also important for inundating wetland areas such as Narran Lakes in the Narran system and Yantabulla Swamp on the Cuttaburra channel. Both wetlands are important waterbird breeding and feeding sites.²³⁷ In addition, overbank flows maintain floodplain vegetation communities and

²³³ Stewardson, M.J., Walker, G. and Coleman, M. (2020) 'Hydrology of the Murray-Darling Basin' in Hart, B.T., Bond, N.R., Byron, N., Pollino, C.A. and Stewardson, M.J. (eds) *Murray-Darling Basin, Australia: Its Future Management*, Volume 1 of Wolanski, E., Elliott, M. and Wohl, E. (series eds) *Ecohydrology from Catchment to Coast*. First Edition. Netherlands: Elsevier, 47-73.

²³⁴ Clause 9(2)(b) of the Intersecting Streams Plan.

²³⁵ Priority 3 from the NSW Water Strategy: 'Improve river, floodplain and aquifer ecosystem health, and system connectivity.' DPIE-Water (2021) *NSW Water Strategy*. Available at: https://water.nsw.gov.au/__data/assets/pdf_file/0007/409957/nsw-water-strategy.pdf.

²³⁶ Sternberg D., Balcombe, S., Marshall, J., Lobegeiger, J. and Arthington, A. (2011) 'Subtle 'boom and bust' response of *Macquarie ambigua* to flooding in an Australian dryland river'. *Environ Biol Fish* 93: pp. 95-104.

²³⁷ DPIE (2018) *Intersecting Streams Long Term Water Plan Parts A and B*. Sydney. Available at: <https://www.mdba.gov.au/publications/mdba-reports/intersecting-streams-water-resource-plan>.

floodplain wetlands, which provide critical habitat for a range of species and support the overall productivity of river floodplain systems.²³⁸

Further, access rules within the Plans should be assessed taking into consideration information and recommendations within the LTWP in regard to where current rules are insufficient. Except for some of the access rules for Narran River Water Source (see **Section 5.2**), water sources in the Plan area have a cease to pump rule set to when there is no visible flow. This does not facilitate connectivity, as low flows are not protected. **Section 5.2** provides discussion of how rules could be improved to better protect important wetlands.

In addition to protecting flows, complementary measures such as improving fish passage through the construction of new fishways or installation of fish-friendly structures would be required to enable fish movement across significant barriers, such as those being installed in Toorale National Park as part of the Toorale Infrastructure Project. It would also require an improved understanding of barriers to fish passage, which DPI-Fisheries identified as a knowledge gap in their fish and flows work for the Intersecting Streams. The study in 2000 identified 56 barriers to fish passage in the Warrego.²³⁹ However, there are knowledge gaps regarding the extent of barriers to fish passage in other water sources that need to be addressed to identify the number, type and potential impact on fish movement and passage of flow.

5.1.2 Connectivity in the Lower Murray-Darling Plan area

In the Lower Murray-Darling Plan area, connectivity is critical for a range of ecosystems functions. For example, catchment-scale connectivity and reconnection of rivers and floodplains is important for the recruitment and dispersal of native fish such as golden perch.^{240,241} Monitoring in the Plan area along the Great Darling Anabranch has also recorded a positive vegetation response to flows.²⁴² When inundated, ephemeral lakes associated with the anabranch provide waterbird habitat, including for species of conservation significance.²⁴³

In the case of the Great Darling Anabranch, the flow regime was altered through river regulation and the anabranch, which is the ancestral channel of the Darling River, became degraded. Consequently, the government invested in the Darling Anabranch Pipeline and Environmental Flows Project to improve water security for domestic and stock users along the anabranch, achieve water savings and return the anabranch to an ephemeral system.²⁴⁴ The water savings achieved through this project were converted to environmental water which is managed outside of the water sharing plan as part of the environmental water portfolio. Restrictions on trade into

²³⁸ Thoms, M., Quinn, G., Butcher, R., Phillips, B., Wilson, G., Brock, M. and Gawne, B. (2002) *Scoping study for the Narran Lakes and Lower Balonne floodplain management study*. Cooperative Research Centre for Freshwater Ecology, Canberra.

²³⁹ Thorncroft, G. and Harris, J. (2000) *Fish passage and fishways in New South Wales: a status report*. Office of Conservation NSW Fisheries, Sydney. Available at: [https://ewater.org.au/archive/crcfe/freshwater/publications.nsf/f8748e6acfab1b7fca256f1e001536e1/7b50f33602c685f2ca256f0f0014b3e6/\\$FILE/Fish%20Passage.pdf](https://ewater.org.au/archive/crcfe/freshwater/publications.nsf/f8748e6acfab1b7fca256f1e001536e1/7b50f33602c685f2ca256f0f0014b3e6/$FILE/Fish%20Passage.pdf).

²⁴⁰ Stuart, I.S. and Sharpe, C.P. (2020) 'Riverine spawning, long distance larval drift, and floodplain recruitment of a pelagophilic fish: A case study of golden perch (*Macquaria ambigua*) in the arid Darling River, Australia', *Aquatic Conservation Marine and Freshwater Ecosystems*, 30(4): 675 – 690.

²⁴¹ Stuart, I. and Sharpe, C. (2017). *Towards a southern connected basin flow plan: connecting rivers to recover native fish communities*. Kingfisher Research and CPS Enviro report to the MDBA.

²⁴² Bogenhuber, D., Linklater, D., Pay, T., Stoffels, R. and Healy, S. (2013) *The Darling Anabranch Adaptive Management Monitoring Program Final Report 2010-2013: Baseline to a decade*. NSW Office of Environment and Heritage. The Murray-Darling Freshwater Research Centre, MDFRC Publication.

²⁴³ King, A.M. and Green, D.L. (1993) *Wetlands of the lower Darling River and the Great Darling Anabranch: Progress report*. TS 93.032. Murray-Darling Basin Commission, Canberra.

²⁴⁴ Department of Environment and Climate Change (2008) *Darling Anabranch Management Plan - Stock and Domestic Pipeline and Reinstatement of Environmental Flows: Review of Environmental Factors for Detailed Design Modifications of In-stream Infrastructure and Consistency Assessment*. Available at: <https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=DA01-01-2004-MOD-2%2120200623T010356.719%20GMT>.

the Great Darling Anabranche were included in the water sharing plan,²⁴⁵ meaning that only water for the environment would flow down the anabranche.

Although there are no water access licences on the Great Darling Anabranche or its associated ephemeral lakes, the outcomes for the river system and downstream Murray River are directly affected by flows into and the operation of Menindee Lakes (specifically Lake Cawndilla) and flows down the lower Darling River. Releases from Lake Cawndilla into the Great Darling Anabranche provide important dispersal pathways for native fish. Flows down the anabranche that resulted in catchment scale recruitment and dispersal of juvenile golden perch from Lake Cawndilla into the Murray River were observed in 2010-11,²⁴⁶ 2016-17²⁴⁷ and 2021-22. These connecting flows can also be influenced by spills from the lower Darling River into the anabranche (when flows exceed 9,000 ML per day). Lateral connectivity with the Anabranche lakes generally requires combined flows from Lake Cawndilla and spills from the Lower Darling River (when flows exceed 17,000 ML per day at Darling Anabranche at Wycot).²⁴⁸

Connecting flows are not just important for the Darling Anabranche and its ephemeral lakes. They are also important for other lagoons in the Plan area, including four lagoons where water access is permitted under the Lower Murray-Darling Plan. They include Thegoa Lagoon, Peacock Creek, Boeill and Neilpo Lagoons (see **Section 5.5**).

5.2 Important wetlands require integrated water planning

In the Intersecting Streams flow frequencies are highly skewed with long periods of no flow and shorter periods of high flow (bust-boom systems). This trend generally increases from east to west and is more pronounced in the Warrego and Paroo water sources.

Large flow events and overbank flows are important for inundating wetland areas including Narran Lakes in the Narran system and Yantabulla Swamp on the Cuttaburra Creek in the Warrego catchment, both of which are important waterbird breeding and feeding sites.²⁴⁹ Significant breeding populations straw-necked ibis (*Threskiornis spinicollis*), eastern great egret (*Ardea modesta*), glossy ibis (*Plegadis falcinellus*), Australian white ibis (*T. molucca*), and royal spoonbill (*Platalea regia*) have been recorded at these sites.

The Narran Lake Nature Reserve is one of the most important areas for water birds in NSW, ranked among the highest for species richness, number of breeding species and total abundance.²⁵⁰ In addition, the broader Narran wetlands and pools in the Narran River have

²⁴⁵ Clause 51(1)(d) prohibits trade under 71Q of the Act from an access licence that does not nominate a water supply work located within the Great Darling Anabranche, as shown on the Plan Map, to an access licence that nominates a water supply work located within the Great Darling Anabranche, unless the Minister is satisfied that the proposed dealing is for an environmental purpose. Clause 59(1)(d) prohibits trade under 71T of the Act into the Great Darling Anabranche, unless the Minister is satisfied that the proposed dealing is for an environmental purpose. Clause 61(d) prohibits trade under 71W of the Act into the Great Darling Anabranche, unless the Minister is satisfied that the proposed dealing is for an environmental purpose.

²⁴⁶ Sharpe, A. (2011) *Spawning and recruitment ecology of golden perch (Macquaria ambigua Richardson 1845) in the Murray and Darling Rivers*. Unpublished PhD Thesis, Faculty of Science, Environment, Engineering and Technology, Griffith University, Nathan QLD, Australia.

²⁴⁷ Stuart, I. and Sharpe, C. (2017) *Towards a southern connected basin flow plan: connecting rivers to recover native fish communities*. Kingfisher Research and CPS Enviro report to the MDBA.

²⁴⁸ DPIE-EES (2020) *Murray-Lower Darling Long Term Water Plan Part B*. Available at: <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Water/Water-for-the-environment/long-term-water-plans/murray-lower-darling-long-term-water-plan-part-b-planning-units-200081.pdf>.

²⁴⁹ DPIE-EES (2018) *Intersecting Streams Long Term Water Plan Parts A and B*. Available at: <https://www.environment.nsw.gov.au/research-and-publications/publications-search/intersecting-streams-long-term-water-plan-parts-a-and-b>.

²⁵⁰ Brandis, K. and Bino, G. (2016) *A review of the relationships between flow and waterbird ecology in the Condamine-Balonne and Barwon-Darling River Systems*. A report prepared for the MDBA by the Centre for Ecosystem Science, UNSW, Sydney.

been identified as 'priority drought refuge' for native fish, including bony bream (*Nematalosa erebi*) and spangled perch (*Leiopotherapon unicolor*).²⁵¹ However, long term monitoring indicates that the frequency of waterbird breeding associated with large flow events has significantly declined at Narran Lakes.²⁵²

Other key wetland sites within the Intersecting Streams for waterbirds include the Paroo River Wetlands, the Western Floodplain in Toorale National Park, and the Darling-Warrego confluence floodplain. These sites provide substantial foraging habitat for waterbirds and breeding habitat for species such as cormorants and egrets.

Overbank flows are important for maintaining floodplain vegetation communities and floodplain wetlands, which provide critical habitat for a range of species and support the overall productivity of river floodplain systems.²⁵³ However, the frequency of overbank flows has declined in some Intersecting Streams water sources and the Lower Darling, as have the peaks of events. In particular, the pattern of water reaching the floodplain has changed over the past three decades and some areas have experienced around a 50 percent decline in all flows.²⁵⁴ Rivers that have experienced the largest changes in flows include the Narran and Culgoa.²⁵⁵ This has implications for system connectivity and the cycling of nutrients and organic matter.²⁵⁶ It also has implications for the health of wetlands and rivers in the Plan area.

5.2.1 Plans require a greater focus on maintaining Ramsar wetlands

There are two Ramsar-listed wetlands in the Intersecting Streams Plan area, including the Paroo River Wetlands in the Paroo Water Source and Narran Lake Nature Reserve located at the end of the Narran River in the Narran Lakes system. Ecological character descriptions have been developed for each site.²⁵⁷ These ecological character descriptions provide a baseline for each wetland at the time the wetlands were listed²⁵⁸ and are important for assessing changes in the ecological character of these sites.²⁵⁹

The NSW Government has a responsibility to maintain the ecological character of Ramsar sites or take steps to remediate them if there is a change in their ecological character in accordance with Ramsar Convention obligations.²⁶⁰ Despite government commitments, a recent policy assessment of Ramsar wetlands in the Murray-Darling Basin found that the Intersecting Streams Plan does not include specific reference to maintaining the ecological character of the

²⁵¹ McNeil, D., Gehrig, S. and Cheshire, K. (2013) *The protection of drought refuges for native fish in the Murray-Darling Basin*. South Australian Research and Development Institute, South Australia.

²⁵² Brandis, K., Bino, G., Spencer, B.J.A., Ramp, D. and Kingsford, R.T. (2018) 'Decline in colonial waterbird breeding highlights loss of Ramsar wetland function', *Biological Conservation*, 225: 22-30.

²⁵³ Thoms, M., Quinn, G., Butcher, R., Phillips, B., Wilson, G., Brock, M. and Gawne, B. (2002) *Scoping study for the Narran Lakes and Lower Balonne floodplain management study*, Cooperative Research Centre for Freshwater Ecology, Canberra.

²⁵⁴ MDBA (2016) *Lower Balonne Floodplain grazing model report*. Murray Darling Basin Authority, Canberra. MDBA publication no.: 38/16.

²⁵⁵ *Ibid.*

²⁵⁶ Southwell, M. (2008) *Floodplains as dynamic mosaics: sediment and nutrient patches in a large lowland riverine landscape*, PhD Thesis, University of Canberra.

²⁵⁷ Butcher, R., Hale, J., Capon, S., and Thoms, M. (2011) *Narran Lake Nature Reserve Ramsar site ecological character description*. Prepared for Department of Sustainability, Environment, Water, Population and Communities.

²⁵⁸ At the time of listing as a wetland of international importance.

²⁵⁹ Department of the Environment, Water, Heritage and the Arts (2008) *National Framework and Guidance for Describing the Ecological Character of Australia's Ramsar Wetlands. Module 2 of the National Guidelines for Ramsar Wetlands— Implementing the Ramsar Convention in Australia*. Australian Government Department of the Environment, Water, Heritage and the Arts, Canberra. ISBN: 978-0-642-55409-3. Available at: <https://www.environment.gov.au/system/files/resources/6d7408dc-2519-4294-9820-f7b2284816dd/files/module-2-framework.pdf>.

²⁶⁰ Department of Agriculture, Water and the Environment (2012) *Wetlands in Australia – roles and responsibilities*. Available at: <https://www.environment.gov.au/water/wetlands/publications/factsheet-wetlands-australia-roles-and-responsibilities>.

Ramsar listed Narran Lake site (Paroo River Wetlands were not part of the assessment).²⁶¹ For this reason, the water sharing plan was rated as having low compliance with Ramsar Convention obligations. Notes in Plan objectives were updated to acknowledge these significant sites, but that does not change the outcomes of the assessment.

Of the two Ramsar-listed sites located in the Plan area, the Narran Lake Nature Reserve Ramsar site is most influenced by water development, primarily upstream in Queensland (see **Section 5.2.2**). The Paroo River Wetlands Ramsar site is situated on the last free flowing river in the Murray-Darling Basin where there is minimal water development.²⁶²

While there are several licence holders along the NSW Narran River, the Commission understands that there is limited water use and therefore unregulated river access licence holders are likely having a limited impact on flows reaching Narran Lakes. However, risks from the possible activation of these licences and the potential for interstate trade should be considered in determining changes to rules in the Intersecting Streams Plan (see **Section 3.5**).

Monitoring indicates there has been a noticeable decline in the health of Narran Lake Nature Reserve, including waterbird breeding,²⁶³ prior to and during the time the water sharing plan has been in effect. Prolonged drought conditions have contributed to this decline.²⁶⁴ As a result, further intervention is needed to support the health and ecological function of the wetlands.

5.2.2 Disparate water planning risks the health of Narran Lakes

The Narran River spans Queensland and NSW, crossing the border near the village of Anglodom in Brewarrina Shire. The transboundary river is subject to multiple water planning instruments (**Table 13**), including the NSW Intersecting Streams Plan.

In Queensland, the Narran River is managed under the Condamine and Balonne Water Plan and associated water management protocol. This plan is a component of the Condamine Balonne WRP, which was accredited by the Australian Government Water Minister as being consistent with the Basin Plan in 2019. The Queensland Water Plan includes protocols for improving flow connectivity, including flows to Narran Lakes. While the Narran Lakes Ramsar site is in NSW, Queensland has had regard to this site by including revised flow management rules intended to support Narran Lakes.²⁶⁵

²⁶¹ Kirsch, E., Collier, M.J. and Pittock, J. (2021) 'Lacking character? A policy analysis of environmental watering of Ramsar wetlands in the Murray-Darling Basin, Australia'. *Marine and Freshwater Research*,

²⁶² Kingsford, R.T. and Lee, E. (2010) *Ecological character description of the Paroo River Wetlands Ramsar site*. Available at: <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Water/Wetlands/paroo-river-wetlands-ramsar-site-ecological-character-description-100213.pdf>.

²⁶³ Brandis, K., Bino, G., Spencer, J., Ramp, D., Kingsford, R. (2018) 'Decline in colonial waterbird breeding highlights loss of Ramsar wetland function', *Biological Conservation*, 225, pp. 22-30.

²⁶⁴ CEWO (2020) *Rebuilding waterbird habitat at Narran Lakes – monitoring update, December 2020*. Available at: <https://www.environment.gov.au/system/files/resources/df123d80-c136-4b58-a62f-6cf92bb794fd/files/narran-lakes-monitoring-update-2020.pdf>.

²⁶⁵ Department of Natural Resources, Mines and Energy (2019) *Explanatory report on unsupplemented flow management rules changes in the Lower Balonne*. Available at: https://www.mdba.gov.au/sites/default/files/pubs/qld-explanatory-report-on-rule-changes-in-the-lower-balonne-2019_1.pdf.

Table 14: Water planning instruments relevant to Narran Lakes

	Queensland	NSW
State-based instruments	Water Plan (Condamine and Balonne) 2019 and associated water management protocol for the plan area. Condamine and Balonne water management protocol contains the flow event management rules and water sharing rules.	<i>Water Sharing Plan for the Intersecting Streams Unregulated River Water Sources 2011</i> Includes access rules for unregulated river access licences on the NSW Narran River.
Required under the Basin Plan		
WRP	Condamine-Balonne WRP 2019 (accredited)	Intersecting Streams Surface WRP (submitted to the MDBA for assessment)
LTWP (not statutory)	Long-term watering plan for the Water Plan (Condamine and Balonne) 2019 primarily focuses on high flows for Narran Lakes.	Intersecting Streams LTWP Part A and B sets out environmental flow requirements for Narran Lakes for different components of the flow regime but indicates that low flows and freshes were high risk.

The Water Plan (Condamine and Balonne) 2004 and associated water management protocol²⁶⁶ were reviewed in 2017-18 to assess the effectiveness of plan rules. This review determined that the original Narran rules, which were based on real time hydrological modelling, were difficult to implement, meaning that the decision to trigger flow management rules were in some cases delayed and did not achieve the intended environmental outcomes.²⁶⁷ The revised rules for managing flow events to support Narran Lakes focus on high flows. When flows are 20,000 ML per day or greater at St George gauging station between 1 March and 31 August, then water access is reduced to 90 percent (via notification) for up to 10 days.²⁶⁸ The purpose of the rule is to provide for flow maintenance to support bird breeding events at Narran Lakes Ramsar site. The rules are consistent with the ecological objectives set out in the LTWP for the Water Plan (Condamine-Balonne).²⁶⁹ DPIE-Water and DPIE-EES were among the stakeholders consulted on the revised flow rules for Narran Lakes.

The Commission understands that the new high flow event management rule has not yet been triggered by the Queensland Government as flows to date have been below 20,000 ML per day during the window that the rule applies.²⁷⁰ It will be important to monitor the effectiveness of this rule, including the contribution of flows to Narran Lakes, when it is applied.

²⁶⁶ Formerly the Resource Operations Plan.

²⁶⁷ Department of Environment and Science (2018) *Review of Water Plan (Condamine and Balonne) 2004 and Resource Operations Plan: Environmental assessment report*. Available at: https://www.mdba.gov.au/sites/default/files/pubs/qld-condamine-balonne-environmental-assessment-report-2018_0.pdf.

²⁶⁸ Section 170, Part 3. *Condamine and Balonne Water Management Protocol, February 2019*. Available at: <https://www.mdba.gov.au/sites/default/files/pubs/qld-condamine-balonne-water-management-protocol-feb-2019-amended-mar-2019.pdf>.

²⁶⁹ Department of Natural Resources, Mines and Energy (2018) *Long-term watering plan for the Water Plan (Condamine Balonne) 2019*. Available at: https://www.mdba.gov.au/sites/default/files/pubs/qld-long-term-watering-plan-condamine-balonne-2019_1.pdf.

²⁷⁰ Based on information in the Queensland Department of Regional Development, Manufacturing and Water (2021) *Lower Balonne Water Management Area March to April 2021 Flow Event Report*, the unsupplemented flow in March to April 2021 reset the low flow trigger for the Lower Balonne Water Management Area.

A large flow event in February 2020 delivered around 90 GL of water to Narran Lakes. Around half of this event comprised Commonwealth environmental water (acquired through the purchase of water harvesting and overland flow licences in Queensland),²⁷¹ plus an additional 9 GL of water that remained in the river through a pilot event-based mechanism involving a grant negotiated with licence holders.²⁷² Prior to this collaborative watering event, Narran Lakes had not received a significant inflow for around seven years (since April 2013).

To secure the health of the Narran Lakes ecosystem, the NSW and Queensland governments need to agree on end of system flow targets for Narran based on the best available information regarding environmental water requirements as set out in the LTWPs. A possible forum to negotiate such requirements could be the existing Border Rivers Commission whose operating area extends to the Intersecting Streams. Alternatively, the recently established Northern Basin Environmental Watering Group which comprises representatives from MDBA, CEWO, NSW and Queensland governments could be an appropriate forum to negotiate and agree on end of system flow targets for Narran Lakes.

In contrast to the updated Queensland Water Plan, the NSW Intersecting Streams Plan contains rules that aim to protect a portion of low flows in the Narran River. The Narran River is the only water source in the Intersecting Streams Plan that has access rules based on flow heights.²⁷³ These rules are important given there are 26 unregulated river access licences in the Narran River Water Source, totalling 8,908 ML of entitlement. They roughly correspond with the 85th percentile, which is intended to protect low flows.²⁷⁴ These rules were considered satisfactory by the Intersecting Streams Interagency Regional Panel for environmental protection when the Plan was developed.²⁷⁵

However, the effectiveness of these access rules in protecting low flows is questionable as is evident through recent monitoring and the high-risk ratings assigned to this water source through the Intersecting Streams WRP risk assessment (zero flow periods, low flows and freshes were assigned high risk). Concerns over the adequacy of access rules were also reflected in submissions:

*'Whilst the last decade has been particularly dry, recent experience since the WSP took effect suggests that the current provisions alone are unlikely to adequately protect some priority ecological assets such as the Narran Lakes in the context of recent climate. Future climate change may exacerbate this.'*²⁷⁶

Despite high risk ratings across a range of flow components, the access rules for Narran River Water Source were not updated when the Intersecting Streams Plan was amended in 2020. The risk assessment indicates that *'these risk results cannot be addressed during the WRP development as the NSW planning principles minimise change for WSPs within their ten year period to provide certainty for water users.'*²⁷⁷ The Commission acknowledges DPIE-Water had a policy of not addressing risk assessments during the plan amendments. However, as the plan is now due to be remade these risks should be adequately addressed in the revised plan.

²⁷¹ MDBA (2020) *The 2020 Basin Plan Evaluation*. Available at: <https://www.mdba.gov.au/sites/default/files/pubs/bp-eval-2020-full-report.pdf>.

²⁷² The Event Based Mechanism pilot project is one of the Northern Basin toolkit measures which will be used by environmental water holders to meet flow targets. The purpose of this measure is to develop trading and other contractual measures to complement management of water for the environment, to benefit environmental outcomes in the northern Murray-Darling Basin.

²⁷³ These are at the New Anglodom No. 2, the Wilby Wilby and the Narran Park stream gauges.

²⁷⁴ DPIE-Water (2019) *Risk Assessment for the Intersecting Streams Water Resource Plan Area (SW13): Part 1*.
²⁷⁵ NSW Office of Water (2011) *Water Sharing Plan for the Intersecting Streams Unregulated and Alluvial Water Sources – Background document* p. 23. Available at:

https://www.industry.nsw.gov.au/__data/assets/pdf_file/0008/166850/intersecting-streams-background.pdf.
²⁷⁶ Submission: CEWO, January 2021.

²⁷⁷ DPIE-Water (2019) *Risk Assessment for the Intersecting Streams Water Resource Plan Area (SW13): Part 1*. Available at: <https://www.mdba.gov.au/publications/mdba-reports/intersecting-streams-water-resource-plan>.

The Intersecting Streams LTWP sets out environmental water requirements for very low flows and indicates that raising the commence to pump thresholds for the management zones in the Narran River Water Source may be warranted, despite the limited number of active users. To improve the protection of low flows in the NSW Narran River Water Source, DPIE-EES advised the following should be considered:

- Management Zone 1 requires a higher commence to pump. Based on advice from DPIE-EES, the ratings table shows the site doesn't commence to flow until the gauge reads 1.8 metres
- the commence to pump for Management Zone 2 should be greater than 126 ML per day (or 1.21 metres) to align with the very low flow environmental water requirement in the LTWP
- the commence to pump for Management Zone 3 should be similar to Zone 2, taking losses into account.

To improve environmental outcomes, two principal actions need to occur:

- firstly, changes need to be made to provide coordinated protection of flows from Queensland to provide end of system flows and ensure there is continuity of flows arriving from Queensland so that they reach Narran Lakes
- secondly, changes to the Intersecting Streams Plan's flow rules to ensure they adequately protect low flows.

These changes are essential for meeting the Ramsar requirement of maintaining the Narran Lakes ecological character.

Limiting take during events that are forecast to meet the smaller environmental water requirements set out in the Intersecting Streams LTWP (25,000 ML delivered over 60 days), may increase the frequency at which this flow event occurs. Focussing rules to protect flows of this magnitude after extended periods of dry (more than 1.5 years) would assist in maintaining the condition of core rookery habitat in the northern lakes zone and increase the chances of successful waterbird breeding when larger flows enter the system.

5.3 Improving management of environmental flows through Toorale

In 2008, the NSW and Australian Governments purchased Toorale Station to recover water for the environment (including increasing flows to the Darling River)²⁷⁸ and for its outstanding environmental and cultural values.

Toorale Station was an agricultural property located at the junction of the Warrego and Darling Rivers southwest of Bourke. Toorale, which falls predominantly within the Warrego River Water Source of the Intersecting Streams Plan, has water infrastructure that was built in the 1860s, including several storages that have modified flows on the Warrego River and levees that direct flows onto the Western Floodplain (**Figure 9**). Given the length of time that water infrastructure has been in place, wetlands have expanded on the Western Floodplain, and threatened and migratory species have become dependent on the altered flow regime.²⁷⁹ The conservation values associated with Toorale were recognised as early as 1983 when around 49,000 hectares of the property was established as a wildlife refuge under the *National Parks and Wildlife Act 1974*.

²⁷⁸ Water recovery as part of the Water for the Future Initiative in the Murray-Darling Basin.

²⁷⁹ NSW National Parks and Wildlife Service (2021) *Toorale National Park and Toorale State Conservation Area Plan of Management*. Available at: <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Parks-reserves-and-protected-areas/Parks-plans-of-management/toorale-national-park-state-conservation-area-plan-management-210082.pdf>.

Water access licences associated with the property,²⁸⁰ totalling 17,826 ML in the Warrego River Water Source, were transferred to CEWH. CEWH currently holds three unregulated river access licences (8,106 ML) and a special additional high flow licence (9,720 ML). The Commission understands that the special additional high flow access licence was formerly a high-flow area-based licence for irrigating 1,620 hectares that at some point was converted to a volumetric licence to extract water from the Warrego River at Boera Dam in the northern part of Toorale.²⁸¹

The land and water infrastructure from the property is now managed by the NSW National Parks and Wildlife Service. The Minister responsible for administering the *National Parks and Wildlife Act 1974* holds the works approvals for the water infrastructure and the CEWH advises the National Parks and Wildlife Service to operate Toorale’s water infrastructure to deliver its water entitlements to environmental assets.

Following the acquisition, a combined area of 85,251 hectares was reserved as Toorale National Park and Toorale State Conservation Area in 2010. The reserved area is jointly managed by the Kurnu-Baakandji People and the National Parks and Wildlife Service, ensuring traditional owners participate in decision-making on how to manage country.

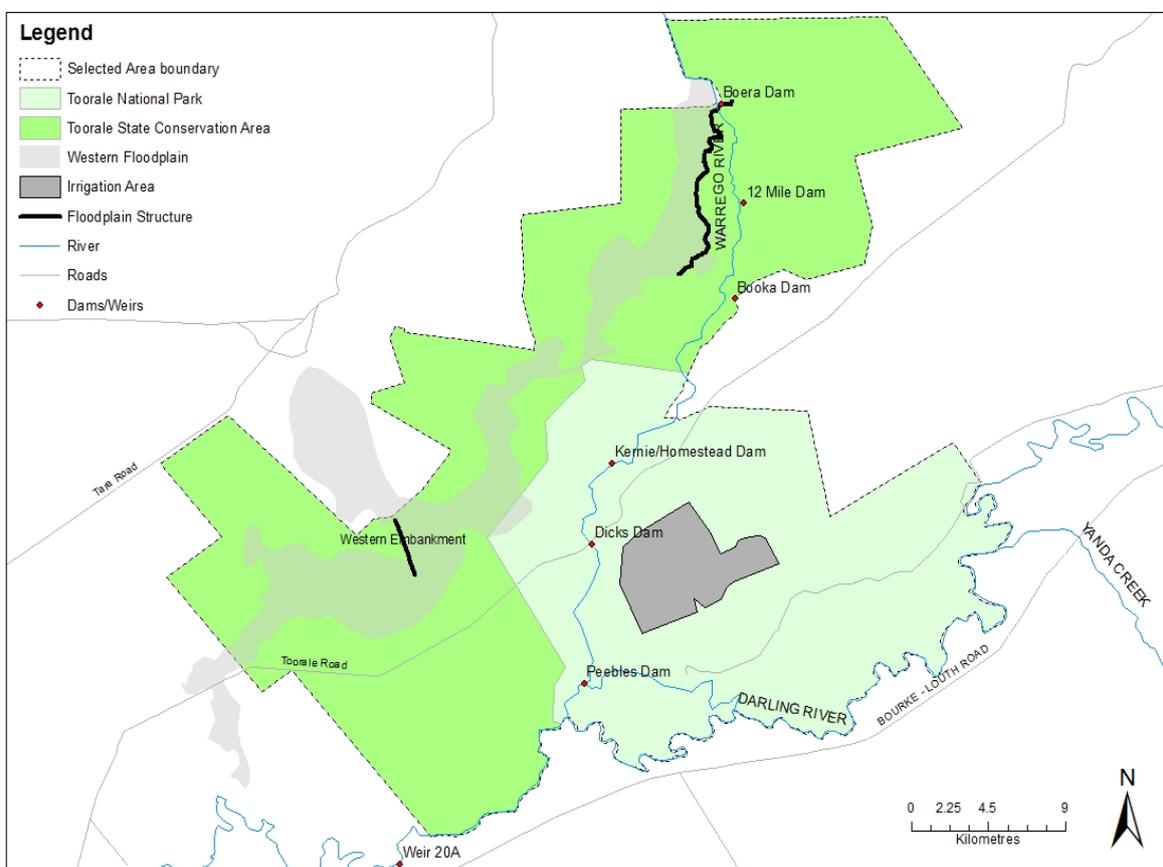


Figure 9: Toorale water infrastructure

²⁸⁰ When Toorale was purchased, its Warrego and Darling water licences were linked to the land in accordance with the *Water Act 1912*.

²⁸¹ Schedule 3 of the Intersecting Streams Plan requires that there must be visible flows in the Warrego River and flows must reach 979 ML per day at Darling River at the Louth gauge before the licence can be used for watering the Western Floodplain.

When the Australian and NSW Governments purchased Toorale, there was an agreement that the NSW Government would modify Toorale's water infrastructure for environmental purposes, specifically to increase flows to the Darling River and improve fish passage,²⁸² while maintaining the environmental values of the Western Floodplain. Phase 1 of this project involved the removal of Peebles Dam in 2019. This was a key step in enhancing flows down the Warrego River to the Darling. Phase 2 of the project is underway and involves upgrades to the largest dam in the park - Boera Dam. Upgrades to Boera Dam will increase the maximum discharge from 600 ML to 1,650 ML per day and allow for fish passage along the Warrego. Booka and Homestead dams will also be modified as fill and spill systems, and Homestead will have a rock ramp fishway installed.

Of the tributaries to the Barwon-Darling River, the Warrego River is the second smallest contributor to long term average flows to the Darling (3 percent). Being ephemeral, this river flows intermittently. While purchase of Toorale and associated infrastructure upgrades aim to improve flows into the Darling, the Warrego will continue to provide a lower percentage of inflows relative to other tributaries but may be able to enhance outcomes dependent on appropriate flow targets to guide water management arrangements.

The water management arrangements for Toorale are complex and have been the source of community concern. Stakeholders have expressed frustration at the time taken to modify water infrastructure to improve flows to the Darling and raised concerns about how water is being used on the Western Floodplain. These concerns resulted in an investigation by NRAR in 2020. It focused on allegations regarding the diversion of water from the Warrego River onto the Western Floodplain.²⁸³ NRAR did not find any breaches of the Act, but recommended measures to 'improve the accountability and transparency of water management at Toorale,' including installation of metering equipment at Boera Dam. The Commission supports this and further considers that including planned environmental water provisions for Toorale will also help towards improving transparency in water management, particularly in relation to the Western Floodplain.

Key issues that DPIE-Water should address in the remake of the Intersecting Streams Plan include:

- **Held environmental water is not protected** – the water access licences acquired by the CEWO are not currently protected through active management. This means when the water associated with the Warrego licences reaches the Darling River, it becomes available to downstream water users unless temporary water restrictions are in place.²⁸⁴
- **Lack of flow targets** - the Intersecting Streams Plan lacks flow targets for the contribution of flows from the Warrego River to the Darling.²⁸⁵ Flow targets are also absent from the current works approval for Boera Dam. However, under the original works approval there was a condition that a flow trigger for the Darling (i.e. 330 ML per day at Louth) be met before the discharge pipes could be closed to hold water in Boera Dam to divert water to the Western Floodplain, ensuring that downstream needs had priority. DPIE-EES advised that when the licence was converted under the Act, those conditions were not carried

²⁸² NSW National Parks and Wildlife Service (2021) *Toorale National Park and Toorale State Conservation Area Plan of Management*, p. 5. Available at: <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Parks-reserves-and-protected-areas/Parks-plans-of-management/toorale-national-park-state-conservation-area-plan-management-210082.pdf>.

²⁸³ DPI (2020) *Media release*. Available at: <https://www.industry.nsw.gov.au/media/releases/2020-media-releases/nrar-and-national-parks-partner-to-improve-water-use-transparency-at-toorale>.

²⁸⁴ DPIE-Water informed the Commission that the Intersecting Streams will be the next priority Plan area for rollout of active management.

²⁸⁵ Note that Schedule 3 of the Intersecting Streams Plan includes rules for the CEWO's special additional high flow access licences which require that there must be visible flows in the Warrego River and flows must reach 979 ML per day at Darling River at the Louth gauge before the licence can be used for watering the Western Floodplain.

across to the new works approval.²⁸⁶ This needs to be rectified in the works approval but should also be included in the water sharing plan. Flow targets should also be reviewed to inform operation of the upgraded infrastructure, latest information on environmental water needs and current best available modelling.

- **Clear management objectives for Toorale** – the amended Intersecting Streams Plan includes updated environmental objectives, for example, around improving connectivity, but does not make any reference to water management arrangements through Toorale and where they could contribute to connectivity of the Warrego and Darling rivers. Specific objectives should be included regarding Toorale, taking into consideration those included in the Intersecting Streams LTWP.
- **Lack of environmental water provisions for Toorale** – flows that occur in addition to the CEWO's licenced water are not currently codified in the Plan. This is potentially creating uncertainty for the community and government when flows spill onto the Western Floodplain. The difference in volume from that of licenced water could be described as planned environmental water in the water sharing plan. This new environmental water provision could be linked to flow measurements and infrastructure operations at Boera Dam, reflecting the environmental objectives associated with Government's acquisition of the property and improved flows to the Darling River since the purchase of Toorale. This would help minimise confusion between stakeholders around the use of water on the Western Floodplain. It would also be more cost effective than alternative options such as licencing this water.

DPIE-EES is developing an operating strategy to guide water management once infrastructure upgrades are complete and will consult the community as part of its process. Operating arrangements will likely be based on the following:

- priority 1 – maximise flows to the Darling River when there have been extended dry conditions in the Darling River
- priority 2 – maximise flows to the Western Floodplain when there have been extended dry conditions on the Western Floodplain
- share delivery of water between the Warrego/Darling Rivers and the Western Floodplain.

DPIE-EES advised that the Intersecting Streams LTWP will inform the operating strategy.²⁸⁷

Under the proposed operating strategy, the upgraded Boera Dam²⁸⁸ will be operated to achieve a minimum of 350 ML per day in the Darling River at Louth. When this flow condition is met, the first priority will continue to be the Darling River, unless a significant flow event is occurring, or has recently occurred in the Darling River (greater than 1,250 ML per day at Bourke). In these circumstances, the Boera regulator would be operated to direct flows onto the Western Floodplain to meet environmental water requirements of the floodplain. Once these requirements are met, downstream and floodplain flows would be shared.

The Commission is of the view that the water sharing plan should set out operating rules and triggers for the sharing of water between the Warrego and Darling rivers and the Western Floodplain, and therefore relevant rules should be included in the replacement Plan. Alternatively, the replacement Intersecting Streams Plan could refer to the operating strategy.

²⁸⁶ Personal communications, EES, 23 August 2021.

²⁸⁷ Personal communications, DPIE-EES, 23 August 2021.

²⁸⁸ The upgraded Boera Dam will have a regulator with a maximum discharge of 1,650 ML per day.

5.4 Protection of held environmental water

CEWO has environmental water holdings in the Queensland Lower Balonne, Condamine, Moonie, Nebine and Warrego catchments that contribute to flows to the NSW Intersecting Streams, with a long-term average annual yield of 113,862 ML. CEWO also has 17,826 ML of unregulated entitlement in the NSW Intersecting Streams in the Warrego Water Source which contribute to flows to the Barwon-Darling (see **Section 5.2**).

At present, held environmental water released in Queensland is not protected in NSW by provisions in the Intersecting Streams Plan. This erodes the potential benefits that held environmental water can deliver, unless it is protected through mechanisms outside of the water sharing plan, such as via temporary water restrictions by order under Section 324 of the Act. The Commission understands that NSW has agreed to implement active management in the Intersecting Streams, which they intend to use rather than Section 324 orders.

Active management has been rolled out in other parts of the northern Basin, including the Barwon-Darling, and unregulated Gwydir and Macquarie rivers as part of recent water reforms to protect held environmental water for its intended environmental purpose. Rules and definitions were included in the respective water sharing plans. Further, an Active Management Procedures Manual for the Barwon-Darling²⁸⁹ was developed and is being implemented by DPIE-Water. The procedures manual defines active environmental water as:

*‘water in the water sources identified or determined by the Minister on any given day as requiring protection from extraction in accordance with the Active Management Procedures Manual’.*²⁹⁰

The Intersecting Streams Plan area was not included in the initial roll out of active management, partly as methods to account for flows crossing the border from Queensland have not yet been developed. Consequently, flows arising from held environmental water originating in Queensland via the Intersecting Streams unregulated water sources are not currently recognised as active environmental water.²⁹¹ DPIE-Water indicated that the Intersecting Streams Plan is the next priority area for implementing active management.²⁹² This is signalled through inclusion of amendment provisions for the shepherding of water in the current Plan.²⁹³

The Intergovernmental Agreement on Implementing Basin Water Reforms requires Queensland and New South Wales to work together to develop a transparent accounting method for determining the timing and volume of held environmental water that crosses the state border. This is effectively a prerequisite for implementing active management in the Intersecting Streams and protecting licenced environmental water into and through the Barwon-Darling. The intergovernmental agreement requires the accounting method and associated procedures for active management of held environmental water from Queensland into NSW would be implemented by the end of 2020. However, this did not transpire. DPIE-Water advised that the accounting method will be finalised by late 2021.²⁹⁴ This is an important milestone in the path towards implementing active management in the Intersecting Streams and protecting licenced environmental water.

²⁸⁹ DPIE-Water (2020) *Water sharing plan implementation – active management procedures manual for the Barwon-Darling unregulated river water source*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0006/337290/active-management-procedures-manual-barwon-darling.pdf.

²⁹⁰ DPIE-Water (2020) *Water sharing plan implementation – active management procedures manual for the Barwon-Darling unregulated river water source*, p. 47.

²⁹¹ DPIE-Water (2020) *Water sharing plan implementation – active management procedures manual for the Barwon-Darling unregulated river water source*.

²⁹² Personal communication, DPIE-Water, 21 July 2021.

²⁹³ Clause 78(1)(c) of the Intersecting Streams Plan.

²⁹⁴ Personal communications, DPIE-Water, 21 July 2021.

However, further work is required to give effect to active management in the Intersecting Streams. Rules will need to be included in the Intersecting Streams Plan, including but not limited to rules that allow for the adjustment of access rules that apply to unregulated river access licences to protect active environmental water. The definition of active environmental water will also need to be updated in the Barwon-Darling Plan and procedures manual to recognise that held environmental water via the Intersecting Streams is also active environmental water.

Implementation of active management of held environmental water would contribute to environmental outcomes within and downstream of the Intersecting Streams Plan area and would be an important contribution to improving connectivity between plan areas. New rules for active management would also be applicable to held environmental water associated with Toorale in the Warrego River Water Source and its contribution to flows in the Darling River (see **Section 5.2**). DPIE-Water should include relevant rules in the replacement Intersecting Streams Plan. In addition, DPIE-Water should update the definition of active environmental water in the *Water Sharing Plan for the Barwon-Darling Unregulated River Water Source 2012* to include held environmental water from the Intersecting Streams to facilitate active management.

5.5 Review access rules for protecting lagoons

The Lower Murray-Darling Plan area comprises several off-river lagoons that hold significant ecological and cultural values. Water access is permitted for four lagoons in the Plan area, including Thegoa lagoon, Peacock Creek, Boeill Lagoon and Neilpo Lagoon.²⁹⁵ There are other lagoons in the Plan area. However, as there is no extractive use they are not listed in the Plan. These lagoons are highly productive and diverse biological systems and make a substantial contribution to food chains. They also support water quality of the river system as they buffer flood flows, filter nutrients and sediments, and provide native wildlife and fish habitat.

The lagoons are highly significant to Aboriginal peoples in the area as meeting places, sources of food and other resources and as critical cultural pathways and storylines (see also **Chapter 7**). Thegoa Lagoon for example, has been a critical meeting place for Barkandji peoples and contains many significant sites. The Barkindji River Rangers team are now active in working to improve the management of the lower Darling River and Thegoa Lagoon, particularly its fish habitat.

These lagoons are also important for water users in the Plan area. Thegoa Lagoon has five unregulated river access licences and the other lagoons listed in the Plan each have one licenced user. The lagoons are subject to different access rules than other off-river pools in the Plan area as they can be drawn down below their full capacity. The access rules for lagoons listed in Schedule 3 of the Plan were developed in line with the *Macro Water Sharing Plans Approach for Unregulated Rivers Access and Trading Rules for Pools policy*. In summary:

- water must not be taken from a lagoon or pool listed in schedule 3 or Thegoa Lagoon when the water level is below 50 percent of its full capacity
- water must not be taken from other off-river natural pools when the water level in the pool is less than 100 percent of its full capacity
- pools within rivers are protected by cease to pump rules when there is no visible flow at the pump site.

The Plan contains amendment provisions to allow for changes to be made to access rules for pools if new information is gained through studies and the Minister may make temporary water restriction orders under Section 324 to protect environmental diversions into Thegoa Lagoon.

²⁹⁵ Thegoa Lagoon has the highest number of unregulated river access licences.

Although located in the unregulated Plan area, the lagoons also interact with the regulated river during high flow via two regulators and through use of licenced environmental water (for Thegoa Lagoon).

While the Plan provides some protection for these lagoons, issues with current rules were identified in this review. It is difficult to quantify the extent of water use occurring in these ephemeral lagoons, and therefore, the effectiveness of access rules in protecting environmental and cultural values is unknown. There are also risks around the rate of drawdown (change in water level), which can affect the fringing zone and basal production if too rapid. The Commission recommends that DPIE-Water consider reviewing the *Macro Water Sharing Plans Approach for Unregulated Rivers Access and Trading Rules for Pools Policy* on which extraction rules are based to ensure that the policy requires assessment to ensure that environmental and cultural values are not compromised.

Thegoa Lagoon

As noted, the Thegoa Lagoon (located west of Wentworth, at the junction of the Murray and Darling Rivers) has significant environmental and cultural values.²⁹⁶ Thegoa Lagoon has a surface area of about 80 hectares. Water enters the lagoon from the regulated Murray River upstream of Lock 10 through an approved pipe at the eastern end at a rate of up to 16 ML per day, or over the sill of a culvert at the western end when the Murray River is in flood.²⁹⁷

Thegoa Lagoon receives held environmental water from the *Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources* during high stream flows. DPIE-EES oversee the management of this held environmental water, which aims to improve habitat values after prolonged drought.

However, the Plan permits licenced extraction with restrictions from Thegoa Lagoon. At Plan commencement there were seven licenced users whose total entitlement was 1,051 ML per year and one user had basic landholder rights access. The Commission is unable to determine the extent to which these entitlements have been used over the life of the Plan, if access rules were triggered, or if the rules have been effective over the life of the Plan. Stakeholders consulted as part of this review expressed concern that the access rules are inadequate and may accelerate the drying cycle of the lagoon, particularly if some inactive licence users became active.

At Plan commencement the 50 percent drawdown rule for Thegoa Lagoon was more restrictive than previous access conditions and was considered to provide an increased level of restriction. However, DPIE-Water has not verified if this rule is adequately protective of the lagoon. The allowance of 50 percent drawdown should be reviewed and if necessary adjusted to ensure adequate protection of the lagoon ecosystem. To support the protection of Thegoa Lagoon, a range of interventions such as stock exclusion and weed management are also required. This has been a historical issue for Thegoa.

The Commission also considers a review of the *Macro Water Sharing Plans Approach for Unregulated Rivers Access and Trading Rules for Pools* policy is warranted to take into consideration new information and advancements in water requirements for lagoons and updated environmental and cultural objectives for water sharing plans. Given the environmental and cultural significance of Thegoa Lagoon an investigation into the environmental watering requirements is timely to conduct as a part of the remake of the Lower Murray-Darling Plan.

²⁹⁶ NSW Office of Water (2012) *Water Sharing Plan for the Lower Murray-Darling Basin Unregulated and Alluvial Water Sources – Background document*. Available at: <https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status/barwon-darling-west-region>.

²⁹⁷ *Ibid.*

5.6 Recommendations

<p>R 4 – Both Plans</p>	<p>When remaking the Plans, to improve protection of the water sources and their water dependent ecosystems, DPIE-Water should:</p> <ul style="list-style-type: none"> a) ensure that the replacement Intersecting Streams Plan includes provisions requiring active management, including protection of licenced environmental water from Queensland entering the Intersecting Streams, and the Warrego River into and through the Barwon-Darling River b) update the Intersecting Streams Plan objectives to specifically refer to the maintenance of the ecological character of Ramsar-listed sites (Narran Lake and Paroo River Wetlands) c) verify the need to raise pumping thresholds for management zones in the Narran River Water Source to adequately protect ecosystems in line with the Intersecting Streams LTWP and revise the Intersecting Streams Plan rules as needed d) include rules coordinated with Queensland in the Intersecting Streams Plan for the protection of critical flows for sustaining water levels in Narran Lakes for waterbird breeding events. This should consider maximum interflow periods and the development of end of system flow targets (see Recommendation 2) e) Ensure that the drawdown rules in the Lower Murray-Darling Plan adequately protect lagoon ecosystems and that Plan rules fully protect held environmental water released into Thegoa Lagoon near Wentworth.
<p>R 5 – Intersecting Streams Plan</p>	<p>When remaking the Plan, to clarify environmental flow management for the Toorale National Park and State Conservation Area (Toorale) property, DPIE-Water should:</p> <ul style="list-style-type: none"> a) Include flow targets that clearly state the minimum contribution of flows from the Warrego to the Darling River (at Louth) before releasing flow to the Western Floodplain. The flow target should be consistent with the operating strategy for Toorale water infrastructure b) include environmental and cultural objectives associated with Toorale water management in the Plan c) recognise the difference in held environmental water from flows onto the Toorale Western Floodplain as planned environmental water, linking this environmental water provision to measurements at Boera Dam.
<p>SA 1 – Both Plans</p>	<p>DPIE-Water should review the <i>Macro Water Sharing Plans Approach for Unregulated Rivers Access and Trading Rules for Pools Policy</i> 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.</p>
<p>SA 2 – Intersecting Streams Plan</p>	<p>DPIE-EES should coordinate with CEWO to ensure there is a flow event-based report for:</p> <ul style="list-style-type: none"> a) the progress of the Toorale Infrastructure Project b) flows through Toorale to provide transparency regarding how these flows are being managed and associated outcomes.
<p>SA 3 – Intersecting Streams Plan</p>	<p>DPIE-Water should update the definition of active environmental water in the <i>Water Sharing Plan for the Barwon-Darling Unregulated River Water Source 2012</i> to include held environmental water from the Intersecting Streams (including from across the Queensland-NSW Border and from Toorale on the Warrego River).</p>

SA 4 – Intersecting Streams Plan	DPIE-Water should update the Active Management Procedures Manual for the Barwon-Darling to include held environmental water from water sources in the Intersecting Streams Plan, including across the border from Queensland, as active environmental water.
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6 Accounting for town water supply

The Commission understands that town water supply needs have largely been met in the Lower Murray-Darling Plan area, but predominantly by water sources from other plan areas. The needs of Broken Hill and surrounding communities were largely met through supply from the regulated Darling River and more recently the regulated Murray River via the Wentworth to Broken Hill pipeline. Stephens Creek and Umberumberka reservoirs also contribute to supply, although the associated entitlement is not in the Plan and water has historically been diverted to the reservoirs from the Menindee Lakes/Darling River. It also appears that Umberumberka Reservoir lies within the area covered by the *Water Sharing Plan for the North Western Unregulated and Fractured Rock Water Sources 2011*. While the volumetric entitlement was created over the life of the Plan, it was not included when the Plan was amended in 2020. Once town water use requirements have been determined, the entitlement should be included in the appropriate Plan.

The Intersecting Stream Plan area has three town water supply licence entitlements that supply the townships of Enngonia, Wanaaring and White Cliffs.²⁹⁸ The Commission cannot report on the effectiveness of the Intersecting Streams Plan in supporting social and economic outcomes associated with town water supply. The Commission did not receive submissions from local water utilities in the Plan area and, while the Commission endeavoured to engage with local councils as part of its stakeholder engagement process, it was unable to interview representatives from local councils. The Commission recognises the region is facing difficult circumstances due to the COVID-19 pandemic. As a result, it will be critical that DPIE-Water engage with local councils during the Plan remake to ensure that town water supply needs and associated entitlements are clear and reflected accurately in the remake of the Intersecting Streams Plan.

The LTAAELs for both the Intersecting Streams and Lower Murray-Darling plans include allowances for town water supply, but these are not numerically defined. This will need to be addressed as a priority, including for compliance purposes.

6.1 Town water supply needs should be fully reflected in the Lower Murray-Darling Plan

Essential Water (a subsidiary of Essential Energy) manages four local water utility licences to provide town water to approximately 18,498 customers in Broken Hill, Silverton, Menindee and Sunset Strip.^{299,300} These licences span the Lower Darling Regulated River Water Source, NSW Murray Regulated River Water Source, the Western Murray Porous Rock Groundwater Source and the Lower Murray-Darling Unregulated Water Source.³⁰¹ The latter comprises access to two reservoirs, which are located nearby Broken Hill and are used for storing water from the regulated and unregulated systems.³⁰²

- **Stephens Creek Reservoir** has a capacity of 19,000 ML with a large surface area and a shallow depth. Stephens Creek Reservoir receives water from its own catchment, as well as water pumped from the Darling River and Copi Hollow.

²⁹⁸ NSW Office of Water (2011) *Water Sharing Plan for the Intersecting Streams Unregulated and Alluvial Water Sources – Background Document*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0008/166850/intersecting-streams-background.pdf.

²⁹⁹ Essential Water (2018) *Drought Management Plan for the water supply business in the Broken Hill Region*. Available at: <https://essentialwater.com.au/media/0tqgjvjd/ceop2288publicdroughtmanagementplan.pdf>.

³⁰⁰ Essential Water also have an entitlement for a high security licence used for recreational facilities.

³⁰¹ Essential Water local water utility access licences as of 2 September 2021 provided by DPIE, unpublished data.

³⁰² Essential Water (2018) *Drought Management Plan for the water supply business in the Broken Hill Region*. Available at: <https://essentialwater.com.au/media/0tqgjvjd/ceop2288publicdroughtmanagementplan.pdf>.

- **Umberumberka Reservoir** has a capacity of 7,800 ML and is located 30 kilometres north-west of Broken Hill on Umberumberka Creek.

However, the Umberumberka reservoir falls outside of the Lower Murray-Darling Plan area and is located in the area covered by the *Water Sharing Plan for the North Western Unregulated and Fractured Rock Water Sources 2011*.

At Plan commencement, town water supply needs were primarily met with the 9,975 ML per year entitlement from the Darling River off take (supplied by the *Lower Murray Darling Regulated Plan 2016*) and the Menindee Lakes Scheme. It was also met with the 6,300 ML per year entitlement from the Lower Murray-Darling Unregulated Water Source (i.e. local rainfall).³⁰³ However, this water source is less reliable given its ephemeral nature.³⁰⁴

During the term of the Lower Murray-Darling Plan, there were changes to the water supply system to secure town water supply for Broken Hill, most notably the Wentworth to Broken Hill pipeline. Since the pipeline became operational in 2019, most town water supply needs for Broken Hill have been provided for by the regulated Murray River system (rather than pumped from the Menindee Lakes), reducing reliance on the Menindee Lakes/Darling River, Stephens Creek and Umberumberka reservoirs and the regulated Darling River (see **Figure 10**). Essential Water advised since connecting to the pipeline, the use of entitlement from the Lower Murray Darling Unregulated River Water Source and the regulated Darling River Water Source has significantly reduced, but they do need to retain a proportion of this entitlement as a contingency supply.³⁰⁵

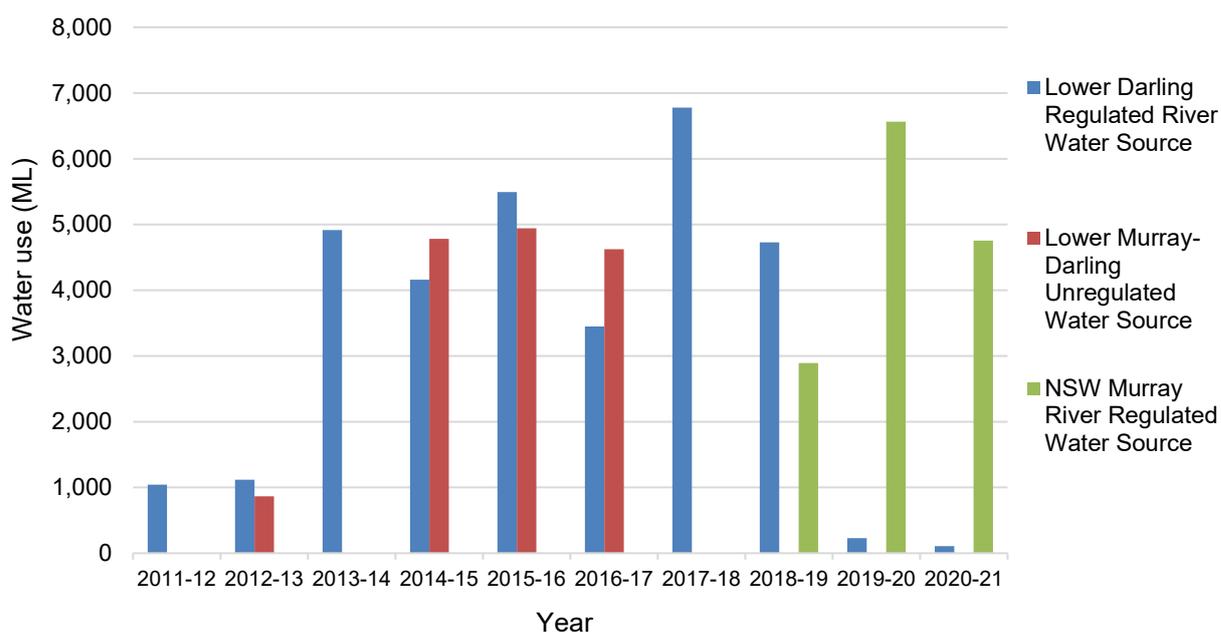


Figure 10: Water use for town water supply over the term of the Lower Murray-Darling Plan

Prior to the Lower Murray-Darling Plan, Broken Hill and Silverton local water utilities were authorised under the *Broken Hill Water and Sewerage Act 1938* and, prior to that, the *Broken Hill and Umberumberka Water Supply Act 1906*. When the current Act came into effect, the Lower Murray-Darling Plan included provisions allowing for applications for local water utility licences to supply town water to the Broken Hill and Silverton community.³⁰⁶ In 2012, a local

³⁰³ *Ibid.*

³⁰⁴ Interview: Essential Water, 30 July 2021.

³⁰⁵ *Ibid.*

³⁰⁶ Clause 35 of the Plan allows for Essential Energy to apply for a local water utility access licence for the purpose of supplying water to Broken Hill and Silverton.

water utility access licence was created under the Act totalling 6,300 ML per year (see **Section 2.2**). As this was after the commencement of the Plan, this entitlement was not included in the Plan. While the Plan was amended in 2020 as part of the development of the WRP, the volumetric entitlement for local water utilities was not updated to reflect the 6,300 ML of entitlement.

Essential Water advised that, during the life of the Plan, town water supply security was at risk from four years of drought. Local rainfall was well below average for an extended period, water levels dwindled in Stephens Creek Reservoir and Umberumberka Dam fell below 1 percent.³⁰⁷ Essential Water and local stakeholders observed there was a real threat of towns 'running out of drinking water'.³⁰⁸ Essential Water worked with its customers to maintain Level 1 water restrictions in this period.³⁰⁹ These reservoirs also faced water quality and treatment issues associated with supply from the Darling River.³¹⁰

Whilst the population in the Plan area has declined and this trend is expected to continue (estimates are a 13.7 percent decline from 2011 to 2036),³¹¹ maintaining secure access to quality town water supply is essential to underpin the critical water needs and socio-economic prosperity of this remote region. Broken Hill is an important social and economic hub for smaller remote communities and offers employment diversity for the local economy (as discussed in **Section 2.6.2**).

The NSW Government funded the Wentworth to Broken Hill pipeline, which became operational in 2019. The pipeline, which is owned and operated by WaterNSW, draws raw water from the Murray River. A local water utility access licence with 8,694 ML of entitlement was created for the *Water Sharing Plan for the NSW Murray and Lower Darling Regulated Water Sources 2016* and, since operational, this entitlement supplies the majority of local water utility access for Broken Hill.³¹²

Essential Water advised since the pipeline became operational town water supply is generally fully provided for by the Murray River. The water storages in the Plan area (predominantly the Stephens Creek Reservoir and the Umberumberka Dam) are rarely used and are now only retained for emergency supplies for Broken Hill in the event of the pipeline being unable to provide town water supplies.³¹³

Essential Water advised that it is difficult to provide an accurate estimate of how much water was historically extracted for town water supply from the unregulated Plan area because there is no flow meter, and the reservoirs were supplemented from the regulated system.

Currently, the LTAAEL calculation provision includes 'an estimated extraction by the Broken Hill Water Board averaged over the period from 1 July 1993 to 30 June 1999 in the water source',³¹⁴ which does not accurately reflect the current town water supply needs or the volumetric use of this entitlement. In calculating a volumetric LTAAEL (see **Section 4.1**), DPIE-Water should work with Essential Water to determine volumetric entitlement needs from the Plan area. Once

³⁰⁷ Essential Energy (2020) *Essential Energy 2019-20 Annual Report*, p. 16. Available at: <https://www.essentialenergy.com.au/-/media/Project/EssentialEnergy/Website/Files/About-Us/AnnualReport2019-20.pdf?la=en&hash=6D19C8345445D6854939B93EA1F7D55BD71BAE32>.

³⁰⁸ Interview: Essential Water, 30 July 2021.

³⁰⁹ *Ibid.*

³¹⁰ Essential Water (2018) *Drought Management Plan for the water supply business in the Broken Hill Region*. Available at: <https://essentialwater.com.au/media/0tqgjvjd/ceop2288publicdroughtmanagementplan.pdf>.

³¹¹ Balmoral Group Australia (2018) *Far West Regional Economic Development Strategy*. Available at: <https://www.nsw.gov.au/sites/default/files/2020-06/Far%20West%C2%A0REDS.pdf>.

³¹² Clause 21 (a) of the *Water Sharing Plan for the Murray Regulated Water Sources* lists the total local water utility entitlement for the Murray Water Source and the Lower Murray Darling Water Source.

³¹³ Interview: Essential Water, 30 July 2021.

³¹⁴ Clause 26 of the Lower Murray-Darling Plan.

entitlement is determined, DPIE-Water should include a volumetric entitlement in the Plan remake to ensure that use is transparent and managed within sustainable limits.

Given the secure town water supply from the Murray River, Essential Water advised it is willing to consider a reduction in entitlement associated with their Unregulated Lower Murray Darling local water utility access licence.³¹⁵ Schedule 4 of the Plan allows for the removal of a local water utility access licence or an access licence of the subcategory 'town water supply' at the Minister's discretion once an augmentation has occurred post plan commencement.³¹⁶ Before a reduction of entitlement is considered, DPIE-Water and Essential Water would need to determine the volume of water required from the Lower Murray Darling Unregulated Water Source to ensure security of supply. The Commission understands DPIE-Water would also require that Essential Water provide an Integrated Water Cycle Management Plan so that there is confidence in reducing the entitlement associated with the Lower Murray-Darling Unregulated Water Source.³¹⁷

Following this step, DPIE-Water should consider if there remains available entitlement within a sustainable LTAAEL limit. Then, alternative uses for the partially retired entitlement should be considered, recognising there would need to be a mechanism for releasing the water from storage for other uses. For example, it could be transferred to Aboriginal communities, such as the Barkandji (see **Chapter 7**) for cultural or economic purposes. Transferring some entitlement to Aboriginal communities could assist to achieve the Aboriginal cultural objectives of the Lower Murray-Darling Plan clauses 10(1) and 10(2)³¹⁸ and could also support Priority 2 of the *NSW Water Strategy* and help achieve the Closing the Gap targets.³¹⁹ This would have implications of the broader community and would require appropriate engagement processes. Any such transfer should be done in accordance with equitable sharing objectives, which should be established in the Plan (see **Section 8.3**).

6.2 Town water supply needs for Intersecting Streams should be clarified

The Commission is unable to report on the effectiveness of the Intersecting Streams Plan in supporting social and economic outcomes associated with town water supply. Without submissions or stakeholder interviews it is difficult to determine. Given the area is facing difficult circumstances due to the COVID-19 pandemic it would be more appropriate for this consultation to be undertaken at Plan remake.

Maintaining access to quality town water supply to the townships of Enngonia, Wanaaring and White Cliffs is essential to underpin the population's critical water needs. These townships are

³¹⁵ Interview: Essential Water, 30 July 2021.

³¹⁶ Clause 72 4(d) of the Lower Murray-Darling Plan

³¹⁷ Personal communication, DPIE-Water, 2 September 2021.

³¹⁸ Lower Murray-Darling Plan Clause 10 Aboriginal cultural objectives

(1) The broad Aboriginal cultural objective of this Plan is to maintain, and where possible improve, the spiritual, social, customary, and economic values and uses of water by Aboriginal people.

(2) The targeted Aboriginal cultural objectives of this Plan are:

(a) to provide access to water in the exercise of native title rights

(b) to provide access to water for Aboriginal cultural use, including fishing

(c) to protect, and where possible improve, identified surface water-dependent culturally significant areas, including important riparian vegetation communities

(d) to contribute to the maintenance of water quality within target ranges to ensure suitability of water for Aboriginal cultural use.

³¹⁹ 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. DPIE-Water (2021) *NSW Water Strategy*. Available at: https://water.nsw.gov.au/__data/assets/pdf_file/0007/409957/nsw-water-strategy.pdf.

categorised as remote and very remote and are likely to be subject to social disadvantages and vulnerabilities.³²⁰

*'The impacts of changes such as water reform, drought or change in agriculture are often larger in outer regional and remote areas where the local economy is often more dependent on agriculture than is the case in inner region areas or in major cities.'*³²¹

Further, these townships have large and diverse Aboriginal and Torres Strait Islander populations. In 2016, the Bourke LGA's (Enngonia and Wanaaring) Aboriginal and Torres Strait Islander people comprised on average 31.3 percent of the population. The Central Darling LGA (White Cliffs) Aboriginal and Torres Strait Islander people comprised on average 39.6 percent of the population.³²² This is much higher than the state average of 2.9 percent or rural areas of NSW at 3.7 percent.³²³ Research has shown that Indigenous Australians experience much higher levels of disadvantage than non-Indigenous Australians.³²⁴ Aboriginal communities in far west NSW have experienced a range of challenges in accessing clean drinking water:

*'Ngemba people also value the health of Country so they can use water for domestic purposes, including bathing, watering gardens, cleaning and drinking. 'My mother used to take us kids to the river when she used to do the washing on the riverbank.' 'People in town still depend on the river a lot. Mainly for household needs.'*³²⁵

As a result, it will be critical that DPIE-Water engage with local councils and Aboriginal representatives during the Plan remake to determine if town water supply needs have been adequately provided for in associated entitlements. The town water supply needs must be clearly reflected in Plan provisions.

At Plan commencement, share components for local water utility access totalled 312 ML per year (less than 1 percent of total entitlement), including 91 ML per year from Culgoa River Water Source and 221 ML per year in the Paroo River Water Source.³²⁶ The 2020 amended Plan notes that the Culgoa share component was repealed.³²⁷ However, data provided by WaterNSW from its Water Licencing System still lists the Culgoa Share component.³²⁸ In the Plan remake, DPIE-Water should determine the status of Culgoa local water utility entitlements and an accurate volume of local water utility entitlement should be reflected in the Plan provisions.

³²⁰ Schirmer, L. and Mylek, M. (2020) *Thriving, surviving, or declining communities: socio-economic change in Murray-Darling Basin communities*, p. 13. A report prepared for the Panel for the Independent Assessment of Social and Economic Conditions in the Murray-Darling Basin. University of Canberra. Available at: <https://www.agriculture.gov.au/sites/default/files/documents/uc-socio-economic-change-mdb-communities.pdf>.

³²¹ *Ibid.*

³²² Australian Bureau of Statistics (2021) *Estimated Resident Population by LGA 2001-2019*. Available at: https://stat.data.abs.gov.au/Index.aspx?DataSetCode=ABS_REGIONAL_LGA2020.

³²³ *Ibid.*

³²⁴ National Agreement on Closing the Gap (2020). Available at: <https://www.closingthegap.gov.au/sites/default/files/files/national-agreement-ctg.pdf>.

³²⁵ DPIE (2019) *Report on culturally appropriate First Nations consultation with Ngemba Nation*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0019/236143/culturally-appropriate-first-nations-consultation-ngemba.pdf.

³²⁶ See Clause 22 of the Intersecting Streams Plan.

³²⁷ See Clause 22(a) of the Intersecting Streams Plan.

³²⁸ Data provided by WaterNSW from its Water Licencing System, as at May 2021.

6.3 Recommendations

<p>R 6 – Lower Murray-Darling Plan</p>	<p>When remaking the Plan, to ensure town water supply needs are adequately accounted for, DPIE-Water should:</p> <ul style="list-style-type: none"> a) in consultation with Essential Energy (Essential Water), review the local water utility entitlement for the Lower Murray Darling Water Source that is required for security of town water supply given the NSW regulated Murray is now the main source of town water supply for Broken Hill and surrounding communities b) include the updated local water utility volumetric entitlement in the Plan remake to ensure that use is transparent and managed within sustainable limits c) update the Plan to make it clear that Umberumberka Reservoir, which has historically been used for town water supply, sits outside of the Plan area (in the <i>Water Sharing Plan for the North Western Unregulated and Fractured Rock Water Sources 2011</i>) and review the Lower Murray-Darling local water utility licence to ensure entitlement sits with the appropriate Plan d) if local water utility access licence entitlement is reduced, consider alternative uses of any remaining entitlement within sustainable limits, including the option to use the entitlement to improve outcomes for Aboriginal communities to achieve Aboriginal cultural plan objectives.
<p>R 7 – Intersecting Streams Plan</p>	<p>When remaking the Plan, to ensure town water supply needs are adequately accounted for, DPIE-Water should:</p> <ul style="list-style-type: none"> a) consult with local stakeholders regarding local water utility entitlements to determine if town water supply has been accurately provided for b) include all the town water supply entitlements in the Plan remake and ensure that operating arrangements are transparent

7 Delivering outcomes for Aboriginal people

The Commission continues to identify critical issues in water sharing plans relating to Aboriginal water rights and protection of cultural values across all its reviews in the 2019-21 period.³²⁹ There are several specific examples of these issues for Aboriginal water within the Plan areas that are highlighted in the sections below.

The Commission acknowledges that the COVID pandemic and lockdowns from June to October 2021 limited face-to-face stakeholder engagement for this review, including with First Nations peoples. The Commission supports engagement with Aboriginal communities as part of any Plan replacement process and views this as critical in the path towards improving outcomes for Aboriginal peoples. The Plan replacement process is the responsibility of DPIE-Water, including stakeholder engagement. The Commission is committed to stakeholder engagement as part of its review process and will continue to engage with Aboriginal stakeholders as part of its review scope.

7.1 Address key state-wide issues as part of the Aboriginal Water Strategy

Research continues to show that engagement with Aboriginal people and the incorporation of cultural values into water sharing plans is inadequate. Aboriginal water holdings are suffering disproportionately under NSW legislation, with continuing issues of inequity that need to be addressed at a state-wide scale.³³⁰ The new Closing the Gap targets³³¹ and the recent Productivity Commission review of national water reform highlight these issues and identify ways to better support Aboriginal water.³³²

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- ³²⁹ Key findings on Aboriginal water from other water sharing plan reviews include:
- Provisions have failed to protect and allocate water for native title for registered claims and determinations, and do not proactively consider native title and other Aboriginal land ownership and management
 - Aboriginal water cultural values are not adequately identified and protected, and watering needs are not provided for under current water sharing plan provisions or licences
 - Native title and Aboriginal water provisions limit uses to traditional cultural applications only, thereby not supporting a range of Aboriginal water values including economic uses as defined in objectives and visions
 - Aboriginal engagement in water planning has been inconsistent and inadequate, thereby limiting knowledge and support of Aboriginal water values and uses
 - Key barriers to Aboriginal water rights and interests are systemic and institutional and require statewide legislative, policy and practice change, and significant increases in Aboriginal staff, resourcing and support.
- See: Natural Resources Commission (2021) *Review of water sharing plans for the Bega and Brogo Rivers Area, Murrah-Wallaga Area, and Towamba River water sources*. Available at: <https://www.nrc.nsw.gov.au/wsp-reviews>.
- ³³⁰ Aboriginal water holdings have suffered ongoing impacts from the inception of water legislation to modern water policy, particularly with the separation of land and water following major water reforms in the early 2000s. A recent study of empirical water entitlement data in the NSW portion of the Murray-Darling Basin showed that while Aboriginal people in this area constitute nearly 10 percent of the population, their organisations hold only 0.2 percent of the available surface water. In addition, 17.2 percent of Aboriginal water holdings by volume were lost from 2009–18. See: Hartwig L.D., Jackson, S. Markham, F. and Osborne, N. (2021) Water colonialism and Indigenous water justice in south-eastern Australia, *International Journal of Water Resources Development*, DOI: 10.1080/07900627.2020.1868980; Hartwig, L., Jackson, S., Osborne, N. (2020) Trends in Aboriginal water ownership in New South Wales, Australia: The continuities between colonial and neoliberal forms of dispossession, *Land Use Policy* 99.
- ³³¹ 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. See: www.closingthegap.gov.au/sites/default/files/files/national-agreement-ctg.pdf.
- ³³² Productivity Commission (2021) *National Water Reform 2020*, Draft Report, Canberra.

Importantly, the *NSW Water Strategy* was released in September 2021 and recognises the need for further improvement in these areas. The Strategy sets out a number of 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 to: ³³³

- strengthen the role of First Nations/Aboriginal People in water planning and management
- develop a state-wide Aboriginal water strategy
- provide Aboriginal ownership of and access to water for cultural and economic purposes
- work with First Nations to improve shared water knowledge
- work with Aboriginal people to maintain and preserve water-related cultural sites and landscapes.

Publicly committing to these strategic actions is welcome. Now, the challenge is in effectively implementing them, particularly in a water system that is already fully allocated.

DPIE-Water has been working with key Aboriginal stakeholders to identify and guide these action areas and recently advertised a Director of Aboriginal Water to develop the Aboriginal Water Strategy. There has also been increased resourcing for Aboriginal liaison staff within DPIE-Water to support a range of planning activities. ³³⁴

The Commission encourages a focus on several key priorities as part of the state-wide strategy. Most urgently, the Aboriginal Water Coalition or a new model of Aboriginal-led governance needs to be established following a period of inactivity. ³³⁵ Aboriginal stakeholders need to be at the core of developing the *NSW Aboriginal Water Strategy* to ensure it meets their needs, addresses critical barriers to water use and access, and includes Aboriginal peoples as knowledge holders and leaders for implementing actions to restore Aboriginal water rights and interests in NSW.

Secondly, the *Aboriginal Water Strategy* must address (at a minimum) common, state-wide issues for Aboriginal water rights, values and uses that the Commission identifies across its reviews. ³³⁶ This will require ongoing resourcing for increasing and retaining employment of

³³³ DPIE-Water (2021) *NSW State Water Strategy*. Available at: <https://dpi.e.nsw.gov.au/water/plans-and-programs/nsw-water-strategy>.

³³⁴ This included funding for the Barkandji Prescribed Body Corporate and Ranger group, and funding for representative groups MLDRIN and NBAN as part of developing WRPs and regional water strategies. Interview: Principal Aboriginal Policy and Legislation Officer - Water Policy & Legislation - DPIE-Water, 7 May 2021.

³³⁵ Input from stakeholders provided for this review suggests that the Aboriginal Water Coalition has not met during 2021 and has not had consistent input from members or members have withdrawn. The reasons for this suspension of the Coalition are multiple, including a formal partnership agreement put forward by DPIE-Water that was not seen as an appropriate model for engagement by some prospective members ‘our argument is that we need to start with our position...what our members think...not what DPIE think. They need to come to the table early enough to ask what we want, not come to the table with their points and ask us to sign up’ (MLDRIN, 28 May 2021). This breakdown in the Coalition means that guidance on the *Aboriginal Water Strategy* have not progressed from the Commission’s last review. Source: Interviews – DPIE-Water, Aboriginal Policy and Legislation Officer, 7 May 2021; MLDRIN Executive Officer and Board Member, 28 May 2021.

³³⁶ The Commission has previously recommended DPIE-Water support Aboriginal water rights, values and uses by:

- Hiring and training Aboriginal staff to undertake culturally appropriate water planning, management and engagement
- Proactively considering native title claims, ILUAs or other Aboriginal land and water agreements wherever possible as part of the planning, drafting and engagement process for plans
- Establishing common provisions to undertake preliminary amendments to a plan when a registered native title claim or determination is made. Allow for additional time to undertake detailed engagement with Traditional Owners to make any specific water allocations and final amendments to the plan required.

Aboriginal water staff to lead meaningful change, engagement and capability-building on complex water sharing issues.³³⁷

Finally, for plans updated in the Murray-Darling Basin, DPIE-Water has recognised the need to establish a clear process for how the findings on cultural values and uses identified as part of Basin engagement efforts³³⁸ can be used to support Aboriginal water in these plans.³³⁹ This needs to include efforts to update the generic provisions currently included across all these inland plans to reflect individual Aboriginal Nation values and contributions, and to undertake more engagement where needed to address known gaps in Aboriginal involvement (see discussion in **Section 7.3**).³⁴⁰

7.2 Better understand and protect native title and Country

In the Plan areas, there are native title determinations and ILUAs for the Barkandji peoples, with further native title claims registered for the Gomeri and Ngemba, Ngiyampaa, Wangaaypuwan and Wayilwan peoples (see **Section 2.5**). The Commission last engaged with some of these Nations as part of the Barwon-Darling water sharing plan review – at which time there was inadequate recognition and support of the Barkandji Native Title determination and rights to water.

Since that review, the updated Plans now specifically acknowledge the native title determination for the Barkandji Traditional Owners, as recommended by the Commission. The Plans also replicate recent updates to water sharing plans across the Basin, in that they now include generic requirements to:

- provide water to satisfy native title rights, where a determination or ILUA is made
- monitor the extent to which native title requirements have been met

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- Identifying Aboriginal values and uses, objectives and outcomes in all plan areas through extensive engagement with local Aboriginal knowledge holders including Aboriginal women
 - Using well-evidenced cultural flow and Country-based principles and processes for identifying, protecting, and monitoring Aboriginal water values and outcomes
 - Co-designing options to support a wide range of cultural, environmental, social and economic water values and uses (for example, volumetric allocations from unallocated flows; water purchase or transfer of licences; improved licencing; other water custodianship that is non-volumetric/non-licenced; commercial and trading options).
 - Identifying and supporting the appropriate infrastructure, resources and education needed to support Aboriginal water access and use
 - Co-designing and delivering awareness-raising, capability-building and education measures on water sharing, planning and management in NSW
 - Support Aboriginal ownership, management and leadership in water and ensure this is well-resourced – to help meet Closing the Gap targets
 - Consider, prioritise and commit to changes to legislation and policy that are needed to support these actions.

³³⁷ The need for consistent resourcing for Aboriginal water staff has been continually noted throughout the Commission's review and was highlighted in stakeholder consultation conducted for these Plans: '*Consistency of [staff] is a key factor, you need to build relationships so you know the pathways for Nations to become involved ... [Water sharing plans] are incredibly complex legal documents, we don't have enough experience of how they work in practice ... without these types of relationships and consistent people to go to it's impossible.*' Interview: Executive Officer and Board Member, MLDRIN, 28 May 2021.

³³⁸ In its latest inland plan reviews, the Commission notes improvements in Aboriginal engagement, resourcing and consideration of Aboriginal water values by DPIE-Water as part of the Basin Plan requirements and processes – including nation-based consultation undertaken for the WRP process and regional water strategies in NSW. However, there was no clear process for how the findings on cultural values and uses identified as part of these Basin engagement efforts would be used to support Aboriginal water in the plans. In addition, plan updates have not adequately reflected individual nation values and contributions; and instead put forward generic provisions for all Aboriginal water in the Basin that are not practical to implement or measure.

³³⁹ Interview: Principal Aboriginal Policy and Legislation Officer - Water Policy & Legislation - DPIE-Water, 7 May 2021.

³⁴⁰ Interview: Executive Officer and Board Member, MLDRIN, 28 May 2021.

- support amendments where native title rights may change under the *Native Title Act 1993*.³⁴¹

Despite these improvements, it remains unclear how these generic provisions reflect the views of individual nations or how they can be practically implemented to protect and support native title rights to water, including for the Barkandji peoples:

*'They need to acknowledge our Native Title rights. Come and understand native title and what it means to us. We don't want to sign on to the [water sharing plans] or [Water Resource Plans] – it won't get water back in the river that way...that will mean they tick that box and move on.'*³⁴²

The need to improve understanding and protection of native title rights is an ongoing gap, not only for Barkandji peoples, but also generally for other Aboriginal Nations – this was also noted by other stakeholders during consultation for this review.³⁴³

The Barkandji peoples have been active in developing a Barkandji Healthy Country Plan, setting up the Baaka Water Commission (see **Figure 11**), establishing the Barkandji Ranger group and gaining funding from relevant agencies. The Commission supports the well-evidenced processes of Country-based planning and the specific vision and targets being developed as part of the Barkandji Healthy Country Planning process currently being undertaken.³⁴⁴

The Commission advocates that the Baaka Water Commission, and similar Country-based groups such as the Gomeroi/Kamilaroi Water Committee (derived from current native title applicants and advisors), form a preferred model for engagement on water planning going forward – to work with Aboriginal Nation groups on better acknowledging and supporting their water values, requirements, rights and aspirations. As aptly described by Barkandji CEO below – this is a new process where a genuine commitment to shared learning and listening is key:

*'We need to ask ourselves, what does Native Title mean? This is new really, especially in the water space. This needs to be about educating community on what Native Title is and what it means to us as Barkandji – there is a lot of confusion and uncertainty out there around this. It's about bringing people together ... when we're on the journey together, we are better able to change and adapt together and understand why. We want to set a precedent for other nations and communities – about self-determination in practice.'*³⁴⁵

The Commission emphasises the importance of such approaches taking a proactive approach to engaging with Nations about their Country and watering needs.³⁴⁶

³⁴¹ Division 2, Section 18 *Water Sharing Plan for the Lower Murray-Darling Unregulated River Water Source 2011*.

³⁴² Interview: CEO – Barkandji Native Title Group Aboriginal Corporation, 3 March 2021.

³⁴³ Interviews: CEO – Barkandji Native Title Group Aboriginal Corporation, 3 March 2021; MLDRIN Executive Officer and Board Member, 28 May 2021.

³⁴⁴ To date, the Barkandji Healthy Country Planning process has undertaken pre-planning and identified a vision, scope, targets and threats together with key community, government and agency stakeholders. Strategies, objectives, indicators and actions will be part of subsequent planning phases.

³⁴⁵ Interviews CEO – Barkandji Native Title Group Aboriginal Corporation, 3 March 2021.

³⁴⁶ See: Behrendt, J. and Thompson, P. (2003) The Recognition and Protection of Aboriginal Interests in NSW Rivers, *Journal of Indigenous Policy*, Issue 3; Jackson, S. and Langton, M. (2012) 'Trends in the recognition of indigenous water needs in Australian water reform: the limitations of 'cultural' entitlements in achieving water equity'. *Water Law* 22 (2/3), 109–123; Tan, P.L.; and Jackson, S. (2013) 'Impossible dreaming—Does Australia's water law and policy fulfil Indigenous aspirations?', *Environment and Planning Law Journal*, 30: 132–49; Duff, N. (2017) 'Fluid Mechanics: The Practical Use of Native Title for Freshwater Outcomes'. AIATSIS Research Publications, Canberra; Hartwig, L., Jackson, S. and Osborne, N. (2020) 'Trends in Aboriginal water ownership in New South Wales, Australia: The continuities between colonial and neoliberal forms of dispossession', *Land Use Policy*, 99. Available at: <https://doi.org/10.1016/j.landusepol.2020.104869>.

CASE STUDY: BAAKA WATER COMMISSION *'The way forward (shared footprints) – going with the flow'*

'Considering the poor state of our Darling Baaka River system we have an opportunity to work together, to bring experts, governments and Traditional Owners together to bring our waterways back to life. We put forward that the way to achieve this is through the formation of the Baaka Water Commission – an entity that gives us all an equal voice with the best interests of the health of our beautiful life-giving Baaka and the individuals, communities and livelihoods that rely on it'

The Baaka Water Commission is a different approach to government and Traditional Owner relations in NSW requiring deep collaboration and whole-of-system redesign across the water sector.

The Water Commission was set up in late 2019 and is being driven by the Barkandji Native Title Group Aboriginal Corporation RNTBC and its Implementation Unit. It comprises a multi-agency decision-making and leadership body bringing together leaders at Ministerial and Departmental levels from across State, Local and Commonwealth Government including DPIE-Water, DPIE-EES, DPI-Fisheries, the Natural Resources Commission, MDBA, CEWO, Aboriginal Affairs, National Indigenous Australians Agency, NSWALC, Local Land Services, NBAN, MLDRIN, Biodiversity Conservation Trust, CSIRO.



'We have the cultural right to speak for our Baaka and do so under Traditional Lore in our attempt to make a lasting difference for the generations who will become custodians to our scared and ancient lands and waters into the future'

Figure 11: Case Study – Baaka Water Commission³⁴⁷

³⁴⁷ Barkandji Native Title Group Aboriginal Corporation RNTBC (2019) *Baaka Water Commission Proposal*.

7.3 Identify Aboriginal water values and uses

The Plans mirror recently updated water sharing plans across the Basin³⁴⁸ that were a result of the WRP process.³⁴⁹ All water sharing plans in the Basin now comprise the same generic vision,³⁵⁰ objectives,³⁵¹ strategies³⁵² and performance indicators³⁵³ to maintain and improve values and uses of water by Aboriginal people. They also include a provision allowing amendments to Plans after Year 5 to provide rules for the protection of water-dependent Aboriginal cultural assets where they are identified.³⁵⁴

Aboriginal Nations and other representative groups in the Plan areas feel the model to engage and collate cultural values across water planning areas was inadequate – often relying on short-term contracts with consultants with limited water knowledge or experience in appropriately collating water values and uses. As a result, the Plan provisions do not reflect the outcomes of nation-based engagement in the area (where it has been conducted), nor have all Nations and groups been adequately consulted as part of this process.³⁵⁵

*'The WSP amendments are all generic objectives, strategies ... across all inland plans. Nations have had no input ... there has been no actual consultation that we are aware of and certainly none at a plan level.'*³⁵⁶

In addition, it is unclear how the objectives and indicators could be practically implemented. As a result, Aboriginal water values are not well understood or integrated in the Plans, nor can they be adequately protected – as was noted in several submissions to these reviews.³⁵⁷

The review of both plans has identified a range of existing information that could be drawn on in these areas to better understand and integrate Aboriginal water values. For example, some of the more informed Nation consultation reports prepared as part of the WRP process (for

³⁴⁸ The Commission has been informed by DPIE-Water that these provisions were included across all recent Plan updates in the basin, as a result of the WRP process.

³⁴⁹ The independent Aboriginal assessments of NSW Water Resource Plans have been completed by MLDRIN and NBAN and no plans have been determined to meet the assessment criteria for Aboriginal water and therefore have not been recommended for approval. The key issues noted during the Commission's consultation for this review include:

- significant delays in starting Aboriginal consultation meant that groups were consulted very late in process – for example, most Aboriginal nations were only consulted after the plans were put on public exhibition
- inconsistency in consultation efforts due to the use of different contractors to undertake engagement with little involvement from departmental staff
- no consideration of Aboriginal nations in the risk assessment process.

Source: Interviews: Executive Officer and Board Member, MLDRIN, 28 May 2021; Board Member, NBAN, 27 May 2021.

³⁵⁰ Part 2, Section 7(c) *Water Sharing Plan for the Lower Murray-Darling Unregulated River Water Source 2011*; Part 2, Section 8(c) *Water Sharing Plan for the Intersecting Streams Unregulated River Water Sources 2011*.

³⁵¹ Part 2, Section 10(1-2); Part 2, Section 11(1-2).

³⁵² Part 2, Section 10(3); Part 2, Section 11(3).

³⁵³ Part 2, Section 10(4); Part 2, Section 11(4).

³⁵⁴ Part 12, Division 3, Section 63(5); Part 11, Division 3, Section 78(6).

³⁵⁵ Nation consultation reports are not finalised for Barkandji and Yitha Yitha Nations in the Plan area.

³⁵⁶ Interview: Executive Officer and Board Member, MLDRIN, 28 May 2021.

³⁵⁷ There were several submissions that stated the Plans had failed to protect Aboriginal water values:

- *'The 2019 Citizen's inquiry into the health of the Barka/Darling River found: people have never seen the Barka/Darling River in such a terrible state, and many believe the river system is suffering ecosystem collapse, and is dying; there is concern about the lack of safe, clean drinking water and the lack of safe water supply for bathing, washing and gardening; people spoke of the ongoing loss of Indigenous Peoples' lands, water, culture and livelihoods; the negative impacts on human mental and physical health; the psychological and emotional toll of watching the natural environment, and much of its wildlife, disappear or die before their eyes'.* (Individual submission, received 18 December 2020)
- *'The WSP has failed to protect, preserve, maintain and enhance the Aboriginal, cultural and heritage values or to protect basic landholder rights'* (Inland Rivers Network, submission received 18 December 2020)
- *'The Barkintji people have not been able to follow their cultural practices, and have become demoralised'.* (Individual submission, received 16 December 2020).

example, Muthi Muthi, Ngemba, Ngemba, Kunja and Ngiyampaa Nations) contain extensive information on Aboriginal water values and uses, risks and impacts and objectives and outcomes.³⁵⁸

The report on engagement with the Ngiyampaa Nation details the knowledge and cultural responsibilities for kalingaa (water) which means a great deal for these dryland communities:

*'Without the water, we lose culture and history.' For the Ngiyampaa, a healthy system brings life. 'It's healthy. You know, health for the people. It brings life. ... Without water, we'd be done. It's our lifeblood.'*³⁵⁹

Knowledge of critical water pathways is evidenced in: creeks fed by springs and rain-filled lakes; billabongs and lagoons fed by creeks; and lakes filled by creeks, such as the Menindee Lakes, the Willandra Lakes and Lake Mungo – all of which are important sources of water and bush tucker.³⁶⁰

The Barkandji Healthy Country Plan and Barkandji Maraura Kiira Tar Ru Healthy Country Plan³⁶¹ are further examples of existing resources that set out clear values, objectives and plans for respective areas of their Country. These plans provide a solid foundation to work with the Barkandji peoples in a way that respects their custodianship and knowledge of how the kiira (land) and nguku (water) are better respected and protected under various mechanisms including water sharing plans.

The Commission recommends that DPIE-Water progress work on how to better translate constructive examples of Nation planning and Nation-based consultation into revised water sharing plans. This includes updating the generic objectives, strategies and indicators currently included to reflect the values and input of Aboriginal peoples in specific Plan areas.

The Commission advocates that the Country-based planning model provides an essential foundation to work with Aboriginal peoples on their Country, in a way that respects their ongoing custodianship – as described by Ngiyampaa Traditional owners: *'This way we're looking after our Country. We're talking about our Country which we relate to.'*³⁶² This is also the fundamental principle set out in DPIE's own *'Our Place on Country' Aboriginal Outcomes Strategy (2020)*.³⁶³ Country-based approaches proactively support Aboriginal Nations and their ability to speak for their Country; and have government listen and hear them.

The well-evidenced National Cultural Flows Methodology and Aboriginal Waterways Assessment³⁶⁴ process can then be used as an effective way to support the transition between Country-based plans and watering needs (see further discussion in **Section 7.4**).³⁶⁵

³⁵⁸ Ngiyampaa Nation consultation report (2018) *Culturally appropriate First Nations consultation, prepared by Dhirrangal Solutions*. Published by NSW DoI.

³⁵⁹ *Ibid.*

³⁶⁰ *Ibid.*

³⁶¹ Barkandji Native Title Group Aboriginal Corporation (2018) *Barkandji Maraura Kiira Tar-Ru Healthy Country Plan*.

³⁶² Ngiyampaa Nation consultation report (2018) *Culturally appropriate First Nations consultation, prepared by Dhirrangal Solutions*. Published by NSW DoI.

³⁶³ DPIE, and the Department of Regional NSW (2020) *Our Place on Country Aboriginal Outcomes Strategy*. Available at: https://www.dpie.nsw.gov.au/__data/assets/pdf_file/0005/348980/Aboriginal-Outcomes-Strategy.pdf.

³⁶⁴ Mooney, W., and Cullen, A. (2019) 'Implementing the Aboriginal Waterways Assessment Tool: Collaborations to Engage and Empower First Nations in Waterway Management'. *Australasian Journal of Environmental Management* 26 (3): 197–215.

³⁶⁵ The National Cultural Flows Research Project is a project driven by and for Aboriginal people, sought to establish a national framework for cultural flows. The framework, released in 2018, provides the first guide and method for future planning, delivery, and assessment of cultural flows (MDBA (2019) *Cultural Flows*. Available at: <https://www.mdba.gov.au/discover-basin/water/cultural-flows>). The Aboriginal Waterways Assessment

7.4 Protect and provide for diverse Aboriginal water values and uses

It is critical that the identification of Aboriginal water values and uses is met with tailored objectives and rules in the Plans that protect and enhance these values.

In these Plans, only an Aboriginal cultural specific purpose access licence is available and this can only be used for traditional cultural purposes (not commercial or trading activities) with allocations capped at up to 10 ML per licence per year.³⁶⁶ This review has not identified any instances where these licences have been issued under the Plans. Indeed, the *NSW Water Strategy* notes that across NSW ‘only seven cultural water entitlements have ever been issued, with only two remaining in use today’.³⁶⁷

The Commission’s water sharing plan reviews have previously found that Aboriginal-specific water licences available in NSW are restrictive, inequitable, and unable to be easily accessed and applied for:³⁶⁸

‘Cultural Access Licence provisions are the only water access option outside of native title. Most Nations in the NSW-MDB do not have native title determinations. Issues with this framework are well known; they do not allow for economic or commercial uses.’³⁶⁹

There is no clear guidance available to assist Aboriginal people in applying for these licences, or to provide details on exemptions from fees³⁷⁰ for cultural access licences and works approvals: *‘licence application forms are really difficult – DPIE recognise the system is not easy but don’t do anything to fix it’.*³⁷¹ Critically, the range of uses of these licences are inherently limiting and inequitable by excluding economic gains through opportunities of trading and selling cultural produce. This is despite the objectives of the Plan clearly stating that Aboriginal ‘economic values are to be maintained, and where possible improved’.³⁷²

The Commission notes that protection of Aboriginal water values and uses means different things to different people. The solutions are likely a combination of mechanisms to support Aboriginal water values and uses ‘the aim is for a mix of both licences and allocations and environmental watering’.³⁷³ However, this can only be determined through working with local Aboriginal groups, Nations and knowledge holders as part of well-resourced engagement efforts in the Plan areas. This will also require the development of culturally appropriate resources to build water literacy and knowledge on water planning across all Plan areas.

For some, protection of water values cannot be prescribed in an entitlement or licence under water sharing plans – as noted by the Barkandji:

Program is a tool that consistently measures and prioritises river and wetland health so that Traditional Owners can more effectively participate in water planning and management in the Basin. (MDBA (2017) *Aboriginal Waterways Assessment Program*. Available at: <https://www.mdba.gov.au/publications/mdba-reports/aboriginal-waterways-assessment-program>).

³⁶⁶ Part 7, Clause 35(3-4); Part 7, Clause 39(3-4).

³⁶⁷ DPIE-Water (2021) *NSW State Water Strategy*, p. 57. Available at: <https://dpie.nsw.gov.au/water/plans-and-programs/nsw-water-strategy>.

³⁶⁸ For example, updated water sharing plans include performance indicators such as: ‘the water made available for Aboriginal cultural values and uses during the term of this Plan through available water determinations and the granting of new access licences’. Part 2, Section 12(4) *Water Sharing Plan for the Murray Unregulated River Water Sources 2011*.

³⁶⁹ Written advice: MLDRIN, received 28 May 2021.

³⁷⁰ This exemption was provided for under an IPART determination in 2014 (not applicable to water usage charges).

³⁷¹ Interview: Executive Officer and Board Member, MLDRIN, 28 May 2021.

³⁷² Part 2, Section 10(1).

³⁷³ Interview: Executive Officer and Board Member, MLDRIN, 28 May 2021.

*'We don't want a value on the water. Say we have x amount, what are we meant to do with it? We don't want to pump it. We don't want to sell it. We don't want to use it other than having water in the river. We want it for our people and our communities, for everyone. There are so many impacts from not having it on our people – we're Baaka river people, we're not desert people, we're not lagoon people, we're river people. We need our river.'*³⁷⁴

Some Nations have been relying on the opportunities offered through environmental water to support their cultural needs. For example, a shared project between the Ngiyampaa people and the CEWO at Booberoi Creek has brought back some cultural plants and animals – *'I seen the turtles coming back. I've seen the fish'* – and supported Aboriginal representation on the Environmental Water Action Group – *'We're putting our point across and getting somewhere.'*³⁷⁵

NBAN has also been developing a First Nations' Environmental Water Guidance for the MDBA in partnership with CEWO.³⁷⁶ In addition, MLDRIN worked with Southern Basin First Nations to develop a 'Statement on Environmental Water Use in 2021-22'.³⁷⁷ Significantly, this work has led to the inclusion of First Nations' environmental water objectives for the first time as part of the *2020-2021 Water Management Plan*.³⁷⁸ Although environmental watering is no replacement for cultural water, it has offered some examples of supporting Aboriginal water values.

For other groups, a cultural water allocation or similar mechanism is critical:

*'Actually having an allocation for communities is key – an amount of water that can be used for whatever purposes we want to use it; cultural, women's' business, economic, trading as well. The river is a highway for us ...these are paths for flows, for nutrients, for monetary and non-monetary trade and business.'*³⁷⁹

*[Ngiyampaa Traditional Owners consulted would like] 'our own allocation. A nation allocation... and we manage that ourselves.'*³⁸⁰

The need for cultural flows alongside other allocations and entitlements is described as part of the Murrawarri Nation project on Gooraman Swamp:

'There's a connection there from the Mundaguddah waterhole to the Gooraman Swamp, and that's of cultural significance. And that's the difference between the environmental flow and the cultural flow ... If we look at the two, some of it will overlap. So for example, the Mundaguddah waterhole and Gerrara Springs will fall into the environmental flow category. But if you get it in the Culgoa, down to Weilmoringle, and you fill that waterhole up, and you have enough water flowing down the system, then there are a number of waterholes, the connection to this place here. [Gooraman Swamp] is his home. The connection then allows him to travel. It's the same – there are all different names for him all through the

³⁷⁴ Interview: CEO – Barkandji Native Title Group Aboriginal Corporation, 3 March 2021.

³⁷⁵ Ngiyampaa Nation consultation report (2018) *Culturally appropriate First Nations consultation*, prepared by Dhirranggal Solutions. Published by DoI.

³⁷⁶ NBAN (2020) *First Nations Environmental Water Guidance*. Available at: <https://nban.org.au/index.php/fnewg/>.

³⁷⁷ Southern Basin First Nations Statement on Environment Water Use in 2021-22. Southern Basin First Nations' Environmental Watering Forum 2021. See: https://www.mldr.in.org.au/wp-content/uploads/2021/08/EWater2021Statement_FINAL.pdf.

³⁷⁸ CEWO (2020) *Water Management Plan 2020-21*, Commonwealth of Australia, Available at: <http://www.environment.gov.au/system/files/resources/fa59d94f-fc17-4391-a1e3-a8c3da947d26/files/water-mgt-plan-2020-21-chapter-1-2.docx>.

³⁷⁹ Interview: Executive Officer and Board Member, Murray Lower Darling Indigenous Nations, 28 May 2021.

³⁸⁰ Ngiyampaa Nation consultation report (2018) *Culturally appropriate First Nations consultation*. Prepared by Dhirranggal Solutions. Published by NSW Department of Industry, November.

*Murray. There's a common connection ... We need the cultural flow to fulfil our spiritual side of it, into Gooraman Swamp.*³⁸¹

The National Cultural Flows Methodology and Aboriginal Waterways Assessment process are increasingly being used as a means for identifying and quantifying cultural water values and flow requirements. The Commission recommends that DPIE-Water proactively work with Aboriginal Nations on using these well-evidenced processes for identifying and protecting cultural flows.³⁸² The Commission also notes as outlined in Chapter 6 that there may be water available within the Lower Murray-Darling due to the potential retirement of town water entitlement. If it is determined that water is available, this represents a unique opportunity to work with the Aboriginal community to determine how it could be used to fulfill the cultural objectives of the Plan.

For example, the Tati Tati peoples have established the first plan in the Murray Darling Basin to deliver cultural flows using this process.³⁸³ The Northern Basin Aboriginal Nations have also been leading early-stage cultural flows assessments over the last few years using the national methodology.³⁸⁴

There are also many earlier examples of cultural flows work undertaken in these Plan areas – developed as part of trialling the National Cultural Flows Methodology. These included identification of Ngemba water values and interests for the Old Mission Billabong and the Brewarrina Fish Traps facilitated by CSIRO in 2012,³⁸⁵ and later work in 2017 with the Murrawarri Nation on cultural flows required to protect water values for Gooraman Swamp.³⁸⁶ These have all applied the cultural flows methodology effectively to quantify water volumes to meet Aboriginal needs and could be used by DPIE-Water as the basis for providing allocations where available.

There has also been a series of recent papers on Indigenous water management,³⁸⁷ which identify opportunities, advice and methods of collecting and inputting cultural values and cultural flows into water planning – including a case study for NSW that established a process and methodology specifically for water planning in NSW.³⁸⁸

³⁸¹ F. Hooper, Research Partner – Murrawarri Provisional Council of State (2016), quoted in: MLDRIN, NBAN & North Australian Indigenous Land and Sea Management Alliance (2017) *Cultural Flows: Gooraman Swamp Cultural Flow Monitoring & Evaluation Plan*. National Cultural Flows Research Project.

³⁸² Perkins, M (2021) *Reversing 'aqua nullius': traditional owners seek cultural water rights*. The Sydney Morning Herald, August 30. Available at: <https://www.smh.com.au/environment/sustainability/reversing-aqua-nullius-traditional-owners-seek-cultural-water-rights-20210827-p58mgn.html>.

³⁸³ Jasper, C. (2021) 'Plan maps path to securing Aboriginal water rights in Murray-Darling Basin's Margooya Lagoon'. *ABC News*. Monday 30 August. Available at: <https://www.abc.net.au/news/rural/2021-08-30/first-nations-water-rights-murray-darling/100413232>; Perkins, M. (2021) 'Reversing 'aqua nullius': traditional owners seek cultural water rights'. *Sydney Morning Herald*, Monday 30 August. Available at: <https://www.smh.com.au/environment/sustainability/reversing-aqua-nullius-traditional-owners-seek-cultural-water-rights-20210827-p58mgn.html>.

³⁸⁴ The first stage has been completed with nine Aboriginal Nations with the aim of identifying and prioritising the spiritual, cultural, environmental, social and economic objectives each Nation has for water, and to capture these in a Plan so that Nations can advocate for the investment needed to meet these objectives. NBAN (2020) *Cultural Flows Nation Planning*. Available at: <https://nban.org.au/index.php/cfnpl/>.

³⁸⁵ Maclean, K., Bark, R.H., Moggridge, B., Jackson, S. and Pollino, C. (2012) *Ngemba Water Values and Interests Ngemba Old Mission Billabong and Brewarrina Aboriginal Fish Traps (Baiaime's Nguunhu)*. CSIRO, Australia.

³⁸⁶ MLDRIN, NBAN & North Australian Indigenous Land and Sea Management Alliance (2017) *Cultural Flows: Gooraman Swamp Cultural Flow Monitoring & Evaluation Plan*. National Cultural Flows Research Project.

³⁸⁷ Australasian Journal of Environmental Management (2019) Special Issue: Indigenous water management. Guest Editors: Sue Jackson and Bradley Moggridge, Volume 26, Issue 3. Available at: <https://www.tandfonline.com/doi/full/10.1080/14486563.2019.1661645>.

³⁸⁸ Moggridge, B. J., Betteridge, L. and Thompson, R. (2019) 'Integrating Aboriginal Cultural Values into Water Planning: A Case Study from New South Wales, Australia.' *Australasian Journal of Environmental Management* 26 (3): 273–286.

The Commission recommends state-wide initiatives for DPIE-Water to support diverse Aboriginal water values and achieve Priority 2 of the *NSW Water Strategy* by:

- adopting a common principle across all water sharing plans to ensure that where additional entitlements become available, Aboriginal water needs are assessed and provided for as a priority. For example, in these Plan areas DPIE-Water should investigate:
 - opportunities for re-purposing any entitlement that becomes available due to reduction in local water utilities needs for Aboriginal needs in the Lower Murray-Darling (see **Section 6.1**)
 - opportunities for buybacks of unregulated river access licences to transfer whole or partial entitlements to Aboriginal people in the Intersecting Streams Plan area – prioritising locations where cultural flow requirements are known such as for Gooraman Swamp
- proactively co-design licences, cultural flows and other water custodianship options (volumetric, non-volumetric and non-licenced solutions) in a community-led model of engagement with Aboriginal stakeholders as part of the *Aboriginal Water Strategy* process that meet a range of identified needs (cultural, environmental, social and economic uses).
- work with Australian Government counterparts to identify opportunities in consultation with Aboriginal stakeholders to access the \$40 million committed to deliver Aboriginal-owned water entitlements in the Basin (note: this was committed in 2018 with a deadline of 31 March 2021; however, the Australian Government is now considering redirecting this to non-water assets).³⁸⁹

³⁸⁹ Foley, M. (2021) 'Breach of faith': Money meant for Indigenous water rights could go elsewhere'. *Sydney Morning Herald*, March 26.

7.5 Recommendations

R 8 – Both Plans	<p>When remaking the Plans, to better achieve the Aboriginal water objectives, DPIE-Water should:</p> <ul style="list-style-type: none">a) ensure that consultation is undertaken to understand specific needs of the Aboriginal communities where there are native title determinations, applications and ILUAsb) allow sufficient time and ongoing resourcing for meaningful engagement with a range of Aboriginal Traditional Owners, groups and knowledge holders, including Aboriginal women, to better understand the water values and uses, identify the rules to protect them, and support water access and use in Plan amendmentsc) use existing information to identify and protect known high value cultural sites in the replacement Plansd) use Country-based plans and governance models as a basis for engagement and management where available and ensure Country-based planning is supported by governmente) use the National Cultural Flows Methodology to identify, prioritise and support Aboriginal water values – build on existing examples of cultural flows assessments available for the Plan areasf) ensure that, where cancelled or surrendered entitlements become available, that Aboriginal water needs are assessed and provided for as a priority – starting with the examples outlined in this reviewg) undertake detailed implementation planning for the <i>NSW Water Strategy</i> and <i>Aboriginal Water Strategy</i> that includes, at a minimum, state-wide actions identified by the Commission to better support Aboriginal values in water sharing plans.
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8 Improving equitable sharing of water consistent with the Act

The Commission has identified issues with how the Plans enable equitable sharing between water users. As outlined in **Section 4.1**, DPIE-Water has not adequately quantified the amount of take actually occurring within the Plan area. Consequently, it has not yet established a numeric extraction limit based on sustainable extraction. This creates both potential risks and potential opportunities.

Feedback from a range of stakeholders, including the MDBA, indicates that there is a considerable amount of interception of overland flow. The Commission has recommended (see **Section 4.2**) that all forms of interception be estimated and included in the LTAAEL to ensure extraction can be properly managed. Quantifying all forms of interception and comparing current water use with a sustainable limit may identify catchments where the take of water is not sustainable. However, the Commission has also identified that a significant portion of the local water utility water entitlement may no longer be required from the Lower Murray-Darling Plan area, potentially providing some additional opportunities to reallocate water in this Plan. The sections below outline the issues and recommendations for achieving equitable sharing of available water in line with the Act, depending upon whether DPIE-Water ultimately determines that the take of water in each catchment is at, above or below sustainable limits.

8.1 The Act requires Plans to manage equitable share

Plans are required by the Act to provide orderly, efficient, and equitable sharing between users.^{390, 391} What equitable sharing means and how it is managed between users is not adequately addressed in the current Plans (as amended in July 2020).

The 2011 Plans included the need to ensure equitable share between water users in the vision and objective provisions, but the amended plans removed the relevant objective and vision statement.³⁹² Clear equity objectives, supported by stakeholders and included in the Plans are necessary to outline transparently how plan rules will manage equitable sharing of water between various types of users. It is important to note that equity does not mean all users get an equal share. Equity relates to the fair distribution of available water consistent with the requirements of the Act. Both Plans need to include equity as an objective and provisions need to ensure equity is defined consistent with principles and priorities in the Act.

8.2 Risk of reductions in allocations needs to be considered

Where the amount of licensed water course extraction is small relative to other take, the rules around LTAAEL compliance can greatly impact the availability for licensed water course extraction. Currently rules would require a reduction in allocation to unregulated access licence holders in the event of LTAAEL exceedances. Reductions in allocations to accommodate any growth in basic landholder rights and interception can have negative socio-economic impacts on unregulated access license users. The socioeconomic impact of these reductions would depend on the extent to which the water available for extraction is required to be reduced.

The extent to which basic landholder rights requirements have been met under the Lower Murray-Darling and Intersecting Streams Plans is difficult to determine due to limited monitoring. There is no monitoring of domestic and stock use. While NRAR undertakes surveillance of

³⁹⁰ See Section 3(e) of the Act.

³⁹¹ See Clause 2(d) of the Act.

³⁹² See Clause 8 and 9(d) of the Plans.

harvestable rights dams in some regions as part of its compliance activities, there is no active monitoring by DPIE-Water.

Population growth for the Plan areas since 2011 was relatively low. Growth projections are below the NSW regional average (see **Section 2.6**) and do not signal significant growth in domestic and stock use alongside town water supply. However, in the Wentworth LGA, DPIE-Water observed a higher demand for river frontage properties, which could have an impact on basic landholder rights.³⁹³ Wentworth Shire Council confirmed there is demand and there have been some divisions in the area:

*'There is big demand for lifestyle properties. There is a minimum 10 hectare rule. There are lots of new developments going in around grapes and almonds. We have also seen a growth in lifestyle properties on the riverfront.'*³⁹⁴

DPIE-Water advised it is currently developing a new method to estimate basic landholder rights for future unregulated water sharing plans, which should be available in 2021. In estimating basic landholder rights requirements for the replacement plans, DPIE-Water should consider current and projected development patterns in basic landholder rights requirements in the Wentworth LGA.

Once basic landholder rights estimates are established, it is critical that all forms of use including harvestable rights, domestic and stock, and native title, are accounted for as part of Plan LTAAELs and actual levels of use are monitored. This will provide transparency to licence holders of any potential risk that AWDs may be reduced due to growth in basic landholder rights. As basic landholder rights are given priority under the Act over licenced extraction, licence holders will necessarily be at risk from any growth – rather than those responsible for increase in take from basic landholder rights. It is important the licence holders are aware of this risk.

Growth in other forms of currently unaccounted for take or interception could also have negative impacts on licence holders. The original Intersecting Streams Plan included a provision to allow for floodplain harvesting in the LTAAEL.³⁹⁵ However, this was removed from the amended Plan. This has implications for equitable sharing between those in this Plan area and other water sharing plans in NSW, as well as between NSW and Queensland users in the same catchment. The MDBA and the Commission have both recommended that all forms of interception should be included in the LTAAEL.

When incorporating additional forms of take into the LTAAEL, DPIE-Water should ensure that the rules equitably distribute any risks of reduced allocations in the future. For example, if it is determined that the system is currently overallocated once all forms of interception are included in estimates, then any reductions necessary will need to be fairly distributed. Currently, the Plan rules would require all reductions to come via a reduction in AWD to those extracting with a licence. Given that the amount of interception may be significantly larger than the total amount of extraction this creates a large and unfair risk for current licence holders.

The issues outlined create inherent risks for equitable sharing between users. Basic landholder rights allocations and any interception should be accurately quantified prior to the Plan remake, consistent with requirements under the Act. Accurate estimates of basic landholder rights should be made for the life of the current Plan and projected into the future in making the new Plan, so that provisions can be appropriately designed and assessed to ensure they are managed equitably, and so users can adequately understand risks within the system.

³⁹³ DPI (2020) *Agriculture Industry Snapshot for Planning Lower Murray Sub Region*. Available at: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/1260490/Lower-Murray-Snapshot.pdf.

³⁹⁴ Interview: Wentworth Shire Council, 26 July 2021.

³⁹⁵ See Clause 27 (c) of the of the original Plan.

8.3 Opportunities due to reduced local water utility entitlement

As outlined in **Section 2.3**, water for local water utilities in the Lower Murray-Darling Plan area is now predominantly supplied via regulated river water sharing plans. As such, the current entitlement of 6,300 ML per year within the Lower Murray-Darling Plan can be reduced.

This could create an opportunity to provide additional entitlement for a range of other uses. It could also help mitigate risks outlined in the previous section of potential overallocation in other forms of take. If there is additional entitlement available from a reduction in local water utility entitlement within a sustainable LTAAEL, this entitlement could also be used to assist in meeting other Plan objectives, such as achieving cultural outcomes. Any reallocation of entitlement should be done in accordance with the equity objectives, once established, and be consistent with the priorities under the Act.

8.4 Recommendations

R 9 – Both Plans	When remaking the Plans, to ensure the Plans facilitate equitable sharing of water, DPIE-Water should: <ul style="list-style-type: none">a) include objectives to provide for equitable sharing of water in both Plansb) assess the risks associated with a reduction in water availability and potential for growth in usec) ensure that the Plan provisions clearly specify how any potential reductions will be fairly allocated consistent with the priorities under the Act.d) include provisions to specify how any additional water that becomes available will be allocated.
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9 Monitoring, evaluation and reporting

Evidence of limited MER is a consistent theme raised in the Commission's reviews of water sharing plans. The lack of MER is largely due to a lack of plan specific MER programs, but also limited resources dedicated to undertaking MER activities.

While the Commission has observed the same limitations for the Intersecting Streams and Lower Murray-Darling Plan areas (i.e. lack of Plan-specific MER over the life of the Plans), the Commission recognises there are a range of other existing or historical monitoring programs in place that do support an understanding of the condition of water sources, and how environmental assets respond to changes in flow (**Section 9.1**).

The Commission recognises that DPIE-Water is taking steps to improve MER arrangements for water sharing plans (**Section 9.2**). However, this work will be subject to available funding. The Commission notes the recently released NSW Water Strategy includes an action under Priority 3 to '*invest in longterm and effective monitoring, evaluation, reporting and research.*'³⁹⁶ The Commission anticipates this action will be associated with funding commensurate with the importance of MER for assessing water sharing plan effectiveness and will support adaptive management.

9.1 Existing monitoring programs in the plan areas

The Intersecting Streams Plan and Lower Murray-Darling Plan areas are extensive. Most of the monitoring that has occurred to date has largely been undertaken by, or funded by, the Australian Government and academic institutions.

The NSW Warrego River has been subject to the CEWO Long-term Intervention Monitoring and Monitoring, Evaluation and Research project since February 2015.³⁹⁷ This continuing program of study has focussed on system hydrology and the response of water quality, primary production, micro- and macro-invertebrates, fish, water birds and frogs. Components of this study are relevant to Intersecting Streams Plan, including the management of flows through Toorale and associated environmental outcomes. Narran Lakes has been the subject of a several monitoring activities, including waterbird surveys³⁹⁸ and vegetation surveys as part of the Queensland Floodplain Vegetation Water Requirements Project.³⁹⁹

The Plan areas are part of a basin scale fish tagging and acoustic surveillance program monitoring the movement of golden perch and associated hydrological drivers over large spatial scales.⁴⁰⁰ This project is part of the Joint Ventures Monitoring and Reporting Program funded by the Murray-Darling Basin Authority.

The Commission understands that DPIE-Water does not intend to duplicate the above monitoring activities but will seek to draw upon these programs and link them back to Plan objectives and monitoring themes as part of an integrated MER plan (**Section 9.2**).

³⁹⁶ DPIE-Water (2021) *NSW Water Strategy*. Available at: https://water.nsw.gov.au/_data/assets/pdf_file/0007/409957/nsw-water-strategy.pdf.

³⁹⁷ Commonwealth of Australia (2015-2020) Commonwealth Water Office Long Term Intervention Monitoring Project Junction of the Warrego and Darling rivers Selected Area: 2015-2020 Evaluation Reports, Canberra.

³⁹⁸ Eastern Australia Aerial Waterbird Surveys run by the UNSW Sydney provide long-term data (spanning 38 years) for major wetland sites in the Murray-Darling Basin, including Narran Lakes.

³⁹⁹ Part of the Murray-Darling Basin Environmental Water Knowledge and Research Project.

⁴⁰⁰ Bice, C.M., Butler, G. L., Fanson, B., Harding, D. Hodges, K., Koster, W., Thiem, J. D., Woods, R and Zampatti, B.D. (2021) Hydrology and movement of adult golden perch (*Macquaria ambigua*) in the Murray and Darling Rivers determined by acoustic telemetry. South Australian Research and Development Institute, Adelaide.

9.2 Pathway towards improved MER

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

- updates to water sharing plan objectives to make them measurable and more meaningful
- the development of the NSW MER Framework and customised environmental MER plans
- 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 seen a copy of the Murray and Lower Darling Surface Water WRP MER Plan and the Intersecting Streams WRP MER Plan. The MER plans were designed to meet Basin Plan reporting requirements.⁴⁰¹ The environmental MER plans are based on program logic developed for the water sharing plan objectives, but also objectives from the LTWP and Water Quality and Salinity Management Plans. The program logic is intended to guide monitoring activities, while risk assessments undertaken as part of the WRP process are intended to inform areas for further research.⁴⁰² The MER plans also map out existing monitoring programs by research theme.

However, there is room for improvement:

- While the amended Plans include 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.
- The MER plans do not explicitly identify areas for further research based on risk and value.
- There do not appear to be clear roles and responsibilities or adequate resources for overseeing and implementing the MER plans, which generates risks to implementation.
- Methods manuals referred to in the MER plan do not appear to have been finalised.

Given limited resources, it will be critical for DPIE-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 the evaluation of the Plans. MER activities should be prioritised based on value and risk, and public reporting of MER findings should be prioritised to improve transparency and public awareness around Plan outcomes. Water source prioritisation and transferability studies currently underway by DPIE-Water will help to target effort and resources.

⁴⁰¹ DPIE-Water (2019) *NSW Murray and Lower Darling Surface Water Resource Plan Monitoring, Evaluation and Reporting Plan: Schedule J*.

⁴⁰² DPIE-Water (2019) *NSW Murray and Lower Darling Surface Water Resource Plan Monitoring, Evaluation and Reporting Plan: Schedule J*.

9.3 Knowledge gaps

The stream diversity and vast area covered by the Intersecting Streams and Lower Murray-Darling Plans means that there are significant knowledge gaps and limitation in monitoring. Further monitoring and research is required to improve system knowledge, refine water sharing plan provisions and support whole of catchment planning. They include, but are not limited to:

- better understanding of flows being captured in Queensland – this is critical to undertake water resource planning across the entirety of the Intersecting Streams catchments
- The impacts of climate change – while these systems are well adapted to periods of dry followed by wet phases, the impact of extended droughts on waterhole persistence and the impact on the environment are poorly understood. The impacts of extended periods between floods on floodplain communities is also not well studied. However, in both cases reduced availability of water is likely to have a detrimental effect on the condition of the environment.
- information regarding ecological processes – key research areas that should be undertaken include:
 - species and community presence and distribution and change in distribution
 - pool water quality and species dynamics in response to drying and reconnection
 - ecological watering requirements of ephemeral system species and communities
 - species resilience to extended dry conditions
 - improved understanding of floodplain ecosystems and floodplain hydrology, given the dominance of floodplains in the water sharing plan areas
- a systematic approach to inundation mapping in the Plan areas and linking the extent to flow stages or volumes – this will require repeat samples (inundation events) to help understand the effect of antecedent conditions on flow passage and inundation
- better understanding barriers to fish movement and how they impact on connectivity
- quantifying the extent of interception of overland flows.

9.4 Recommendations

R 10 – Both Plans	<p>By June 2024, to improve Plan-based MER for both Plans, DPIE-Water should:</p> <ul style="list-style-type: none">a) expedite the finalisation and publication of DPIE-Water's water sharing plan evaluation framework and methods manuals and ensure there is multi-agency support and oversight of their implementationb) identify feasible and appropriate resourcing to support ongoing MER activities in line with the <i>NSW Water Strategy</i>c) specify timely reporting requirements of the results of MER activities to support transparency, public awareness and adaptive managementd) 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. Clearly communicate how this framework interacts with monitoring plans and publicly report on where and why effort is being targeted.
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10 Compensation

Under the Act, compensation may be payable by the NSW Government to access licence holders. This can only occur 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 of the 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 changes 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. However, the Commission considers that compensation might be payable under Section 87AA in relation to some recommendations listed in **Table 14**.

Table 15: Recommendations that may trigger compensation

R 2	<p>To enhance cross-border management of flows, the NSW Government should, by the Intersecting Streams Plan remake:</p> <p>b) incorporate requirements for flow targets consistent with the Plan's environmental objectives into the remade Plan</p>
R 4	<p>To improve protection of the water sources and their water dependent ecosystems, in the remake of the Plans DPIE-Water should:</p> <p>c) verify the need to raise pumping thresholds for management zones in the Narran River Water Source to adequately protect ecosystems in line with the Intersecting Streams Long Term Water Plan and revise the Intersecting Stream Plan rules as needed.</p>

Recommendation 2b could require compensation if the flow targets materially affect the overall long-term allocation available to users. The proposed changes would be to provide additional water for the environment based on latest available information on environmental needs as well as projected reduction in inflows due to climate change.

Recommendation 4c could require compensation if it affects the overall long-term allocation available to users. This may be caused by providing additional water to the environment based on latest available information on environmental needs. However, Section 73 Part 8 of the Plans allows for many changes to be made without compensation, including alternate access rules for lagoons, lakes, in-river pools and other lentic water bodies.

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.

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. DPIE-Water should seek its own legal advice regarding any potential compensation implications of implementing the recommendations in this report.

Appendix A – Policies, plans and strategies considered

Table A1: List of policies, plans and strategies considered in this review

Name of document
NSW Water Strategy 2021 (DPIE, 2021)
Basin Plan Implementation - Intersecting Streams Surface Water Resource Plan - SW13 Water Resource Plan Area (DPIE, 2020)
Intersecting Streams Long Term Water Plan Parts A and B (DPIE, 2019)
Water quality management plan for the Intersecting Streams surface Water Resource Plan area SW13 (DPIE, 2019)
Intersecting Streams Surface Water Resource Plan Area Description Appendix A (DPIE, 2019)
Risk assessment for the Intersecting Streams Surface Water Resource Plan Area (SW13) Schedule D (DPIE, 2019)
Intersecting Streams Surface Water Resource Plan Consultation Report Schedule C (DPIE, 2019)
Our Place on Country Aboriginal Outcomes Strategy 2020–23 (DPIE, 2020)
Water Infrastructure NSW Strategy for delivering Aboriginal community outcomes - Consultation draft (DPIE, 2021)
Intergovernmental Agreement for the Paroo River between New South Wales and Queensland 2003
NSW Floodplain Harvesting Policy - version published in 2018 (NSW DoI, 2018)

Appendix B – Plan objectives, strategies and indicators

Table B1: Objectives, strategies and indicators in the Intersecting Streams Plan

Vision statement	
<p>8 The vision for this Plan is to provide for the following—</p> <ul style="list-style-type: none"> (a) the health and enhancement of these water sources and their water-dependent ecosystems, (b) the continuing productive extraction of surface water for economic benefit, (c) the spiritual, social, customary and economic benefits of surface water to Aboriginal communities, (d) social and cultural benefits to urban and rural communities that depend on surface water. 	
<p>Environmental Objectives</p> <p>9 (1) The broad environmental objective of this Plan is to protect, and contribute to the enhancement of, the ecological condition of these water sources and their water-dependent ecosystems over the term of this Plan.</p>	
Targeted objectives	Strategies
<p>9 (2) The targeted environmental objective of this Plan is to protect, and contribute to the enhancement of, the following over the term of this Plan—</p> <ul style="list-style-type: none"> (a) the recorded distribution or extent, and population structure, of target ecological populations, (b) the longitudinal and lateral connectivity within and between water sources to support target ecological processes, (c) water quality within target ranges for these water sources to support water-dependent ecosystems and ecosystem functions. 	<p>9 (3) The strategies for reaching the targeted environmental objective of this Plan are as follows—</p> <ul style="list-style-type: none"> (a) establish and maintain compliance with a long-term average annual extraction limit and a long-term average sustainable diversion limit, (b) reserve a portion of flows to partially mitigate alterations to natural flow regimes in these water sources, (c) restrict the take of water from in-river and off-river pools when the volume of that water is less than full containment volume, (d) restrict or prevent water supply work approvals within the Paroo River and its tributaries in the Paroo River Water Source, (e) reserve a portion of flows to maintain hydrological connectivity between these water sources and other connected water sources.
<p>Environmental Performance Indicators</p> <p>9 (4) The performance indicator used to measure the success of the strategies for reaching the broad environmental objective in subclause (1) is an evaluation of the extent to which the combined outcomes of the targeted objectives in subclause (2) have contributed to achieving the broad objective.</p> <p>9 (5) The performance indicators used to measure the success of the strategies for reaching the targeted environmental objectives in subclause (2) are the changes or trends in ecological condition during the term of this Plan, as assessed using one or more of the following—</p> <ul style="list-style-type: none"> (a) the recorded range, extent or condition of target ecological populations, (b) measurements of fish movements through priority fish passage areas, (c) the recorded values of water quality measurements including salinity, turbidity, total nitrogen, total phosphorous, pH, water temperature and dissolved oxygen. <p>9 (6) In evaluating the effectiveness of the strategies in meeting the objectives in this clause, the following will be relevant—</p> <ul style="list-style-type: none"> (a) the extent to which the strategies in subclause (3) and provisions in this Plan have been implemented and complied with, (b) the extent to which changes in the performance indicators can be attributed to the strategies in subclause (3) and provisions in this Plan, (c) the extent to which the strategies in subclause (3) support achievement of the environmental objectives, 	

(d) the extent to which external influences on these water sources during the term of this Plan have affected progress toward achieving the environmental objectives.

Economic Objectives

10 (1) The broad economic objective of this Plan is to maintain, and where possible improve, access to water to optimise economic benefits for agriculture, surface water-dependent industries and local economies.

Objectives	Plan strategy
<p>10 (2) The targeted economic objectives of this Plan are as follows—</p> <p>(a) to maintain, and where possible improve, water trading opportunities for surface water-dependent businesses,</p> <p>(b) to maintain, and where possible improve, access to water for agriculture, surface water-dependent businesses and landholders,</p> <p>(c) to contribute to maintaining water quality within target ranges for agriculture, surface water-dependent businesses and landholders.</p>	<p>10 (3) The strategies for reaching the targeted economic objectives of this Plan are as follows—</p> <p>(a) provide for trade of water allocations and share components subject to environmental constraints.</p> <p>(b) provide a stable and predictable framework for sharing water among water users,</p> <p>(c) provide flexibility of access to water,</p> <p>(d) manage extractions to the long-term average annual extraction limit and the long-term average sustainable diversion limit.</p>

Economic Performance Indicators

10 (4) The performance indicator used to measure the success of the strategies for reaching the broad economic objective in subclause (1) is an evaluation of the extent to which the combined outcomes of the targeted economic objectives in subclause (2) have contributed to achieving the broad objective.

10 (5) The performance indicators used to measure the success of the strategies for reaching the targeted economic objectives in subclause (2) are the changes or trends in economic benefits during the term of this Plan, as assessed using one or more of the following—

- (a) the economic benefits of water extraction and use,
- (b) the economic benefits of water trading as demonstrated by—
 - (i) the annual number or volume of share components of access licences transferred or assigned,
 - (ii) the weighted average unit price of share components of access licences transferred or assigned,
 - (iii) the annual volume of water allocations assigned,
 - (iv) the weighted average unit price of water allocations assigned,
- (c) the recorded values of water quality measurements including salinity, sodium adsorption ratio, harmful algal blooms, total nitrogen, total phosphorus, pH and dissolved oxygen.

Aboriginal Objectives

11 (1) The broad Aboriginal cultural objective of this Plan is to maintain, and where possible improve, the spiritual, social, customary and economic values and uses of water by Aboriginal people.

Objectives	Strategies
<p>11 (2) The targeted Aboriginal cultural objectives of this Plan are as follows—</p> <p>(a) to provide access to water in the exercise of native title rights,</p> <p>(b) to provide access to water for Aboriginal cultural use, including fishing,</p>	<p>11 (3) The strategies for reaching the targeted Aboriginal cultural objectives of this Plan are as follows—</p> <p>(a) manage access to water consistently with the exercise of native title rights,</p> <p>(b) provide for water associated with Aboriginal cultural values and uses,</p>

(c) to protect, and where possible improve, identified surface water-dependent culturally significant areas, including important riparian vegetation communities,
(d) to contribute to the maintenance of water quality within target ranges to ensure suitability of water for Aboriginal cultural use.

(c) reserve a portion of flows to partially mitigate alterations to natural flow regimes in these water sources,
(d) restrict the take of water from in-river and off-river pools when the volume of that water is less than full containment volume,
(e) reserve a portion of flows to maintain longitudinal connectivity within and between these water sources, and between these water sources and other connected water sources.

Aboriginal Performance Indicators

11 (4) The performance indicator used to measure the success of the strategies for reaching the broad Aboriginal cultural objective in subclause (1) is an evaluation of the extent to which the combined outcomes of the targeted Aboriginal cultural objectives in subclause (2) have contributed to achieving the broad objective.

11 (5) The performance indicators used to measure the success of the strategies for reaching the targeted Aboriginal cultural objectives in subclause (2) are the changes or trends in Aboriginal cultural benefits during the term of this Plan as assessed using one or more of the following—

- (a) the use of water by Aboriginal people by measuring factors including—
 - (i) the extent to which native title rights are capable of being exercised, consistently with any determination of native title or indigenous land use agreement
 - (ii) the extent to which access to water has contributed to achieving Aboriginal cultural outcomes,
- (b) the recorded range or extent of target populations of native fish,
- (c) the recorded range or condition of target populations of riparian vegetation,
- (d) the recorded values of water quality measurements including salinity, harmful algal blooms, total nitrogen, total phosphorus, pH, water temperature and dissolved oxygen.

Social and Cultural Objectives

11A (1) The broad social and cultural objective of this Plan is to provide access to surface water to support surface water-dependent social and cultural values.

Objectives	Plan strategy
<p>11 (2) The targeted social and cultural objectives of this Plan are to maintain, and where possible improve the following—</p> <ul style="list-style-type: none"> (a) access to water for basic landholder rights, town water supply and licenced domestic and stock purposes, (b) access to water for surface water-dependent cultural, heritage and recreational uses, including recreational fishing, (c) water quality within target ranges for basic landholder rights, town water supply, domestic and stock purposes and surface water-dependent cultural, heritage and recreational uses, including recreational fishing. 	<p>11 (3) The strategies for reaching the targeted social and cultural objectives of this Plan are as follows—</p> <ul style="list-style-type: none"> (a) provide access to water for basic landholder rights, town water supply, and for licenced domestic and stock purposes, (b) reserve a portion of flows to partially mitigate alterations to natural flow regimes in these water sources, (c) restrict the take of water from in-river and off-river pools when the volume of that water is less than full containment volume, (d) reserve a portion of flows to maintain longitudinal connectivity within and between these water sources, and between these water sources and other connected water sources.

Social and Cultural Performance Indicators

11 (4) The performance indicator used to measure the success of the strategies for reaching the broad social and cultural objective in subclause (1) is an evaluation of the extent to which the combined outcomes of the targeted social and cultural objectives in subclause (2) have contributed to achieving the broad objectives.

11 (5) The performance indicators used to measure the success of the strategies for reaching the targeted social and cultural objectives in subclause (2) are the changes or trends in social and cultural benefits during the term of this Plan as assessed using one or more of the following—

- (a) the social and cultural uses of water during the term of this Plan, by measuring factors including—
 - (i) the extent to which basic landholder rights and licenced domestic and stock requirements have been met, and
 - (ii) the extent to which major utility access licence and local water utility access licence requirements have been met,
 - (b) the recorded range or extent of target populations of native fish that are important for recreational fishing,
 - (c) the recorded takes of native fish that are important for recreational fishing within legal age and size classes,
 - (d) the recorded values of water quality measurements including salinity, harmful algal blooms, total nitrogen, total phosphorus, pH, water temperature and dissolved oxygen.
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Table B2: Objectives, strategies and indicators in the Lower Murray-Darling Plan

Vision statement	
<p>7 The vision for this Plan is to provide for the following—</p> <ul style="list-style-type: none"> (a) the health and enhancement of these water sources and their water-dependent ecosystems, (b) the continuing productive extraction of surface water for economic benefit, (c) the spiritual, social, customary and economic benefits of surface water to Aboriginal communities, (d) social and cultural benefits to urban and rural communities that depend on surface water. 	
Environmental Objectives	
<p>8 (1) The broad environmental objective of this Plan is to protect, and contribute to the enhancement of, the ecological condition of the water source and its water dependent ecosystems over the term of this Plan.</p>	
Targeted objectives	Strategies
<p>8 (2) The targeted environmental objective of this Plan is to protect, and contribute to the enhancement of, the following over the term of this Plan—</p> <ul style="list-style-type: none"> (a) the recorded distribution or extent, and population structure, of target ecological populations, (b) the longitudinal and lateral connectivity within and between water sources to support target ecological processes, (c) water quality within target ranges for these water sources to support water-dependent ecosystems and ecosystem functions. 	<p>8 (3) The strategies for reaching the targeted environmental objective of this Plan are as follows—</p> <ul style="list-style-type: none"> (a) establish and maintain compliance with a long-term average annual extraction limit and a long-term average sustainable diversion limit, (b) reserve a portion of flows to partially mitigate alterations to natural flow regimes in these water sources, (c) restrict the take of water from in-river and off-river pools when the volume of that water is less than full containment volume, (d) restrict the take of water from a lagoon identified in Schedule 3 and Thegoa Lagoon when the volume of that water is less than 50% of full containment volume, (e) restrict or prevent water supply work approvals on lagoons listed in Schedule 3 and Thegoa Lagoon. (f) reserve a portion of natural flows to maintain longitudinal connectivity within the water source and between the water source and other connected water sources, including the New South Wales Murray Regulated River Water Source and the Lower-Darling Regulated River Water Source.
Environmental Performance Indicators	
<p>8 (4) The performance indicator used to measure the success of the strategies for reaching the broad environmental objective in subclause (1) is an evaluation of the extent to which the combined outcomes of the targeted objectives in subclause (2) have contributed to achieving the broad objective.</p>	
<p>8 (5) The performance indicators used to measure the success of the strategies for reaching the targeted environmental objectives in subclause (2) are the changes or trends in ecological condition during the term of this Plan, as assessed using one or more of the following—</p> <ul style="list-style-type: none"> (a) the recorded range, extent or condition of target ecological populations, (b) measurements of fish movements through priority fish passage areas, (c) the recorded values of water quality measurements including salinity, turbidity, total nitrogen, total phosphorous, pH, water temperature and dissolved oxygen. 	
<p>8 (6) In evaluating the effectiveness of the strategies in meeting the objectives in this clause, the following will be relevant—</p> <ul style="list-style-type: none"> (a) the extent to which the strategies in subclause (3) and provisions in this Plan have been implemented and complied with, (b) the extent to which changes in the performance indicators can be attributed to the strategies in subclause (3) and provisions in this Plan, 	

- (c) the extent to which the strategies in subclause (3) support achievement of the environmental objectives,
- (d) the extent to which external influences on these water sources during the term of this Plan have affected progress toward achieving the environmental objectives.

Economic Objectives

9 (1) The broad economic objective of this Plan is to maintain, and where possible improve, access to water to optimise economic benefits for agriculture, surface water-dependent industries and local economies.

Objectives	Plan strategy
<p>9 (2) The targeted economic objectives of this Plan are as follows—</p> <p>(a) to maintain, and where possible improve, water trading opportunities for surface water-dependent businesses,</p> <p>(b) to maintain, and where possible improve, access to water for agriculture, surface water-dependent businesses and landholders,</p> <p>(c) to contribute to maintaining water quality within target ranges for agriculture, surface water-dependent businesses and landholders.</p>	<p>9 (3) The strategies for reaching the targeted economic objectives of this Plan are as follows—</p> <p>(a) provide for trade of water allocations and share components subject to environmental constraints.</p> <p>(b) provide a stable and predictable framework for sharing water among water users,</p> <p>(c) provide flexibility of access to water,</p> <p>(d) manage extractions to the long-term average annual extraction limit and the long-term average sustainable diversion limit.</p>

Economic Performance Indicators

9 (4) The performance indicator used to measure the success of the strategies for reaching the broad economic objective in subclause (1) is an evaluation of the extent to which the combined outcomes of the targeted economic objectives in subclause (2) have contributed to achieving the broad objective.

9 (5) The performance indicators used to measure the success of the strategies for reaching the targeted economic objectives in subclause (2) are the changes or trends in economic benefits during the term of this Plan, as assessed using one or more of the following—

- (a) the economic benefits of water extraction and use,
- (b) the economic benefits of water trading as demonstrated by—
- (i) the annual number or volume of share components of access licences transferred or assigned,
 - (ii) the weighted average unit price of share components of access licences transferred or assigned,
 - (iii) the annual volume of water allocations assigned,
 - (iv) the weighted average unit price of water allocations assigned,
- (c) the recorded values of water quality measurements including salinity, sodium adsorption ratio, harmful algal blooms, total nitrogen, total phosphorus, pH and dissolved oxygen.

Aboriginal Objectives

10 (1) The broad Aboriginal cultural objective of this Plan is to maintain, and where possible improve, the spiritual, social, customary and economic values and uses of water by Aboriginal people.

Objectives	Strategies
<p>10 (2) The targeted Aboriginal cultural objectives of this Plan are as follows—</p> <p>(a) to provide access to water in the exercise of native title rights,</p>	<p>10 (3) The strategies for reaching the targeted Aboriginal cultural objectives of this Plan are as follows—</p> <p>(a) manage access to water consistently with the exercise of native title rights,</p> <p>(b) provide for water associated with Aboriginal cultural values and uses,</p>

- (b) to provide access to water for Aboriginal cultural use, including fishing,
- (c) to protect, and where possible improve, identified surface water-dependent culturally significant areas, including important riparian vegetation communities,
- (d) to contribute to the maintenance of water quality within target ranges to ensure suitability of water for Aboriginal cultural use.

- (c) reserve a portion of flows to partially mitigate alterations to natural flow regimes in these water sources,
- (d) restrict the take of water from in-river and off-river pools when the volume of that water is less than full containment volume,
- (e) reserve a portion of flows to maintain longitudinal connectivity within and between these water sources, and between these water sources and other connected water sources.

Aboriginal Performance Indicators

10 (4) The performance indicator used to measure the success of the strategies for reaching the broad Aboriginal cultural objective in subclause (1) is an evaluation of the extent to which the combined outcomes of the targeted Aboriginal cultural objectives in subclause (2) have contributed to achieving the broad objective.

10 (5) The performance indicators used to measure the success of the strategies for reaching the targeted Aboriginal cultural objectives in subclause (2) are the changes or trends in Aboriginal cultural benefits during the term of this Plan, as assessed using one or more of the following—

- (a) the use of water by Aboriginal people by measuring factors, including—
 - (i) the extent to which native title rights are able to be exercised, consistently with any determination of native title or indigenous land use agreement, and
 - (ii) the extent to which access to water has contributed to achieving Aboriginal cultural outcomes,
- (b) the recorded range or extent of target populations of native fish,
- (c) the recorded range or condition of target populations of riparian vegetation,
- (d) the recorded values of water quality measurements including salinity, harmful algal blooms, total nitrogen, total phosphorus, pH, water temperature and dissolved oxygen.

Social and Cultural Objectives

10A (1) The broad social and cultural objective of this Plan is to provide access to surface water to support surface water-dependent social and cultural values.

Objectives	Plan strategy
<p>10 (2) The targeted social and cultural objectives of this Plan are to maintain, and where possible improve the following—</p> <ul style="list-style-type: none"> (a) access to water for basic landholder rights, town water supply and licenced domestic and stock purposes, (b) access to water for surface water-dependent cultural, heritage and recreational uses, including recreational fishing, (c) water quality within target ranges for basic landholder rights, town water supply, domestic and stock purposes and surface water-dependent cultural, heritage and recreational uses, including recreational fishing. 	<p>10 (3) The strategies for reaching the targeted social and cultural objectives of this Plan are as follows—</p> <ul style="list-style-type: none"> (a) provide access to water for basic landholder rights, town water supply, and for licenced domestic and stock purposes, (b) reserve a portion of flows to partially mitigate alterations to natural flow regimes in these water sources, (c) restrict the take of water from in-river and off-river pools when the volume of that water is less than full containment volume, (d) reserve a portion of flows to maintain longitudinal connectivity within and between these water sources, and between these water sources and other connected water sources.

Social and Cultural Performance Indicators

10 (4) The performance indicator used to measure the success of the strategies for reaching the broad social and cultural objective in subclause (1) is an evaluation of the extent to which the combined outcomes of the targeted social and cultural objectives in subclause (2) have contributed to achieving the broad objectives.

10 (5) The performance indicators used to measure the success of the strategies for reaching the targeted social and cultural objectives in subclause (2) are the changes or trends in social and cultural benefits during the term of this Plan as assessed using one or more of the following—

- (a) the social and cultural uses of water during the term of this Plan, by measuring factors including—
 - (i) the extent to which basic landholder rights and licenced domestic and stock requirements have been met, and
 - (ii) the extent to which major utility access licence and local water utility access licence requirements have been met,
 - (b) the recorded range or extent of target populations of native fish that are important for recreational fishing,
 - (c) the recorded takes of native fish that are important for recreational fishing within legal age and size classes,
 - (d) the recorded values of water quality measurements including salinity, harmful algal blooms, total nitrogen, total phosphorus, pH, water temperature and dissolved oxygen.
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Appendix C – Water sources in the Plan areas

Table C1: Intersecting Streams Plan water sources

Extraction Management Unit	Water source
n/a	<ul style="list-style-type: none"> ▪ Mooni River (I)
	<ul style="list-style-type: none"> ▪ Narran River (I)
	<ul style="list-style-type: none"> ▪ Culgoa River (I)
	<ul style="list-style-type: none"> ▪ Warrego River (I)
	<ul style="list-style-type: none"> ▪ Paroo River (I)
	<ul style="list-style-type: none"> ▪ Yanda Creek

Note: (I) high or very high ecological value and (C) high community dependence on extraction (estimated by combining information about the volumes and economic value of water extraction such as value of irrigated industries, town water supply, proportion of community employment in agriculture etc.) (note there are no water sources in the Plan area with high community dependence on extraction)⁴⁰³

Table C2: Lower Murray-Darling Plan water source

Extraction Management Unit	Water source
n/a	<ul style="list-style-type: none"> ▪ Lower Murray-Darling Unregulated (I)

Note: (I) high or very high ecological value aquatic ecosystem (HEVAE)⁴⁰⁴ - high HEVAE category for one river reach on the Great Darling Anabranch at the confluence with the Murray River

⁴⁰³ DPIE (2019) *Basin Plan Implementation Intersecting Streams Surface Water Resource Plan Area Description Appendix A*. Available at: <https://www.mdba.gov.au/publications/mdba-reports/intersecting-streams-water-resource-plan>.

⁴⁰⁴ DPIE (n.d.) *Instream Ecological Value for NSW Freshwater Riverine Ecosystems*. Available at: <https://www.arcgis.com/apps/webappviewer/index.html?id=91904a403e7742518ce42120321a76ad>.

Appendix D – Water dependent environmental assets

Table D1: Water dependent environmental assets by water source in the Plans

Area	Environmental asset
Intersecting Streams Plan⁴⁰⁵	
Moonie River	<ul style="list-style-type: none"> ▪ Moonie River channel, riparian zone and floodplain
Narran River	<ul style="list-style-type: none"> ▪ Narran River channel, riparian zone and floodplain ▪ Coocoran Lake ▪ Angledool Lake ▪ Grawin Creek floodplain
Narran Lakes	<ul style="list-style-type: none"> ▪ Narran Lakes ▪ Narran Lakes nature reserve ▪ Narran Lakes RAMSAR site, which includes Clear Lake, Back Lake and Long Arm Lake ▪ Narran floodplains
Culgoa River	<ul style="list-style-type: none"> ▪ Culgoa River channel, riparian zone and floodplain
Paroo River	<ul style="list-style-type: none"> ▪ Paroo River Wetlands Ramsar site – consists of the floodplains and channels of the Paroo River and Cuttaburra and Kulkyne creeks in Nocoleche Nature Reserve, and Peery and Poloko lakes in Paroo–Darling National Park ▪ Yantabulla Swamp, on the Cuttaburra Creek, which is recognised as a highly important breeding area for waterbirds in the Paroo and Warrego catchments ▪ Paroo River wetlands ▪ Paroo River instream and fringing vegetation, and the important floodplain wetland adjacent to the river ▪ Peery Lake and Poloko Lake, which are also part of the Ramsar site; the artesian mound springs at Peery Lake are listed as an Artesian Springs Ecological Community (EPBC, 1999) ▪ Mullawoolka Basin and Blue, Gilpoko, Poloko, Peery, Tongo and Yantabangee lakes (are known as Paroo Overflow Lakes)
Yanda Creek	<ul style="list-style-type: none"> ▪ Instream aquatic habitat in Yanda, Mulga, Sandy and Box Creeks ▪ Yanda Creek in Gundabooka National Park is known as a bird hotspot ▪ Tilpilly Lake ▪ Unnamed ephemeral lakes between Louth and Tilpa
Warrego River	<ul style="list-style-type: none"> ▪ Warrego River - aquatic habitat instream and important fringing vegetation ▪ Irrara Creek and its large floodplain of vegetation ▪ Green Creek and Green Creek Swamp ▪ Cuttaburra Creek and Yantabulla Swamp ▪ Racecourse Swamp ▪ Tom's Lake
Toorale National Park & State Conservation Area	<ul style="list-style-type: none"> ▪ Toorale Western Floodplain ▪ Warrego River between Boera Dam and the Darling River ▪ Toorale water storages

⁴⁰⁵ 2rog Consulting (2021) *Technical review of the Water Sharing Plan for Intersecting Streams Unregulated River Water Sources 2011*. A report prepared for the Natural Resources Commission for this review.

Area	Environmental asset
Lower Murray-Darling Plan⁴⁰⁶	
Murray-Lower Darling planning units	<ul style="list-style-type: none">▪ Creeks, wetlands and their associated in-channel and floodplain habitats and fringing vegetation communities, including (but not limited to):<ul style="list-style-type: none">- all wetlands, lakes, anabranches and creeks located on the floodplain- wetlands or creeks with existing water access licences, including Thegoa Lagoon and Peacock Creek

⁴⁰⁶ DPIE-EES (2021) *Murray-Lower Darling Long Term Water Plan Part B*. Murray-Lower Darling planning units p. 131. Available at: <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Water/Water-for-the-environment/long-term-water-plans/murray-lower-darling-long-term-water-plan-part-b-planning-units-200081.pdf>.