NSW GOVERNMENT

Natural Resources Commission

Final report
Review of the Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources 2009

April 2020

Acknowledgement of Country

The Natural Resources Commission acknowledges and pays respect to traditional owners and Aboriginal peoples. The Commission recognises and acknowledges that traditional owners 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 relation to the Lower North Coast area, the Commission pays its respects to Worimi and Biripai 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 throughout the review process will help to shape collaborative water planning and sharing that is beneficial to their people and their country.

Enquiries

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Acronyms and units of measurement

Act	Water Management Act 2000 (NSW)
AHIMS	Aboriginal Heritage Information Management System
AWD	Available Water Determinations
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
EPA	Environment Protection Authority
ICOLL	Intermittently Closed and Open Lakes and Lagoons
IDEL	Individual Daily Extraction Limit
LTAAEL	Long-term Annual Average Extraction Limit
MER	Monitoring, evaluation and reporting
ML	Megalitre (unit of volume equivalent to one million (1×10^6) litres)
OEH	Former NSW Office of Environment and Heritage
NSW	New South Wales
Plan	the Water Sharing Plan for the Lower North Coast Unregulated River and Alluvial Water Sources 2009
SMART	Specific, measurable, achievable, relevant and time-bound
TDEL	Total Daily Extraction Limit

Table of Contents

Executive summary

In line with its statutory responsibility under the *Water Management Act 2000* (the Act), the Natural Resources Commission (the Commission) has reviewed the *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources 2009* (the Plan).

The Commission is tasked with assessing the extent to which the Plan has achieved its environmental, social, cultural and economic outcomes, and advising on whether changes to the Plan provisions are warranted. The Commission has drawn on a range of evidence, including targeted consultation, document review, public submissions and expert technical advice.

A lack of clear outcomes and limited monitoring, evaluation and reporting (MER) activities made it difficult to determine the Plan's performance. This report presents the Commission's findings using the best available evidence.

Advice on Plan extension and replacement

The Commission's review has identified a range of areas for improvement that justify a Plan replacement process.

The Department of Planning, Industry and Environment – Water (DPIE-Water) has advised the Commission that it is requesting a two-year extension for remaking expiring coastal plans, including this Plan. The Commission supports this extension to allow enough time and resources to make required improvements.

The Commission therefore recommends that the Plan is:

- **extended for a further two years until June 2022** to allow enough time and resources to make required Plan improvements
- **replaced by June 2022** to address the recommendations of this report.

Priority issues to address in the development of the replacement Plan include:

- reviewing key provisions to protect the environment to ensure they are evidence based, transparently reported and their implementation monitored
- considering future risks from climate change and risks outside Plan regulation
- improving metering, gauging and reporting of extraction and flow
- managing future risks to town water supply and other utility needs
- supporting Aboriginal outcomes through improved water access and involvement in water management
- supporting more effective water account management and trade
- developing a Plan-specific MER framework and increasing MER activities
- building stakeholder understanding and support for the Plan through improved engagement and tailored communication
- improving the Plan's objectives, strategies and performance indicators in line with best practice approaches.

The Commission recognises the significant amount of work required to address these recommendations. Due to the risks to the unique environmental, social and economic values of the Plan area, the Commission encourages the NSW Government to support DPIE-Water to appropriately fund and resource the work required to address the issues in the Plan area.

Summary of findings

Environmental outcomes

Plan design and implementation could be improved to better support environmental outcomes in accordance with the priority they are afforded under the Act. The Commission reviewed the Plan's performance against the current environmental outcomes, objectives and performance indicators and found that:

- limited ecological monitoring indicates that river condition in the Manning and Karuah catchments is generally good,[1] although there are pressures on estuaries and fish condition is poor[2] – stakeholders also raised concerns around the ecological health of water sources and environmental flows
- the Plan established water availability limits but does not include numeric Long-term Annual Average Extraction Limits (LTAAELs) and there is no evidence that publicly available LTAAELs have been complied with – entitlements also appear to have increased in some water sources with high instream and economic value, which may pose a moderate risk to planned environmental water
- the Plan has relatively sophisticated rules to maintain planned environmental water compared to other water sharing plans developed in the same period; however, flow sharing rules should be revised based on recent ecological studies and addressing study limitations – the implementation of these rules can be strengthened with adequate monitoring, support for self-regulation and accreditation schemes, community engagement and active communication with community
- groundwater dependent ecosystems can be better protected by clearly defining groundwater assets for protection, aligning with the *NSW Aquifer Interference Policy 2012* and improving definitions and management strategies for groundwater connectivity
- given the Plan's 10-year period, it should incorporate likely impacts of climate change on water demand and stream flow over the medium to long term
- there are several risks outside of the Plan's regulation that may still impact on Plan outcomes – integrated catchment management should be used to overall improve resilience at the landscape scale.

1 Based on the NSW River Condition Index, which considers riparian vegetation cover, hydrological stress, biodiversity condition and geomorphic condition (EPA (2015) *New South Wales State of the Environment: River Health.* Available at: https://www.epa.nsw.gov.au/about-us/publications-and-reports/state-of-the-environment/state-of-the-environment-2015; and EPA (2018) *New South Wales State of the Environment: River Health*. Available at https://www.soe.epa.nsw.gov.au/all-themes/water-and-marine/river-health).

2 NSW Government (2010) *State of the Catchments: Riverine ecosystems Hunter – Central Rivers region*, pp. 10-11. Available at: https://www.environment.nsw.gov.au/resources/soc/huntercentralrivers/10440HUNTCENestuarine.pdf.

Social and cultural outcomes

The Commission reviewed the Plan's performance against the current social and cultural outcomes, objectives and performance indicators and found that:

- the Plan provides for basic landholder rights as follows:
  - **domestic and stock rights** are being met but DPIE-Water should consult community with draft options developed for reasonable use guidelines to set standards for estimates of extraction for different uses
  - **harvestable rights** are provided for, although there are calls from stakeholders to allow an increase from the current allowance of 10 percent of average annual regional rainfall run-off to 30 percent
  - **native title rights** are provided for but future native title determinations need to be proactively planned for and accommodated in the Plan and timeframes should be specified for required amendments following a successful native title claim
- Aboriginal outcomes can be improved as follows:
  - Aboriginal water values, rights and interests need to be better defined and supported in consultation with relevant Aboriginal stakeholders in the Plan area
  - provisions to allocate water for Aboriginal cultural purposes are in line with other water sharing plans but there is no evidence that water has been accessed under these provisions or that water has been reserved for use under these entitlements
  - barriers to the access and use of Aboriginal water entitlements need to be addressed, including lack of awareness, multiple licence categories with differing restrictions, and lack of agency processes for applying for licences and providing allocations for cultural flows
  - there is a significant need to improve the engagement and involvement of Aboriginal stakeholders to deliver cultural outcomes, particularly around decision-making and leadership in water
- current utility needs are met but future risks to town water supply must be managed given the limited ability to reduce town water consumption any further, and the likely pressure from climate change and population growth
- some minor amendments to the Plan would improve the clarity and consistency of basic landholder rights and address risks to town water supply security.

Economic outcomes

The Commission reviewed the Plan's performance against current economic outcomes, objectives and performance indicators and found that:

- the Plan provides some opportunities for trade, but some stakeholders consider these to be somewhat limited by rules restricting trade between water sources
- some stakeholders expressed interest in undertaking more trading, although any changes to increase the flexibility of trading rules should consider environmental requirements and impacts on other water users
- the Plan provides flexibility in account management rules to encourage responsible use of available water but the effectiveness of these rules is limited in practice by the lack of reporting of water use by licence holders
- no data were available around changes in the economic benefits derived from water extraction and use over the plan period – gross regional product has remained reasonably

steady over the Plan period ($3.16 billion in 2018) but this covers the broad regional economy and is not specific to water extraction and use.

Monitoring, evaluation and reporting

The Commission reviewed the Plan's MER arrangements and found that:

- as with many water sharing plans, the Plan does not have a robust MER framework – this limits that amount of data available, the evaluation of outcomes and adaptive management
- there is limited metering or gauging in the Plan area, resulting in a lack of information about extraction and flow under the Plan – this undermines enforcement activities, the function of the LTAAEL, water account management and trade, and prevents the evaluation and improvement of the Plan and its provisions.
- there were significant gaps in the knowledge base when the Plan was developed and these have yet to be addressed – in the absence of additional data or studies, amendments intended to improve Plan provisions affected by knowledge gaps have not been made
- the Plan does not provide suitable, well-defined objectives, strategies and performance indicators in line with best-practice approaches or present a clear logical flow between these components.

Recommendations

Key recommendations for the Plan are provided in **Table 1**. **Table 2** includes supporting actions to improve the replacement Plan. Recommendations and actions with an asterisk (*) are strategic initiatives that the Commission considers DPIE-Water should undertake across NSW to support all water sharing plans outcomes.

Table 1: Recommendations

Overall	
1	The Plan should be: **a) extended for a further two years until June 2022** b) **replaced by June 2022** to address the recommendations and suggested actions (**Table 2**) of this report.
Environmental outcomes	
2	To adequately establish and maintain planned environmental water, DPIE-Water should: a) when developing the replacement Plan, revisit and amend the LTAAEL at Plan commencement, including providing a numeric LTAAEL in the Plan and make these publicly available to improve transparency and minimise confusion for water users b) investigate the potential take of water under harvestable rights at current and full uptake and include harvestable rights in the amended LTAAELs c) consider ways to address the lack of water extraction data to manage long-term extraction growth with Available Water Determinations (AWD) and monitor extraction limits regularly to protect planned environmental water – in addition, provide adequate information and support water users to assist their understanding of performance in relation to LTAAEL of performance extraction limits d) undertake an audit of water access licences issued since Plan commencement to determine if their granting was consistent with the Plan and the Act, and to understand and manage the scale of increases e) in the replacement Plan, amend the share components listed in the Plan as at Plan commencement following the audit f) reassess potential impacts of high flow conversions on the flow regime and environmental values and encourage the adoption of high flow conversions where appropriate g) given the lack of metering and monitoring, review the effectiveness of conversions and their impact on groundwater systems before granting licence conversions.
3*	Implement a transparent and timely process to notify all licensees of any changes to water access conditions within three months of any Plan amendment across all plans to ensure all appropriate provisions are in force.
4	To strengthen environmental water sharing rules in the replacement Plan, DPIE-Water should: a) define water sharing rules – including flow class provisions – based on environmental water requirements and prioritise the protection of water sources and their dependent ecosystems based on continuing risk assessments of coastal water sharing plans

b) build on existing hydrological flow studies and assess estuarine flow requirements, including adequate flows to support fish passage and other key species and protect Aboriginal, cultural and heritage values and sites

c) investigate ways to better support implementation of Individual Daily Extraction Limits (IDELs) – this should include improved monitoring and compliance activities, and clearer communication and engagement with water user associations

d) assess the wider benefits of a water use accreditation scheme and, if positive, implement a scheme in priority water sources (including those with high instream values, high economic dependence and high hydrologic stress).

5 During the development of the replacement Plan over the next two years, collect (as required) and report (reviewed in year four at a minimum) to:

a) describe the natural flow regime

b) map and ground-truth the presence and extent of water and groundwater dependent environmental assets, including estuarine and coastal ecosystems

c) identify key assets and classify high priority ecosystems and high ecological value aquatic ecosystems using the High Ecological Value Aquatic Ecosystem framework, including those assets identified in (b)

d) define flow and groundwater requirements for key assets

e) determine the impact of the Plan on the flow regime in (a) and flow requirements of key assets in (d).

6* To improve consideration of groundwater in the replacement Plan, DPIE-Water should:

a) identify low- and medium-priority groundwater dependent ecosystems in the Plan and refer to them explicitly as relevant in any groundwater dependent ecosystem protection provisions

b) clearly define groundwater terms and their relevance to the Plan, including connectivity, ecological value, potential and type – connectivity should include both discharge of groundwater to surface water and surface water recharge to groundwater systems

c) standardise set back distances for work near identified groundwater dependent ecosystems based on the *NSW Aquifer Interference Policy 2012*

d) identify groundwater sources with high environmental, social or economic value, monitor their groundwater levels and quality, and undertake on-ground studies to determine the presence and absence of confining beds throughout the system.

7* To improve consideration of climate change in the replacement Plan, DPIE-Water should:

a) transparently model the impacts of various climate regimes to ensure the Plan functions appropriately under a range of scenarios

b) review and revise Plan provisions based on climate modelling and allow for Plan amendments to address longer-term water availability based on evidence of changing climatic conditions.

Social and cultural outcomes

8* Continue processes to finalise the *Reasonable Use Guidelines* for stock and domestic use and include agreed standards as part of the replacement Plan.

9* Include a timeframe of three months to undertake initial amendments of the Plan following native title determinations and other land/water use agreements, and enough time to undertake the detailed engagement, final amendment and allocation process.

10*	Identify Aboriginal values and uses, objectives and outcomes, flow allocations mechanisms for access in the replacement Plan, using a strengthened engagement process (see **Sections 4.2.3** and **4.4**). This should use relevant guidelines, be well-resourced, and include a specific process and clear timeframe for development in consultation with Aboriginal stakeholders.
11	Allow for investigations of storage facilities where the water is from allowable sources (not third order or higher streams); noting that investigations for any storage facilities must undertake the required impact and cost-benefit studies and ensure that the LTAAEL and environmental flow regimes can be maintained in line with the Plan provisions.
12	Consider MidCoast Council's *Drought Management Plan* and any other relevant studies to ensure the replacement Plan aligns with them and accommodates identified risks to town water supply.

Economic outcomes

13	Assess the economic dependence of each water source in the Plan area to inform Plan provisions, with the assessment described in the replacement Plan's background document considering the full range of economic benefits and impacts including: a) extractive industries (for example dairy, beef) b) non-extractive industry (for example tourism, aquaculture) c) community and ecological services (for example amenity, suitable water quality).

Monitoring, evaluation and reporting

14*	By 2020, finalise the draft NSW MER framework for coastal water sharing plans to inform the development of the replacement Plan. This should include: a) a Plan-specific MER program following established guidelines b) clear governance arrangements for MER, including roles and responsibilities c) timely public reporting of the results of monitoring and evaluation activities to support transparency, public awareness and active compliance d) appropriate governance arrangements and timeframes for adaptation and improvement, particularly in response to new information e) metering and record keeping provisions consistent with the NSW Government's planned new framework for measurement and metering of water take.
15*	Improve the foundations for monitoring, evaluation and reporting on the replacement Plan by including: a) Specific, measurable, achievable, relevant and time-bound (SMART) objectives, strategies and performance indicators that align with the water management principles in the Act and clearly address the prioritisation of environmental, social (including native title) and economic outcomes b) clear logical links demonstrated between the objectives, strategies, performance indicators and rules.

Table 2: Supporting actions for the replacement Plan

Environmental outcomes	
A*	Outline a transparent process that can be initiated to review water sharing arrangements if climate change results in significant changes in the water available in the system.
B	If the NSW Government considers re-commissioning and using the Barnard Scheme in future, undertake and publish a comprehensive study on downstream impacts on the environment and reliability of supply for users in the Lower North Coast.
C	Fund and implement integrated catchment actions to improve riverine and estuarine health objectives drawing on relevant agencies across the DPIE cluster.
Social and cultural outcomes	
D*	Continue development of a NSW Aboriginal Water Framework by end-2020 to provide consistent and transparent guidelines and resourcing for Aboriginal water access and involvement in water planning and management. At a minimum, the framework should consider: a) relevant guidelines and legislation, including any need for legislative reforms b) Aboriginal water values and its uses c) processes for allocating water for Aboriginal interests including cultural, environmental, social and economic purposes d) processes for improving Aboriginal water access and use, through simplified licencing or other identified mechanisms e) clear requirements for including native title determinations and proactive processes for undertaking other land/water use agreements f) strengthened Aboriginal engagement processes across the state to expand on the basin engagement process, broaden the stakeholder base, and increase Aboriginal staff with capacity to lead and maintain engagement g) appropriate Aboriginal-led governance, funding and resources, including dedicated Aboriginal staff with capability in water planning and management.
E*	Adopt processes that support key social outcomes throughout the remake and implementation of the replacement Plan: a) enhance communication of the Plan through active, simple, and consistent language and modes of communication b) improve implementation and enforcement of the Plan using clear and consistent governance, roles and responsibilities c) strengthen processes of stakeholder engagement, including a stakeholder engagement plan and appropriate forum for engagement (such as a stakeholder advisory panel) – make sure it includes a range of stakeholders with diverse interests and knowledge of water, and responds to the unique coastal context of this Plan d) better communicate the current balance of 'equitable' water sharing and include a relevant performance indicator.

Economic outcomes	
F*	DPIE-Water should continue to implement their program to improve all trade information. In finalising this program DPIE-Water should coordinate with agencies to: a) support improvements in price reporting by licence holders b) ensure account management rules are fit for purpose and implementable c) ensure consistent alignment of plan provisions and licence conditions for trade d) consider environmental and industry impacts as part of any review of trade rules.

Monitoring, evaluation and reporting	
G*	Identify Plan-specific and state-wide research needs and knowledge gaps across all water sharing plans and seek to address these gaps in collaboration with other organisations and research institutions.
H*	Make all monitoring, modelling and research associated with the replacement Plan publicly available to improve accountability and transparency.

1 Review background

This chapter outlines:

- the purpose of water sharing plans
- the Commission's role in reviewing these plans
- the roles of the various NSW water management agencies
- the water management principles that underpin water sharing under the Act, most importantly that the needs of the environment and then basic landholder rights must be met as a priority
- the Commission's review approach and method, including the targeted stakeholder consultation and public submissions processes undertaken as part of the review.

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 are intended to provide certainty for water users over the life of the plan, which is typically ten years, unless the plan is extended.

The Plan commenced on 1 August 2009 and is due for extension or replacement on 1 July 2020.[3] In 2016, the Plan was amended to include the former *Water Sharing Plan for the Karuah River Water Source 2003*. This review focusses on the Plan's current provisions and does not consider previous versions or the provisions governing water sharing under the Karuah plan.

The Commission has a role under Section 43A of the Act to review water sharing plans approaching expiry and provide a report to the Minister responsible for the Act[4] on:

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

Depending on its review findings, the Commission can recommend a plan is extended, or replaced with a new water sharing plan.

For reference, the roles of the various NSW water management agencies are summarised in **Figure 1**, noting that as of 1 July 2019 the former Department of Industry – Water (DoI-Water) is now DPIE-Water, and the former Office of Environment and Heritage (OEH) is now the Environment, Energy and Science Group (DPIE-EES) within DPIE.

3 Parliament of NSW (2009) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources 2009*. Available at: https://www.legislation.nsw.gov.au/#/view/regulation/2009/348/full.

4 Currently the Minister for Water, Property and Housing.

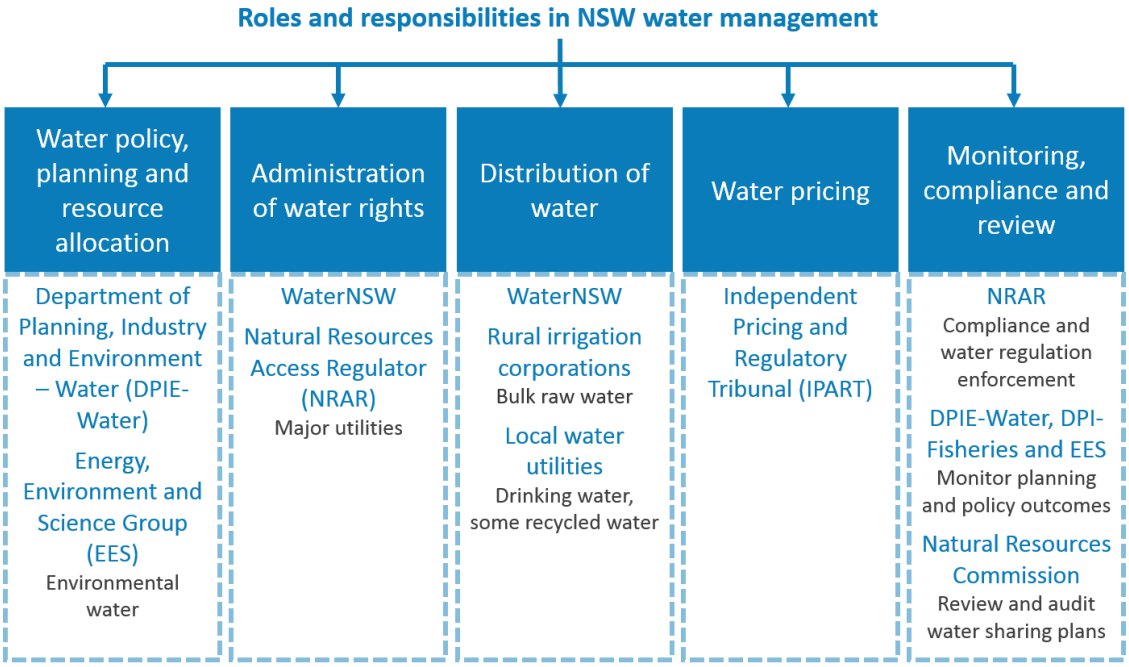


Figure 1: Roles and responsibilities in rural and regional water management[5]

1.1.1 Water management principles

The Commission is required to consider the water management principles listed in the Act as part of its review. The Act makes it clear that water sharing is not about balancing uses and values; it firstly provides for the environment and secondly recognises basic landholder rights above other uses. The relevant water sharing principles are found in Section 5(3) of the Act and are part of a broader set of water management principles.[6] The Act specifies that:

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).

Further, Section 9(1)(b) of the Act emphasises that the water management principles should be prioritised in the order that they are set out in Section 5(3) of the Act.

1.2 Review approach

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

- **document and data review –** the Commission examined a range of information including the Plan and its background document, relevant publicly available information, and unpublished reports and data from water management agencies, including DPIE-Water. The Commission also considered other relevant state-wide and regional government policies or agreements that apply to the catchment management area.

5 Revised from 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.

6 Parliament of NSW (2000) *Water Management Act 2000*, Section 5. Available at: https://legislation.nsw.gov.au/~/view/act/2000/92/

- **technical advice –** consultants provided expert analysis key aspects of the Plan including groundwater and environmental objectives, the effectiveness of Plan provisions and opportunities for improvement
- **targeted consultation –** 17 stakeholders were consulted, including a range of government agencies, community and industry organisations, Aboriginal stakeholders including Local Aboriginal Land Councils, and non-government organisations[7]
- **Public submissions – w**hen reviewing water sharing plans, the Commission must request and consider public submissions. The Commission called for submissions via letters and emails to key stakeholders, advertising in local newspapers and on the Commission's website. Eight submissions were received. Stakeholders were asked to respond to the following five questions to assess the contribution of the Plan 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 water sharing plan to improve outcomes?

  Non-confidential submissions are made public on the Commission's website.

The Commission thanks all the stakeholders who provided their time and input to this review.

1.2.1 Evaluation of Plan performance

The Commission evaluated the Plan's performance against its stated objectives 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 as shown in **Table 3**).

A lack of clearly linked objectives and outcomes and limited MER activities made it difficult to determine the Plan's performance. This report presents the Commission's findings using the best available evidence. To allow for future evaluation, a robust MER framework needs to be developed that better aligns objectives, outcomes and indicators. This is discussed further in **Chapter 6**.

[7] Interviews carried out as part of targeted consultation were documented in comprehensive notes, but not recorded and transcribed, hence some quotes are reported as 'indirect' rather than "direct" quotes.

Table 3: Objectives and indicators used for the Commission's evaluation

Stated Plan objective	Stated Plan performance indicator	Key outcome category
10(a) protect, preserve, maintain or enhance the important river flow dependent ecosystems of these water sources	12(a) change in low flow regime 12(b) change in moderate to high flow regime 12(c) change in surface water and groundwater extraction relative to the long-term average annual extraction limit 12(d) change in water quality in these water sources 12(e) change in the ecological condition of these water sources and their dependent ecosystems	Environmental
10(b) protect, preserve, maintain and enhance the Aboriginal, cultural and heritage values of these water sources	12(f) change in the extent to which native title rights requirements have been met 12(i) change in the extent to which water has been made available in recognition of the Aboriginal cultural and heritage values of these waters	Social/cultural
10(c) manage these water sources to ensure equitable sharing between users[8]	12(f) change in the extent to which domestic and stock rights have been met	Social
10(d) protect basic landholder rights	12(f) change in the extent to which domestic and stock rights have been met	Social
10(e) provide opportunities for market-based trading of access licences and water allocations within sustainability and system constraints	12(g) change in economic benefits derived from water extraction and use	Economic
10(f) provide enough flexibility in water account management to encourage responsible use of available water	12(h) change in economic benefits derived from water extraction and use	Economic
10(g) provide recognition of the connectivity between surface water and groundwater	No performance indicator available	Environmental
10(h) adaptively manage these water sources	No performance indicator available	All

8 DPIE-Water advised that equitable sharing between users relates to the appropriate prioritisation of different licences classes under the Act (information provided by DPIE-Water, 27 March 2019).

2 Plan context

This chapter provides an overview of the approach used to develop the Plan and relevant environmental, social and economic background in relation to the Plan area. Key points are:

- The Plan area includes 22 surface water sources and one groundwater source.
- The total entitlement in 2018-19 for the Plan was 93,887 megalitres (ML) per year.
- A large proportion of the Plan area is covered by conservation reserves and state forest, which includes high environmental value areas, threatened species, key wetlands, lakes, estuaries and floodplains, and groundwater dependent ecosystems.
- Major centres in the area are Taree, Forster, Tuncurry, Gloucester and Wingham and the current population is just over 93,000. This is predicted to increase by a further 20 percent by 2036, alongside seasonal population change due to tourism in the Plan area.
- The Plan area includes the traditional lands of the Worimi and Biripai people, and the Local Aboriginal Land Council areas of Forster, Purfleet/Taree, Worimi and Karuah.
- The region had a gross regional product of $3.16 billion in 2018, which was 0.6 percent of NSW's gross state product. The regional economy is driven by services industries and is underpinned by the area's amenity, land and water assets which attract retirees and tourists.

2.1 Plan background

The Plan commenced in August 2009 and included 21 surface water sources. It was one of the earliest water sharing plans to be developed using the 'macro' planning approach for unregulated rivers.[9] The Hunter Regional Panel provided local context to guide the Plan and supported Plan revisions in response to submissions and matters raised at the consultation. In line with the macro planning approach, the Plan was amended in 2016 to include the former *Water Sharing Plan for the Karuah River Water Source 2003*.[10]

The Karuah River Water sources increased the total Plan water sources to 23. Of these, 22 are surface water sources and one is a groundwater source. At the same time the Plan was updated to align with the contemporary NSW legislative and policy frameworks for water sharing. The background document notes that there was no change to the intent of the existing plan rules as a result of the 2016 update.[11]

As noted in **Section 1.1**, this review focusses on the Plan's current provisions and does not consider previous provisions governing water sharing under the Karuah plan.

9 DPI-Water (2011) *Macro water sharing plans - the approach for unregulated rivers - A report to assist community consultation, Second Edition*. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0008/548153/macro_unreg_manual_web.pdf.

10 DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources - Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

11 *Ibid*.

2.2 Plan area and water sources

The Plan area lies at the southern end of the NSW mid-north coast (**Figure 2**). It is bound by the Hastings River basin to the north-north west and the Hunter Valley to south west. The Plan area generally aligns with the MidCoast local government area.[12]

The Plan area includes the following catchments:

- **Manning River –** located in the north of the Plan area, the larger Manning catchment includes the Manning River and major tributaries including the Avon, Rowley's, Nowendoc, Barnard, Little Manning, Barrington, Gloucester, Dawson and Lansdowne rivers.
- **Great Lakes –** the Great Lakes include Wallis Lake, Smiths Lake and the Myall Lakes. Smith's Lake is an intermittently closed and open lake (ICOLL), with only two small tributary streams. Wallis Lake has two major tributaries; the Wallamba and Coolongolook rivers. The upper Myall River provides the most freshwater input to the Myall Lakes.
- **Karuah River –** located in the south, the Karuah catchment is drained mainly by the Karuah and Myall rivers.

The Plan's 23 water sources (22 surface water and one groundwater source) are outlined in **Table 4**. These are divided into 18 management zones, where a finer resolution of rules is required. The water sources are divided into three extraction management units that correspond with the Manning River, Great Lakes and Karuah River catchment areas.

As specified in subclause 4 of the Plan, the Plan's water sources include all surface water within the water source boundaries, as well as rivers, lakes, estuaries and wetlands, and all alluvial sediments within the boundaries. It does not include water in alluvial sediments downstream of the tidal limit, coastal sands or fractured rock aquifers and basement rocks. It also excludes rivers, lakes, estuaries and wetlands below the mangrove limit, except Khappinghat Creek in the Wallamba Water Source and Myall Lakes in the Myall Lakes Water Source.

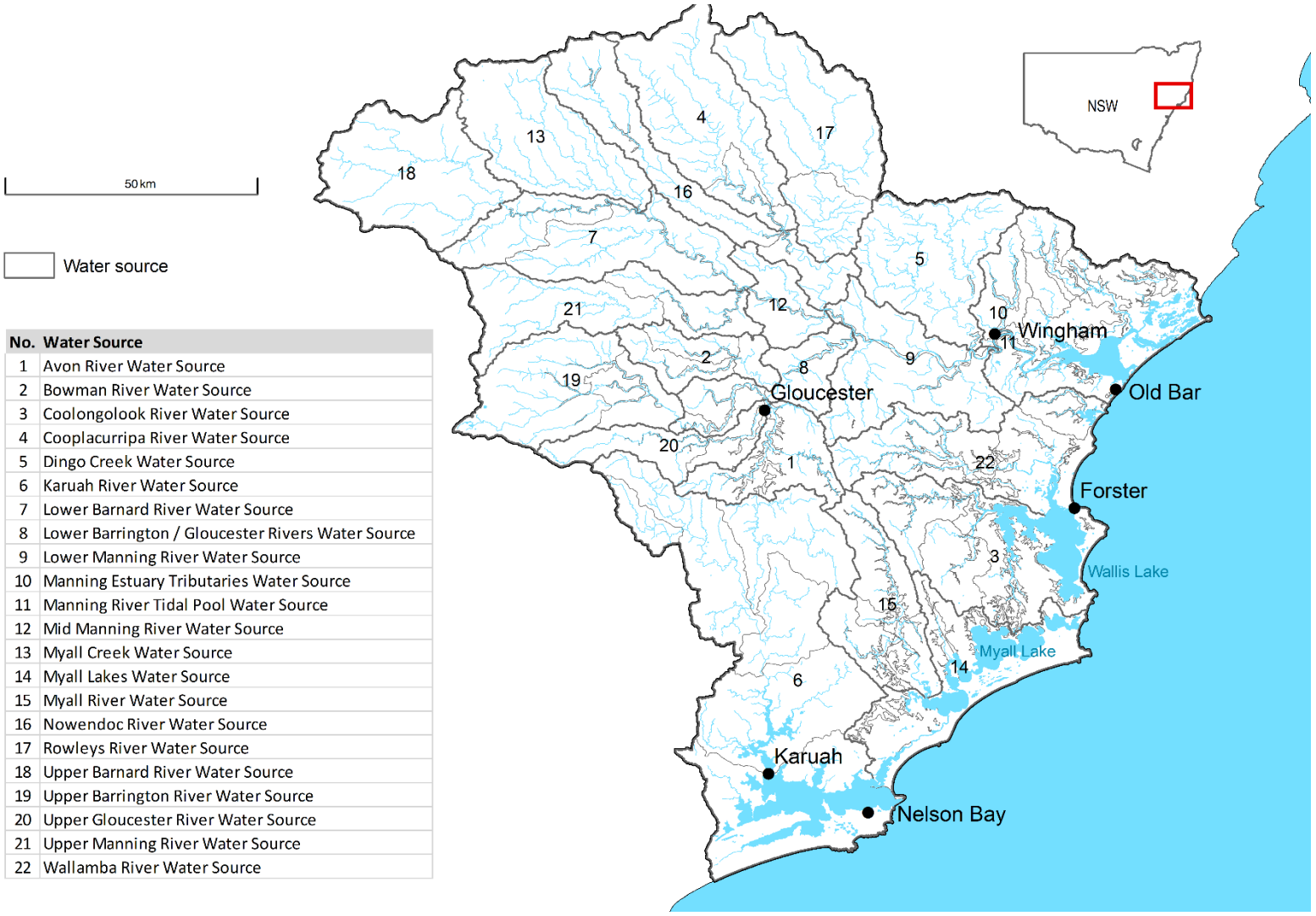
12 The Plan area includes very small parts of the Newcastle, Upper Hunter, and Tamworth local government areas.

Table 4: Water source and extraction management units in the Plan area

Water source	Extraction management unit (estimated system flows) [13]
Avon River	Manning (2,530,000 ML per year)
Lower Barrington/Gloucester Rivers	
Upper Barrington River	
Bowman River	
Cooplacurripa River	
Dingo Creek	
Upper Gloucester River	
Lower Barnard River	
Manning Estuary Tributaries	
Manning River Tidal Pool	
Lower Manning River	
Mid Manning River	
Myall Creek	
Nowendoc River	
Rowleys River	
Upper Barnard River	
Upper Manning River	
Myall Lakes	Great Lakes (610,000 ML per year)
Myall River	
Coolongolook River	
Wallamba River	
Karuah River	Karuah River (not specified)[14]

[13] Calculated from data from DPI–Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Source – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

[14] The estimated system flows for Karuah River were not documented in the Plan or its background document.



No.	Water Source
1	Avon River Water Source
2	Bowman River Water Source
3	Coolongolook River Water Source
4	Cooplacurripa River Water Source
5	Dingo Creek Water Source
6	Karuah River Water Source
7	Lower Barnard River Water Source
8	Lower Barrington / Gloucester Rivers Water Source
9	Lower Manning River Water Source
10	Manning Estuary Tributaries Water Source
11	Manning River Tidal Pool Water Source
12	Mid Manning River Water Source
13	Myall Creek Water Source
14	Myall Lakes Water Source
15	Myall River Water Source
16	Nowendoc River Water Source
17	Rowleys River Water Source
18	Upper Barnard River Water Source
19	Upper Barrington River Water Source
20	Upper Gloucester River Water Source
21	Upper Manning River Water Source
22	Wallamba River Water Source

Figure 2: Plan area

2.3 Water use

Table 5 shows the breakdown of the 2018-19 entitlement for the Plan, totalling 93,887 ML per year.[15] Unregulated river access licences hold the largest volume of entitlement at 50,479 unit shares, or 54 percent of the total entitlement.[16] Most licences are used for irrigation to support beef and dairy cattle farming.[17] Utility access licences represent the second largest entitlement, including:

- 17,256 ML per year for local water utility access licences, most of which (12,500 ML per year) is from the Lower Manning River Water Source
- 20,000 ML per year held for power generation in times of drought, which is pumped from the Lower Barnard River Water Source by the Barnard River Diversion Scheme.[18]

Table 5: Estimated annual entitlement volume[19]

Category	Entitlement volume	Proportion of total entitlement (%)
Basic landholder rights		
Native title rights	0 ML per year	0
Domestic and stock	5,044 ML per year	5
Harvestable rights	No estimate provided[20]	0
Licenced entitlement		
Aquifer	992 unit shares	1
Domestic and stock	116 ML per year	0.1
Local water utility access licences	17,256 ML per year	18
Major utility access licences[21]	20,000 ML per year	21
Unregulated river access licences	50,479 unit shares	54
Total	**93,887 ML per year[22]**	

15 WaterNSW (2019) *Water Register*. Available at: https://waterregister.waternsw.com.au/water-register-frame.

16 Extraction limits for unregulated river access licences are expressed as unit shares. Allocations vary according to the available water determination. The Commission calculated share entitlement based on Plan history of a 100 percent AWD per unit share.

17 DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources - Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

18 Note: The Plan includes 30,000 ML per year share component capped at 20,000 ML per year extraction for power generation under the Barnard Scheme (Clause 29 of the Plan). The Commission is using the current licence in the NSW Water Register for 20,000 ML per year.

19 WaterNSW (2019) *NSW Water Register*. Available at: https://waterregister.waternsw.com.au/water-register-frame; and Clause 22 of the Plan. For licences expressed in unit shares the Commission calculated entitlement volume based on Plan history of a 100 percent AWD per unit share.

20 Harvestable rights refer to landholders' capture of up to 10 percent of average regional rainwater runoff on their land, with certain limitations (NSW Government (2006) *NSW Government Gazette 40 – 31 March 2006*, pp. 1,628-1,631).

21 AGL Macquarie holds this entitlement which is pumped by the Barnard Scheme into the Hunter River system to Jerrys Plains where AGL Macquarie's power stations are located.

22 Extraction limits per unit share vary according to the AWD. The Commission calculated share entitlement based on Plan history of a 100 percent allocation per unit share.

The Plan's estimate of the domestic and stock component of basic landholder rights is 5,044 ML per year.[23] There are no native title determinations in the Plan area so there is no associated estimate.

There are no significant on-stream storages on the Manning River.[24] However, water from the Manning River is pumped to Bootawa Dam as part of the Manning Scheme, which is the primary source of town water for customers in the lower north coast area served by MidCoast Water.[25]

2.4 Climate

Rainfall in the Plan area generally decreases from east to west. The highest rainfall occurs in the Comboyne Plateau and Barrington Tops (average around 1,735 millimetres per year). On average, the highest total rainfall occurs between January and March.[26]

Like much of Australia, there is considerable variability in annual rainfall, with years of higher precipitation and consecutive years of lower than average precipitation and drought conditions.[27] **Figure 3** provides an example of the long-term river gauge data on the Manning River at Killawarra Bridge, which shows regular significant flow events interspersed with lower flows.

Drought conditions were experienced across the Plan area in the later years of the Plan. The period under the Plan, especially the period from April 2013, have had lower river flows. **Figure 4** shows the flow and river height for the Manning River at Killawarra Bridge during the Plan period, which is currently experiencing its longest period of no flow recorded (since 13 November 2019). The last significant flow at this gauge was in April 2018.[28]

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23 Based on 13.8 ML per day as per Clause 22 of the Plan. Note: The background document quotes a slightly different figure of 4,580 ML per year.

24 WaterNSW (2019) *Water Register*. Available at: https://waterregister.waternsw.com.au/water-register-frame.

25 MidCoast Council (n.d.) *Water Supplies*. Available at: https://www.midcoast.nsw.gov.au/Water-Services/Water-Supplies.

26 DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources - Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

27 Based on Bioregional Assessments data for the Gloucester subregion, which covers part of but not all the Plan area. A map of this subregion is presented in McVicar TR, Langhi L, Barron OV, Rachakonda PK, Zhang YQ, Dawes WR, Macfarlane C, Holland KL, Wilkes PG, Raisbeck-Brown N, Marvanek SP, Li LT and Van Niel TG (2014) *Context statement for the Gloucester subregion. Product 1.1 from the Northern Sydney Basin Bioregional Assessment*. Prepared for the Department of the Environment, Bureau of Meteorology, CSIRO and Geoscience Australia, Australia. Available at: https://www.bioregionalassessments.gov.au/assessments/11-context-statement-gloucester-subregion.

28 WaterNSW (2019) *Real Time Data – Manning River at Killawarra (208004*). Available at: https://realtimedata.waternsw.com.au/.

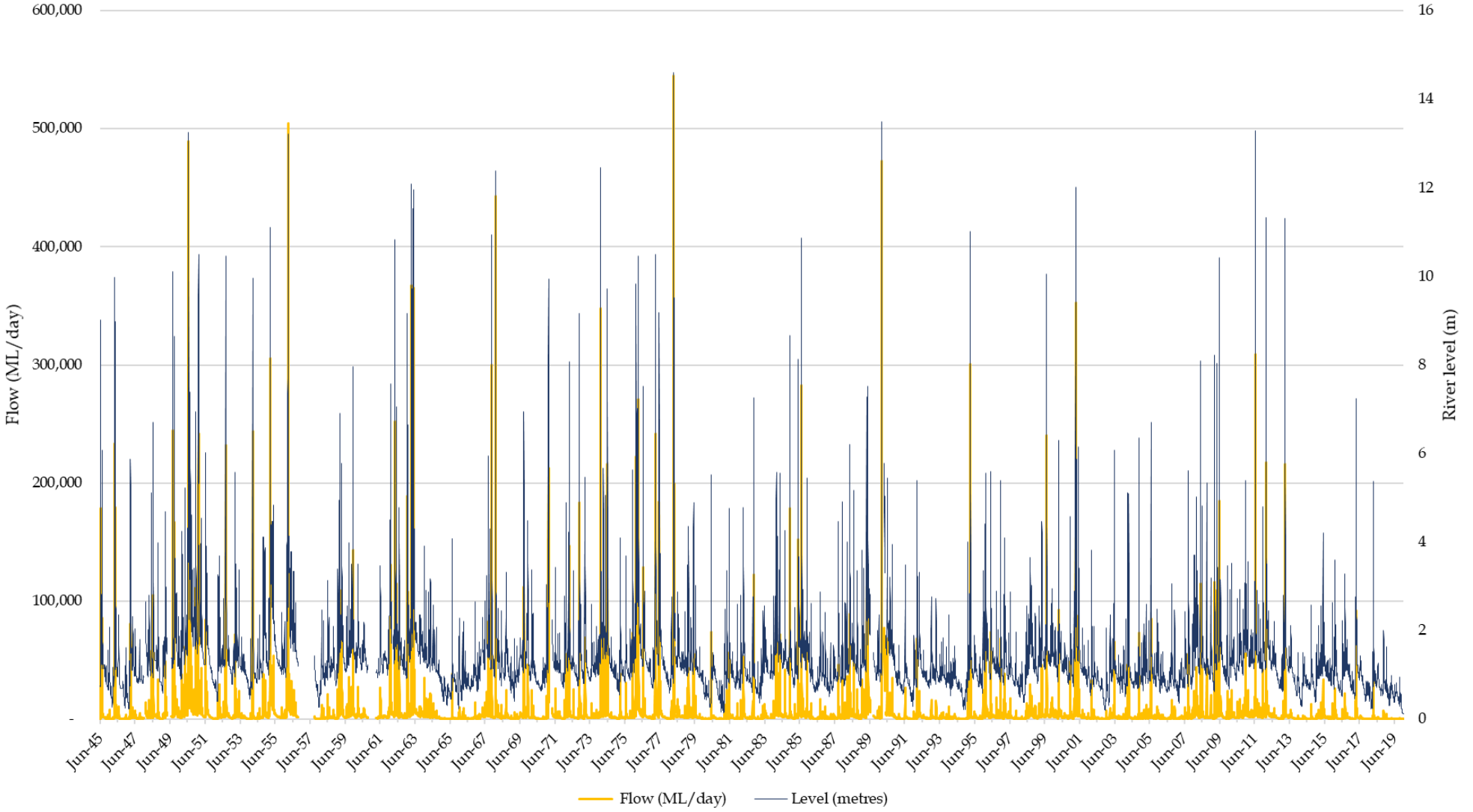

Figure 3: Long term river flow and level data at the Manning River at Killawarra gauge[29]

29 WaterNSW (2019) *Real Time Data – Manning River at Killawarra (208004*). Available at: https://realtimedata.waternsw.com.au/.

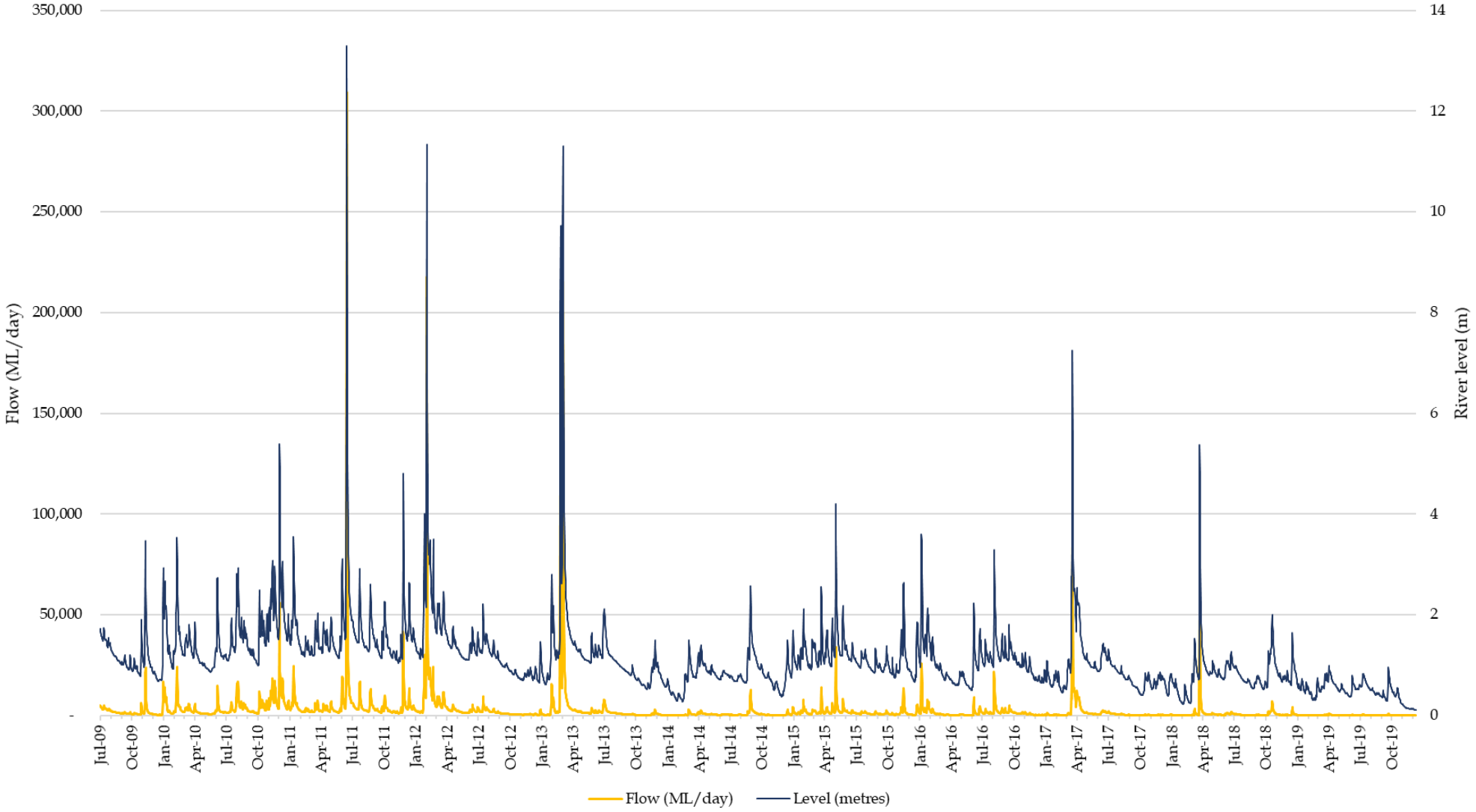

Figure 4: River flow and level at the Manning River at Killawarra gauge, showing a cease to flow period since 13 November 2019[30]

30 WaterNSW (2019) *Real Time Data – Manning River at Killawarra (208004*). Available at: https://realtimedata.waternsw.com.au/

In addition to the historic variability in climate, climate change projections and scenarios create further uncertainty for the region. Climate projections for the NSW North Coast Region[31] indicate that mean temperatures will increase by 0.7 degree Celsius by 2030, with temperatures increasing across all seasons. There are expected to be more hot days and warm spells, and fewer frosts. Temperature increases projected for the region are large compared to the natural variability in temperature and are of a similar order of magnitude as temperature increase rates projected for other regions of NSW.[32]

The Gloucester Subregion Bioregional Assessment provides estimated impacts on rainfall, potential evapotranspiration and runoff for the Intergovernmental Panel on Climate Change scenario of a 1 degree Celsius temperature rise by 2030 (compared to the global mean temperature in 1990).[33] Results for 2030 for the Manning River Catchment indicate the following projections:

- **Rainfall –** an 8 percent and 2 percent decline in rainfall for the projected dry extreme and median respectively, and a 3 percent increase in rainfall for the wet extreme.
- **Runoff –** a 20 percent and 7 percent decline in runoff for the projected dry extreme and median respectively, and a 5 percent increase for the wet extreme, based on approximate projections.[34]

Other projections for eastern Australia more broadly indicate that evapotranspiration will increase by 2090, relative to 1995.[35]

The former OEH presented climate change projections based on the NSW and ACT Regional Climate Modelling (NARCLiM) of the broad North Coast Region.[36] These projections also

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31 The North Coast region includes part of the Plan area but also covers a broader area extending north of Bryon Bay. A map of the North Coast Region is presented in OEH (2014) *North Coast climate change snapshot*. Available at: https://climatechange.environment.nsw.gov.au/Climate-projections-for-NSW/Climate-projections-for-your-region/North-Coast-Climate-Change-Downloads.

32 OEH (2014) *North Coast climate change snapshot*. Available at: https://climatechange.environment.nsw.gov.au/Climate-projections-for-NSW/Climate-projections-for-your-region/North-Coast-Climate-Change-Downloads.

33 McVicar, T.R., Langhi, L., Barron, O.V., Rachakonda, P.K., Zhang, Y.Q., Dawes, W.R., Macfarlane, C., Holland, K.L., Wilkes, P.G., Raisbeck-Brown, N., Marvanek, S.P., Li, L.T. and Van Niel, T.G. (2014) *Context statement for the Gloucester subregion. Product 1.1 from the Northern Sydney Basin Bioregional Assessment*. Prepared for the Department of the Environment, Bureau of Meteorology, CSIRO and Geoscience Australia, Australia. Available at: https://www.bioregionalassessments.gov.au/assessments/11-context-statement-gloucester-subregion.

34 Note: Runoff projections exclude consideration of wind speed and are therefore approximate projections only. Wind speed, along with other climatic factors such as air temperature and vapour-pressure deficit, have an impact on potential evapotranspiration, which was a model input. As a result, the impact of declining rates of observed wind speed are not included in the projections, even though they may offset the impact of increasing air temperature on potential evapotranspiration (McVicar TR, Langhi L, Barron OV, Rachakonda PK, Zhang YQ, Dawes WR, Macfarlane C, Holland KL, Wilkes PG, Raisbeck-Brown N, Marvanek SP, Li LT and Van Niel TG (2014) *Context statement for the Gloucester subregion. Product 1.1 from the Northern Sydney Basin Bioregional Assessment*. Prepared for the Department of the Environment, Bureau of Meteorology, CSIRO and Geoscience Australia, Australia. Available at: https://www.bioregionalassessments.gov.au/assessments/11-context-statement-gloucester-subregion).

35 CSIRO (2016) *Australian changing climate*. Available at: https://www.climatechangeinaustralia.gov.au/media/ccia/2.1.6/cms_page_media/176/AUSTRALIAS_CHANGING_CLIMATE_1.pdf.

36 Note: the readily available NARCliM maps referred to in this report present the multi-model mean, which may understate the change and misrepresent the direction of change. It is possible to further interrogate the NARCliM datasets for example to further understand the extreme cases. However, this has not been explored for this review.

indicate changes to annual average rainfall patterns, ranging from a decrease of 8 percent to an increase of 11 percent by 2030, and a decrease of 6 percent to an increase of 31 percent by 2070.[37]

Across seasons, increases in autumn and spring rainfall and decreases in winter rainfall are projected over both time horizons. A decrease in summer rainfall is projected by 2030 but an increase is projected by 2070. Changes in rainfall are associated with changes in extremes, such as droughts and floods, and secondary impacts including water quality and soil erosion issues. The Commission notes that modelling rainfall is challenging due to the complexity of weather systems and caution is required when interpreting changes.[38]

Changes in surface runoff will also affect flows to storage dams operated by utility providers and farms dams. Current projections indicate that northern areas of NSW are likely to see small increases in runoff to 2030, although there is considerable variation across seasons.[39]

2.5 Geology and hydrogeology

The major river catchments in the Plan area – the Manning River to the north and the Karuah River to the south – are part of the Gloucester Basin. The Gloucester Basin is a synclinal north-south trending structure consisting of Permian sediments that is approximately 40 kilometres long, 10 kilometres wide and up to 3 kilometres deep.

The Gloucester Basin contains two Late Permian coal measures - the Gloucester Coal Measures and the underlying Dewrang Group. Collectively there are numerous coal seams with a thickness 2.5 metres or more. Coal is mined in the area and there is coal seam gas project exploration and development in the groundwater source.

The Gloucester Basin is considered a geologically closed basin with three main hydrogeological units:

- Surface alluvium up to 15 metres thick – a semi-confined to unconfined aquifer.
- Shallow weathered and fractured rocks up to 150 metres thick – a confined to semi-confined aquifer.
- Interburden units alternating with coal seams to a maximum depth of about 2,500 metres – only considered to be water-bearing strata.

Within the Plan area, both the Avon and Karuah rivers are unregulated streams that connect with local groundwater. The river system is mostly gaining, with baseflow estimated to be about one-tenth of total streamflow. The alluvial aquifer only receives water from the river system during high flow and flood events.

The aquifers across the Plan area have been grouped into five categories:

- Up-river alluvial.
- Coastal floodplain alluvial.

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37 OEH (2014) *North Coast climate change snapshot*. Available at: https://climatechange.environment.nsw.gov.au/Climate-projections-for-NSW/Climate-projections-for-your-region/North-Coast-Climate-Change-Downloads.

38 *Ibid*.

39 DPIE-EES (n.d.) *Hydrology Climate Change Impact Snapshot.* Available at: https://climatechange.environment.nsw.gov.au/-/media/NARCLim/Files/Climate-Change-Impact-Reports/Hydrology-Climate-Change-Impact-Snapshot.pdf.

- Coastal sands.
- Fractured rock.
- Porous rock.

The up-river and coastal floodplain alluvial aquifers are categorised based on the type of alluvial material and degree of connectivity with surface water. The shallow alluvial aquifers are significant water sources along the major rivers in the Plan area, including the Karuah River, Myall River, Avon River, Coolongolook River, Manning River estuary tributaries and Lower Barrington/Gloucester Rivers.

Not all aquifers in the Gloucester Basin are managed under the Plan. The coastal sands aquifers such as the Manning Coastal Sands are instead managed by the *Water Sharing Plan for the North Coast Coastal Sands Groundwater Sources*. The porous and fractured rock aquifers are managed by the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources*.

2.6 Environmental context

The Plan covers a range of landscapes, including beaches, coastline, forests, waterways and mountains with elevations over 1,500 metres.[40] Landscapes in the area are influenced by tropical, subtropical and temperate bioregions.[41] Significant areas of the Plan are located in conservation reserves, with 23 national parks, 47 nature reserves, 16 state conservation areas, one regional park and one marine park.[42] A significant proportion of the Plan area is state forest, including 22 percent of the Manning catchment (largely on steep country).[43] State forests are also the largest land use managed by a single land manager within the Karuah River catchment.[44]

2.6.1 Key environmental assets

The Port Stephens Great Lakes Marine Park is NSW's largest marine park, at 98,000 hectares, and in the Plan area includes the Karuah River, the Myall River, Myall and Smiths Lakes and their creeks and tributaries to the tidal limit. The marine park is a unique environment where tropical, subtropical and temperate species co-exist.

The Myall Lakes (75 kilometres north of Newcastle) are NSW's largest brackish barrier lake system.[45] They were listed under the Ramsar Convention in 1999 as they represent unique wetlands, and support five threatened species, littoral rainforests and a rich biodiversity,

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40 .id Demographic Resources (2019) *MidCoast Council Area*. Available at: https://profile.id.com.au/midcoast/about.

41 DPI (n.d.) *Port Stephens - Great Lakes Marine Park*. Available at: https://www.dpi.nsw.gov.au/fishing/marine-protected-areas/marine-parks/port-stephens-marine-park and Great Lakes Council (2015) *Karuah River Catchment Management Plan*. Available at: https://www.midcoast.nsw.gov.au/Council/Works-and-Projects/Council-Projects/Karuah-River-Catchment-Management-Plan.

42 National Parks and Wildlife Estate spatial data Version 2/2019, NSW Sharing and Enabling Environmental Data (SEED) website, retrieved May 2019. Available at: https://datasets.seed.nsw.gov.au/dataset.

43 DPIE-Water (n.d.) *Catchment snapshots – Manning*. Available at: https://www.industry.nsw.gov.au/water/basins-catchments/snapshots/manning.

44 Great Lakes Council (2015) *Karuah River Catchment Management Plan*. Available at: https://www.midcoast.nsw.gov.au/Council/Works-and-Projects/Council-Projects/Karuah-River-Catchment-Management-Plan.

45 DPI (n.d.) *Port Stephens - Great Lakes Marine Park*. Available at: https://www.dpi.nsw.gov.au/fishing/marine-protected-areas/marine-parks/port-stephens-marine-park.

including over 900 species of plants and 400 species of animals.[46] The Myall Lakes National Park is one of NSW's most visited national parks. Licenced extraction is not permitted from the Myall Lakes Water Source.[47]

The waters of the Karuah River upstream of the Pacific Highway Bridge are a habitat protection zone, which limits the activities that may occur in waterways, including restrictions on recreational or commercial fishing methods. There are substantial areas of mangrove and saltmarsh habitats in the Karuah River estuary that provide food sources and nursery areas for fish, but only very small areas of seagrass exist. The marine park contains the largest extent of mangroves and saltmarsh in NSW.[48]

The Karuah River headwaters are in the Barrington Tops National Park and occupy part of the Gondwana Rainforests of Australia World Heritage Area.[49] These areas contain unique and ancient species of international conservation and scientific significance. Much of this area is also declared as Wilderness Area under the *Wilderness Act 1987*.[50] Due to influences from both tropical and temperate bioregions, the Karuah River catchment contains many species that are at the limit of their natural range.[51]

The Wallis Lake catchment contains habitat for threatened and international migratory species and contains 35 percent of NSW's seagrass beds. Smiths Lake is the largest ICOLL in NSW.[52] Wallis Lake and estuarine islands is a nationally important wetland.[53] The Manning River is a double delta with two river entrances, which is unique on the NSW coast.[54] The Harrington entrance is a major breeding area for endangered Little Terns.[55]

Estuary sensitivity to freshwater inflows is variable depending on their size, shape and the freshwater inflow volume. Small estuaries are more likely to be highly sensitive to inflows, whereas long and narrow estuaries are less sensitive to changes in inflows. The Plan's background document outlined inflow sensitivity for the following estuaries:

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46 DPIE (2018) *Myall* Lakes. Available at: https://www.environment.nsw.gov.au/topics/water/wetlands/internationally-significant-wetlands/myall-lakes.

47 Clause 19(3)(i) of the Plan prohibits extraction of water in this water source under a water access licence.

48 Great Lakes Council (2015) *Karuah River Catchment Management Plan*. Available at: https://www.midcoast.nsw.gov.au/Council/Works-and-Projects/Council-Projects/Karuah-River-Catchment-Management-Plan.

49 MidCoast Council (2018) *MidCoast 2030: Shared vision, shared responsibility*. Available at: https://www.midcoast.nsw.gov.au/files/assets/public/document-resources/council/plans-amp-publications/midcoast-2030-shared-vision-shared-responsibility.pdf.

50 Great Lakes Council (2015) *Karuah River Catchment Management Plan*. Available at: https://www.midcoast.nsw.gov.au/Council/Works-and-Projects/Council-Projects/Karuah-River-Catchment-Management-Plan.

51 *Ibid*.

52 DPI (n.d.) *Port Stephens - Great Lakes Marine Park*. Available at: https://www.dpi.nsw.gov.au/fishing/marine-protected-areas/marine-parks/port-stephens-marine-park.

53 Australian Government Department of the Environment and Energy (n.d.) *Directory of Important Wetlands in Australia.* Available at: http://www.environment.gov.au/cgi-bin/wetlands/report.pl.

54 Midcoast Council (2019) *Waterway and catchment report*. Available at: https://www.midcoast.nsw.gov.au/Part-of-your-everyday/Council-Projects/Waterways-Report-Card-2019-Results and MidCoast Council (2018) *MidCoast 2030: Shared vision, shared responsibility*. Available at: https://www.midcoast.nsw.gov.au/files/assets/public/document-resources/council/plans-amp-publications/midcoast-2030-shared-vision-shared-responsibility.pdf.

55 Department of Planning and Environment (2015) *Marine-Based Industry Policy – Far North Coast & Mid North Coast NSW*. Available at: https://www.planning.nsw.gov.au/Plans-for-your-area/Regional-Plans/North-Coast/~/media/63BEA62595574ED5B3890FF85134ADF6.ashx.

- Myall Lakes, and the intermittently opening Khappinghat and Smiths lakes, are highly sensitive to inflows.
- Manning River estuary has medium sensitivity to inflows
- Wallis Lake coastal lagoons have a low sensitivity to inflows.[56]

2.6.2 High environmental value areas

Eighteen water sources are identified as having high instream value (see **Table 6**).[57] These contain threatened frog and bird species. Other factors that were considered in this assessment include riparian vegetation, fish community integrity, whether the source is a drought refuge for platypus and other aquatic species, and the ecological value of the river for invertebrates. Instream values are an important consideration when setting flow sharing rules. For these water sources, the Plan proposed to limit trade, increases in water entitlement (in some cases decrease in entitlement), and conservative cease to pump rules.

56 DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources - Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

57 High instream values were identified using 'macro' planning approach for unregulated rivers. Instream value is defined as ecological (intrinsic), economic (non-extractive use) and cultural (place). Special areas (for example, critical habitat, SEPP 14 wetlands and threatened or endangered species, ecological communities and populations are also assessed. The attributes are scored for each water source to determine relative instream value. Where information is not available, the Interagency Regional Panel chooses either to proceed without it, to use alternative information, or to make a subjective judgment. The relative assessment is undertaken for each major catchment or, in the case of estuaries, the marine bioregion. In NSW, legislation is a key driver for the management of threatened species. For macro water sharing plans, rarity is defined as threatened or endangered water-dependent species, populations or communities as listed under the *Threatened Species Conservation Act 1995* or the *Fisheries Management Act 1994* (DPI-Water (2011) *Macro water sharing plans - the approach for unregulated rivers - A report to assist community consultation, Second Edition*. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0008/548153/macro_unreg_manual_web.pdf).

Table 6: Water sources identified as having high instream values for environmental factors[58]

Water source	Threatened species		Significant wet flora species	Riparian vegetation condition	Fish community integrity	Drought refuge for platypus, aquatic plants & animals	Overall ecology health (AUSRIVAS)
	Frog	Bird					
Lower Manning River	5	1	-	Good	Good	-	Moderate
Lower Barrington/ Gloucester Rivers	5	2	-	-	Good	-	Moderate
Bowman River	6	1	-	Moderate	Good	-	High
Upper Barrington River	7	-	-	Moderate	Good	Yes	Moderate
Upper Gloucester River	6	1	Yes	-	-	Yes	Moderate
Myall River	5	2	-	Good	Good	Yes	Moderate
Myall Lakes	6	3	-	Good	Good	Yes	Moderate
Coolongolook River	5	4	-	Moderate	Good	Yes	-
Wallamba River	5	3	-	Moderate	Good	Yes	Moderate
Rowleys River	7	-	-	Good	Good	Yes	Moderate
Cooplacurripa River	6	-	-	Good	Good	Yes	Moderate
Nowendoc River	7	-	-	Moderate	Good	Yes	Moderate
Myall Creek	7	-	-	Good	Good	Yes	Moderate
Upper Barnard River	5	-	-	Moderate	Good	Yes (not for platypus)	High
Lower Barnard River	6	-	-	Moderate	Good	Yes	Moderate
Upper Manning River	7	-	-	Moderate	Good	Yes	High
Mid Manning River	6	-	-	Moderate	Good	-	Moderate
Karuah River	5	3	-	Poor	Good	-	Moderate

[58] DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources - Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

2.6.3 Threatened flora and fauna species

Seventeen water-sensitive threatened flora and fauna species were identified in one or more of the Plan's water sources during Plan development (see **Table 7**). Other key species identified in the Plan area include the threatened Manning River helmeted turtle (*Myuchelys purvisi*),[59] the threatened Beach Stone Curlew and Hooded Plover, and critically endangered flora including *Rhodamnia rubescens*, *Genoplesium littorale*, *Rhodomy psidioides*, *Diuris flavescenes*, *Banksia conferta subsp. conferta*.[60] There are additional water dependent and threatened species that have been identified since Plan commencement that should be considered in the replacement Plan.

Table 7: Threatened flora and fauna species that occur within one or more of the Plan's water sources[61]

Threatened flora and fauna species	
Amphibians	
Booroolong Frog (Litoria booroolongensis)	Green-thighed Frog (Litoria brevipalmata)
Davies' Tree Frog (Litoria daviesae)	Olongburra Frog (Litoria olongburensis)
Giant Barred Frog (Mixophyes iterates)	Sphagnum Frog (Philoria sphagnicolus)
Glandular Frog (Litoria subglandulosa)	Stuttering Frog (Mixophyes balbus)
Green and Golden Bell Frog (Litoria aurea)	Wallum Froglet (Crinia tinnula)
Birds	
Australasian Bittern (Botaurus poiciloptilus)	Blue-billed Duck (Oxyura australis)
Black Bittern (Ixobrychus flavicollis)	Comb-crested Jacana (Irediparra gallinacea)
Black-necked Stork (Ephippiorhynchus asiaticus)	Magpie Goose (Anseranas semipalmata)
Flora	
Maundia (Maundia triglochinoides)	

59 DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources - Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

60 DPIE-EES (2019) *Review of the Lower North Coast Unregulated and Alluvial Water Sources Water Sharing Plan* (unpublished).

61 DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources - Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

2.6.4 Estuaries

DPIE-Water assessed estuary sensitivity to changes in freshwater inflows during plan development. The results are presented in **Table 8**, with high sensitivity estuaries highlighted.

The Manning River has a significant tidal pool that sustains some commercial extraction. This is in the main trunk of the river, directly downstream of Wingham.[62] The other estuaries listed in **Table 8** only have temporary tidal pools, generally immediately after high flow events.

Table 8: Inflow sensitivities for Lower North Coast catchments (high sensitivity estuaries shaded grey)

Water source	Groundwater sensitivity	Low flow inflow sensitivity	High flow inflow sensitivity
Manning River Estuary	Medium	Medium	Medium
Khappinghat Creek	High	High	Medium
Wallis Lake, Proper	Medium	Low	Low
Wallis, Wallamba River	Medium	Medium	Medium
Wallis, Coolongolook River	Medium	Medium	Medium
Wallis, Wallingat River	Medium	Medium	Medium
Smiths Lake	Medium	High	High
Myall Lakes, Upper	High	High	High
Myall Lakes, Lower	High	High	High
Myall River Estuary	Medium	Medium	Medium
Karuah River Estuary, Upper	Medium	Low	Low
Port Stephens & Lower Karuah	Medium	Low	Low
Tilligerry Creek	Medium	Medium	Medium

2.6.5 Groundwater dependent ecosystems

Groundwater dependent ecosystems are ecosystems which have their species composition and natural ecological processes determined, to some extent, by the availability of groundwater. Groundwater dependent ecosystems can include cave systems, springs, wetlands and

62 DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources - Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

groundwater dependent threatened ecological communities. Groundwater dependent ecosystems are classified according to the ecosystems they support (**Table 9**).

Table 9: Classification of groundwater dependent ecosystems[63]

Type 1	**Ecosystems living in an aquifer** – for example, stygofauna, which is fauna found in groundwater systems such as caves[64]
Type 2	**Ecosystems supported by discharging groundwater to the surface** – for example, wetlands, seeps, springs and river baseflow
Type 3	**Ecosystems supported by the subsurface presence of groundwater** – for example, deep-rooted terrestrial vegetation

All ecosystem types can be impacted by reduced groundwater quantity (in terms of flow or level) or changes in groundwater quality, but each have different risk profiles based on their level of water dependence. Type 2 groundwater dependent ecosystems are widespread throughout NSW coastal regions as wetlands, occurring wherever there is discharge, while Type 3 ecosystems are common in coastal sands.

High-priority groundwater dependent ecosystems are identified during the planning process and are listed in a schedule to the Plan. In line with Plan amendment provisions, DPIE-Water can review and amend the list of groundwater dependent ecosystems, as well as the rules that have been developed to protect them based on its expertise. The list of high-priority groundwater dependent ecosystems compiled at this stage can be amended as further groundwater dependent ecosystems are identified during the life of the Plan.

The Plan currently identifies eight high-priority groundwater dependent ecosystems, which are all wetlands (see **Table 10**).

63 These types are used by the Bureau of Meteorology and the Independent Expert Scientific Committee in its guidelines to assess groundwater dependent ecosystems.

64 The Commission notes that DPIE-Water are progressing research into the science behind stygofauna watering requirements. These requirements are currently largely unknown making rule development difficult.

Table 10: High-priority groundwater dependent ecosystems[65]

High-priority groundwater system	Type	Water source
Bobs Swamp	Wetland	Upper Barrington River Water Source
Black Swamp		
Brumlow Swamp		
Edwards Swamp		
Little Murray Swamp		
Saxby Swamp		
Great Swamp	Wetland	Manning Estuary Tributaries Water Source
Wallaroo Swamp	Wetland	Karuah River

Water sharing rules have been designed to protect significant groundwater dependent ecosystems where they are known to occur on alluvial aquifers, including that new or replacement bores will not be permitted within a buffer zone around the groundwater dependent ecosystems. Existing bores that are not affecting the buffer zones are able to continue operating, that is, within the existing conditions of their access licences.[66]

2.7 Social context

At the last Census in 2016, the MidCoast Local Government Area had a resident population of 90,303, an increase of 3.4 percent since 2011. The estimated population is just over 93,000 in 2019 and population is predicted to increase by a further 20 percent by 2036 (to just over 113,000 people).[67] The largest town in the area is Taree, with other major centres being Forster, Tuncurry, Gloucester and Wingham.

Overall, the population in the MidCoast Local Government Area is much older than regional NSW, with the ageing population cohort increasing between 2011 and 2016 and the largest age group currently being 65-69.[68] The coastal location has been popular for retirees and those seeking a sea-change lifestyle.[69]

Dwellings have increased in line with changes in population. In 2016, there were 47,538 dwellings with an average household size of 2.24 persons. Dwellings increased by nearly 5

65 See Schedule 4 (Table B) of the Plan.

66 DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources - Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

67 .id Demographic Resources (2019) *MidCoast Council Area - Population*. Available at: https://profile.id.com.au/midcoast/population-header.

68 *Ibid*.

69 MidCoast Council (2018) *MidCoast Regional economic development strategy 2018–2022*. Available at: https://www.midcoast.nsw.gov.au/Council/Works-and-Projects/Council-Projects/Regional-Economic-Development-Strategy.

percent since 2011 (from 45,353 to 47,538) and are forecast to increase by 25.6 percent (to 60,269) by 2036. Most housing stock is composed of separate houses (77.9 percent of stock), which is higher than the regional NSW average of 64.9 percent.

There were 43 residential buildings approved to be built in the financial year 2019-20, and 309 in 2018-19. Most future growth in dwelling stock is expected to occur primarily in the areas of Brimbin, Old Bar, Hallidays Point and Foster South, primarily due to new housing development and some infill of higher density housing.

Seasonal population change is also important to consider in the Plan area due to the importance of tourism. The natural environment, recreational opportunities and its proximity to major urban centres such as Sydney and Newcastle make the area particularly attractive to tourists. According to a national visitor survey, the North Coast[70] received 42 percent of international visitors, 23 percent of domestic overnight visitors and 17 percent of domestic daytrip visitors to Regional NSW[71] over 2018-19, with a total of 13.7 million visitors spending $4.7 billion.[72] From 2014 to 2019, international visitors, nights and expenditure in the region all increased significantly; by 37.8 percent, 40.4 percent and 72.9 percent respectively (see **Section 2.9** for a description of the tourism industry value).[73]

Most visitors surveyed were seeking nature-based experiences (68 percent), with water-based and beach activities one of the top identified activities.[74] Water sources in the Plan support a range of amenity uses, including recreational fishing and boating, marine park tourism, visual amenity and foreshore recreation.[75]

2.8 Aboriginal context

Aboriginal and Torres Strait Islander people represent 6.2 percent of the population (just over 5,500 people) in the MidCoast Local Government Area. This represents an increase of 1.5 percent since 2011 and is higher than the regional NSW average of 5.5 percent. The Plan area overlaps primarily with the traditional lands of the Worimi and Biripai people.[76] The Plan area also covers Local Aboriginal Land Councils of Forster, Purfleet/Taree, Worimi and Karuah. The Plan area includes Aboriginal-owned land, including the Worimi Conservation Lands (discussed in **Section 2.8.1**).

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70 The 'North Coast' tourism region includes the lower and upper North Coast.

71 Regional NSW includes all areas outside of Sydney and surrounds.

72 Destination NSW (2019) *NSW North Coast Visitor Profile - Year ending June 2019*. Available at: https://www.destinationnsw.com.au/wp-content/uploads/2019/10/north-coast-fact-sheet-ye-jun-19.pdf.

73 DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources - Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

74 Destination NSW (2019) *NSW North Coast Visitor Profile - Year ending June 2019*. Available at: https://www.destinationnsw.com.au/wp-content/uploads/2019/10/north-coast-fact-sheet-ye-jun-19.pdf.

75 MidCoast Council (2018) *MidCoast Regional economic development strategy 2018–2022*. Available at: https://www.midcoast.nsw.gov.au/Council/Works-and-Projects/Council-Projects/Regional-Economic-Development-Strategy

76 DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources - Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

The Plan's background document describes the land use history, including the traditional lands of the Worimi and Biripai Aboriginal people which occupied much of the Great Lakes, Karuah and Manning areas. For Aboriginal people, protecting the health of rivers, lakes, waterways and coastal environments is a critical part of their connection to Country, traditional obligations and overall health and well-being.[77]

The Worimi (Warrimay) Nation have documented parts of their oral history as traditional custodians of a large area of land within the Plan area.[78] In these accounts they note that much of Worimi Country has changed dramatically since 1788, and dispossession has had significant impacts on people and their culture.

The Worimi Nation oral history passed down by the Elders record that the Worimi Nation was originally bounded by four rivers, Hunter River to the south, Manning River to the north, the Allyn and Patterson Rivers to the west. The Nation was home to 18 clan groups or 'ngurras', all of which spoke the Gathang language.

The coastal location, unique landform and diverse environments of the area provided rich resources for the Worimi people. They had direct access to marine resources from the ocean, all estuarine resources covered in the Plan including Tilligerry Creek, forest resources from the area between beach and estuary. Being a coastal environment, fishing was one of the most important activities. Methods included both line, and spearing - the women (galbaan) utilised fishing lines (yirawaan) and typically fished from canoes (guuyang), while the men (guri) also speared fish from canoes and the shoreline. There are hundreds of sites that are significant to Worimi people whose relationship with this area is evident in the extent and diversity of cultural material present.

77 DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources - Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

78 Worimi Conservation Lands (2019) *History of the Park.* Available at: https://worimiconservationlands.com/.

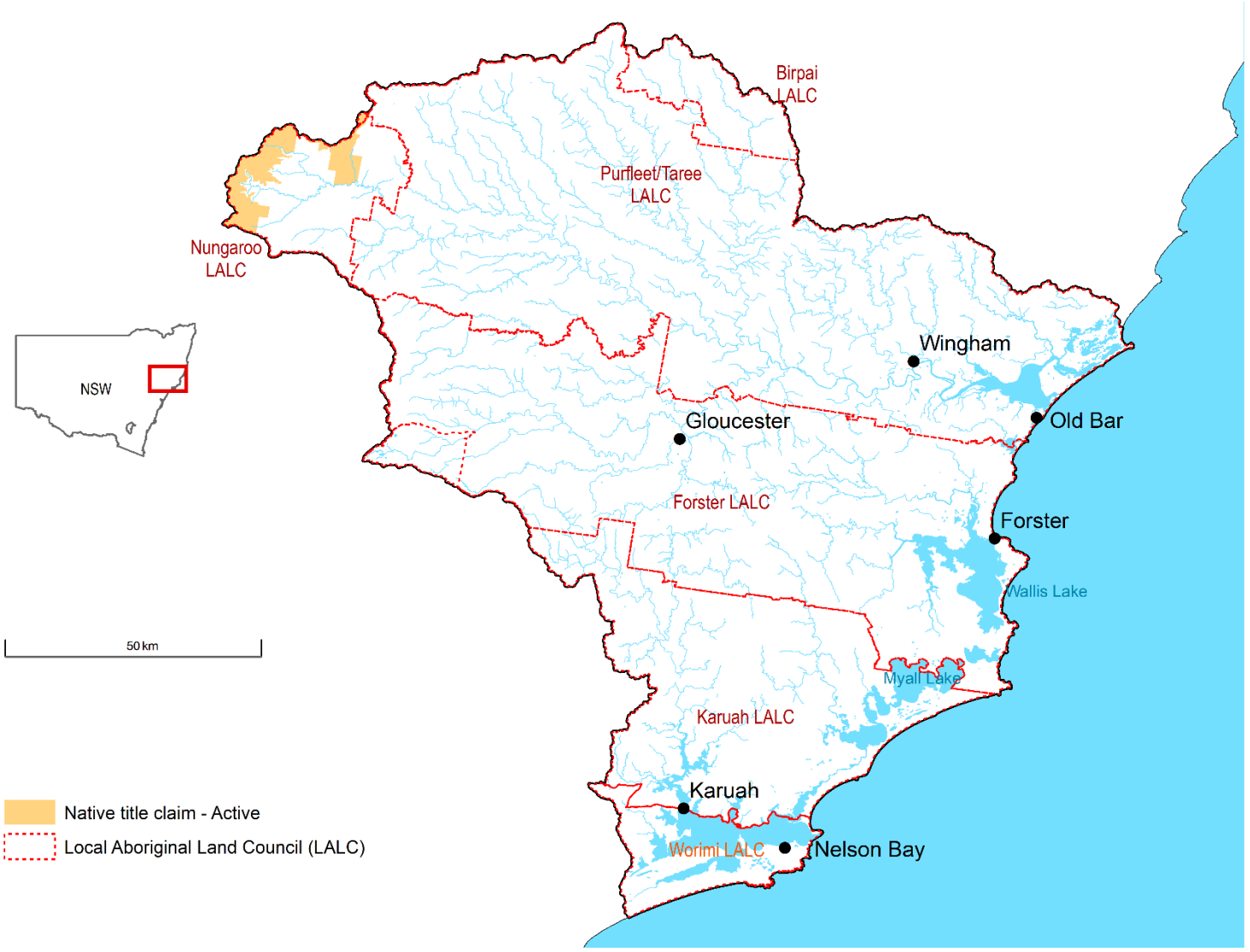

Figure 5: Local Aboriginal Land Council areas in the Plan area[79]

79 Note: there are no native title determinations in the Plan area.

2.8.1 Worimi Conservation Lands

In 2001, the Worimi Local Aboriginal Land Council and the Worimi Traditional Owners and Elders Group reached an agreement with the NSW Government to resolve a number of land claims in the area by creating a 4200-hectare park that is Worimi-owned and leased back to the NSW Government to be jointly managed with the Traditional Owners.[80] Worimi Local Aboriginal Land Council representatives and an Aboriginal Negotiating Panel of Worimi Traditional Owners negotiated the lease agreement with the Minister for the Environment, which was finalised in 2007. The land was then granted to the Worimi Local Aboriginal Land Council under the *NSW Aboriginal Land Rights Act 1983* and gazetted in 2007 under the *National Parks and Wildlife Act 1974* as Worimi National Park, Worimi State Conservation Area and Worimi Regional Park – referred to collectively as the 'Worimi Conservation Lands'.[81]

The granting of the freehold title over the Worimi Conservation Lands means the area is of particular significance to the Worimi. It is an area where the protection of Worimi cultural values has priority in law, where decisions affecting Country and culture are made by Worimi people through their majority representation on the Board of Management, and where Worimi Traditional Owners are employed to implement these decisions. A plan of management for the area sets out the vision, values, planned outcomes and strategies agreed by the Board.[82]

Although the agreement does not include rights to water,[83] the plan of management sets out several partnerships between the Board and responsible agencies regarding water use and management in the area. For example, the agreement includes provisions to work cooperatively with DPI to ensure that activities licensed under the *Fisheries Management Act 1994* have minimal impact on park values and to require commercial fishers to have a licence to access the area.

2.9 Economic context

The MidCoast Council area had a gross regional product of $3.16 billion in 2018, representing 0.6 percent of the gross state product of NSW.[84] Significant industries in the region include:

- retail trade (7.0 percent of gross regional product)
- health care services (5.5 percent of gross regional product)
- residential care and social assistance services (4.8 percent of gross regional product)

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80 Worimi Conservation Lands (2019) History of the Park. Available at: https://worimiconservationlands.com/.

81 The intertidal zone to mean low water mark was gazetted as part of Worimi Regional Park under Part 4 of the *National Parks and Wildlife Act 1974*, and therefore not returned to Aboriginal ownership. The lease agreement commits the National Parks and Wildlife Service to managing the intertidal zone.

82 Worimi Conservation Lands Board of Management (2015) *Worimi Conservation Lands: Plan of Management.* Prepared by the Worimi Conservation Lands Board of Management with staff the NSW National Parks and Wildlife Service. Available at: https://worimiconservationlands.com/wp-content/uploads/2014/07/Worimi-Conservation-Lands-Plan-of-Management.pdf.

83 The *NSW Aboriginal Land Rights Act 1983* and *National Parks and Wildlife Act 1974* do not include any specific rights to water.

84 .id Demographic Resources (2019) *MidCoast Council – Economic profile.* Available at: https://economy.id.com.au/midcoast.

- non-residential property operators and real estate services (4.5 percent of gross regional product)
- primary and secondary education services (4.0 percent of gross regional product).[85]

The largest employment industry in the MidCoast region is health care and social assistance (18.5 percent of total employment), followed by retail trade (13.6 percent), accommodation and food services (10.1 percent), education and training (8.6 percent), construction (6.9 percent), and agriculture, forestry and fishing (5.6 percent).[86] Employment in the agriculture and forestry industries has grown at a faster rate than the NSW average.[87]

The MidCoast Region's assets have been identified as:

- infrastructure and location
- lifestyle, institutions and amenity
- land, water and related assets.[88]

The region has land and rainfall highly suitable for beef and dairy production, and estuaries highly suitable for aquaculture.[89] Reflecting this, the top five specialisations in the MidCoast area have been identified as:

- aquaculture
- fishing, trapping and hunting
- non-metallic mineral mining and quarrying
- forestry and logging
- agriculture.[90]

The agriculture, forestry, fishing and related processing currently contribute about seven percent of the gross value added to the region and play a key role in the region's economic development strategy.[91]

Fishing and oyster farming are particularly important industries in these coastal areas. The Wallis Lakes area is NSW's largest producer of Sydney rock oysters, contributing 29 percent of production in 2015-16.[92] It is also one of NSW's top three producing estuarine fisheries, producing 80 percent of NSW's commercial crabs.[93]

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85 MidCoast Council (2018) *MidCoast Regional economic development strategy 2018–2022*. Available at: https://www.midcoast.nsw.gov.au/Council/Works-and-Projects/Council-Projects/Regional-Economic-Development-Strategy.

86 .id Demographic Resources (2019) *MidCoast Council Area – Employment by industry (census)*. Available at: https://economy.id.com.au/midcoast/Employment-census.

87 MidCoast Council (2018) *MidCoast Regional economic development strategy 2018–2022*. Available at: https://www.midcoast.nsw.gov.au/Council/Works-and-Projects/Council-Projects/Regional-Economic-Development-Strategy.

88 *Ibid*.

89 *Ibid*.

90 *Ibid*.

91 *Ibid*.

92 DPI (2017) *Aquaculture Production Report 2015–2016*. Available at: www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/699878/Aquaculture-Production-Report-2015_2016_final.pdf.

93 Midcoast Council (2019) *Waterway and catchment report*. Available at: www.midcoast.nsw.gov.au/Part-of-your-everyday/Council-Projects/Waterways-Report-Card-2019-Results.

A large part of the rural area is used for livestock farming and forestry. Livestock farming is primarily for beef and dairy cattle,[94] although there is also a growing poultry industry.[95] There are hardwood and softwood forests in the western parts of the region which support the forestry industry, including employment in harvesting, transportation and saw milling.[96]

The Gloucester coal basin also supports coal mines, which are an important industry for the Gloucester area, but a smaller contributor to the broader regional economy.[97]

The coastal waters, lakes and rivers also support tourism, whale watching, recreational fishing and boating. Waterways in the region, especially Wallis Lake, Myall Lakes and Myall River, are central to local tourism. The Myall Lakes National Park is one of NSW's most-visited national parks, with estimated annual visitor numbers of 250,000.[98] Tourism is the largest export industry in the MidCoast Council area, with visitors spending an estimated $505 million in 2016.[99]

Three of the water sources covered by the Plan were classified as having a high economic dependence on commercial extraction:

- **Lower Manning –** relatively high value extraction for regional town water supply.
- **Lower Barrington Gloucester –** relatively high value irrigation for pasture and Lucerne.
- **Upper Gloucester –** relatively high value irrigation for improved pasture.[100]

Other water sources were classified as having moderate or low levels of economic dependence, comprising areas characterised by opportunistic irrigation extraction, a small number of licences and relatively small entitlements.

94 NSW Irrigators' Council's submission noted that dairy production has been declining along the coast and that large rainfall events occur in coastal areas; however, these are not consistent through the year.

95 MidCoast Council (2018) *MidCoast Regional economic development strategy 2018–2022*. Available at: www.midcoast.nsw.gov.au/Council/Works-and-Projects/Council-Projects/Regional-Economic-Development-Strategy.

96 *Ibid*.

97 *Ibid*.

98 Midcoast Council (2019) *Waterway and catchment report*. Available at: www.midcoast.nsw.gov.au/Part-of-your-everyday/Council-Projects/Waterways-Report-Card-2019-Results.

99 MidCoast Council (2018) *MidCoast Regional economic development strategy 2018–2022*. Available at: www.midcoast.nsw.gov.au/Council/Works-and-Projects/Council-Projects/Regional-Economic-Development-Strategy.

100 DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Source – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

3 Opportunities to improve environmental outcomes

Under the Act, water sharing must prioritise the protection of water sources, floodplains and their dependent ecosystems and contribute to the general principle of restoring these ecosystems.[101] To support this, the Plan establishes provisions for the identification, establishment and maintenance of planned environmental water.

The Plan has two main approaches to providing planned environmental water:

1 **Limits to the availability of water –** including the long-term annual average extraction limit (LTAAEL)[102] and available water determinations (AWD)[103]

2 **Environmental water rules that support water sharing –** comprising flow classes[104] and corresponding cease to pump and commence to pump rules, and rules for daily surface flows, including total daily extraction limits (TDEL), individual daily extraction limits (IDEL) and an option to introduce an accreditation scheme.[105]

The Plan also includes provisions to protect groundwater including:

- **protection of groundwater dependent ecosystems –** through rules for granting and amending works approvals[106] and accounting for climate variability[107]
- **maintenance of groundwater connectivity** – using rules for access licences and supply works.[108]

Findings from limited ecological studies in the Plan area indicate that river condition in the region is good to very good. However, there is currently no Plan-specific evidence to determine environmental outcomes of the Plan.

While river condition appears to be good from limited evidence, the Commission found some of the key environmental provisions established in the Plan have not been fully implemented or monitored, which poses a risk to environmental outcomes.

Opportunities to improve environmental provisions and outcomes are discussed in more detail in later parts of this chapter and include the following recommendations:

- Numeric LTAAELs should be documented and transparently reported to protect planned environmental water (**Section 3.2**).
- An audit of entitlements should be undertaken to assess risks to high value water sources (**Section 3.2**).
- Flow class rules should be revised to consider findings of recent ecological studies (**Section 3.3**).

101 As per the water management principles, *NSW Water Management Act 2000,* Section 5(3a).
102 Clauses 44-47 of the Plan.
103 Clauses 48-54 of the Plan.
104 Clause 17 of the Plan.
105 Clauses 57-66 of the Plan.
106 Clauses 35, 41 and 41(a) of the Plan.
107 Clause 14 of the Plan.
108 Clause 67 of the Plan.

- Flow class study limitations need to be addressed and incorporated into rule revisions, including the protection of Aboriginal values, estuarine flow requirements and fish passage (**Section 3.3**).
- Licence holders must be notified in writing of water sharing rules and associated licence conditions to take effect (**Section 3.3**).
- Protection of groundwater dependent ecosystems should be strengthened – clearly define groundwater assets for protection, align with the *NSW Aquifer Interference Policy 2012*[109] and improve definitions and management for connectivity (**Section 3.5**).
- Climate change impacts should be incorporated – given the Plan's 10-year period, the replacement plan must consider impacts of climate change on water demand and stream flow over the medium- to long-term (**Section 3.6**).
- DPIE-Water should consider risks and measures outside of the Plan – using the principles of integrated catchment management, identify areas for collaboration or additional funding during Plan development and implementation (**Section 3.7**).

3.1 River condition is generally good

Although required by the Plan, DPIE-Water did not provide evidence of monitoring of changes in the ecological condition of water sources, their dependent ecosystems or the water quality specific to the Plan.[110] With limited data it is difficult to assess how the Plan has supported its environmental objectives. Monitoring changes is critical for understanding baseline ecological conditions and as a minimum, existing monitoring commitments should be acted on as a priority to enable this.

However, there are broader sources of information on river condition and ecological health. The river condition for the Manning and Karuah Catchments was classified as good to very good (on a scale of very poor to very good).[111] The Commission notes that 2015 and 2018 reporting for the NSW State of the Environment assessments used the same data, so trends over time are unknown. At the start of the Plan period, there was a very low to low freshwater flow pressure in all Plan water sources.[112]

Table 11 summarises water quality, fish and hydrology indicators in the Plan area.[113] While the overall river condition for key water sources was reported to be good, indicators for specific ecological values such as fish are very poor.

109 Information provided by DPIE at All Stakeholder Advisory Panel meeting, October 2018.
110 Required in Clause 12(e) and 12(d) of the Plan.
111 Using the NSW River Condition Index, which is based on riparian vegetation cover, hydrological stress, biodiversity condition, geomorphic condition (EPA (2015) *New South Wales State of the Environment: River Health.* Available at: https://www.epa.nsw.gov.au/about-us/publications-and-reports/state-of-the-environment/state-of-the-environment-2015; and EPA (2018) *New South Wales State of the Environment: River Health.* Available at https://www.soe.epa.nsw.gov.au/all-themes/water-and-marine/river-health).
112 NSW Government (2010) *State of the Catchments: Riverine ecosystems Hunter – Central Rivers region*, pp. 9. Available at: https://www.environment.nsw.gov.au/resources/soc/huntercentralrivers/10440HUNTCENestuarine.pdf.
113 NSW Government (2010) *State of the Catchments: Riverine ecosystems Hunter – Central Rivers region*, pp. 10-11. Available at: https://www.environment.nsw.gov.au/resources/soc/huntercentralrivers/10440HUNTCENestuarine.pdf.

Table 11: Summary of environmental indicators in the Plan area

Indicator	Findings
General hydrology condition	Rivers in the Plan area that have had hydrological studies (Hunter, Manning and Karuah rivers) have a good general hydrology condition in the coastal and lowland altitude zones; while the higher reaches of these river systems were not classified, they are expected to be in good condition.[114]
Fish Condition Index	The Fish Condition Index for the entire region was classified as very poor: ▪ the lowland zone was in moderate condition, the upland zone was in poor condition, the slopes and highland zones were in very poor condition and the coastal plains zone was in extremely poor condition ▪ across basins, the Manning basin was in moderate and the Karuah basin was in poor condition.
Estuarine condition	The estuarine condition[115] for the Hunter-Central Rivers region ranges from good to poor.[116] Estuaries for Manning River, Wallis Lake, Smiths Lake and Myall River were classified as having good estuarine condition, while Kapphinghat Creek, and Karuah River were classified as having fair condition. More recent data from MidCoast Council's *Waterway and Catchment Report Card 2019* indicated that estuary condition has improved overall. Of eighteen sample locations, six were rated excellent, nine were rated as good and three were rated as moderate.[117,118]
Estuarine pressure	Myall River was classified as having very low overall pressure, and Kappinghat Creek and Karuah River classified as low pressure. Manning River, Wallis Lake, Smiths Lake were classified as having moderate pressure. Freshwater inflow pressures across all estuaries in 2010 ranged from low to very low while tidal flow pressures ranged from very high in Wallis Lake to very low in Kappinghat Creek, Myall River and Karuah River.[119]

Stakeholders also raised concerns during interviews and submissions about river condition including:

- threats to the ecological health of water sources including low flows, over extraction (threatening pool persistence), nutrient run-off, and land management practices

114 NSW Government (2010) *State of the Catchments: Riverine ecosystems Hunter – Central Rivers region*. Available at: https://www.environment.nsw.gov.au/resources/soc/huntercentralrivers/10440HUNTCENestuarine.pdf.

115 The indicators of estuary condition used are: 1) eutrophication: chlorophyll a, macroalgae and turbidity, 2) habitat distribution: change in seagrass, mangrove and saltmarsh (macrophytes) extent, and 3) fish assemblages: species diversity and composition, species abundance, nursery function and trophic integrity (food web). Each indicator has been scored relative to a reference or least impaired condition. Several methods have been used to develop scoring classes on a scale of 'very good', 'good', 'fair', 'poor' and 'very poor' representing the extent of deviation from the reference condition. In the case of macrophytes, the size of change in extent observed has been scored.

116 Noting that several estuaries had limited data and did not receive a condition score (NSW Government (2010) *State of the Catchments: Riverine ecosystems Hunter – Central Rivers region*. Available at: https://www.environment.nsw.gov.au/resources/soc/huntercentralrivers/10440HUNTCENestuarine.pdf).

117 Bombah Broadwater, Myall Lake, Smiths Lake, Charlottle Bay, Wallis Lake and Pipers Creek were rated excellent. Khappinghat, Upper Manning Estuary, Dawson River, Mid Manning Estuary, Lower Manning Estuary, Lower Myall Estuary, Farquhar Inlet, Wallamba Cove and Coolongoolook Estuary were rated as good. Karuah Estuary, The Branch Estuary and Mid Wallamba Estuary were rated moderate).

118 MidCoast Council (2019) *Waterway and Catchment Report Card*. Available at: https://www.midcoast.nsw.gov.au/Part-of-your-everyday/Council-Projects/Waterways-Report-Card-2019-Results.

119 Pressures include cleared land, population, sediment input, nutrient input, freshwater flow, distributed habitat, tidal flow and fishing.

- consideration of end of system flow requirements or water quality for estuarine health within the Plan
- environmental flows not being allocated or used strategically for healthy river flow.

The Commission recognises that there are several factors influencing river condition that are outside of the control of Plan provisions, including climate, land use, invasive species and recreational uses. Integrated catchment management in the Plan area is essential to maintain and improve river condition and requires a coordinated and consistent approach to planning, implementation and MER.

3.2 Numeric LTAAELs should be documented, transparently reported and monitored

The Commission's review found that while the Plan established water availability limits, LTAAELs were not adequately implemented. There is a risk this has compromised planned environmental water. The key issues regarding LTAAELs are:

- Numeric LTAAELs for extraction management units are not included in the Plan or publicly available.
- There is no evidence to show the Plan's LTAAELs have been assessed annually and AWDs used to protect environmental water.
- Without monitoring there is a risk that long term extraction growth has not been managed to protect environmental water.
- Entitlements appear to have increased in some water sources with high instream and economic value.
- The take for harvestable rights is not included in the LTAAEL calculations and poses a risk to environmental water.
- There are significant inconsistencies in the reporting of share components and water requirements which need to be addressed to monitor LTAAELs.

3.2.1 Numeric LTAAELs should be defined and included in the Plan

The Plan only describes the method used for estimating the LTAAELs and does not provide numeric LTAAELs. The Plan establishes an LTAAEL for each extraction management unit as the sum of the share components of all access licences and the annual water requirements for domestic and stock rights and native title rights, as per the coastal macro planning approach.[120]

The Commission understands that LTAAELs were not specified for coastal plans to allow for changes in the LTAAELs over time. Specifically, the Plan has provisions that allow LTAAELs to be varied as a result of changes to access licences under specific circumstances (discussed further in **Section 3.2.3**).[121]

120 NSW Office of Water (2011) *Macro water sharing plans – the approach for unregulated rivers: a report to assist community consultation*. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0008/548153/macro_unreg_manual_web.pdf.

121 Clause 45 (1) of the Plan.

The draft 2014 audit of the Plan recommended establishing a clear numerical statement of the LTAAELs.[122] This has not yet been undertaken. Numeric LTAAELs, which should be updated regularly to reflect current entitlements and reported in the Plan and other accessible locations, are important as they:

- provide transparency to stakeholders and support their understanding of performance in relation to LTAAEL
- inform water source management
- determine compliance with the protection of planned environmental water volumes
- allow DPIE-Water to adjust AWDs if any LTAAEL is exceeded.

LTAAELs are also required to track growth in water use against extraction limits (see **Section 6.2**).

In the absence of specified LTAAELs, the Commission has estimated the LTAAELs at Plan commencement and at 2018-19. **Table 12** summarises potential changes in the LTAAELs between Plan commencement and 2018-19. These changes are:

- a small percentage increase in Manning extraction management unit of 1 percent or 1,186 ML per year
- an increase in the Great Lakes extraction management unit of 15 percent or 529 ML per year
- a decrease in the Karuah River extraction management unit of 8 percent or 364 ML per year.

Table 12: LTAAEL estimate for 2009 and 2018-19 by extraction management unit (excluding basic landholder rights)[123]

Extraction management unit	LTAAEL 2009 (ML per year)	LTAAEL 2018-19 (ML per year)	Change in LTAAEL over time (%)
Manning	84,861[124]	86,047	1
Great Lakes	2,981	3,510	18
Karuah River	4,684	4,320	-8

The Commission identified inconsistencies in the reporting of share components and basic landholder rights in 2009, which makes assessing LTAAELs over time difficult. These issues are discussed further in **Section 7.1**.

122 NSW Office of Water (2014) *Draft Audit of implementation – Lower North Coast unregulated and alluvial water sharing plan audit report card*, NSW Government (unpublished).

123 The LTAAEL at Plan commencement has been determined from information in the Plan (except for Manning, which uses NSW Water Register data for the Major Utility Access Licence share component for 2009-10, see footnote below). LTAAEL at 2018-19 determined from share components for access licences in the NSW Water Register.

124 Using NSW Water Register data for 2009-10 for the Major Utility Access Licence share component in the Manning Extraction Management Unit of 20,000 share components, not 30,000 as identified in Clause 29 of the Plan. Clause 67(7) of the Plan identifies 20,000 ML per year as the average annual diversion allowed under the Major Utility Access Licence.

Further, the Commission notes that the LTAAELs do not include harvestable rights. The cumulative impact of farm dams on streamflow can be significant, with potential flow on impacts to environmental flows and the security of supply for other water users.[125] The exclusion of harvestable rights is inconsistent with some other water sharing plans and the Commission supports its inclusion in LTAAEL calculations.

The Commission recommends that DPIE-Water:

- revisit and amend the LTAAELs for the Plan replacement
- provide numerical LTAAELs in the replacement Plan and make these publicly available to improve transparency and minimise confusion for water users
- investigate the potential take of water under harvestable rights and include in numerical LTAAELs.

3.2.2 LTAAELs should be assessed regularly

The Plan requires an annual assessment of average annual water extraction over three years against the LTAAELs.[126] If an LTAAEL is found to have been exceeded by 5 percent or more, the Plan contains a provision to enable the AWDs to be reduced.[127]

AWDs can be used to reduce extraction volumes and maintain planned environmental water if LTAAEL compliance assessments show water extractions exceed the LTAAEL by 5 percent or more. DPIE-Water advised that AWDs have not been adjusted to address any growth in extractions since the Plan commenced.

There is no evidence that the Plan's LTAAELs have been assessed regularly or compared to annual average water use as required by the Plan. The draft 2014 audit of the Plan noted that LTAAELs had not been implemented, as the information required to quantify the limit is not readily accessible.[128] Consequently, the LTAAEL has not been changed in the Plan area to reflect changes in entitlement and AWDs have been set at 100 percent each year.

This creates a risk that long-term growth in extraction has not been identified or managed with AWDs to protect planned environmental water.

In the replacement Plan, DPIE-Water should:

- consider ways to address the lack of water extraction data to manage long-term growth in extraction with AWDs
- monitor extraction limits regularly to protect planned environmental water
- consider how LTAAELs can be better defined and assessed to support implementation of water sharing plans across all coastal regions.

125 Nathan, R. and Lowe, L. (2012) 'The Hydrologic Impacts of Farm Dams', *Australasian Journal of Water Resources*, 16(1), pp. 75-83.
126 Clause 46 of the Plan.
127 Clause 47 of the Plan.
128 NSW Office of Water (2014) *Draft Audit of implementation – Lower North Coast unregulated and alluvial water sharing plan audit report card*, NSW Government (unpublished).

3.2.3 Risks from increasing entitlements should be assessed

The Plan allows LTAAELs to be varied through the granting, cancellation, modification, purchase and cancellation, or conversion of licences in limited circumstances. The Commission understands that the only permitted methods of increasing entitlements under the Plan are for:

- volumetric conversion of *Water Act 1912* entitlements that were non-volumetric[129]
- granting of specific purpose access licence as defined in the *Water Management (General) Regulation 2010*[130]
- conversion of an unregulated river access licence to:
    - an aquifer access licence, or
    - 2.5 shares of unregulated river (high flow) access licence in the Dingo Creek, Mid Manning River, Lower Manning, Lower Barrington/Gloucester Rivers, Upper Gloucester River or Avon River water sources (the Commission understands there have been no conversions under the Plan)
- granting of an unregulated river (Aboriginal community development) access licence
- granting of an aquifer (Aboriginal community development) access licence
- granting of a local water utility access licence in the Karuah River Water Source
- granting of an access licences as a result of a controlled allocation[131] prescribed by an order made under Section 65 of the Act.

The draft 2014 audit noted that entitlements in the Plan area had changed under these provisions, but the LTAAELs had not been amended to reflect these changes.[132]

The Commission's comparison of total share components for unregulated river shares across various sources indicates that three high instream value water sources (Lower Barrington/Gloucester Rivers, Lower Manning River and Myall River) had an increase in share components from 2009-10 to 2018-19 by 8, 3 and 9 percent respectively. These increases appear to be attributable to growth in unregulated river access licences. The Lower Barrington, Gloucester Rivers and Lower Manning River water sources were also identified as having high economic dependence on water at Plan commencement.

The largest growth in share components (22 percent) occurred in the Manning Estuary Tributaries Water Source (not identified as having high instream value or high economic dependence), with growth attributable to an increase in aquifer access licences.

The Commission's analysis found that the growth in share components appears to have been in licence categories that are not permitted for the granting of new licences. It is unclear why these licences have been granted. These licences may be related to the conversion of *Water Act 1912* entitlements (which is allowed for in the Plan). In the process of developing the replacement Plan DPIE-Water should clarify the purpose for granting these licences.

129 Clause 33 of the Plan.
130 Part 8 of the Plan and Clause 10 of the *Water Management (General) Regulation 2010*.
131 Clause 34A of the Plan.
132 NSW Office of Water (2014) *Draft Audit of implementation – Lower North Coast unregulated and alluvial water sharing plan audit report card* (unpublished).

There are significant inconsistencies between share components reported in the Plan (2009), the Plan's report cards (2009) and the NSW Water Register 2009-10. **Figure 4** shows the inconsistencies in total share components listed in the various sources.[133] These should be addressed to enable annual assessment of LTAAELs and a transparent understanding of planned environmental water. Noting the significant data inconsistencies, the Commission considered changes in entitlement over time for access licences by water source.

DPIE-Water should undertake an audit of water access licences issued since Plan commencement to:

- understand the cause and scale of these increases
- determine if their granting was consistent with the Plan and the Act's requirements
- determine if there has been an actual increase in entitlement, conversion of *Water Act 1912* entitlements, or changes in accounting and paperwork.

This uncertainty further highlights the need for clear, transparent record keeping supporting effective Plan implementation and the assessment and regulation of extraction limits particularly in high instream value water sources.

133 See also **Table 5** in **Section 2.3**.

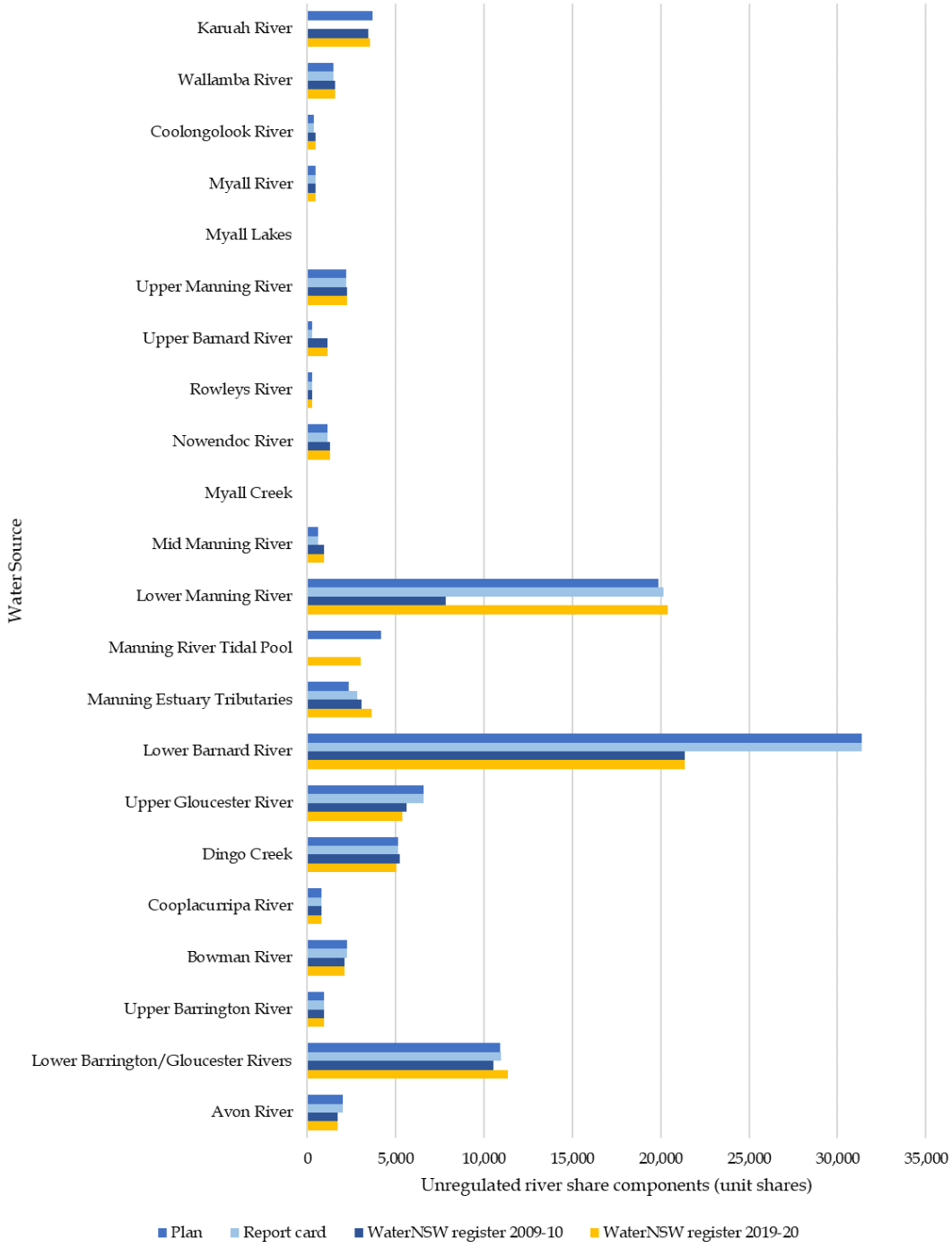

Figure 6: Comparison of total share components for unregulated river shares across various sources[134]

134 Part 7 of the Plan; NSW Department of Water and Energy (2009) *Report card for [various] water sources*. Available at: www.archive.water.nsw.gov.au; and WaterNSW (2019) *Information about a water source: total number of water access licences and water use for a water source*. Available at: https://waterregister.waternsw.com.au/water-register-frame. Note: in the first year of the Plan, the available water was 200 percent of entitlements, except for major water utility access licences, which were set at 100 percent. In all other years, available water was 100 percent.

3.2.4 Increases from licence conversions pose risks if inadequately managed

There are allowances to adjust the LTAAELs to account for licence conversions. The inclusion of high flow conversions[135] for unregulated river entitlements and the conversion of surface water licences to alluvial groundwater[136] were designed to reduce hydrological stress and therefore environmental impact.

High flow conversions encourage extraction out of low flows and into higher flows[137] by issuing 2.5 shares per cancelled share. This intends to reduce competition for water between users and the environment but relies on the use of farm dams or storages to hold the water for later use. There are currently no unregulated river high flow access licences in the Plan area.[138] DPIE-Water should assess potential impacts of high flow conversions on the flow regime and environmental values. For those water sources deemed able to accommodate greater extraction in higher flows and with hydrological stress in low flows, DPIE-Water should encourage the adoption of high flow conversions.

Surface water licence conversion to alluvial groundwater[139] licences similarly encourage a shift in extraction out of the river and into the alluvial groundwater, where in theory there is less environmental impact. However, in times of drought this could result in over-extraction of groundwater if not properly managed and monitored. Considering the lack of groundwater metering and monitoring, the Commission does not support this shift without investment in understanding potential impacts. This concern warrants a review of the effectiveness of conversions and their impact on groundwater systems.

3.3 Environmental water rules need to be revised and water users updated

The Plan has relatively sophisticated rules to maintain planned environmental water compared to other water sharing plans developed in the same period. However, the following issues should be addressed to further strengthen environmental water rules:

- Flow sharing rules should be revised to consider the findings of recent ecological studies.
- TDELs were not implemented due to a lack of monitoring of flow and extraction and this data should be collected to allow the provision to be effective.
- IDELs have not been established but self-regulation by water user associations is considered effective and should be adequately supported.
- The benefits of a flow accreditation scheme should be assessed and, if positive, a scheme should be implemented in priority water sources.
- Licence holders should be advised in writing of amendments to water access conditions as soon as Plan provisions are implemented.
- Exemptions to take planned environmental water should be investigated to determine if they are being used and the extent of the likely impacts on the environment.

135 Clause 71 of the Plan.
136 Clause 71(2)(a) of the Plan.
137 Those flows occurring 50 percent of the time.
138 WaterNSW (2019) *NSW Water Register*. Available at: https://waterregister.waternsw.com.au/water-register-frame.
139 Clause 71(2) of the Plan.

3.3.1 Plan establishes flow classes for water sources with high instream value

Flow class and pumping rules in water sources are a key mechanism to protect planned environmental water. The Plan establishes flow classes (very low flow, A and B Class licences) and cease to pump rules for water sources, with rules varying depending on water source.[140] The Plan rules were developed considering instream values and hydrological stress.[141]

Flow classes and cease to pump rules require licence holders to stop pumping when the river falls below a certain level to protect portions of the flow regime, particularly refuge pools. Commence to pump rules delay licensee's ability to pump to allow the river to recover slightly after periods of low or no flow. The Plan's flow classes are summarised below:

- **Very low flow class –** generally, the 98th percentile flow (that is, the lowest two percent of flows as defined over the relevant flow record can be accessed by these users).
- **A Class –** if established, these are generally based on flows greater than the 97th percentile flow (with exceptions based on 95th percentile flows).
- **B Class** – if established, these are generally based on flows greater than the 50th percentile flow (with exceptions based on 80th percentile flows).

For example, based on the Plan provisions:[142]

- no flow classes were established in the Plan for the Manning Estuary Tributaries, Manning River Tidal Pool and Myall Lakes water sources, and the Tidal Myall River, Wang Wauk River, Tidal Coolongolook River, Khappinghat Creek and Tidal Wallamba River management zones.
- The Karuah Estuarine Management Zone has no commence or cease to pump thresholds, but no extraction is permitted if the volume of water in an off-river pool or an in-river pool is less than the full capacity of the pool.
- In the Upper Myall River, Crawford, Upper Coolongolook River and Upper Wallamba River management zones (all towards the coast), very low flow class licences can extract during no visible flow, while A Class are limited to visible flow but cannot commence to pump until there has been visible flow for 24 hours.
- The Avon River Water Source has a cease to pump threshold of no visible flow and commence to pump when there is visible flow. There is no A Class licence category, but B Class can access flows when they are over the estimated 50th percentile flow[143] at the relevant reference point.

3.3.2 Licence holders need to be advised of amendments to conditions in writing

The flow class rules were designed in two stages:

- **Stage 1** rules should have applied from Plan commencement to 1 August 2016.
- **Stage 2** rules should have applied since 1 August 2016 (or until field verification studies were undertaken).

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140 Clause 17 of the Plan.

141 DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Source – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

142 Clause 17 of the Plan.

143 Clause 17 (a) note in the Plan.

Stage 2 rules are more stringent, and the phasing was designed to allow water users time to adjust to the impacts. For example, prior to Plan commencement, at least nine water sources in the Plan area had no existing licence conditions requiring pumping to cease when flows were low. In others, only a small proportion of licenses were subject to flow rules. In general, access licences relating to groundwater extraction focused on annual limits rather than daily management rules.[144] Upon Plan commencement, cease to pump levels were not specified for some management zones or were set at 'no visible flow' levels until Year 5.

The Commission notes that, while Stage 2 rules were in force under the Plan from August 2016, water users were not notified in writing of the changes to access licences conditions which is required for them to take effect.

Notification in writing is required under Section 67(1) of the Act. While the 'take of water' conditions on the *NSW Water Register* water access licences include the updated provisions, DPIE-Water advised that, while licence holders had not previously been notified of these changes, this is now a priority. The Commission understands DPIE-Water commenced a process in December 2019 to address this issue.[145] In the absence of notification, all access licence holders in the Plan area are still able to operate under water rules as specified at the Plan's commencement.

Stakeholders advised that water use associations have been supporting licensees to comply with water sharing rules, but there is confusion as they have not been notified about the changes. The Commission supports stakeholder concern about this failure to effectively implement cease to pump rules or communicate changes.

In the future, access licence holders should be notified of any changes as a result of any further water condition amendments as a priority, as discussed in **Chapter 5**. This will support compliance with licence condition requirements and planned environmental water provisions.

3.3.3 Very low flows and refuge pools should be maintained

In drier periods – when flows are naturally low – river health declines as pools contract, water quality deteriorates, and fauna compete for reducing food supplies.[146] Refuge pools have been shown to be important in the Lower North Coast. For example, the endangered Manning River helmeted turtle (*Myuchelys purvisi*), eastern long-necked turtle (*Chelodina longicollis*) and platypus *(Ornithorhynchus anatinus)* have been identified in refuge pools in the Plan area, with populations concentrated in deeper refuge holes with better water quality.[147] Water quality in

144 DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Source – Background document for amended plan 2016*. Page 33 Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

145 Personal communication, DPIE-Water, 28 February 2020.

146 DPIE-Water (2018) *Greater Hunter Regional Water Strategy*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0008/196055/greater-hunter-regional-water-strategy.pdf.

147 Spark, P. (2019) *Survey for the Manning River Helmeted Turtle Conservation Program*. Prepared for OEH. Available at: https://datasets.seed.nsw.gov.au/dataset/66503b40-d1e9-4013-88d7-1f8cf8bbab99/resource/39159712-7d4f-4254-ac39-f4ff92e08b27/download/manning-river-turtle-survey-report-western-catchments-may-2019.pdf.

pools decreases in cease to flow periods, with a survey of the Barnard River showing high turbidity, algae, odour and higher temperatures in shallow pools.[148]

DPIE-Water assessed the very low flow classes for 27 Plan management zones. The findings of these studies were intended to be implemented in 2016. An ecological study showed that to meet the Plan objectives, the default cease to pump threshold should be set at the 95th percentile of flow to provide a small refuge of all hydraulic conditions. The 95th percentile will prevent licenced extraction from pools and help maintain a small refuge area of well-oxygenated higher velocity flow to support other populations including macroinvertebrates.[149]

The 98th percentile cease to pump thresholds were adopted in the Plan from 1 August 2016 but water users have not been officially notified. As such, the rules do not have to be implemented by licensees and cannot be enforced (see **Section 3.3.2**). In 2016, an interagency regional panel convened by DPIE-Water to assess cease to pump thresholds recommended the 95th and 96th percentile thresholds should be implemented in the headwater catchments of Gloucester, Barrington and Manning Rivers to protect the higher ecological values in these water sources. However, DPIE-Water advised that the cease to pump thresholds were designed to balance socioeconomic requirements and environmental outcomes (see **Section 3.3.4**). This is not in line with the requirements of the Act.

The protection of a variety of habitat and maintenance of pools are key flow requirements. For example, among other threats, the Manning River helmeted turtle is threatened by changes to natural stream flows and is limited by the habitat area of deep refuge pools in dry seasons.[150] Its population appears to have dramatically declined in recent times.[151]

DPIE-Water staff indicated that the percentile flows that flow classes are based on may need to be recalculated given prevailing dry conditions in the Plan area recently.[152] DPIE-Water staff also advised they are developing a risk assessment for coastal water sharing plans to mitigate or respond to the factors that pose the highest overall risks.[153] The Plan rules should be based on best available evidence using the longest time series available and considering the potential changes under a shifting climate.

However, flow rules must be based on ecological requirements, not shifting percentiles. That is, if an environmental requirement is for a very low flow of 'X' ML per day at a specific location, that flow should be protected from extraction. If over time, this volume shifts from being a 98th percentile flow to a 95th percentile flow, the cease to pump thresholds should reflect the required flows rather than the percentiles. If thresholds are gradually shifted based on changing percentile flows, environmental, social and economic outcomes will be affected, and this must be recognised and assessed.

148 Spark, P. (2019) *Survey for the Manning River Helmeted Turtle Conservation Program*. Prepared for OEH. Available at: https://datasets.seed.nsw.gov.au/dataset/66503b40-d1e9-4013-88d7-1f8cf8bbab99/resource/39159712-7d4f-4254-ac39-f4ff92e08b27/download/manning-river-turtle-survey-report-western-catchments-may-2019.pdf.

149 DPI-Water (2016) *Lower North Coast Water Sharing Plan amendment review: Ecological review of very low flow classes for high priority water management zones* (unpublished).

150 DPIE-EES (2019) *Manning River Helmeted Turtle, Purvis' Turtle – profile*. Available at: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=20326.

151 *Ibid*.

152 Interview: DPIE-Water, 30 October 2019.

153 Personal communications, DPIE-Water, 28 February 2020.

DPIE-Water should not reduce percentile flow volumes based on prevailing dry climatic conditions, and instead should set the flow class provisions based on environmental water requirements.

In addition, some licences can access flows below the very low flow class, including domestic and stock licences, local water utility access, basic landholder rights, or for limited agricultural washing and hygiene needs.[154] This will impact on essential flow requirements and potential adverse impacts should be monitored. The Commission also supports the development and implementation of *Reasonable Use Guidelines* as described in **Section 4.1** to ensure take is consistent with allowances and can be reasonably estimated.

The Plan required field studies to support amendments to tidal pool provisions (flow classes and access dealing rules) and the installation of a salinity probe, which the Commission understands has not occurred. Tidal pools tend to have very high ecological values because of the rarity of freshwater species occurring in an estuarine setting and establishing appropriate cease to pump rules for tidal pools is essential in the replacement Plan.

3.3.4 Water sharing rules should reflect the Act's priorities

The Act makes it clear that water sharing is not about balancing uses and values, it is about firstly providing for the environment, and secondly recognising basic landholder rights above other uses.[155] DPIE-Water must ensure the required prioritisation is achieved under the replacement Plan.

The Commission highlights the evidence provided by DPIE-Water and agreed by their interagency regional panel that the 95th percentile cease to pump thresholds are required to protect ecological values.[156] The Commission further notes that:

- DPIE-Water's socio-economic assessment did not incorporate the full range of social or economic costs, such as the benefit of estuarine flushing to one of NSW's top estuarine fishing industries, or the risk of reduced flows on amenity and recreation on tourism in Myall Lakes – one of NSW's most visited national parks
- Hydraulic modelling demonstrates that fish passage requirements are not met at the 95th percentile flows, with fish passage conditions deteriorating from the 86th percentile.[157] As such, fish passage was not considered in the cease to pump limits.[158] Adequate flows to support fish passage should be included when assessing extraction risks, and time, duration and seasonality of impacts. Given that the region's fish condition index is very poor (see **Section 3.1**) [159] and that DPI-Fisheries has highlighted the importance of considering fish passage in setting water access rules,[160] the Commission recommends that fish passage is considered when defining water sharing rules in the replacement Plan.

154 Clause 19(3)(f) and Schedule 2 of the Plan.
155 Section 5 (3) of the *Water Management Act 2000*.
156 DPI-Water (2016) *Lower North Coast Water Sharing Plan amendment review: Ecological review of very low flow classes for high priority water management zones* (unpublished).
157 *Ibid*.
158 *Ibid*.
159 NSW Government (2010) *State of the Catchments: Riverine ecosystems Hunter – Central Rivers region*, pp. 10-11. Available at: https://www.environment.nsw.gov.au/resources/soc/huntercentralrivers/10440HUNTCENestuarine.pdf.
160 Interview: DPIE-Fisheries, 24 October 2019.

- DPIE-Water did not consider the protection of Aboriginal, cultural and heritage values or sites.[161] As outlined in **Section 4.2**, the Commission recommends that Aboriginal water values and interests are better supported, and these factors should be considered when revising the water sharing rules.
- Estuarine flow requirements should be provided for when developing water sharing rules, noting that the Plan recognises the need to account for estuarine needs.[162]
- Saline dynamics modelling in the Manning River estuary indicated the current cease to pump threshold of 98 ML per day is likely to have high associated ecological risks for the estuary (recommending that the cease to pump threshold at the Bootawa extraction point should be increased to 225 ML per day).[163] Ecological data including estuarine requirements should be used to define water sharing rules.

The Commission recommends that DPIE-Water reassess the rules, specifically cease to pump thresholds, in accordance with the prioritisation required by the Act and incorporating all water dependent ecosystems, including estuarine and downstream dependent ecosystem requirements.

The Commission understands that DPIE-Water is using High Ecological Value Aquatic Ecosystem mapping, which will be complete for NSW coastal regions by mid-2020.[164]

The Commission recognises that more stringent cease to pump rules will have socioeconomic implications for the region; however, any assessment of these implications must assess the full range of potential impacts and risks (see **Chapter 5**).

3.3.5 Plan establishes TDELs and IDELs but these are limited without metering and monitoring

The Plan includes daily flow sharing provisions for:

- **TDELs**, which set daily limits on how much water can be taken from each flow class across all users. This includes specific provisions for unregulated river (high flow) access licences in B Class flows for six water sources.[165]
- **IDELs**, which are daily volume limits that apply for licence holders, in particular, flow classes.[166]

The 2014 Plan audit states TDELs and IDELs were not introduced on any water source because broad scale metering has not been implemented.[167] DPIE-Water confirmed that TDELs remain

161 DPI-Water (2016) *Lower North Coast Water Sharing Plan amendment review: Ecological review of very low flow classes for high priority water management zones* (unpublished).
162 Clause 86(iv) of the Plan, providing for amendment of very low flow provisions.
163 Bishop KA (2013) *Ecological interpretation of saline dynamics modelling of the Manning River estuary*. Report prepared for MidCoast Council (unpublished).
164 DPIE-Water recently undertook studies using High Ecological Value Aquatic Ecosystem analysis across some water sharing plans in the basin to identify high priority groundwater dependent ecosystems. The High Ecological Value Aquatic Ecosystem methods provide a derived ecological value dataset for identified groundwater dependent vegetation that is used to inform the planning and policy decisions in NSW. These decisions are required to manage and mitigate current and future risks caused by groundwater extraction (Personal communication, DPIE-Water, 29 November 2019).
165 Clauses 58-60 of the Plan.
166 Clause 61 of the Plan.
167 NSW Office of Water (2014) *Draft Audit of implementation – Lower North Coast unregulated and alluvial water sharing plan audit report card* (unpublished).

difficult to implement without metering to monitor extraction data.[168] The Commission recognises that establishing TDELs for water sources without metering makes compliance difficult.

IDEL provisions are included in water sharing plans to reflect water sharing arrangements that existed prior to their development. In the past, water user associations have set limits on extraction when flows are low to ensure that water is shared equitably between users. Irrigation stakeholders advised that there are still active sharing arrangements operating in many water sources and the conditions that they implement are often more stringent than the Plan's water use rules. These can include rostering, cease to pump levels above those expressed in the Plan, and consideration of the needs of other water users and the environment.

> '*Currently the farmers work under a voluntary scheme that the farmers have been working on forever. Irrigators work together on cease to pump conditions and keep an eye on water in the Manning River. Most farmers abide by the voluntary restrictions to look after downstream users.*'[169]

While most stakeholders consulted in the review recognised that self-regulation has been largely effective in the Plan area, they also note that this is not always the case and suspicion between water users can occur due to the lack of clarity and enforcement (see **Section 4.4.1**).

DPIE-Water advised that the implementation of IDELs will continue to rely on self-regulation to implement. The Commission recommends investigating ways to better support the implementation of IDELs, particularly through improved monitoring and compliance activities (see **Chapter 6**), and improved community engagement (see **Section 4.4.1**).

3.3.6 The benefits of a flow accreditation scheme should be assessed

The Plan contains a provision to allow amendments for an accreditation scheme.[170] A water use accreditation scheme permits variable cease to pump levels for accredited and non-accredited farmers. Participation is voluntary and accreditation conditions can include on-farm works (such as fencing), equipment updates and practice change. The benefits to the accredited farmer include access to flows in the very low flow class, enabling them to access water after non-accredited users must cease pumping. Catchment benefits can include improved water quality, albeit with potentially reduced stream flows.

The accreditation scheme was not established in the Plan area. The Williams River Accreditation Scheme pilot was trialled under the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*, but DPIE-Water advised the scheme was not continued after the trial finished.

Water users expressed an interest in participating in a water use accreditation scheme that would allow them to access the very low flow class in their water source, improve on-farm works and support their social licence to operate.

As noted above, if the cease to pump conditions are implemented (**Section 3.3.1**), this may drive increased interest in an accreditation scheme in order to access the very low flow class.

168 Interview with DPIE-Water, 30 October 2019.
169 Interview: Lower Manning Water User Association, 16 October 2019.
170 Clause 65 of the Plan.

3.4 Impacts from the Barnard Scheme should be re-assessed

The Barnard Scheme can transfer a significant entitlement out of the Plan area.[171] The Plan allows an average annual diversion of no more than 20,000 ML per year to be transferred from the Lower Barnard River Water Source to the Hunter River system for use in Bayswater and Liddell power stations during drought.[172] There is a maximum take of 100,000 ML over five years during B Class flows (above the 80th percentile),[173] with allowance for the Minister to increase extraction to protect the NSW's electricity supply.[174]

At 22.5 percent the Barnard Scheme is a major share component for the Plan area, allowing significant volumes to move out of the Manning River catchment. This could impact on the environmental and social outcomes of the Plan. There are limited data available to assess extraction using the Barnard Scheme but the Commission understands it was not in use 'for a number of years' before 2014.[175] The Commission understands that the NSW Government retained the operation of the Barnard Scheme when the power stations were sold to AGL, and that it is currently decommissioned or unable to be used due to poor condition.[176] Before any decision is taken to recommission the Scheme, the medium- to long-term need for it must be carefully considered.

The Barnard Scheme provides benefit (if used) for power generation as well as potential indirect benefits to other users in the Hunter River catchment. If the power stations use less of their allocation from the Hunter River (Glenbawn Dam) by accessing water via the Barnard Scheme, the reliability of the other category of licences such as general security in the Hunter River are improved.[177] This shifts economic as well as environmental use from the Lower North Coast to the Hunter River.

MidCoast Council support the continuation of the Barnard Scheme but the Commission notes that:

- the Lower Barnard River Water Source has high instream value (see **Section 2.6.2**)
- the Lower Barnard River Water Source is a receiving water source for the Mid and Lower Manning and the Manning tidal pools[178]
- the Lower Manning has high economic dependence.

The use of the Barnard Scheme in periods of drought and resulting low flow are the periods when the scheme is likely to have a detrimental impact on flows in the Lower Barnard River and downstream. The environmental impact statement for the scheme was completed in 1981 and the Commission is unaware of more recent impact studies. If the NSW Government

171 Clause 29 of the Plan.

172 With an estimate in the Plan of 30,000 ML per year. Liddell power station is planned to close in 2022-23. Both power stations are currently operated by AGL (being part of the NSW Government power producer Macquarie Generation at Plan commencement).

173 Clause 56 (7) of the Plan.

174 Clause 84 (2) of the Plan.

175 Kelly, M. (2019) 'Water Pressure: Water regulation not keeping up the demands of industrial users'. *Newcastle Herald*, 26 July. Available at: https://www.newcastleherald.com.au/story/6291662/hunter-water-under-the-pump-from-industry/.

176 *Ibid*.

177 NSW Department of Industry (2018) *Greater Hunter regional water strategy.* Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0008/196055/greater-hunter-regional-water-strategy.pdf.

178 NSW Government (2019) *Report card for Lower Barnard River water source.* Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0010/549253/wsp_lnc_report_card_lower_barnard_river.pdf.

considers recommissioning and using the scheme in future, the Commission suggests a comprehensive study is undertaken on downstream impacts on the environment and reliability of supply for users in the Lower North Coast.

3.5 Groundwater dependent ecosystem protections can be strengthened

Water sharing plans are required to reserve water for the overall health of groundwater dependent ecosystems. The Plan includes objectives and provisions to protect groundwater dependent ecosystems. However, there are opportunities to strengthen the protection of groundwater dependent ecosystems in the replacement plan by:

- updating mapping and identification of all groundwater dependant ecosystems
- expanding consideration of groundwater dependent ecosystems beyond high-priority ecosystems
- strengthen recognition of surface and groundwater connectivity
- aligning Plan provisions with the relevant NSW groundwater policies.

3.5.1 Updating mapping and identification of all groundwater dependant ecosystems

The Plan currently only applies to high priority groundwater dependent ecosystems, whereas low and medium priority ecosystems are considered in other legislation such as the *Environmental Planning and Assessment Act 1979*. The Plan identifies eight high-priority groundwater dependent ecosystems:

- six in the Upper Barrington River Water Source
- one in the Manning Estuary Tributaries Water Source and
- one in the Karuah River Water Source (see **Section 2.6.5, Table 10**).[179]

The Plan also has protections for the Myall Lakes Water Source, with no licenced extraction permitted.[180]

Alongside the current protection afforded to high priority groundwater dependent ecosystems, the Plan should be updated to provide clarity around terminology and the extent of protection of low and medium priority groundwater dependent ecosystems. This is important given the classification of high priority ecosystems or high ecological value is inconsistent across jurisdictions and policies.

3.5.2 Connectivity definition and management should be strengthened

Stakeholders raised concerns about groundwater connectivity, including:

- increasing groundwater demand and extraction due to increasing insecurity in surface water supply
- concerns about alluvial sources dropping considerably in times of drought due to extraction and unsustainable recharge rates

179 Refer to Schedule 4 and Maps in Appendix 4 of the Plan.
180 Clause 19(3)(i) of the Plan prohibits extraction of water in this water source under a water access licence.

- threats to groundwater sources with high connectivity to surface waters, with impacts on low pool persistence and river recharge, particularly in periods of no or low surface flow
- impacts on groundwater dependent ecosystems and groundwater fed refuge pools
- risks around converting surface water licences to aquifer licences for water sources.[181]

Stakeholders also raised concerns regarding saltwater intrusion in the coastal sand aquifers and estuarine areas due to groundwater extraction, raising the need for salinity management and critical salinity thresholds in the Plan area.

The level of connectivity, the relative level of impact and the timing of connection were considered in developing both the unregulated Plan and the associated groundwater sharing plans for the Lower North Coast.[182] In the Plan, water sources were defined as highly connected if 70 percent or more of groundwater pumped in an irrigation season is derived from stream flow.[183] The most significant surface water-groundwater interaction is between rivers and the shallow upriver alluvial aquifers and are classified as 'highly connected' to their parent streams.[184] The fractured and porous rock aquifers have low to moderate connectivity and coastal floodplain alluvial aquifers (downstream of the tidal limit), have a small amount of interchange between the surface and groundwater.[185]

Alluvial groundwater is a major source of baseflow and freshwater inflow into the Manning River. The river is a primary water source for irrigation and utility use, and recreational and commercial fishing rely on appropriate water quality in the Manning estuaries. MidCoast Council raised the need to protect groundwater sources in the Manning catchment, as "*an increase in demand of water from aquifers is likely as a result of increasing insecurity in surface water supply*".[186]

The coastal floodplain alluvium has a low to moderate connection with surface water, although this occurs in the tidal section only and is excluded from the Plan. The fractured and porous rock groundwater sources have a low to moderate level of connectivity and are also excluded from the Plan.[187]

Connectivity in the existing Plan refers to input of base flow from groundwater to surface water systems but does not consider the consequences of leakage from surface waters to shallow

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181 Mid Coast Council highlighted the importance of not permitting conversions to aquifer licences and no increase in allocation in the Manning catchment: "*to protect high priority groundwater dependent ecosystems do not permit conversions to aquifer licences and do not increase allocations in these systems*".

182 DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Source – Background document for amended plan 2016.* Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

183 *Ibid.*

184 *Ibid*.

185 *Ibid*.

186 Submission: MidCoast Council, received 16 September 2019.

187 DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Source – Background document for amended plan 2016.* Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

groundwater.[188] The *National framework for integrated management of connected groundwater systems*[189] defines connected water systems as:

- abstraction from the groundwater system that can affect the quantity (and quality) and reliability/accessibility of abstraction from the surface water system, or
- abstraction from the surface water system that can affect the quantity (and quality) and reliability/accessibility of abstraction from the groundwater system, or
- abstraction of water from either can affect water supply to ecosystems that rely on both surface and groundwater, for example low flows in rivers and certain wetlands.

It appears that connectivity in the Plan should relate to both the potential input of baseflow to the river and Type 2 groundwater dependent ecosystems, as well as stream-flow augmentation from groundwater.

Water quality also needs to be better addressed in groundwater assessments and management. Water quality studies of this system indicate pollution from livestock and residential activities,[190] though in general most surface water supplies meet *Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000)*.[191]

The recognition of surface and groundwater connectivity should be retained in the replacement Plan. However, this can be strengthened to:

- manage the river and alluvial systems as a connected single water source
- explicitly acknowledge the spatial and temporal variability, as well as the three-dimensional nature of connectivity (including surface to groundwater connectivity)
- use the *National framework for integrated management of connected groundwater systems*[192] as a guide in the replacement Plan for defining connected systems, risk and potential impact of changes to natural connectivity.

Further, the Commission recommends DPIE-Water monitors groundwater sources and assesses the lateral interconnectivity of groundwater supplies. This should include review of the presence or absence of confining beds in the sequence of aquifers.

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188 DPI-Water (2016) Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Source – Background document for amended plan 2016. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

189 SKM (2011) *National framework for integrated management of connected groundwater and surface water systems*, Waterlines report series No. 57, National Water Commission, Canberra.

190 Moore, S. and Suthers, I.M. (2005) 'Can the nitrogen and carbon stable isotopes of the pygmy mussel, Xenostrobus securis, indicate catchment disturbance for estuaries in Northern New South Wales, Australia?' *Estuaries*, 28(5), pp. 714-725.

191 Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) (2000) *Australian and New Zealand guidelines for fresh and marine water quality*. Available at: https://www.waterquality.gov.au/anz-guidelines/resources/previous-guidelines/anzecc-armcanz-2000.

192 SKM (2011) *National framework for integrated management of connected groundwater and surface water systems*, Waterlines report series No. 57, National Water Commission, Canberra.

3.5.3 Plan provisions should align with relevant NSW groundwater policies

The *NSW Aquifer Interference Policy 2012*[193] holistically protects groundwater dependent ecosystems, considering both potential water level and water quality impacts.[194] It outlines a comprehensive approach to groundwater dependent ecosystem protection and includes a method to assess setback distances and a reporting framework. The policy requires impact assessments for all proposed extraction works if an entire aquifer is a high priority groundwater dependent ecosystem, including the extent of impact on the water source as a whole.

It is noted that DPIE-Water has undertaken considerable work to standardise setback distances in inland areas as part of the implementation of the *Basin Plan 2012*. DPIE-Water's intention is to use the distances set for inland for coastal systems, although local modifications may still occur based on consultation feedback.[195]

The Plan includes a range of setback distances for work near groundwater dependent ecosystems. Setback distances aim to minimise the potential impacts of groundwater extraction on environmental features, including groundwater dependent ecosystems.

The Commission recommends DPIE-Water align the replacement Plan with the *NSW Aquifer Interference Policy 2012* for consistency in setback distances. Caveats should be retained that give the Minister discretion to vary these distances, provided adequate studies are undertaken

3.6 Climate change impacts should be addressed

Given the Plan's 10-year period, the replacement Plan should incorporate likely impacts of climate change over the medium-to long-term on water demand and stream flow.

As outlined in **Section 2.4**, climate change is predicted to lead to increases in temperature and evapotranspiration. This will have an impact on plant stress, water demand and water availability.

Recent work regarding climate variability indicates that there are risks associated with relying on the relatively brief observed climate record (about 100 years) for water planning, which may not represent the full range of past or longer-term variability.[196] The Commission understands that DPIE-Water is developing methods to better understand and address climatic risk to water management outcomes across NSW.[197] This includes developing methods to incorporate climate change information based on DPIE-EES NARCliM climate modelling project, which includes a more comprehensive representation of natural variability and integrates climate change

193 DPI-Water (2012) *NSW Aquifer Interference Policy.* Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0004/549175/nsw_aquifer_interference_policy.pdf.

194 NSW DPI – Office of Water (2012) *NSW Aquifer Interference Policy: NSW policy for the licensing and assessment of aquifer interference activities*. Available at: https://www.water.nsw.gov.au/__data/assets/pdf_file/0004/549175/nsw_aquifer_interference_policy.pdf.

195 Information provided by DPIE-Water, 27 March 2019.

196 Zhang, L., Kuczera, G., Kiem, A.S., and Willgoose, G. (2018) *Using paleoclimate reconstructions to analyse hydrological epochs associated with Pacific decadal variability*, Hydrology and Earth System Sciences, 22:6399-6414. Available at: https://www.hydrol-earth-syst-sci.net/22/6399/2018/.

197 Personal communication, DPIE-Water, 28 August 2019.

projections, especially of increased evaporative demand.[198,199] The project also extends climate information to 10,000 years of data using statistical techniques.

It is important to note that the readily available NARCliM maps referred to in this report present the multi-model mean, which may understate the change and misrepresent the direction of change. It is possible to further interrogate the NARCliM datasets, including to further understand extreme scenarios but this has not been explored for this review.

The Plan relies on existing water allocation mechanisms, such as trading and AWDs to adapt to climate change. The replacement Plan should better consider climate change given projected temperature increases and decreases in water availability. These revisions should:

- ensure the Plan can function under a range of modelled climate scenarios
- consider how water will be shared to firstly protect the water source and its dependent ecosystems, secondly protect basic landholder rights and thirdly shared equitably among all other users, if scarcity and demand on the resource increases.

3.7 Risks outside the Plan regulation should be considered

Using the principles of integrated catchment management, DPIE-Water should consider risks and measures outside of Plan regulation during the replacement Plan development and implementation and identify areas for collaboration or additional funding. This will increase overall resilience at the landscape scale, which is particularly important as climate change places additional pressures on environmental, social and economic outcomes.

Specific issues that should be considered for action in the Plan area include:

- improve aquatic habitat via refuge restoration, riparian restoration, removal of barriers to fish passage and reinstatement of instream woody habitats[200]
- over-clearing and poor management practices along riparian zones and gullies, with an associated need for buffer zones, riparian fencing and native revegetation.
- addressing pressures, with wetlands in the region in very poor condition with the greatest pressure from habitat disturbance caused by feral animals, fringing zones and roads crossing or adjoining the wetland, and recreational facilities.[201]

3.8 Recommendations

The Commission presents the following recommendations (**Table 13**) and suggested actions (**Table 14**) to strengthen environmental outcomes and ensure that flow management rules adequately protect key environmental values.

198 The NARCliM (NSW/ACT Regional Climate Modelling) project is developing regional climate projections for south-east Australia to span the range of likely future changes in climate. It is a collaboration between NSW and ACT governments and the University of NSW Climate Change Research Centre. It will be independently expert reviewed (NSW Government (n.d.) *About NARCliM*. Available at: http://www.climatechange.environment.nsw.gov.au/Climate-projections-for-NSW/About-NARCliM).

199 Personal communication, DPIE-Water, 28 August 2019.

200 DPI-Fisheries (2019) *Improving fish habitats*. Available at: https://www.dpi.nsw.gov.au/fishing/habitat/rehabilitating/habitats.

201 NSW Government (2010) *State of the Catchments: Riverine ecosystems Hunter – Central Rivers region*, pp. 10-11. Available at: https://www.environment.nsw.gov.au/resources/soc/huntercentralrivers/10440HUNTCENestuarine.pdf.

Table 13: Recommendations for improving environmental outcomes

Recommendations:	
2	To adequately establish and maintain planned environmental water, DPIE-Water should: a) when developing the replacement Plan, revisit and amend the LTAAEL at Plan commencement, including providing a numeric LTAAEL in the Plan and make these publicly available to improve transparency and minimise confusion for water users b) investigate the potential take of water under harvestable rights at current and full uptake and include harvestable rights in the amended LTAAELs c) consider ways to address the lack of water extraction data to manage long-term extraction growth with AWDs and monitor extraction limits regularly to protect planned environmental water – in addition, provide adequate information and support water users to assist their understanding of performance in relation to LTAAEL of performance extraction limits d) undertake an audit of water access licences issued since Plan commencement to determine if their granting was consistent with the Plan and the Act, and to understand and manage the scale of increases e) in the replacement Plan, amend the share components listed in the Plan as at Plan commencement following the audit f) reassess potential impacts of high flow conversions on the flow regime and environmental values and encourage the adoption of high flow conversions where appropriate a. given the lack of metering and monitoring, review the effectiveness of conversions and their impact on groundwater systems before granting licence conversions.
3*	Implement a transparent and timely process to notify all licensees of any changes to water access conditions within three months of any Plan amendment across all plans to ensure all appropriate provisions are in force.
4	To strengthen environmental water sharing rules in the replacement Plan, DPIE-Water should: a) define water sharing rules – including flow class provisions – based on environmental water requirements and prioritise the protection of water sources and their dependent ecosystems based on continuing risk assessments of coastal water sharing plans b) build on existing hydrological flow studies and assess estuarine flow requirements, including adequate flows to support fish passage and other key species and protect Aboriginal, cultural and heritage values and sites c) investigate ways to better support implementation of IDELs – this should include improved monitoring and compliance activities, and clearer communication and engagement with water user associations d) assess the wider benefits of a water use accreditation scheme and, if positive, implement a scheme in priority water sources (including those with high instream values, high economic dependence and high hydrologic stress).
5	During the development of the replacement Plan over the next two years, collect (as required) and report (reviewed in year four at a minimum) to: a) describe the natural flow regime

	b) map and ground-truth the presence and extent of water and groundwater dependent environmental assets, including estuarine and coastal ecosystems c) identify key assets and classify high priority ecosystems and high ecological value aquatic ecosystems using the High Ecological Value Aquatic Ecosystem framework, including those assets identified in (b) d) define flow and groundwater requirements for key assets e) determine the impact of the Plan on the flow regime in (a) and flow requirements of key assets in (d).
6*	To improve consideration of groundwater in the replacement Plan, DPIE-Water should: a) identify low- and medium-priority groundwater dependent ecosystems in the Plan and refer to them explicitly as relevant in any groundwater dependent ecosystem protection provisions b) clearly define groundwater terms and their relevance to the Plan, including connectivity, ecological value, potential and type – connectivity should include both discharge of groundwater to surface water and surface water recharge to groundwater systems c) standardise set back distances for work near identified groundwater dependent ecosystems based on the *NSW Aquifer Interference Policy 2012* d) identify groundwater sources with high environmental, social or economic value, monitor their groundwater levels and quality, and undertake on-ground studies to determine the presence and absence of confining beds throughout the system.
7*	To improve consideration of climate change in the replacement Plan, DPIE-Water should: a) transparently model the impacts of various climate regimes to ensure the Plan functions appropriately under a range of scenarios b) review and revise Plan provisions based on climate modelling and allow for Plan amendments to address longer-term water availability based on evidence of changing climatic conditions.

Table 14: Suggested actions for improving environmental outcomes

Suggested actions	
A*	Outline a transparent process that can be initiated to review water sharing arrangements if climate change results in significant changes in the water available in the system.
B	If the NSW Government considers re-commissioning and using the Barnard Scheme in future, undertake and publish a comprehensive study on downstream impacts on the environment and reliability of supply for users in the Lower North Coast.
C	Fund and implement integrated catchment actions to improve riverine and estuarine health objectives drawing on relevant agencies across the DPIE cluster.

4 Opportunities to improve social and cultural outcomes

The Commission's review of the social and cultural outcomes of the Plan found that:

- provisions adequately provide for and prioritise basic landholder rights, but the clarity and consistency of these rights could be improved with some minor amendments
- the Plan can better support Aboriginal outcomes by identifying and linking Aboriginal values, objectives and indicators; improving Aboriginal access to and use of water; and supporting Aboriginal engagement, capacity and leadership in water
- there are risks to the security of town water supply that could be addressed with minor amendments
- active, simple and consistent language and communication of the Plan would decrease misunderstanding and social tensions
- equity considerations and related performance indicators are required in the replacement Plan to ensure a key objective is met
- well-evidenced and resourced processes of stakeholder engagement are required to support Plan implementation and ensure diverse local stakeholder interests are included.

4.1 The Plan provides for basic landholder rights

There are three types of basic landholder rights in NSW under the Act:[202]

- **domestic and stock rights –** owners or occupiers of land which is overlaying an aquifer or has river, estuary or lake frontage can take water without a licence for domestic (household) purposes or to water stock
- **harvestable rights – dams –** harvestable rights allow landholders in most rural areas to collect a proportion of the runoff on their property and store it in one or more farm dams up to a certain size
- **native title rights –** individuals who hold native title, as determined under the *Commonwealth Native Title Act 1993,* can take and use water for a range of personal, domestic and non-commercial purposes.

Basic landholder rights are given priority and do not require a water access licence. These extractions are not subject to water licence rules and may be accessed subject to water availability.

The Plan is consistent with the Act by providing priority of access for basic landholder rights in the area. The Plan includes a relevant objective to 'protect basic landholder rights',[203] with the associated performance indicator 'the change in the extent to which domestic and stock rights and native title rights requirements have been met'.[204]

The Commission did not receive any data that reports against this objective or performance indicator. There is also no data available relating to harvestable rights. With no requirement for a licence or metering equipment for basic landholder rights, it is difficult to quantify what

202 *Water Management Act 2000*, Sections 52-55.
203 Part 1, Clause 10(d) of the Plan.
204 Part 1, Clause 12(f) of the Plan.

impact these extractions are having on water sources or may have with changes in population and land use (see **Section 6.2**).

Submissions and consultation undertaken as part of this review did not identify any specific concerns related to basic landholder rights being met. However, there was feedback that DPIE-Water could provide further clarification of basic landholder rights in the Plan itself and in its engagement and communication activities to reduce confusion and misunderstanding among water users (see **Section 4.4**).[205]

4.1.1 Domestic and stock rights are being met but require guidelines

The Plan estimates the water requirements of persons entitled to domestic and stock rights total 5,044 ML per year[206] (representing 5 percent of total entitlements; see **Table 5**), distributed across each water source.[207]

Consultation for the review did not identify any issues with the domestic and stock rights set out in the Plan. However, under the current drought conditions (**Section 2.4**), several stakeholders[208] noted that domestic and stock rights had to be augmented with town water to meet their needs, meaning that the *'water bills to feed stock are very high'*.[209]

The Plan recognises that domestic and stock rights may increase during the life of the plan.[210] It also notes that domestic and stock rights must be exercised in accordance with any mandatory guidelines established under Section 336B of the Act with respect to the taking and use of water for domestic consumption or stock watering.

The Commission understands that the NSW Water Renewal Taskforce and DPIE-Water plan to introduce *Reasonable Use Guidelines* for stock and domestic consumption as part of the NSW Government's *Water Reform Action Plan*. It was expected that this guideline would proceed through a stakeholder consultation process in 2019.[211] This was also a recommendation of the Office of Water's 2014 audit of the Plan's implementation.[212] However, the Commission was informed that the NSW Government may no longer be committed to this action.

It is important that this process is resumed so that guidelines are developed and implemented across NSW to provide clarification and consistency regarding these rights. In making the

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205 Submission: NSW irrigators Council, received 25 October 2019.

206 Basic landholder rights requirements were estimated using the number of properties with river frontage in each water source and estimated water use based on property size, climatic region and land use (DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Source – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf).

207 Part 5, Clause 22(1) of the Plan.

208 Interviews: MidCoast Council, 31 October 2019 and Lower Manning Water Users Association, 16 October 2019.

209 Interview: Lower Manning Water Users Association, 16 October 2019.

210 As a result of an increase in the number of landholdings fronting rivers and lakes or overlying alluvial groundwater in these water sources and/or as a result of the increase in the exercise of basic landholder rights by existing landholders. See Part 5, Clause 22(notes) in the Plan.

211 DoI (2018) *NSW Non-Urban Water Metering Policy*, p. 5. Available at: www.industry.nsw.gov.au/__data/assets/pdf_file/0017/205442/NSW-non-urban-water-metering-policy.pdf.

212 NSW Office of Water (2014) *Draft Audit of implementation – Lower North Coast unregulated and alluvial water sharing plan audit report card* (unpublished).

replacement Plan, DPIE-Water should update estimates and modelling to reflect the reasonable use guidelines once established.

4.1.2 Harvestable rights are provided for

Harvestable rights are part of basic landholder rights and so do not require a water licence.[213] The Commission's review does not consider in detail any changes to harvestable rights. Agricultural stakeholders requested a review of the harvestable rights provision to clarify allowances and investigate an increase for coastal water users.[214] They suggest that this would alleviate some pressures generated from trade restrictions and increase the ability to store and trade water across valleys. They also requested that opportunities for harvesting water from surplus flows during high flow and flood events are investigated, as well as potentially inequitable arrangements for floodplain harvesting across NSW.[215]

The Commission notes that DPIE-Water have made ongoing efforts to improve regulation of floodplain harvesting, commencing with the *Floodplain Harvesting Policy 2013*, which aimed to stop unconstrained floodplain harvesting by bringing it into a licensing framework, followed by a review and update of the policy in 2018.[216] The policy has been implemented in five northern NSW valleys and evaluated via a subsequent probity review of licensing and peer review.[217]

The Commission recommends that any expansion of the policy or further changes to harvestable rights would need to be considered across all coastal catchments and would require further catchment-specific data and modelling of potential impacts and risks. This would need to be informed by better knowledge around existing flow and extraction levels within the system, noting the limited metering and monitoring in the area currently (**Section 6.2**).

4.1.3 Native title rights provisions can be strengthened

As part of basic landholder rights, a native title holder is entitled to take and use water without an access licence, water supply work approval or water use approval under Section 55(1) of the Act.

Clause 23 of the Plan states that 'there are no native title rights in these water sources and therefore the water requirements for native title rights total 0 ML per year', with an associated performance indicator being the 'extent to which native title requirements have been met'.

At the time of this review, there are no native title areas and there are no current native title claims within the Plan bounds (**Section 2.2**).[218] However, this does not preclude future native

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213 Farm dams only require an access licence when: they are located on a third order (or greater) river, irrespective of capacity or purpose; they exceed the maximum harvestable right dam capacity for the property, which enables the capture of ten per cent of the mean annual run-off from the property, or they are on a permanent (spring fed) first or second order stream.

214 Submission: NSW Irrigators Council, received 25 October 2019.

215 Submission: NSW Irrigators Council, received 25 October 2019.

216 NSW Department of Industry (2013) *NSW Floodplain Harvesting Policy*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0017/143441/NSW-Floodplain-harvesting-policy.pdf

217 The NSW Government's floodplain harvesting related actions and documents are available online: https://www.industry.nsw.gov.au/water/plans-programs/healthy-floodplains-project/harvesting

218 National Native Title Tribunal (n.d.) *Maps*. Available at: http://www.nntt.gov.au/assistance/Geospatial/Pages/Maps.aspx.

title claims and determinations and these need to be proactively planned for and accommodated in the Plan.

Although Clause 94(4) states that 'this Plan may be amended following the granting of a native title claim pursuant to the provisions of the *Native Title Act 1993* of the Commonwealth to give effect to an entitlement granted under that claim', a timeframe should be included for this clause. In the recent Commission review of the *Water Sharing Plan for the Barwon-Darling Unregulated and Alluvial Water Sources 2012*, this amendment clause was in place but did not result in the determined native title rights of the Barkandji people being included in the Plan in a timely manner.[219]

The Commission recommends that a timeframe of three months is adopted to undertake initial amendments of the Plan, and a further 12 months to undertake detailed engagement, determine water allocations, and make final amendments to the replacement Plan.[220]

It is also recommended that Indigenous Land Use Agreements or other agreements[221] be used proactively wherever possible to prevent issues related to the long timeframes of native title claims and extended periods of inaction that often follow final determinations.

4.2 The Plan can better support Aboriginal outcomes

The Commission suggests that Aboriginal water values, rights and interests need to be better defined and supported in consultation with relevant Aboriginal stakeholders in the Plan area. It is important that the replacement Plan supports Aboriginal outcomes through provisions that reflect the priorities of the Act, alongside processes that protect Aboriginal cultural water values, enable water access and use, and genuinely involve Aboriginal peoples in water planning and management.

4.2.1 Describe and link Aboriginal values, objectives and indicators

The Plan recognises that Aboriginal peoples have a spiritual, customary and economic relationship with land and water that provides an important insight into natural resource management. The Plan's vision includes respect statements for Aboriginal values in these water sources as follows:[222]

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219 Natural Resources Commission (2019) *Review of the Water Sharing Plan for the Barwon-Darling Unregulated and Alluvial Water Sources 2012*. Available at: https://www.nrc.nsw.gov.au/_literature_251193/Final.

220 The Commission considers that a volumetric or proportional allocation is preferable as it helps to clarify what is achievable within the native title entitlement. However, this does vary with some native title rights providing an entitlement without a specific allocation. In addition, some stakeholders have advised the Commission that the focus on an allocation may detract from the process of recognising cultural entitlements due to the lengthy and complex processes involved in determining an allocation.

221 There are several agreements that can be made under relevant NSW and Commonwealth legislation. For example, Indigenous Land Use Agreements or a Section 31 Deed can be used successfully to resolve native title claims proactively. These are legally binding and may include rights in relation to employment, economic development, freehold land and compensation. Aboriginal Land Agreements can also be used as an alternative to the land claims process under the *Aboriginal Land Rights Act 1983 (NSW)* and provide a broad scope for negotiating claims. Indigenous Protected Areas are also effective, encompassing areas of land and sea country owned or managed by Indigenous groups which are voluntarily managed as a protected area for biodiversity conservation through an agreement with the Australian Government as part of the National Reserve System.

222 Part 2(9) of the Plan.

- (a) life-giving water is of extreme significance to Aboriginal culture for its domestic, traditional and spiritual values, and
- (b) while water supplied for the environment will provide protection for native flora and fauna, water for fishing, food gathering and recreational activities, it is important that the community respects the spiritual significance of water to the Aboriginal peoples.

To reflect this vision, the Plan includes an objective to 'protect, preserve, maintain or enhance the Aboriginal, cultural and heritage values of these water sources'[223] alongside a relevant performance indicator 'the change in the extent to which water has been made available in recognition of the Aboriginal, cultural and heritage values of these water sources'.[224]

The Plan provisions also allow for amendment after year five[225] to provide rules for the protection of water-dependent Aboriginal cultural assets in the following contexts:

- identifying water-dependent Aboriginal cultural assets[226]
- restricting the granting and amending of water supply work approvals to protect water-dependent Aboriginal cultural assets[227]
- amending the dealing rules to protect water-dependent Aboriginal cultural assets.

While there are these general provisions, the Commission has not received any information or data on this objective or performance indicator.

In addition, the lack of any specified water values makes assessment of the outcomes relating to the recognition and protection of water values difficult. There is a lack of clear links between the vision, objectives, strategies and performance indicators that makes it difficult to monitor and assess Aboriginal outcomes of the Plan (this is true of many of the Plan outcomes and is discussed in **Section 6.4**).

The Plan needs to better identify and support Aboriginal cultural and heritage values and uses, objectives and outcomes in line with relevant legislation. Both state and national water legislation and policy integrate Aboriginal cultural and heritage values and uses of water.[228]

The broad legislative and policy objectives need to be implemented in a way that recognises the diverse water values of Aboriginal peoples, both material and intangible, including:

- cultural heritage and evidence of historic occupation and use

223 Part 2(10b) of the Plan.
224 Part 2(12h) of the Plan.
225 Clause 90 Other of the Plan.
226 Clause 86 of the Plan: 'Amendment of very low flow provisions allows amendments under 5(b)(v) for 'any Aboriginal cultural values or sites which may need to be protected by a specific flow regime'.
227 See 'Clause 41A Rules for water supply works located near groundwater-dependent culturally significant'. The Plan also provides amendment opportunities to protect dependent cultural assets, stating that a 'full list of potential groundwater-dependent culturally significant sites will be identified on the Department-held register'. Despite this clause, there are no groundwater-dependent culturally significant sites identified in the Plan and no evidence of this work being undertaken or identified in a register.
228 In NSW, the Act notably includes a broad objective to 'recognise and foster the significant social and economic benefits to the Aboriginal people in relation to their spiritual, social, customary and economic use of land and water' (Section 3) and associated provisions. The National Water Initiative acknowledges that 'native title should not be solely relied upon to deliver Indigenous peoples the access and rights to their traditional waters. Water planners should consider other mechanisms for giving access and rights to water to Indigenous peoples'.

- connection to key water dependent plant and animal species
- customary food, fibre and tool production
- land and water management activities and expertise
- creation stories and customary lore
- movement and presence of spiritual and metaphysical beings
- well-being and recreation
- economic development and opportunities.[229]

Further, it should be acknowledged that these values are interconnected as part of a broad cultural landscape and are not confined only to individual, tangible cultural sites.[230]

Consultation undertaken as part of this review[231] described these values in diverse ways, and highlighted other specific values in the area of the Plan including the:

- **interconnection of water and cultural rights –** water is a critical part of cultural obligations and connections; they cannot be separated
- **value of subterranean water –** as an important and underutilised asset for Aboriginal peoples
- **importance of estuaries and tributaries –** as much value as the main river, critical for maintaining the health of the whole river system
- **need for cultural flows –** to be provided to support a range of Aboriginal water uses, in line with progress made in other states and territories
- **importance of cultural landscapes –** although there are important cultural sites located all the way along waterways, these are part of a wider and connected cultural landscape that is often poorly understood and inaccessible to Aboriginal people due to a range of barriers (for example, private lands, fencing, poorly managed public lands).

Meaningful access to water for Aboriginal peoples has been precluded by narrow definitions of water for 'traditional purposes'[232]; either under cultural water access licences (see further discussion in **Section 4.2.2**) or under native title (see **Section 4.1.3**). This lack of understanding is described by an interviewee below:

> '*Water itself is difficult – land you have an anchor point of ownership so it's much easier for people to understand, however water country can traverse different ownership and not as*

229 Murray Lower Darling Rivers Indigenous Nations (MLDRIN), Northern Basin Aboriginal Nations (NBAN) & North Australian Indigenous Land and Sea Management Alliance (NAILSMA) (2017) *Dhungala Baaka: Rethinking the Future of water management in Australia*. Available at: http://www.mldrin.org.au/wp-content/uploads/2018/06/Dhungala-Baaka.pdf.

230 Interviews: Indigenous Land and Sea Corporation, 30 September 2019; Illawarra Local Aboriginal Land Council, 24 October 2019; and Forster Local Aboriginal Land Council, 31 October 2019.

231 Interview: CEO of Forster Local Aboriginal Land Council, 31 October 2019; and Indigenous Land and Sea Corporation, 30 September 2019.

232 The Plan's background document states that: 'The plans allow Aboriginal communities to apply for water access licences for cultural purposes such as manufacturing traditional artefacts, hunting, fishing, gathering, recreation and for cultural and ceremonial purposes. Aboriginal cultural licences can also be used for drinking, food preparation, washing and watering domestic gardens.' (DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Source – Background document for amended plan 2016,* p. 20. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf).

> *tangible as land … Water is incredibly important culturally and can be connected to critical songlines, however this is hard for people to understand and value in that way'*.[233]

A lack of recognition of these diverse water values, particularly those intangible values, has impacted Aboriginal water values and uses in NSW.

There have been significant efforts to provide guidance on how to undertake effective engagement with Aboriginal stakeholders to identify cultural water values[234], including Aboriginal waterways assessments[235] and cultural flows assessments.[236] There are also a number of other sources of information on cultural sites and values in the area that can be drawn on initially to help inform these engagement processes, such as plans of management for the region's national parks[237] and other reserves[238], and cultural sites registered as part of the Aboriginal Heritage Information Management System (AHIMS).[239] Although these sources of information have limitations, they provide a foundation for understanding cultural values and uses and involving Aboriginal peoples meaningfully in water planning and management.

DPIE-Water should draw on these established guidelines and processes to begin to better understand, value and support the values of Aboriginal people in the Plan area. The Commission notes the recent efforts of DPIE-Water in Aboriginal involvement as part of the water resource planning process for the Basin (further discussed in **Section 4.2.3**). DPIE-Water should expand these efforts and use the process to identify values, develop objectives and outcomes, and determine required cultural flows to support Aboriginal water values in consultation with a range of Aboriginal stakeholders across the remainder of NSW.

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233 Interview: Indigenous Land and Sea Corporation, 30 September 2019.

234 Including additional modules for the *National Water Initiative* and the *Basin Plan*, and as part of the *National Cultural Flows* project.

235 The purpose of the Aboriginal Waterways Assessment Program was to develop 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. (Murray-Darling Basin Authority (2017) *Aboriginal Waterways Assessment Program*. Available at: https://www.mdba.gov.au/publications/mdba-reports/aboriginal-waterways-assessment-program).

236 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 (Murray-Darling Basin Authority (2019) *Cultural Flows*. Available at: https://www.mdba.gov.au/discover-basin/water/cultural-flows).

237 Plans of management for the region's national parks and other reserves refer to various culturally significant sites, which include rock engravings, axe grinding groove sites, middens, stone arrangements, camp sites, rock shelters containing art and shells, and other archaeological material. These are published by NSW National Parks and Wildlife Service for national parks, state conservation areas and nature reserves and can be viewed at: https://www.environment.nsw.gov.au/topics/parks-reserves-and-protected-areas/park-management/parks-plans-of-management.

238 Several significant Aboriginal cultural and spiritual sites exist within or adjacent to the marine park, including middens, burial sites and traditional campsites. Aboriginal people's association with the sea and land in the area dates back thousands of years and local people still gather food in the traditional way (DPI (n.d.) *Port Stephens – Great Lakes Marine Park*. Available at: https://www.dpi.nsw.gov.au/fishing/marine-protected-areas/marine-parks/port-stephens-marine-park).

239 AHIMS is a database that contains detailed information on over 93,000 recorded sites and over 13,500 archaeological and cultural heritage assessment reports (DPIE (2018) *Aboriginal Heritage Information Management System*. Available at: https://www.environment.nsw.gov.au/topics/aboriginal-cultural-heritage/protect-and-manage/aboriginal-heritage-information-management-system).

4.2.2 Improve Aboriginal water access and use

Aboriginal-specific water licences are the primary mechanism to enable Aboriginal water access and use under the Act.[240] While the Act provides for three different types of licences, these are not available across all water sharing plans.[241] Further, all Aboriginal-specific water licences have been conditioned with limits to volumetric entitlements and uses, and restrictions or prohibition of trade.[242] These features, together with limited awareness of these licences within Aboriginal communities, has meant that the actual uptake of specific access licences has been minimal.[243]

In this Plan, an unregulated river (subcategory 'Aboriginal community development') access licence is available (capped at 500 ML per year)[244], as well as an access licence of the subcategory 'Aboriginal cultural' (10 ML per year).[245]

The Commission has not been provided with any evidence that water has been accessed under these provisions or that water has been reserved for use under these entitlements. Further, DPIE-Water does not appear to have a clear policy or application process for Aboriginal-specific water licences, with sources describing the process as 'laborious' at best.[246] There has also been ineffective engagement with Aboriginal stakeholders regarding these available entitlements, resulting in a reported lack of awareness amongst stakeholders about these access licences (**Section 4.2.3**).[247]

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240 The *Water Management Act 2000* includes a broad objective to 'recognise and Forster the significant social and economic benefits . . . to the Aboriginal people in relation to their spiritual, social, customary and economic use of land and water' (s 3). Provisions are included to help meet this objective, including:
- The Minister can establish multi-stakeholder catchment-level water management committees of at least 12 but no more than 20 members, of whom at least two are Aboriginal persons (Section 13).
- Specific Purpose Aboriginal Licences include, which include Aboriginal cultural access licences, Aboriginal community development access licences and supplementary (Aboriginal environmental) water access licences.
- Native title rights are recognised.

241 Aboriginal cultural access licences (available in all surface water and groundwater management areas); Aboriginal community development access licences (only available in catchments where water extraction is not yet over allocated - largely in coastal areas); and supplementary (Aboriginal environmental) water access licence (only available in the Barwon-Darling area).

242 The Plan notes that 'an unregulated river (subcategory 'Aboriginal community development') access licence is a specific purpose access licence and as such can only be the subject of limited trade that is consistent with the purpose for which the licence was granted. Aboriginal communities, enterprises and individuals are encouraged to seek financial assistance from funding bodies to purchase other categories of access licence if they require fully tradeable licences'.

243 Hartwig, L.D., Jackson, S. and Osborne, N. (2018) 'Recognition of Barkandji Water Rights in Australian Settler-Colonial Water Regimes', *Resources*, 7(1), pp. 16-32.

244 Note: This provision was included in the update of the Plan when the Karuah River Water Source was added (Part 8, Section 34(2) – 'Rules for granting access licences'.

245 Part 8, Section 34(3) – 'Rules for granting access licences'.

246 Hartwig, L.D., Jackson, S. and Osborne, N. (2018) 'Recognition of Barkandji Water Rights in Australian Settler-Colonial Water Regimes', *Resources*, 7(1), pp. 16-32; 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, pp. 132–149; Moggridge, B.J., Betterridge, L. and Thompson, R.M. (2019) 'Integrating Aboriginal cultural values into water planning: a case study from New South Wales, Australia', *Australasian Journal of Environmental Management*, 26(3), pp. 273-286.

247 Interviews: Hunter Local Land Services, 6 November 2019; Individual – Mark Bulley, 6 November 2019; CEO of Forster Local Aboriginal Land Council, 31 October 2019; Aboriginal Affairs NSW, 30 September 2019; NSW Aboriginal Land Council, 4 October 2019.

A range of barriers to Aboriginal people using their water entitlements in NSW that are relevant in the context of this Plan. These were identified in literature[248] and confirmed during consultation[249] and include:

- limits to volumetric entitlement
- restrictions on uses of water to narrow cultural definitions
- exclusion of economic and commercial uses of water
- complexity of water licence governance and application processes
- limited awareness and capability around water policy and governance
- reliance on lengthy and complex land rights processes for accessing water
- restricted physical access to land and water, for example private lands, fencing, poorly maintained land and banks
- lack of infrastructure to use water, for example pumps and dams.

Aboriginal stakeholders who spoke with the Commission indicated that it was particularly challenging for Aboriginal peoples to maintain cultural connections with waterways in coastal areas, and that barriers differed from those in inland areas. In coastal areas, land ownership with water access is extremely limited due to the history and patterns of settlement and the economic value of waterfront land.[250] This issue was noted by an interviewee as follows:

> *'[We are] not aware of [water sharing plan] provisions and licences as the [Local Aboriginal Land Council] does not have much interaction with water … the history of dispossession and land settlement means a lot of freehold so not much opportunity to access land under Land Rights … Any land with water attached is definitely already freehold so even less likely to have ownership of this land.'*[251]

In addition, the water catchments for town water supply are often located in areas of high cultural value to Aboriginal peoples. These areas have restricted access for Aboriginal peoples.

The Commission is aware of only one case across NSW Water Sharing Plans where meaningful land and water access has been negotiated between a water utility and Aboriginal peoples – this has occurred in the Lower North Coast area. In this case, a Local Aboriginal Land Council granted access to their land for a water utility to secure town water provisions (see case study in **Box 1, Section 4.3**). This ongoing partnership presents a unique example of cooperation to support water sharing and security.

248 Jackson, S. and Moggridge, B. (2019) 'Indigenous water management', *Australasian Journal of Environmental Management*, 26(3), pp. 193-196; Moggridge, B.J., Betterridge, L. and Thompson, R.M. (2019) 'Integrating Aboriginal cultural values into water planning: a case study from New South Wales, Australia', *Australasian Journal of Environmental Management*, 26(3), pp. 273-286; Mooney, W. and Woods, R. (2019) 'Pathways to water sovereignty: cultural flows and first nations' water rights', paper submitted to Legalwise: 10th Water Symposium, 19 October.

249 Interviews: CEO of Forster Local Aboriginal Land Council, 31 October 2019; Indigenous Land and Sea Corporation, 30 September 2019; Aboriginal Affairs NSW, 30 September 2019; NSW Aboriginal Land Council, 4 October 2019; Native Title Services Corporation, 2 October 2019.

250 Interviews: Individual – Mark Bulley, 6 November 2019; and CEO of Forster Local Aboriginal Land Council, 31 October 2019.

251 Interview: CEO of Forster Local Aboriginal Land Council, 31 October 2019.

DPIE-Water should help to address the significant barriers to Aboriginal people accessing and using water. Actions to simplify Aboriginal water licences need to be considered – this may include the simplification of licence categories and removal of unnecessary restrictions on the purpose of water use.[252] Any attempts to address Aboriginal water access through these means needs to be part of the co-designed, state-wide Aboriginal Water Framework (discussed in **Section 4.2.3**).

4.2.3 Support Aboriginal engagement, capacity and leadership in water

Meaningful and consistent engagement is required to achieve the Act's outcomes and Plan objectives for Aboriginal peoples. Stakeholders consulted as part of this review indicated there is a significant need to improve the engagement and involvement of Aboriginal stakeholders to deliver the Plan's cultural outcomes.

The Hunter Aboriginal Community and Environment Network was engaged during the initial development of the Plan in 2005 and 2006.[253] The key issues raised at the time included the need for capability-building in water policy and management, protection of water values and improved access to water.[254] The Commission is aware that the NSW Aboriginal Water Initiative[255] was key in supporting Aboriginal engagement and involvement at this time. The initiative was well-resourced and Aboriginal staff had experience and understanding of water management. Since the initiative was disbanded in 2017, there has been little resourcing for this work and a reliance on Aboriginal Elders with limited experience in water management to support this role[256] – although the Commission notes that DPIE-Water have recently increased their Aboriginal liaison staff.

Stakeholders consulted as part of this review identified several key issues regarding engagement:

- **Limited awareness of water governance and entitlements due to lack of engagement –** stakeholders were generally unaware of water sharing plans, water access licences and entitlements.
- **Lack of consultation and feedback –** most stakeholders felt they had not been consulted at all, and if they had, they described the frustrations of not receiving any feedback on how the information was used; this was seen to result in consultation fatigue and an absence of Aboriginal values from water planning and management.

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252 The restrictions on the purposes and dealings of licences held by Aboriginal peoples are unnecessary and need to be removed. No other category or sub-category of licence is subject to the specification of the purpose of take.

253 DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Source – Background document for amended plan 2016,* p. 14. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

254 Interview: DPIE-Water, 1 October 2019; and DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Source – Background document for amended plan 2016,* p. 20. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

255 The Aboriginal Water Initiative Program was established in 2012 and ran until 2017, with funding of $1.69 million per year. It aimed to improve Aboriginal involvement and representation in water planning and management in NSW and monitor progress against targets established in water sharing plans.

256 Taylor, K.S., Moggridge, B.J. and Poelina A. (2017) 'Australian Indigenous Water Policy and the impacts of the ever-changing political cycle', *Australasian Journal of Water Resources*, 20(2), pp. 132-147.

- **No genuine involvement in decision-making and leadership in water** – there was a sense that there had not been any meaningful attempts to involve Aboriginal people in water planning and management and that this was a result of both a lack of awareness within the Aboriginal community and the inadequate levels of government-led engagement and capacity-building.[257]

The lack of dialogue between Aboriginal communities and the NSW Government on water issues is particularly evident in the Plan area, as described by one interviewee:

> *'We have not been factored into water discussions at any level of government in any meaningful way. There are efforts to improve and have dialogue, but their framework doesn't fit with ours … this stops progress for Aboriginal people'*.[258]

The Commission notes that DPIE-Water's recent and significant efforts in undertaking Aboriginal nation-based engagement in basin communities as part of the Murray Darling Basin Authority's Water Resource Planning Process. This has involved consultation with Aboriginal nations in basin communities to identify water-related objectives, values and uses, which are presented in nation-specific consultation reports.[259]

There has been significant progress made in completing this engagement process as part of the basin plan requirements, with limited resources and short timeframes. However, this process was only undertaken in basin communities and has not been applied in coastal areas. Further, feedback to the Commission suggests that some Aboriginal stakeholders within basin communities have felt left out and that the process was rushed.

The Commission recommends that DPIE-Water increases and expands its current engagement efforts to enable an inclusive and culturally appropriate approach to cultural water across NSW. This includes offering similar engagement opportunities in non-basin areas, including the lower north coast, and involving a range of other Aboriginal stakeholders not currently captured in the nation-based process, including Traditional Owners, Nation groups, local Aboriginal land councils and other representative groups. These engagement activities must also be better resourced to provide the time and expertise needed to undertake culturally sensitive engagement.[260] This would also support the engagement that DPIE-Water need to undertake in developing the regional water strategies.[261]

Across all water sharing plan reviews, there is consistent evidence and feedback that significant efforts are needed to redress Aboriginal values and uses, objectives and outcomes across NSW. This needs to be undertaken using a state-wide approach that is consistent and transparent. In previous reviews, the Commission has identified valuable examples of such approaches.[262]

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257 Interviews: Hunter Local Land Services, 6 November 2019; Individual – Mark Bulley, 6 November 2019; CEO of Forster Local Aboriginal Land Council, 31 October 2019; Aboriginal Affairs NSW, 30 September 2019; and NSW Aboriginal Land Council, 4 October 2019.

258 Interview: Forster Local Aboriginal Land Council, 31 October 2019.

259 For example, NSW Department of Industry (2018) *Report on culturally appropriate First Nations consultation with Gomeroi Nation*. Prepared y Dhirranggal Solutions. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0020/192332/gwydir-first-nations-consultation-gomeroi-nation-report.pdf.

260 The Commission is aware that additional staff have been appointed within DPIE-Water to support these efforts but recommends that further resources will be required to undertake appropriate consultation.

261 Interview: Aboriginal Cultural Liaison Officer, DPIE-Water, 1 October 2019.

262 Examples include:

- Recent reforms in Victoria as part of the *Water and Catchment Legislation Amendment Bill 2019* which formalised obligations for Victorian water and catchment management agencies to engage with and support

The Commission have been made aware that DPIE-Water are making significant progress on this state-wide framework in consultation with the NSW Peak Aboriginal Bodies group.[263] The Commission strongly supports these efforts and recommends that DPIE-Water continue to drive the state-wide changes required to adequately address Aboriginal water issues comprehensively across legislation, policy, programs and processes by the end of 2020. Any efforts need a consistent policy framework and associated funding to support ongoing Aboriginal involvement and leadership in water management in NSW, beyond the water sharing plan processes.

4.3 Town water supply issues and risks

4.3.1 Current town supply needs have been met

Water utilities, such as local councils, are issued with water utility access licences that set the parameters for extraction. Water utilities and extraction for town supply have precedence over most other licences (with only the environment and basic landholder rights having priority).[264]

The local water utility access licences total 17,256 ML per year (representing 18 percent of total entitlement; see **Table 5** in **Section 2.3**), distributed across the water sources and held by MidCoast Council.[265] There is also a major utility access licence for transfer via the Barnard

opportunities for Aboriginal involvement as part of the 'Water for Victoria Plan'. This sets out the process for documenting water-dependent values, collaborating with water management agencies and pursuing economic development opportunities through access to water.

- The *Yarra River Protection (Wilip-gin Birrarung murron) Act 2017*, which combines Traditional Owner knowledge with modern river management expertise and treats the Yarra as one integrated living natural entity to be protected. It also gives an independent voice to the river through the Birrarung Council, a statutory advisory body which must have at least two Traditional Owner representatives on it.
- Whole-of-Country planning and management such Gunaikurnai Land and Waters Aboriginal Corporation and Native Title Services Victoria (2015) *Gunaikurnai Whole-of-Country Plan*. Available at: www.glawac.com.au; Dja Wurrung Clans Aboriginal Corporation (2014) *Dja Wurrung Country Plan 2014-34*. Available at: www.djadjawurrung.com.au; and Barengi Gadjin Land Council (2017) *Country Plan: Growing What Is Good*. Available at: www.bglc.com.au.
- Dedicated Aboriginal roles in water management (for example, Aboriginal rangers and water officers for monitoring and compliance).
- Aboriginal Water and Land Holder and an associated Trust Account.
- Cultural Flows Projects and officers.
- Economic development opportunities through Aboriginal-led programs and business ownership such as aquaculture businesses (University of Technology Sydney (2016) *Social and Economic Evaluation of NSW Coastal Aquaculture*. Available at: www.uts.edu.au/sites/default/files/fass-report-social-economic-evaluation-nsw-coastal-aquaculture.pdf).

263 Interview: Principal Aboriginal Policy and Legislation Officer - Water Policy & Legislation, DPIE-Water, 28 February 2020.

264 *Water Management Act 2000*, Section 58(1) states that 'for the purposes of this Act, … (a) local water utility access licences, major utility access licences and domestic and stock access licences have priority over all other access licences … (2) If one access licence (the higher priority licence) has priority over another access licence (the lower priority licence), then if the water allocations under them have to be diminished, the water allocations of the higher priority licence are to be diminished at a lesser rate than the water allocations of the lower priority licence'; and DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Source – Background document for amended plan 2016,* p. 20. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

265 See Part 7, Clause 28 of the Plan: (a) 570 ML per year in the Lower Barrington/Gloucester Rivers Water Source; (b) 12,500 ML per year in the Lower Manning River Water Source; (c) 221 ML per year in the Myall River Water Source; (d) 3000 ML per year in the Manning River Tidal Pool Water Source; (e) 375 ML per year in the Manning Estuary Tributaries Water Source; (f) 320 ML per year in the Karuah River Water Source; (g) 0 ML per year in all other water sources.

Scheme to the Hunter River system for use during power generation, rather than town water supply, which is discussed in **Section 3.4**.[266]

Over the Plan period, water use data suggest that local water utility needs have been met. Water use data from MidCoast Council indicate that local water utility use was 33 percent lower in 2018-19 than in 2009-10, at 493 ML and 739 ML, respectively. However, use has fluctuated over the Plan period and there has not been a steady growth trend. For example, the lowest and highest annual demands during the Plan period were 177 ML in 2010-11, and 9,058 ML during 2017-18, respectively, with an average of 5,611 ML over the entire Plan period.

While steady growth in water use is often associated with an increasing population, MidCoast Council advised that variability in the Plan area is also related to other key factors influencing water use, including intermittent changes to water availability and supply, reduced storage capacity, seasonal population changes, as well as the impacts of water restrictions and behaviour change campaigns on use.[267] Despite variations, the local water utility remains well within the licensed entitlement of 16,986 ML per year.

Stakeholder consultation confirmed that town water needs have largely been met, with MidCoast Council stating that *'the Plan has enabled provision of water for drinking supplies and recreational opportunities'*.[268] However, despite town water needs being met to date, there is evidence that current and future risks need to be accommodated in the Plan. Feedback from MidCoast Council confirmed these risks and noted that the apparent room for growth is limited by reduced water availability under drought conditions and the need to manage water quality (salinity levels) once storage levels are reduced. MidCoast Council also noted that population growth, land use trends and water demand projections will continue to impact on town water supply.[269]

4.3.2 Consider future risks to town water supply in the Plan

The Commission's review identified several key risks to town water supply in the Plan area, including:

- recent drought conditions (see **Section 2.4**)
- future predictions of population growth (see **Section 2.7**) – MidCoast Council currently supplies 37,000 households, with a forecast of 50,000 households by 2050[270]
- storage capacity, water quality and salinity issues.

From 25 November 2019, Level 4 ('severe') water restrictions were introduced across all MidCoast Council region town supplies, except for the Hawks Nest/Tea Gardens area, which remains on Level 3 ('very high') restrictions. This situation has been described by MidCoast

266 This consists of 20,000 ML per year (representing 21 percent of total entitlements) held by AGL Macquarie (formerly Macquarie Generation) allowing water to be pumped to Jerrys Plains in the Hunter River system where the power stations are located (Part 7, Clause 29 of the Plan). Note: accounting provisions as specified in Clause 56 of the Plan ensure an average annual diversion of no more than 20,000 ML per year.

267 Interview: MidCoast Council, 31 October 2019.

268 Submission: MidCoast Council, received 31 October 2019.

269 Interview: MidCoast Council, 31 October 2019.

270 MidCoast Council (n.d.) *Water Supplies*. Available at: www.midcoast.nsw.gov.au/Water-Services/Water-Supplies.

council as *'an unprecedented water shortage in the history of our water supply service'*.[271] The region only moved to Level 3 ('very high') water restrictions on 11 November 2019 but the combination of an unprecedented drought and extreme bushfires in the region have increased use by nearly 30 percent over this short period.[272] For smaller water supplies, such as Gloucester, short term emergency supplies may need to be accessed by transporting water by road or rail.

Future predictions of population growth and water demand are also recognised as a major challenge for MidCoast Council.[273] Considerable planning and investments are underway to provide for increased demand, including water restrictions and associated behaviour change and pricing programs, as well as investment in research. MidCoast Council have invested in several studies and plans to better understand the region's water sources and ensure water security into the future. These include studies of the ecological impacts on estuarine environments in the area, saline dynamics modelling [274], coastal zone management plans [275] and the *Integrated Water Cycle Management Strategy*.[276]

In addition, behaviour change programs and pricing mechanisms have been in place and working successfully in the region for the last five years.[277] These have improved water use efficiency significantly, with the MidCoast Council Local Government Area recording the second lowest residential water use in NSW per property at 141 kilolitres per property. Further efficiency improvements are unlikely to significantly increase the current system capacity.[278] MidCoast Council also state it has been enforcing voluntary cease to pump rules during this period, in line with the levels imposed on other water licence holders (see **Section 3.3.1**).[279]

Storage capacity and related water quality and salinity issues were also raised by MidCoast Council as key challenges in meeting town water supply needs.[280] Several significant investments in water supply and storage have been made and are being investigated. The $32 million Nabiac Aquifer Water Supply System[281] became operational in early 2019 to provide the region with:

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271 MidCoast Council (2019) *Water Restrictions*. Available at: www.midcoast.nsw.gov.au/Water-Services/Managing-Water-Use/Water-Restrictions.

272 The average use recorded over October-November 2019 was 27 ML per day. Under previous restrictions, the average was just over 20 ML per day.

273 MidCoast Council operates six water supply systems, harvesting around 11 billion litres of water per year. The largest water supply system is the Manning scheme, with four smaller scale water treatment plants for Stroud, Bulahdelah, Gloucester/Barrington and Hawks Nest/Tea Gardens. The Nabiac Aquifer Water Supply only started operations in 2019 (MidCoast Council (n.d.) *Water Supplies*. Available at: www.midcoast.nsw.gov.au/Water-Services/Water-Supplies).

274 Bishop, K.A. (2013) *Ecological Interpretation of Saline Dynamics Modelling of the Manning River Estuary*. Report prepared for MidCoast Water.

275 MidCoast Council (n.d.) *Coastal Management.* Available at: https://www.midcoast.nsw.gov.au/Environment/Coastal-River-Management/Coastal-Management.

276 MidCoast Water (2015) *Our Water, Our Future 2045: MidCoast Water's Integrated Water Cycle Management Strategy*. Available at: https://www.midcoast.nsw.gov.au/files/assets/public/document-resources/council/plans-amp-publications/our-water-our-future-summary.pdf.

277 Interview: MidCoast Council, 31 October 2019.

278 MidCoast Council (2019) *Peg Leg Creek Dam: Project Information*. Provided by MidCoast Council, 27 November 2019.

279 Interview: MidCoast Council, 31 October 2019.

280 Submission: MidCoast Council, 16 September 2019.

281 MidCoast Council has invested $22.7 million in this project, together with an Australian Government grant of $9.43 million under the National Stronger Regions Fund and a NSW Government grant of $2.47 million, partly from the Country Towns Water Supply and Sewerage Program. Construction began in 2007, including borefield infrastructure, the Nabiac Water treatment plant and the Darawank reservoir and pump station,

- a diversity of supply if there are problems with the Manning water source[282]
- additional capacity
- lower pumping costs to Forster and Tuncurry
- reduced demand on Bootawa Dam.

The Bootawa Dam (2,200 ML capacity) provides an estimated 80-100 days of supply security,[283] while the Nabiac system is estimated to increase the supply security to a maximum of 130 days.[284] This project was an agreement between Forster Local Aboriginal Land Council – who own the land – and MidCoast Council (case study presented in **Box 1**) and may also offer potential for further expansion of supply.

Box 1: Aboriginal partnership enables town water supply and security[285]

In 2015, the Forster Local Aboriginal Land Council entered into a landmark agreement with MidCoast Water (now MidCoast Council) to transfer land to the local water utility to secure water supplies for the region while retaining cultural access to the site. This is the first case in NSW where this type of Aboriginal partnership has been undertaken with a water utility.

The utility purchased 1,600 hectares of Aboriginal owned land under a signed agreement. The land, located at Nabiac, was previously sand mined Crown land and was returned to the Aboriginal community as part of successful Aboriginal land claims in the 1990s.

The sale has financed social and economic development opportunities for local Aboriginal people while retaining a perpetual right of cultural access to the site. The Chief Executive of Forster Local Aboriginal Land Council at the time (Dan Rose) stated: "*We are proud of the negotiation process that has taken place … we are proud to maintain a right of cultural access for our members to allow them to walk the land, fish and gather*".

For MidCoast Water, it allowed them to develop the Nabiac Inland Dune Aquifer project. MidCoast Water's acting general manager at the time (Brendan Guiney) stated: "*We have spent a number of years negotiating the purchase of [the] land to be able to progress a major water security project for the mid north coast community. As part of our ongoing management plan we will ensure it is protected and work to maintain and improve the natural biodiversity of the site.*"

According to Forster Local Aboriginal Land Council, the sale was a 'win-win situation', with MidCoast Water also withdrawing objections to land claims lodged near the site. Forster Local Aboriginal Land Council advised that they are currently discussing expanding the cultural use rights under the

along with over 16 kilometres of pipelines, electrical and telecommunication services (MidCoast Council (n.d.) *Water Supplies*. Available at: www.midcoast.nsw.gov.au/Water-Services/Water-Supplies).

282 The scheme is designed to provide a supplementary supply to the Manning Scheme, servicing approximately 70,000 people and up to 100,000 during peak holiday periods (MidCoast Council (n.d.) *Water Supplies*. Available at: www.midcoast.nsw.gov.au/Water-Services/Water-Supplies).

283 This estimate depends on the time of year and effectiveness of restrictions (MidCoast Council (2019) 'Peg Leg Creek Dam: Project Information').

284 Under current severe drought conditions, a lower yield is evident than these original estimates (MidCoast Council (2019) 'Peg Leg Creek Dam: Project Information').

285 Aboriginal Affairs NSW (2015) *Land Council deal secures water future* [Press release]. 2 July. Available at: www.aboriginalaffairs.nsw.gov.au/news/land-council-deal-secures-water-future; 'Forster Local Aboriginal Land Council transfers land to MidCoast Water' (2015), *Great Lakes Advocate*, July 9. Available at: www.greatlakesadvocate.com.au/story/3199297/deal-first-of-its-kind-photos;
Brooks, N. (2019) 'Nabiac Aquifer Water Supply Scheme Officially Opens', *Manning River Times*, 28 February. Available at: www.manningrivertimes.com.au/story/5931239/nabiac-aquifer-water-supply-scheme-officially-opens; MidCoast Council (2019) *News: Nabiac water supply system is operational* [Press release], 28 February. Available at: www.midcoast.nsw.gov.au/News-Media/Nabiac-water-supply-system-is-operational.

agreement to better support commercial and other development opportunities in the area. At the same time, MidCoast Council are looking at options to expand the Nabiac borefield to address risks to future water supply.

Further water security investments being investigated include installing a temporary desalination plant on the Manning River to treat brackish water, expanding the Nabiac system, and increasing water storage capacity.[286] MidCoast Council advised that the temporary desalination plant would be used to address the water quality (high salinity) issues presented when dam storage levels are low. The council is also investigating the current partnership arrangement with the Forster Local Aboriginal Land Council to consider expanding the capacity of the Nabiac borefield (refer to previous paragraph and case study presented in **Box 1**).

Another key strategy MidCoast Council are investigating is increasing water storage capacity by using a current extraction point in the Manning River water source via pipeline to store water in a new, 7,000 ML capacity dam in Peg Leg Creek. From there, water would be transferred back to the treatment plant at Bootawa Dam when necessary. The new dam would increase the security of supply to about 350 days under the present license conditions.[287]

Currently, the Plan does not allow for this proposed dam as it is located on a third order or higher stream in the Manning River Water source.[288] However, the water is not sourced from the dam location and is instead pumped from a source allowed under the Plan. MidCoast Council advocates for a revision to the Plan to formally accommodate this storage proposal given the water is from an allowable source.

The Plan currently allows the Minister to vary a local water utility's share component at five-year intervals or on application of the local water utility where there is rapid growth in population.[289] This appears to provide sufficient flexibility given the relatively small share component provided to the local water utility currently and the clear indications of growth provided in population data and projections. However, the Commission understands that the share component may not fully address the water security issues presented by extreme drought, climate change and the currently small storage capacity in the area.

A key challenge is having enough volumes of water available at a certain quality to allow for town water supply. MidCoast Council indicated that the current small dam storage capacity only provides a small window in which to extract due to the implementation of voluntary cease to pump restrictions and the need to meet water quality standards. Poor-quality water costs more to treat and presents higher risks and flow-on impacts, so it is preferable not to pump at those levels.[290]

Given this risk and the new dam proposal, the Commission recommends that the Plan is amended to allow for investigations of storage facilities where the water is pumped from allowable sources (not third order or higher streams). Any such investigations for storage

286 Interview: MidCoast Council, 31 October 2019 and MidCoast Council (2019) *Water Restrictions*. Available at: www.midcoast.nsw.gov.au/Water-Services/Managing-Water-Use/Water-Restrictions.

287 MidCoast Council (2019) *Peg Leg Creek Dam: Project Information*. Provided by MidCoast Council, 27 November 2019.

288 Part 9, Clause 37 of the Plan.

289 Part 8, Clause 34 (notes) in the Plan.

290 Interview: MidCoast Council, 31 October 2019.

facilities must undertake the required impact and cost-benefit studies and ensure that the LTAAEL and environmental flow regimes can be maintained in line with the Plan provisions.

In light of current drought conditions and predicted future climate variability (**Section 2.4**), the replacement Plan should also consider the MidCoast Council's draft *Drought Management Plan*[291] to ensure it aligns with and accommodates risks and actions included in the plan.

4.4 Other actions to support social outcomes and equity

The Commission has identified several other opportunities to improve social outcomes and equity. These have implications for the Plan itself as well as the broader actions of DPIE-Water.

4.4.1 Implement the Plan with consistent governance

Many stakeholders raised issues regarding the lack of clear and consistent implementation of the Plan. The planned change to cease to pump levels is one example where the lack of clear communications has created misunderstanding and even suspicion among landholders (see **Section 3.3**). Feedback from water users suggests that original cease to pump levels have been maintained in the absence of advice from DPIE-Water and notification of licence conditions by DPIE-Water. Water users are also self-regulating these limits in place of enforcement. Although self-regulation is considered largely effective and well-coordinated, some stakeholders described the situation as creating 'social disharmony' as neighbours 'argued over water quality and use'.[292]

One stakeholder gave an example of the common sense of uncertainty around the Plan's governance and implementation:

> *'There's a lot of uncertainty in the community, industry and government around whether the water sharing plan is actually being implemented and how this works. There's a real state of limbo at the moment around the Plan and who will enforce the plan*'.[293]

Clear implementation of the Plan and consistent governance, roles and responsibilities are critical to meeting the outcomes of the Plan, reducing uncertainty and rebuilding trust. Implementation needs to be supported by consistent and transparent MER (see **Chapter 6**).

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291 Mid Coast Council (2019) *Future Directions (2018 – 2048): Drought Management Plan*. Draft document currently under review.

292 Submission: Dingo Creek Water Users Association, 1 November 2019.

293 Interview: MidCoast Council, 31 October 2019.

4.4.2 Develop community relationships and capacity in water management

Stakeholders identified communication and engagement as critical to ensuring the outcomes of the Plan are met. Firstly, the Plan itself is seen as complicated in its language and framing, leading to misinterpretation and a lack of stakeholder support:

> *"There is a need to ensure [water sharing plans] are clear and comprehensible to a broad range of stakeholders…to enhance stakeholder support"*.[294]

Plan aspects in need of simplified and consistent language and communication include basic landholder rights, water licence conditions (for example, cease to pump levels) and harvesting rights (see **Sections 4.1** and **4.4.1**). It was also noted that all water sources in the area of the Plan could be included to simplify planning and management.[295]

The modes of communication with water users were also viewed as inadequate. DPIE-Water was seen to rely on passive forms of engagement such as letters and its website, leaving some water users feeling 'isolated'.[296] In the absence of leadership from relevant agencies, MidCoast Council has been acting as a central contact point for stakeholders:

> *'They need more proactive engagement … It doesn't seem like the plan is actually implemented … The council has had to be the default for consultation with farmers because the department and WaterNSW aren't talking to them so we end up talking to them'*.[297]

The Commission notes that DPIE-Water has recently provided summaries and updates on Plans on its website and WaterNSW has provided public information on licences, conditions and applications. However, direct engagement and notification of stakeholders could be improved, as illustrated in the lack of notification of licence conditions in the area (see **Section 3.3.2**). Stakeholders considered that the NSW Government should lead more active and inclusive communications, in addition to publishing information online.[298]

The lack of stakeholder advisory panels or similar engagement mechanisms in the Plan area was seen to contribute to poor communications:

> *"Coastal Valleys do not have Stakeholder Advisory Panels (SAP) as inland valleys do … Coastal valleys should have established process of stakeholder engagement incorporated as a mandatory component of water plans"*.[299]

294 Submission: NSW Irrigators Council, received 25 October 2019.
295 Information provided by WaterNSW, received 28 November 2019.
296 Interview: Barrington Water Users Association, 25 October 2019.
297 Interview: MidCoast Council, 31 October 2019.
298 Submission: NSW Irrigators Council, received 25 October 2019.
299 Submission: NSW Irrigators Council, received 25 October 2019.

This problem was raised across all coastal water sharing plans. Stakeholders noted that these groups should have a range of representatives to provide a diversity of perspectives while maintaining local involvement:

> *"[we need] a proper water sharing system – one rep from council, farmer, environment, government and a range of others – those people should be involved in managing the river system, not people from Sydney that don't know the river system. Generations of farmers in the area have a lot of knowledge about the river and how it works and should be included in working out what to do"*.[300]

Involvement from a broad range of community stakeholders was viewed as important to implementing the Plan but not undertaken effectively to date.[301]

Finally, education and capacity building in water policy and management was viewed by many stakeholders as critical to supporting equitable water sharing and implementation of the Plan:

> '*education and communication with water users is really important and not being done well at the moment*'.[302]

Education was described as a pivotal way to address misunderstanding and uncertainty and to shift people's persistent attitudes to water:

> *'that the river is a means to transport water so I can use it…[they] need to work on behavioural perceptions with a view to changing them'*.[303]

The Commission acknowledges, as do many stakeholders, that DPIE-Water have limited resources to undertake this level of active engagement involving education and capacity-building but note the effectiveness of such approaches in supporting the Plan's objectives.

Strengthening the overarching stakeholder engagement strategy developed as part of the water reform action plan[304] would be useful to target DPIE-Water's efforts, particularly in coastal areas. This needs to include a stakeholder engagement plan for the Plan area that specifies appropriate forums for engagement, such as a stakeholder advisory panel. These activities should take place during the replacement Plan development and on an ongoing basis to refresh and capture new users and community members.

4.4.3 Address socio-economic trends and risks with tailored approaches

The area has a range of patterns of land and water use that are not always adequately reflected in the Plan. There are patterns of significant population growth (**Section 2.7**) alongside increasingly small scale and hobby farming, increasing lifestyle rural blocks and housing estates, and associated shifts in industry trends. Consultation for the review indicated that many stakeholders felt that the Plan was not flexible enough to adequately accommodate such trends or forecasts of future change, as described here:

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300 Submission: Lower Manning Water Users Association received, 25 October 2019.
301 Interview: DPI-Fisheries, 24 October 2019.
302 Interview: NSW Irrigators Council, 21 October 2019.
303 Interview: Hunter Local Land Services, 6 November 2019.
304 Department of Industry-Water (2018) *Water Stakeholder and Community Engagement Policy*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0011/148529/IND-I-245-Water-Stakeholder-and-Engagement-Policy.pdf.

> *"there is a need to consider forecast of future needs for agricultural, industrial and urban/rural residential use, so that water supply authorities and governments have accurate information on which to base decision making as well as to reduce the chances of conflict".* [305]

Stakeholders considered that water sharing plans had become a 'one size fits all' model that was more relevant to inland areas. Adaptive management is a key approach to support a more tailored approach to local areas (see **Section 6.5**).

4.4.4 Communicate and measure equitable sharing

The Plan objective to 'manage these water sources to ensure equitable sharing between users' requires further consideration and integration in developing and implementing the Plan,[306] including the identification of an appropriate performance indicator (see **Section 6.4**).

DPIE-Water advised that equitable sharing between users relates to the appropriate prioritisation of different licence classes under the Act.[307] However, feedback suggests that DPIE-Water need to better communicate the ways in which water sharing is determined.

The equitable distribution of water needs to be better understood, measured and communicated to the public. As noted above, stakeholders felt that Plan does not adequately reflect the full range of stakeholders with water interests. Certain industries such as the oyster industry, commercial fisheries, aquaculture and tourism[308] felt left out of discussions and decision-making and considered that the *'department needs to better understand the mix of industries'*[309], and:

> *'…need to factor in contradictory expectations from different industries … for example oysters are more concerned with salinity and reduced run off. Tourism is really important to the area; healthy river equals tourists who will use it. These areas have high recreation values'*.[310]

Equity can be difficult to define but transparency and measurement can contribute to building stakeholder support and a shared understanding of how decisions around water distribution are made.

To address social issues in the development and implementation of the replacement Plan, the Commission recommends that DPIE-Water:

- enhance communication of the Plan through active, simple, and consistent language and modes of communication

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305 Submission: NSW Irrigators Council, received 25 October 2019; and interviews: MidCoast Council, 31 October 2019; Hunter Local Land Services, 6 November 2019; and Lower Manning Water Users Association, 16 October 2019.

306 Equity assessments may be useful in developing replacement Plans to ensure they meet this objective. While there is no standardised methodology for undertaking equity assessments, there are guiding principles, tools and techniques used that are often used in sustainability and environmental impact assessments. Common considerations include: inter- and intra-generational equity, decision-making equity, quality of life, distribution of costs and benefits.

307 Information provided by DPIE-Water, 27 March 2019.

308 Barclay, K., McIlgorm, A., Mazur, N., Voyer, M., Schnierer, S. and Payne, A.M. (2016) *Social and Economic Evaluation of NSW Coastal Aquaculture*. Available at: https://www.uts.edu.au/sites/default/files/fass-social-economic-evaluation-nsw-coastal-aquaculture-report.pdf?no-cache.

309 Interview: Hunter Community Environment Centre, 22 October 2019.

310 Interview: MidCoast Council, 31 October 2019.

- improve implementation and enforcement of the Plan using clear and consistent governance, roles and responsibilities
- develop well-evidenced and resourced processes of stakeholder engagement[311], including an appropriate forum for engagement (such as a stakeholder advisory panel) – making sure it includes a range of stakeholders with diverse interests and knowledge of water, and responds to the unique coastal context of this Plan
- better communicate the current balance of water sharing and include a relevant performance indicator.

4.5 Recommendations

The Commission presents the following recommendations (**Table 15**) and suggested actions (**Table 16**) for improving social and cultural outcomes.

Table 15: Recommendations for strengthening social and cultural outcomes

Recommendations	
8*	Continue processes to finalise the *Reasonable Use Guidelines* for stock and domestic use and include agreed standards as part of the replacement Plan.
9*	Include a timeframe of three months to undertake initial amendments of the Plan following native title determinations and other land/water use agreements, and enough time to undertake the detailed engagement, final amendment and allocation process.
10*	Identify Aboriginal values and uses, objectives and outcomes, flow allocations mechanisms for access in the replacement Plan, using a strengthened engagement process (see **Sections 4.2.3** and **4.4**). This should use relevant guidelines, be well-resourced, and include a specific process and clear timeframe for development in consultation with Aboriginal stakeholders.
11	Allow for investigations of storage facilities where the water is from allowable sources (not third order or higher streams); noting that investigations for any storage facilities must undertake the required impact and cost-benefit studies and ensure that the LTAAEL and environmental flow regimes can be maintained in line with the Plan provisions.
12	Consider MidCoast Council's *Drought Management Plan* and any other relevant studies to ensure the replacement Plan aligns with them and accommodates identified risks to town water supply.

311 There are common and well-established approaches to stakeholder engagement that outline the key steps in planning, implementation and maintenance of stakeholder relationships, including social impact assessment and management strategies, dispute resolution mechanisms (for example, the International Association for Public Participation (n.d.) *IAP2*. Available at: https://www.iap2.org).

Table 16: Suggested actions for strengthening social and cultural outcomes

Suggested actions	
D*	Continue development of a NSW Aboriginal Water Framework by end-2020 to provide consistent and transparent guidelines and resourcing for Aboriginal water access and involvement in water planning and management. At a minimum, the framework should consider: a) relevant guidelines and legislation, including any need for legislative reforms b) Aboriginal water values and its uses c) processes for allocating water for Aboriginal interests including cultural, environmental, social and economic purposes d) processes for improving Aboriginal water access and use, through simplified licencing or other identified mechanisms e) clear requirements for including native title determinations and proactive processes for undertaking other land/water use agreements f) strengthened Aboriginal engagement processes across the state to expand on the basin engagement process, broaden the stakeholder base, and increase Aboriginal staff with capacity to lead and maintain engagement g) appropriate Aboriginal-led governance, funding and resources, including dedicated Aboriginal staff with capability in water planning and management.
E*	Adopt processes that support key social outcomes throughout the remake and implementation of the replacement Plan: a) enhance communication of the Plan through active, simple, and consistent language and modes of communication b) improve implementation and enforcement of the Plan using clear and consistent governance, roles and responsibilities c) strengthen processes of stakeholder engagement, including a stakeholder engagement plan and appropriate forum for engagement (such as a stakeholder advisory panel) – make sure it includes a range of stakeholders with diverse interests and knowledge of water, and responds to the unique coastal context of this Plan d) better communicate the current balance of 'equitable' water sharing and include a relevant performance indicator.

5 Opportunities to improve economic outcomes

The Commission reviewed the Plan's performance against the current economic objectives and performance indicators, and found that:

- the Plan provided some opportunities for trade, although some stakeholders consider these to be somewhat limited by rules restricting trade between water sources (**Section 5.1**)
- some stakeholders have expressed interest in undertaking more trading, although any changes to these provisions should consider environmental requirements and impacts on other water users (**Section 5.2**)
- the Plan provides flexibility in account management rules to encourage responsible use of available water although, in practice, the effectiveness of these rules is limited by the lack of reporting of water use by licence holders (**Section 5.3**).

No specific data were provided by DPIE-Water around changes in the economic benefits derived from water extraction and use over the plan period. The MidCoast Council area's gross regional product has remained reasonably steady over the Plan period, with a value of $3.16 billion in 2018.[312] However, this covers the broad regional economy and is not specific to water extraction and use.

Although no specific data was available on changes in economic benefits, the Commission notes that the former DPI - Office of Water prepared an internal draft audit report in 2014, which presented findings on the implementation of trade and water account rules. DPI's Strategy and Policy Division also prepared an assessment report on the socioeconomic impacts from cease to pump amendments (**Section 3.3.3**).[313]

5.1 The Plan provides opportunities for trade

An objective of the Plan is to provide opportunities for market-based trading of access licences and water allocations within sustainability and system constraints. The Commission found that the Plan provides for trade opportunities, but activities are somewhat limited by restrictive trade rules.

Water trading is intended to encourage the movement of water licences to high value uses.[314] The trade of water access licences or associated shares generally occurs on a permanent basis, while the trade of annual allocations allows for trade on a temporary basis.

Trading within the Plan area is governed by the Plan's trading rules. These rules were established with consideration of hydrological constraints and other potential impacts from trade, primarily related to environmental values.[315]

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312 .id Demographic Resources (2019) *MidCoast Council – Economic profile.* Available at: https://economy.id.com.au/midcoast.

313 Department of Primary Industries (2017*) Final Report: Lower North Coast Water Sharing Plan amendment review – socio-economic impact assessment of cease-to-pump options.*

314 Commonwealth of Australia (2018) *National Water Initiative.* Available at: http://www.agriculture.gov.au/water/policy/nwi.

315 DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Source – Background document for amended plan 2016.* Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

In general, trading is permitted within water sources, subject to assessment and restrictions on trading between certain management zones. Some trading is also permitted between certain water sources but this is typically subject to additional assessments or restrictions based on 'no net gain'[316] in entitlement rules.[317] Water sources classified as having high instream value were protected by the Plan and trade is not allowed in them.[318]

The Plan also places a range of other restrictions on trading. For example, there are restrictions on the assignment of allocation water based between certain licence categories.[319] There are also restrictions on the assignment of allocation water and access rights (share component) between aquifer licences based on the location of their nominated supply works.[320]

The Commission received anecdotal evidence that licence holders experienced challenges in identifying trading partners, as there is no trading platform and trading opportunities often rely on local networks. While technically outside the provisions of the Plan, this may place a practical restriction on trade in the Plan area.

According to the publicly available *NSW Water Register*, 395 trades occurred during the Plan period (**Table 17**). These trades have a total reported value of $3.76 million, although DPIE-Water have indicated that the available pricing data are incomplete and unreliable on a grouped basis.

The two types of trades that have occurred over the Plan period are:

- **transfer trades –** transfer to an access licence from one licence holder to another[321]
- **share assignment trades –** transfer of all or part of the share component of one access licence to another.

There were no allocation assignment trades over the Plan period. These trades involve the transfer of a volume of water from the account of one access licence to another. The draft DPIE-Water audit report from 2014 indicated that this type of trade had been restricted due to lack of metering to facilitate management of water users' account balances (see also **Section 6.2**).[322] As these trades require information on account water balances, they are generally only possible if a water user has installed a metering device.

316 'No net gain trades' means that a trade cannot increase entitlement in a water source to a level above that at the commencement of the Plan.

317 DPI-Water (2009) *Lower North Coast Unregulated water source rules*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/149899/Lower-North-Coast-Unregulated-water-source-rules.pdf.

318 DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Source – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

319 For example, dealings under Section 71T of the Act from a major utility access licence or from an unregulated river (high flow) access licence to another category of licence (Clause 69(2)(a)).

320 For example, dealings under Section 71T and 71Q of the Act from an aquifer access licence that nominates a supply works located more than 40 metres from the top of a river bank to one which is located within 40 meters of the top of the bank (Clause 69(2)(c)).

321 The *NSW Water Register* includes data on three categories of transfer trades for the Lower North Coast unregulated and alluvial water sharing plans: (1) sale or transfer of a water access licence or a holding in a water access licence from one holder to another under Section 71M of the Act; (2) action taken by a security interest holder to transfer the water access licence (or holding in the licence) by default under Section 71X of the Act; and (3) other forms of transfers such as transmissions and orders by the court.

322 DPI-Office of Water (2014) *Draft Audit of Implementation – Lower North Coast unregulated and alluvial water sharing plan audit report card – Prepared for the period between 1 July 2009 and 30 June 2014,* (unpublished).

Supplementary data provided by WaterNSW also indicate that dealings occurred over the Plan period to subdivide, consolidate, move and convert access licences. There were also dealings to amend licences to nominate alternative supply works. These dealings may be used in combination with other types of trades between licence holders, and therefore contribute to supporting opportunities for trade in the Plan area. For example, a party may choose to acquire a licence via a transfer trade and then nominate an alternative supply works.

Table 17: Summary of water access licence trades, 2009-10 to 2018-19[323]

Trade type	Licence category	Number of transactions	Total volume (ML) or share component (units)	Total reported price
Transfer trade (71M)	Unregulated River	266	20,870	$3,594,851
	Major Utility	1	20,000	-
	Local Water Utility	3	640	-
	Aquifer	7	570	-
	Domestic and Stock	21	194	-
	Sub-total	298	42,274	$3,594,851
Transfer trade (Other)	Unregulated River	74	5,785	
	Local Water Utility	9	17,256	-
	Aquifer	3	374	-
	Domestic and Stock	2	6	-
	Sub-total	88	23,421	-
Transfer trade (71X)	Unregulated River	1	810	-
	Sub-total	1	810	-
Share assignment (71Q)	Unregulated River	8	221	$163,750
	Sub-total	8	221	$163,750
Allocation assignment (71T)	-	-	-	-
	Sub-total	-	-	-
Total		**395**	**66,726**	**$3,758,601**

323 WaterNSW (2019) *NSW Water Register*. Available at: https://waterregister.waternsw.com.au/water-register-frame.

Data from the *NSW Water Register* and DPIE-Water indicate that all trades occurred within the same water sources and management zones. This is consistent with the internal draft audit report from 2014, which indicated that there had been no applications to trade between water sources at that time. While some trading is permitted between certain water sources under certain conditions and assessments, the report also indicated that several clauses require knowledge of the sum of all access licence share components at the commencement of the Plan, and that the information to undertake this calculation is not readily available.[324]

Based on *NSW Water Register* data, the most common type of trade in terms of number of transactions and volume of entitlement traded was transfer trades (71M) of unregulated river access licences (**Table 17**). These occurred across 19 of the 22 surface water sources in the Plan area. Based on Water Register data, approximately 40 percent of the entitlement for this group of trades was traded in the three water sources classified at the commencement of the Plan as having a high level of economic dependence: Lower Manning, Lower Barrington/Gloucester, and Upper Gloucester water sources.[325] A further 24 percent was traded in the Karuah River Water Source, which was incorporated into the Plan in 2016 and had previously been covered by a separate water sharing plan.[326]

Very few of the trades (9 percent) have prices greater than $0 recorded against them. While this is not uncommon in some water markets,[327] it does limit the availability of information to the market, which in turn impacts on the effectiveness and efficiency of the water market. Reasons for price variation or absence may include prices being recorded incorrectly due to data entry errors, confusion about form requirements or because the price included other assets, such as land. In some cases, there are other legitimate reasons for trades appearing with zero dollars recorded against them, such as transfers between related entities or family businesses, although it may also reflect a reluctance for price disclosure by the water holders.

DPIE-Water indicated that the NSW Land Register Service is responsible for maintaining the Water Access Licence Register to keep a record of all water access licences. As part of this process, NSW Land Register Service records prices of water licence transfers. Where prices are provided by the transacting parties, these can sometimes bundle the price of land and water when both types of assets are included in the same sale. In these cases, it can be difficult to separate out the price paid for the water licence(s) which makes the transfer price data presented in the public *NSW Water Register* less reliable.

Given transfer trade price data in the *NSW Water Register* is unreliable, DPIE-Water noted that a better indication of the price of water can be obtained from share assignment (71Q) trades. The average price was $1,189 per ML for these trades; however, this is based on a small sample size of four trades from 2010-2012 and it is therefore unknown if these prices reflect the current value of water entitlements in the region.

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324 DPI-Office of Water (2014) *Draft Audit of Implementation – Lower North Coast unregulated and alluvial water sharing plan audit report card – Prepared for the period between 1 July 2009 and 30 June 2014* (unpublished).

325 DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Source – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

326 *Ibid*.

327 In its 2016-17 *Australian Water Markets Report*, ABARES reported that 74 percent of entitlement trade transactions in unregulated surface water systems outside the Murray Darling Basin record a $0 transaction, while all allocation trade transactions in unregulated surface water systems outside the Murray Darling Basin record a $0 transaction.

The Commission understands that WaterNSW has recently updated their trade application form to require price be included.[328]

5.2 There is some interest in increasing the flexibility of trade

Given the current restrictions on trade, including rules limiting trade between water sources with high instream values, some unregulated licence holders expressed an interest in the Plan providing for increased flexibility for water trade. For example, it was suggested that this could be achieved by broadening the areas where trade can occur. However, there were contradictory views expressed by other licence holders and water user stakeholders. For example, some irrigators consider there to be many dormant licences and do not want them activated through trade. Concerns were also raised around the impacts of water use on non-extractive industries such as the oyster industry, which is more concerned with salinity and reduced freshwater flows than trade rules, and the tourism industry, which values healthy waterways.

The Commission notes that the current trade rules were developed with input from the regional panel in line with the guidelines and processes documented at the time and consistent with the macro planning approach used in many unregulated river and groundwater systems in NSW. Any changes to the flexibility of trade rules would be challenging to implement given the current lack of metering and use data, and the lack of baseline data to inform impacts associated with trades, including environmental impacts and impacts on non-extractive other industries.

Any processes to change the rules allowing trade between water sources would need to consider hydrological connectivity, other environmental and industry impacts, and include broad stakeholder consultation. This would raise an appropriate level of awareness and understanding of the rules and assist in identifying any perverse or unintended outcomes.

Irrigator stakeholders also noted that some water access licences list 'whole-of-source' water sources (including tidal and non-tidal water sources) but they have been unable to trade between water sources. This is considered an administrative oversight and cause of frustration for these water users looking to trade. While the Commission did not assess individual licence conditions as part of this review, as a general principle, the Commission supports removing any inconsistent, conflicting or anomalous provisions from the Plan or conditions from licences where this is consistent with our other advice and recommendations, including any recommendations to protect the environment.

5.3 Implementation issues are limiting flexible water account management

The Plan aims to provide enough flexibility in water account management to encourage responsible use of available water. The Commission has found that while the Plan itself provides for flexibility, issues related to reporting of water use and metering are preventing effective Plan implementation.

Water allocation accounts are ledgers in which allocation announcements, carryover, allocation assignment water and water taken are recorded for each licence.[329] The account balance is the

328 Personal communication, DPIE-Water, received 27 February 2020.

329 WaterNSW (n.d.) *Glossary of water terms.* Available at: https://www.waternsw.com.au/customer-service/service-and-help/tips/glossary.

volumetric quantity of water that remains available to be taken by the licence holder during the water year.

The Plan contains provisions that govern the management of water allocation accounts, including the accounting rules around AWDs, carryover of unused water balances, allocation assignments ('temporary' trades) and annual water use limits. These rules ultimately determine the volume of water available to licence holders each year.

AWDs are primarily used to credit water into water allocation accounts for each licence at the commencement of each water year but can also be used to manage growth in extractions above the LTAAEL (see **Section 3.2**).[330]

Carryover allowances enable licence holders to carry over their water balance from one year to the next, up to a maximum of 100 percent of the share component for unregulated river access licences, and to use up to twice their annual water allocation in a given year provided that over a consecutive three year period their use does not exceed the sum of their water allocations for those three years.[331]

The water account management rules are intended to provide flexibility and encourage responsible use of available water, in line with Objective 10(f) of the Plan. For example, carryover provisions allow licence holders to carryover that part of an allocation that remains unused at the end of the year – for example, due to water not being available for extraction due to low flows and daily access rule extraction limits – to the following water year to be taken at a time when flows are higher. The variability of annual flows in unregulated rivers is therefore reflected in the accounting rules.[332] Similarly, reductions in allocations may be implemented to flexibly control growth in use if the average annual use exceeds the LTAAEL over multiple years.[333]

While these account rules intend to provide flexibility, in practice there is a general lack of metering and reporting of water use, particularly by unregulated river access licence holders - the largest licence category by share component (see **Table 5** in **Section 2.3**). The Commission notes that a key exception is the use reporting by local water utility licences held by MidCoast Council.

The lack of metering and reporting of water use means that water account balances in water allocation accounts are not reduced by the volume of water taken by irrigators and other licence holders during the year. As a result, the account management process is of significantly less use. As mentioned in **Section 5.1**, the adoption of allocation assignment trades – which are also captured in water accounts – have also been restricted due to this lack of metering and reporting of water use (see also **Section 6.2**).

330 DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Source – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

331 *Ibid*.

332 *Ibid*.

333 *Ibid*.

The Commission's findings regarding poor reporting of water use is consistent with findings from the draft internal audit report from 2014.[334] The draft audit indicated that account management provisions for all licence categories, except major utility licences, had not been implemented as broad scale metering had not been rolled out across NSW.

The Commission notes that a new metering framework for non-urban water meters in NSW commenced on 1 December 2018 (discussed further in **Section 6.2**). The replacement Plan should be consistent with this framework. Although this framework is expected to lead to some improvement around metering in the Plan area by 2023, it is estimated that only 16 percent of pumps (by count of approved supply works) are likely to require metering.[335] In addition, users not required to have meters will be subject to new mandatory conditions requiring them to keep certain records about their water take.[336]

DPIE-Water advised they are developing a program to capture all trade information following a trade price audit report in 2019. Further DPIE-Water and WaterNSW are in the process of improving trade application forms to include mandatory price reporting, justification of price, and identify purposes of trades.[337]

Overall, the account management rules are difficult to implement without appropriate infrastructure or processes to facilitate their implementation.

5.4 The full range of economic benefits and impacts should be assessed

The Commission recognises that changes to water sharing provisions will have socioeconomic implications for the region, either positive or negative.

DPIE-Water assessed the socio-economic impacts from changes in cease to pump thresholds (described in **Section 3.3.3**) in three water sources with high level of economic dependence.[338] The study findings suggested that:

- changing cease to pump levels to the 98th percentile would be socio-economically acceptable for three water sources
- changing the 95th percentile flow rate would be socio-economically unacceptable.

Submissions from some irrigator groups expressed concerns regarding DPIE-Water's study and the impacts of 98th percentile water access rules. Submissions noted that the thresholds would place financial pressure on irrigators, which may compound current impacts of drought and incur additional costs for some water users (see also **Section 4.3**).

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334 DPI-Office of Water (2014) *Draft Audit of Implementation – Lower North Coast unregulated and alluvial water sharing plan audit report card – Prepared for the period between 1 July 2009 and 30 June 2014* (unpublished).

335 Information provided by WaterNSW on pump capacity data for the Plan area, received via email 18 October 2019. Data presented is an estimate only and does not consider multiple works on the same licence, approval or landholding the meet the capacity threshold.

336 DPIE-Water (2018) *NSW Non-Urban Water Metering Policy*, p. 17. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0017/205442/NSW-non-urban-water-metering-policy.pdf.

337 Personal communication, DPIE Water, 28 February 2020

338 Lower Manning, Lower Barrington/Gloucester and Upper Gloucester water sources. See DPI-Water (2017) *Final Report: Lower North Coast Water Sharing Plan amendment review – socio-economic impact assessment of cease-to-pump* options (unpublished).

As noted in **Section 3.3.3**, the 98th percentile cease to pump thresholds were adopted in the Plan from 1 August 2016 but licensees were not officially notified, hence they do not have to implement the rules and they cannot be enforced.

DPIE-Water's assessment of socio-economic implications did not address the full range of potential social or economic impacts and risks. These must be incorporated to avoid perverse outcomes and ensure potential impacts are considered and addressed. Benefits and impacts that are not currently considered and should be assessed in the replacement Plan include:

- benefits and impacts of flow and water quality on non-extractive industries and water uses such as tourism, high value aquaculture, utility use, ecosystem services and community activities
- benefits and impacts from extractive industry.

5.5 Recommendations

The Commission's recommendations in relation to economic outcomes are presented in **Table 18** and suggested actions in **Table 19**.

Table 18: Recommendations for improving economic outcomes

Recommendations	
13	Assess the economic dependence of each water source in the Plan area to inform Plan provisions, with the assessment described in the replacement Plan's background document considering the full range of economic benefits and impacts including: a) extractive industries (for example dairy, beef) b) non-extractive industry (for example tourism, aquaculture) c) community and ecological services (for example, amenity, suitable water quality).

Table 19: Suggested actions for improving economic outcomes

Suggested actions	
F*	DPIE-Water should continue to implement their program to improve all trade information. In finalising this program DPIE-Water should coordinate with agencies to: a) support improvements in price reporting by licence holders b) ensure account management rules are fit for purpose and implementable c) ensure consistent alignment of plan provisions and licence conditions for trade d) consider environmental and industry impacts as part of any review of trade rules.

6 Opportunities to improve MER

There have been limited MER activities since the Plan commenced. In addition, there is little information available – particularly to the public – to indicate whether the Plan objectives are being met and what, if any, adaptive management may be required.

There has been one publicly-released audit report card that covers Plan implementation during the period 1 July 2009 to 30 June 2014.[339] This focused primarily on the extent to which the Plan provisions had been applied and did not report on the monitoring of performance indicators for social, environmental and economic objectives.

Apart from this audit, no further performance reporting against the Plan's specified performance indicators or objectives has been made publicly available. The Commission is not aware of any MER for environmental water or the environmental condition of the water sources in the Plan area by DPIE-Water. During consultation, stakeholders criticised the lack of public reporting.[340] They indicated that a lack of clarity around MER activities led to uncertainties and concerns about Plan performance.

An assessment of the ecological and socioeconomic performance of water sharing plans for the Hunter Valley, Central and Lower North Coast was undertaken in 2009-10 and the results were publicly reported.[341] However, this process did not continue after this first round of public reporting, so there is no equivalent performance assessment for the duration of the Plan.

The lack of MER – particularly around extraction – is undermining the outcomes of the Plan, notably the determination and enforcement of environmental water requirements, the function of the LTAAEL, and the performance of water account management and trade.

The replacement Plan should include Plan-specific MER framework that:

- increases the measurement of extraction and flow
- addresses identified knowledge gaps
- clearly defines outcomes and assesses them against clear and linked objectives, strategies and performance indicators assesses
- supports adaptation and improvement.

339 DPI-Water (2014) *Lower North Coast unregulated and alluvial water sharing plan audit report card - Prepared for the period between 1 July 2009 and 30 June 2014*, Sydney NSW (unpublished).

340 Interviews: Nature Conservation Council, 21 October 2019 and MidCoast Council, 31 October 2019.

341 DPIE-Water (2011) *Environmental flow response and socio-economic monitoring. Hunter Valley, Central and Lower North Coast- progress report 2010.* Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/146284/EFR-socio-economic-monitoring-hunter-valley-central-lower-north-coast-rpt-2010.pdf.

6.1 A Plan-specific MER framework is needed

DPIE-Water developed a *Monitoring, Evaluation and Reporting Framework*[342] with three main strategies for evaluating water sharing plans:

- assessment of performance indicators (using the *Environmental Flows Monitoring and Modelling Program*)[343]
- implementation audit of plans
- review of each plan at the end of its ten-year term.[344]

The lack of quality MER is a significant and recurring issue across NSW that has been repeatedly highlighted in previous Commission reviews, as well as by the National Water Commission.[345] As a result, DPIE-Water should include additional MER requirements in the replacement Plan and a Plan-specific MER framework should be developed to support implementation.

The Commission acknowledges that MER is done by multiple agencies (including DPIE-Water, DPIE-EES, and WaterNSW) and this has created confusion and been a barrier to knowledge sharing. For instance, water quality assessment is typically carried out by DPIE-EES, rather than DPIE-Water. There are also a range of other parallel assessments of water condition at various spatial and temporal scales.[346]

DPIE-Water advised that it is currently developing a MER framework for coastal water sharing plans which will assist coordination of activities conducted by all agencies.[347] This framework needs to be finalised and used to inform the replacement Plan.

As part of the MER arrangements for the Plan, DPIE-Water should consider:

- clearly defining roles and responsibilities around MER for the Plan
- using a platform where MER information is publicly available in a timely manner to support knowledge sharing and adaptive management.

MER activities should be supported by adequate resources. However, the Commission recognises there is a need to ensure the cost of MER is proportionate to the risk to the resource of over extraction.

342 DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Source – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

343 This program aims to help make flow study results more transferable between water sources, and identify links between flow, hydraulics and ecological responses (*Ibid*).

344 *Ibid*.

345 National Water Commission (2014) *The National Water Planning Report Card 2013*, p. 11. Available at: http://www.agriculture.gov.au/SiteCollectionDocuments/water/2013-national-water-planning-report-card.pdf.

346 Examples of monitoring data include the NSW Government (2010) *State of the catchments 2010*. Available at: https://www.environment.nsw.gov.au/soc/huntercentralrivers.htm.; and the *NSW Marine Estate Management Strategy 2018 – 2028* monitoring programs may also soon provide useful environmental information in estuaries that may benefit Plan performance monitoring.

347 Personal communication, DPIE-Water, 28 February 2020

6.2 A lack of metering affects monitoring, compliance, Plan rules and trade

The lack of metering and flow gauging is a key issue. Although the local water utility access licence holder (MidCoast Council) reports annually on extraction and compliance with the rules, compliance and enforcement activities for other licence holders is limited as licence holders in most of the water sources do not have metered pumps.

Without effective and widespread monitoring and reporting of extraction, broader compliance with the Plan's LTAAELs is difficult to assess and enforce (see **Section 3.2**). Data about the volume of water extracted are also fundamental to the development of Plan provisions, particularly the cease to pump rules (see **Section 3.3**). In addition, extraction data facilitates the management of water users' account balances, which in turn supports trading activities (**Section 5.1**).

There are similar requests from stakeholders for metering to be increased and Plan access rules enforced, with effective follow-up of identified breaches.

The Commission notes that the NSW Government has established a new metering framework for non-urban water meters in NSW, which commenced on 1 December 2018 and will be delivered in a staged process. Coastal regions are required to comply by 1 December 2023.[348]

In the Plan area, it is estimated that only 16 percent of pumps (by count of approved supply works) are 100 millimetres or larger and therefore likely to be impacted by these metering reforms.[349] However, the policy outlines that users not required to have meters will be subject to new mandatory conditions requiring them to keep certain records about their water take.[350] It will be important to balance the cost of these controls with the risk to the resource of over extraction as multiple stakeholders voiced concerns about the cost to licence holders of increased metering.[351]

The Plan[352] area is reasonably well gauged, and the NSW government has improved the flow gauging stations since 2009. Real time hydrometric stations have been established for all flow reference points in the Plan that specify numeric flow conditions.[353] Any changes to flow gauges or flow reference points that have occurred since Plan commencement need to be included in the replacement Plan. Stakeholders suggested that an increased number of flow gauges be installed across the system to increase the knowledge base and better inform future water

348 Except for pumps 500 millimetres or larger, which are required to comply by 1 December 2019. However, there are no pumps of this size in the Plan area according to WaterNSW (DoI-Water (2018) *NSW non-urban water metering framework*, p. 1 and p. 16. Available at: https://www.industry.nsw.gov.au/water-reform/metering-framework).

349 Information provided by WaterNSW on pump capacity data for the Plan area, received via email 18 October 2019. Data presented is an estimate only and does not consider multiple works on the same licence, approval or landholding the meet the capacity threshold.

350 DPIE-Water (2018) *NSW Non-Urban Water Metering Policy*, p. 17. Available at: www.industry.nsw.gov.au/__data/assets/pdf_file/0017/205442/NSW-non-urban-water-metering-policy.pdf.

351 Note: financial incentives ('two-part tariffs') to install meters have already been offered to licence holders but this had not resulted in a significant increase in meter installations (DPI-Water (2014) *Lower North Coast unregulated and alluvial water sharing plan audit report card - Prepared for the period between 1 July 2009 and 30 June 2014* (unpublished).

352 Clause 16 of the Plan.

353 DPI-Water (2014) *Lower North Coast unregulated and alluvial water sharing plan audit report card - Prepared for the period between 1 July 2009 and 30 June 2014* (unpublished).

sharing planning.[354] While gauging is generally good, some water sources do not have operational gauges and require observation and reporting of flows by stakeholders. Some water users reported that having a live electronic gauge that can be easily accessed by everyone for data on daily water flow is extremely useful.[355]

Monitoring of extraction bores (including for stock and domestic), along with water quality sampling of these bores, should also be encouraged to facilitate accurate records of groundwater take and assessment against sustainable extraction limits.

DPIE-Water should ensure the replacement Plan is consistent with the provisions of the *NSW Non-Urban Water Metering Policy (2018)* and investigate the expansion of flow gauges to improve the standard and coverage of data.

6.3 Gaps in the Plan's knowledge base need to be addressed

The Plan's background document recognised that the Plan's provisions were based on available data but that integrated hydrological and ecological studies and socio-economic models were required to better assess trade-offs.[356] It specifically acknowledges that:

> 'in fourteen of the Lower North Coast unregulated water sources, adequate information to develop water sharing rules which could fully manage the risk to instream values and/or protect community dependencies was lacking'.

The background document advised that further analysis or data collection would be undertaken during the life of the Plan, including additional monitoring or studies on surface water flows and tidal pool behaviour, salinity levels and estuarine water requirements. Issues identified as requiring further data collection or study included salinity and extraction levels in the Manning River Tidal Pool, and determination of appropriate cease to pump levels and access rules in various water sources.[357] Additional information was to be collected in order to inform adaptive management and amendment of the Plan provisions.

The Commission understands that despite these knowledge gaps being identified, only further investigations related to cease to pump provisions have been undertaken (**Section 3.3**). The monitoring activities and studies associated with other identified knowledge gaps have not been undertaken and no associated Plan amendments have occurred. As a result, a lack of knowledge remains around key aspects of the Plan and Plan area, including critical issues such as the connectivity of groundwater and surface water systems, and the status and extent of high potential groundwater dependent ecosystems.

Stakeholders consistently identified that there were gaps in the knowledge base and a lack of environmental studies underpinning the Plan provisions:

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354 MidCoast Council also advised that it previously provided rebates for 10 meters on the Barrington River but did not negotiate to get the results of those flow meters.

355 Submission: Dingo Creek Water Users Association, received 1 November 2019.

356 DPI-Water (2016) *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Source – Background document for amended plan 2016.* Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/166855/lower-nth-coast-unreg-alluvial-background.pdf.

357 *Ibid*.

> *"The plan failed to use the best available scientific evidence to demonstrate sufficient environmental water was allocated".*[358]

In addition, there was concern about the poor progress in undertaking monitoring and studies to address known knowledge gaps. There was an understanding that many of the planned field studies over the life of the Plan had not been undertaken, or where they have been undertaken, they have not been adequately reflected in the Plan. Stakeholders noted areas for improving the evidence base of the Plan, including:

- groundwater connectivity
- salinity management and monitoring
- the impact of prolonged droughts
- climate change data, modelling and impacts.

Stakeholders also reported that in the absence of evidence generated by DPIE-Water, some other agencies and organisations – including Local Land Services and local councils – were undertaking their own relevant studies and investigations.

The Commission suggests that DPIE-Water draw on available information from existing sources and identify any further studies required to improve the Plan's knowledge base. Identifying state-wide research needs and knowledge gaps across all water sharing plans may assist in streamlining this process, alongside collaborating with other organisations and research institutions.

6.4 Outcomes should be defined and align with water management principles

Clearly defined outcomes and links between outcomes, objectives, strategies and performance indicators are the foundation of robust monitoring, evaluation and reporting frameworks.

The Plan does not clearly specify environmental, social and economic outcomes that are prioritised in line with the Act. It also does not provide suitable, well-defined objectives, strategies and performance indicators in line with best-practice approaches or present a clear logical flow between these components.

The Plan itself includes several standard performance indicators derived from the *Monitoring, Evaluation and Reporting Framework* that are supposed to be monitored during implementation.[359] However, the Plan lacks clear links between its objectives, outcomes and performance indicators. The performance indicators are also high-level and impractical to evaluate against and contain significant gaps, such as the lack of performance indicators for equitable sharing of water between users (**Section 4.4.4**).

To support delivery of Plan outcomes, the replacement Plan needs revised objectives, strategies and performance indicators developed using best-practice approaches. These should demonstrate clear and logical relationships, be SMART, and appropriately prioritise the full range of water management principles listed in the Act (outlined in **Section 1.1.1**). These aspects should underpin the Plan-specific MER framework (**Section 6.1**).

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358 Submission: MidCoast Council, received 16 September 2019.

359 Part 2, Clause 12 of the Plan.

The Commission recognises that DPIE-Water have already identified these issues and are taking steps to address them. The *Guidelines for setting and evaluating plan objectives for water management* were developed in 2018 as a response to earlier water sharing plan reviews.[360] These reviews found that some objectives could not be fully evaluated as their links to Plan strategies and rules were not clear, and supporting documentation was not readily available.[361] The guidelines provide a step-by-step process for setting and documenting evaluable plan objectives, strategies and performance indicators and therefore present a key component of a comprehensive approach to MER (**Section 6.1**).

DPIE-Water is also currently improving objectives in water sharing plans as part of the water resource planning process under the Australian Government's *Murray Darling Basin Plan*. The Commission understands that a similar approach will be taken to improve the coastal unregulated water sharing plans in the future. Arrangements would need to be tailored to reflect the nature and scale of the Lower North Coast, but these programs could provide a suitable reference point in making a new monitoring, evaluation and reporting framework for the replacement Plan. Development of replacement Plan objectives could also be informed by other planning in place or underway including the *Hunter Regional Plan 2036* [362] and the regional water strategies being developed across by NSW DPIE-Water.

6.5 The replacement Plan should better support adaptive management

The Plan includes provisions for adaptive management, including amendment of Very Low Flow Class provisions, tidal pool and pool protection provisions, floodplain and stormwater harvesting, and provisions for alluvial aquifers downstream of the tidal limit. These provisions were intended to allow the Plan to be improved over time and incorporate new information, such as updated mapping and modelling. Continually improving the Plan with new information is important, particularly given the limitations in the evidence base when the Plan rules were set (**Section 6.3**). Apart from updating the Very Low Flow Class provisions in 2016 (**Section 3.3**), the Commission is not aware of any instances where these amendments have been made.[363]

During consultation, stakeholders indicated that they wanted the Plan to be improved based on new information from monitoring, field verification and other studies:

> "*Updating of the Plan should be done more frequently than every ten years, as information becomes available*".[364]

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360 DoI (2018) *Guidelines for setting and evaluating plan objectives for water management*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0005/172373/guidelines-for-setting-and-evaluating-plan-objectives.pdf.

361 *Ibid*.

362 Department of Planning and Environment (2016) *Hunter Regional Plan 2036*, p. 29. Available at: https://www.planning.nsw.gov.au/-/media/Files/DPE/Plans-and-policies/hunter-regional-plan-2036-2016-10-18.pdf.

363 DPI–Water's 2014 unpublished audit report identifies that the Minister has not exercised the discretion to implement any of the available amendments. Reference: DPI-Water (2014) *Lower North Coast unregulated and alluvial water sharing plan audit report card - Prepared for the period between 1 July 2009 and 30 June 2014* (unpublished).

364 Submission: MidCoast Council, received 16 September 2019; and NSW Irrigators' Council, received 25 October 2019.

The replacement Plan should better support adaptive management in response to new information being generated. It appears that the general provisions for amendments within the Plan are not leading to effective adaptation and improvement. The replacement Plan and Plan-specific MER framework should identify appropriate governance arrangements and timeframes for adaptation that will underpin the adaptive management process.

The types of information that could be used in replacement Plan design and incorporated into an adaptive monitoring, evaluation and reporting framework could include current and updated:

- climate change and climate variability modelling
- environmental and flow studies relevant to the catchment
- High Ecological Value Aquatic Ecosystems Assessment mapping
- groundwater dependent ecosystem mapping in the Bureau of Meteorology's *Groundwater Dependent Ecosystems Atlas*[365]
- drought data and management plans
- land-use data including current infrastructure to inform modelling
- updated policies for example reasonable use guidelines
- current hydrological datasets
- ecological datasets and modelling (for example, SEED Portal[366], *Directory of Important Wetlands*[367], listed threatened species, monitoring of vulnerable habitats, fish sampling)
- riverine and estuarine condition studies
- Saving our Species program threatened species data[368]
- targeted research projects to fill knowledge gaps and inform ongoing decision making
- socio-economic modelling and impact assessments.

365 Bureau of Meteorology (2019) *Groundwater Dependent Ecosystems Atlas*. Available at: http://www.bom.gov.au/water/groundwater/gde/.

366 NSW Government (n.d.) *SEED Sharing and Enabling Environmental Data*. Available at: https://www.seed.nsw.gov.au/edphome/home.aspx.

367 Department of the Environment and Energy (n.d.) *Directory of Important Wetlands*. Available at: http://www.environment.gov.au/water/wetlands/australian-wetlands-database/directory-important-wetlands.

368 DPIE-EES (n.d.) *Saving our Species program*. Available at: https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/saving-our-species-program.

6.6 Recommendations

In order to strengthen MER for the replacement Plan, the Commission presents the following recommendations (**Table 20**) and suggested actions (**Table 21**).

Table 20: Recommendations for improving MER

Recommendations	
14*	By 2020, finalise the draft NSW MER framework for coastal water sharing plans to inform the development of the replacement Plan. This should include: a) a Plan-specific MER program following established guidelines b) clear governance arrangements for MER, including roles and responsibilities c) timely public reporting of the results of monitoring and evaluation activities to support transparency, public awareness and active compliance d) appropriate governance arrangements and timeframes for adaptation and improvement, particularly in response to new information e) metering and record keeping provisions consistent with the NSW Government's planned new framework for measurement and metering of water take.
15*	Improve the foundations for monitoring, evaluation and reporting on the replacement Plan by including: a) SMART objectives, strategies and performance indicators that align with the water management principles in the Act and clearly address the prioritisation of environmental, social (including native title) and economic outcomes b) clear logical links demonstrated between the objectives, strategies, performance indicators and rules.

Table 21: Suggested actions for improving MER

Suggested actions	
G*	Identify Plan-specific and state-wide research needs and knowledge gaps across all water sharing plans and seek to address these gaps in collaboration with other organisations and research institutions.
H*	Make all monitoring, modelling and research associated with the replacement Plan publicly available to improve accountability and transparency.